FINAL DRAINAGE REPORT
FOR
DWIRE STORAGE YARD FILING NO. 1

EL PASO COUNTY, COLORADO

JANUARY 2021

Prepared for:
DWIRE Earthmoving, Inc.
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Prepared by:

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Project #43-117

PCD Project No. MS-20-002

FINAL DRAINAGE REPORT FOR
DWIRE STORAGE YARD FILING NO. 1

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 applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omission on my part in preparing this report.

COLORADO REGISTERED
VIRGIL A. SANCHEZ
37160
PROFESSIONAL ENGINEER
1-29-21

_____
Virgil A. Sanchez, P.E. #37160
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.

BY:_____

TITLE: Jeff Dwire, Owner
DATE: 2-1-21

ADDRESS: Dwire Earthmoving, Inc.
6799 Bismark Road, Suite C
Colorado Springs, CO 80922

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 Engineering Manual, as amended.

BY:_____ DATE:____
Jennifer Irvine, P.E.
County Engineer

APPROVED
Engineering Department
03/17/2021 3:31:41 PM
dsdnijkamp
EPC Planning & Community Development Department

CONDITIONS:

FINAL DRAINAGE REPORT FOR
DWIRE STORAGE YARD FILING NO. 1

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PURPOSE

This document is intended to serve as the Final Drainage Report for the DWIRE Storage Yard Filing No. 1. 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 site safely and in a manner that satisfies the requirements set forth by the El Paso County Drainage Criteria Manual. The development plan for Lot 1 will consist of a gravel storage yard with office/warehouse buildings, asphalt, curb, lighting, and Tract B Full Spectrum Detention Pond and landscaping. Tract A will include areas within the 100 year floodplain and is identified as "No Build Area and No Disturbance" and Tract C is proposed as a gravel storage yard and can be replatted in the future, upon which an updated drainage letter shall be required for review and approval. The parcel is zoned "I-3" and the proposed use is permissible within the Industrial zoning criteria.

GENERAL LOCATION AND DESCRIPTION

DWIRE Storage Yard Filing No. 1 is located in the southeast quarter of the southwest quarter of Section 28, Township 13 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The parcel is bound to the north by an existing and abandoned railroad embankment approximately 100 feet from the northern boundary and the East Fork Sand Creek Sub-tributary, to the west by Transit Mix property and East Fork Sand Creek Sub-tributary, to the south by Lot 7 of the Marksheffel Industrial Park, Capitol Drive, and to the east by Timberline Storage Yard. As shown on the enclosed FIRM panel, a channel known as the East Fork of Sand Creek Sub-tributary flows from north to south approximately 85 feet from the western boundary of the site. The site is located within the greater Sand Creek Drainage Basin and is tributary to the Sand Creek Channel via the East Fork Sand Creek Sub-Tributary. A vicinity map showing the location of the proposed development has been provided in the appendix of this report.

The proposed storage yard development and improvements will be constructed on approximately 8.356 acres of the 19.362 acre parcel. The site is currently zoned "I-3" which is associated with industrial development. In the existing condition, both the parcel and offsite contributing watershed lands are sparsely vegetated, with ground cover consisting primarily of native grasses ranging in density from fair to good. The proposed development will consist of a gravel storage yard with two office/warehouse buildings, gravel and asphalt parking areas, lighting, landscaping, and an access road. Slopes across the development typically range between 2% to 5%. Offsite flows reaching development are contributed in part from areas of Timberline Storage Yard along the eastern boundary and from small portions of unplatted property to the north. Flows produced within the development will be collected by proposed storm sewer improvements, swales, riprap rundowns, and will be routed to a proposed full spectrum detention (FSD) pond located at the southern boundary of the development.

SOILS

Soils for this project are delineated by the map in the appendix as Blendon Sandy Loam (10) which is characterized as Hydrologic Soil Types "B". Soils in the study area are shown as mapped by Soil Conservation Service in the "Soils Survey of El Paso County Area".

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

A portion of the site lies within the 100 year floodplain according to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0543 F, effective date March 17, 1997 and the more recent FIRM Panel No. 08041C0543 G, effective date December 7, 2018. Base Flood Elevation (BFE) lines from FIRM Panel No. 08041C0543 F (NGVD29) are used for hydraulic calculations, drainage maps, and a discussion within this report. No development is anticipated to occur within the floodplain located at the northwest corner of the site. See Proposed Drainage Map and the FIRM Panels located in the appendix of this report for details. Tract A is provided on the plat for the portion of the lot encumbered by the floodplain. The Floodplain application and Floodplain permit are included in this report, in the Floodplain Map section in the appendix. No portions of the developed lots are within the 100 year flood zone. Additional work will be at the discretion of the local floodplain administrator in accordance with FEMA policy.

DRAINAGE CRITERIA

This drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual and where applicable the City of Colorado Springs DCM Volume 1 dated May 2014 effective January 2015. Hydrologic 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 130 acres (in accordance with Chapter 6 of the City of Colorado Springs DCM Volume 1). Full spectrum detention facilities have been designed in accordance with Section 3.2.1. of Chapter 13 of the City of Colorado Springs DCM Volume 1, dated May 2014, effective January 31, 2015 and Urban Drainage and Flood Control District Manuals dated January 2016.

FOUR STEP PROCESS

Step 1: Employ Runoff Reduction Practices. – Approx. 1.469 acres of the proposed development 19.362 acres is being set aside for a Full Spectrum Detention (FSD) Pond. Whenever possible, runoff produced within developable area containing impervious surfaces will be routed through landscaped areas or earthen swales (grass-lined where slope exceeds 2%) to minimize direct connection of impervious surfaces.

Step 2: Stabilize drainage ways –The DWIRE Storage Yard site proposes a Full Spectrum Detention (FSD) Pond to control developed runoff that is discharging to the East Fork Sand Creek Sub-Tributary located approximately 85-170 feet from the northern and western boundaries of the subject site. The FSD outlet structure has been designed to drain the water quality event storm in 40 hours, while reducing the 100 year peak discharge to approximately 90% of the predevelopment conditions. The development of this site is not anticipated to have negative effects on downstream drainageways. The existing channel embankment has been stabilized at the FSD pond's emergency spillway and where the outlet pipe from the pond enters the channel. Per the DBPS the existing channel is to remain, and no improvements are necessary for this reach of the channel (See "Referenced Reports" in the Appendix, Sheets EF-27 & EF-28).

Step 3: Provide water quality capture volume. – A Full Spectrum Detention Pond is proposed to reduce peak discharge rates and provide water quality treatment. The WQCV will be released over a 40 hour period while larger event storms will be released in periods of times between 64-80 hours.

Step 4: Consider Need for Industrial and Commercial BMP's – This submittal provides a final grading and erosion control plans with BMPs in place. The proposed project will use silt fence, inlet protection, straw bales, a vehicle tracking control pad, and concrete washout area, mulching and reseeding to mitigate the potential for erosion across the site. DL Holdings, LLC shall be responsible for existing and potentially necessary the BMPs for the site including staging, storage and stockpile areas as determined by the contractor. Individual lot owners will be responsible for additional permanent BMPs if necessary because of site uses.

EXISTING DRAINAGE CONDITIONS

The DWIRE Storage Yard Filing No. 1site consists of 19.362 acres situated south and east of the East Fork Sub-tributary of Sand Creek. There are no existing structures within the site. In accordance with the Engineering Criteria Manual (ECM) and Drainage Criteria Manual (DCM) an existing conditions hydrologic analysis was performed to determine existing flow quantities entering and exiting the subject site so a comparison to post development discharge rates could be made. As shown on the enclosed Existing Drainage Map (located in the appendix of this report) the existing site terrain within the parcel generally slopes from north to south at grades that vary between 2% to 5%. An existing and abandoned railroad embankment lies approximately 100 feet from the northern boundary of the site and protects the site from the East Fork Sand Creek Sub-tributary and offsite runoff. The East Fork Sand Creek Sub-Tributary continues from north to south approximately 85 feet from the western boundary of the site. A site visit was made and it was observed that existing channel banks appear to be stable with established vegetation and minimal scour. Per the DBPS the existing channel is to remain, and no improvements are necessary for this reach of the channel (See "Reference Reports" in the Appendix, Sheets EF-27 & EF-28).

An overlay of the 100 yr floodplain (Zone AE) is shown on the Existing Drainage Map and the Floodplain Map, of which 0.28 acres overlaps the northwest corner of the site. Refer to the enclosed Existing Drainage Map for specific flow rates associated with Existing Basins and Design Points.

Design Point 1 consists of native grass covered un-platted land located along the east parcel property boundary. Runoff produced by **Basins OS1, OS2 and A,** has been calculated to be 0.8 cfs in the 5-year storm event and 5.10 cfs in the 100-year storm event. Runoff from these basins is conveyed as sheet flow and earthen swale to the east towards **Design Point 1.** These flows will combine with flows from the Timberline storage yard and be routed via a swale to and be treated by the Timberline Storage Yard Full Spectrum Detention Pond 1. The "Amendment No.1 to the Final Drainage Report for Timberline Storage Yard", dated March 2020, by M&S Civil Consultants, Inc. accounts for these flows and the Full Spectrum Detention Pond 1 was designed with consideration to this tributary area (See Timberline Storage Yard Proposed Drainage Map, Basins OS2).

Design Point 2 consists of grass covered un-platted land and a portion of Timberline Storage Yard (Basin OS3). Runoff produced by **Basins A1 and OS3,** has been calculated to be 3.6 cfs in the 5-year storm event and 7.5 cfs in the 100-year storm event. Runoff from these basins is conveyed as sheet flow to the east towards **Design Point 2.** Runoff from Basin OS3 and A1 continues south on existing Capital Drive.

Design Point 3 consists of native grass covered un-platted land located central portion of the property and along the south and west property boundary. Runoff produced by **Basins OS4, OS5 and B,** has been calculated to be 2.6 cfs in the 5-year storm event and 17.2 cfs in the 100-year storm event. Runoff from these basins is conveyed as sheet flow to the south and is captured by an existing swale on the southern property boundary and routed west towards **Design Point 3.** This runoff outfalls into the East Fork Sand Creek Sub-tributary.

Design Point 4 consists of native grass covered un-platted land located at the northwest portion of the property boundary. Runoff produced by **Basins OS6 and C,** has been calculated to be 0.4 cfs in the 5-year storm event and 2.4 cfs in the 100-year storm event. Runoff from these basins is conveyed as sheet flow to the northwest towards **Design Point 4.** This runoff outfalls into the East Fork Sand Creek Sub-tributary.

Design Point 5 consists of native grass covered un-platted land located at the west portion of the property boundary. Runoff produced by **Basins OS7, D, Design Point 3 and Design Point 4,** has been calculated to be 4.5 cfs in the 5-year storm event and 29.3 cfs in the 100-year storm event. Runoff from these basins is conveyed as sheet flow to the southwest towards **Design Point 5.** This runoff outfalls into the East Fork Sand Creek Sub-tributary. The cumulative runoff values are from the onsite flows and do not include the East Fork Sand Creek Sub-tributary upstream flows. The values provided by FEMA for Sand Creek East Fork Subtributary at confluence with Sand Creek East Fork are 1970 cfs for the 100 year event.

PROPOSED DRAINAGE CHARACTERISTICS

General Proposed Conditions Drainage Discussion

The proposed storage yard development and improvements will be constructed on approximately 8.356 acres of the 19.362 acre parcel. The majority of the site has been accounted for as a storage yard and the remaining northern portion identified as Tract C being considered as pastureland/undeveloped is shown on the Proposed Drainage Map. Refer to the Proposed Drainage Map for weighted runoff coefficients for the

site. Proposed drainage patterns generally remain consistent with those in the existing condition with surface runoff traveling north to south. A swale is proposed on the western boundary of the site to capture and route runoff south to the Full Spectrum Detention (FSD) pond. The combined onsite runoff, offsite runoff from Timberline Storage Yard, and adjacent Basins OS3 & OS4 are conveyed to the proposed FSD pond. The runoff reaching the pond will be detained and discharged via a staged outlet structure and proposed 24" RCP storm system to the East Fork Sand Creek Sub-Tributary below historic rates. The outfall into the East Fork Sand Creek Sub-Tributary channel is armored with a proposed riprap pad and is grading away from main flows within the channel. Type M riprap protection is also proposed to stabilize the emergency spillway bank and all proposed grading around the outfall. Refer to the Proposed Drainage Map in the appendix for an illustration of the proposed site drainage patterns. A detailed description of the proposed drainage characteristics follows:

Proposed Conditions Detailed Drainage Discussion

Design Point 1, 2.59 acres, consists of offsite **Basins OS1** and onsite **Basin A**. Surface runoff, from these contributing areas, generally flows from north to south and exits the site at **Design Point 1,** where it combines with flows from neighboring Timberline Storage Yard and ultimately enters the Full Spectrum Detention Pond 1 on the Timberline Storage Yard site. The Proposed Drainage Map overlays Timberline Basin OS2 boundary in a gray dashed line type. Any discrepancy is minor, and within tolerance, with no significant drainage affects and changes to runoff values. The "Amendment No.1 for the Final Drainage Report for Timberline Storage Yard", dated March 2020, by M&S Civil Consultants, Inc. accounts for these flows and the Full Spectrum Detention Pond 1 was designed with consideration to this undeveloped tributary area (See Timberline Storage Yard Proposed Drainage Map, Basin OS2, referenced in the appendix). Onsite Basin A is to remain undeveloped at this time and runoff values are Q5=4.1 cfs and Q100=9.3 cfs have been calculated for **DP1**. The Timberline pond has been built.

Design Point 2, 2.89 acres, consists of offsite **Basin OS2** and onsite **Basin B**. Developed runoff of Q5=8.6 cfs and Q100=16.7 cfs has been calculated for **DP2**. Runoff from the existing neighboring Timberline Storage Yard improvements (parking lot, gravel lot, building) within offsite Basin OS2 travels as sheet flow west to onsite Basin B. All tributary runoff will be routed via a 6' wide pan, curb and gutter and collected by a 10' CDOT Type R sump inlet located at a low point at **DP2**. Captured flows are routed to the east forebay of the FSD pond and are treated before being discharged to the East Fork Sand Creek Sub-Tributary.

Design Point 3, 2.74 acres, consists of onsite **Basin B1**. Developed runoff of Q5=6.1 cfs and Q100=12.1 cfs has been calculated for **DP3**. Existing and proposed grading conveys runoff south (to **DP3**) where a localized swale captures all sheet and concentrated flows conveying them south into the FSD pond via a 3' wide trapezoidal riprap rundown. Energy associated with the runoff is dissipated by the trapezoidal rundown and outfalls into a concrete forebay located at the bottom of the rundown. All runoff tributary to **DP3** is treated within the FSD pond prior to being discharged to the East Fork Sand Creek Sub-Tributary.

Design Point 4, 10.67 acres, consists of onsite **Basins B2** and **Basin D**. Developed runoff of Q5=20.4 cfs and Q100=40.5 cfs has been calculated for **DP4**. A proposed swale along the western property boundary prevents any runoff produced within **Basin D** from traveling offsite. A proposed swale located along the north side of the larger proposed building routes runoff west where it combines with flows in the aforementioned swale prior to reaching **DP4**. At **DP4**, a 3' wide trapezoidal riprap rundown conveys concentrated flows south into the FSD pond. Energy associated with the runoff is dissipated by the

trapezoidal rundown and outfalls into a concrete forebay located at the bottom of the rundown. All runoff tributary to DP4 is treated within the FSD pond prior to being discharged to the East Fork Sand Creek Sub-Tributary.

Design Point 5, 1.34 acres, consists of **Basin OS4** and **Basin B3.** Developed runoff from Design Points **DP2, DP3, DP4,** offsite **Basins OS4** and **Basin B3** contribute to the proposed FSD pond at **DP5** at a peak flow rate of Q5=32.8 cfs, Q100=66.3 cfs. The proposed full spectrum detention pond was sized utilizing the UDFCD MFHD-Detention Worksheet, Ver 4.03. Based upon the contributing watershed acreage, characteristics, and imperviousness of the site, the pond requires a minimum of 2.352 acre feet of storage in the 100-year event and was limited to a peak discharge of 17.5 cfs. A proposed outlet structure with a 24" RCP storm pipe and restrictor plate is recommended to meet the allowable discharge rate. All treated discharge from the FSD pond is released to the East Fork Sand Creek Sub-Tributary via a flared end section and riprap pad to dissipate energy and maintain integrity of the outfall. The low tailwater basin, D_{50}= 12", riprap and flared end section have been graded into the channel bank away from higher velocity main channel flows. In the case that the outlet structure were to become clogged, 100 year flows will be released through a 25.5' wide emergency spillway and rundown armored with Type M riprap, D_{50}= 12". The emergency spillway is designed with a foot of freeboard in the 100-year event and has a crest elevation of 6533.15. This crest elevation is 5' above the 100-year FEMA water surface elevation of 6528.0. A hydraulic analysis for the FSD pond outlet structure and 24" RCP was performed in StormCAD and is enclosed in the appendix. The FEMA 100-year water surface elevation of 6528.0 was used as the starting hydraulic grade line (HGL) elevation. The results show that the FSD pond remains functional in the 100-year event and the outlet structure is able to discharge flows to the East Fork Sand Creek Sub-Tributary.

Design Point 6, 1.44 acres, consists of offsite **Basin OS5** and **Basin C**. Developed runoff of Q5=0.5 cfs and Q100=3.2 cfs has been calculated for **DP6**. As shown on the Proposed Drainage Map, runoff from **DP6** enters the East Fork Sand Creek Sub-Tributary channel and continues south. The FEMA 100 yr floodplain, Zone AE, has been overlayed on the Proposed Drainage Map and crosses the northwest corner of the site within Basin C. Tract A within the plat has been dedicated to this area and no development is anticipated to occur within the floodplain, per plat restriction.

Design Point 7, 4.64 acres, consists of **Basin OS6.** Developed runoff from Design Point **DP6** and Pipe Run **PR2** contribute to the existing East Fork Sand Creek Sub-tributary at **DP7** at a peak flow rate of Q5=2.3 cfs, Q100=29.7 cfs. The flows released do not exceed the flows calculated in the historic condition. The cumulative runoff values are from the onsite flows and do not include the East Fork Sand Creek Sub-tributary upstream flows. The FEMA 100 yr floodplain, Zone AE, has been overlayed on the Proposed Drainage Map along with the associated cross section IDs and water surface elevation markers. No grading is proposed within the floodplain with the exception of the emergency spillway from the proposed FSD pond and some cut around the FSD pond outfall to grade in the 24" RCP flared end section and riprap pad. Riprap is proposed in these areas to protect the FSD pond and all storm improvements discharging from the FSD pond to the East Fork Sand Creek Sub-Tributary channel. A floodplain development permit is included in the appendix on this report.

Basin OS3, 0.46 acres, consists of 4:1 vegetated slope with runoff of Q5=0.2 cfs and Q100=1.1 cfs has been calculated for **Basin OS3**. As shown on the Proposed Drainage Map, runoff from **Basin OS3** is released as sheet flow.

WATER QUALITY PROVISIONS AND MAINTENANCE

The proposed full spectrum detention (FSD) pond functions to provide detention and water quality for the proposed development. This full spectrum detention pond will function to treat approximately 19.362 acres of tributary area by providing 0.453 acre-feet of storage for the water quality event, 1.519 acre feet of storage at the EURV event storm and 2.352 acre-feet of storage in the 100-year event. The 25.5' wide emergency spillway is designed with a foot of freeboard in the 100-year event and has a crest elevation of 6533.15. This crest elevation is 5' above the 100-year FEMA water surface elevation of 6528.0. A hydraulic analysis for the FSD pond outlet structure and 24" RCP was performed and is enclosed in the appendix (Storm Cad). The FEMA 100-year water surface elevation of 6528.0 was used as the starting hydraulic grade line (HGL) elevation. The results show that the FSD pond remains functional in the 100-year event and the outlet structure is able to discharge flows to the East Fork Sand Creek Sub-Tributary. The sizing for the full spectrum detention facility has been determined using the guidelines set forth in the Urban Drainage and Flood Control District Criteria Manual. Refer to the UDFCD MHFD-Detention, Version 4.03, Excel Workbook located within the appendix of this report for calculations.

The proposed FSD pond will be private and shall be maintained by the property owner. Access shall be granted to the owner and El Paso County for access and maintenance of the private WQCV facility. A private maintenance agreement document shall accompany this report submittal.

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 silt fence, vehicle traffic control, and concrete washout area are proposed as erosion control measures. The costs for these measures have been provided on the Grading and Erosion Control plan.

CONSTRUCTION COST OPINION

Private Drainage Facilities (**NON-Reimbursable**):

Item	Description	Quantity		Unit Cost		Cost
1.	18" RCP	22	LF	$40	/LF	$880.00
2.	24" RCP	42	LF	$50	/LF	$2,100.00
3.	18" RCP FES	1	EA	$800	/EA	$800.00
4.	24" RCP FES	1	EA	$900	/EA	$900.00
5.	10' CDOT Type R Inlet	1	EA	$5,000	/EA	$5,000.00
6.	Type M riprap, 2' deep	255	CY	$65	/CY	$16,575.00
7.	FSD Pond (Inlcuding Outlet Struct, Access Road, Trickle Channel, Forebays)	1	EA	$23,000	/EA	$23,000.00
					Total $	**$49,255.00**

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 and below is only an estimate of the facility cost and drainage basin fee amounts in 2020.

DRAINAGE & BRIDGE FEES – DWIRE STOREAGE YARD

This site is within the Sand Creek Drainage Basin. The 2020 (Resolution 19-441) Drainage and Bridge Fees per El Paso County for the DWIRE Storage Yard Filing No. 1 site are as follows:

Per DWIRE Storage Yard Filing No. 1 Plat –		**19.362 Acres**
Tract A (No build per Plat restriction, within floodplain)-		**-0.432 Acres**
	Total Area	**18.93 Acres**

DWIRE STORAGE YARD FILING NO. 1 FEES:

Drainage Fees:	18.93	x	72.2%	$	19,698.00	=		$ 269,221.63
Bridge Fees:	18.93	x	72.2%	$	8,057.00	=		$ 110,118.73
							Total	**$ 379,340.36**

SUMMARY

Per this final drainage report, the proposed drainage facilities recommended within this report will adequately convey, detain and route runoff from the planned development to the East Fork Sand Creek Sub-Tributary drainage way at peak flow rates which are below existing with no negative impacts on surrounding developments. All drainage facilities described herein and shown on the included Proposed Drainage Map (See Appendix), this final Drainage Report and site construction documents are simultaneous review. Tract C shall be identified on "No Build Area"(gravel-surfaced storage only) and Tract C can be replatted in the future, upon which an updated drainage letter shall be required for review and approval. Care will be taken to accommodate overland emergency flow routes on site and temporary drainage conditions. The development of the DWIRE Storage Yard Filing No.1 site will not adversely affect adjacent or downstream properties.

REFERENCES

1.) "El Paso County and City of Colorado Springs Drainage Criteria Manuals".

2.) "Urban Storm Drainage Criteria Manual"

3.) SCS Soils Map for El Paso County.

4.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency (Map No. 08041C0543F), Effective date March 17, 1997.

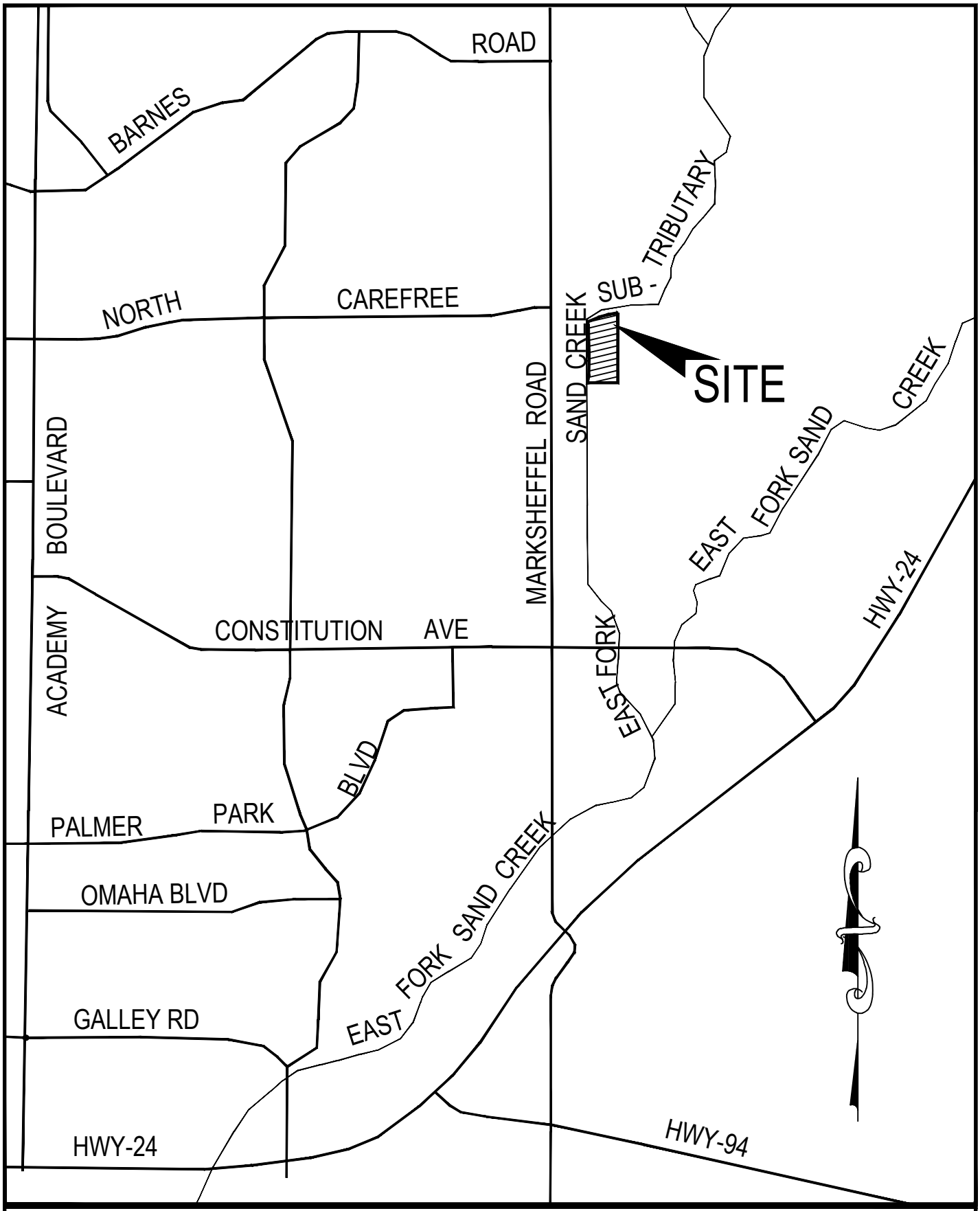
5.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency (Map No. 08041C0543G), Effective date December 7, 2018.

