FINAL DRAINAGE REPORT

FOR

WIDEFIELD WATER & SANITATION DISTRICT

BOOSTER 2 PUMP STATION REPLACEMENT

EL PASO COUNTY, COLORADO

100% Submittal

February 2022

Prepared for:

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Prepared by:



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Project #70-077 CID No. 2019.815.2027 PCD Project # PPR-21-069

FINAL DRAINAGE REPORT FOR WIDEFIELD WATER & SANITATION DISTRICT BOOSTER 2 PUMP STATION REPLACEMENT

DRAINAGE PLAN STATEMENTS

ENGINEERS STATEMENT

The attached drainage plan and report was prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Darin L. Moffett, P.E. #38923 For and on Behalf of M&S Civil Consultants, Inc

DEVELOPER'S STATEMENT

I, the developer have read and will comply with all the requirements specified in this drainage report and plan.

TITLE District Engi DATE: 2

ADDRESS: Widefield Water and Sanitation District 8495 Fontaine Blvd. Colorado Springs, CO80925

EL PASO COUNTY'S STATEMENT

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

	APPROVED Engineering Department		
BY:	05/31/2022 3:21:28 PM dsdnijkamp EPC Planning & Community Development Department	 DATE:	

County Engineer/ECM Administrator

CONDITIONS



FINAL DRAINAGE REPORT FOR WIDEFIELD WATER & SANITATION DISTRICT BOOSTER 2 PUMP STATION REPLACEMENT

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FINAL DRAINAGE REPORT FOR WIDEFIELD WATER & SANITATION DISTRICT BOOSTER 2 PUMP STATION REPLACEMENT

PURPOSE

This document is intended to serve as the Final Drainage report for the Widefield Water & Sanitation District Booster 2 Pump Station. The purpose of this document is to identify and analyze the on and offsite drainage patterns and to ensure that post development runoff is routed through the sitesafely.

GENERAL LOCATION AND DESCRIPTION

The Widefield Water & Sanitation District (WWSD) Booster 2 Pump Station and associated infrastructure and site improvements are to be constructed within both an un-platted parcel and Tract D of Widefield County Club Heights East both of which contiguous and under the ownership of the WWSD.

The parcels of land are located within a portion of the northwest quarter of the southeast quarter and within a portion of the southwest corner of the northeast quarter of Section 19, Township 15 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The site to the north and south by developed residential lots (Lot 7 & Lot 8 of Block 1) within Widefield Country Club Heights East and to east by existing Metropolitan Street Rights-of-Way and to the west by a portion of the Fountain Mutual Irrigation Company Channel (FMIC). Flows from this site are tributary to the East Big Johnson drainage basin and are ultimately tributary to Fountain Creek.

With the exception of the existing tank, pump house, fences and underground utilities the two parcels remain largely undeveloped. Vegetation is sparse, consisting of native grasses. The site has likely experienced overlot grading activities associated within the construction of the existing facilities and adjacent subdivision which occurred in the latter part of the 1970's. The existing site terrain generally slopes from east to west at grade rates that vary between 1% and 10%. The side slopes of the adjacent FMIC channel, directly to the west and southwest of the subject possess steep vegetative slopes that typically range between 1:1-2:1 (H:V).

As previously discussed the proposed site improvement will include a new pump station building and gravel access/parking lot. A small asphalt or concrete access drive with cantilever gate and additional security fencing will added along with below ground utility extensions necessary to connect the pump house to the existing tank site and subsequent waterlines. A small storm water collection system and landscaping will also be provided.

SOILS

Soils for this project are delineated on the Soils map in the appendix as have been determined to be Truckton Sandy Loam (97) and Wiley Silt Loam which have been characterized as Hydrologic Soil Types "A". Soils in the study area are shown as mapped by S.C.S. in the "Soils Survey of El Paso County Area". As previously discussed, vegetation on the site is sparse, consisting of native grasses and weeds.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual and where applicable the Urban Storm Drainage Criteria Manual. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

HYDRAULIC CALCULATIONS

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual. The relevant data sheets are included in the appendix of this report.

FLOODPLAIN STATEMENT

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0952 G, effective date December 07, 2018. An annotated FIRM Panel (Floodplain Map) is included in the Appendix to illustrate that <u>NO</u> portion of the site lies within the regulatory 100-year floodplain.

DRAINAGE CRITERIA

This drainage analysis has been prepared in accordance with the current City of Colorado Springs/El Paso County Drainage Criteria Manuals. Calculations were performed to determine runoff quantities for the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres.

FOUR STEP PROCESS/WATER QUALITY

The proposed project is considered to be development with less than 1 acre of disturbance and is not part of a large common plan of development or sale, as a result no water quality improvements are required per the El Paso County Municipal Separate Storm Sewer System (MS4) Permit.

The proposed and existing conditions have been developed for information purposes and to ensure runoff is safely routed and erosion control is properly implemented. As the proposed earthwork moving activities are anticipated to exceed 500 cubic yards a Stormwater manage Program Plan (SWMP) and Erosion and Stormwater Quality Control Permit (ESQCP) will be provided. A copy of the Proposed Grading and Erosion Control Plans are provided within the appendix of this report.

EXISTING DRAINAGE CONDITIONS

The two parcels that make up the existing site consist of approximately 1.69 acres. With the exception of the existing tank, pump house, fences and underground utilities the parcels remain largely undeveloped. The existing site terrain generally slopes from east to west at grade rates that vary between 1% and 10%. A small ridgeline which runs east to west generally divides the subject site into a north and south basin. With the exception of a small portion of the adjacent residential lot located to the south of the site and a very small portion of the adjacent Rights-of-Way (0.01 ac), the site is not burdened by offsite runoff, having nearly all of the site drainage directed to the adjacent Fountain Mutual Irrigation Company Channel as sheet flow. Onsite inspection shows limited reeling along the channel slopes from subject site

runoff. A small onsite area located at the southeast corner of the site (0.03 acres) discharges to the adjacent Metropolitan street curb and gutter where it is direct to a low point and sump inlet located north of the subject site. Flows intercepted by the inlet appear to be directed to the FMIC via an existing storm sewer (located to the north of lot 7).

Detailed Existing Drainage Discussion

Basin OS1, 0.01 acres, ($Q_5 < 0.1$ cfs, $Q_{100} < 0.1$ cfs), consists of a small area of existing vegetated rights of way located to the west of the subject site. Runoff produced within the Basin OS1 sheet flows to into Basin A.

Basin A, 0.83 acres, $(Q_5=0.3 \text{ cfs}, Q_{100}=1.9 \text{ cfs})$, consists of a portion of the undeveloped Tract D. Runoff produced within the Basin A combines with flows from Basin OS1 and travels as both sheet and concentrated runoff to the northwest and to the existing FMIC channel. The combined runoff from the 0.84 acres totals 0.3 cfs and 2.0 cfs in the 5 and 100 year storm events respectively at east channel bank (Design Point 1).

Basin OS2, 0.11 acres, ($Q_5=0.1$ cfs, $Q_{100}=0.4$ cfs), consists of a portion of residential Lot 3, Blk 1 of Widefield County Club Heights East. Runoff produced within the Basin OS2 travel west as sheet flow and enters Basin B along the southern property boundary.

Basin B, 0.83 acres, ($Q_5=0.4$ cfs, $Q_{100}=2.3$ cfs), consists of the majority of the south half of the site and includes the existing pump house and water tank. Runoff from Basin B combines with flows from offsite basin OS2 and travels as sheet and concentrated flow to the south west property line and the existing FMIC channel at Design Point 2 ($Q_5=0.3$ cfs, $Q_{100}=2.7$ cfs).

Basin C, 0.03 acres, $(Q_5 < 0.1 \text{ cfs}, Q_{100}=0.1 \text{ cfs})$, consists of a segment of existing vegetated roadway rights of way. Runoff produced within the Basin C sheet flows to the west curb and gutter of existing Metropolitan Street. Flows collected with the west curb and gutter section is conveyed north to an existing offsite sump inlet.

PROPOSED DRAINAGE CHARACTERISTICS

General Concept Drainage Discussion

In the proposed condition the site improvements will include installation of a new pump station building and gravel access/parking lot. A small asphalt or concrete access drive with cantilever gate and additional security fencing will added along with the various below ground utility extensions necessary to connect the pump house to the existing tank site and subsequent waterlines. Runoff within the south half of the two parcels generally not be disturbed and will continue to drain as in the existing condition. While drainage from the north half of the site, where improvements are proposed, will now be collected and conveyed by a pair of earthen swales which will direct runoff to a proposed storm drain located at the far west end of the site. A small offsite easement will be required to construct and maintain the proposed storm sewer pipe and outfall. A riprap pad is proposed at the terminus of the pipe to protect the existing channel from any erosion that otherwise might be caused from the existing concentrated. In addition to the riprap armoring around the proposed flared end section, seeded permanent erosion control blanket is proposed to aid in protecting and restoring vegetation to the steep slope of the FMIC channel, where the channel bank will need to be removed and replaced in order to install the pipe. A small amount of riprap is also planned at the entrance of the storm sewer to stabilize the steep slope at the proposed A detailed drainage discussion for each proposed conditions sub-basin is described FES.

below. A worksheet detailing the calculated coefficients for each sub-basin and developed times of concentration can be found in the appendix under Hydrologic Calculations.

Detailed Drainage Discussion

Basin A1, 0.07 acres, ($Q_5 < 0.1$ cfs, $Q_{100}=0.2$ cfs), consists of a segment of slope grading located along the north and northwest sides of the development. Flows produced within the Basin A1 sheet flow to the existing FMIC channel as in the existing condition. Flows reaching the northwest boundary of the site at Design Point 1 are calculated at less than 0.1 cfs the 5 year event and 0.2 cfs in the 100 year stormevent.

Basin A2, 0.50 acres, ($Q_5=1.4$ cfs, $Q_{100}=2.5$ cfs), consists of a portion of the proposed booster pump house, proposed gravel parking area as well as re-vegetated portions of the existing lot. Runoff from Basin A1 is routed as surface runoff via a min. 1'deep earthen swale to DP1A.

Basin OS1, 0.01 acres, ($Q_5 < 0.1$ cfs, $Q_{100} < 0.1$ cfs), consists of a small area of existing vegetated rights of way located to the west of the subject site. Runoff produced within the Basin OS1 sheet flows to into Basin A3.

Basin A3, 0.35 acres, ($Q_5=0.1$ cfs, $Q_{100}=0.4$ cfs), consists of a portion of the proposed booster pump house, proposed gravel parking area as well as re-vegetated portions of the existing lot. Runoff from Basin A3 is routed as surface runoff via a min. 1'deep earthen swale to DP1A, where it ultimately combines with flows from Basins OS1 and A2 at a proposed 18" private reinforced concrete culvert totaling $Q_5=0.8$ cfs, $Q_{100}=2.6$ cfs. The installation of a culvert to convey runoff from the site directly to the FMIC, will significantly reduce any potential erosion caused by the uncontrolled release of developed runoff across the steep channel embankment slopes.

JDS Hydro has determined in correspondence with the FMIC that approximately 50 cfs is conveyed by the irrigation channel. Given an calculated slope of 0.05%, a bottom width of approximately 9' and 1 to 1 (H:V) side slopes and a n value of 0.03, the calculated normal depth of the channel is approximately 30" at a velocity of 1.7' feet per second. This low tailwater condition will not adversely affect the proposed hydraulics of the proposed storm culvert given the pipe grade and entrance elevation and limited runoff there by allowing for free discharge. Given the design slope of 13.5% the proposed 18" culvert will convey the 2.6 cfs at a normal depth of 3.2" and at a velocity of 12.4 feet per second in the 100 year event. Refer to the Hydraulic Calculations portion of the appendix for additional information.

Basin OS2, 0.11 acres, ($Q_5=0.1$ cfs, $Q_{100}=0.4$ cfs), consists of a portion of residential Lot 3, Blk 1 of Widefield County Club Heights East. Runoff produced within the Basin OS2 travel west as sheet flow and enters Basin B along the southern property boundary.

Basin B, 0.74 acres, ($Q_5=0.4$ cfs, $Q_{100}=2.1$ cfs), consists of the majority of the south half of the site and includes the existing pump house and water tank. Runoff from Basin B combines with flows from offsite basin OS2 and travels as sheet and concentrated flow to the south west property line and the existing FMIC channel at Design Point 2 ($Q_5=0.6$ cfs, $Q_{100}=2.9$ cfs).

Basin C, 0.03 acres, ($Q_5 < 0.1$ cfs, $Q_{100}=0.1$ cfs), consists of a segment of existing vegetated roadway rights of way. Runoff produced within the Basin C sheet flows to the west curb and gutter of existing Metropolitan Street. Flows collected with the west curb and gutter section is conveyed north to an existing offsite sump inlet.

It should be noted that the estimated combined runoff discharged from the site in the existing condition totals ~ 4.7 cfs (direct addition of DP1, DP1A &DP2) while the total discharge from the proposed

condition is only slightly higher at 5.7 cfs (direct addition of DP1&DP2). These minor increases in flows of approximately 1 cfs are considered negligible. With the installation of the recommended infrastructure, and the presence of an adequate outfall structure, no negative effects are anticipated to water quality or downstream facilities. Furthermore thru the implementation of outfall protection, slope stabilization as well as site stabilization (reseeding) the potential of erosion from construction and function should be mitigated.

EROSION CONTROL

It is the policy of the El Paso County that we submit a grading and erosion control plan with the drainage report. Proposed erosion control blanket, silt fence, vehicle traffic control, concrete washout area are proposed as erosion control measures. Recommendations for Stabilized staging area and stockpile management are also included.

CONSTRUCTION COST OPINION

(Private) Drainage Facilities NON-Reimbursable:

Item	Description	Qua	ntity	Unit	Cost		Cost
1.	18" Storm Sewer	50	LF	\$60	/LF		\$3,000.00
2.	18" Flared End Sections	2	EA	\$900	/EA		\$1,800.00
3.	D50=9" Riprap	5	CY	\$50	/CYF		\$250.00
4.	Erosion Control Blanket	26	SY	\$9	/SY		\$234.00
						Total \$	\$5,284.00

DRAINAGE & BRIDGE FEES

The site is currently platted as a Tract. No re-plat is being submitted and the structure is being constructed on the Tract via administrative relief (ADM-19-026) in which it was determined that the proposed project will not require a "1041" permit. Thus no drainage and bridge fees are required for the development of the site.

M &S Civil Consultants, Inc. (M&S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost and drainage basin fee amounts in 2017.

SUMMARY

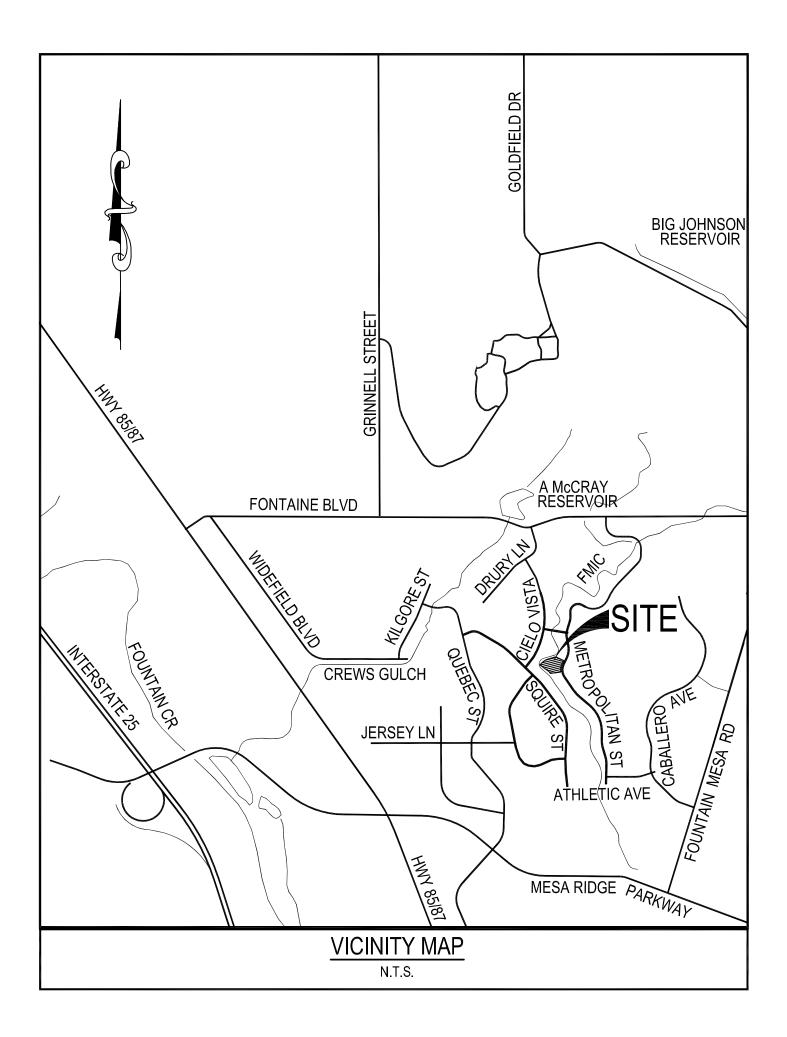
The installation of the proposed facilities associated the construction of Widefield Water and Sanitation District Booster 2 Pump Station site shall not adversely affect adjacent or downstream properties per this final drainage report. The proposed drainage facilities will adequately convey, detain and route runoff from tributary onsite and existing offsite flows to the Sand Creek Drainage channel. Maintenance of the proposed private facilities shall be the responsibility of the WWSD.

