FINAL DRAINAGE REPORT FOR
LOT 1 POWERS POINTE FILING NO 1
5835 OMAHA BOULEVARD
COLORADO SPRINGS, COLORADO

MAY 2019

Prepared For:

A STORAGE PLACE - COLORADO SPRINGS LLC
5835 OMAHA BOULEVARD
COLORADO SPRINGS, CO 80915
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Prepared By:

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Job No. 1745.00

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COLORADO SPRINGS, COLORADO

TABLE OF CONTENTS

REQUIRED MAPS AND DRAWINGS

CERTIFICATION STATEMENT:

Engineers Statement

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

_____

L Ducett, P.E. 32339 Seal

Developers Statements

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

A STORAGE PLACE - COLORADO SPRINGS LLC
Business Name

By:_____
Title:_____
Address:_____
_____

El Paso County Approval:

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

_____ _____

Jennifer Ervine, P.E. Date
County Engineer / ECM Administrator

Conditions:

FINAL DRAINAGE REPORT FOR
LOT 1 POWERS POINTE FILING NO 1
5835 OMAHA BOULEVARD
COLORADO SPRINGS, COLORADO

PURPOSE

The purpose of this Final Drainage Report is to compare the existing drainage patterns and runoff quantities with those resulting from the proposed improvements to the A Storage Place property and to determine the impact of the site development on downstream and adjacent properties. A previously approved Drainage Report was not available at the time this report was compiled.

GENERAL DESCRIPTION

This Final Drainage Report is an analysis of approximately 5.15 acres for the site located at 5835 Omaha Boulevard, previously platted as Lot 1 Powers Pointe Filing No 1. The property is currently used as a residential and commercial self-storage facility and the proposed improvements are in conformance with its existing use.

The property is located in the northwest quarter of Section 7, Township 14 South, Range 65 West of the 6th Principal Meridian in the El Paso County, Colorado, near the intersection of Omaha and N Powers Boulevards. More specifically, the site is bounded on the north by Omaha Boulevard, on the south by vacant unplatted land, to the east by All Foster Lumber Sub and Lots 4-5 Blk 2 O K Sub, to the west by Lots 1-2 Powers Pointe Filing No 2, Powers Pointe Filing No 3, Lot 1 Powers Pointe Filing No 4, and Lots 1-3 Powers Pointe Filing No 5.

The site lies within the Sand Creek Drainage Basin and is subject to the Sand Creek DBPS. For the reach of Sand Creek to which this site contributes, no regional detention facilities were proposed since the substantially developed nature of the area did not provide any suitable locations.

The soil consists exclusively of Blendon Sandy Loam (10), designated as belonging to Hydrologic Soil Group B. The study area is primarily metal buildings with asphalt and concrete lot areas. The existing topography has a consistent 2% slope from the north to the south.

HISTORIC DRAINAGE CONDITIONS

This site was previously analyzed in the *Preliminary/Final Drainage Report for Powers Pointe, Filing No. 1, Nolte and Associates (1996).*

The 5.15 acre site is 1191 feet long by 189 feet wide with the long axis oriented north-south. The northern three-quarters of the site has three rows of storage buildings with concrete driving lanes on all sides. On the southern quarter sits a single row of storage buildings with asphalt lots on either side for the outdoor storage of vehicles. The property is accessed from the north via Omaha

Boulevard. Ainsworth Street, which runs along the north and west side of the property has curb and gutter which prevents offsite runoff from entering the site from those directions, while on the east side the grading is such that the property line forms the drainage boundary on that side; therefore, no offsite runoff affects this property. However, a portion of the commercial properties west of Ainsworth Street is analyzed as part of the proposed drainage system for appropriately sizing the proposed storm sewer for future development (see Developed Drainage Conditions).

The runoff generated onsite is directed southward between the rows of storage buildings via swales and flows onto the undeveloped area at the south end of the property, making its way eastward into the public drainage way along Powers Boulevard and eventually into Sand Creek. The property is composed of two drainage basins.

Basin EX-A contributes to Design Point X-1 and has an area of 2.40 acres consisting of roofs, asphalt pavement and gravel, generating runoff amounts of Q5= 8.7 cfs and Q100= 16.4 cfs.

Basin EX-B contributes to Design Point X-2 and has an area of 2.75 acres consisting of roofs, asphalt pavement and gravel, generating runoff amounts of Q5= 9.0 cfs and Q100= 17.2 cfs.

The *Preliminary/Final Drainage Report for Powers Pointe, Filing No. 1, Nolte and Associates (1996)* indicates that flow from Basin OS-1 was intended to be conveyed from the south end of Ainsworth Street westward to the public drainage way along Powers Boulevard via a curb and gutter channel. Field observations indicate that the curb and gutter channel was never constructed, thus the runoff from Basin OS-1 flows onto the undeveloped property at the south end of Ainsworth Street.

Basin OS-1 contributes to Design Point X-3 and has an area of 1.90 acres consisting of asphalt pavement and commercial areas, generating runoff amounts of Q5= 6.9 cfs and Q100= 13.0 cfs.

DEVELOPED DRAINAGE CONDITIONS

The proposed changes include the construction of two additional storage buildings on the asphalt lots at the southern end of the site along with the replacement of some of the existing adjacent asphalt and gravel with concrete. The combined area of disturbance is 0.96 acre. The imperviousness of the site remains essentially the same, with a slight increase due to less gravel area and greater roof/pavement area.

The drainage patterns for the eastern half of the site (Basins PR-B and PR-C) will remain unchanged and runoff will continue to flow onto the undeveloped area at the south end of the property. The runoff from western half of the site (PR-A and PR-D) will be collected and conveyed westward via a proposed storm sewer to the public drainage way along Powers Boulevard.