6.) "Amendment No.1 to the Final Drainage Report for Timberline Storage Yard", dated March 2020, by M&S Civil Consultants, Inc.

7.) "Sand Creek Drainage Basin Planning Study, Preliminary Design Report", Revised March 1996, by Kiowa Engineering Corporation.

APPENDIX

VICINITY MAP



VICINITY MAP

N.T.S.

SOILS MAP

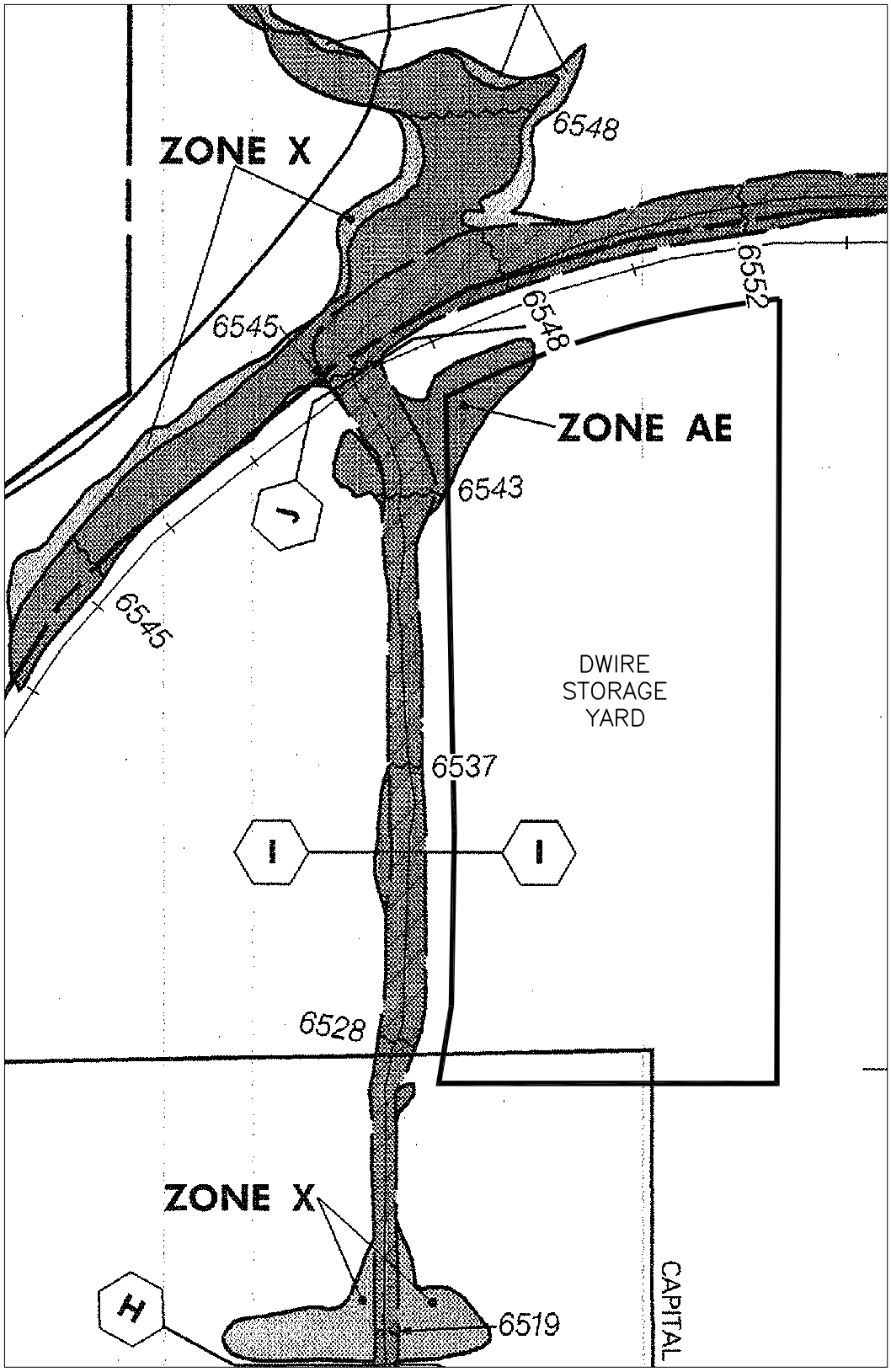
NOT TO SCALE

Tables — Hydrologic Soil Group — Summary By Map Unit		
	Summary by Map Unit — El Paso County Area, Colorado (CO625)	
Summary by Map Unit — El Paso County Area, Colorado (CO625)		
Map unit symbol	**Map unit name**	**Rating**
10	Blendon sandy loam, 0 to 3 percent slopes	B

DWIRE
STORAGE YARD
SOILS MAP

M&S
CIVIL CONSULTANTS, INC.

FIRM PANEL



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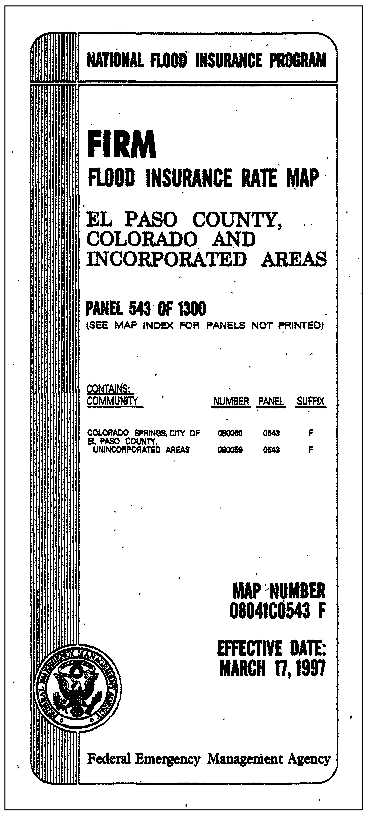

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 543 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0543	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0543	F

MAP NUMBER
08041C0543 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

ZONE 'X' – 500 YEAR FLOODPLAIN

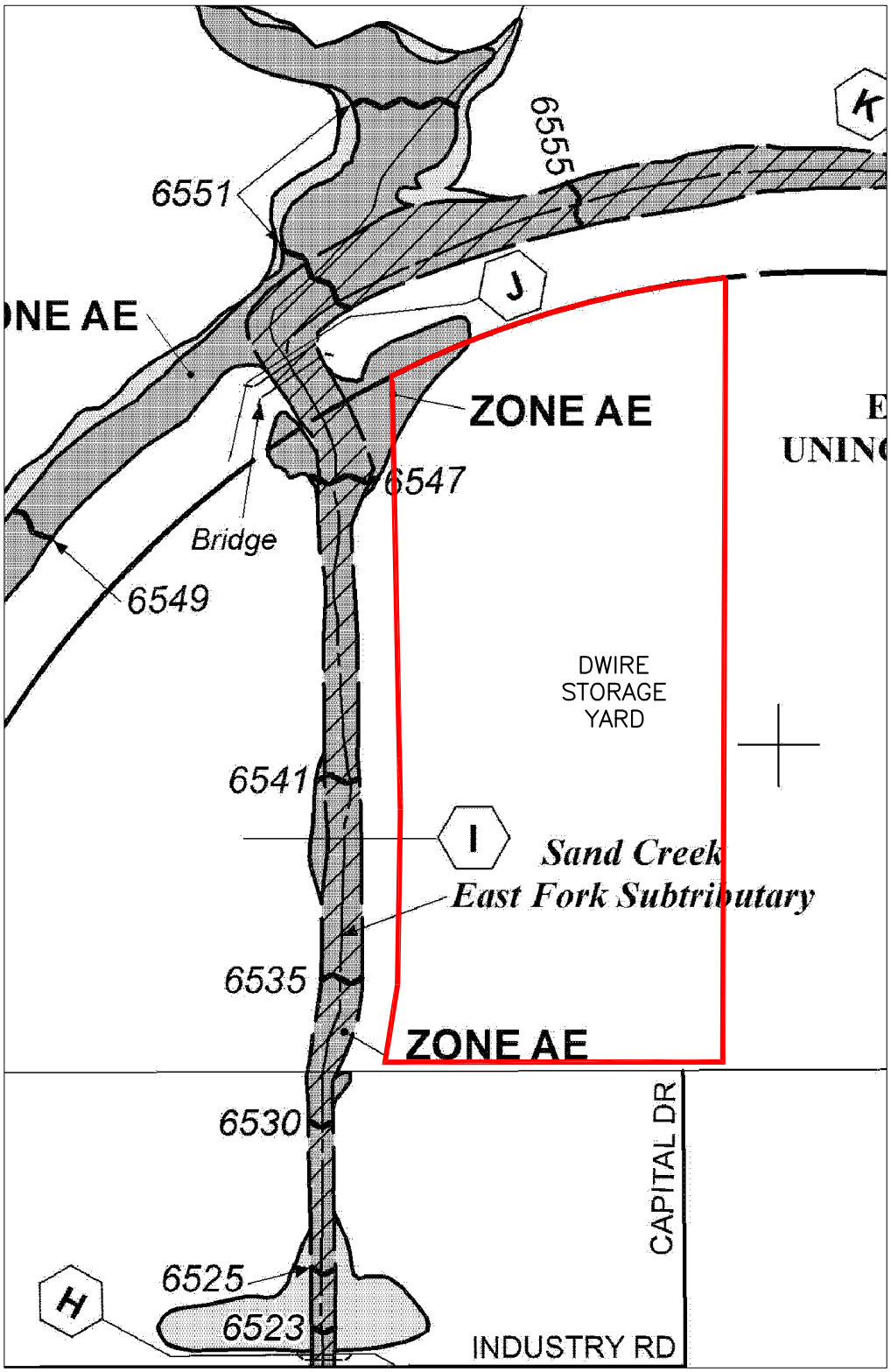
ZONE 'AE' – 100 YEAR FLOODPLAIN

FLOODWAY AREAS IN ZONE 'AE'

DWIRE STORAGE YARD

FLOODPLAIN MAP

M&S CIVIL CONSULTANTS, INC.



NOT TO SCALE

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 543 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0543	G
EL PASO COUNTY	080059	0543	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0543G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

ZONE 'X' – 500 YEAR FLOODPLAIN

ZONE 'AE' – 100 YEAR FLOODPLAIN

FLOODWAY AREAS IN ZONE 'AE'

DWIRE STORAGE YARD
FLOODPLAIN MAP

CIVIL CONSULTANTS, INC.

COLORADO
Division of Water Resources
Department of Natural Resources
Water Division 2 - Main Office

January 31, 2020

Tim Emick
8110 Opportunity View
Colorado Springs, CO 80939

Via Email temick@timberlinelandscaping.com

When replying, please refer to:
DWIRE Storage Yard DAM Non-Jurisdictional
Water Division 2 Water District 10

SUBJECT: Signed Notice of Intent to Construct a Non-Jurisdictional Water Impoundment Structure

Dear Mr. Emick:

Our office is in receipt of a Notice of Intent (NOI) to Construct a Non-Jurisdictional Water Impoundment Structure for the subject dam. The impoundments are to be located adjacent to East Fork of Sand Creek tributary to Fountain Creek, with the filling source to be Stormwater for Temporary Detention.

In accordance with Rule 11.1 of the Colorado Rules and Regulations for Dam Safety and Dam Construction, the hazard of this dam has been assessed as Low based on the construction drawing plans submitted with the NOI. A copy of the signed NOI is attached. An electronic copy will be maintained with the Division of Water Resources.

Please note the following:

- Location information has been corrected on your submission.
- This structure must be designed and constructed to standards outlined in 37-92-602(8) for stormwater detention facilities.
- Because this structure is located on a tributary to Fountain Creek, the structure can only operate pursuant a Colorado Discharge Permit System Municipal, Separate Storm Sewer System Permit issued by the Department of Public Health and Environment Pursuant to Article 8 of Title 25, C.R.S.
- In the event groundwater is encountered during construction of the pond, the pond must be backfilled so as not to expose groundwater until such time as: 1) a well permit has been obtained for the groundwater pond pursuant to CRS §37-90-137, or 2) the pond is lined in accordance with the document, "State Engineer Guidelines for Lining Criteria for Gravel Pits," dated August 1999.

The requirements and recommendations provided herein are based on our review of the safety and water administration aspects of the proposed dam and the information provided in the submitted NOI. These requirements and recommendations create no liability for the State of Colorado should the dam fail for any reason. Please be aware that it is in the owner's best interest to construct, operate, and maintain the structure in a safe manner, as he or she may be held liable in civil court for any downstream damages resulting from failure of the dam. A copy of Specifications for Construction of Non-Jurisdictional Dams is provided to assist you in the construction of a sound structure.

Finally, please be aware of any other permitting or regulatory requirements associated with the construction of a water impoundment structure, including but not limited to county and/or municipal regulations and wetland permitting through the U.S. Army Corps of Engineers (see www.usace.army.mil for regional contact information).

The plans reviewed in this determination are submitted as part of the Developmental Approval process. Prior to the operation of this structure, please provide notice of completion of construction and as-constructed plans in PDF form including as constructed Stormwater Detention and Infiltration Data Sheet. Additionally, prior to the operation of this structure, notice must be provided pursuant to 37-92-602(8)(d) to the substitute water supply plan notification list maintained by the state engineer pursuant to section 37-92-308 (6) for the water division in which the facility is located.

If you have any questions regarding this approval, please contact Water Commissioner, Doug Hollister, at (719) 227-5291 or via email to doug.hollister@state.co.us, or Dam Safety Engineer, John Hunyadi, at (719)-227-5294, or via email to john.hunyadi@state.co.us,

Sincerely,

Bill W. Tyner

Bill W. Tyner, P.E.
Division Engineer, Division 2

Enc: Signed Notice of Intent to Construct a Non-Jurisdictional Water Impoundment Structure
Specifications for Construction of Non-Jurisdictional Dams
Completion of Construction Form

ec: John Hunyadi, P.E., Dam Safety Engineer
Doug Hollister, District 10 Water Commissioner

Laserfiche File

COLORADO
Division of Water Resources
Department of Natural Resources

COMPLETION OF CONSTRUCTION

DAM ID.___100541___

Upon the completion of the DWIRE Storage Yard DAM, Subject of the Notice of Intent to Construct a Non-Jurisdictional Dam under the Receipt above, location in Sec. 28 _____ Twp. 13 S _____ Rng. 65 W _____; UTM NAD83 , Northing 4304006, Easting 527860.

Indicate in the blank at the bottom of this form, the date of completion of construction and return to:

Colorado Division of Water Resources
Division 2
310 East Abriendo Ave, Suite B
Pueblo, CO 81004

Date of Completion: _____

_____
Signature of Owner Date

COLORADO
Division of Water Resources
Department of Natural Resources
www.water.state.co.us P 303.866.3581

NON-JURISDICTIONAL WATER IMPOUNDMENT STRUCTURE[1]

This notice is required per Section 37-87-125, C.R.S. (1998) and
must be submitted to the Division Engineer's Office a minimum of 45 days prior to construction.

OWNER INFORMATION

Name: TIM EMICK Telephone/E-Mail: (719) 499-1291 / TEMICK@TIMBERLINELANDSCAPING.COM

Address: 8110 OPORTUNITY VIEW COLORADO SPRINGS CO 80939
Street / P.O. Box/ Rural Route City State Zip Code

Responsible Person: TIM EMICK Telephone/E-Mail: ( ) SAME /

Address: SAME
Street / P.O. Box/ Rural Route City State Zip Code

Contractor: SAME Telephone/E-Mail: ( ) /

STRUCTURE INFORMATION

Name of Dam: DWIRE STORAGE YARD Water Division: 2 Water District: CS

Location: *(Provide Section, Township, Range, and GPS Point taken at crest of dam above streamline/outlet)*

- Section: 28, Township: 13 SOUTH, Range: 65 WEST P.M.
- Northing 527860 meters, Easting 4304006 meters (*Datum should be UTM, NAD 83*)

Dam Dimensions:

- Vertical Height[2]: 5.08 ft., Length: 85 ft., Crest Width: 17 ft., Slopes: U/S: 4:1 (H:1V), D/S 4:1 (H:1V)

Reservoir:

- Surface Area[1]: 0.7 acres, Capacity[1]: 1.619 acre-feet, Drainage Area*: 19.362 acres
(If drainage area is unknown leave blank and a spillway size will be assigned):

Emergency Spillway: *(See Table 1, Spillway Sizing Guidelines)*

- Bottom Width: 15' ft., Side Slopes: 4:1 H:1V, Freeboard[3]: 0.95 ft

Outlet Conduit Type: RCP, Size: 24" inches, Location: WESTSIDE

Stream Name or Water Source[4]: SAND CREEK E. TRIB Proposed Water Use: STORMWATER

Water Court Case *or* WDID :
(Water District Identification Number)

1/7/2020
Signature of Owner Date

Office Use Only

DIVISION ENGINEER'S REQUIREMENTS:

Bill W. Tyner January 31, 2020
Signature of Division Engineer Date

Dam I.D. 100541

[1] A "Non-Jurisdictional Structure" is a dam creating a reservoir with a capacity of 100 acre-feet or less *and* a surface area of 20 acres or less *and* a vertical height (footnote 2) of 10 feet or less. Non-jurisdictional size dams are regulated and subject to the authority of the State Engineer consistent with sections 37-87-102 and 37-87-105 C.R.S.

[2] "Vertical Height" is measured from the elevation of the lowest point of the natural surface of the ground or the invert of the outlet conduit (whichever is lower) where that point occurs along the longitudinal centerline of the dam up to the crest of the emergency spillway of the dam.

[3] "Freeboard" is the vertical distance from the bottom of spillway to the crest of the dam. Minimum Freeboard is 3 feet.

[4] If construction in reservoir intercepts groundwater, a well permit is required. (Well permit applications can be found at www.water.state.co.us)

HYDROLOGIC CALCULATIONS

DWIRE STORAGE YARD
FINAL DRAINAGE REPORT DRAINAGE CALCULATIONS
(Existing Conditions Area Runoff Coefficient Summary)

			PAVEMENT			*ROOF*			*STORAGE YARD (GRAVEL)*			*LANDSCAPED/PASTURELAND*			*WEIGHTED*	
BASIN	**TOTAL AREA (Sq Ft)**	**TOTAL AREA *(Acres)***	**AREA *(Acres)***	**C_5**	**C_{100}**	**AREA *(Acres)***	**C_5**	**C_{100}**	**AREA *(Acres)***	**C_5**	**C_{100}**	**AREA *(Acres)***	**C_5**	**C_{100}**	**C_5**	**C_{100}**
OS1	*39125.8*	0.90	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.90	0.09	0.35	***0.09***	***0.35***
OS2	*6346.6*	0.15	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.15	0.09	0.35	***0.09***	***0.35***
OS3	*55083.7*	1.26	0.54	0.90	0.96	0.28	0.73	0.81	0.45	0.30	0.50	0.00	0.09	0.35	***0.65***	***0.76***
OS4	*7008.0*	0.16	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.16	0.09	0.35	***0.09***	***0.35***
OS5	*15582.7*	0.36	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.36	0.09	0.35	***0.09***	***0.35***
OS6	*64655.6*	0.78	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.78	0.09	0.35	***0.09***	***0.35***
OS7	*198141.1*	4.55	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	4.55	0.09	0.35	***0.09***	***0.35***
A	*107676.5*	2.47	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	2.47	0.09	0.35	***0.09***	***0.35***
A1	*13107.4*	0.30	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.30	0.09	0.35	***0.09***	***0.35***
B	*550809.9*	12.64	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	12.64	0.09	0.35	***0.09***	***0.35***
C	*28780.7*	0.66	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.66	0.09	0.35	***0.09***	***0.35***
D	*139029.7*	3.19	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	3.19	0.09	0.35	***0.09***	***0.35***

Calculated by: DLM
Date: 11/19/2018
Checked by: VAS

DWIRE STORAGE YARD
FINAL DRAINAGE REPORT DRAINAGE CALCULATIONS
(Existing Conditions - Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel*		*INTENSITY **		*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}**	**Q_5**	**Q_{100}**
	(Acres)	*From DCM Table 6-6*			*(ft)*	*(ft)*	*(min)*	*(ft)*	*(%)*	*(fps)*	*(min)*	*(min)*	*(min)*	*(in/hr)*	*(in/hr)*	*(c.f.s.)*	*(c.f.s.)*
OS1	0.90	0.09	0.35	0.09	150	4	17.1	300	1.0%	1.0	5.0	22.1	12.5	2.9	4.9	***0.2***	***1.6***
OS2	0.15	0.09	0.35	0.09	100	3	13.4	350	1.4%	1.2	4.9	18.3	12.5	3.2	5.4	***0.0***	***0.3***
OS3	1.26	0.65	0.76	0.65	50	3	5.1	540	1.0%	2.0	4.5	9.6	13.3	4.2	7.0	***3.4***	***6.8***
OS4	0.16	0.09	0.35	0.09	50	1	10.9	300	0.7%	0.8	6.1	17.0	11.9	3.3	5.6	***0.0***	***0.3***
OS5	0.36	0.09	0.35	0.09	100	1	19.3	325	3.7%	1.9	2.8	22.1	12.4	2.9	4.9	***0.1***	***0.6***
OS6	0.78	0.09	0.35	0.09	100	1	19.3	480	4.8%	2.2	3.7	23.0	13.2	2.9	4.8	***0.2***	***1.3***
OS7	4.55	0.09	0.35	0.09	100	1.5	16.9	1200	1.2%	1.1	18.5	35.4	17.2	2.2	3.7	***0.9***	***6.0***
A	2.47	0.09	0.35	0.09	150	5	15.9	885	1.1%	1.1	13.9	29.8	15.8	2.5	4.2	***0.6***	***3.6***
A1	0.30	0.09	0.35	0.09	50	1.5	9.5	460	3.7%	2.9	2.7	12.2	12.8	3.8	6.4	***0.1***	***0.7***
B	12.64	0.09	0.35	0.09	180	6	17.4	1450	1.8%	1.3	18.0	35.5	19.1	2.2	3.7	***2.5***	***16.6***
C	0.66	0.09	0.35	0.09	50	1	10.9	60	10.0%	3.2	0.3	11.2	10.6	4.0	6.7	***0.2***	***1.5***
D	3.19	0.09	0.35	0.09	150	1.5	23.7	750	1.6%	1.3	9.9	33.5	15.0	2.3	3.9	***0.7***	***4.3***

Calculated by: DLM
Date: 11/19/2018
Checked by: VAS

DWIRE STORAGE YARD
FINAL DRAINAGE REPORT DRAINAGE CALCULATIONS
(Existing Conditions - Basin Routing Summary)

From Area Runoff Coefficient Summary				OVERLAND				CHANNEL FLOW				Time of Travel (T_t)	INTENSITY *		TOTAL FLOWS		
DESIGN POINT	CONTRIBUTING BASINS	CA_5	CA_{100}	C_5	Length (ft)	Height (ft)	T_C (min)	Length (ft)	Slope (%)	Velocity (fps)	T_t (min)	TOTAL (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)	COMMENTS
PROPOSED DRAINAGE BASIN ROUTING SUMMARY																	
1	OS1	0.08	0.31														
	OS2	0.01	0.05														
	A	0.22	0.87														
		0.32	1.23					Tc From Basin A				29.8	2.5	4.2	0.8	5.1	
2	A1	0.03	0.11														
	OS3	0.82	0.97														
		0.85	1.07					Tc From Basin OS3				9.6	4.2	7.0	3.6	7.5	
3	OS4	0.01	0.06														
	OS5	0.03	0.13														
	B	1.14	4.43														
		1.18	4.61					Tc From Basin B				35.5	2.2	3.7	2.6	17.2	
4	OS6	0.07	0.27														
	C	0.06	0.23														
		0.13	0.50					Tc From Basin OS6				23.0	2.9	4.8	0.4	2.4	
5	DP3	1.18	4.61														
	DP4	0.13	0.50														
	OS7	0.41	1.59														
	D	0.29	1.12														
		2.01	7.82					Tc From Basin OS7				35.4	2.2	3.7	4.5	29.3	

Calculated by: DLM
Date: 11/19/2018
Checked by: VAS

DWIRE STORAGE YARD
FINAL DRAINAGE REPORT DRAINAGE CALCULATIONS
(Proposed Conditions Area Runoff Coefficient Summary)