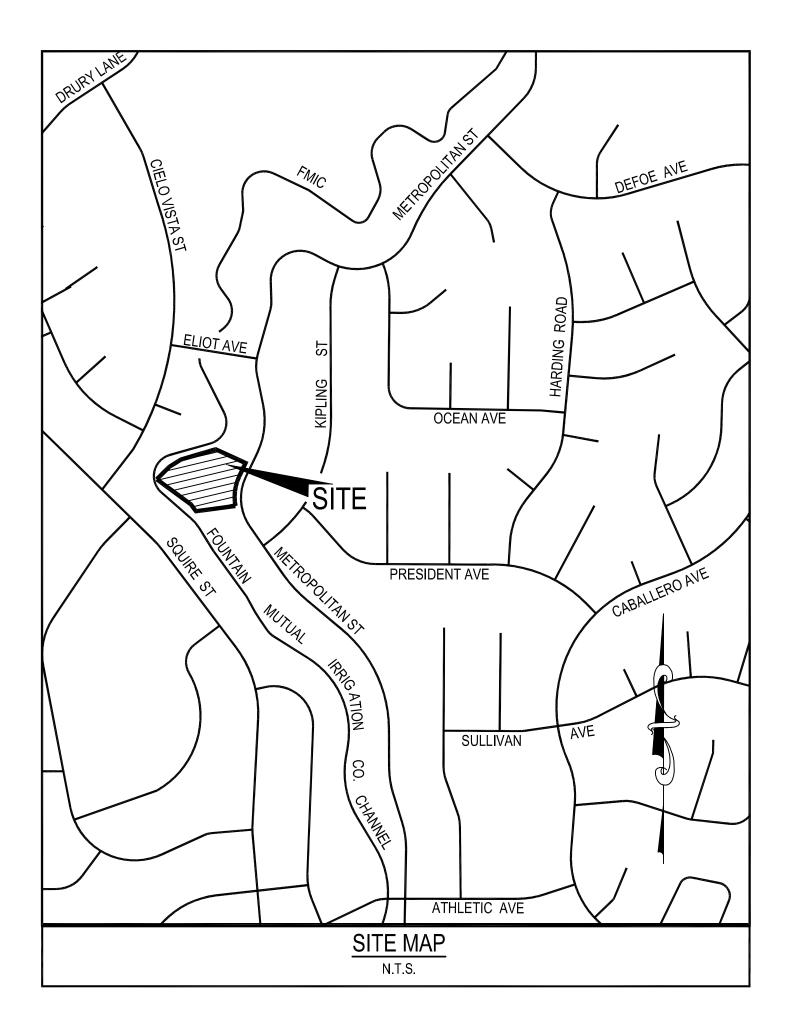
REFERENCES

- 1.) "El Paso County and City of Colorado Springs Drainage Criteria Manual".
- 2.) "Urban Storm Drainage Criteria Manual"
- 3.) SCS Soils Map for El Paso County.
- 4.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency, Effective date December 7, 2018.

APPENDIX

VICINITY MAP

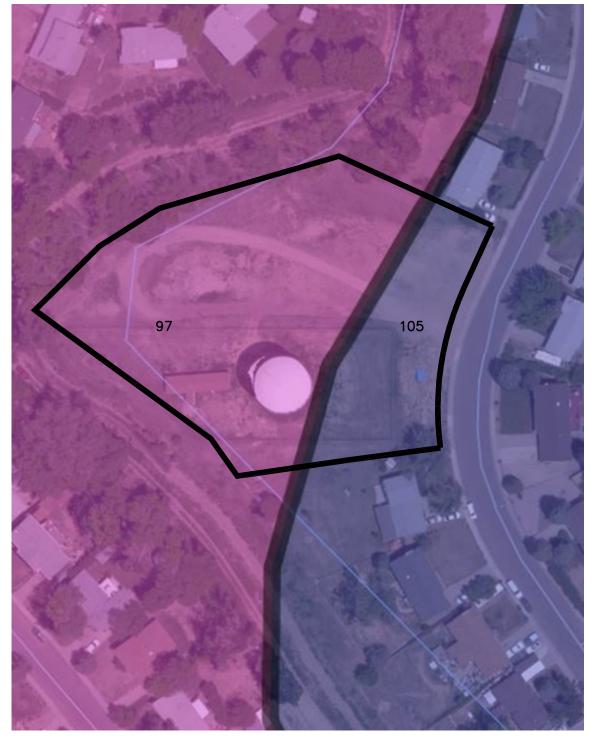




SOILS MAP



NOT TO SCALE

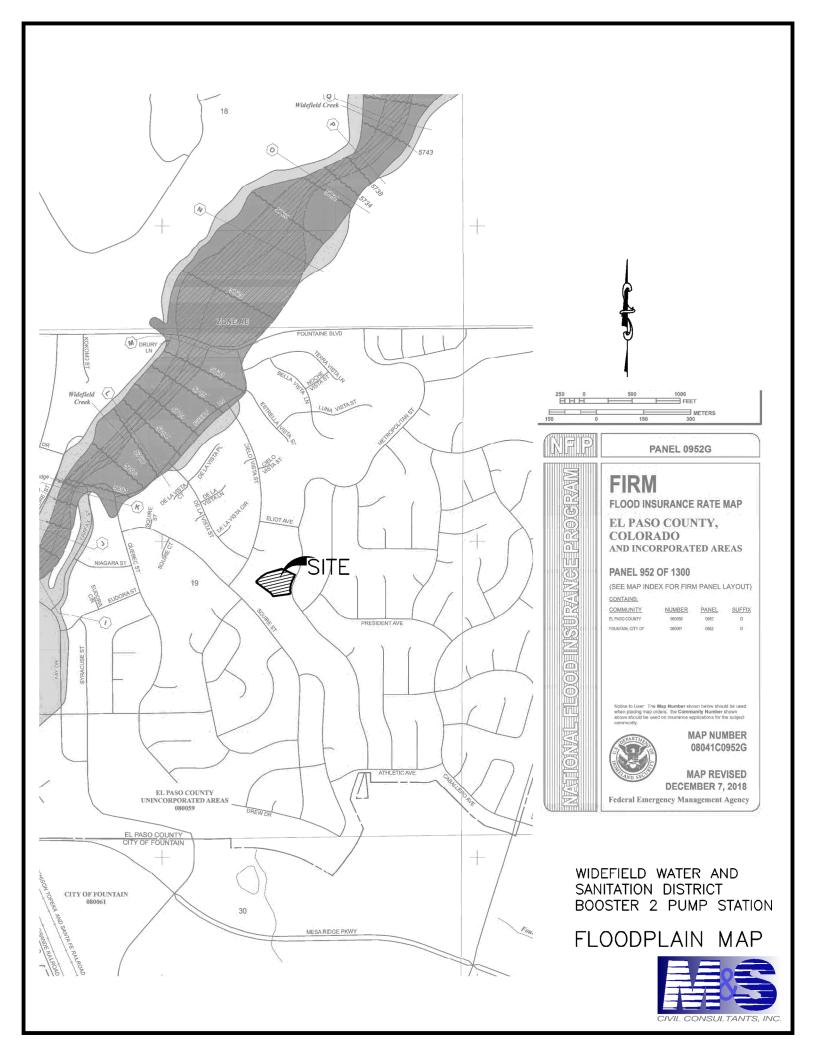


MAP UNIT SYMBOL	MAP UNIT NAME	RATING	WIDEFIELD WATER AND SANITATION DISTRICT BOOSTER 2 PUMP STATION
97	Truckton sandy loam, 3 to 9 percent slopes	A	SOILS MAP
108	Wiley silt loam, 3 to 9 percent slopes	В	

CONSULTANTS, INC

CIVIL

ANNOTATED FIRM PANEL



HYDROLOGIC CALCULATIONS

WIDEFIELD WATER AND WASTEWATER DISTRICT - BOOSTER 2 PUMP STATION EXISTING CONDITIONS DRAINAGE CALCULATIONS (Area Runoff Coefficient Summary)

												RUNOFF C	OEFFICIENT
BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀
A	36008.1896	0.83	0.00	0.90	0.96	0.00	0.59	0.70	0.83	0.09	0.36	0.09	0.36
В	36198.4781	0.83	0.03	0.90	0.96	0.00	0.59	0.70	0.80	0.09	0.36	0.12	0.38
С	1281.6639	0.03	0.00	0.90	0.96	0.00	0.59	0.70	0.03	0.09	0.36	0.09	0.36
OS1	520.2481	0.01	0.00	0.90	0.96	0.00	0.30	0.50	0.01	0.09	0.36	0.09	0.36
OS2	4830.2806	0.11	0.02	0.90	0.96	0.00	0.30	0.50	0.10	0.09	0.36	0.20	0.44

WIDEFIELD WATER AND WASTEWATER DISTRICT - BOOSTER 2 PUMP STATION EXISTING CONDITIONS DRAINAGE CALCULATIONS

(Area Drainage Summary)

From Area Runoj	f Coefficient Summ	nary			OVERL/	4ND		S7	REET / CH	ANNEL FLO)W	Time of T	Travel (T _t)	INTEN	SITY *	TOTAL	FLOWS
BASIN	AREA TOTAL	C ₅	C ₁₀₀	C ₅	Length	Height	T _C	Length	Slope	Velocity	T _t	TOTAL	CHECK	I ₅	I ₁₀₀	Q5	Q ₁₀₀
	(Acres)	From DCI	A Table 5-1		(ft)	(ft)	(min)	(ft)	(%)	(fps)	(min)	(min)	(min)	(in/hr)	(in/hr)	(c.f.s.)	(c.f.s.)
A	0.83	0.09	0.36	0.09	100	5.5	10.4	90	2.9%	1.2	1.3	11.7	11.1	3.9	6.5	0.3	1.9
В	0.83	0.12	0.38	0.12	60	4	7.3	150	5.3%	1.6	1.5	8.9	11.2	4.3	7.2	0.4	2.3
С	0.03	0.09	0.36	0.09	15	0.3	5.6	0	0.0%	0.0	0.0	5.6	10.1	5.0	8.4	0.0	0.1
OS1	0.01	0.09	0.36	0.09	10	0.2	4.6	0	0.0%	0.0	0.0	4.6	10.1	5.3	8.9	0.0	0.0
OS2	0.11	0.20	0.44	0.20	50	2	7.3	0	0.0%	0.0	0.0	7.3	10.3	4.6	7.7	0.1	0.4

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: DLM Date: 8/26/2019 Checked by: VAS

WIDEFIELD WATER AND WASTEWATER DISTRICT - BOOSTER 2 PUMP STATION EXISTING CONDITIONS DRAINAGE CALCULATIONS (Basin Routing Summary)

	From Area Runoff Coefficient Summary	<i>,</i>			OVI	ERLAND		PIPE	E / CHA	NNEL FLO	W	Time of Travel (T _t)	INTEN	SITY *	TOTAL	FLOWS	
DESIGN POINT	CONTRIBUTING BASINS	CA ₅	CA ₁₀₀	C ₅	Length	Height	T _C	Length	Slope	Velocity	T _t	TOTAL	I ₅	I ₁₀₀	Q5	Q ₁₀₀	COMMENTS
					(ft)	(ft)	(min)	(ft)	(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	(c.f.s.)	(c.f.s.)	
1	OS1, A	0.08	0.30									11.7	3.9	6.5	0.3	2.0	
					Basin E	B Tc was use	ed										
2	OS2, B, C	0.13	0.38									8.9	4.3	7.2	0.6	2.7	
					Basin A	Tc was use	ed										

WIDEFIELD WATER AND WASTEWATER DISTRICT - BOOSTER 2 PUMP STATION PROPOSED CONDITIONS DRAINAGE CALCULATIONS (Area Runoff Coefficient Summary)

												RUNOFF C	OEFFICIENT
BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀
A1	2864.3099	0.07	0.00	0.90	0.96	0.00	0.59	0.70	0.07	0.09	0.36	0.09	0.36
A2	21650.5603	0.50	0.06	0.90	0.96	0.09	0.59	0.70	0.35	0.09	0.36	0.27	0.49
A3	15244.5339	0.35	0.02	0.90	0.96	0.07	0.59	0.70	0.27	0.09	0.36	0.22	0.45
В	32440.8858	0.74	0.03	0.90	0.96	0.00	0.59	0.70	0.71	0.09	0.36	0.13	0.39
С	1281.6639	0.03	0.00	0.90	0.96	0.00	0.59	0.70	0.03	0.09	0.36	0.09	0.36
OS1	207.67	0.00	0.00	0.90	0.96	0.00	0.30	0.50	0.00	0.09	0.36	0.09	0.36
OS2	4830.2806	0.11	0.02	0.90	0.96	0.00	0.30	0.50	0.10	0.09	0.36	0.20	0.44

WIDEFIELD WATER AND WASTEWATER DISTRICT - BOOSTER 2 PUMP STATION PROPOSED CONDITIONS DRAINAGE CALCULATIONS

(Area Drainage Summary)

From Area Runoff	Coefficient Sumn	nary			OVERL/	4ND		ST	REET / CH	ANNEL FLC	DW	Time of T	ravel (T _t)	INTEN	SITY *	TOTAL	FLOWS
BASIN	AREA TOTAL	C ₅	C ₁₀₀	C ₅	Length	Height	T _C	Length	Slope	Velocity	T _t	TOTAL	CHECK	I ₅	I ₁₀₀	Q5	Q ₁₀₀
	(Acres)	From DCM	M Table 5-1		(ft)	(ft)	(min)	(ft)	(%)	(fps)	(min)	(min)	(min)	(in/hr)	(in/hr)	(c.f.s.)	(c.f.s.)
Al	0.07	0.09	0.36	0.09	10	0.5	3.4	0	0.0%	0.0	0.0	5.0	10.1	5.2	8.7	0.0	0.2
A2	0.50	0.27	0.49	0.27	90	5.5	7.8	285	1.9%	1.4	3.4	11.2	12.1	3.8	6.5	0.5	1.6
A3	0.35	0.22	0.45	0.22	90	5.5	8.3	250	2.2%	1.5	2.8	11.1	11.9	3.9	6.5	0.3	1.0
В	0.74	0.13	0.39	0.13	60	4	7.3	150	5.3%	1.6	1.5	8.8	11.2	4.3	7.2	0.4	2.1
С	0.03	0.09	0.36	0.09	15	0.3	5.6	0	0.0%	0.0	0.0	5.6	10.1	5.0	8.4	0.0	0.1
OS1	0.00	0.09	0.36	0.09	10	0.2	4.6	0	0.0%	0.0	0.0	5.0	10.1	5.2	8.7	0.0	0.0
OS2	0.11	0.20	0.44	0.20	50	2	7.3	0	0.0%	0.0	0.0	7.3	10.3	4.6	7.7	0.1	0.4

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: DLM Date: 8/26/2019 Checked by: VAS