Basin PR-A contributes to Design Point 1 and has an area of 2.20 acres consisting of roof/pavement and gravel, generating runoff amounts of Q5= 8.4 cfs and Q100= 15.8 cfs.

Basin PR-B contributes to Design Point 2 and has an area of 1.61 acres consisting of roof/pavement and gravel, generating runoff amounts of Q5= 6.1 cfs and Q100= 11.3 cfs.

Basin PR-C contributes to Design Point 3 and has an area of 1.14 acres consisting of roof/pavement and gravel, generating runoff amounts of Q5= 4.1 cfs and Q100= 7.7 cfs.

Basin PR-D contributes to Design Point 5 and has an area of 0.2 acres consisting of roof/pavement, generating runoff amounts of Q5= 0.9 cfs and Q100= 1.7 cfs.

Basin OS-1 contributes to Design Point 6 and has an area of 1.90 acres consisting of asphalt pavement and commercial areas, generating runoff amounts of Q5= 6.9 cfs and Q100= 13.0 cfs.

A Pipe Run Summary Table is included in the Appendices. The inlets are in sump condition and each is designed to intercept 100% of the flow coming to it. Should the sump inlets become blocked or otherwise overflow, the bypass flow drains to south and away from the buildings. All pipe runs and inlets for this project are private unless otherwise noted.

Pipe Run 1 is a proposed 24" RCP, 106.2 ft long at 0.7% slope, carrying Q5= 8.4 cfs and Q100= 15.8 cfs from the proposed Inlet Type C-Triple Grate Close Mesh at Design Point 1 to the proposed Manhole Type 1 at Design Point 4. Pipe Run 1 includes inlet flow from Design Point 1.

Pipe Run 2 is a proposed 24" RCP, 27.2 ft long at 0.7% slope, carrying Q5= 8.4 cfs and Q100= 15.8 cfs from the proposed Manhole Type 1 at Design Point 4 to the proposed Inlet Type C-Single Grate Close Mesh at Design Point 5. Pipe Run 2 includes upstream flow from Pipe Run 1.

Pipe Run 3 is a proposed 30" RCP, 225.0 ft long at 0.5% slope, carrying Q5= 16.0 cfs and Q100= 30.2 cfs from the proposed Inlet Type C-Single Grate Close Mesh at Design Point 5 to the proposed 30" Flared End Section outfall. Pipe Run 3 includes upstream flow from Pipe Run 2 and inlet flow from Design Point 5. However, Pipe Run 3 is sized for the flows at Design Point 6, which include Basins A, D, and OS-1, to allow for the future inclusion of that portion Ainsworth Street and adjoining property into the storm sewer system via a curb inlet.

HGL calculations were performed for the 5-yr and 100-yr storms. Storm Sewer 1, upstream to downstream, is a main trunk of Pipe Runs 1, 2, and 3 discharging into the public drainage way along Powers Boulevard. The flows developed for the Pipe Runs using the Rational Method were entered into UDSewer using the Known Flows option. The tailwater elevations (Tw) for Storm Sewer 1 correspond to the normal depth in the outfall channel for the design storms, yielding Tw(5)= 6268.44 and Tw(100)= 6268.84 .

The proposed outfall ditch will be a 2 ft flat bottomed channel at 0.5% slope with 4:1 side slopes. The ditch will carry a discharge of Q5= 16.0 cfs and Q100= 30.2 cfs having corresponding flow depths of D5= 1.5 ft and D100= 1.97 ft. The ditch will be lined with Type L riprap to a depth of 2.5 ft at a thickness of $2D_{50}$ and should extend from the back of the Flared End Section to its confluence with the Powers Blvd. drainage way. The total volume of riprap Type L is 101 cu yd.

Please see detailed Hydrologic and Hydraulic calculations in the appendix.

HYDROLOGIC AND HYDRAULIC CALCULATIONS

Hydrologic and Hydraulic calculations were performed using the El Paso County Storm Drainage Design Criteria Manual Volumes 1 & 2 latest editions. The Rational Method was used to estimate storm water runoff. UDSewer 2009 was used for the HGL calculations.

FLOODPLAIN STATEMENT

No portion of this site is within a designated F.E.M.A. floodplain, as determined by Flood Insurance Rate Maps Nos. 08041C0751 G & 08041C0752 G dated December 7, 2018.

WATER QUALITY AND DETENTION

This site is not part of a larger common plan of development and the combined area of ground disturbance associated with these improvements is less than an acre; therefore, water quality and detention are not required.

The proposed flows on the eastern portion of the site will follow historic drainage patterns and the runoff is not increasing for the proposed conditions; therefore, the proposed conditions will not impact the downstream properties. The proposed flows on the western portion of the site will be conveyed via storm sewer directly to the public drainage way along Powers Boulevard, reducing the runoff impact on downstream properties as compared to existing conditions.

EROSION CONTROL

An erosion control plan has been submitted along with this report.

CONSTRUCTION COST OPINION

Public Non Reimbursable
NOT APPLICABLE

Private Non Reimbursable

Item	Quantity	Unit	Unit Price	Cost
24" Pipe	133	L.F.	$55	$7315
30" Pipe	225	L.F.	$65	$14,625
Inlet Type C 1 Grate Close Mesh	1	Each	$4000	$4000
Inlet Type C 3 Grates Close Mesh	1	Each	$12,000	$12,000
Manhole Type 1	1	Each	$6000	$6000
30" Concrete Flared End Section	1	Each	$1386	$1386
Riprap (Type L)	101	Cu Yd	$200	$20,200
			Subtotal	$65,526
Engineering Contingency	10%	Lump Sum		$6553
			Total	$72,079

DRAINAGE FEES

This site is not being platted. Drainage or bridge fees do not apply.