			PAVEMENT/CONC			*ROOF*			*STORAGE YARD*			*PASTURELAND/UNDEVELOPED*			*WEIGHTED*	
BASIN	**TOTAL AREA (Sq Ft)**	**TOTAL AREA *(Acres)***	**AREA *(Acres)***	**C_5**	**C_{100}**	**AREA *(Acres)***	**C_5**	**C_{100}**	**AREA *(Acres)***	**C_5**	**C_{100}**	**AREA *(Acres)***	**C_5**	**C_{100}**	**C_5**	**C_{100}**
OS1	*6346.6*	0.15	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.15	0.09	0.36	***0.09***	***0.36***
OS2	*65383.0*	1.50	0.85	0.90	0.96	0.00	0.73	0.81	0.55	0.30	0.50	0.10	0.09	0.36	***0.63***	***0.75***
OS3	*19864.6*	0.46	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.46	0.09	0.36	***0.09***	***0.36***
OS4	*5124.1*	0.12	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.12	0.09	0.36	***0.09***	***0.36***
OS5	*64655.6*	0.78	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	0.78	0.09	0.36	***0.09***	***0.36***
OS6	*202148.8*	4.64	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.30	0.50	4.64	0.09	0.36	***0.09***	***0.36***
A	*106469.9*	2.44	0.00	0.90	0.96	0.00	0.73	0.81	1.90	0.59	0.70	0.54	0.09	0.36	***0.48***	***0.62***
B	*60512.9*	1.39	0.66	0.90	0.96	0.00	0.73	0.81	0.73	0.59	0.70	0.00	0.09	0.36	***0.74***	***0.82***
B1	*119490.8*	2.74	0.16	0.90	0.96	0.23	0.73	0.81	2.35	0.59	0.70	0.00	0.09	0.36	***0.62***	***0.72***
B2	*325993.3*	7.48	0.14	0.90	0.96	0.11	0.73	0.81	7.23	0.59	0.70	0.00	0.09	0.36	***0.60***	***0.71***
B3	*53002.6*	1.22	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.59	0.70	1.22	0.16	0.41	***0.16***	***0.41***
C	*28780.7*	0.66	0.00	0.90	0.96	0.00	0.73	0.81	0.00	0.59	0.70	0.66	0.09	0.36	***0.09***	***0.36***
D	*139029.7*	3.19	0.00	0.90	0.96	0.00	0.73	0.81	3.19	0.59	0.70	0.00	0.09	0.36	***0.59***	***0.70***

Calculated by: GT
Date: 11/12/2020
Checked by: VAS

DWIRE STORAGE YARD
FINAL DRAINAGE REPORT DRAINAGE CALCULATIONS
(Proposed Conditions - Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel*		*INTENSITY **		*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}	Q_5	Q_{100}
	(Acres)	*From DCM Table 6-6*			*(ft)*	*(ft)*	*(min)*	*(ft)*	*(%)*	*(fps)*	*(min)*	*(min)*	*(min)*	*(in/hr)*	*(in/hr)*	*(c.f.s.)*	*(c.f.s.)*
OS1	0.15	0.09	0.36	0.09	100	4	11.5	44	4.5%	2.1	0.3	11.9	10.8	4.0	6.7	***0.1***	***0.4***
OS2	1.50	0.63	0.75	0.63	50	1	4.8	47	4.0%	4.0	0.2	5.0	10.5	5.2	8.7	***4.9***	***9.8***
OS3	0.46	0.09	0.36	0.09	50	1	10.3	0	0.0%	0.0	0.0	10.3	10.3	4.1	6.9	***0.2***	***1.1***
OS4	0.12	0.09	0.36	0.09	100	1	18.2	200	2.5%	1.6	2.1	20.3	11.7	3.9	6.5	***0.0***	***0.3***
OS5	0.78	0.09	0.36	0.09	100	1	18.2	480	4.8%	2.2	3.7	21.9	13.2	3.7	6.2	***0.3***	***1.7***
OS6	4.64	0.09	0.36	0.09	100	1.5	16.0	1200	1.2%	1.1	18.5	34.5	17.2	3.3	5.6	***1.4***	***9.3***
A	2.44	0.48	0.62	0.48	100	7	5.9	830	2.0%	1.4	9.7	15.6	15.2	3.5	5.9	***4.1***	***9.0***
B	1.39	0.74	0.82	0.74	100	3	4.6	440	1.6%	1.9	3.9	8.4	13.0	4.4	7.4	***4.5***	***8.4***
B1	2.74	0.62	0.72	0.62	100	1	8.7	636	1.8%	1.3	7.9	16.6	14.1	3.6	6.1	***6.1***	***12.1***
B2	7.48	0.60	0.71	0.60	100	6	5.0	1435	1.9%	2.1	11.6	16.6	18.5	3.2	5.4	***14.3***	***28.4***
B3	1.22	0.16	0.41	0.16	30	6	3.5	447	0.5%	1.4	5.3	8.7	12.7	4.3	7.3	***0.8***	***3.6***
C	0.66	0.09	0.36	0.09	53	2	8.6	54	25.0%	5.0	0.2	8.7	10.6	4.3	7.3	***0.3***	***1.7***
D	3.19	0.59	0.70	0.59	100	5	5.4	905	1.7%	1.3	11.7	17.1	15.6	3.5	5.8	***6.5***	***13.0***

Calculated by: GT
Date: 11/12/2020
Checked by: VAS

MARKSHEFFEL & CONSTITUTION
FINAL DRAINAGE REPORT DRAINAGE CALCULATIONS
(Proposed Conditions - Basin Routing Summary)

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				Time of Travel (T_t)	INTENSITY *		TOTAL FLOWS		
DESIGN POINT	CONTRIBUTING BASINS	CA_5	CA_{100}	C_5	Length (ft)	Height (ft)	T_C (min)	Length (ft)	Slope (%)	Velocity (fps)	T_t (min)	TOTAL (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)	COMMENTS
PROPOSED DRAINAGE BASIN ROUTING SUMMARY																	
1	OS1	0.01	0.05														
	A	1.17	1.53														
		1.18	1.58					Tc From Basin A				15.2	3.5	5.9	4.1	9.3	
2	OS2	0.94	1.13														
	B	1.02	1.14														
		1.96	2.27					Tc From Basin B				8.4	4.4	7.4	8.6	16.7	
3	B1	1.70	1.99														
		1.70	1.99					Tc From Basin B1				14.1	3.6	6.1	6.1	12.1	
4	B2	4.47	5.29														
	D	1.88	2.23														
		6.36	7.52					Tc From Basin B2				18.5	3.2	5.4	20.4	40.5	
5	DP2	1.96	2.27														
	DP3	1.70	1.99														
	DP4	6.36	7.52														
	OS4	0.01	0.04														
	B3	0.19	0.50														
		10.23	12.32					Tc From Basin DP4				18.5	3.2	5.4	32.8	66.3	FSD Pond
6	OS5	0.07	0.28														
	C	0.06	0.24														
		0.13	0.52					Tc From Basin OS5				13.2	3.7	6.2	0.5	3.2	
7	DP6	0.13	0.52														
	OS6	0.42	1.67														
		0.55	2.19					Tc From Basin OS6				17.2	3.3	5.6	1.8	12.2	
	PR2														0.5	17.5	
													Total		2.3	29.7	

Calculated by: GT
Date: 11/12/2020
Checked by: VAS

DWIRE STORAGE YARD
FINAL DRAINAGE REPORT DRAINAGE CALCULATIONS
(Storm Sewer Routing Summary)

PIPE RUN	*Contributing Pipes/Design Points*	*Equivalent CA_5*	*Equivalent CA_{100}*	*Maximum T_C*	*Intensity**		*Flow*		PIPE SIZE
					I_5	*I_{100}*	*Q_5*	*Q_{100}*	
1	**DP2**	1.96	2.27	8.4	4.4	7.4	***8.6***	***16.7***	18" RCP
2	**FSD Outlet Structure**	UD-Detention, V 3.07, Routed Hydrograph Results					***0.5***	***17.5***	24" RCP

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

DP - Design Point
EX - Existing Design Point

FB- Flow By from Design Point
INT- Intercepted Flow from Design Point

Calculated by: GT
Date: 11/12/2020
Checked by: VAS

HYDRAULIC CALCULATIONS / FSD POND CALCULATIONS

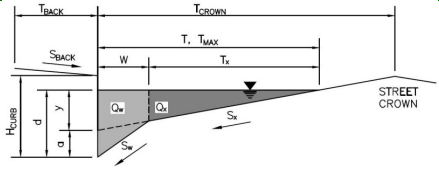
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Dwire Storage Yard**

Inlet ID: **Inlet at DP2**



Gutter Geometry (Enter data in the blue cells)

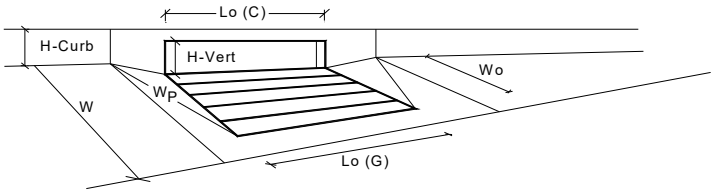
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.018	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	21.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	21.0	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



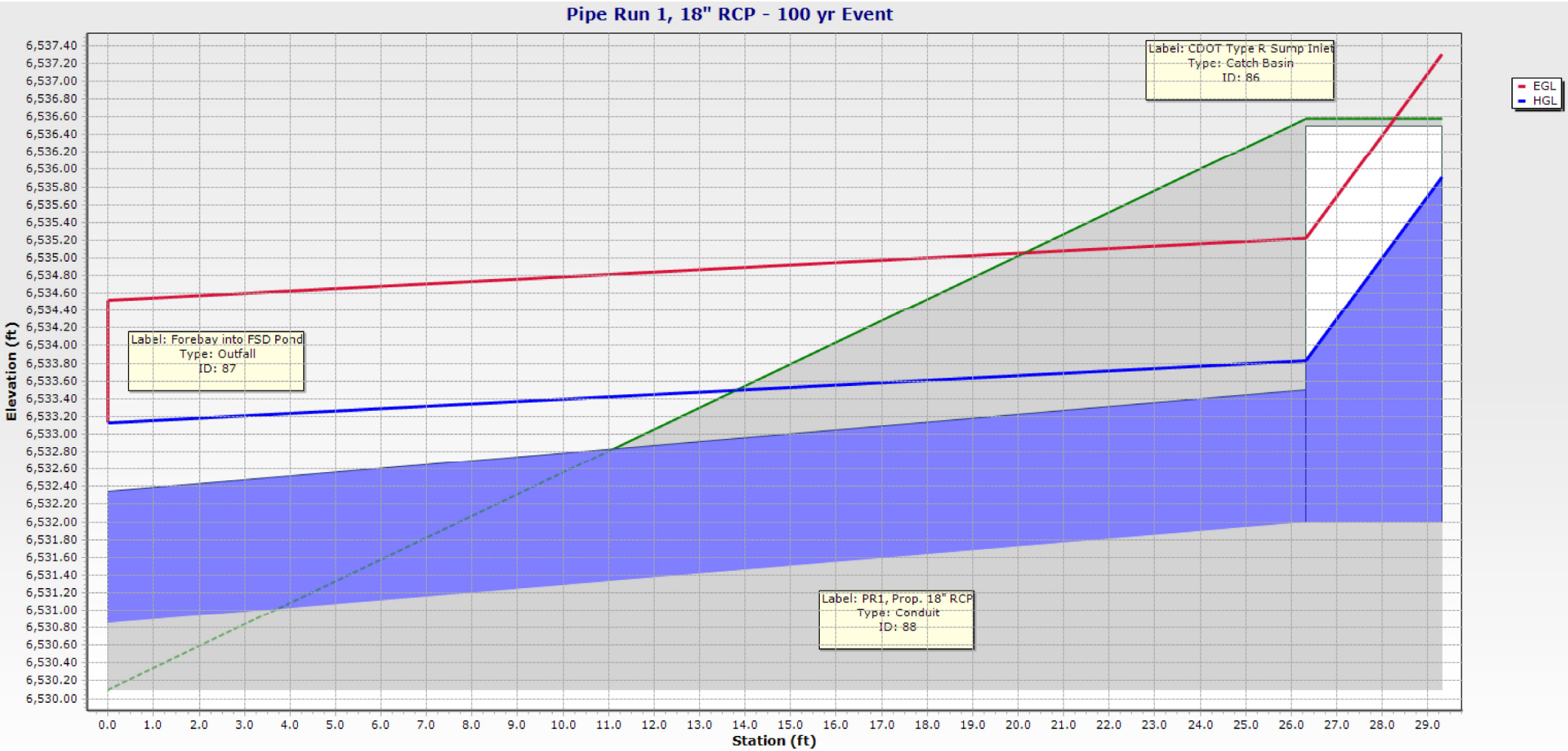
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.6	7.8	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.30	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.53	0.74	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.91	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**8.7**	**18.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	8.6	16.7	cfs

18" RCP INDEX MAP

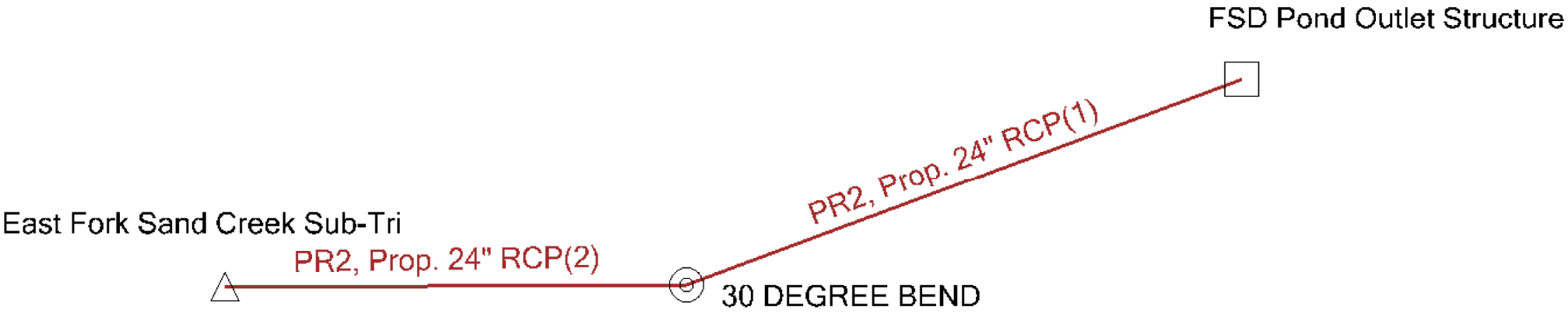
Conduit FlexTable: 18inch Outfall 100-YR

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Froude Number (Normal)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)
PR1, Prop. 18" RCP	88	CDOT Type R Sump Inlet	16.70	78.2	27.8	9.45	2.511	1.00	1.44	6,535.22	6,534.52	6,533.83	6,533.13	0.70

Upstream Structure Hydraulic Grade Line (In) (ft)	Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description	Manning's n	Friction Slope (ft/ft)
6,535.92	9.45	1.500	2.08	6,536.58	6,530.10	6,532.00	6,530.85	Circle - 18.0 in	0.013	0.025


Pipe Run 1, 18" RCP - 100 yr Event
Elevation (ft)
Station (ft)
EGL
HGL
Label: CDOT Type R Sump Inlet
Type: Catch Basin
ID: 86
Label: Forebay into FSD Pond
Type: Outfall
ID: 87
Label: PR1, Prop. 18" RCP
Type: Conduit
ID: 88

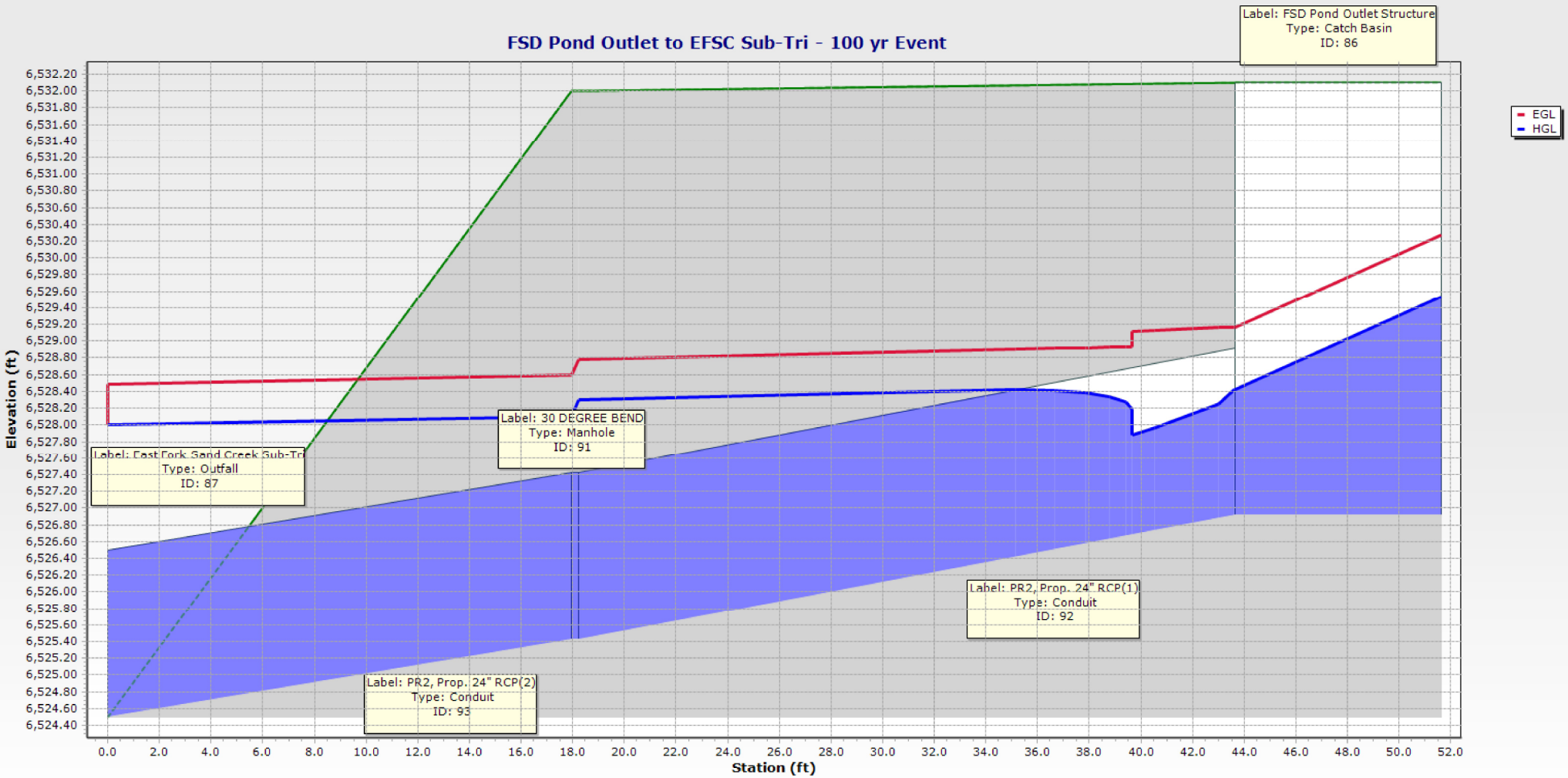
24" RCP INDEX MAP



Conduit FlexTable: POND 1- 24inch OUTFALL 100-YR

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Froude Number (Normal)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
PR2, Prop. 24" RCP(1)	92	FSD Pond Outlet Structure	17.50	34.3	29.5	14.71	3.332	0.81	1.51	6,529.17	6,528.78	6,528.43	6,528.30	0.13	6,529.53
PR2, Prop. 24" RCP(2)	93	30 DEGREE BEND	17.50	34.3	18.1	5.57	3.335	0.81	1.51	6,528.59	6,528.48	6,528.11	6,528.00	0.11	6,528.30

Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
6.89	1.500	1.11	6,532.10	6,532.00	6,526.92	6,525.42	Circle - 24.0 in
5.57	0.400	0.19	6,532.00	6,524.50	6,525.42	6,524.50	Circle - 24.0 in


FSD Pond Outlet to EFSC Sub-Tri - 100 yr Event
Label: FSD Pond Outlet Structure
Type: Catch Basin
ID: 86
EGL
HGL
Label: 30 DEGREE BEND
Type: Manhole
ID: 91
Label: East Fork Sand Creek Sub-Tri
Type: Outfall
ID: 87
Label: PR2, Prop. 24" RCP(1)
Type: Conduit
ID: 92
Label: PR2, Prop. 24" RCP(2)
Type: Conduit
ID: 93
Elevation (ft)
Station (ft)

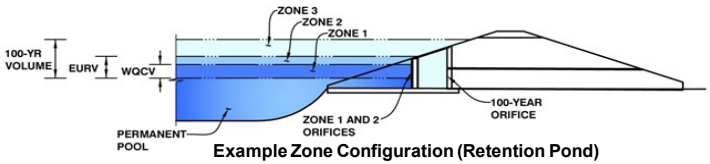
Weighted Percent Imperviousness of Dwire Storage Yard Site				
Contributing Onsite Basins	***Area (Acres)***	***C_5***	***Impervious % (I)***	***(Acres)*(I)***
A	2.44	0.48	69	168.65
B	1.39	0.74	91	126.42
B1	2.74	0.62	82	224.94
B2	7.48	0.60	81	606.19
B3	1.22	0.16	13	15.82
C	0.66	0.09	2	1.32
D	3.19	0.59	80	255.33
Totals	***19.36***			***1398.66***
Imperviousness of Site %	***72.2***			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **DWIRE Storage Yard**

Basin ID: **FSD Pond 1**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	19.36	acres
Watershed Length =	1,535	ft
Watershed Length to Centroid =	768	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	72.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.453	acre-feet	0.453	acre-feet
Excess Urban Runoff Volume (EURV) =	1.518	acre-feet	1.518	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.391	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.867	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.267	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.732	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.149	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.640	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	4.697	acre-feet		inches
Approximate 2-yr Detention Volume =	1.206	acre-feet		
Approximate 5-yr Detention Volume =	1.603	acre-feet		
Approximate 10-yr Detention Volume =	2.016	acre-feet		
Approximate 25-yr Detention Volume =	2.164	acre-feet		
Approximate 50-yr Detention Volume =	2.250	acre-feet		
Approximate 100-yr Detention Volume =	2.402	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.453	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.065	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.884	acre-feet
Total Detention Basin Volume =	2.402	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Depth Increment = ft

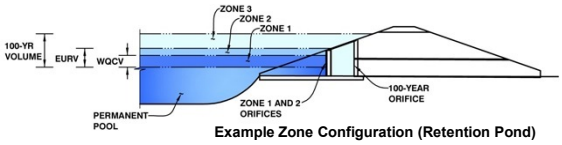
	Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6527.17	**Top of Micropool**	--	0.00	--	--	--	102	0.002		
6527.5		--	0.33	--	--	--	102	0.002	33	0.001
		--	0.83	--	--	--	550	0.013	196	0.005
		--	1.83	--	--	--	6,231	0.143	3,587	0.082
		--	2.83	--	--	--	19,968	0.458	16,686	0.383
		--	3.83	--	--	--	24,562	0.564	38,951	0.894
6532.00		--	4.83	--	--	--	29,300	0.673	65,882	1.512
6533.00		--	5.83	--	--	--	34,177	0.785	97,621	2.241
6534.00		--	6.83	--	--	--	39,216	0.900	134,317	3.083
6535.00		--	7.83	--	--	--	44,188	1.014	176,019	4.041

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **DWIRE Storage Yard**

Basin ID: **FSD Pond 1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.98	0.453	Orifice Plate
Zone 2 (EURV)	4.84	1.065	Orifice Plate
Zone 3 (100-year)	6.04	0.884	Weir&Pipe (Restrict)
Total (all zones)		2.402	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)	Underdrain Orifice Area =		ft^2
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	4.84	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	19.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.61	3.23					
Orifice Area (sq. inches)	1.91	1.91	6.25					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.85	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.85	N/A	feet
Overflow Weir Front Edge Length =	8.00	N/A	feet	Overflow Weir Slope Length =	3.50	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	12.82	N/A	
Horiz. Length of Weir Sides =	3.50	N/A	feet	Overflow Grate Open Area w/o Debris =	19.60	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	9.80	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.53	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.56	N/A	feet
Restrictor Plate Height Above Pipe Invert =	11.75		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.55	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.78	feet
Spillway Crest Length =	25.00	feet	Stage at Top of Freeboard =	7.78	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.01	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.99	acre-ft