WIDEFIELD WATER AND WASTEWATER DISTRICT - BOOSTER 2 PUMP STATION PROPOSED CONDITIONS DRAINAGE CALCULATIONS (Basin Routing Summary) From Area Runoff Coefficient Summary OVERLAND PIPE / CHANNEL FLOW Time of Travel (T,) INTENSITY * TOTAL FLOWS COMMENTS

DESIGN POINT	CONTRIBUTING BASINS	CA ₅	CA100	C ₅	Length	Height	T _C	Length	Slope	Velocity	T _t	TOTAL	I ₅	I ₁₀₀	Q5	Q ₁₀₀	COMMENTS
					(ft)	(ft)	(min)	(ft)	(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	(c.f.s.)	(c.f.s.)	
1	A1	0.01	0.02									5.0	5.2	8.7	0.0	0.2	Sheet flows to FMIR
					Basin A	1 Tc was us	ed										
1A	OS1, A2, A3	0.21	0.40									11.9	3.9	6.5	0.8	2.6	Prop 18" RCP (private)
					Basin A	3 Tc was us	ed										
2	OS2, B, C	0.12	0.35									5.6	5.0	8.4	0.6	2.9	Sheet flows to FMIR
					Basin C	Tc was use	d										

HYDRAULIC CALCULATIONS

Project Description		
Friction Method Solve For	Manning Formula Normal Depth	
Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.135 ft/ft	
Diameter	18.0 in	
Discharge	2.60 cfs	
Results		
Normal Depth	3.2 in	
Flow Area	0.2 ft ²	
Wetted Perimeter	1.3 ft	
Hydraulic Radius	1.9 in	
Top Width	1.14 ft	
Critical Depth	7.3 in	
Percent Full	17.6 %	
Critical Slope	0.005 ft/ft	
Velocity	12.44 ft/s	
Velocity Head	2.40 ft	
Specific Energy	2.67 ft	
Froude Number	5.125	
Maximum Discharge	41.52 cfs	
Discharge Full	38.59 cfs	
Slope Full	0.001 ft/ft	
Flow Type	Supercritical	
GVF Input Data		
Downstream Depth	0.0 in	
Length	0.0 ft	
Number Of Steps	0	
GVF Output Data		
Upstream Depth	0.0 in	
Profile Description	N/A	
Profile Headloss	0.00 ft	
Average End Depth Over Rise	0.0 %	
Normal Depth Over Rise	17.6 %	
Downstream Velocity	Infinity ft/s	
Upstream Velocity	Infinity ft/s	
Normal Depth	3.2 in	
Critical Depth	7.3 in	
Channel Slope	0.135 ft/ft	
Critical Slope	0.005 ft/ft	

Worksheet for 18" Pipe @ 13.5% - 2.6 cfs

Untitled1.fm8 8/29/2019 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 FlowMaster [10.02.00.01] Page 1 of 1

Project Description		
Friction Method	Manning	
	Formula	
Solve For	Normal Depth	
Input Data		
Roughness Coefficient	0.030	
Channel Slope	0.001 ft/ft	
Left Side Slope	1.000 H:V	
Right Side Slope	1.000 H:V	
Bottom Width	9.00 ft	
Discharge	50.00 cfs	
Results		
Normal Depth	30.3 in	
Flow Area	29.1 ft²	
Wetted Perimeter	16.1 ft	
Hydraulic Radius	21.6 in	
Top Width	14.05 ft	
Critical Depth	11.4 in	
Critical Slope	0.015 ft/ft	
Velocity	1.72 ft/s	
Velocity Head	0.05 ft	
Specific Energy	2.57 ft	
Froude Number	0.211	
Flow Type	Subcritical	
GVF Input Data		
Downstream Depth	0.0 in	
Length	0.0 ft	
Number Of Steps	0	
GVF Output Data		
Upstream Depth	0.0 in	
Profile Description	N/A	
Profile Headloss	0.00 ft	
Downstream Velocity	0.00 ft/s	
Upstream Velocity	0.00 ft/s	
Normal Depth	30.3 in	
Critical Depth	11.4 in	
Channel Slope	0.001 ft/ft	
Critical Slope	0.015 ft/ft	

Worksheet for FMIC Irrigation Channel - 50 cfs

GRADING AND EROSION CONTROL PLAN

STANDARD CONSTRUCTION NOTES:

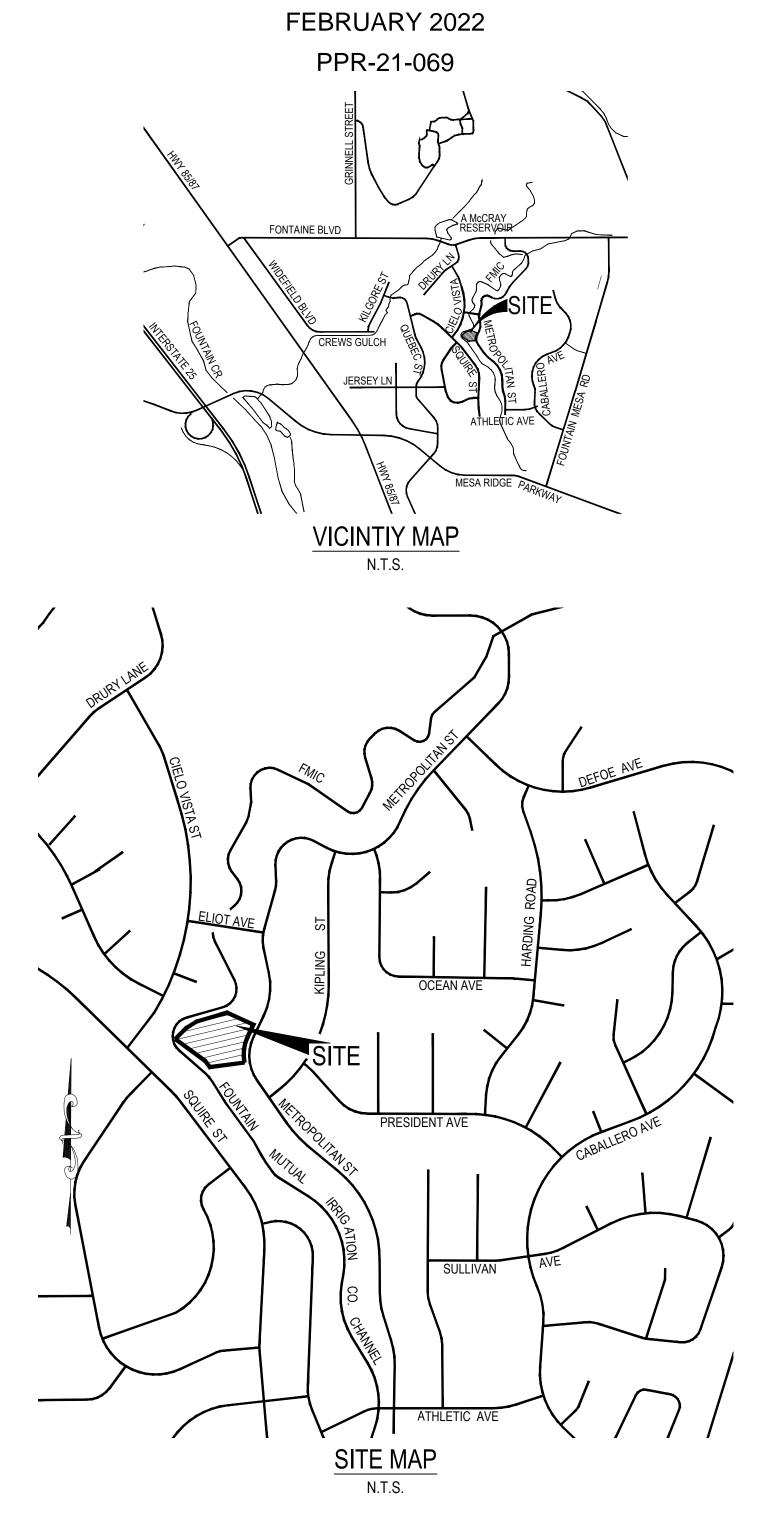
- . ALL DRAINAGE AND ROADWAY CONSTRUCTION SHALL MEET THE STANDARDS AND SPECIFICATIONS OF THE CITY OF COLORADO SPRINGS/EL PASO COUNTY DRAINAGE CRITERIA MANUAL VOLUMES 1 AND 2, AND THE EL PASO COUNTY ENGINEERING CRITERIA MANUAL
- CONTRACTOR SHALL BE RESPONSIBLE FOR THE NOTIFICATION AND FIELD LOCATION OF 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 SPRINGS.
- 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 TIME INCLUDING THE FOLLOWING: 3.1 EL PASO COUNTY ENGINEERING CRITERIA MANUAL (ECM)
- 3.2 CITY OF COLORADO SPRINGS/EL PASO COUNTY ENGINEERING CRITERIA MANUAL VOLUMES 1 AND 2. 3.3 COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) STANDARDS SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION.
- 3.4 CDOT M&S STANDARDS
- 4. IT IS THE DESIGN ENGINEERS RESPONSIBILITY TO ACCURACY SHOW EXISTING CONDITION BOTH ONSITE AND OFFSITE ON THE CONSTRUCTION PLANS. ANY MODIFICATION NECESSARY DUE TO CONFLICT OMISSIONS OR CHANGED CONDITIONS WILL BE ENTIRELY THE DEVELOPERS RESPONSIBILITY TO RECTIFY.
- 5. ONCE THE ESQCP HAS BEEN ISSUED, THE CONTRACTOR MAY INSTALL THE INITIAL STAGE EROSION AND SEDIMENT CONTROL BMPS AS INDICATED ON THE 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 PCD INSPECTIONS STAFF
- 6. IT IS THE CONTRACTORS 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 STORM WATER QUALITY CONTROL PERMIT (ESQCP), US ARMY CORPS OF ENGINEER ISSUED 401 AND/OR 404 PERMITS AND COUNTY AND STATE FUGITIVE DUST PERMITS.
- 7. ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE CONSTRUCTION SITE AT APPROVED CONSTRUCTION ACCESS POINTS.
- 8. ANY TEMPORARY SIGNAGE AND STRIPING SHALL COMPLY WITH EL PASO COUNTY DOW AND MUTCD CRITERIA
- 9. CONTRACTOR SHALL OBTAIN ANY PERMITS REQUIRE BY EL PASO COUNTY DOT INCLUDING WORK WITHIN THE RIGHT-OF-WAY AND SPECIAL TRANSPORT PERMITS.
- 10. 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 OFFSITE DISTURBANCE GRADING, OR CONSTRUCTION.

GRADING AND EROSION CONTROL NOTES:

- 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.
- . 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.
- . A SEPARATE STORMWATER MANAGEMENT PLAN (SWMP) FOR THIS PROJECT SHALL BE COMPLETED AND AN EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP) ISSUED PRIOR TO COMMENCING CONSTRUCTION. DURING CONSTRUCTION THE SWMP IS THE RESPONSIBILITY OF THE DESIGNATED QUALIFIED STORMWATER MANAGÉR OR CERTIFIED EROSION CONTROL INSPECTOR AND 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 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 MAY CONTRIBUTE POLLUTANTS TO STORMWATER. TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES, OR ANY DISTURBED LAND AREA SHALL BE COMPLETED IMMEDIATELY UPON COMPLETION OF THE DISTURBANCE.
- 5. 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. ALL CHANGES TO TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES MUST BE INCORPORATED IN TO THE STORMWATER MANAGEMENT PLAN PRIOR TO IMPLEMENTATION.
- 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. AN AREA THAT IS GOING TO REMAIN IN AN INTERIM STATE FOR MORE THAN 60 DAYS SHALL ALSO BE STABILIZED.
- 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 PLAN 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 DEFINED IN THE APPROVED PLANS. ANY PROPOSED CHANGES THAT EFFECT THE HYDROLOGY OR HYDRAULICS OF A PERMANENT STORMWATER MANAGEMENT STRUCTURES MUST BE APPROVED BY THE ECM ADMINISTRATOR PRIOR TO IMPLEMENTATION
- 10. ANY EARTH DISTURBANCE SHALL BE CONDUCTED IN SUCH A MANNER SO AS TO EFFECTIVELY REDUCE 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 INFEASIBLE.
- 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 SHALL ALSO BE PROTECTED FROM SEDIMENTATION DURING CONSTRUCTION UNTIL FINAL STABILIZATION IS ACHIEVED.
- 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
- RUNOFF TO STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES. CONCRETE WASHOUT SHALL NOT BE LOCATED IN AN AREA WHERE SHALLOW GROUNDWATER MAY BE PRESENT, OR WITHIN 50 FEET OF A SURFACE WATER BODY. 14. DEWATERING OPERATIONS: UNCONTAMINATED GROUND WATER MAY BE DISCHARGED ON SITE, BUT MAY NOT LEAVE THE SITE IN THE FORM OF SURFACE RUNOFF.
- 15. EROSION CONTROL BLANKETING IS TO 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 CHEMICALS ARE TO BE USED BY THE CONTRACTOR, WHICH HAVE THE POTENTIAL TO BE RELEASED IN STORMWATER UNLESS PERMISSION FOR THE USE OF A SPECIFIC CHEMICAL IN GRANTED IN WRITING BY THE ECM ADMINISTRATOR. IN GRANTING THE USE OF SUCH CHEMICALS, SPECIAL CONDITIONS AND MONITORING MAY BE REQUIRED.
- 22. BULK STORAGE OF PETROLEUM PRODUCTS OR OTHER LIQUID CHEMICALS IN EXCESS OF 55 GALLONS SHALL HAVE ADEQUATE SECONDARY CONTAINMENT PROTECTION TO CONTAIN ALL SPILLS AND PREVENT ANY SPILLED MATERIAL FROM ENTERING STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES
- 23. NO PERSON SHALL CAUSE THE IMPEDIMENT OF STORMWATER FLOW IN THE FLOW LINE OF THE CURB AND GUTTER OR IN THE DITCH FLOW LINE.
- 24. INDIVIDUALS 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 INCLUDED IN THE DCM VOLUME II AND THE ECM APPENDIX I. ALL APPROPRIATE PERMITS MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION (NPDES, FLOODPLAIN, 404, FUGITIVE DUST, ETC.). IN THE EVENT OF CONFLICTS BETWEEN THESE REQUIREMENTS AND LAWS, RULES, OR REGULATIONS OF OTHER FEDERAL, STATE, OR COUNTY AGENCIES, THE MORE RESTRICTIVE LAWS, RULES, OR REGULATIONS SHALL APPLY.
- 25. ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE AT APPROVED CONSTRUCTION ACCESS POINTS.
- 26. PRIOR TO ACTUAL CONSTRUCTION THE PERMITEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.
- 27. A WATER SOURCE SHALL BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.
- 28. THE SOILS REPORT FOR THIS SITE HAS BEEN PREPARED BY VIVID ENGINEERING GROUP, INC, ENTITLED GEOTECHNICAL EVALUATION REPORT, WIDEFIELD WATER AND SANITATION TANK, VICINITY OF METROPLITAN STREET AND KIPLING STREET, WIDEFIELD COLORADO, DATED OCTOBER 31, 2019, AND SHALL BE CONSIDERED A PART OF THESE PLANS.
- 29. AT LEAST TEN DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB 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

WIDEFIELD WATER AND SANITATION **DISTRICT - BOOSTER 2 PUMP STATIO**

COUNTY OF EL PASO, STATE OF COLORADO **GRADING & EROSION CONTROL PLAN**



ADDITIONAL NOTES:

STAGING AREA TO BE DETERMINED BY CONTRACTOR IN THE FIELD. THE LOCATIONS SHALL BE DELINEATED ON THIS PLAN BY THE CONTRACTOR. THE EROSION CONTROL DELINEATED ON THIS PLAN SHALL BE REGULARLY UPDATED BY THE CONTRACTOR.

NO PORTION OF THIS PROPERTY IS LOCATED WITHIN A DESIGNATED FEMA FLOODPLAIN IN ACCORDANCE WITH FLOOD INSURANCE RATE MAPS (FIRM) 08041C00952G, EFFECTIVE DATE DECEMBER 7, 2018.