MAINTENANCE

The proposed erosion control measures will be repaired and maintained by the property owner or owner's representative as required.

SUMMARY

Runoff from the A Storage Place development will not adversely affect the surrounding and downstream properties. The proposed flows, as detailed in this report, are not increased over historic flows and will follow the drainage patterns for the historic conditions and/or be safely routed downstream. Therefore, detention measures are not required for this project. Water quality measures are not required as the proposed improvements will disturb less than 1 acre and the site is not part of a larger common plan of development. No storm drainage modifications are necessary as a result of the A Storage Place development.

PREPARED BY:
TERRA NOVA ENGINEERING, INC.

L Ducett P.E.
President
Terra Nova Engineering, Inc.

BIBLIOGRAPHY

Preliminary/Final Drainage Report for Powers Pointe, Filing No. 1, Nolte and Associates (1996)

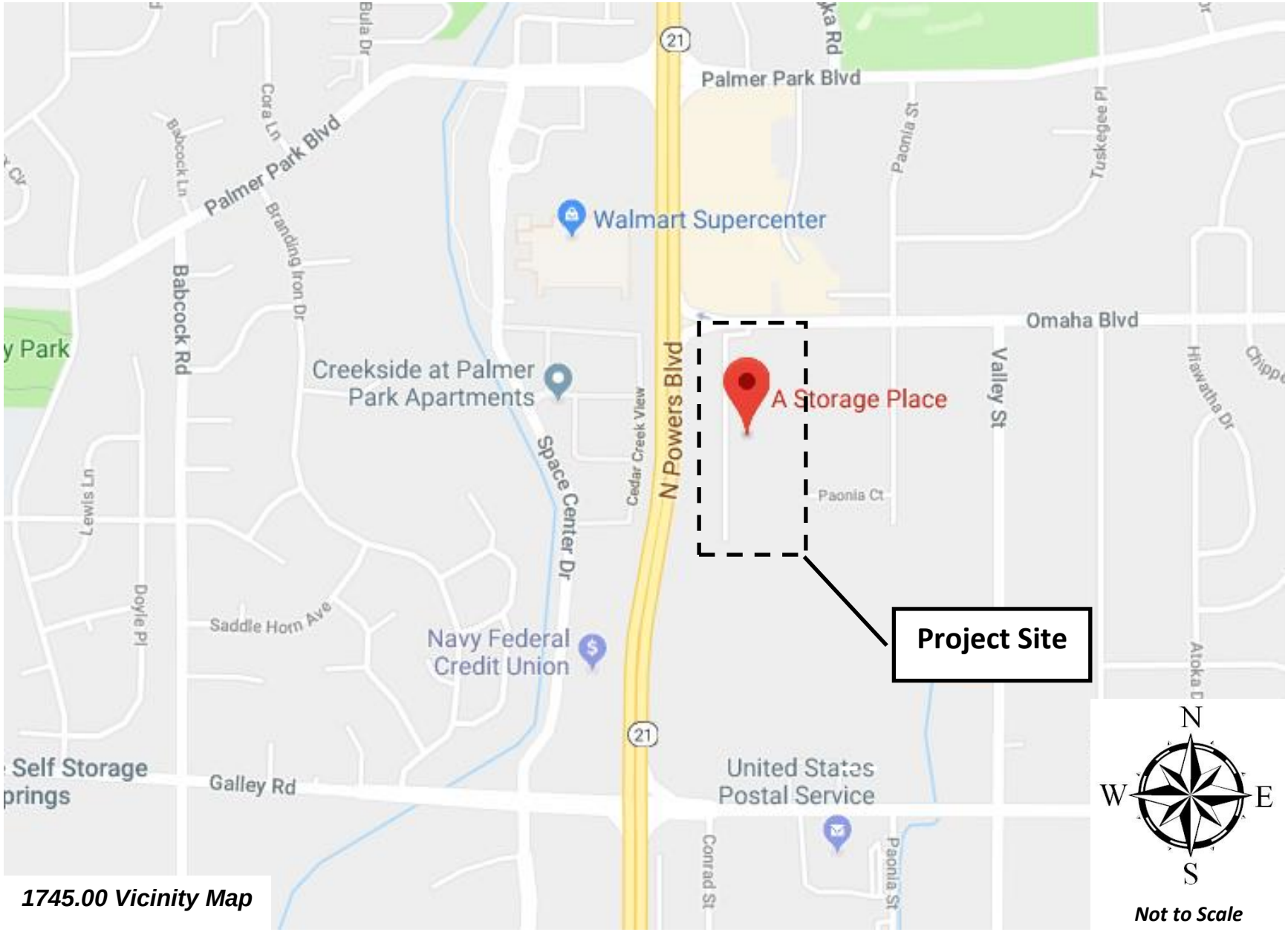
El Paso County Drainage Criteria Manual-Volumes 1 & 2, latest edition