Calculated Parameters for Spillway

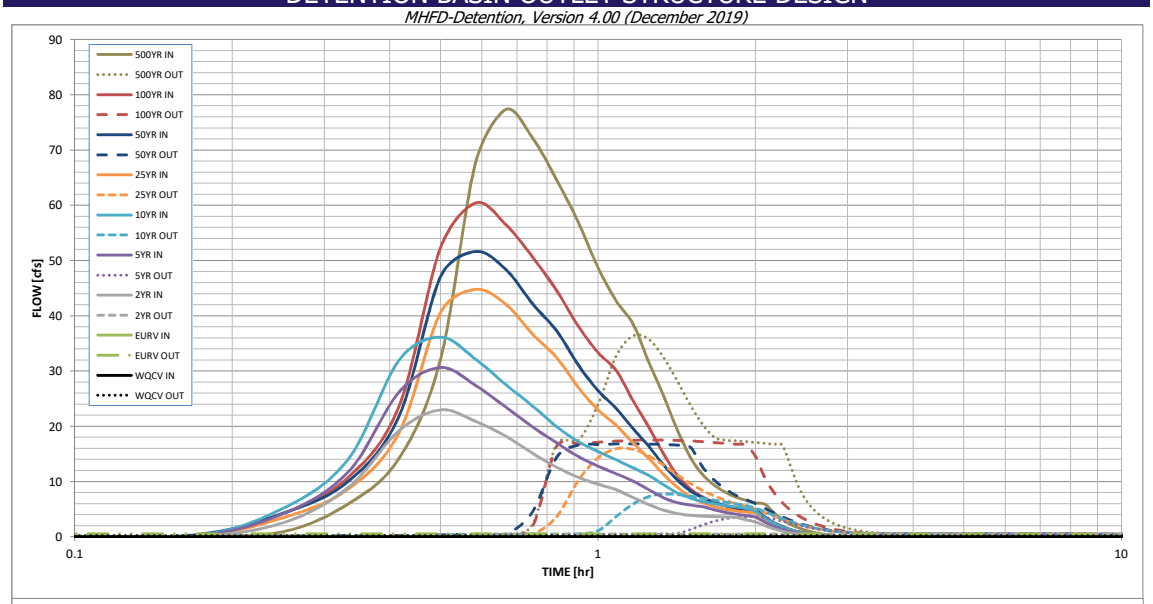
Routed Hydrograph Results

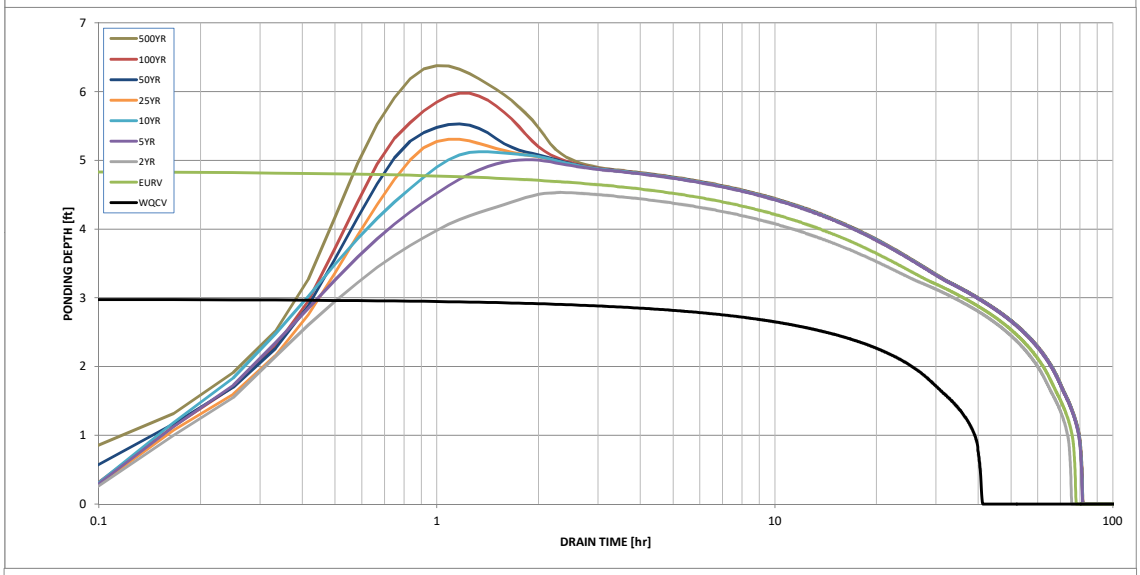
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

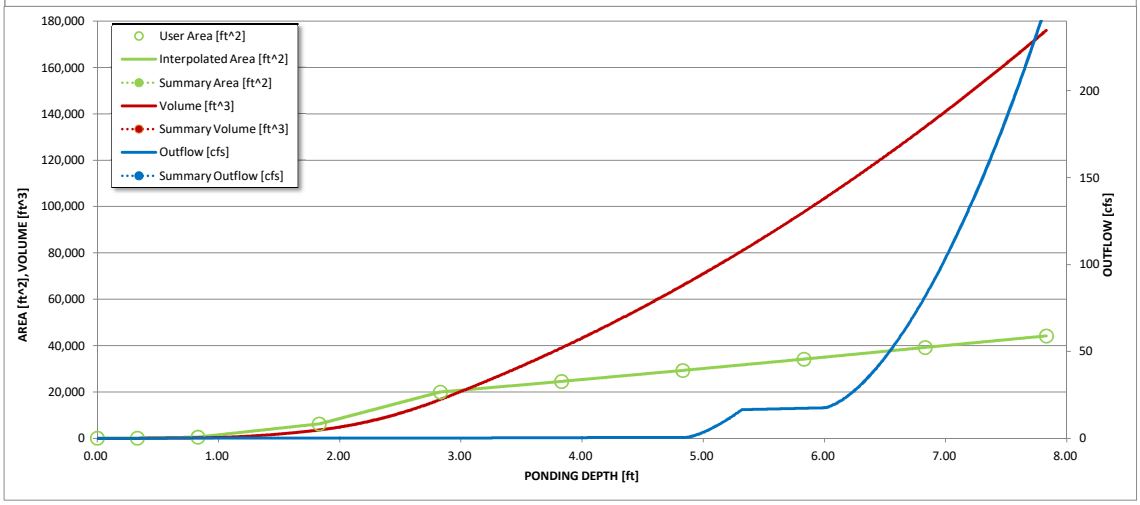
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.453	1.518	1.391	1.867	2.267	2.732	3.149	3.640	4.697
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.391	1.867	2.267	2.732	3.149	3.640	4.697
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.8	5.1	7.8	14.1	17.7	22.6	31.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.27	0.40	0.73	0.91	1.17	1.63
Peak Inflow Q (cfs) =	N/A	N/A	22.9	30.6	36.1	44.8	51.6	60.4	77.4
Peak Outflow Q (cfs) =	0.2	0.5	0.5	3.6	7.7	15.9	16.8	17.5	36.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	1.0	1.1	1.0	0.8	1.2
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.4	0.8	0.8	0.9	0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	70	68	72	70	69	68	66	63
Time to Drain 99% of Inflow Volume (hours) =	**40**	75	73	78	77	76	76	75	73
Maximum Ponding Depth (ft) =	2.98	4.84	4.53	5.01	5.12	5.31	5.53	5.97	6.38
Area at Maximum Ponding Depth (acres) =	0.47	0.67	0.64	0.69	0.71	0.73	0.75	0.80	0.85
Maximum Volume Stored (acre-ft) =	0.453	1.519	1.316	1.628	1.712	1.841	2.011	2.352	2.682

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







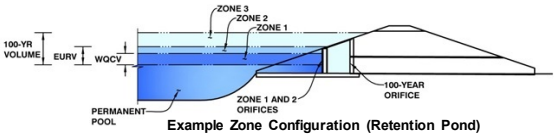
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Timberline Storage (Amended)

Basin ID: FSD Pond 1



Example Zone Configuration (Retention Pond)

Required Volume Calculation

			Optional User Override 1-hr Precipitation	
Selected BMP Type =	**EDB**			
Watershed Area =	63.84	acres		
Watershed Length =	1,880	ft		
Watershed Slope =	0.014	ft/ft		
Watershed Imperviousness =	22.50%	percent		
Percentage Hydrologic Soil Group A =	30.0%	percent		
Percentage Hydrologic Soil Group B =	70.0%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Desired WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			
Water Quality Capture Volume (WQCV) =	0.668	acre-feet		
Excess Urban Runoff Volume (EURV) =	1.406	acre-feet		
2-yr Runoff Volume (P1 = 1.19 in.) =	1.016	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.450	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.269	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.027	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.340	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	7.102	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet		inches
Approximate 2-yr Detention Volume =	0.947	acre-feet		
Approximate 5-yr Detention Volume =	1.358	acre-feet		
Approximate 10-yr Detention Volume =	2.026	acre-feet		
Approximate 25-yr Detention Volume =	2.489	acre-feet		
Approximate 50-yr Detention Volume =	2.700	acre-feet		
Approximate 100-yr Detention Volume =	3.333	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.668	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.737	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.928	acre-feet
Total Detention Basin Volume =	3.333	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Depth Increment = ft

	Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
30.18	**Top of Micropool**	--	0.00	--	--	--	0	0.000		
	30.51	--	0.33	--	--	--	147	0.003	23	0.001
	31	--	0.82	--	--	--	853	0.020	261	0.006
	32	--	1.82	--	--	--	7,247	0.166	4,247	0.097
	33	--	2.82	--	--	--	20,867	0.479	18,376	0.422
	34	--	3.82	--	--	--	29,321	0.673	43,470	0.998
	35	--	4.82	--	--	--	32,162	0.738	74,212	1.704
	36	--	5.82	--	--	--	35,142	0.807	107,864	2.476
	37	--	6.82	--	--	--	38,215	0.877	144,542	3.318
	38	--	7.82	--	--	--	41,392	0.950	184,346	4.232
	39	--	8.82	--	--	--	44,738	1.027	227,411	5.221
	40	--	9.82	--	--	--	48,283	1.108	273,921	6.288
	40.5	--	10.32	--	--	--	50,043	1.149	298,503	6.853
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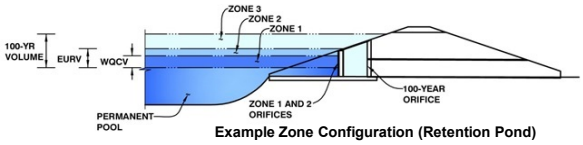
Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Timberline Storage (Amended)

Basin ID: FSD Pond 1



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.29	0.668	Orifice Plate
Zone 2 (EURV)	4.41	0.737	Orifice Plate
Zone 3 (100-year)	6.84	1.928	Weir&Pipe (Restrict)
		3.333	Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.41	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	19.60	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.47	2.94					
Orifice Area (sq. inches)	2.51	2.30	1.50					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.41	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	17.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.41	N/A	feet
Over Flow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.24	N/A	should be $\geq$ 4
Overflow Grate Open Area w/o Debris =	47.60	N/A	ft^2
Overflow Grate Open Area w/ Debris =	23.80	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	42.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	27.15		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	6.58	N/A	ft^2
Outlet Orifice Centroid =	1.28	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.87	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.85	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	72.50	feet
Spillway End Slopes =	10.00	H:V
Freeboard above Max Water Surface =	0.67	feet

Calculated Parameters for Spillway

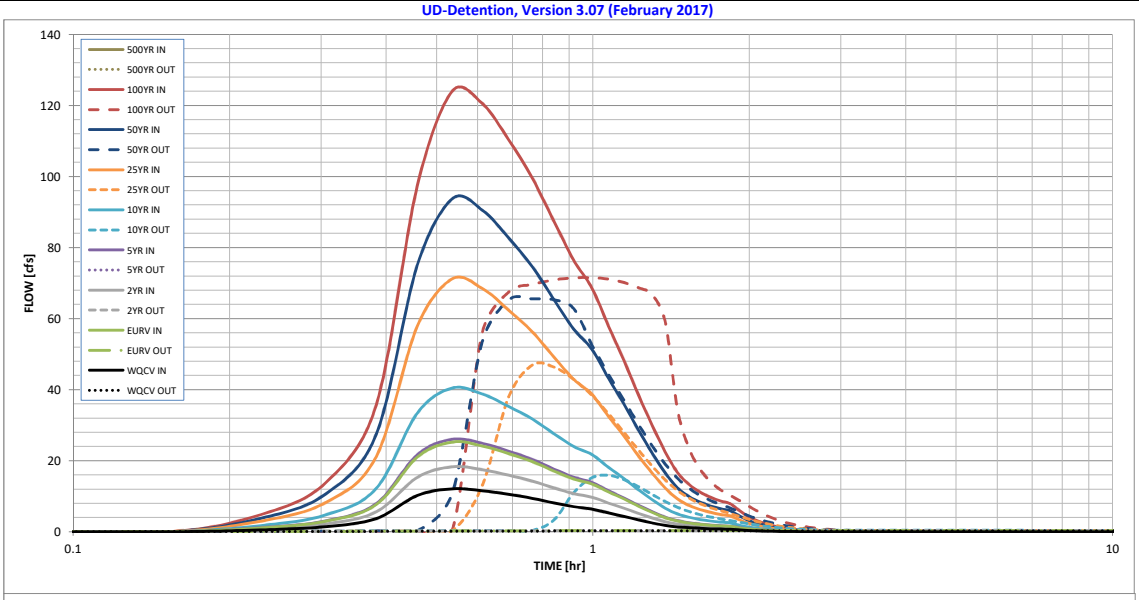
Spillway Design Flow Depth=	0.65	feet
Stage at Top of Freeboard =	8.17	feet
Basin Area at Top of Freeboard =	0.98	acres

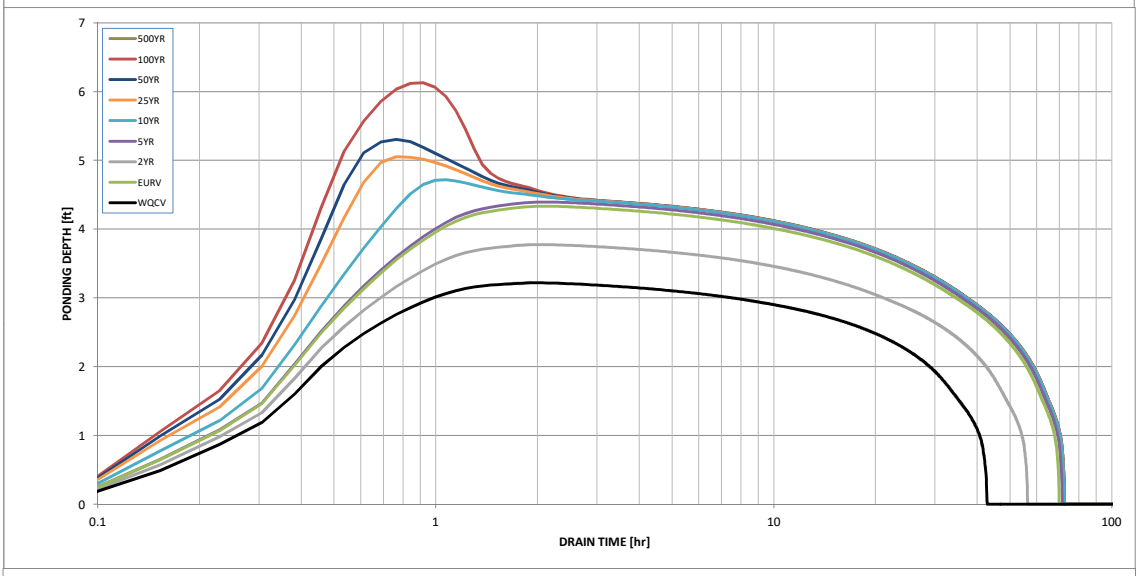
Routed Hydrograph Results

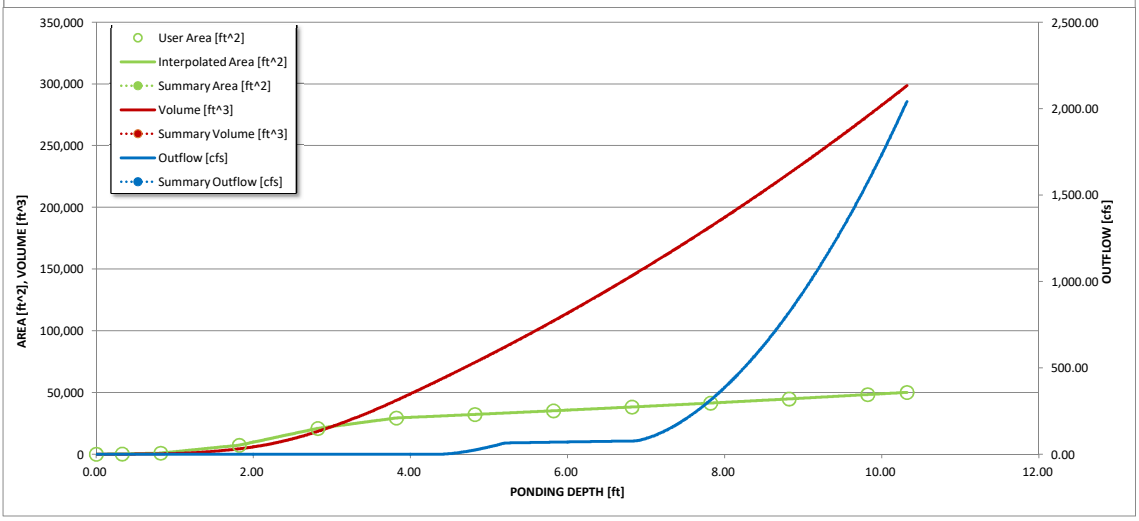
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	0.00
Calculated Runoff Volume (acre-ft) =	0.668	1.406	1.016	1.450	2.269	4.027	5.340	7.102	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.668	1.406	1.016	1.451	2.270	4.030	5.336	7.108	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.16	0.53	0.78	1.12	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	0.6	1.2	10.5	33.6	49.9	71.5	0.0
Peak Inflow Q (cfs) =	12.1	25.2	18.3	26.0	40.4	71.2	93.7	123.9	#N/A
Peak Outflow Q (cfs) =	0.3	0.4	0.3	0.4	15.9	47.0	65.5	71.5	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.5	1.4	1.3	1.0	#N/A
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.3	1.0	1.4	1.5	#N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	#N/A
Time to Drain 97% of Inflow Volume (hours) =	40	64	52	65	64	60	57	54	#N/A
Time to Drain 99% of Inflow Volume (hours) =	**42**	68	55	69	69	67	65	64	#N/A
Maximum Ponding Depth (ft) =	3.22	4.33	3.77	4.39	4.72	5.05	5.31	6.13	#N/A
Area at Maximum Ponding Depth (acres) =	0.55	0.71	0.66	0.71	0.73	0.75	0.77	0.83	#N/A
Maximum Volume Stored (acre-ft) =	0.623	1.350	0.965	1.392	1.623	1.875	2.066	2.721	#N/A

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename: O:\43095A\Tim Emick\Documents\Reports\Drainage\Excel\2019 UPDATE

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	#N/A
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
4.59 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	0:04:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
Hydrograph	0:09:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
Constant	0:13:46	0.53	1.09	0.80	1.13	1.73	2.96	3.79	4.83	#N/A
1.090	0:18:22	1.44	2.98	2.17	3.07	4.74	8.22	10.67	13.83	#N/A
	0:22:57	3.70	7.65	5.57	7.88	12.17	21.10	27.39	35.52	#N/A
	0:27:32	10.17	20.99	15.30	21.64	33.40	57.87	75.04	97.23	#N/A
	0:32:08	12.08	25.21	18.28	25.99	40.44	71.18	93.68	123.90	#N/A
	0:36:43	11.53	24.11	17.47	24.87	38.75	68.46	90.53	120.54	#N/A
	0:41:19	10.50	21.95	15.90	22.64	35.27	62.33	82.61	110.29	#N/A
	0:45:54	9.38	19.68	14.23	20.30	31.68	56.15	74.46	99.46	#N/A
	0:50:29	8.10	17.07	12.32	17.61	27.58	49.11	65.25	87.35	#N/A
	0:55:05	7.05	14.84	10.72	15.30	23.98	42.87	57.03	76.42	#N/A
	0:59:40	6.39	13.45	9.72	13.88	21.73	38.70	51.38	68.69	#N/A
	1:04:16	5.28	11.19	8.06	11.54	18.13	32.43	43.19	57.97	#N/A
	1:08:51	4.31	9.20	6.61	9.49	14.97	26.87	35.83	48.16	#N/A
	1:13:26	3.32	7.17	5.12	7.41	11.76	21.28	28.50	38.48	#N/A
	1:18:02	2.48	5.43	3.85	5.61	8.98	16.43	22.09	29.94	#N/A
	1:22:37	1.79	3.96	2.79	4.10	6.63	12.26	16.57	22.56	#N/A
	1:27:13	1.39	3.03	2.14	3.13	5.02	9.20	12.38	16.77	#N/A
	1:31:48	1.14	2.47	1.76	2.56	4.07	7.40	9.91	13.37	#N/A
	1:36:23	0.97	2.09	1.49	2.16	3.44	6.23	8.33	11.22	#N/A
	1:40:59	0.85	1.83	1.31	1.89	3.00	5.42	7.24	9.73	#N/A
	1:45:34	0.77	1.64	1.18	1.70	2.69	4.85	6.47	8.68	#N/A
	1:50:10	0.71	1.51	1.08	1.56	2.47	4.44	5.92	7.93	#N/A
	1:54:45	0.52	1.11	0.79	1.15	1.82	3.31	4.44	6.01	#N/A
	1:59:20	0.38	0.81	0.58	0.84	1.33	2.40	3.21	4.34	#N/A
	2:03:56	0.28	0.60	0.43	0.62	0.98	1.77	2.38	3.22	#N/A
	2:08:31	0.21	0.44	0.32	0.46	0.73	1.32	1.77	2.39	#N/A
	2:13:07	0.15	0.32	0.23	0.33	0.53	0.96	1.30	1.76	#N/A
	2:17:42	0.10	0.23	0.16	0.23	0.38	0.69	0.93	1.27	#N/A
	2:22:17	0.07	0.16	0.12	0.17	0.27	0.50	0.68	0.92	#N/A
	2:26:53	0.05	0.11	0.08	0.11	0.19	0.35	0.48	0.65	#N/A
	2:31:28	0.03	0.07	0.05	0.07	0.12	0.23	0.31	0.43	#N/A
	2:36:04	0.01	0.04	0.02	0.04	0.06	0.13	0.18	0.25	#N/A
	2:40:39	0.00	0.01	0.01	0.01	0.03	0.06	0.08	0.12	#N/A
	2:45:14	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.04	#N/A
	2:49:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	2:54:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	2:59:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:03:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:08:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:12:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:17:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:21:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:26:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:31:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:35:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:40:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:44:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:49:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:54:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	3:58:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:03:16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:07:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:12:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:17:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:21:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:26:13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:30:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:35:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:39:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:44:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:49:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:53:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	4:58:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:02:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:07:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:12:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:16:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:21:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:25:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
	5:30:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A

Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: **Pond 1**

Facility Location & Jurisdiction: **Timberline Storage Yard, El Paso County / El Paso County**

User Input: Watershed Characteristics

Watershed Slope =	0.014	ft/ft
Watershed Length =	1880	ft
Watershed Area =	63.84	acres
Watershed Imperviousness =	22.5%	percent
Percentage Hydrologic Soil Group A =	30.0%	percent
Percentage Hydrologic Soil Group B =	70.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent

Location for 1-hr Rainfall Depths (use dropdown):

User Input

WQCV Treatment Method = Extended Detention

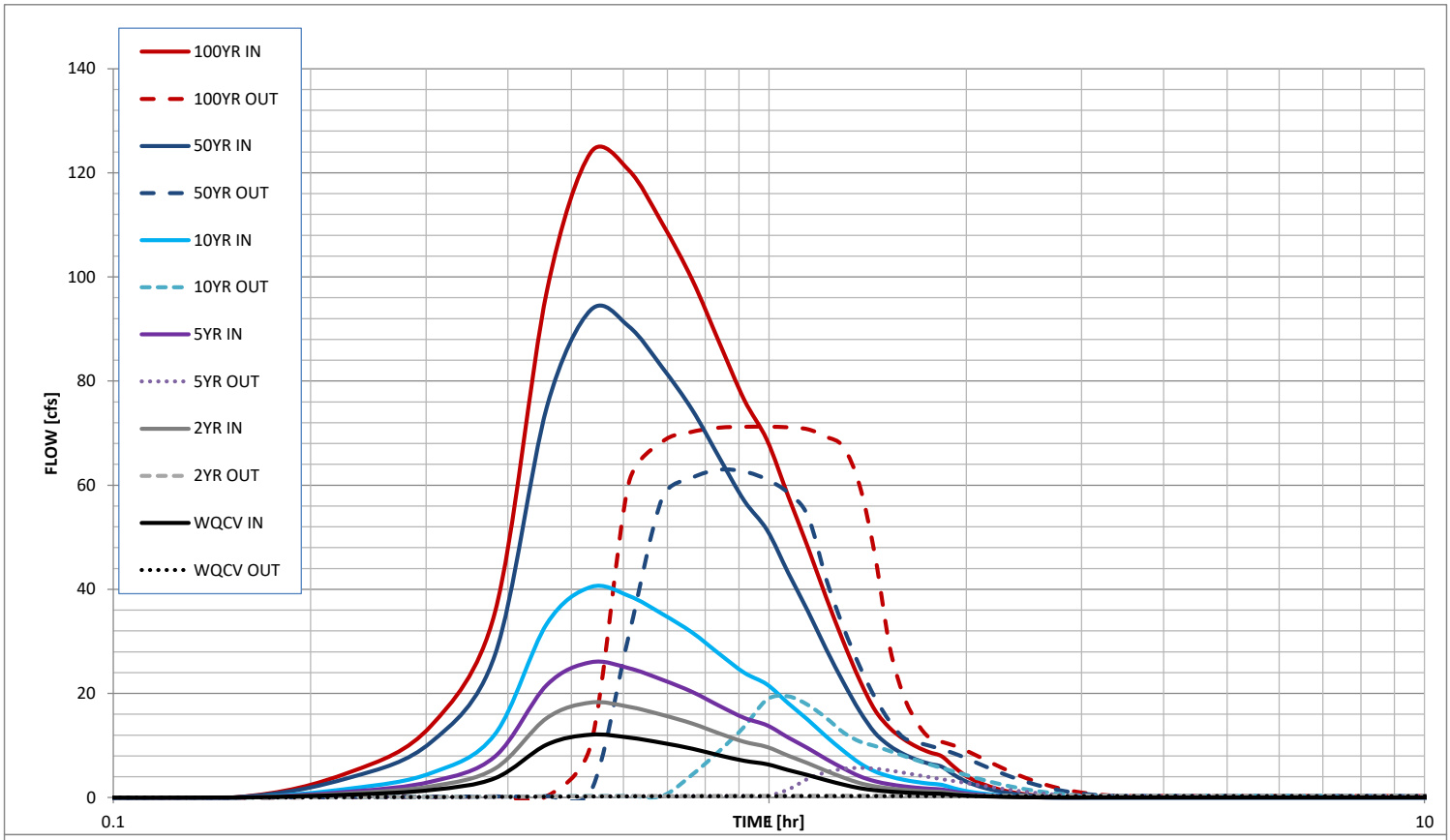
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	0	0.00	0.00
0.33	147	0.30	0.06
1.00	843	1.00	0.10
2.00	7,247	2.00	0.20
3.00	20,867	3.00	0.28
3.50	25,252	3.50	0.30
4.00	29,321	4.00	0.33
4.50	30,747	4.50	11.20
5.00	32,162	5.00	55.50
5.50	33,655	5.50	67.53
6.00	35,142	6.00	70.91
6.31	36,692	6.31	71.50