TOPOGRAPHY SURVEY CONDUCTED BY M&S CIVIL CONSULTANTS, INC (DATED 05/03/2019). SEE SURVEY FOR ESTABLISHED CONTROL. THE FOLLOWING COORDINATE SYSTEM AND DATUM RECORD IS AS FOLLOWS:

ELEVATION D	DATUM: NAVD88				
	NORTHING	EASTING	ELEVATION		
	(FT)	(FT)	(FT)		
U347	15000.000	20000.000	5662.75	<u>SHEET INDEX</u>	
CP 5013 (WAC KRAET (LS 2154)	14927.827 TLI)	18496.980	5640.39	SHEET 1 TITLE SHEET SHEET 2 GRADING & EF SHEET 3 GRADING & EF SHEET 4 GRADING & EF	ROS

FOR INFORMATION PURPOSE ONLY

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AGENCIES	
OWNER:	WIDEFIELD WATER & SANITATION DISTRICT 8495 FONTAINE BLVD COLORADO SPRINGS, CO 80925 ROBERT BANNISTER P.E. (719) 955–6118
CONSULTING/DESIGN ENGINEER:	JDS–HYDRO CONSULTANTS, INC. 5540 TECH CENTER DR, STE 100 COLORADO SPRINGS, CO 80903 MARIO DIPASQUALE, PE (719) 227–0072
DRAINAGE ENGINEER	M&S CIVIL CONSULTANTS, INC 20 BOULDER CRESCENT, SUITE 110 COLORADO SPRINGS, CO 80903 VIRGIL A. SANCHEZ P.E. (719) 955–5485
COUNTY ENGINEERING:	EL PASO COUNTY PLANNING AND COMMUNITY DEVELOPMENT 2880 INTERNATIONAL CIRCLE, SUITE 110 COLORADO SPRINGS, CO 80910 GLENN, P.E. (719) 520–6300
TRAFFIC ENGINEERING:	EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS 3275 AKERS DRIVE COLORADO SPRINGS, CO 80922 JENNIFER IRVINE, P.E. (719) 520–6460
WATER & WASTEWATER RESOURCES:	WIDEFIELD WATER & SANITATION DISTRICT 8495 FONTAINE BLVD COLORADO SPRINGS, CO 80925
ELECTRICAL ENGINEER:	CHAVEZ, TIFFANY & AYERS 611 N NEVADA AVE, STE 4 COLORADO SPRINGS, CO 80903 CONTACT: JOSH AYERS, PE PHONE: (719) 636–0021

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ENGINEER'S STATEMENT

THIS GRADING AND EROSION CONTROL PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. SAID PLAN HAS BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR GRADING AND EROSION CONTROL PLANS. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY NEGLIGENT ACTS. FRRORS OR OMISSIONS ON MY PART IN PREPARING THIS REPORT.

DARIN L. MOFFETT COLORADO P.E. NO. 38923 FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

OWNER'S STATEMENT:

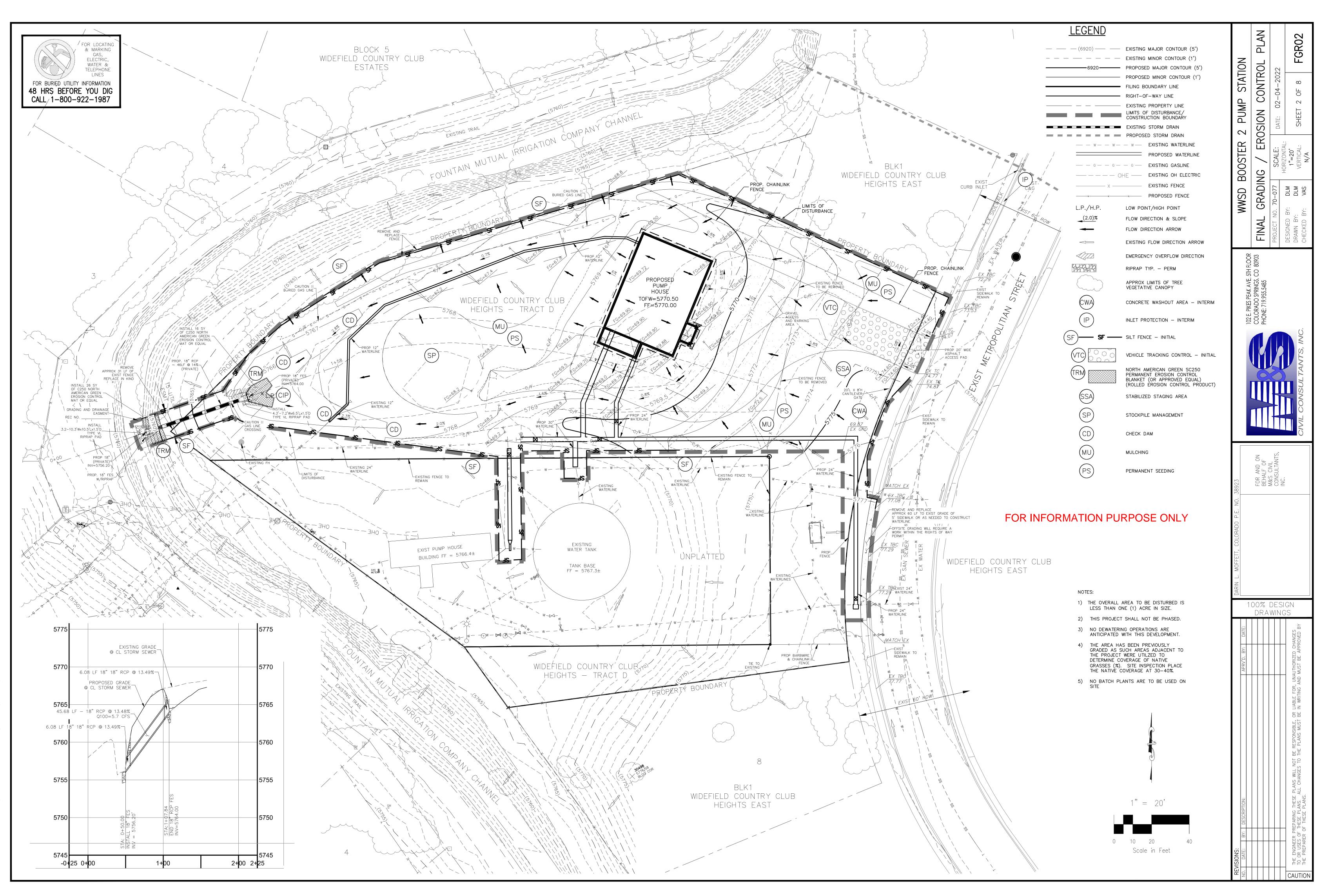
THE OWNER WILL COMPLY WITH ALL THE REQUIREMENTS OF THE GRADING AND EROSION CONTROL

ON BEHALF OF WIDEFIELD WATER & SANITATION DISTRICT (WWSD) 8495 FONTAINE BLVD COLORADO SPRINGS, CO 80925 (719) 955–6118

	CRITERIA. THE COUNTY IS DIMENSIONS, AND/OR ELEV	ROVIDED ONLY FOR GENERAL CONFORMANC NOT RESPONSIBLE FOR THE ACCURACY AN ATIONS WHICH SHALL BE CONFIRMED AT TH	ID ADEQUACY OF THE DESIGN, IE JOB SITE. THE COUNTY	APRV'D. E		OR LIABLE FOR, UNAUTHORIZED CHANGE WRITING AND MUST BE APPROVED BY TH
	AND/OR ACCURACY OF THI	OF THIS DOCUMENT ASSUMES NO RESPONSI S DOCUMENT. I THE REQUIREMENTS OF THE EL PASO CO				FOR, UNAL
		AND ENGINEERING CRITERIA MANUAL AS AMI				IABLE VG AN
	CONSTRUCTION FOR A PER ENGINEER. IF CONSTRUCTI	SECTION 1.12, THESE CONSTRUCTION DOCI IOD OF 2 YEARS FROM THE DATE SIGNED I ON HAS NOT STARTED WITHIN THOSE 2 YEA APPROVAL, INCLUDING PAYMENT OF REVIEW DIRECTORS DISCRETION.	BY THE EL PASO COUNTY ARS, THE PLANS WILL NEED			-
INC (DATED 05/03/2019). DINATE SYSTEM AND DATUM	JENNIFER IRVINE, P.E. COUNTY ENGINEER/ECM	I ADMINISTRATOR	DATE	TION:		; THESE PLANS WILL NOT BE RESPONSIBLE, ALL CHANGES TO THE PLANS MUST BE IN
SHEET INDEX		STATEMENT:	FOR LOCATIN			ARING NS. A
SHEET 1 TITLE SHEET SHEET 2 GRADING & EROSION SHEET 3 GRADING & EROSION		THE CITY OF COLORADO SPRINGS RECOGNIZES THE DESIGN ENGINEER AS HAVING RESPONSIBILITY FOR	& MARKING GAS, ELECTRIC, WATER & WATER &	BY:		HESE PLA
SHEET 4 GRADING & EROSION	CONTROL DETAILS CONTROL DETAILS	THE DESIGN; THE CITY HAS LIMITED ITS SCOPE OF REVIEW ACCORDINGLY. RESUBMITTAL REQUIRED IF CONSTRUCTION HAS	FOR BURIED UTILITY INFORMATION	DATE:		THE ENGINEER PREPARING USES OF THESE PLANS. / OF THESE PLANS.
SHEET 5GRADING & EROSIONSHEET 6GRADING & EROSIONSHEET 7GRADING & EROSION		NOT COMMENCED WITHIN 180 DAYS AFTER APPROVAL DATE.	48 HRS BEFORE YOU DIC	3 18 1		FD0

DATE

DATE



File: 0:\70077A Widefield W&S JDS Hydro\7010 metropolitan street\dwg\Const Dwg\FGR02.dwg Plotstamp: 2/4/2022 12:12 PN

EC-2 Temporary and Permanent Seeding (TS/PS)

soil amendments and rototill them into the soil to a depth of 6 inches or more.

Topsoil should be salvaged during grading operations for use and spread on areas to be revegetated later. Topsoil should be viewed as an important resource to be utilized for vegetation establishment, due to its water-holding capacity, structure, texture, organic matter content, biological activity, and nutrient content. The rooting depth of most native grasses in the semi-arid Denver metropolitan area is 6 to 18 inches. At a minimum, the upper 6 inches of topsoil should be stripped, stockpiled, and ultimately respread across areas that will be revegetated.

Where topsoil is not available, subsoils should be amended to provide an appropriate plant-growth medium. Organic matter, such as well digested compost, can be added to improve soil characteristics conducive to plant growth. Other treatments can be used to adjust soil pH conditions when needed. Soil testing, which is typically inexpensive, should be completed to determine and optimize the types and amounts of amendments that are required.

If the disturbed ground surface is compacted, rip or rototill the surface prior to placing topsoil. If adding compost to the existing soil surface, rototilling is necessary. Surface roughening will assist in placement of a stable topsoil layer on steeper slopes, and allow infiltration and root penetration to greater depth.

Prior to seeding, the soil surface should be rough and the seedbed should be firm, but neither too loose nor compacted. The upper layer of soil should be in a condition suitable for seeding at the proper depth and conducive to plant growth. Seed-to-soil contact is the key to good germination.

Seed Mix for Temporary Vegetation

To provide temporary vegetative cover on disturbed areas which will not be paved, built upon, or fully landscaped or worked for an extended period (typically 30 days or more), plant an annual grass appropriate for the time of planting and mulch the planted areas. Annual grasses suitable for the Denver metropolitan area are listed in Table TS/PS-1. These are to be considered only as general recommendations when specific design guidance for a particular site is not available. Local governments typically specify seed mixes appropriate for their jurisdiction.

Seed Mix for Permanent Revegetation

To provide vegetative cover on disturbed areas that have reached final grade, a perennial grass mix should be established. Permanent seeding should be performed promptly (typically within 14 days) after reaching final grade. Each site will have different characteristics and a landscape professional or the local jurisdiction should be contacted to determine the most suitable seed mix for a specific site. In lieu of a specific recommendation, one of the perennial grass mixes appropriate for site conditions and growth season listed in Table TS/PS-2 can be used. The pure live seed (PLS) rates of application recommended in these tables are considered to be absolute minimum rates for seed applied using proper drill-seeding equipment.

If desired for wildlife habitat or landscape diversity, shrubs such as rubber rabbitbrush (*Chrysothamnus* nauseosus), fourwing saltbush (Atriplex canescens) and skunkbrush sumac (Rhus trilobata) could be added to the upland seedmixes at 0.25, 0.5 and 1 pound PLS/acre, respectively. In riparian zones, planting root stock of such species as American plum (Prunus americana), woods rose (Rosa woodsii), plains cottonwood (Populus sargentii), and willow (Populus spp.) may be considered. On non-topsoiled upland sites, a legume such as Ladak alfalfa at 1 pound PLS/acre can be included as a source of nitrogen for perennial grasses.

TS/PS-2

Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3

EC-2 Temporary and Permanent Seeding (TS/PS)

Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses (cont.)

Common Name	Botanical Name	Growth Season ^b	Growth Form	Seeds/ Pound	Pounds of PLS/acre
Sandy Soil Seed Mix		I			
Blue grama	Bouteloua gracilis	Warm	Sod-forming bunchgrass	825,000	0.5
Camper little bluestem	Schizachyrium scoparium 'Camper'	Warm	Bunch	240,000	1.0
Prairie sandreed	Calamovilfa longifolia	Warm	Open sod	274,000	1.0
Sand dropseed	Sporobolus cryptandrus	Cool	Bunch	5,298,000	0.25
Vaughn sideoats grama	Bouteloua curtipendula 'Vaughn'	Warm	Sod	191,000	2.0
Arriba western wheatgrass	Agropyron smithii 'Arriba'	Cool	Sod	110,000	5.5
Total					10.25
Heavy Clay, Rocky Foothill Seed	l Mix				
Ephriam crested wheatgrass ^d	Agropyron cristatum 'Ephriam'	Cool	Sod	175,000	1.5
Oahe Intermediate wheatgrass	Agropyron intermedium 'Oahe'	Cool	Sod	115,000	5.:
Vaughn sideoats grama ^e	Bouteloua curtipendula 'Vaughn'	Warm	Sod	191,000	2.0
Lincoln smooth brome	Bromus inermis leyss 'Lincoln'	Cool	Sod	130,000	3.0
Arriba western wheatgrass	Agropyron smithii 'Arriba'	Cool	Sod	110,000	5.5
Total					17.5

doubled if seed is broadcast and should be increased by 50 percent if the seeding is done using a Brillion Drill or is applied through hydraulic seeding. Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1. If hydraulic seeding is used, hydraulic mulching should be done as a separate operation.

^o See Table TS/PS-3 for seeding dates.

² If site is to be irrigated, the transition turf seed rates should be doubled.

^d Crested wheatgrass should not be used on slopes steeper than 6H to 1V.

Can substitute 0.5 lbs PLS of blue grama for the 2.0 lbs PLS of Vaughn sideoats grama.

Seeding dates for the highest success probability of perennial species along the Front Range are generally in the spring from April through early May and in the fall after the first of September until the ground freezes. If the area is irrigated, seeding may occur in summer months, as well. See Table TS/PS-3 for appropriate seeding dates.

EC-2

	(Numbers in	l Grasses table reference able TS/PS-1)	Perennial Grasses	
Seeding Dates	Warm	Cool	Warm	Cool
January 1–March 15			✓	\checkmark
March 16–April 30	4	1,2,3	✓	\checkmark
May 1–May 15	4		✓	
May 16–June 30	4,5,6,7			
July 1–July 15	5,6,7			
July 16–August 31				
September 1–September 30		8,9,10,11		
October 1–December 31			\checkmark	✓

Mulch

Cover seeded areas with mulch or an appropriate rolled erosion control product to promote establishment of vegetation. Anchor mulch by crimping, netting or use of a non-toxic tackifier. See the Mulching BMP Fact Sheet for additional guidance.

Maintenance and Removal

Monitor and observe seeded areas to identify areas of poor growth or areas that fail to germinate. Reseed and mulch these areas, as needed.

Seeded areas may require irrigation, particularly during extended dry periods. Targeted weed control may also be necessary.