SCS Soils Map for El Paso County

Federal Emergency Management Agency (FEMA) flood maps

Sand Creek Drainage Basin Planning Study

VICINITY MAP



1745.00 Vicinity Map

Not to Scale

S.C.S. SOILS MAP

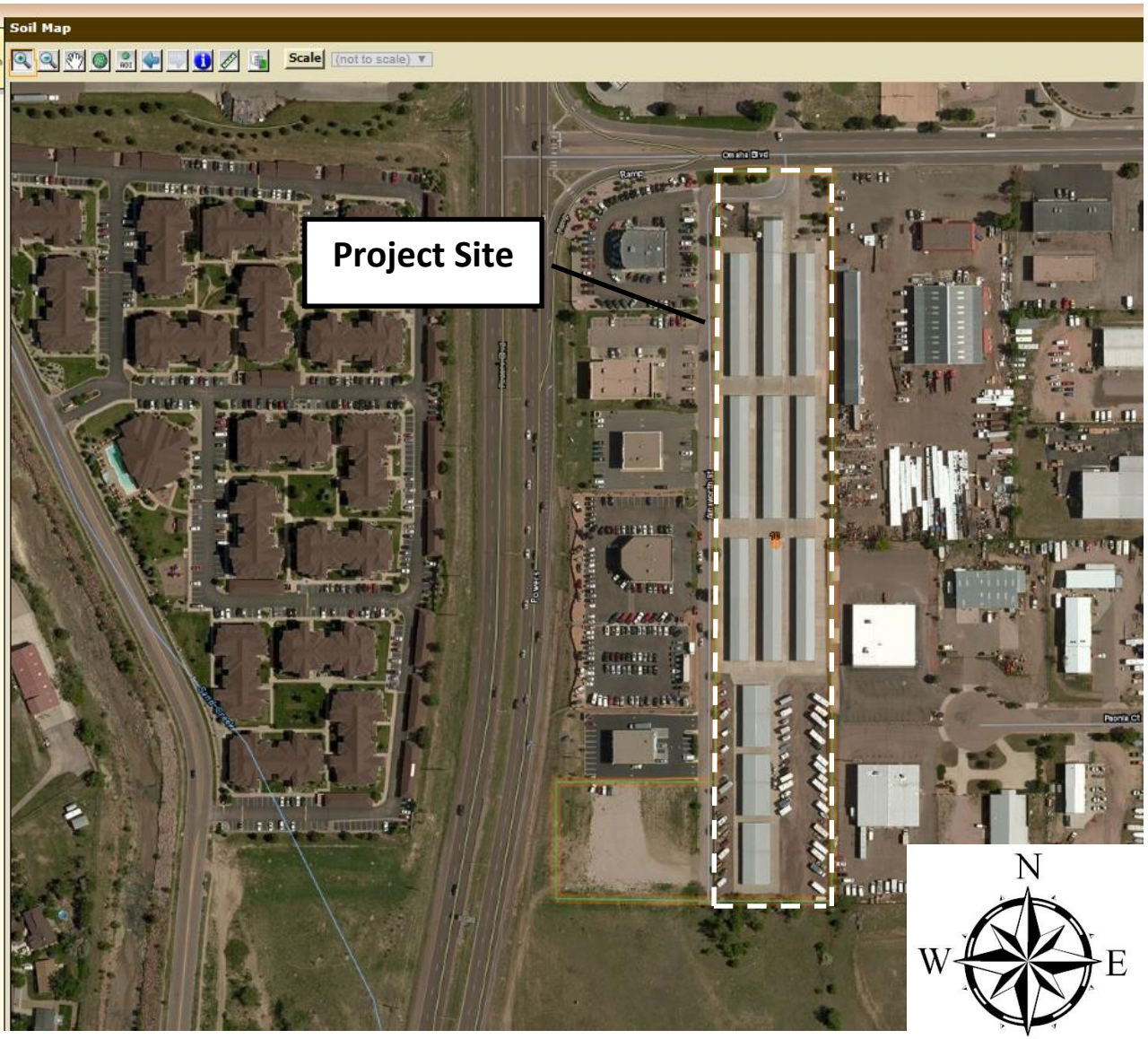
Search

Map Unit Legend

El Paso County Area, Colorado (CO625)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Blendon sandy loam, 0 to 3 percent slopes	6.3	100.0%
Totals for Area of Interest		**6.3**	**100.0%**