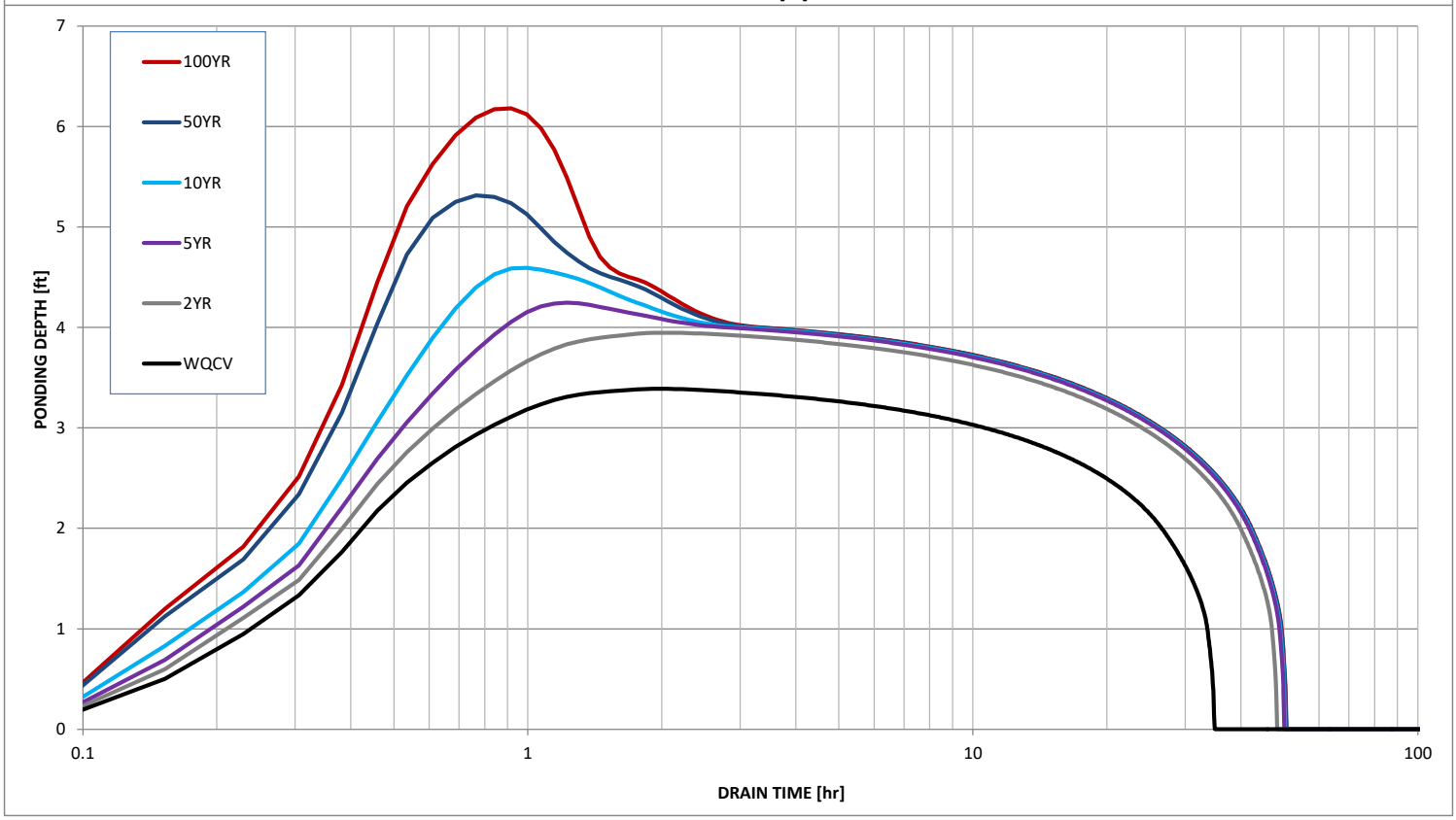
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.668	1.016	1.450	2.269	5.340	7.102	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.668	1.015	1.449	2.268	5.331	7.101	acre-ft
Time to Drain 97% of Inflow Volume =	32.5	44.9	**45.7**	44.1	38.9	36.2	hours
Time to Drain 99% of Inflow Volume =	33.9	46.9	48.1	47.6	45.4	**44.3**	hours
Maximum Ponding Depth =	3.39	3.95	4.25	4.59	5.31	6.18	ft
Maximum Ponded Area =	0.56	0.66	0.69	0.71	0.76	**0.83**	acres
Maximum Volume Stored =	0.622	0.964	1.165	1.410	1.936	2.625	acre-ft

Stormwater Detention and Infiltration Design Data Sheet





DWIRE YARD

EMERGENCY SPILLWAY CALCULATIONS FSD POND

Horizontal Broad-Crested Weir (Eqn 12-20 UDFCD)						
Variable				*Solve For*		
C	3.00			L (ft)	H (ft)	Q (cfs)
L	25.50	ft		0.0	0.0	60.0
H	0.85	ft				
Q		cfs				

Sloping Broad-Crested Weir (Eqn 12-21 UDFCD)						
Variable				*Solve For*		
C	3.00			Z (ft)	H (ft)	Q (cfs)
Z	4.00	ft		0.0	0.0	3.2
H	0.85	ft				
Q		cfs				

Total Q	66.34

Equation 12-20

$$Q = C_{BCW} L H^{1.5}$$

Equation 12-21

$$Q = \left(\frac{2}{5}\right) C_{BCW} Z H^{2.5}$$

Where:

Q = discharge (cfs)

C_{BCW} = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

L = broad-crested weir length (ft)

H = head above weir crest (ft)

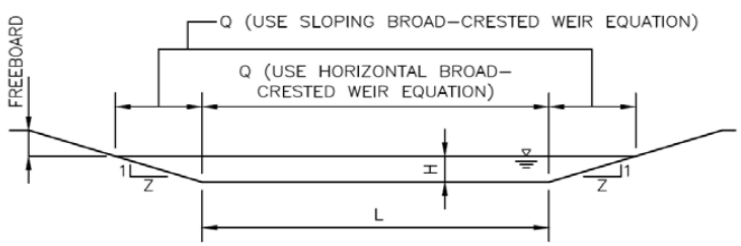


Figure 12-20. Sloping broad-crest weir

MS CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, STE 110
COLORADO SPRINGS, CO 80903
(719) 955-5485

PROJECT: DWIRE STORAGE YARD

DATE:

OUTFALL RIPRAP APRON

$V_{ALLOWED} = 5$ ft/s NON-COHESIVE SOILS

$A_t = \frac{Q}{V}$ (Eq. 9-12)

$A_t = \frac{17.5 \text{ cfs}}{14.7 \text{ ft/s}} = 1.19 \approx 1.2$

$Q = 17.5$ cfs
$W = 2$ ft
$y_t = 1.6$ ft, 40% full @ $Q = 17.5$ cfs

$\frac{y_t}{D} = 0.80$

$\frac{Q}{D^{2.5}} = \frac{17.5}{2^{(2.5)}} = 3.09 < 6.0$ CHECK

$\theta = \tan^{-1}\left(\frac{1}{2(\text{EXPANSION FACTOR})}\right) = \tan^{-1}\left(\frac{1}{2(6.6)}\right) = 4.33$ degrees

$3(D) = 3(2) = 6$ ft

$L_p = \left(\frac{1}{2\tan(4.33)}\right)\left(\frac{2.0}{0.8} - 2\right) = 3.3 < 6$ ft USE 6ft MINIMUM

FIGURE 9-38

$Q/D^{1.5} = 17.5 \text{ cfs} / 2 \text{ ft}^{1.5} = 6.19$ FROM FIG. 9-38 RIP RAP TYPE "L" = D_{50} = 9"
UPGRADE TO TYPE "M" = D_{50} = 12"

THICKNESS $2D_{50} = 2(12") = 24"$ THICK

$L_p = 6$ ft

$T = 2(6\tan(4.33)) + 2 = 2.90$

DESIGN = 6' x 2.9' x 2' RIPRAP ACTUAL 12' x 18' x 2' RIPRAP BASIN

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COLORADO SPRINGS, CO 80903
(719) 955-5485

PROJECT: DENIRE STORAGE YARD

DATE:

FORE BAY VOLUMES FSD POND

SIZE OF CONTRIBUTING AREA = 19.36 ACRES

MIN FOREBAY VOLUME = 3% WQCV (MHFD V. 4.03)

WQCV = 0.453 AC-FT

TOTAL VOL REQ = 0.03 (0.453 Ac-ft) $\left(\frac{43560 \text{ ft}^3}{1 \text{ Ac-FT}}\right)$ = 591 cf

DENIRE VOL BASED ON CONTRIBUTING FLOW TO FORE BAY

Q_{100} = DESIGN POINT 2 = 16.7 cfs
Q_{100} TOTAL = 66.3 cfs
$\frac{16}{66.3}$ = 24% EAST FOREBAY

Q_{100} = DESIGN POINT 3 = 12 cfs
Q_{100} TOTAL = 66.3 cfs
$\frac{12}{66.3}$ 18% NORTH FOREBAY

Q_{100} = DESIGN POINT 4 = 40.5 cfs
Q_{100} TOTAL = 66.3 cfs
$\frac{40}{66.3}$ 60% WEST FOREBAY

REQ VOLUME	ACTUAL VOLUME
(591 cf)(0.24) = 141 cf	(126 sf)(1.25 ft) = 158 cf
(591 cf)(0.18) = 106 cf	(98 sf)(1.1 ft) = 108 cf
(591 cf)(0.60) = 354 cf	(257 sf)(1.4 ft) = 360 cf

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PROJECT: DWIRE STORAGE YARD

DATE:

SIZE FOREBAY NOTCHES

2% OF CONTRIBUTING 100YR FLOW

EAST $Q_{100} = 16.7\text{cfs} \times 0.02 = 0.334\text{ cfs}$ $H = 1.25\text{ ft}$

NORTH $Q_{100} = 12.1\text{ cfs} \times 0.02 = 0.242\text{ cfs}$ $H = 1.1\text{ ft}$

WEST $Q_{100} = 40.5\text{ cfs} \times 0.02 = 0.81\text{ cfs}$ $H = 1.4\text{ ft}$

WIRE EQN.

$Q = CLH^{1.5}$

$L = \frac{Q}{CH^{1.5}}$

EAST $L = \frac{0.334}{3.0(1.25)^{1.5}} = (0.08)\left(\frac{12\text{ in}}{1\text{ ft}}\right) = 0.96''$ USE 3" WIDE PER DCM MANUAL

NORTH $L = \frac{0.242\text{ ft}}{3.0(1.1)^{1.5}} = (0.07)\left(\frac{12\text{ in}}{1\text{ ft}}\right) = 0.83''$ USE 3' WIDE PER DCM MANUAL

WEST $L = \frac{0.81}{3.0(1.4)^{1.5}} = (0.16)\left(\frac{12''}{1\text{ ft}}\right) = 1.95''$ USE 3' WIDE PER DCM MANUAL

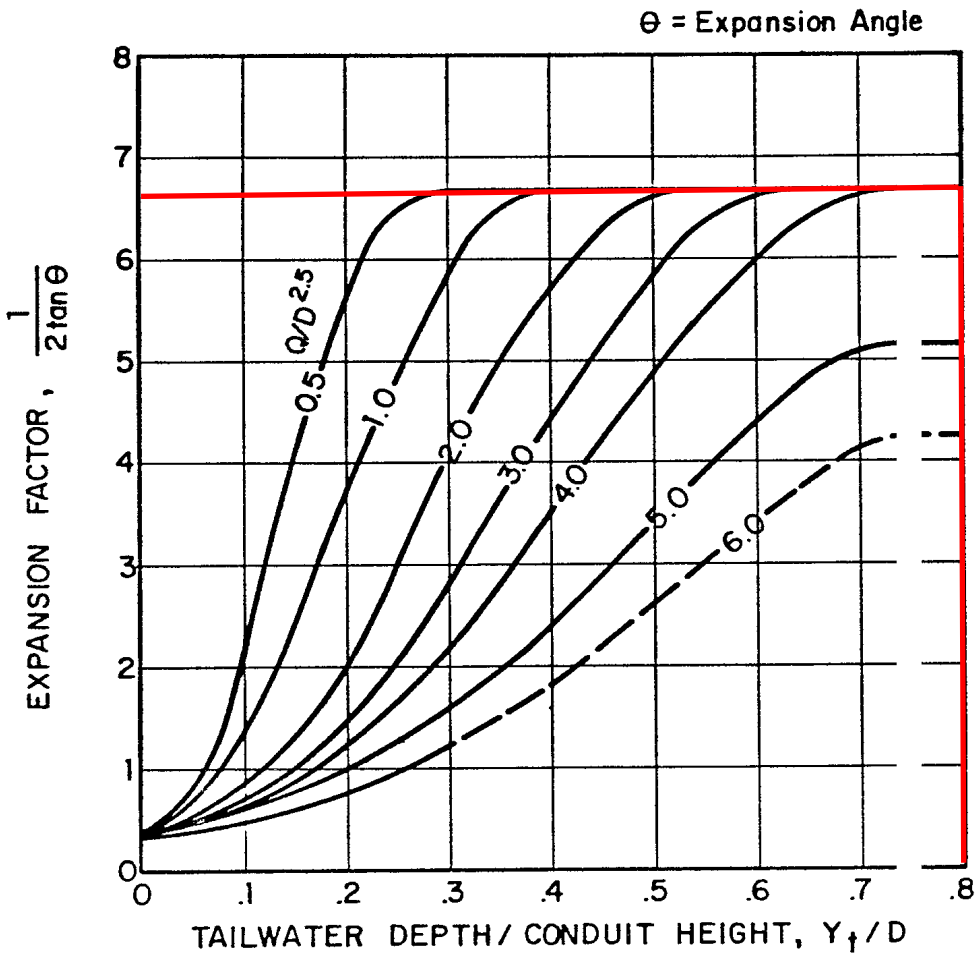


Figure 9-35. Expansion factor for circular conduits

$$H_a = \frac{(H + Y_n)}{2}$$ Equation 9-19

Where the maximum value of H_a shall not exceed H, and:

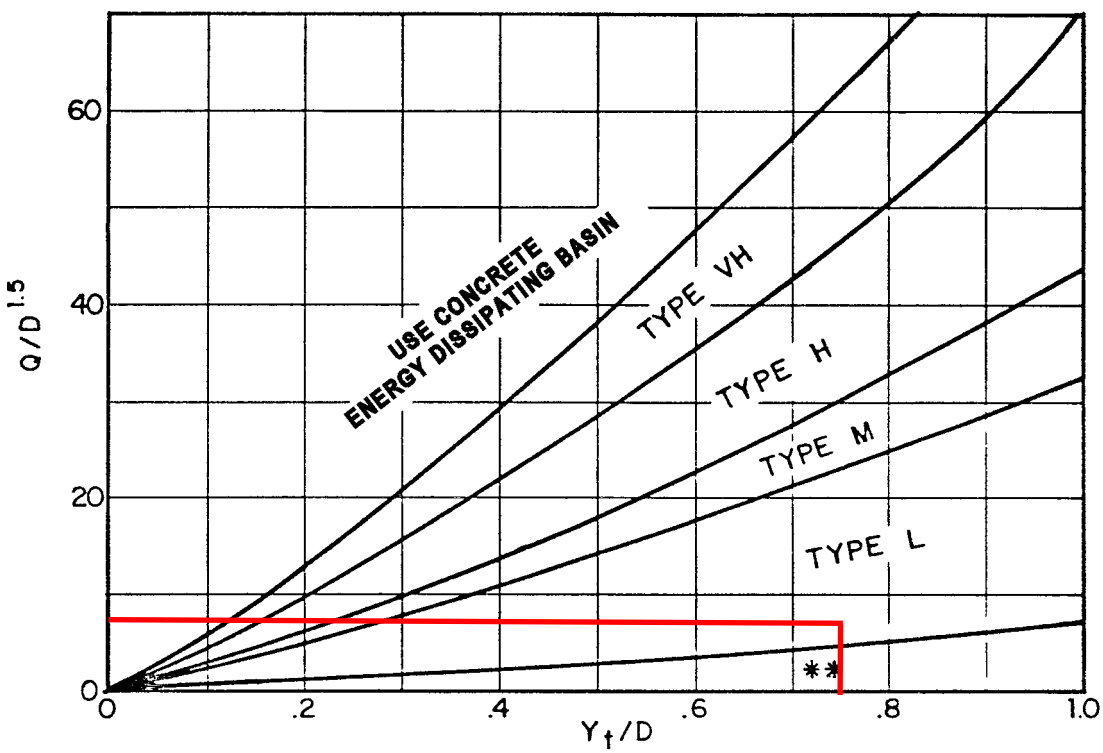
D_a = parameter to use in place of D in Figure 9-38 when flow is supercritical (ft)

D_c = diameter of circular culvert (ft)

H_a = parameter to use in place of H in Figure 9-39 when flow is supercritical (ft)

H = height of rectangular culvert (ft)

Y_n = normal depth of supercritical flow in the culvert (ft)



Use D_a instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – VMax® SC250® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 70% straw and 30% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between a heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The SC250 shall meet Type 5A, 5B, and 5C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content		
Matrix	70% Straw Fiber	0.35 lb/sq yd (0.19 kg/sm)
	30% Coconut Fiber	0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	5 lb/1000 sq ft (2.44 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes		
Width	6.5 ft (2.0 m)	8 ft (2.44m)
Length	55.5 ft (16.9 m)	90 ft (27.4 m)
Weight ± 10%	34 lbs (15.42 kg)	70 lbs (31.8 kg)
Area	40 sq yd (33.4 sm)	80 sq. yd. (66.8 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.62 in. (15.75 mm)
Resiliency	ASTM 6524	95.2%
Density	ASTM D792	0.891 g/cm^3
Mass/Unit Area	ASTM 6566	16.13 oz/sy (548 g/sm)
UV Stability	ASTM D4355/ 1000 HR	100%
Porosity	ECTC Guidelines	99%
Stiffness	ASTM D1388	222.65 oz-in.
Light Penetration	ASTM D6567	4.1%
Tensile Strength – MD	ASTM D6818	709 lbs/ft (10.51 kN/m)
Elongation – MD	ASTM D6818	23.9%
Tensile Strength – TD	ASTM D6818	712 lbs/ft (10.56 kN/m)
Elongation – TD	ASTM D6818	36.9%
Biomass Improvement	ASTM D7322	441%

Design Permissible Shear Stress		
	Short Duration	**Long Duration**
Phase 1: Unvegetated	3.0 psf (144 Pa)	2.5 psf (120 Pa)
Phase 2: Partially Veg.	8.0 psf (383 Pa)	8.0 psf (383 Pa)
Phase 3: Fully Veg.	10.0 psf (480 Pa)	8.0 psf (383 Pa)
Unvegetated Velocity	9.5 fps (2.9 m/s)	
Vegetated Velocity	15 fps (4.6 m/s)	

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2.1	≥ 2:1
≤ 20 ft (6 m)	0.0010	0.0209	0.0507
20-50 ft	0.0081	0.0266	0.0574
≥ 50 ft (15.2 m)	0.0455	0.0555	0.081

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.040
0.50 – 2.0 ft	0.040-0.012
≥ 2.0 ft (0.60 m)	0.011

North American Green
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633

nagreen.com
800-772-2040

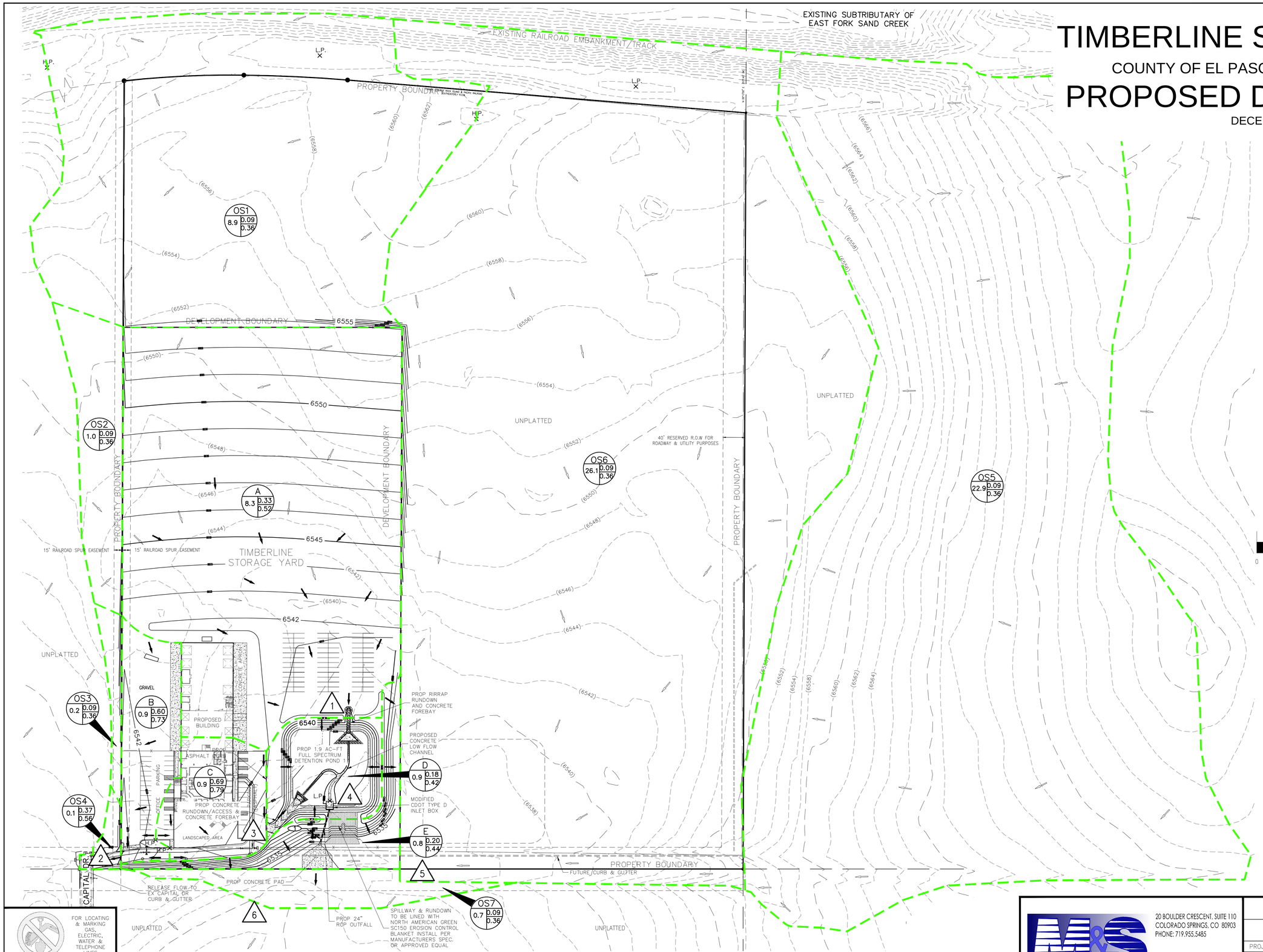
REFERENCED REPORTS

TIMBERLINE STORAGE YARD

COUNTY OF EL PASO, STATE OF COLORADO

PROPOSED DRAINAGE MAP

DECEMBER 2017



LEGEND

- BASIN DESIGNATION (Z; 25; .25 / .35; C5 / C100; ACRES)
- PIPE RUN (PR) REFERENCE LABEL
- SURFACE DESIGN POINT (DP)
- BASIN BOUNDARY
- (6920) EXISTING CONTOUR
- 6538 PROP CONTOUR
- PARCEL BOUNDARY
- TIMBERLINE STORAGE YARD SITE BOUNDARY
- STORM SEWER PIPE
- FUTURE STORM SEWER PIPE
- INLET
- EXISTING FLOW DIRECTION ARROW
- EMERGENCY OVERFLOW DIRECTION
- FLOW DIRECTION
- FLARED END SECTION
- H.P. HIGH POINT
- L.P. LOW POINT

BASIN SUMMARY

BASIN	AREA (ACRES)	Q_5	Q_{100}
A	8.27	9.4	25.1
B	0.94	2.2	4.4
C	0.90	3.2	6.1
D	0.90	0.8	3.1
E	0.82	0.9	3.1
OS1	8.93	2.5	16.6
OS2	1.03	0.3	2.2
OS3	0.21	0.1	0.5
OS4	0.13	0.3	0.7
OS5	22.93	7.6	50.9
OS6	26.07	4.9	33.2
OS7	0.68	0.2	1.4