12:13

TS/PS-5

June 2012

TS/PS-6

Temporary and Permanent Seeding (TS/PS) EC-2

Minimum Drill Seeding Rates for Various Temporary Annual Grasses

pecies ^a mon name)	Growth Season ^b	Pounds of Pure Live Seed (PLS)/acre [°]	Planting Depth (inches)
	Cool	35 - 50	1 - 2
g wheat	Cool	25 - 35	1 - 2
g barley	Cool	25 - 35	1 - 2
al ryegrass	Cool	10 - 15	1/2
t	Warm	3 - 15	1/2 - 3/4
ngrass	Warm	5–10	¹ / ₂ - ³ / ₄
num	Warm	5–10	1/2 - 3/4
er wheat	Cool	20–35	1 - 2
er barley	Cool	20–35	1 - 2
er rye	Cool	20–35	1 - 2
ale	Cool	25–40	1 - 2

Successful seeding of annual grass resulting in adequate plant growth will usually produce enough dead-plant residue to provide protection from wind and water erosion for an additional year. This assumes that the cover is not disturbed or mowed closer than 8 inches.

Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist. When hydraulic seeding is used, hydraulic mulching should be applied as a separate operation, when practical, to prevent the seeds from being encapsulated in

See Table TS/PS-3 for seeding dates. Irrigation, if consistently applied, may extend the use of cool season species during the summer months. Seeding rates should be doubled if seed is broadcast, or increased by 50 percent if done using a Brillion Drill or by hydraulic seeding.

> Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3

TS/PS-3

Temporary and Permanent Seeding (TS/PS)

Table TS/PS-3. Seeding Dates for Annual and Perennial Grasses

An area that has been permanently seeded should have a good stand of vegetation within one growing season if irrigated and within three growing seasons without irrigation in Colorado. Reseed portions of the site that fail to germinate or remain bare after the first growing season.

Protect seeded areas from construction equipment and vehicle access.

СС-2 Те	mporary and Pe	erman	ent See	ding (ΓS/PS)
	5/PS-2. Minimum Drill Seedi				
Common ^a	Botanical	Growth	Growth	Seeds/	Pounds of
Name akali Soil Seed Mix	Name	Season ^b	Form	Pound	PLS/acre
li sacaton n wildrye	Sporobolus airoides Elymus cinereus	Cool Cool	Bunch Bunch	1,750,000 165,000	0.25
streambank wheatgrass	Agropyron riparium 'Sodar'	Cool	Sod	170,000	2.5
all wheatgrass	Agropyron elongatum 'Jose' Agropyron smithii 'Arriba'	Cool Cool	Bunch	79,000	7.0
					17.75
m crested wheatgrass	Agropyron cristatum	Cool	Sod	175,000	2.0
hard fescue	'Ephriam' Festuca ovina 'duriuscula'	Cool	Bunch	565,000	1.0
n smooth brome	Bromus inermis leyss 'Lincoln'	Cool	Sod	130,000	3.0
streambank wheatgrass	Agropyron riparium 'Sodar'	Cool	Sod	170,000	2.5
a western wheatgrass	Agropyron smithii 'Arriba'	Cool	Sod	110,000	7.0 15.5
Water Table Soil Seed M ow foxtail	Iix Alopecurus pratensis	Cool	Sod	900,000	0.5
	Agrostis alba	Warm	Open sod	5,000,000	0.25
arygrass	Phalaris arundinacea Bromus inermis leyss	Cool	Sod	68,000	0.5
smooth brome	Lincoln' Panicum virgatum	Cool	Sod	130,000	3.0
ler switchgrass	'Pathfinder'	Warm	Sod	389,000	1.0
1 wheatgrass	Agropyron elongatum 'Alkar'	Cool	Bunch	79,000	5.5
on Turf Seed Mix ^c					10.75
Canadian bluegrass	Poa compressa 'Ruebens'	Cool	Sod	2,500,000	0.5
ard fescue perennial ryegrass	Festuca ovina 'duriuscula' Lolium perenne 'Citation'	Cool Cool	Bunch Sod	565,000 247,000	1.0 3.0
nooth brome	Bromus inermis leyss 'Lincoln'	Cool	Sod	130,000	3.0
	Urban Drainage and Flood C Urban Storm Drainage Criteria				June 2012
			olume 3	ulching	
C-4 n, weed-free and seed to be tacked or fastened ored (and not merely the aid of tackifiers of mmended method for ch fibers into the soil l substitute, may work		a Manual Vo d be applied condition of an be accom- ping implem- nical crimper cutting them	evenly at a rather site. Strapplished mechanished mech	ulching ate of 2 tons p aw mulch mu hanically by red, and is th pable of tuck tural disk, wi	g (MU) per acre and ast be crimping or te cring the long hile not an
C-4 an, weed-free and seed at be tacked or fastened hored (and not merely in the aid of tackifiers of commended method for ch fibers into the soil al substitute, may work to be weighted to aff ss hay may be used in d, mulching with hay r native seed. Alternati are more expensive th costly mulching method	Urban Storm Drainage Criteria I-free cereal grain straw should I by a method suitable for the of placed) on the surface. This co or nets. Anchoring with a crimi- areas flatter than 3:1. Mechan to a depth of 3 inches without of a fif the disk blades are dull or b	a Manual Vo d be applied condition of an be accom- ping implem- nical crimper cutting them olunted and s use hay is co- ve grass spe ay may be pu- izing a certif	evenly at a ra the site. Stra plished mech nent is prefer rs must be ca . An agricul set vertically; omprised of the cies which murchased, but ied weed-free	ulching ate of 2 tons p aw mulch mu hanically by red, and is th pable of tuck tural disk, wl ; however, th he entire plan hight in turn of can be diffic e straw is an	g (MU) per acre and ist be crimping or e ting the long hile not an e frame may at including put-compete cult to find easier and
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C-4 an, weed-free and seed st be tacked or fastened hored (and not merely h the aid of tackifiers of commended method for lch fibers into the soil al substitute, may work te to be weighted to aff ass hay may be used in d, mulching with hay r native seed. Alternati l are more expensive the s costly mulching meth- ive). small areas sheltered f holding it in place. For throl blankets anchored draulic mulching consi- applied at a rate of no fa- kifier) with a hydraulic extive hydroseeding. For hiled immediately prior uld be avoided. assion control mats, blan eper) and waterways. If the material shelter and the source of the source of the source of the source of the source of the source of the source of the source applied at a rate of no fa- kifier) with a hydraulic extive hydroseeding. For the source of the source of the source of the source of the source of the source of the source of the source of the source of the source of the source of the source of the source of the source of t	Urban Storm Drainage Criteria I-free cereal grain straw should I by a method suitable for the of placed) on the surface. This can areas flatter than 3:1. Mechan areas flatter than 3:1. Mechan to a depth of 3 inches without of the disk blades are dull or be ord proper soil penetration. place of straw; however, becan nay seed the site with non-natively, native species of grass ha an straw. Purchasing and utili od. When using grass hay, follow from the wind and heavy runoffor r steep slopes and special situation with stakes should be used insists of wood cellulose fibers miliess than 1,500 pounds per acreed mulcher. For steeper slopes, under the step slopes of the step slopes of the step slopes, the step slopes of the slopes	a Manual Vo d be applied condition of an be accom- ping implem- nical crimper cutting them olunted and s use hay is co- ve grass spe ty may be pu- izing a certif llow the sam f, spraying a ations where stead of mul- ixed with wa e (1,425 lbs of up to 2000 p up to 24 hou ation to road d to help stat- se may be us restricted to nut, coconut	evenly at a ra the site. Stra plished mech nent is prefer. rs must be ca . An agriculty eventically; omprised of the cies which murchased, but ied weed-free e guidelines tackifier on greater control ch. atter and a tack of fibers mixed ounds per ac rs to dry; the ls, waterways pilize steep sl ed alone or in o relatively sr	ate of 2 tons p aw mulch mu hanically by red, and is th pable of tuck tural disk, wi ; however, th he entire plan night in turn of can be diffic e straw is an as for straw (the mulch is rol is needed kifying agent ed with at lease re may be re- perefore, it sho s and existing lopes (genera n conjunction nall areas.	g (MU) per acre and ist be crimping or eding the long hile not an e frame may at including put-compete cult to find easier and (provided satisfactory , erosion t and should ast 75 lbs of quired for buld not be g vegetation ally 3:1 and n with grass
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SC-6	
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Inlet Protection (IP)

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

Propriety 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.

IP-2

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SC-6	Inlet Protection (IP)	Inlet Pr
	GENERAL INLET PROTECTION INSTALLATION NOTES	 Remove se BMP effec protection. Remove se the functio
	1. SEE PLAN VIEW FOR: -LOCATION OF INLET PROTECTION. -TYPE OF INLET PROTECTION (IP.1, IP.2, IP.3, IP.4, IP.5, IP.6)	 Propriety in
	2. INLET PROTECTION SHALL BE INSTALLED PROMPTLY AFTER INLET CONSTRUCTION OR PAVING IS COMPLETE (TYPICALLY WITHIN 48 HOURS). IF A RAINFALL/RUNOFF EVENT IS FORECAST, INSTALL INLET PROTECTION PRIOR TO ONSET OF EVENT.	manufactur in a timely
	3. 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.	Inlet protection reached final st
	INLET PROTECTION MAINTENANCE NOTES	
	 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 INLET PROTECTION SHALL BE REMOVED AS NECESSARY TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN STORAGE VOLUME REACHES 50% OF CAPACITY, A DEPTH OF 6" WHEN SILT FENCE IS USED, OR ½ OF THE HEIGHT FOR STRAW BALES.	
	5. INLET PROTECTION IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS PERMANENTLY STABILIZED, UNLESS THE LOCAL JURISDICTION APPROVES EARLIER REMOVAL OF INLET PROTECTION IN STREETS.	
	6. WHEN INLET PROTECTION AT AREA INLETS IS REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOP SOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.	
	(DETAIL ADAPTED FROM TOWN OF PARKER, 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.	
	NOTE: THE DETAILS INCLUDED WITH THIS FACT SHEET SHOW COMMONLY USED, CONVENTIONAL METHODS OF INLET PROTECTION IN THE DENVER METROPOLITAN AREA. THERE ARE MANY PROPRIETARY INLET PROTECTION METHODS ON THE MARKET. UDFCD NEITHER ENDORSES NOR DISCOURAGES USE OF PROPRIETARY INLET PROTECTION; HOWEVER, IN THE EVENT PROPRIETARY METHODS ARE USED, THE APPROPRIATE DETAIL FROM THE MANUFACTURER MUST BE INCLUDED IN THE SWMP AND THE BMP MUST BE INSTALLED AND MAINTAINED AS SHOWN IN THE MANUFACTURER'S DETAILS.	
	NOTE: SOME MUNICIPALITIES DISCOURAGE OR PROHIBIT THE USE OF STRAW BALES FOR INLET PROTECTION. CHECK WITH LOCAL JURISDICTION TO DETERMINE IF STRAW BALE INLET PROTECTION IS ACCEPTABLE.	
IP-8	Urban Drainage and Flood Control District August 2013	August 2013
11-0	Urban Storm Drainage Criteria Manual Volume 3	August 2015

August 2013

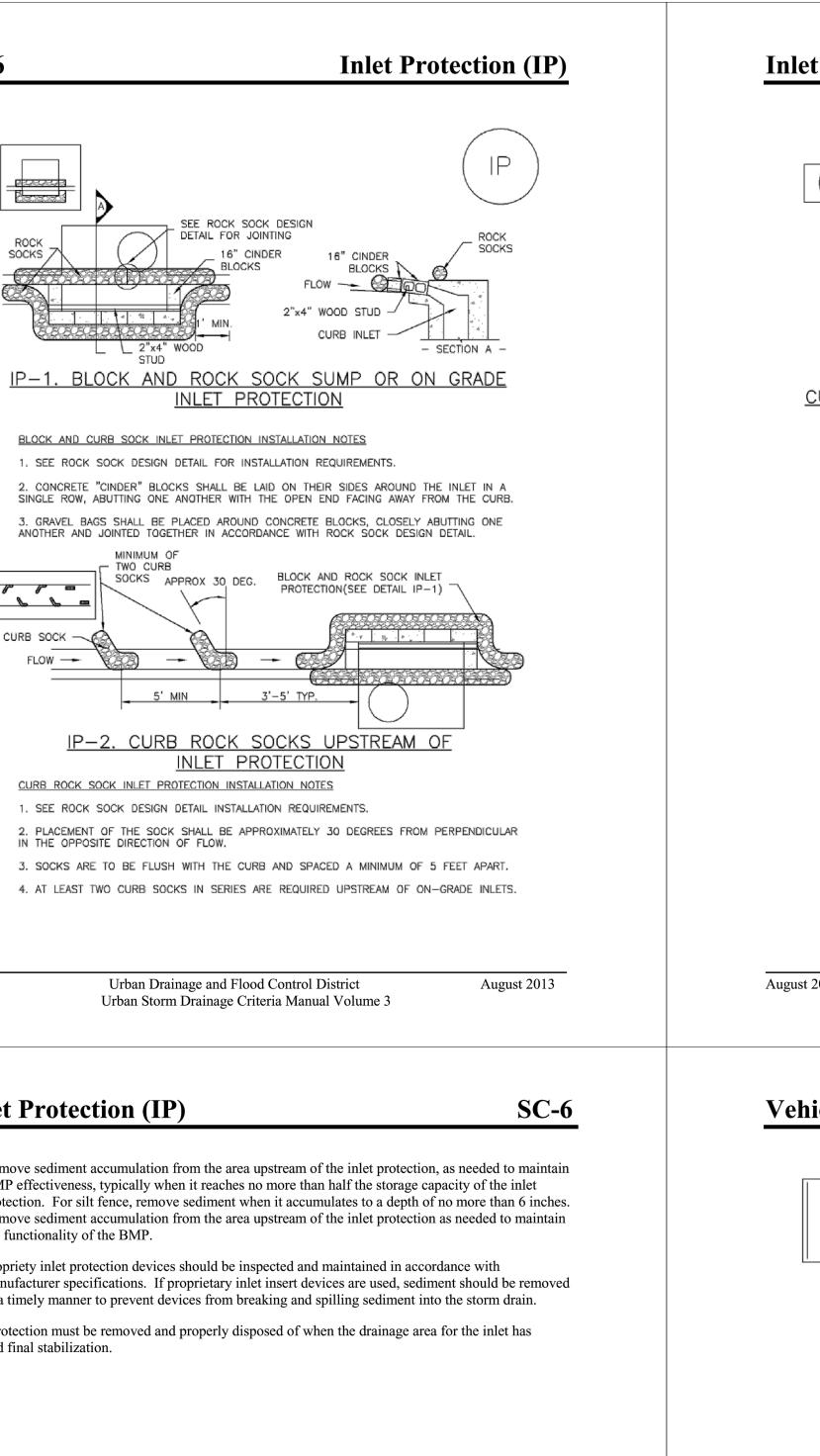
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SC-6

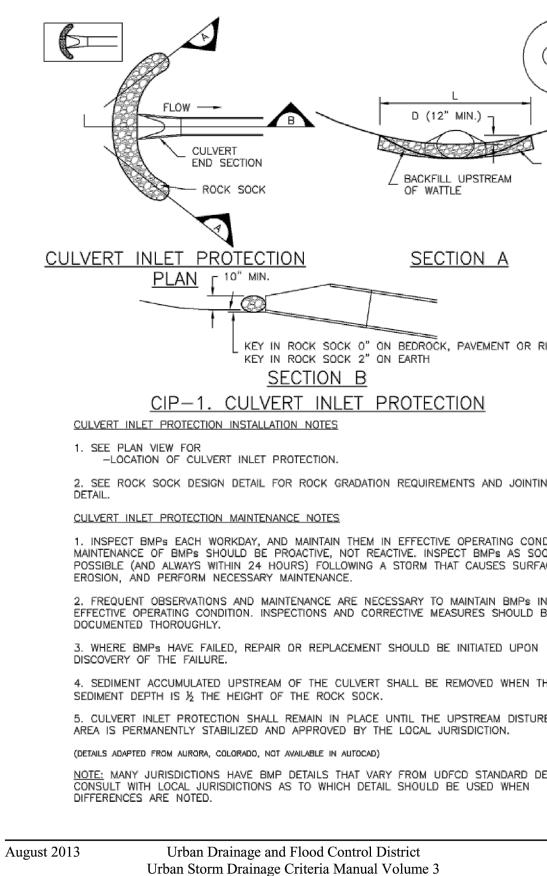
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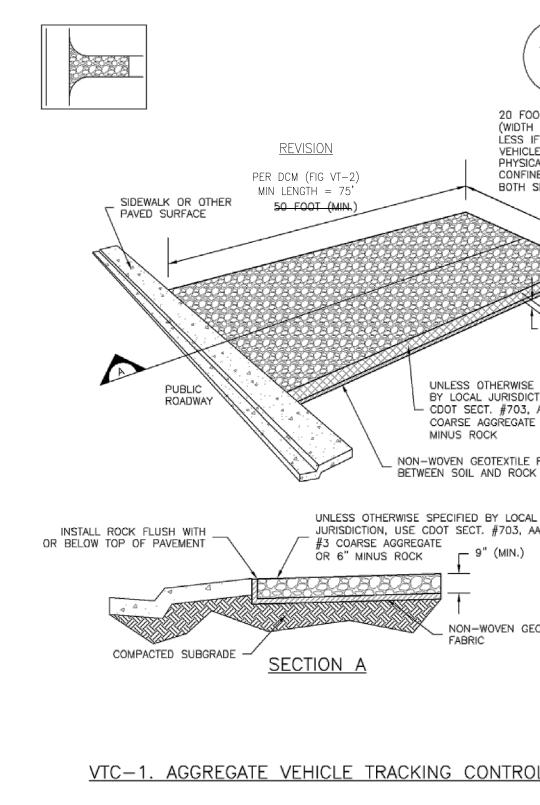
tabilization.