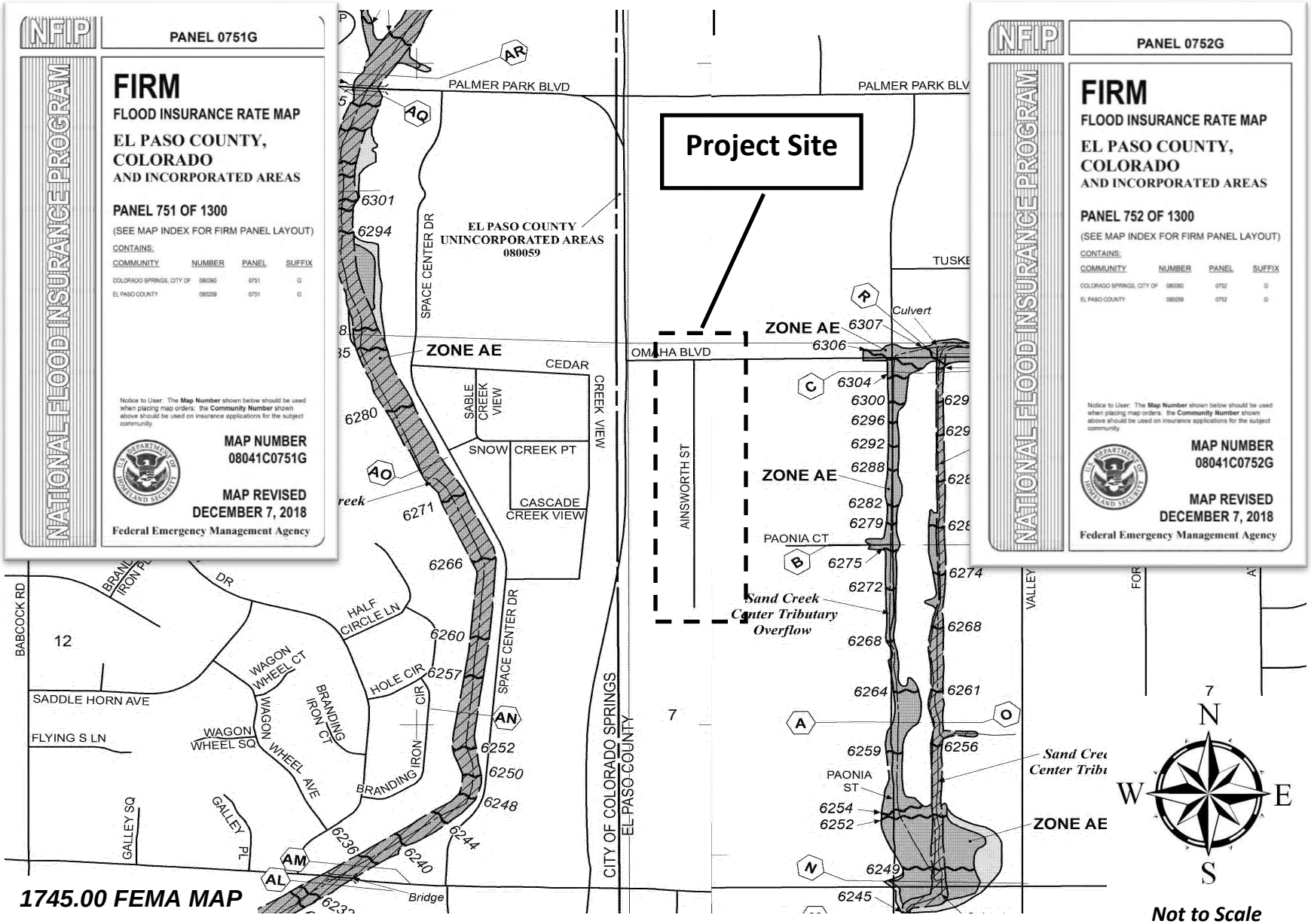
HSG - B



1745.00 S.C.S. Soils Map

Not to Scale

FEMA MAP


NFIP
PANEL 0751G
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS
PANEL 751 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
COLORADO SPRINGS, CITY OF 080060 0751 G
EL PASO COUNTY 080059 0751 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
08041C0751G
MAP REVISED
DECEMBER 7, 2018
Federal Emergency Management Agency
NFIP
PANEL 0752G
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS
PANEL 752 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
COLORADO SPRINGS, CITY OF 080060 0752 G
EL PASO COUNTY 080059 0752 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
08041C0752G
MAP REVISED
DECEMBER 7, 2018
Federal Emergency Management Agency
Project Site
PALMER PARK BLVD
EL PASO COUNTY
UNINCORPORATED AREAS
080059
SPACE CENTER DR
ZONE AE
CEDAR
SABLE CREEK VIEW
CREEK VIEW
SNOW CREEK PT
CASCADE CREEK VIEW
OMAHA BLVD
AINSWORTH ST
PAONIA CT
PAONIA ST
Culvert
Sand Creek Center Tributary Overflow
CITY OF COLORADO SPRINGS
EL PASO COUNTY
BABCOCK RD
HALF CIRCLE LN
HOLE CIR
SADDLE HORN AVE
FLYING S LN
WAGON WHEEL CT
WAGON WHEEL SQ
WAGON WHEEL AVE
BRANDING IRON CT
BRANDING IRON CIR
GALLEY SQ
GALLEY PL
Bridge
6301
6294
6280
6271
6266
6260
6257
6252
6250
6248
6244
6240
6236
6307
6306
6304
6300
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6292
6288
6282
6279
6275
6272
6268
6264
6261
6259
6256
6254
6252
6249
6245
N
S
E
W
1745.00 FEMA MAP
Not to Scale

HYDROLOGIC AND HYDRAULIC CALCULATIONS

1745.00 A Storage Place, Colorado Springs
(Area Runoff Coefficient Summary)

EXISTING CONDITIONS

		PAVEMENT/ROOF			*GRAVEL*			*WEIGHTED*	
BASIN	**TOTAL AREA**	**AREA**	**C_5**	**C_{100}**	**AREA**	**C_5**	**C_{100}**	**C_5**	**C_{100}**
	(Acres)	*(Acres)*			*(Acres)*				
EX-A	2.40	2.13	0.90	0.96	0.27	0.59	0.70	0.87	0.93
EX-B	2.75	1.84	0.90	0.96	0.91	0.59	0.70	0.80	0.87
		Paved Street			*Commercial Area*				
OS-1	1.90	0.81	0.90	0.96	1.09	0.81	0.88	0.85	0.91

DEVELOPED CONDITIONS

		PAVEMENT/ROOF			*GRAVEL*			*WEIGHTED*	
BASIN	**TOTAL AREA**	**AREA**	**C_5**	**C_{100}**	**AREA**	**C_5**	**C_{100}**	**C_5**	**C_{100}**
	(Acres)	*(Acres)*			*(Acres)*				
PR-A	2.20	2.19	0.90	0.96	0.01	0.59	0.70	0.90	0.96
PR-B	1.61	1.55	0.90	0.96	0.06	0.59	0.70	0.89	0.95
PR-C	1.14	0.99	0.90	0.96	0.15	0.59	0.70	0.86	0.93
PR-D	0.20	0.20	0.90	0.96	0.00	0.59	0.70	0.90	0.96
		Paved Street			*Commercial Area*				
OS-1	1.90	0.81	0.90	0.96	1.09	0.81	0.88	0.85	0.91

DWD

Date: 3/27/2019

Checked by: _____

1745.00 A Storage Place, Colorado Springs
AREA DRAINAGE SUMMARY

EXISTING CONDITIONS

		WEIGHTED		*OVERLAND*				*STREET / CHANNEL FLOW*				T_t	*INTENSITY*		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	C_5	C_{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.)*
		** For Calcs See Runoff Summary*														
EX-A	2.40	0.87	0.93	0.87	64	5.0	1.8	1190	1.8%	2.7	7.3	9.1	4.2	7.3	8.7	16.4
EX-B	2.75	0.80	0.87	0.80	75	4.0	2.8	1124	1.8%	2.7	6.9	9.8	4.1	7.1	9.0	17.2
OS-1	1.90	0.85	0.91	0.85	12	0.2	1.3	1155	1.7%	2.6	7.4	8.7	4.3	7.5	6.9	13.0