DESIGN POINT SUMMARY

DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
1	8.1	29.6	OS1, OS2, A	RIP RAP RUNDOWN INTO FULL-SPECTRUM DETENTION POND
2	2.4	5.4	B, OS3, OS4	OUTFALL TO CAPITAL DR. C&G
3	3.2	6.1	C	CONCRETE RUNDOWN INTO FULL-SPECTRUM DETENTION POND
4	9.8	33.7	DP1, DP3, D	PROPOSED FULL-SPECTRUM DETENTION POND1
5	11.3	76.2	OS5, OS6	HISTORIC DRAINAGE PATTERNS
6	12.4	85.8	DP5, PIPE 1, OS7	HISTORIC DRAINAGE PATTERNS TOTAL DISCHARGE

STORM SEWER SUMMARY

PIPE RUN	Q_5	Q_{100}	PIPE SIZE	CONTRIBUTING STRUCTURES
1	0.8	8.3	24" RCP	POND 1 OUTFALL

POND 1 FULL SPECTRUM DETENTION BASIN DATA

WQ WATER SURFACE EL=7035.72
WQ VOLUME=0.216 AC-FT.
EURV WATER SURFACE EL=6536.40
EURV VOLUME=0.516 AC-FT
100-YR WATER SURFACE EL=6538.93
SPILLWAY CREST EL=6539.05
TOP OF EMBANKMENT EL=6541.0
100-YR VOLUME=1.876 AC-FT
100-YR INFLOW=33.7 CFS
100-YR RELEASE=8.3 CFS

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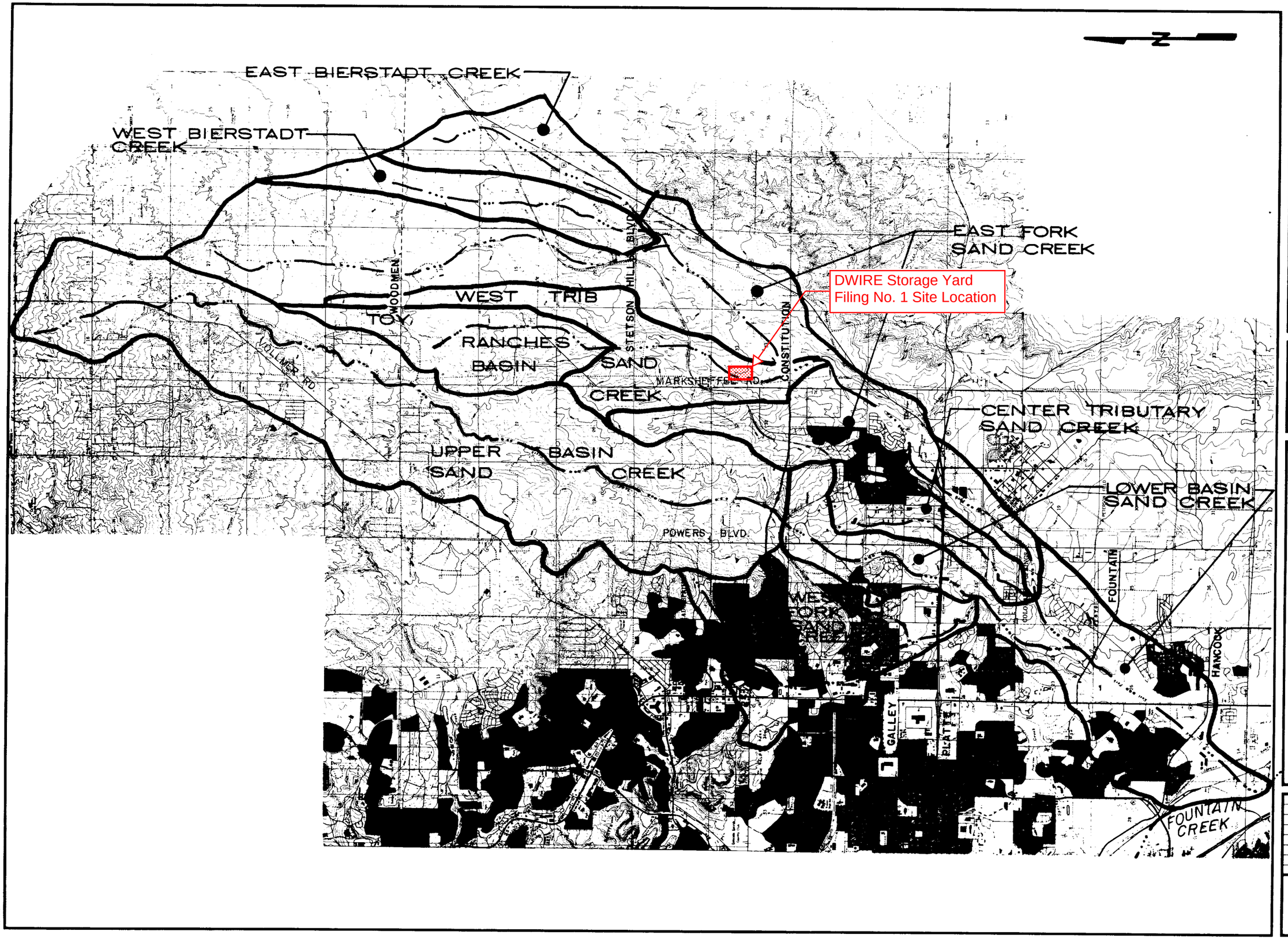
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

TIMBERLINE STORAGE YARD

PROPOSED DRAINAGE MAP

PROJECT NO. 43-095	SCALE: HORIZONTAL: 1"=80' VERTICAL: N/A	DATE: 12/01/2017	
DESIGNED BY: CMN DRAWN BY: CMN CHECKED BY: VAS		SHEET 1 OF 1	PDM



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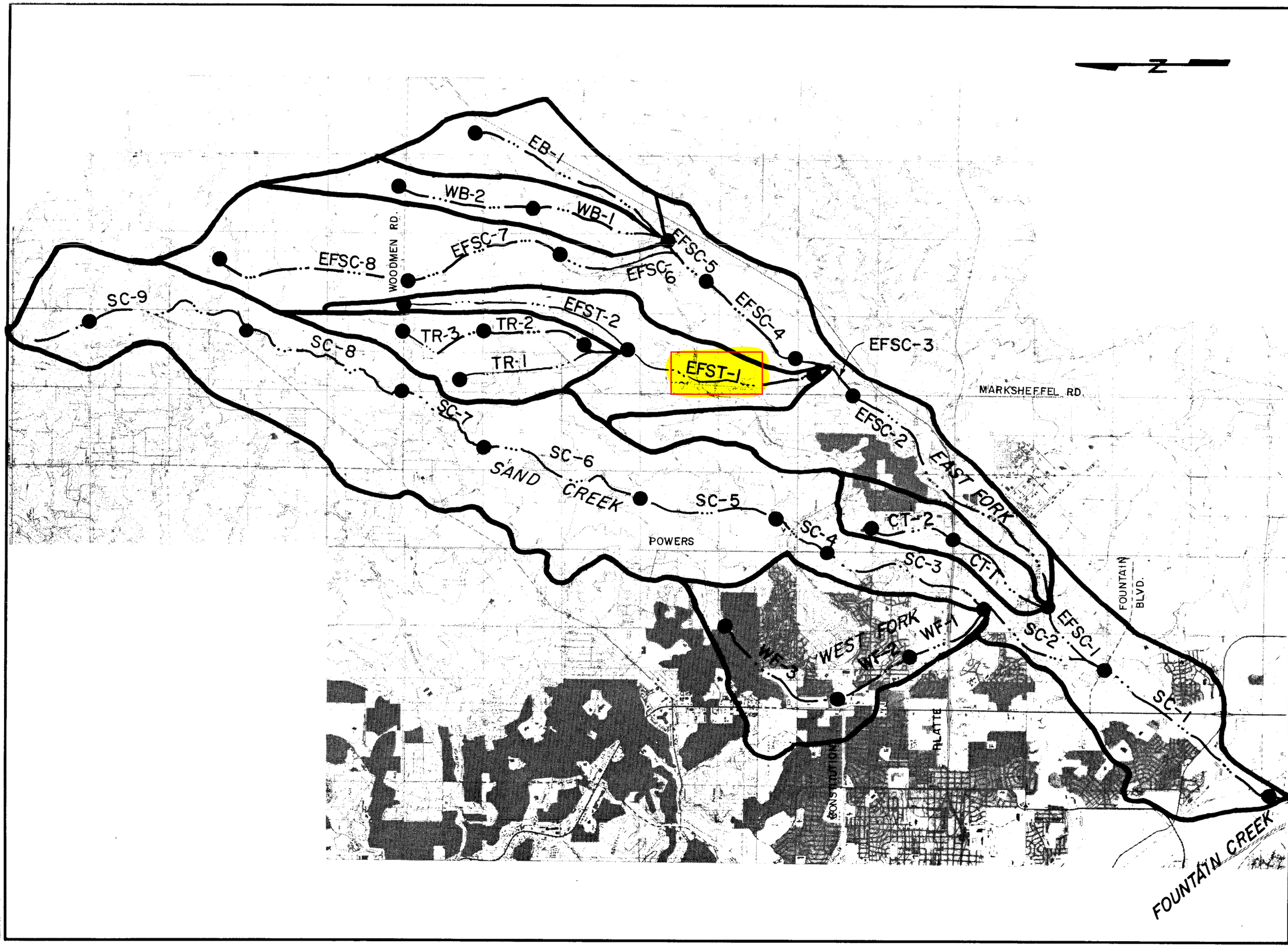
SAND CREEK DRAINAGE BASIN PLANNING STUDY

REGIONAL SUB-BASINS

Project No	90-04-09
Date:	11/90
Design:	
Drawn:	EAK
Check:	
Revisions:	

11

FIG. III-1



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Colorado Springs, Colorado
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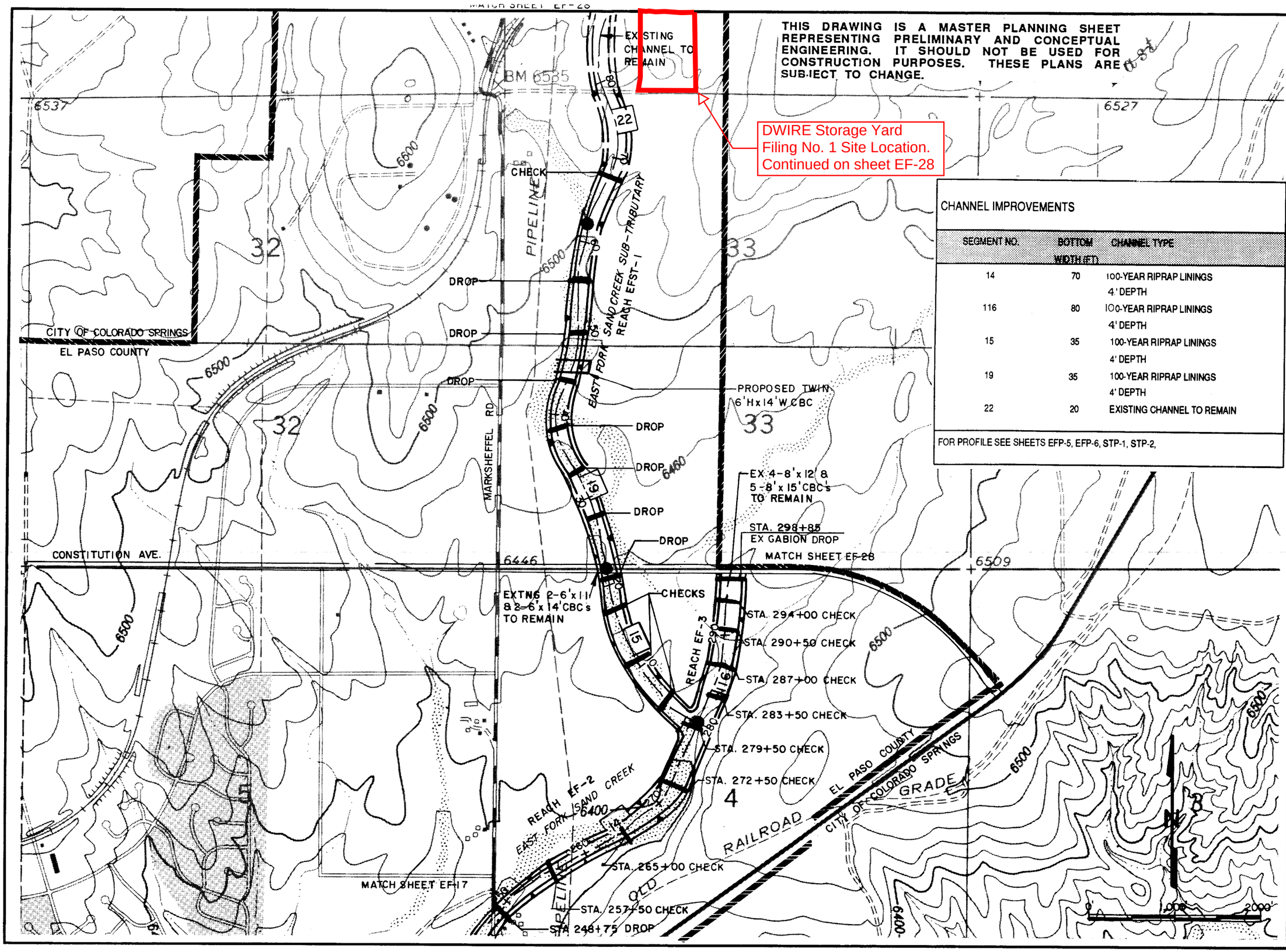
SAND CREEK DRAINAGE BASIN PLANNING STUDY

REACH DELINEATIONS

Project No.	90-04-09
Date:	1-91
Design:	RNW
Drawn:	EAK
Check:	
Revisions:	

30

FIG. IV-1



DWIRE Storage Yard Filing No. 1 Site Location. Continued on sheet EF-28

THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES. THESE PLANS ARE SUBJECT TO CHANGE.

CHANNEL IMPROVEMENTS

SEGMENT NO.	BOTTOM WIDTH (FT)	CHANNEL TYPE
14	70	100-YEAR RIPRAP LININGS 4' DEPTH
116	80	100-YEAR RIPRAP LININGS 4' DEPTH
15	35	100-YEAR RIPRAP LININGS 4' DEPTH
19	35	100-YEAR RIPRAP LININGS 4' DEPTH
22	20	EXISTING CHANNEL TO REMAIN

FOR PROFILE SEE SHEETS EFP-5, EFP-6, STP-1, STP-2,

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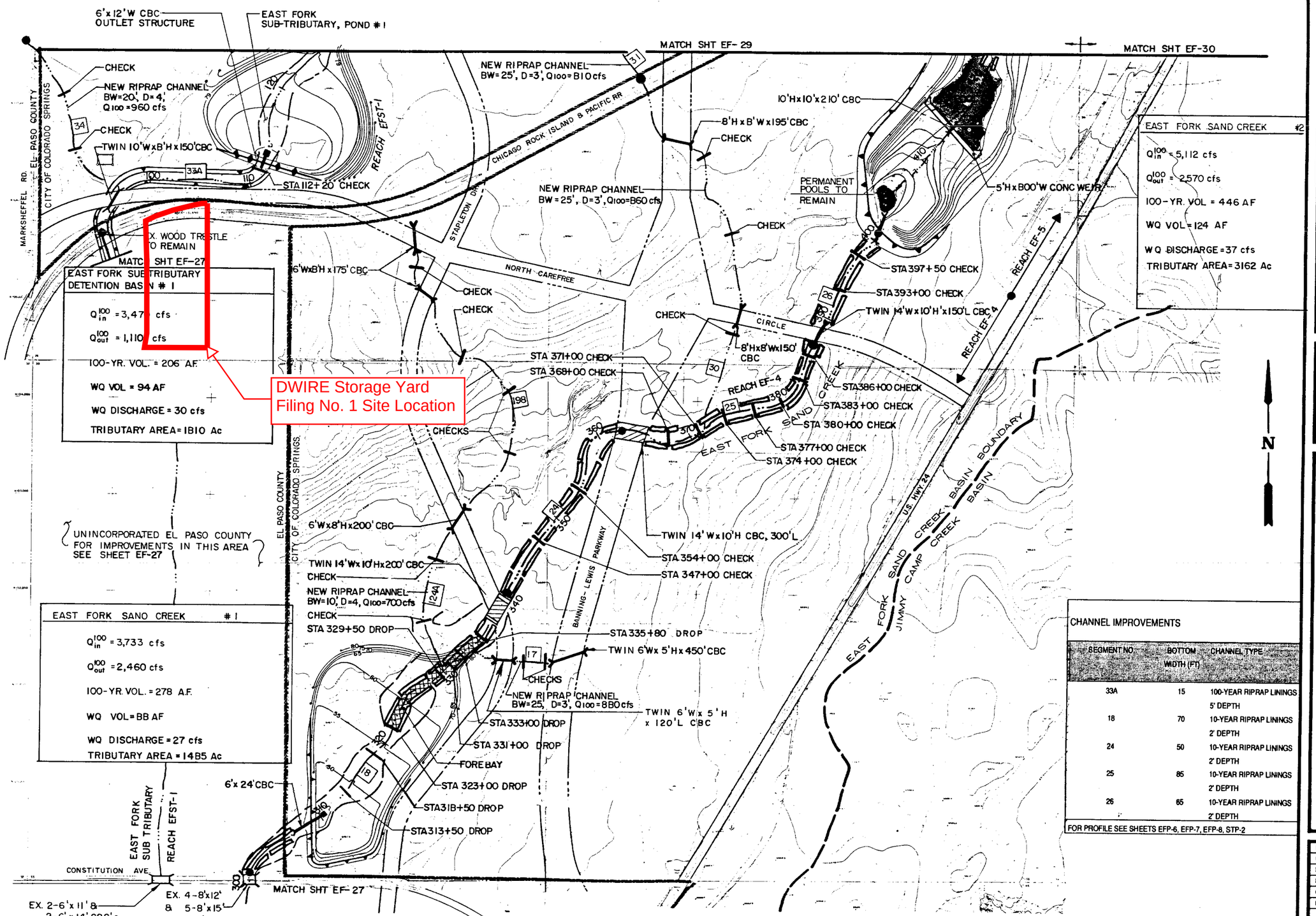
SAND CREEK DRAINAGE BASIN PLANNING STUDY
PRELIMINARY DESIGN PLANS

Project No	
Date:	
Design:	
Drawn:	
Check.	
Revisions:	

EF-27



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CHANNEL IMPROVEMENTS

SEGMENT NO.	BOTTOM WIDTH (FT)	CHANNEL TYPE
33A	15	100-YEAR RIPRAP LININGS 5' DEPTH
18	70	10-YEAR RIPRAP LININGS 2' DEPTH
24	50	10-YEAR RIPRAP LININGS 2' DEPTH
25	85	10-YEAR RIPRAP LININGS 2' DEPTH
26	65	10-YEAR RIPRAP LININGS 2' DEPTH

FOR PROFILE SEE SHEETS EFP-6, EFP-7, EFP-8, STP-2

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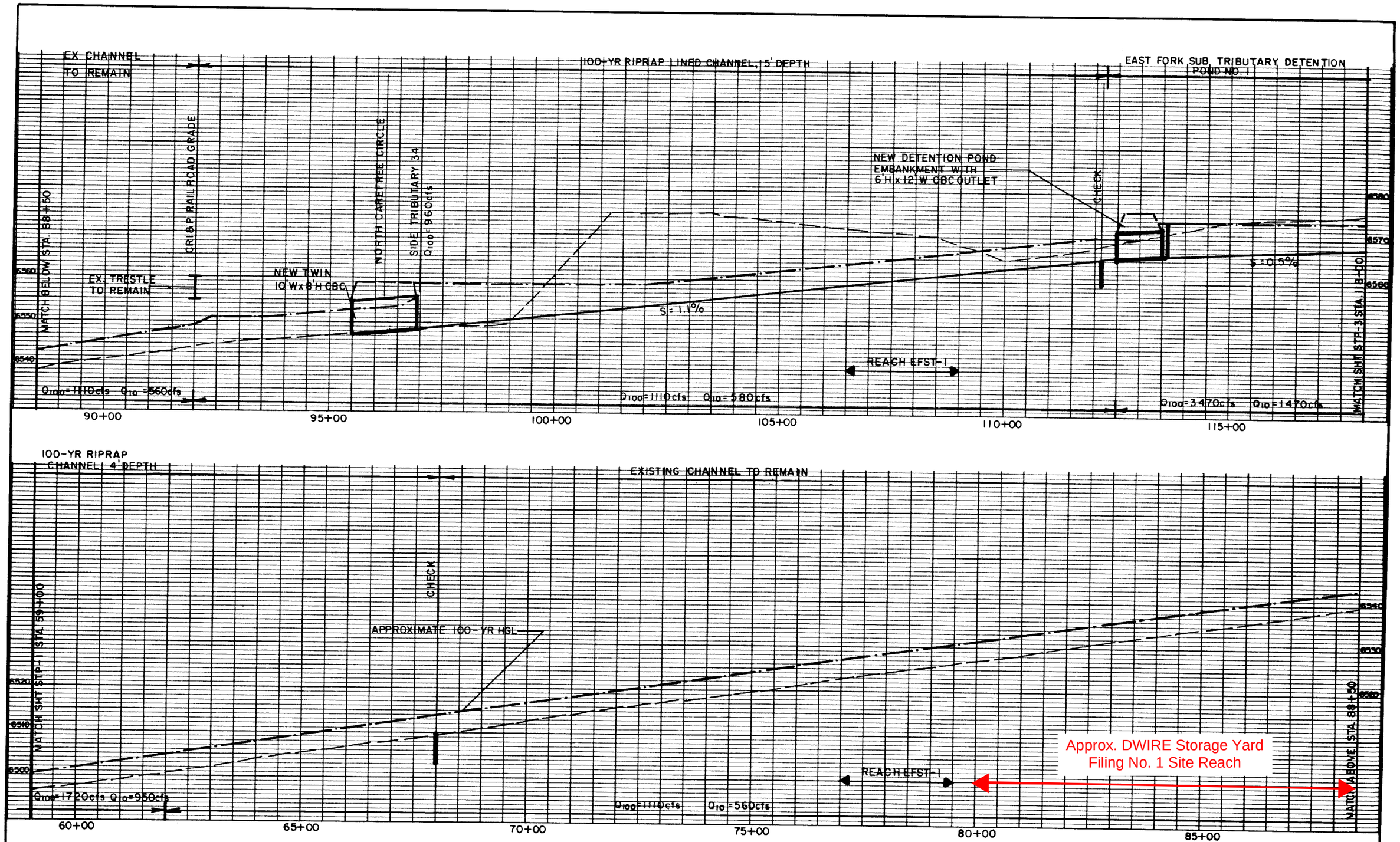
EAST FORK SAND CREEK DRAINAGE BASIN PLANNING STUDY

PRELIMINARY PLANS

Project No.	88.11.23
Date:	6/89
Design:	JYC
Drawn:	EAK
Check:	
Revisions:	

EF-28



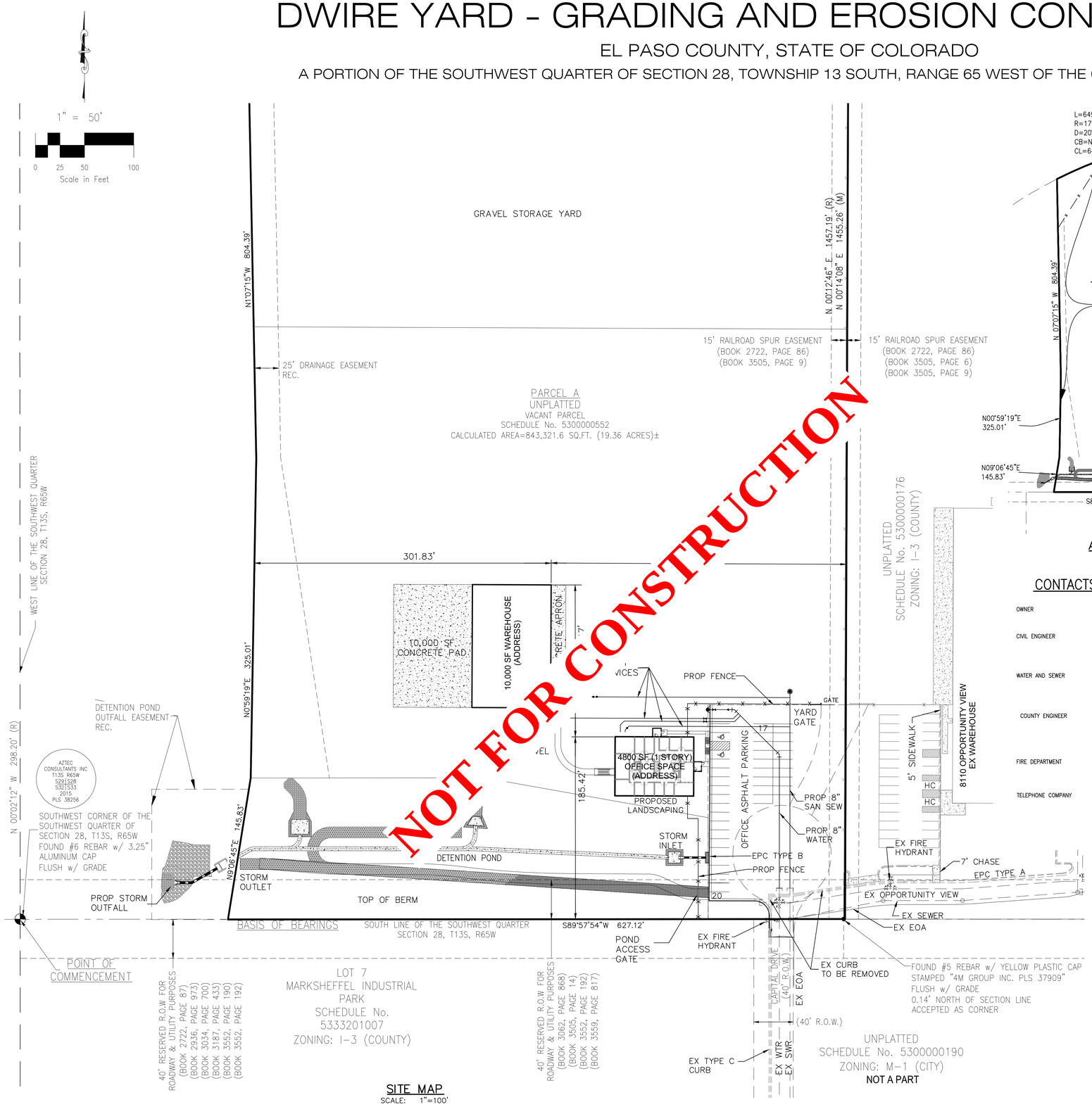
Kiowa Engineering Corporation	DESIGNED RNW DATE CHECKED DATE DRAWN EAK DATE REVISED DATE	SAND CREEK DRAINAGE BASIN PLANNING STUDY PRELIMINARY DESIGN PROFILES	CITY OF COLORADO SPRINGS EL PASO COUNTY, COLORADO	EAST FORK SUB-TRIBUTARY Station 59+00 to 118+00	STP-2

GRADING AND EROSION CONTROL PLAN

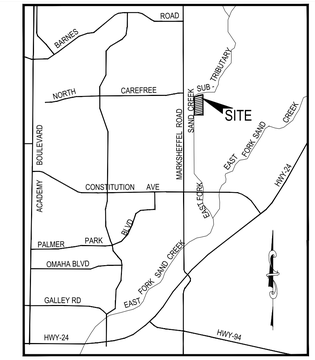
DWIRE YARD - GRADING AND EROSION CONTROL PLAN

EL PASO COUNTY, STATE OF COLORADO

A PORTION OF THE SOUTHWEST QUARTER OF SECTION 28, TOWNSHIP 13 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN,



SITE MAP
SCALE: 1"=100'



VICINITY MAP
N.T.S.