Inlet Protection (IP)



Vehicle Tracking Control (VTC)



Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 IP-3

November 2010

Urban Drainage and Flood Control District

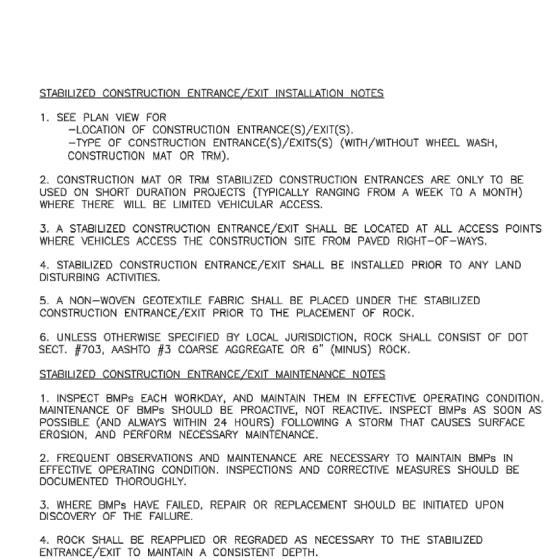
Urban Storm Drainage Criteria Manual Volume 3

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ING IDITION. JON AS ACE IN BE THE RBED		102 E. PIKES PEAK AVE., 5TH FLOOR	COLORADO SPRINGS, CO 80903 PHONE: 719.955.5485		
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Vehicle Tracking Control (VTC)

Silt Fence (SF)



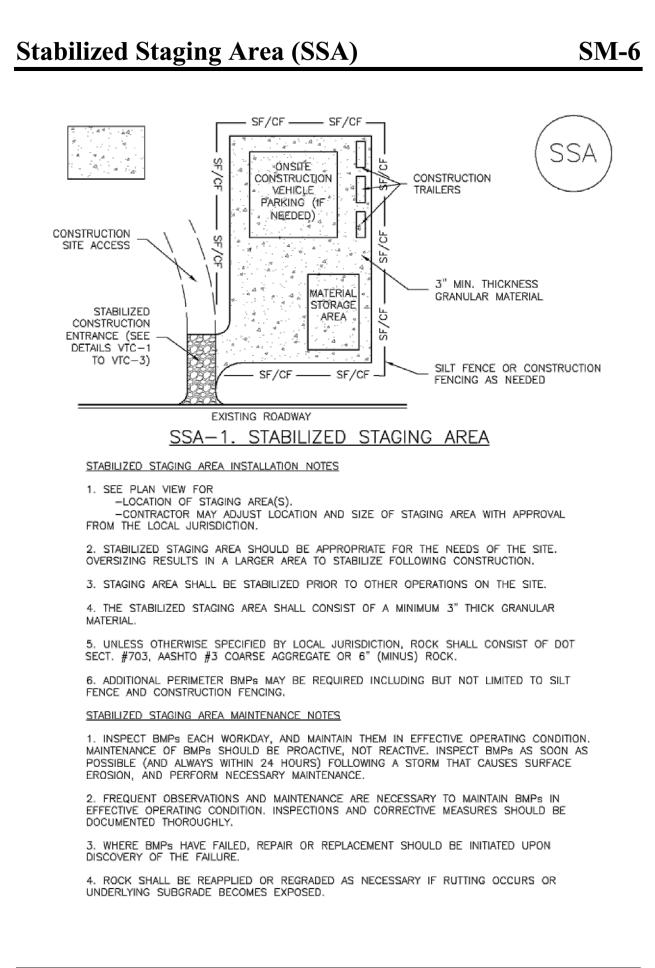
5. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED THROUGHOUT THE DAY AND AT THE END OF THE DAY BY SHOVELING OR SWEEPING. SEDIMENT MAY NOT BE WASHED DOWN STORM SEWER DRAINS.

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.

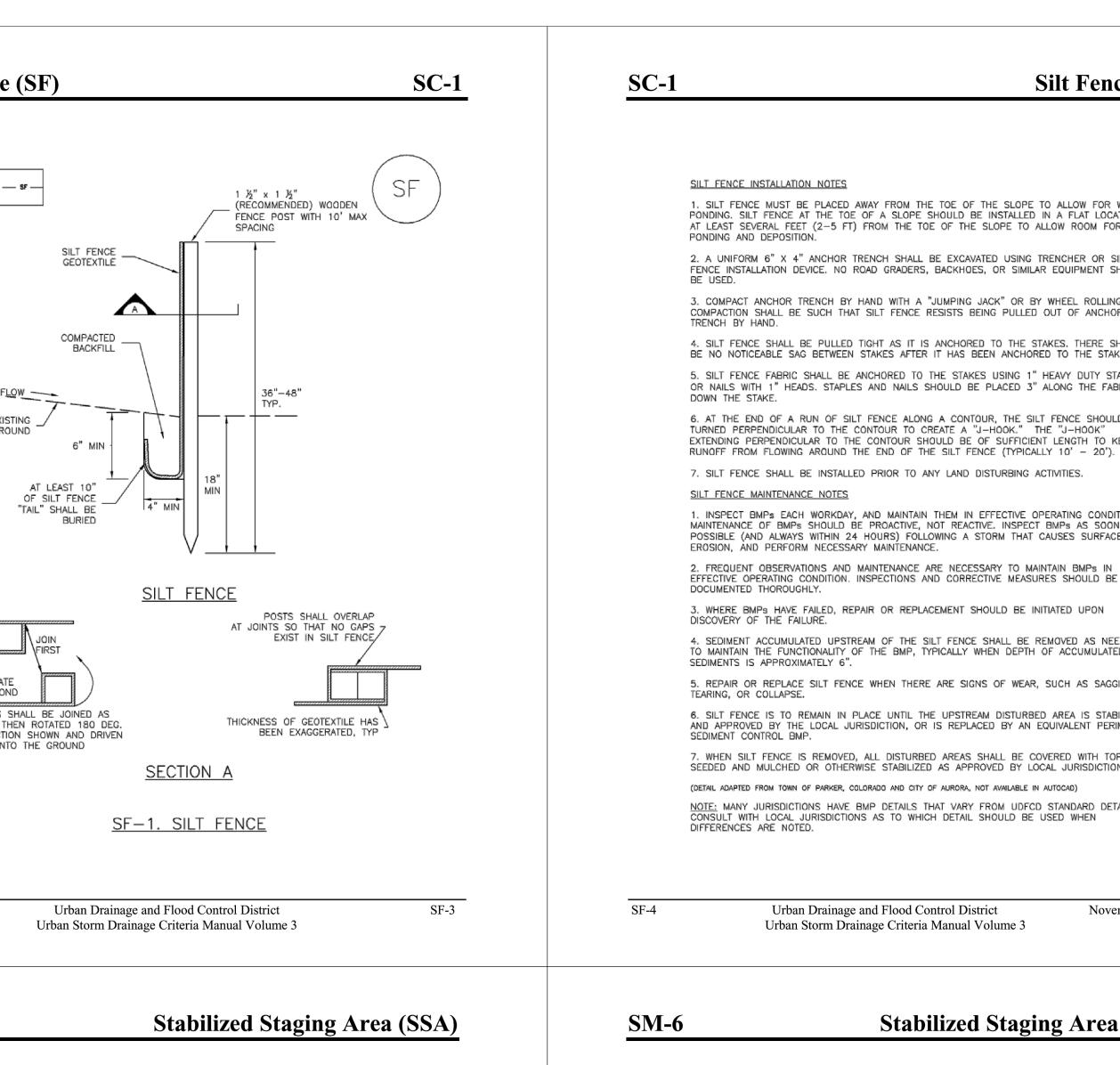
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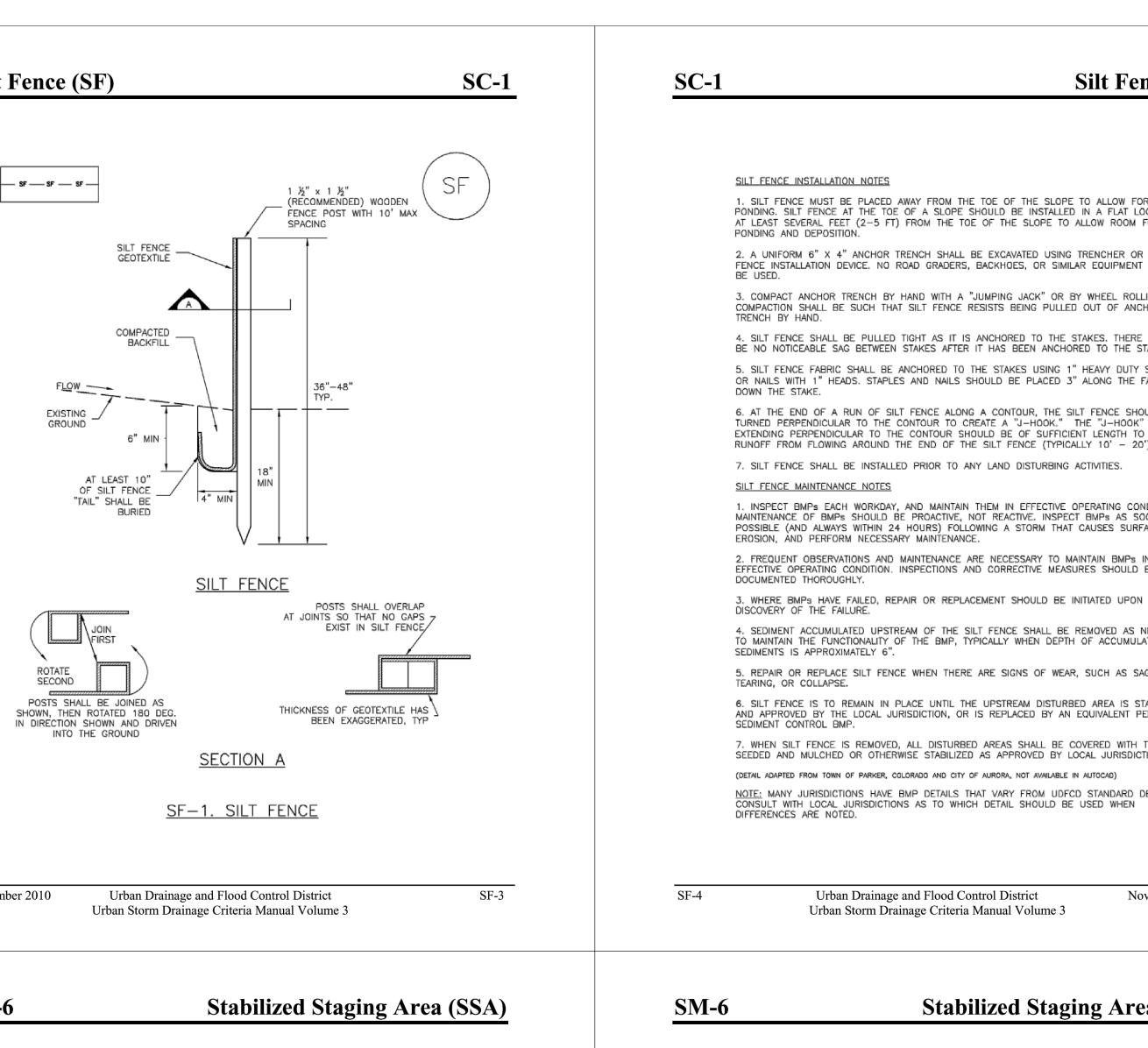
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Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3



EXISTING GROUND





November 2010

SM-6

otherwise. stabilized surface.

disturbed.

See Detail SSA-1 for a typical stabilized staging area and SSA-2 for a stabilized staging area when materials staging in roadways is required.

Maintenance and Removal

Maintenance of stabilized staging areas includes maintaining a stable surface cover of gravel, repairing perimeter controls, and following good housekeeping practices.

When construction is complete, debris, unused stockpiles and materials should be recycled or properly disposed. In some cases, this will require disposal of contaminated soil from equipment leaks in an appropriate landfill. Staging areas should then be permanently stabilized with vegetation or other surface cover planned for the development.

November 2010

November 2010

SSA-2

Minimizing Long-Term Stabilization Requirements

• Utilize off-site parking and restrict vehicle access to the site.