DEVELOPED CONDITIONS

		WEIGHTED		*OVERLAND*				*STREET / CHANNEL FLOW*				T_t	*INTENSITY*		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	C_5	C_{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.)*
		** For Calcs See Runoff Summary*														
PR-A	2.20	0.90	0.96	0.90	64	5.0	1.5	1170	1.8%	2.7	7.2	8.8	4.3	7.5	8.4	15.8
PR-B	1.61	0.89	0.95	0.89	75	4.0	2.0	1124	1.8%	2.7	6.9	8.9	4.2	7.4	6.1	11.3
PR-C	1.14	0.86	0.93	0.86	75	4.0	2.2	1124	1.8%	2.7	6.9	9.2	4.2	7.3	4.1	7.7
PR-D	0.20	0.90	0.96	0.90	18	2.1	0.7	0	0.0%	0.0	0.0	5.0	5.0	9.1	0.9	1.7
OS-1	1.90	0.85	0.91	0.85	12	0.2	1.3	1155	1.7%	2.6	7.4	8.7	4.3	7.5	6.9	13.0

Calculated by: DWD
Date: 3/27/2019
Checked by: _____

1745.00 A STORAGE PLACE
Surface Routing

EXISTING CONDITIONS									
Design Point(s)	***Contributing Basins***	***Area (Acres)***	***Equivalent CA_5***	***Equivalent CA_{100}***	***Maximum T_C***	***Intensity***		***Flow***	
						I_5	***I_{100}***	***Q_5***	***Q_{100}***
X-1	EX-A	2.40	2.08	2.23	9.1	4.2	7.3	8.7	16.4
X-2	EX-B	2.75	2.19	2.40	9.8	4.1	7.1	9.0	17.2
X-3	OS-1	1.90	1.61	1.74	8.7	4.3	7.5	6.9	13.0

PROPOSED CONDITIONS									
Design Point(s)	***Contributing Basins***	***Area (Acres)***	***Equivalent CA_5***	***Equivalent CA_{100}***	***Maximum T_C***	***Intensity***		***Flow***	
						I_5	***I_{100}***	***Q_5***	***Q_{100}***
1	PR-A	2.20	1.98	2.11	8.8	4.3	7.5	8.4	15.8
2	PR-B	1.61	1.43	1.53	8.9	4.2	7.4	6.1	11.3
3	PR-C	1.14	0.98	1.06	9.2	4.2	7.3	4.1	7.7
4	N/A (manhole)								
5	PR-D	0.20	0.18	0.19	5.0	5.0	9.1	0.9	1.7
6*	A,D,OS-1	4.30	3.77	4.04	8.8	4.3	7.5	16.0	30.2

* Design Point 6 is included to size Pipe Run 3 for Basin OS-1 for future developed conditions

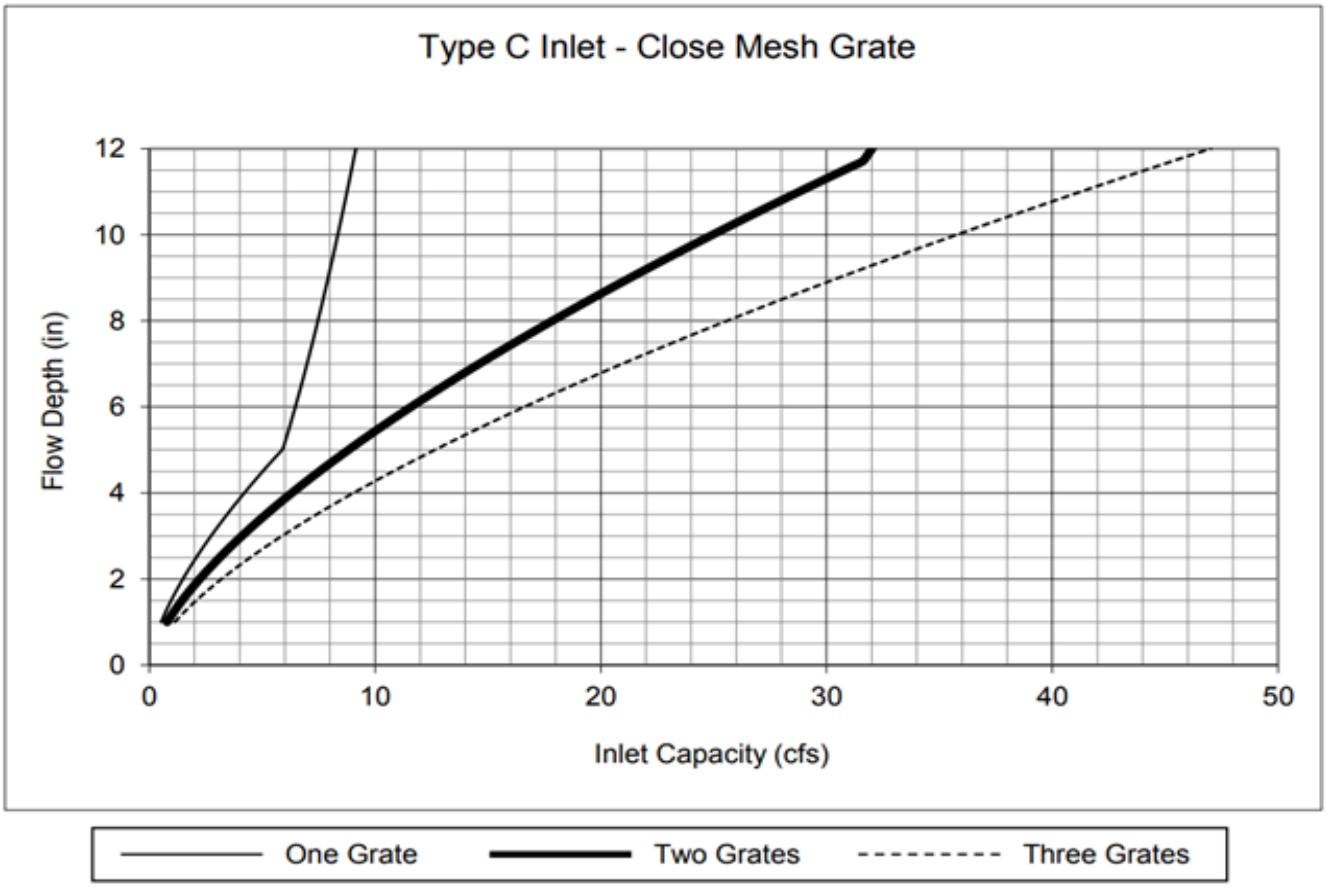
1745.00 A STORAGE PLACE
Pipe Routing Summary