DESIGN 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, ERRORS OR OMISSIONS ON MY PART IN PREPARING THIS PLAN.

COLORADO REGISTERED VIRGIL A. SANCHEZ 37160 1-26-21 PROFESSIONAL ENGINEER

1-26-21

VIRGIL A. SANCHEZ, COLORADO P.E. #37160
FOR AND ON BEHALF OF M & S CIVIL CONSULTANTS, INC. DATE

OWNER/DEVELOPER'S STATEMENT:

I, THE OWNER/DEVELOPER HAVE READ AND WILL COMPLY WITH ALL OF THE REQUIREMENTS SPECIFIED IN THESE DETAILED PLANS AND SPECIFICATIONS.

NAME: DATE

BUSINESS NAME:

ADDRESS:

CONTACTS

OWNER	DL HOLDINGS LLC 6547 N. ACADEMY BLVD #523 COLORADO SPRINGS, CO 80918
CIVIL ENGINEER	MS CIVIL CONSULTANTS, INC 102 E. PIKES PEAK AVE. STE 306 COLORADO SPRINGS, CO 80903 VIRGIL A. SANCHEZ, P.E. 719-491-0818
WATER AND SEWER	CHEROKEE METROPOLITAN DISTRICT 6250 PALMER PARK BOULEVARD COLORADO SPRINGS, CO 80915 JEFF MUNGER 719-597-5080
COUNTY ENGINEER	EL PASO COUNTY PLANNING AND COMMUNITY DEVELOPMENT 2880 INTERNATIONAL CIRCLE, SUITE 110 COLORADO SPRINGS, COLORADO 80910 GILBERT LAFORCE, P.E. 719-520-7945
FIRE DEPARTMENT	CIMARRON HILLS FIRE DEPARTMENT 1835 TUSKEGEE PLACE COLORADO SPRINGS, CO 80915 719-591-0960
TELEPHONE COMPANY	U.S. WEST COMMUNICATIONS (LOCATORS) 800-922-1987 AT&T (LOCATORS) 719-635-3674

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, 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 DIRECTOR'S DISCRETION.

JENNIFER IRVINE, P.E. DATE
COUNTY ENGINEER / ECM ADMINISTRATOR

LEGAL DESCRIPTION:

A PARCEL OF LAND IN THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 28, TOWNSHIP 13 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: A PORTION OF THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW1/4) OF SECTION 28, TOWNSHIP 13 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO. THE SECTION CORNER COMMON TO SECTIONS 28,29, 32, AND 33 BEING MONUMENTED WITH A 3" ALUMINUM CAP STAMPED "PLS 38256", FROM WHICH A YELLOW PLASTIC CAP STAMPED "PLS 37909", BEARS N89°58'59"E, A DISTANCE OF 861.03 FEET.

COMMENCING AT THE AFORESAID YELLOW PLASTIC CAP;
THENCE N09°06'45"E A DISTANCE OF 145.85 FEET;
THENCE N00°59'19"E A DISTANCE OF 325.07 FEET;
THENCE N01°07'15"W A DISTANCE OF 804.53 FEET TO THE SOUTHERLY LINE OF THE FORMER CHICAGO, ROCK ISLAND, AND PACIFIC RAILROAD AS RECORDED UNDER RECEPTION NO. 215057836 IN THE RECORDS OF EL PASO COUNTY, COLORADO;
THENCE 649.44 FEET ON THE ARC OF A NON-TANGENT CURVE TO THE RIGHT ON SAID SOUTHERLY LINE, SAID CURVE HAVING A RADIUS OF 1795.32 FEET, AND A CENTRAL ANGLE OF 20°43'34" (THE CHORD OF WHICH BEARS N75°36'49"E, 645.91 FEET);
THENCE S00°13'52"W A DISTANCE OF 1455.11 FEET TO THE AFORESAID SOUTH LINE OF SECTION 28;
THENCE N89°57'07"W ALONG SAID SOUTH LINE A DISTANCE OF 626.77 FEET TO THE POINT OF BEGINNING;

SAID PARCEL CONTAINS A CALCULATED AREA OF 843,414 S.F. (19.362 ACRES MORE OR LESS).

EL PASO COUNTY FILE NO. MS 20-002

DWIRE YARD
GRADING AND EROSION CONTROL PLAN
PROJECT NO. 43-117 | DATE: 1/26/2021 | SHEET 1 OF 5 | GR01
DESIGNED BY: DLM | DRAWN BY: JP | CHECKED BY: VAS | SCALE: HORIZONTAL: N/A VERTICAL: N/A

102 E. PIKES PEAK AVE. SUITE 300
COLORADO SPRINGS, CO 80903
PHONE: 719.355.5465
CIVIL CONSULTANTS, INC.

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.
VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160
COLORADO REGISTERED VIRGIL A. SANCHEZ 37160 1-26-21 PROFESSIONAL ENGINEER

REVISIONS: NO. | DATE: | BY: | DESCRIPTION: | APRV'D. BY: | DATE:

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 BY THE PREPARER OF THESE PLANS.

CAUTION

File: O:\431174-Dwire Yard\Dwire Yard\dwg\Dev Plan\PGR01-COVER.dwg Plotstamp: 1/26/2021 6:33 PM

DWIRE STORAGE YARD

GRADING AND EROSION CONTROL PLAN

3520 CAPITAL DRIVE

GRADING AND EROSION CONTROL NOTES:

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 EFFECT 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 THE 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.

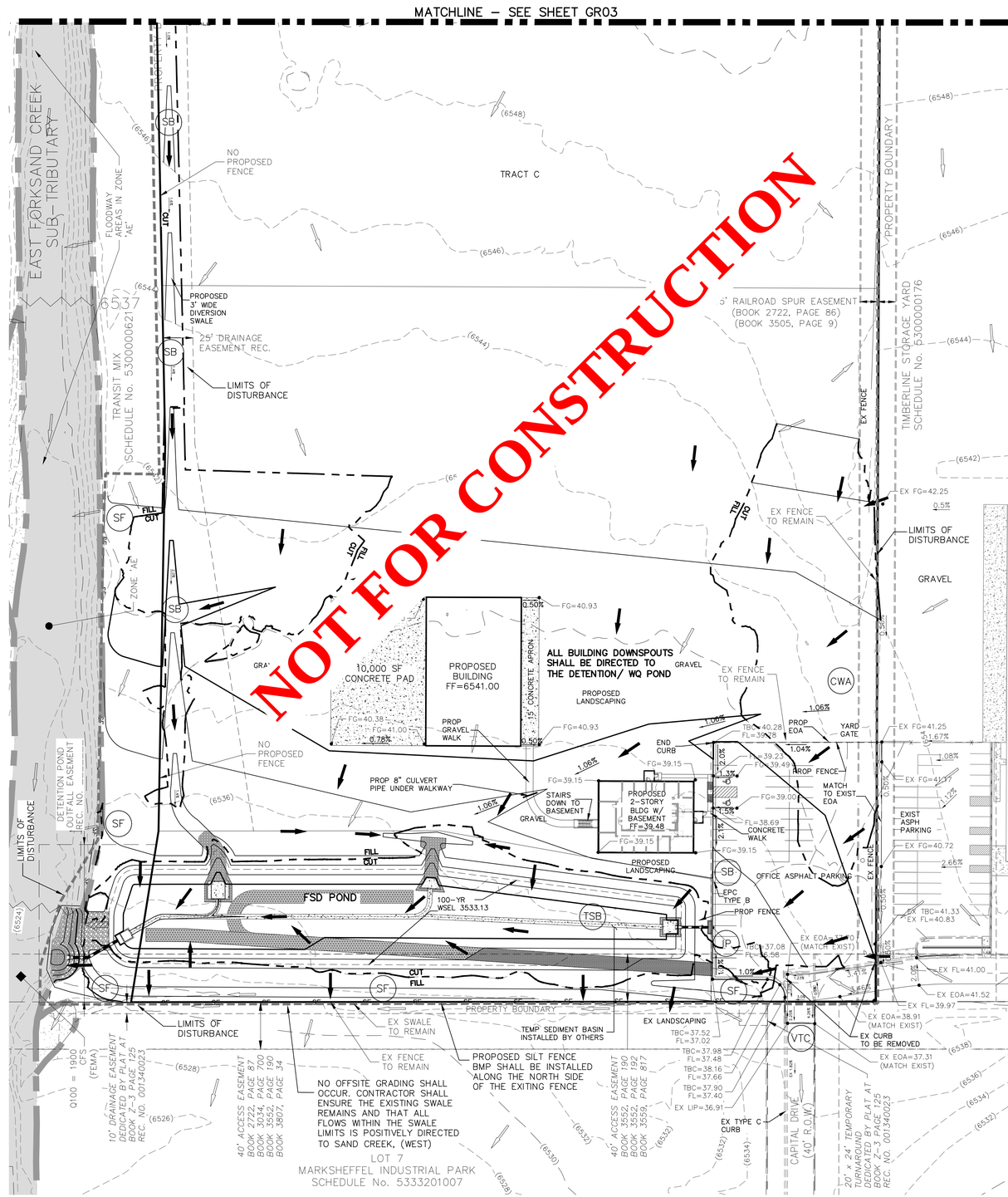
26. PRIOR TO CONSTRUCTION THE PERMITTEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.

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 SOILS REPORT FOR THIS SITE HAS BEEN PREPARED BY RMG ENGINEERS, DATED MAY 3RD, 2019 AND SHALL BE CONSIDERED 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



LEGEND

	EX MAJ CONT
	EX MIN CONT
	PROP MAJ CONT
	PROP MIN CONT
LP	LOW POINT
HP	HIGH POINT
EX	EXISTING
FL	FLOWLINE
TC	TOP OF CURB
FG	FINISH GRADE
FF	FINISH FLOOR
TOF	TOP OF FOOTING
	PROPOSED FLOW
	EXISTING FLOW
SF	SILT FENCE INITIAL, INTERIM, FINAL
VTC	VEHICLE TRACKING CONTROL INITIAL, INTERIM, FINAL
CWA	CONCRETE WASH-OUT BASIN INTERIM, FINAL
SB	STRAW BALE INITIAL, INTERIM, FINAL
IP	INLET PROTECTION INTERIM, FINAL
TSB	TEMP SEDIMENT POND INITIAL, INTERIM

ADDITIONAL NOTES:

STAGING, STORAGE AND STOCKPILE AREAS 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.

CONSTRUCTION NOTES:

NO WETLANDS ARE TO BE PERMANENTLY DISTURBED PER THIS GRADING PLAN.

NO CONCRETE OR ASPHALT BATCH PLANTS WILL BE USED ONSITE.

EL PASO COUNTY FILE NO. MS 20-002

DWIRE STORAGE YARD
GRADING AND EROSION CONTROL PLAN
PROJECT NO. 43-117
DATE: 01/25/2021
SHEET 2 OF 5
GR02
SCALE: HORIZONTAL: 1" = 40' VERTICAL: N/A
DESIGNED BY: DLM
DRAWN BY: JP
CHECKED BY: VAS

102 E. PIKE PEAKS AVE. SUITE 500
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485
M&S CIVIL CONSULTANTS, INC.
FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.
VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

REVISIONS:

NO.	DATE:	BY:	DESCRIPTION:	APPV'D. BY	DATE:

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 BY THE PREPARER OF THESE PLANS.

CAUTION

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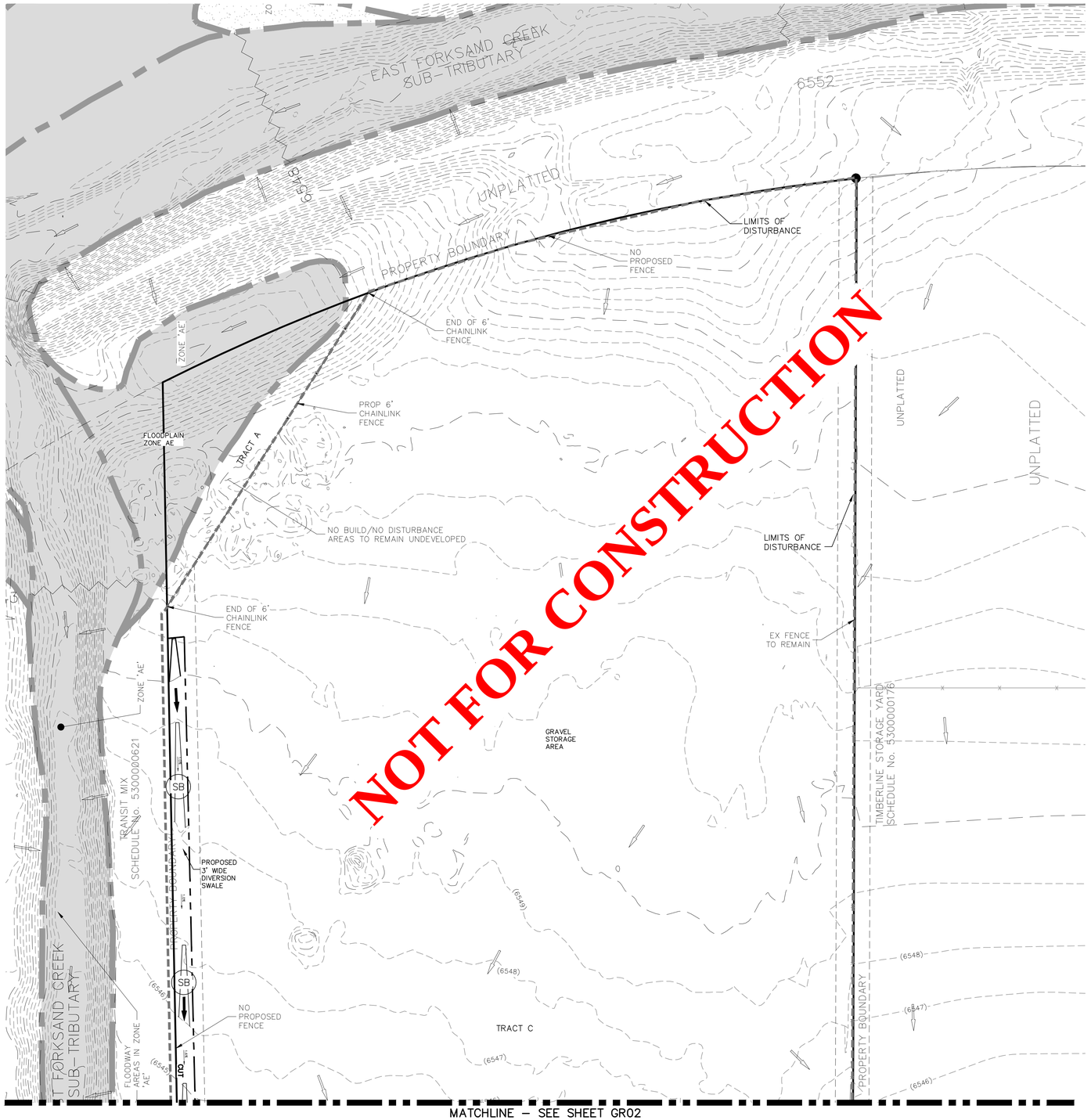
DWIRE STORAGE YARD

GRADING AND EROSION CONTROL PLAN

3520 CAPITAL DRIVE



MATCHLINE – SEE SHEET GR02

1" = 40'

0 20 40 80

Scale in Feet

LEGEND

	EX MAJ CONT
	EX MIN CONT
	PROP MAJ CONT
	PROP MIN CONT
LP	LOW POINT
HP	HIGH POINT
EX	EXISTING
FL	FLOWLINE
TC	TOP OF CURB
FG	FINISH GRADE
FF	FINISH FLOOR
TOF	TOP OF FOOTING
	PROPOSED FLOW
	EXISTING FLOW
SF — SF —	SILT FENCE INITIAL, INTERIM, FINAL
VTC	VEHICLE TRACKING CONTROL INITIAL, INTERIM, FINAL
CWA	CONCRETE WASH-OUT BASIN INTERIM, FINAL
SB	STRAW BALE INITIAL, INTERIM, FINAL
IP	INLET PROTECTION INTERIM, FINAL

EL PASO COUNTY FILE NO. MS 20-002

DWIRE STORAGE YARD

GRADING AND EROSION CONTROL PLAN

PROJECT NO. 43-117

DATE: 01/25/2021

SHEET 3 OF 5

GR03

SCALE: HORIZONTAL: 1" = 40' VERTICAL: N/A

DESIGNED BY: DLM
DRAWN BY: JP
CHECKED BY: VAS

102 E. PIKE PEAKS AVE. SUITE 500
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

M&S CIVIL CONSULTANTS, INC.

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

COLORADO REGISTERED PROFESSIONAL ENGINEER VIRGIL A. SANCHEZ 37160 1-26-21

REVISIONS:

NO.	DATE:	BY:	DESCRIPTION:	APPRV'D. BY:	DATE:

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 BY THE PREPARER OF THESE PLANS.

CAUTION

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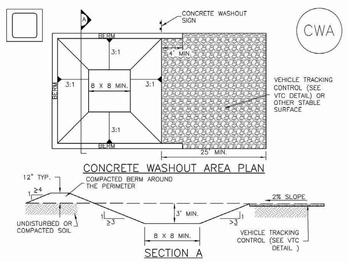
DWIRE STORAGE YARD

GRADING AND EROSION CONTROL PLAN

Concrete Washout Area (CWA) — MM-1

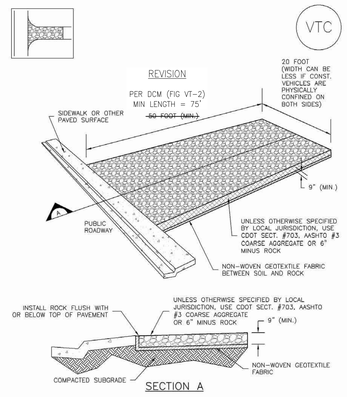


CWA–1. CONCRETE WASHOUT AREA

CWA INSTALLATION NOTES

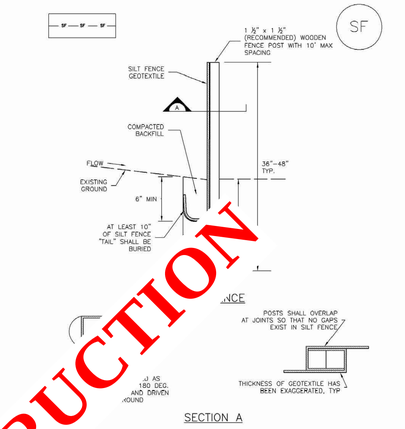
1. SEE PLAN VIEW FOR: –CWA INSTALLATION LOCATION.
2. DO NOT LOCATE AN UNLINED CWA WITHIN 400' OF ANY NATURAL DRAINAGE PATHWAY OR WATERBODY. DO NOT LOCATE WITHIN 1,000' OF ANY WELLS OR DRINKING WATER SOURCES. IF SITE CONSTRAINTS MAKE THIS INFEASIBLE, OR IF HIGHLY PERMEABLE SOILS EXIST ON SITE, THE CWA 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 ELSEWHERE 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.

Vehicle Tracking Control (VTC) — SM-4

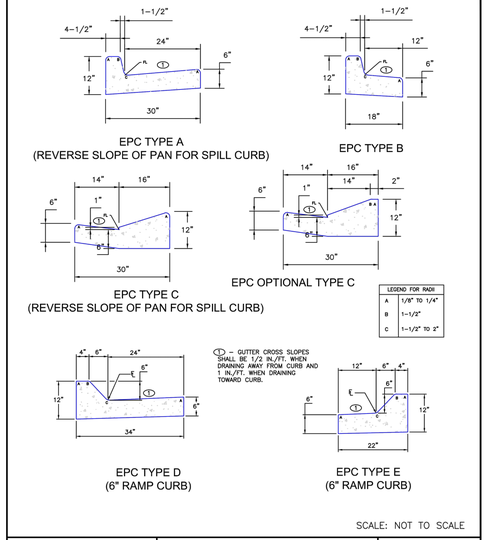


VTC–1. AGGREGATE VEHICLE TRACKING CONTROL

Silt Fence (SF) — SC-1



SF–1. SILT FENCE



8/11/11 DATE APPROVED: André P. Brackin DEPARTMENT OF TRANSPORTATION	Typical Curb and Gutter Details Standard Drawing	EL PASO COUNTY DEPARTMENT OF TRANSPORTATION
	REVISION DATE: 12/8/15	FILE NAME: SD_2–20

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

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

Common[a] Name	Botanical Name	Growth Season[b]	Growth Form	Seeds/ Pound	Pounds of PLS/acre
Alakali Soil Seed Mix					
Alkali sacaton	*Sporobolus airoides*	Cool	Bunch	1,750,000	0.25
Basin wildrye	*Elymus cinereus*	Cool	Bunch	165,000	2.5
Sodar streambank wheatgrass	*Agropyron rigaratum 'Sodar'*	Cool	Sod	170,000	2.5
Jose tall wheatgrass	*Agropyron elongatum 'Jose'*	Cool	Bunch	79,000	7.0
Arriba western wheatgrass	*Agropyron smithii 'Arriba'*	Cool	Sod	110,000	5.5
Total					**17.75**
Fertile Loamy Soil Seed Mix					
Ephriam crested wheatgrass	*Agropyron cristatum 'Ephriam'*	Cool	Sod	175,000	2.0
Dural hard fescue	*Festuca ovina 'durtuscula'*	Cool	Bunch	565,000	1.0
Lincoln smooth brome	*Bromus inermis leyss 'Lincoln'*	Cool	Sod	130,000	3.0
Sodar streambank wheatgrass	*Agropyron rigaratum 'Sodar'*	Cool	Sod	170,000	2.5
Arriba western wheatgrass	*Agropyron smithii 'Arriba'*	Cool	Sod	110,000	7.0
Total					**15.5**
High Water Table Soil Seed Mix					
Meadow foxtail	*Alopecurus pratensis*	Cool	Sod	900,000	0.5
Redtop	*Agrostis alba*	Warm	Open sod	5,000,000	0.25
Reed canarygrass	*Phalaris arundinacea*	Cool	Sod	68,000	0.5
Lincoln smooth brome	*Bromus inermis leyss 'Lincoln'*	Cool	Sod	130,000	3.0
Pathfinder switchgrass	*Panicum virgatum 'Pathfinder'*	Warm	Sod	389,000	1.0
Alkar tall wheatgrass	*Agropyron elongatum 'Alkar'*	Cool	Bunch	79,000	5.5
Total					**10.75**
Transition Turf Seed Mix[c]					
Ruebens Canadian bluegrass	*Poa compressa 'Ruebens'*	Cool	Sod	2,500,000	0.5
Dural hard fescue	*Festuca ovina 'durtuscula'*	Cool	Bunch	565,000	1.0
Citation perennial ryegrass	*Lolium perenne 'Citation'*	Cool	Sod	247,000	3.0
Lincoln smooth brome	*Bromus inermis leyss 'Lincoln'*	Cool	Sod	130,000	3.0
Total					**7.5**

Temporary and Permanent Seeding (TS/PS) — F

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

Common Name	Botanical Name	Growth Season[b]	Growth Form		
Sandy Soil Seed Mix					
Blue grama	*Bouteloua gracilis*	Warm	Sod [illegible]		0.5
Camper little bluestem	*Schizachyrium scoparium 'Camper'*	Warm			1.0
Prairie sandreed	*Calamovilfa longifolia*	W[illegible]			1.0
Sand dropseed	*Sporobolus cryptandrus*			,000	0.25
Vaughn sideoats grama	*Bouteloua curtipendula 'Vaughn'*			191,000	2.0
Arriba western wheatgrass	*Agropyron smithii 'A[illegible]'*			110,000	5.5
Total					**10.25**
Heavy Clay, Rocky Foothill Seed Mix					
Ephriam crested wheatgrass[f]	*Agropyr 'Ephr'*		Sod	175,000	1.5
Oahe Intermediate wheatgrass	*A[illegible] 'O[illegible]'*	[illegible]el	Sod	115,000	5.5
Vaughn sideoats grama[f]	*Bouto[illegible] 'Vaughn'*	Warm	Sod	191,000	2.0
Lincoln smooth brome	*Bromus inerm[illegible] 'Lincoln'*	Cool	Sod	130,000	3.0
Arriba western wheatgrass	*Agropyron smithii 'Arriba'*	Cool	Sod	110,000	5.5
Total					**17.5**

[a] All of the above seeding mixes and rates are based on drill seeding followed by crimped straw mulch. These rates should be 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.