• Use construction mats in lieu of rock when staging is provided in an area that will not be disturbed

• Consider use of a bermed contained area for materials and equipment that do not require a

• Consider phasing of staging areas to avoid disturbance in an area that will not be otherwise

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. 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-ESTABLISHMEN

VEGETATION IN AREAS WHERE RECYCLED CONCRETE WAS PLACED. NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETA 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)

Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 November 2010

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Rolled Erosion Control Products (RECP) EC-6 • **Turf Reinforcement Mat (TRM)**: A rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, threedimensional matrix of sufficient thickness. TRMs, which may be supplemented with degradable components, are designed to impart immediate erosion protection, enhance vegetation establishment and provide long-term functionality by permanently reinforcing vegetation during and after **Product Description** maturation. Note: TRMs are typically used in hydraulic applications, such as high flow ditches and channels, steep slopes, stream banks, and shorelines, where erosive forces may exceed the limits of natural, unreinforced vegetation or in areas where limited vegetation establishment is anticipated. Tables RECP-1 and RECP-2 provide guidelines for selecting rolled erosion control products appropriate to site conditions and desired longevity. Table RECP-1 is for conditions where natural vegetation alone Mulch Control Nets will provide permanent erosion control, whereas Table RECP-2 is for conditions where vegetation alone will not be adequately stable to provide long-term erosion protection due to flow or other conditions. Netless Rolled Erosion Control Blankets Single-net Erosion Control Blankets & Open Weave Textiles Double-net Erosion Control Blankets Mulch Control Nets Erosion Control Blankets & Open Weave Textiles (slowly degrading) **Erosion Control** Blankets & Open Weave Textiles on the C Factor.) acceptable by the engineer. RECP-2 Urban Drainage and Flood Control District November 2010 November 2010 Urban Storm Drainage Criteria Manual Volume 3 **EC-6 Rolled Erosion Control Products (RECP)** ECB **DIVERSION DITCH** TYPICALLY AT TOP OF JOINT ANCHOR _ TOP OF UNDISTURBED PERIMETER SOIL TRENCH, TYP. / CHANNEL BANK ANCHOR TRENCH, TYP ANCHOR DETAILS GEOTEXTILE FABRIC OR MAT, TYP 6 "MIN, TYP. ∽ SINGLE EDGE STAKE, TYP. COMPACTED BACKFILL, TYP TYPE OF ECB AS INDICATED IN PLAN VIEW, INSTALL IN PERIMETER ANCHOR TRENCH DISTURBED AREAS OF STREAMS AND DRAINAGE CHANNELS 1 D ABOVE CHANNEL INVERT. ECB SHALL GENERALLY BE ORIENTED PERIMETER PARALLEL TO FLOW DIRECTION (I.E. LONG DIMENSIONS OF BLANKET ANCHOR PARALLEL TO FLOWLINES) STAKING PATTERN SHALL MATCH ECB TRENCH OR AND/OR CHANNEL TYPE. JOINT, TYP. TWO EDGES OF TWO ECB-1. PIPE OUTLET TO DRAINAGEWAY ADJACENT ROLLS JOINT ANCHOR TRENCH TYPE OF ECB, JOINT ANCHOR INDICATED IN PLAN VIEW TRENCH, TYP STRAW LOOP FROM - MIDDLE OF ECB SHALL ROLL EXTEND TO 1 TOP OF THE CHANNEL INTERMEDIATE ANCHOR TRENCH PERIMETER ANCHOR TRENCH, TYP. COMPACTED SUBGRADE STAKING PATTERN PER MANUFACTURER SPEC. OR PATTERN 4:1-3:1 SLOPES ∠ BASED ON ECB AND/OR CHANNEL TYPE (SEE STAKING OVERLAPPING JOINT PATTERN DETAIL) --- 3" MIN. ECB-2. SMALL DITCH OR DRAINAGEWAY 12" MIN. WOOD STAKE DETAIL RECP-6 Urban Drainage and Flood Control District November 2010 November 2010 Urban Storm Drainage Criteria Manual Volume 3

Rolled Erosion Control Products (RECP)

EC-6

RECP-3

EC-6

Table RECP-1. ECTC Standard Specification for Temporary Rolled Erosion Control Products (Adapted from Erosion Control Technology Council 2005)

Slo Applica		Channel Applications*	Minimum Tensile Strength ¹	Expected Longevity	
Maximum Gradient	C Factor ^{2,5}	Max. Shear Stress ^{3,4,6}			
5:1 (H:V)	≤0.10 @ 5:1	0.25 lbs/ft ² (12 Pa)	5 lbs/ft (0.073 kN/m)		
4:1 (H:V)	≤0.10 @ 4:1	0.5 lbs/ft ² (24 Pa)	5 lbs/ft (0.073 kN/m)	Up to 12	
3:1 (H:V)	≤0.15 @ 3:1	1.5 lbs/ft ² (72 Pa)	50 lbs/ft (0.73 kN/m)	months	
2:1 (H:V)	≤0.20 @ 2:1	1.75 lbs/ft ² (84 Pa)	75 lbs/ft (1.09 kN/m)		
5:1 (H:V)	≤0.10 @ 5:1	0.25 lbs/ft ² (12 Pa)	25 lbs/ft (0.36 kN/m)	24 months	
1.5:1 (H:V)	≤0.25 @ 1.5:1	2.00 lbs/ft ² (96 Pa)	100 lbs/ft (1.45 kN/m)	24 months	
1:1 (H:V)	≤0.25 @ 1:1	2.25 lbs/ft ² (108 Pa)	125 lbs/ft (1.82 kN/m)	36 months	

* C Factor and shear stress for mulch control nettings must be obtained with netting used in conjunction with pre-applied mulch material. (*See Section 5.3 of Chapter 7 Construction BMPs for more information on the C Factor*)

¹ Minimum Average Roll Values, Machine direction using ECTC Mod. ASTM D 5035.

² C Factor calculated as ratio of soil loss from RECP protected slope (tested at specified or greater gradient, H:V) to ratio of soil loss from unprotected (control) plot in large-scale testing.

³ Required minimum shear stress RECP (unvegetated) can sustain without physical damage or excess

erosion (> 12.7 mm (0.5 in) soil loss) during a 30-minute flow event in large-scale testing.

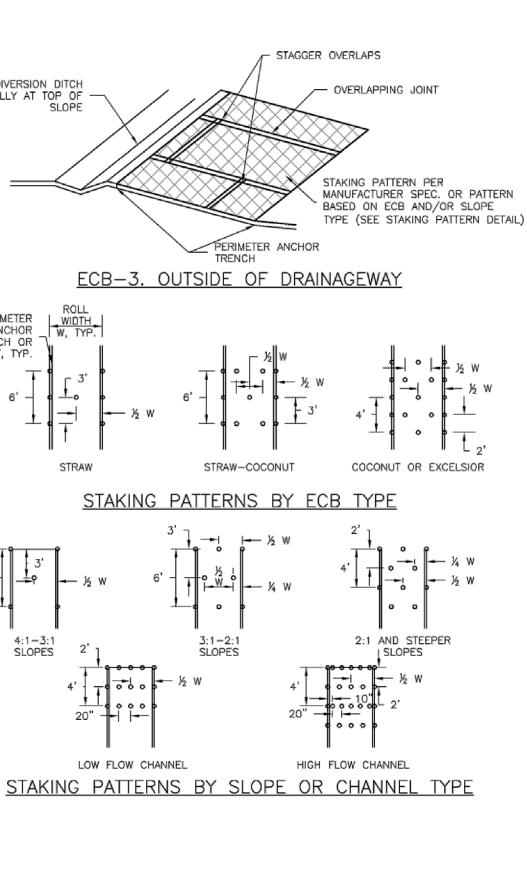
⁴ The permissible shear stress levels established for each performance category are based on historical experience with products characterized by Manning's roughness coefficients in the range of 0.01 - 0.05. ⁵ Acceptable large-scale test methods may include ASTM D 6459, or other independent testing deemed

acceptable by the engineer. ⁶ Per the engineer's discretion. Recommended acceptable large-scale testing protocol may include ASTM

D 6460, or other independent testing deemed acceptable by the engineer.

Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3

Rolled Erosion Control Products (RECP)



RECP-7

EC-6 Rolled Erosion Control Products

 Table RECP-2. ECTC Standard Specification for Permanent¹ Rolled Erosion Contro

 (Adapted from: Erosion Control Technology Council 2005)

	Product Type	Slope Applications	Channel Applications	
		Maximum Gradient	Maximum Shear Stress ^{4,5}	
	TRMs with a minimum thickness of 0.25 inches (6.35 mm) per ASTM D 6525 and UV stability of 80% per ASTM D 4355 (500 hours exposure).	0.5:1 (H:V)	6.0 lbs/ft ² (288 Pa)	12
		0.5:1 (H:V)	8.0 lbs/ft ² (384 Pa)	15
		0.5:1 (H:V)	10.0 lbs/ft ² (480 Pa)	17

¹ For TRMs containing degradable components, all property values must be obtained on the degradable portion of the matting alone.

² Minimum Average Roll Values, machine direction only for tensile strength determination <u>D 6818</u> (Supersedes Mod. <u>ASTM D 5035</u> for RECPs)

 3 Field conditions with high loading and/or high survivability requirements may warrant the with a tensile strength of 44 kN/m (3,000 lb/ft) or greater.

⁴Required minimum shear stress TRM (fully vegetated) can sustain without physical dama erosion (> 12.7 mm (0.5 in.) soil loss) during a 30-minute flow event in large scale testing.

⁵ Acceptable large-scale testing protocols may include <u>ASTM D 6460</u>, or other independen deemed acceptable by the engineer.

Design and Installation

RECPs should be installed according to manufacturer's specifications and guidelines. Regative of product used, it is important to ensure no gaps or voids exist under the material and corners of the material are secured using stakes and trenching. Continuous contact between and the soil is necessary to avoid failure. Never use metal stakes to secure temporary eroside products. Often wooden stakes are used to anchor RECPs; however, wood stakes may press and maintenance challenges and generally take a long time to biodegrade. Some local jurise had favorable experiences using biodegradable stakes.

This BMP Fact Sheet provides design details for several commonly used ECB applications

ECB-1 Pipe Outlet to Drainageway

ECB-2 Small Ditch or Drainageway

ECB-3 Outside of Drainageway

RECP-4Urban Drainage and Flood Control DistrictNoUrban Storm Drainage Criteria Manual Volume 3

EC-6 Rolled Erosion Control Products

EROSION CONTROL BLANKET INSTALLATION NOTES

 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.

 100% NATURAL AND BIODEGRADABLE MATERIALS ARE PREFERRED FOR RECPS, ALTH SOME JURISDICTIONS MAY ALLOW OTHER MATERIALS IN SOME APPLICATIONS.
 IN AREAS WHERE ECBS ARE SHOWN ON THE PLANS. THE PERMITTEE SHALL PLACE

3. IN AREAS WHERE ECBS ARE SHOWN ON THE PLANS, THE PERMITTEE SHALL PLACE TOPSOIL AND PERFORM FINAL GRADING, SURFACE PREPARATION, AND SEEDING AND M SUBGRADE SHALL BE SMOOTH AND MOIST PRIOR TO ECB INSTALLATION AND THE ECB 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 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 FOR COCONUT AND EXCELSIOR ECBs.7. OVERLAPPING JOINT DETAIL SHALL BE USED TO JOIN ROLLS OF ECBs TOGETHER F

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 INSTALLI SHALL BE RESEEDED AND MULCHED.

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

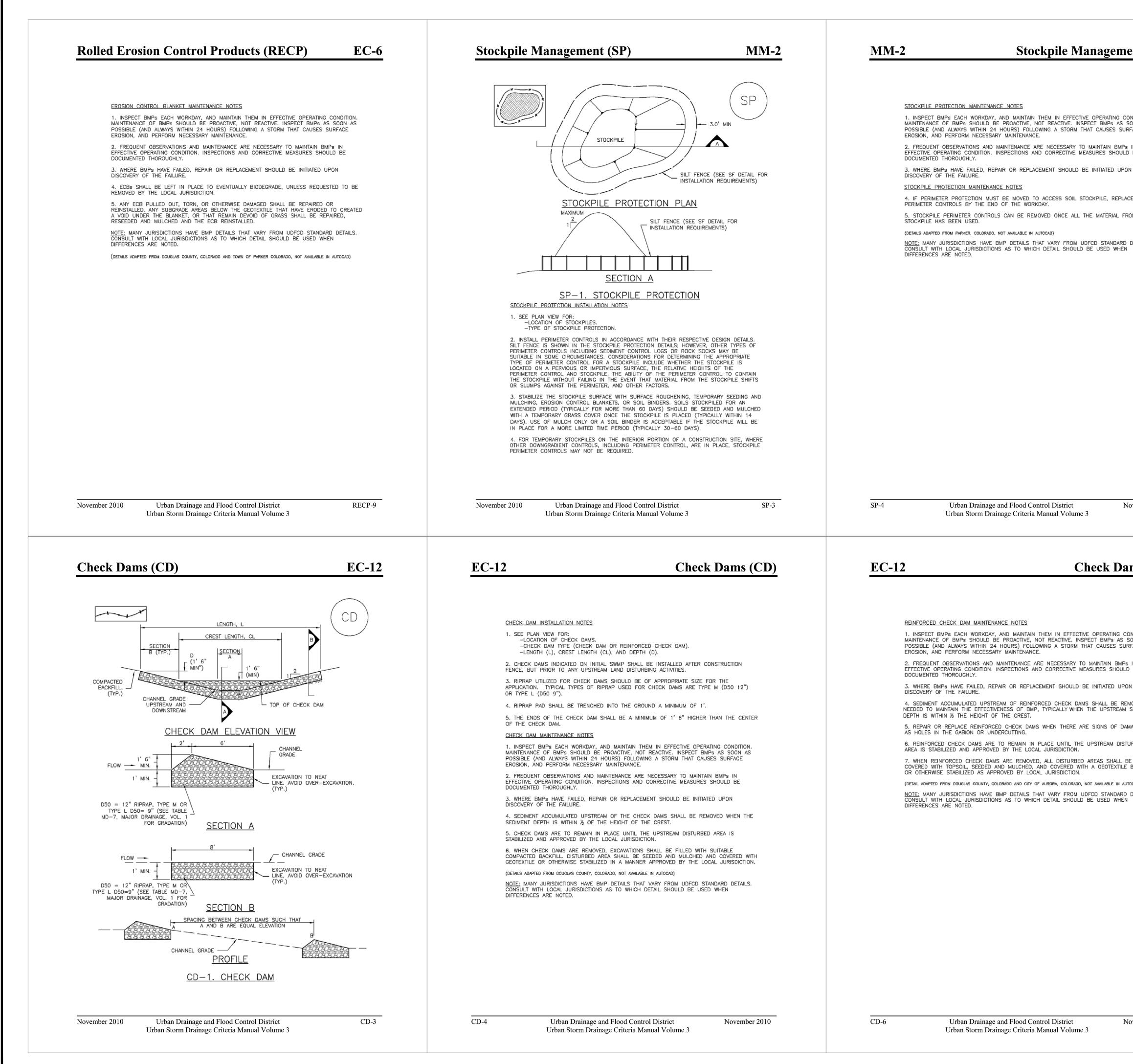
TABLE ECB-1.	ECB MATERIA	AL SPECIFICAT	IONS
COCONUT CONTENT	STRAW CONTENT	EXCELSIOR CONTENT	RECOMMENDED NETTING**
-	100%	-	DOUBLE/ NATURAL
30% MIN	70% MAX	-	DOUBLE/ NATURAL
100%	_	_	DOUBLE/ NATURAL
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	COCONUT CONTENT – 30% MIN	COCONUT CONTENT STRAW CONTENT – 100% 30% MIN 70% MAX	CONTENT CONTENT CONTENT - 100% - 30% MIN 70% MAX - 100% - -

*STRAW ECBS MAY ONLY BE USED OUTSIDE OF STREAMS AND DRAINAGE CHANNEL. **ALTERNATE NETTING MAY BE ACCEPTABLE IN SOME JURISDICTIONS

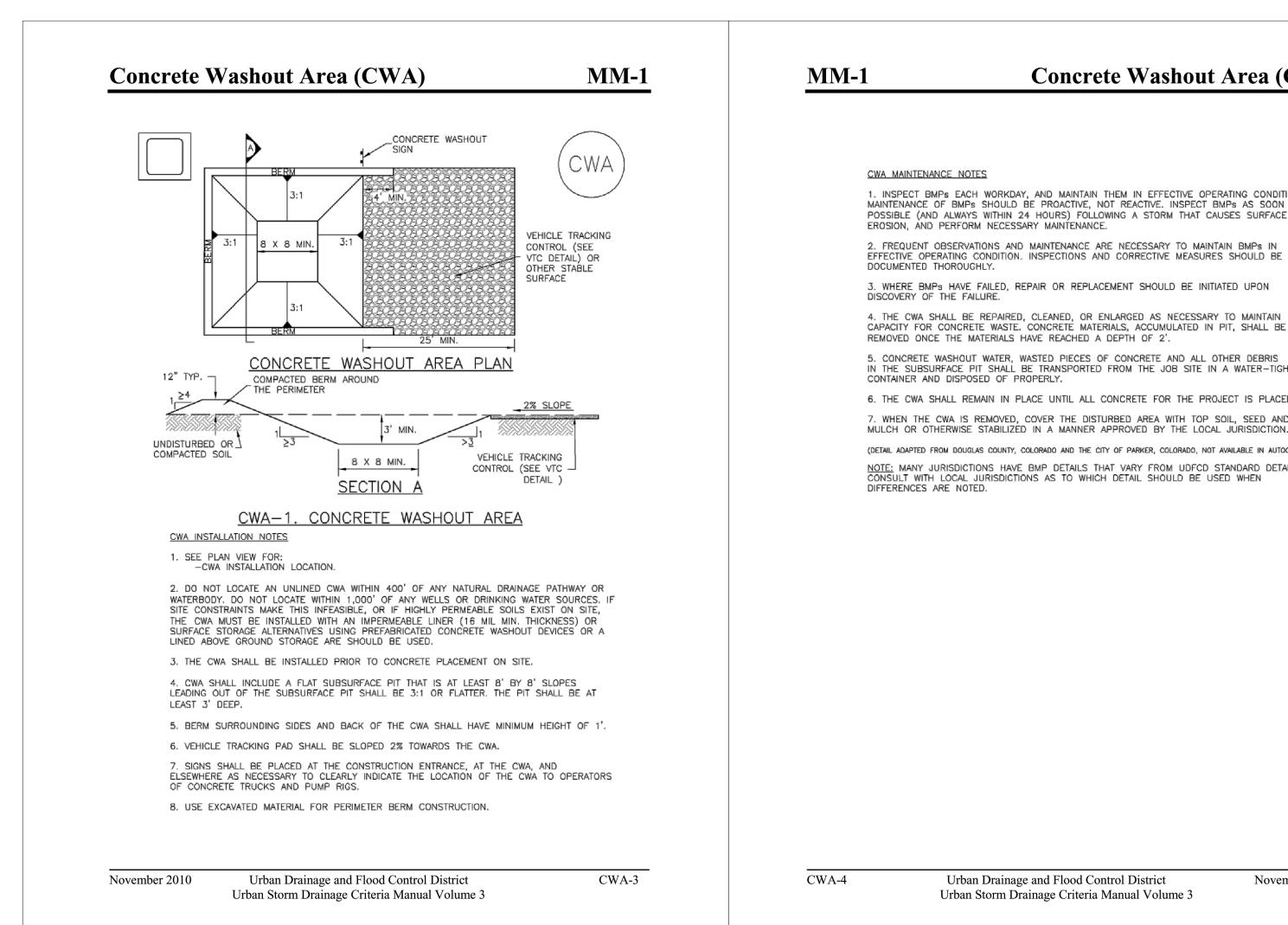
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Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 No