Pipe Run(s)	*Contributing Design Points*	*Equivalent* CA_5	*Equivalent* CA_{100}	*Maximum* T_C	*Intensity*		*Flow*	
					I_5	I_{100}	Q_5	Q_{100}
1	1	1.98	2.11	8.8	4.3	7.5	8.4	15.8
2	1,4	1.98	2.11	8.8	4.3	7.5	8.4	15.8
3	1,4,6	3.77	4.04	8.8	4.3	7.5	16.0	30.2

1745.00 A STORAGE PLACE

PROPOSED BOX INLETS

Figure 8-10. Inlet Capacity Chart Sump Conditions, Area (Type C) Inlet



			Allowable Depth at Grate				Inlet Capacity		Number	Design
Design Point	Q5 cfs	Q100 cfs	D5 ft	D5 in	D100 ft	D100 in	Q at D5 cfs	Q at D100 cfs	of Grates	is Adequate?
1	8.4	15.8	0.33	4.0	0.49	6.0	9.0	16.0	3	yes
5	0.9	1.7	0.25	4.0	0.50	6.0	4.0	6.1	1	yes

1745.00 A STORAGE PLACE

Pipe Run Summary

	Pipe Run	US Inlet Type	Q5 (cfs)	Q100 (cfs)	Dia. (in)	Length (ft)	Rim/Grate Elev	Box Ht.*	US Invert Elev	DS Invert Elev	Slope (ft/ft)	Bend Angle	Lateral Angle	Mannings n
Storm Sewer 1	1	C	8.4	15.8	24	106.2	6272.80	3.47	6269.33	6268.59	0.007	63	n/a	0.012
	2	MH 1	8.4	15.8	24	27.20	6272.90	4.51	6268.39	6268.20	0.007	26	n/a	0.012
	3	C	16.0	30.2	30	225.0	6272.76	4.76	6268.00	6266.87	0.005	n/a	n/a	0.012

* Rim/Grate Elevation - US Invert Elevation

	Depth (ft)	Elevation
Tailwater for Storm Sewer 1 (5yr) =	1.57	6268.44
Tailwater for Storm Sewer 1 (100yr) =	1.97	6268.84

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project: **1745.00 A Storge Place** Location: Tw at Strmswr Outfall Q5=16.0 cfs

By: Date:

Chk By: Date: version 12-2004

Mannings Formula

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

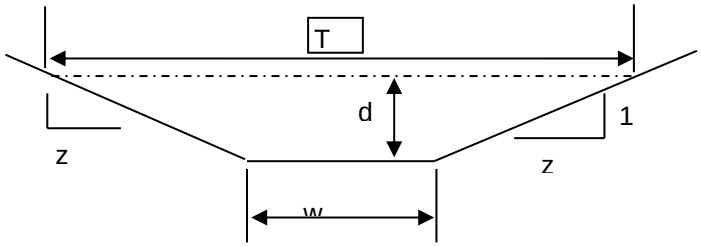
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	4
z (sideslope)=	4
b (btm width, ft)=	2
d (depth, ft)=	1.51
S (slope, ft/ft)	0.005
n_{low} =	0.07
n_{high} =	0.07

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
1.51	12.14	14.45	0.84	1.33642432	16.2247	1.336424	16.2247	T =	14.08
								Dm =	0.862
				Sc low =	0.0776	Sc high =	0.0776		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0543	0.1009	0.0543	0.1009		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project: **1745.00 A Storge Place** Location: Tw at Strmswr Outfall Q100= 30.2 cfs

By: Date:

Chk By: Date: version 12-2004

Mannings Formula

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

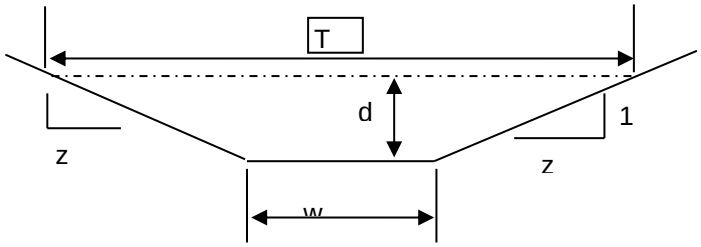
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	4
z (sideslope)=	4
b (btm width, ft)=	2
d (depth, ft)=	1.97
S (slope, ft/ft)	0.005
n_{low} =	0.07
n_{high} =	0.07