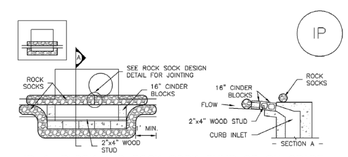
[b] See Table TS/PS-3 for seeding dates.

[c] 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.

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

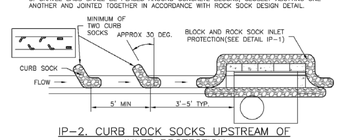
SC-6 Inlet Protection (IP)



IP–1. BLOCK AND ROCK SOCK SUMP OR ON GRADE INLET PROTECTION

BLOCK AND CURB SOCK INLET PROTECTION INSTALLATION NOTES

1. SEE ROCK SOCK DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.
2. CONCRETE "CINDER" BLOCKS SHALL BE LAID ON THEIR SIDES AROUND THE INLET IN A SINGLE ROW, ABUTTING ONE ANOTHER WITH THE OPEN END FACING AWAY FROM THE CURB.
3. GRAVEL BAGS SHALL BE PLACED AROUND CONCRETE BLOCKS, CLOSELY ABUTTING ONE ANOTHER AND JOINTED TOGETHER IN ACCORDANCE WITH ROCK SOCK DESIGN DETAIL.

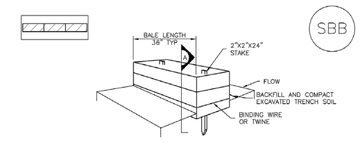


IP–2. CURB ROCK SOCKS UPSTREAM OF INLET PROTECTION

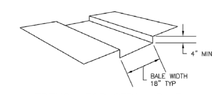
CURB ROCK SOCK INLET PROTECTION INSTALLATION NOTES

1. SEE ROCK SOCK DESIGN DETAIL INSTALLATION REQUIREMENTS.
2. PLACEMENT OF THE SOCK SHALL BE APPROXIMATELY 30 DEGREES FROM PERPENDICULAR IN THE OPPOSITE DIRECTION OF FLOW.
3. SOCKS ARE TO BE FLUSH WITH THE CURB AND SPACED A MINIMUM OF 5 FEET APART.
4. AT LEAST TWO CURB SOCKS IN SERIES ARE REQUIRED UPSTREAM OF ON–GRADE INLETS.

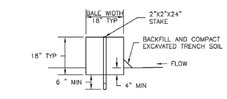
SC-3 Straw Bale Barrier (SBB)



STRAW BALE



TRENCH FOR STRAW BALE



SECTION A

SBB–1. STRAW BALE

EL PASO COUNTY FILE NO. MS 20–002

DWIRE STORAGE YARD
GRADING AND EROSION CONTROL DETAILS
PROJECT NO. 43–117 | DATE: 01/25/2021 | SHEET 4 OF 5 | GR04
DESIGNED BY: DLM | DRAWN BY: JP | CHECKED BY: VAS | SCALE: HORIZONTAL: N/A VERTICAL: N/A

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COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485
M&S CIVIL CONSULTANTS, INC.

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.
VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160
COLORADO REGISTERED PROFESSIONAL ENGINEER VIRGIL A. SANCHEZ 37160 1-26-21

REVISIONS: NO. | DATE: | BY: | DESCRIPTION: | APPV'D. BY: | DATE:

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DWIRE STORAGE YARD

GRADING AND EROSION CONTROL PLAN

Description

A sediment basin is a temporary pond built on a construction site to capture eroded or disturbed soil transported in storm runoff prior to discharge from the site. Sediment basins are designed to capture site runoff and slowly release it to allow time for settling of sediment prior to discharge. Sediment basins are often constructed in locations that will later be modified to serve as post-construction stormwater basins.

Photograph SB-1. Sediment basin at the toe of a slope. Photo courtesy of WWE.

Appropriate Uses

Most large construction sites (typically greater than 2 acres) will require one or more sediment basins for effective management of construction site runoff. On linear construction projects, sediment basins may be impractical; instead, sediment traps or other combinations of BMPs may be more appropriate.

Sediment basins should not be used as stand-alone sediment controls. Erosion and other sediment controls should also be implemented upstream.

When feasible, the sediment basin should be installed in the same location where a permanent post-construction detention pond will be located.

Design and Installation

The design procedure for a sediment basin includes these steps:

- **Basin Storage Volume**: Provide a storage volume of at least 3,600 cubic feet per acre of drainage area. To the extent practical, undisturbed and/or off-site areas should be diverted around sediment basins to prevent "clean" runoff from mixing with runoff from disturbed areas. For undisturbed areas (both on-site and off-site) that cannot be diverted around the sediment basin, provide a minimum of 500 ft^3/acre of storage for undeveloped (but stable) off-site areas in addition to the 3,600 ft^3/acre for disturbed areas. For stable, developed areas that cannot be diverted around the sediment basin, storage volume requirements are summarized in Table SB-1.
- **Basin Geometry:** Design basin with a minimum length-to-width ratio of 2:1 (L:W). If this cannot be achieved because of site space constraints, baffling may be required to extend the effective distance between the inflow point(s) and the outlet to minimize short-circuiting.
- **Dam Embankment**: It is recommended that embankment slopes be 4:1 (H:V) or flatter and no steeper than 3:1 (H:V) in any location.

Sediment Basins	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No

- **Inflow Structure**: For concentrated flow entering the basin, provide energy dissipation at the point of inflow.

Table SB-1. Additional Volume Requirements for Undisturbed and Developed Tributary Areas Draining through Sediment Basins

Imperviousness (%)	Additional Storage Volume (ft^3) Per Acre of Tributary Area
Undeveloped	500
10	800
20	1230
30	1600
40	2030
50	2470
60	2980
70	3560
80	4360
90	5300
100	6460

- **Outlet Works**: The outlet pipe shall extend through the embankment at a minimum slope of 0.5 percent. Outlet works can be designed using one of the following approaches:
  - **Riser Pipe (Simplified Detail):** Detail SB-1 provides a simplified design for basins treating no more than 15 acres.
  - **Orifice Plate or Riser Pipe**: Follow the design criteria for Full Spectrum Detention outlets EDB Fact Sheet provided in Chapter 4 of this manual for sizing of outlet perforations wit emptying time of approximately 72 hours. In lieu of the trash rack, pack uniformly siz 2-inch gravel in front of the plate or surrounding the riser pipe. This gravel will nee cleaned out frequently during the construction period as sediment accumulates w gravel pack will need to be removed and disposed of following construction t for use as a permanent detention facility. If the basin will be used as a perr detention basin for the site, a trash rack will need to be installed once co have been stabilized and the gravel pack and accumulated sediment b
  - **Floating Skimmer**: If a floating skimmer is used, install it usir recommendations. Illustration SB-1 provides an illustration ng Outlet™, one of the more commonly used floating skimm be designed to release the design volume in no less than 4 skimmer outlet can increase the sediment capture efficiency o ating outlet continually decants cleanest water off the surface ner water than would discharge from a perforated riser pipe o

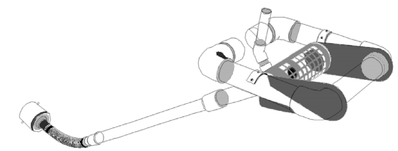

Illustration SB-1. Outlet structure for a temporary sediment basin - Faircloth Skimmer Floating Outlet. Illustration courtesy of J. W. Faircloth & Sons, Inc., FairclothSkimmer.com.

- **Outlet Protection and Spillway:** Consider all flow paths for runoff leaving the basin, including protection at the typical point of discharge as well as overtopping.
  - **Outlet Protection:** Outlet protection should be provided where the velocity of flow will exceed the maximum permissible velocity of the material of the waterway into which discharge occurs. This may require the use of a riprap apron at the outlet location and/or other measures to keep the waterway from eroding.
  - **Emergency Spillway:** Provide a stabilized emergency overflow spillway for rainstorms that exceed the capacity of the sediment basin volume and its outlet. Protect basin embankments from erosion and overtopping. If the sediment basin will be converted to a permanent detention basin, design and construct the emergency spillway(s) as required for the permanent facility. If the sediment basin will not become a permanent detention basin, it may be possible to substitute a heavy polyvinyl membrane or properly bedded rock cover to line the spillway and downstream embankment, depending on the height, slope, and width of the embankments.

Maintenance and Removal

Maintenance activities include the following:

- Dredge sediment from the basin, as needed to maintain BMP effectiveness, typically when the design storage volume is no more than one-third filled with sediment.
- Inspect the sediment basin embankments for stability and seepage.
- Inspect the inlet and outlet of the basin, repair damage, and remove debris. Remove, clean and replace the gravel around the outlet on a regular basis to remove the accumulated sediment within it and keep the outlet functioning.
- Be aware that removal of a sediment basin may require dewatering and associated permit requirements.
- Do not remove a sediment basin until the upstream area has been stabilized with vegetation.

Final disposition of the sediment basin depends on whether the basin will be converted to a perm post-construction stormwater basin or whether the basin area will be returned to grade. For b converted to permanent detention basins, remove accumulated sediment and reconfigure the ba outlet to meet the requirements of the final design for the detention facility. If the sediment basin be used as a permanent detention facility, fill the excavated area with soil and stabilize with vegetati

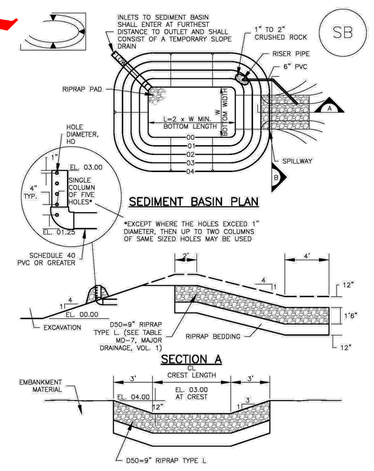

TABLE SB-1. SIZING INFORMATION FOR STANDARD SEDIMENT BASIN			
Upstream Drainage Area (rounded to nearest acre), (ac)	Basin Bottom Width (W), (ft)	Spillway Crest Length (CL), (ft)	Hole Diameter (HD), (in)
1	12 ½	3	9/32
2	21	3	11/64
3	28	5	½
4	33 ½	6	9/16
5	38 ½	8	17/32
6	43	9	19/32
7	47 ¼	11	25/32
8	51	12	27/32
9	55	13	⅞
10	58 ¼	15	15/16
11	61	16	29/32
12	64	18	1
13	67 ½	19	1 1/64
14	70 ½	21	1 ⅛
15	73 ¼	22	1 3/16

SEDIMENT BASIN INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION OF SEDIMENT BASIN.
   - TYPE OF BASIN (STANDARD BASIN OR NONSTANDARD BASIN).
   - FOR STANDARD BASIN, BOTTOM WIDTH W, CREST LENGTH CL, AND HOLE DIAMETER, HD.
   - FOR NONSTANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT H, NUMBER OF COLUMNS N, HOLE DIAMETER HD AND PIPE DIAMETER D.
2. FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.
3. SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO ANY OTHER LAND-DISTURBING ACTIVITY THAT RELIES ON ON BASINS AS AS A STORMWATER CONTROL.
4. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.
5. EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.
6. PIPE SCH 40 OR GREATER SHALL BE USED.
7. THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES.

EL PASO COUNTY FILE NO. MS 20-002

DWIRE STORAGE YARD
GRADING AND EROSION CONTROL DETAILS
PROJECT NO. 43-117
DESIGNED BY: DLM
DRAWN BY: JP
CHECKED BY: VAS
SCALE: HORIZONTAL: N/A VERTICAL: N/A
DATE: 01/25/2021
SHEET 5 OF 5
GR05

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M&S CIVIL CONSULTANTS, INC.
FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.
JIROIL A. SANCHEZ, COLORADO P.E. NO. 37160
COLORADO REGISTERED PROFESSIONAL ENGINEER JIROIL A. SANCHEZ 37160 1-26-21

REVISIONS:

NO:	DATE:	BY:	DESCRIPTION:	APPR'D BY:	DATE:

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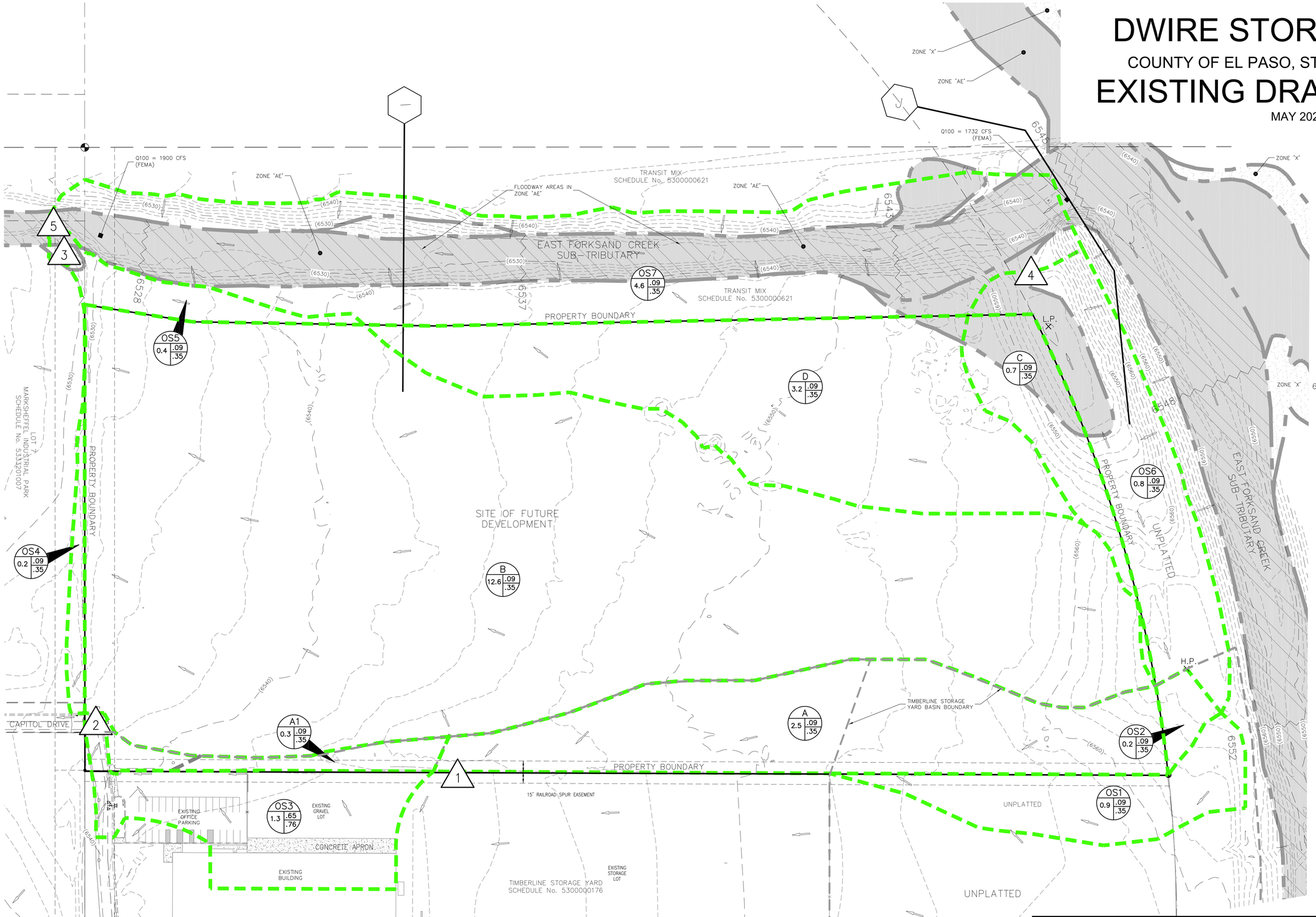
EXISTING AND PROPOSED DRAINAGE MAPS

DWIRE STORAGE YARD

COUNTY OF EL PASO, STATE OF COLORADO

EXISTING DRAINAGE MAP

MAY 2020



LEGEND

BASIN DESIGNATION — Z; 25 (ACRES); .25 / .35; C5 / C100

- 6 — SURFACE DESIGN POINT (DP)
- BASIN BOUNDARY
- TIMBERLINE STORAGE YARD BASIN BOUNDARY
- (6920) EXISTING INDEX CONTOUR (10')
- EXISTING NOMINAL CONTOUR (2')
- 6920 FEMA BASE FLOOD EL. (NGVD29)
- DWIRE STORAGE YARD SITE BOUNDARY
- EXISTING FLOW DIRECTION ARROW
- H.P. HIGH POINT
- L.P. LOW POINT
- FEMA CROSS SECTION ID

BASIN SUMMARY

BASIN	AREA (ACRES)	Q_5	Q_{100}
OS1	0.90	0.2	1.6
OS2	0.15	0.0	0.3
OS3	1.26	3.4	6.8
OS4	0.16	0.0	0.3
OS5	0.36	0.1	0.6
OS6	0.78	0.2	1.3
OS7	4.55	0.9	6.0
A	2.47	0.6	3.6
A1	0.30	0.1	0.7
B	12.64	2.5	16.6
C	0.66	0.2	1.5
D	3.19	0.7	4.3

DESIGN POINT SUMMARY

DESIGN POINT	Q_5	Q_{100}	BASIN & DES. PTS
1	0.8	5.1	OS1,OS2,A
2	3.6	7.5	A1,OS3
3	2.6	17.2	OS4,OS5,B
4	0.4	2.4	OS6,C
5	4.5	29.3	DP3,DP4,OS7,D

1" = 60'

0 30 60 120

Scale in Feet

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

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

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

DWIRE STORAGE YARD

EXISTING DRAINAGE MAP

PROJECT NO. 43-117	SCALE: HORIZONTAL: 1"=60' VERTICAL: N/A	DATE: 05/21/2020	
DESIGNED BY: DLM DRAWN BY: DLM CHECKED BY: VAS		SHEET 1 OF 1	EDM

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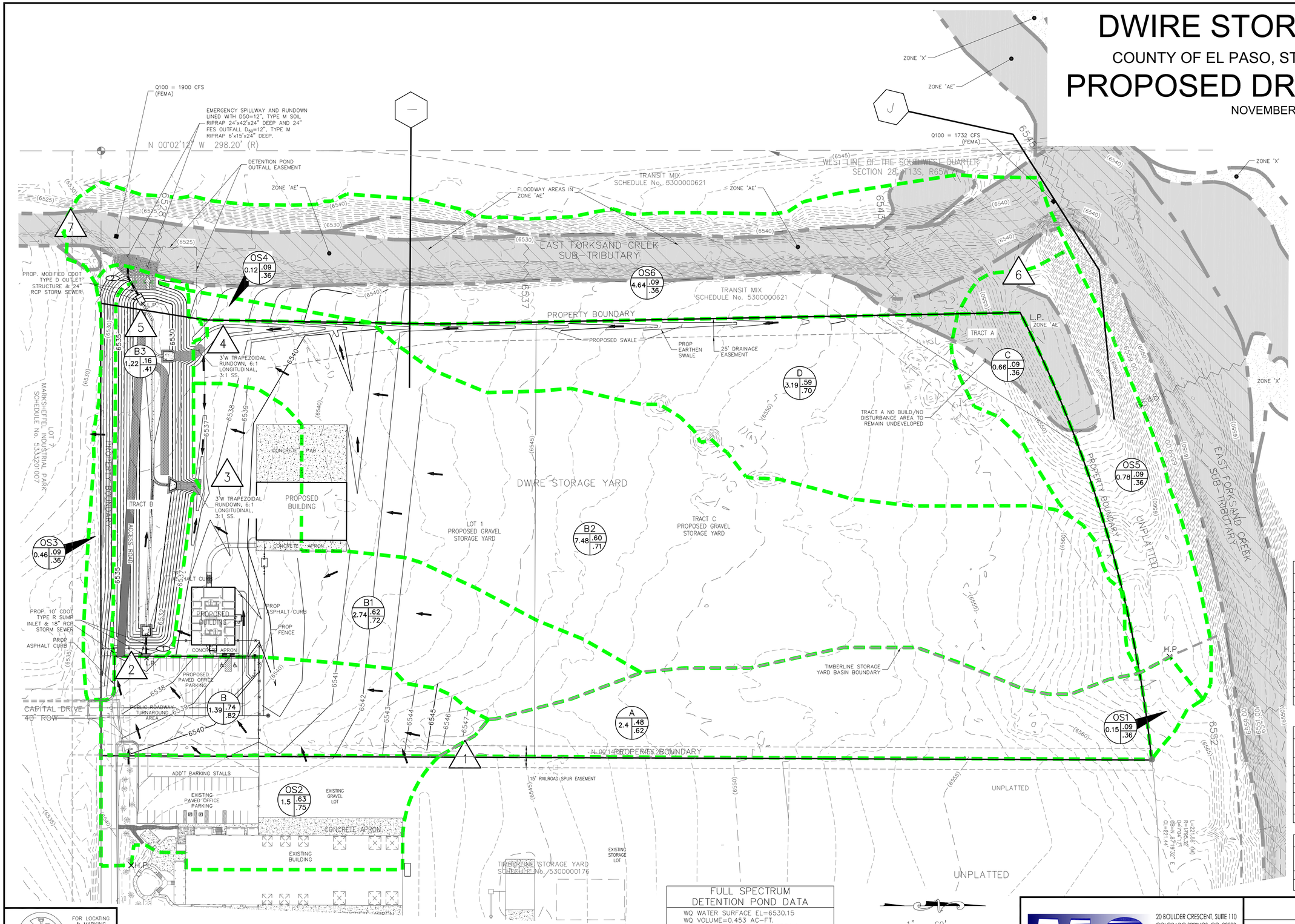
DWIRE STORAGE YARD

COUNTY OF EL PASO, STATE OF COLORADO

PROPOSED DRAINAGE MAP

NOVEMBER 2020



LEGEND

BASIN DESIGNATION — Z; ACRES — 25; C5 — .25; C100 — .35

- 4 — PIPE RUN REFERENCE LABEL
- 6 — SURFACE DESIGN POINT (DP)
- PROPOSED BASIN BOUNDARY
- TIMBERLINE STORAGE YARD BASIN BOUNDARY
- (6920) — EXISTING CONTOUR
- 6920 — PROPOSED CONTOUR
- PROPOSED FENCE
- PROPOSED STORM SEWER PIPE
- DWIRE STORAGE YARD SITE BOUNDARY
- 6920 — FEMA BASE FLOOD EL. (NGVD29)
- FLARED END SECTION
- INLET/OUTLET STRUCTURE
- PROPOSED RIPRAP
- PERMANENT EROSION CONTROL BLANKET
- EXISTING FLOW DIRECTION ARROW
- PROPOSED FLOW DIRECTION
- EMERGENCY SPILLWAY OVERFLOW DIRECTION
- H.P. — HIGH POINT
- L.P. — LOW POINT
- FEMA CROSS SECTION ID

BASIN SUMMARY

BASIN	AREA (ACRES)	Q_5	Q_{100}
OS1	0.15	0.1	0.4
OS2	1.50	4.9	9.8
OS3	0.46	0.2	1.1
OS4	0.12	0.0	0.3
OS5	0.78	0.3	1.7
OS6	4.64	1.4	9.3
A	2.44	4.1	9.0
B	1.39	4.5	8.4
B1	2.74	6.1	12.1
B2	7.48	14.3	28.4
B3	1.22	0.8	3.6
C	0.66	0.3	1.7
D	3.19	6.5	13.0

DESIGN POINT SUMMARY

DESIGN POINT	Q_5	Q_{100}	BASIN & DES. PTS
1	4.1	9.3	OS1, A
2	8.6	16.7	OS2, B
3	6.1	12.1	B1
4	20.4	40.5	B2, D
5	32.8	66.3	DP2, DP3, DP4, OS4, B3
6	0.5	3.2	OS5, C
7	2.3	29.7	DP6, OS6, PR2

PIPE RUN SUMMARY

PIPE RUN	Q_5	Q_{100}	CONTRIBUTING DES. PTS, STRUCTURES
1	8.6	16.7	DP2
2	0.5	17.5	FSD OUTLET STRUCTURE

FULL SPECTRUM DETENTION POND DATA

WQ WATER SURFACE EL=6530.15
WQ VOLUME=0.453 AC-FT.
EURV WATER SURFACE EL=6532.01
EURV VOLUME=1.519 AC-FT
100-YR WATER SURFACE EL=6533.15
SPILLWAY CREST EL=6533.15
TOP OF EMBANKMENT EL=6535.00
100-YR VOLUME=2.352 AC-FT
100-YR INFLOW=60.4 CFS
100-YR RELEASE=17.5 CFS

1" = 60'

0 30 60 120
Scale in Feet

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

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

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

DWIRE STORAGE YARD
PROPOSED DRAINAGE MAP

PROJECT NO. 43-117	SCALE: HORIZONTAL: 1"=60' VERTICAL: N/A	DATE: 11/16/2020	
DESIGNED BY: DLM DRAWN BY: DLM CHECKED BY: VAS		SHEET 1 OF 1	PDM

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