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	FOR INFORMATION PURPOSE ONLY	
ovember 2010	FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES FOR BURIED UTILITY INFORMATION 48 HRS BEFORE YOU DIG CALL 1-800-922-1987	REVISIONS: NO. DATE: BY: DESCRIPTION: NO. DATE: BY: DESCRIPTION: The Enclose of These Plans THE ENCINEER PREPARING THESE PLANS NILL NOT THE PREPARER OF THESE PLANS. THE REPARER OF THESE PLANS. NILL NOT



ent (SM)		WWSD BOOSTER 2 PUMP STATION	GRADING & EROSION CONTROL DETAILS	70-077	DEAUN BY: JWP VERTICAL: SHEET 7 OF 8 FGR07 CHECKED BY: VAS N/A
		100 F PIKES PEAK AVE 5TH FLOOR	COLORADO SPRINGS, CO 80903 PHONE: 719.955.5485		
ovember 2010					CIVIL CONSULTANTS, INC.
Ins (CD)		COLORADO P.E. NO. 38923	FOR AND ON Behalf of	CONSULTANTS, INC.	
SOON AS RFACE IN D BE IN MOVED AS SEDIMENT MAGE SUCH URBED		DARIN L. MOFFETT,	00% DRA	DESIC	
BLANKET, TOCAD) DETAILS.		APRV'D. BY: DATE:			BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY
ovember 2010	FOR INFORMATION PURPOSE ONLY	REVISIONS: No. DATE: BY: DESCRIPTION:			THE ENGINEER PREPARING THESE PLANS WILL NOT BE TO OR USES OF THESE PLANS. ALL CHANGES TO THE THE PREPARER OF THESE PLANS.



Concrete Washout Area (CWA)

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

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON

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.

> Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3

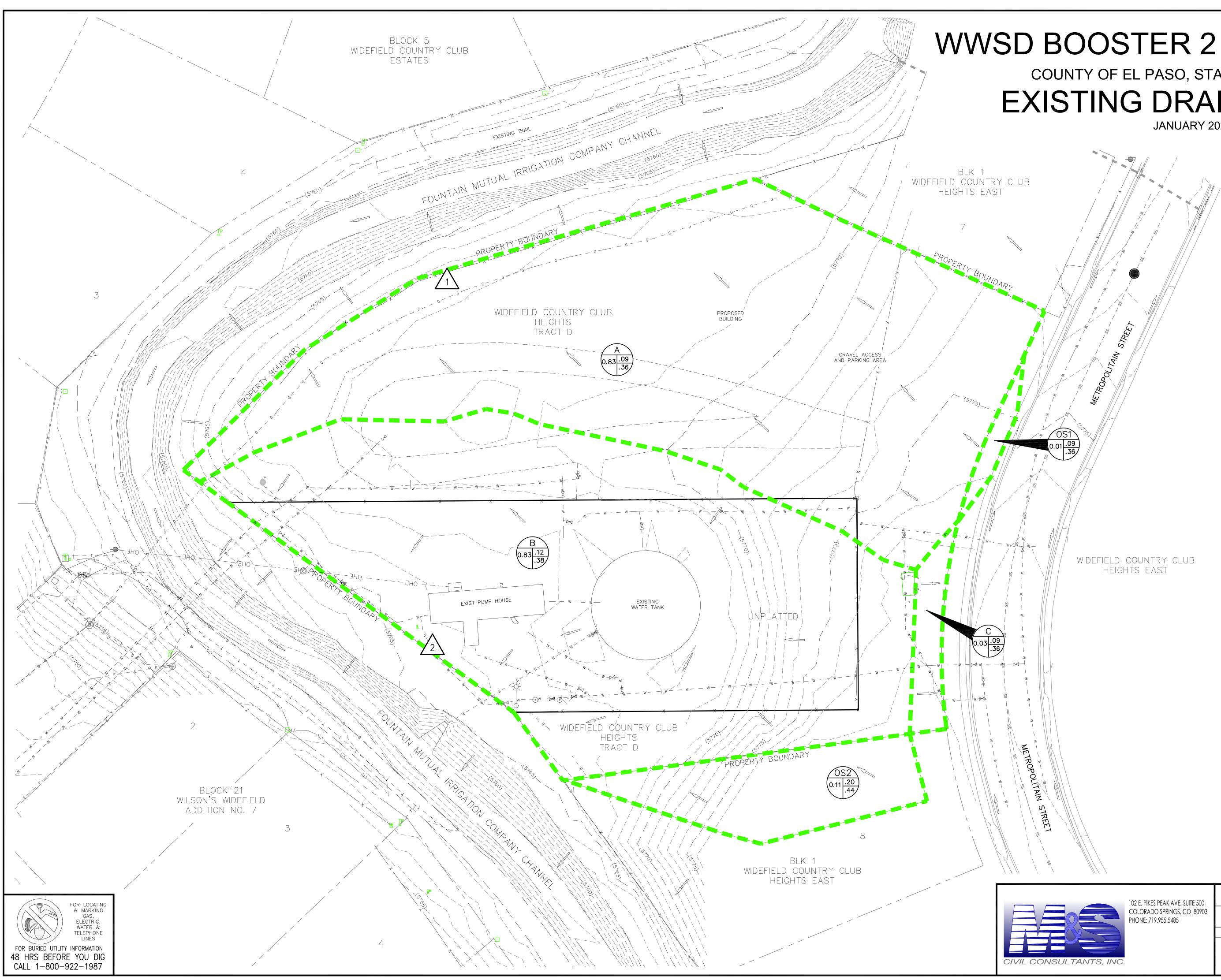
November 2010

REVISIONS:			DARII	DARIN L. MOFFETT, COLORADO P.E. NO. 38923			
NO. DATE: BY: DESCRIPTION:		APRV'D. BY: DATE:					WWSU BUUSIER Z FUMP SIAIIUN
			1 (102 E. PIKES PEAK AVE., 51H FLOOK	
)(7			COLORADO SPRINGS CO 80903	
		2A		BEHALF UF		PHONE: / 19.733.3483	
		VV					
				CONSULTANTS,			PRUJECI NU. /U-U// SCALE: DATE: 02-04-2022
				INC.			HORIZONTAL -
THE ENGINEER PREPARING TO OR USES OF THESE F THE PREPARER OF THESE	THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED ITHE PREPARER OF THESE PLANS.	OR LIABLE FOR, UNAUTHORIZED CHANGES BE IN WRITING AND MUST BE APPROVED BY	GN		CIVIL CONSULTANTS, INC.		DESIGNED BY: DLM N/A N/A DRAWN BY: JWP VERTICAL: SHEET 8 OF 8 FGR08 CHECKED BY: VAS N/A

FOR INFORMATION PURPOSE ONLY



PROPOSED AND EXISTING DRAINAGE MAP



WWSD BOOSTER 2 PUMP STATION

COUNTY OF EL PASO, STATE OF COLORADO EXISTING DRAINAGE MAP



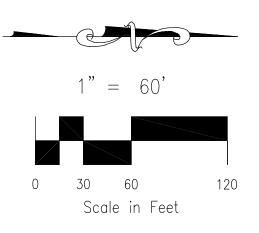
<u>LEGEND</u> BASIN DESIGNATION . SURFACE DESIGN POINT (DP) PIPE RUN REFERENCE LABEL 4BASIN BOUNDARY EXISTING INDEX CONTOUR (5') (6920) EXISTING NOMINAL CONTOUR (1') WWSD SITE BOUNDARY EXISTING FLOW DIRECTION ARROW HIGH POINT LOW POINT PROPOSED STORM SEWER PIPE FLARED END SECTION EXISTING FLOW DIRECTION ARROW

PROPOSED FLOW DIRECTION

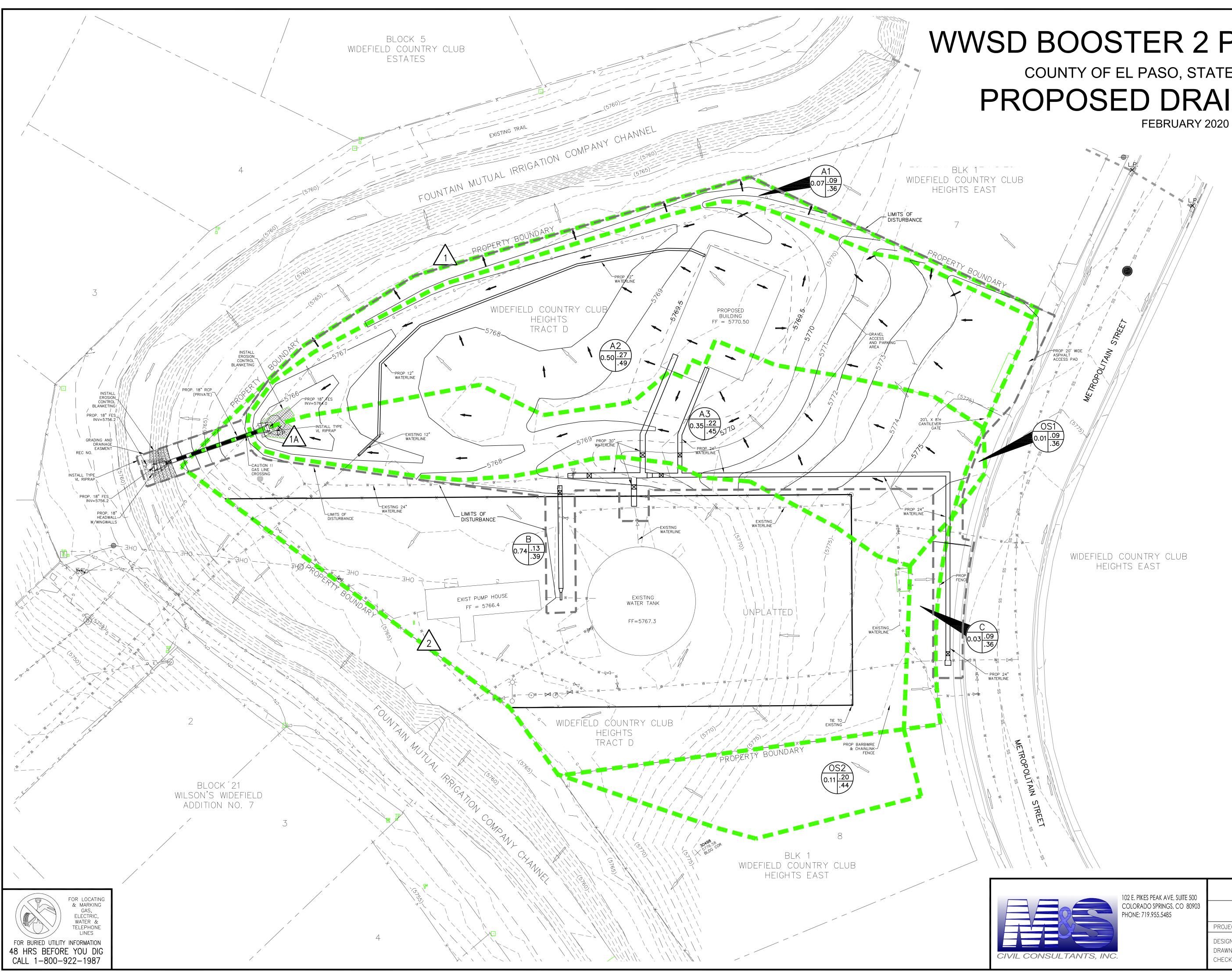
BASIN	I SUMMA	ARY	
BASIN	AREA (ACRES)	Q ₅	Q ₁₀₀
А	0.83	0.3	1.9
В	0.83	0.4	2.3
С	0.03	0.0*	0.1
OS1	0.01	0.0*	0.0*
OS2	0.11	0.1	0.4

* RUNOFF FROM BASIN IS LESS THAN 0.1 CFS

DESIGN		NT SI	JMMARY
DESIGN POINT	Q ₅	Q ₁₀₀	BASIN & DES. PTS
1	0.3	2.0	0S1,0S2,A
2	0.6	2.7	A1,0S3



102	102 E. PIKES PEAK AVE, SUITE 500 COLORADO SPRINGS, CO 80903 PHONE: 719.955.5485	WWSD BOOSTER 2 PUMP STATION					
		EXISTING DRAINAGE MAP					
		PROJECT NO. 70-077		SCALE:	DATE: 8/21/2019		
SULTANTS, INC.		DESIGNED BY: DRAWN BY: CHECKED BY:	DLM DLM VAS	HORIZONTAL: 1"=20' VERTICAL: N/A	SHEET 1 OF 1	EDM	



WWSD BOOSTER 2 PUMP STATION

COUNTY OF EL PASO, STATE OF COLORADO PROPOSED DRAINAGE MAP

> <u>LEGEND</u> BASIN DESIGNATION . SURFACE DESIGN POINT (DP) PIPE RUN REFERENCE 4LABEL BASIN BOUNDARY EXISTING INDEX CONTOUR (5') (6920) EXISTING NOMINAL CONTOUR (1') WWSD SITE BOUNDARY EXISTING FLOW DIRECTION ARROW HIGH POINT LOW POINT PROPOSED STORM SEWER PIPE FLARED END SECTION

> > EXISTING FLOW DIRECTION

PROPOSED FLOW DIRECTION

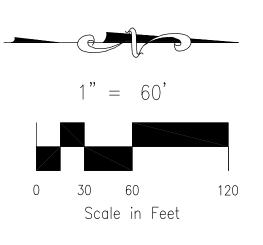
ARROW

BASIN SUMMARY AREABASIN(ACRES)Q5Q100 0.07 0.0* 0.2 A1 0.50 0.5 1.6 A2 A30.350.31.0B0.740.42.1 0.03 0.0* 0.1 С
 <0.01</th>
 0.0*
 0.0*

 0.11
 0.1
 0.4
 OS1 OS2

* RUNOFF FROM BASIN IS LESS THAN 0.1 CFS

DESIGN POINT SUMMARY								
DESIGN POINT	Q_5	Q ₁₀₀	BASIN & DES. PTS					
1	0.0	0.2	A1					
1A	0.8	2.6	OS1, A2, A3					
2	0.6	2.9	OS2, B, C					



	102 E. PIKES PEAK AVE, SUITE 500 COLORADO SPRINGS, CO 80903 PHONE: 719.955.5485	WWSD BOOSTER 2 PUMP STATION					
		PROPOSED DRAINAGE MAP					
		PROJECT NO. 7		SCALE: HORIZONTAL:	DATE: 2/4/2022		
VIL CONSULTANTS, INC.		DESIGNED BY: DRAWN BY: CHECKED BY:	DLM DLM VAS	1"=20' VERTICAL: N/A	SHEET 1 OF 1	PD	

PDM