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
1.97	19.46	18.25	1.07	1.5672045	30.5034	1.567204	30.5034	T =	17.76
								Dm =	1.096
				Sc low =	0.0717	Sc high =	0.0717		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0502	0.0932	0.0502	0.0932		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project: **1745.00 A Storge Place** Location: Outfall Ditch Q100= 30.2 cfs

By: Date: Velocity Check using n= 0.03

Chk By: Date: version 12-2004

Mannings Formula

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

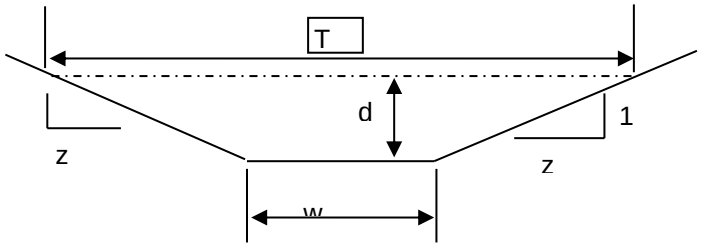
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	4
z (sideslope)=	4
b (btm width, ft)=	2
d (depth, ft)=	1.38
S (slope, ft/ft)	0.005
n_{low} =	0.03
n_{high} =	0.03

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
1.38	10.38	13.38	0.78	2.95672567	30.6837	2.956726	30.6837	T =	13.04
								Dm =	0.796
				Sc low =	0.0146	Sc high =	0.0146		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0102	0.0190	0.0102	0.0190		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

1745.00 A STORAGE PLACE

Protection for Pipe Outlet and Outfall Ditch

Outfall Ditch - Bw= 2ft, Side Slopes = 4:1, Channel Slope = 0.005 ft/ft, Mannings n = 0.07 for riprap

Riprap Apron for Pipe Outlet

Extent of Protection[1]

Q100 =	30.2	cfs
D =	2.5	ft
W =	2.5	ft
Y_t =	1.97	ft
V =	5	ft/s
At =	6.0	sqft
$Q/D^{2.5}$	3.1	
Ef =	6.6	
L_p =	3.7	ft
min. L_p =	8	ft
max. L_p =	25	ft
θ =	4.3	degrees
T =	3.1	ft

Riprap Apron

Use d_{50} = 9 in (Type L)

Channel Lining

Use d_{50} = 9 in (Type L)

Riprap Apron Rock Size[2]

min. d_{50} = 0.23 ft for $Q/D^{2.5} \leq 6.0$

Channel Lining for Outfall Ditch[3]

Check Outfall Ditch at Mannings n= 0.03 for Velocity and Froude Number

V =	2.96	ft/s	(if V < 0.5 check use of grass-lined channel)
D_m =	0.8	ft	
Fr =	0.58		(if Fr < 0.5 check use of grass-lined channel)
S =	0.005	ft/ft	
min. d_{50} =	0.04	ft	

[1] see USDCM Chapter 9 Section 3.2.1

[2] see USDCM Chapter 9 Section 3.2.3

[3] see USDCM Chapter 8 Section 8.1.1 and Chapter 12 Section 3.2.2

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 5/6/2019 1:48:46 PM	# UDSewer Results Summary **Project Title:** 1745.00 A Storage Place (5 YR) **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in): 2.52
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 15.00
Maximum Depth to Rise Ratio: 0.80
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 3.0

Backwater Calculations:

Tailwater Elevation (ft): 6268.44

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	**Ground Elevation (ft)**	**Total Known Flow (cfs)**	**Local Contribution (cfs)**	**Drainage Area (Ac.)**	**Runoff Coefficient**	**5yr Coefficient**	**Overland Length (ft)**	**Overland Slope (%)**	**Gutter Length (ft)**	**Gutter Velocity (fps)**
Powers Blvd	6272.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Ditch										
Pipe Run 3	6272.76	16.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
Pipe Run 2	6273.17	8.40	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
Pipe Run 1	6272.80	8.40	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	**Overland Time (min)**	**Gutter Time (min)**	**Basin Tc (min)**	**Intensity (in/hr)**	**Local Contrib (cfs)**	**Coeff. Area**	**Intensity (in/hr)**	**Manhole Tc (min)**	**Peak Flow (cfs)**	**Comment**
Powers Blvd Ditch	0.00	0.00	0.00	0.00	0.00	3.00	5.33	17.33	16.00	
Pipe Run 3	0.00	0.00	5.00	8.55	8.55	3.00	5.33	17.33	16.00	Used Minimum Tc
Pipe Run 2	0.00	0.00	5.00	8.55	8.55	2.00	4.20	27.04	8.40	Used Minimum Tc
Pipe Run 1	0.00	0.00	5.00	8.55	8.55	1.00	8.40	5.34	8.40	Used Minimum Tc

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	**Sewer Length (ft)**	**Downstream Invert (ft)**	**Slope (%)**	**Upstream Invert (ft)**	**Mannings n**	**Bend Loss**	**Lateral Loss**	**Cross Section**	**Rise (ft or in)**	**Span (ft or in)**
Pipe Run 3	225.00	6266.88	0.5	6268.00	0.013	0.03	1.00	CIRCULAR	30.00 in	30.00 in
Pipe Run 2	27.20	6268.20	0.7	6268.39	0.012	0.13	1.00	CIRCULAR	24.00 in	24.00 in
Pipe Run 1	106.20	6268.59	0.7	6269.33	0.012	0.52	1.00	CIRCULAR	24.00 in	24.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
Pipe Run 3	29.08	5.92	16.21	5.91	15.88	6.07	1.04	Supercritical	16.00	0.00	
Pipe Run 2	20.56	6.54	12.39	5.13	10.68	6.21	1.33	Supercritical	8.40	0.00	
Pipe Run 1	20.56	6.54	12.39	5.13	10.68	6.21	1.33	Supercritical	8.40	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
Pipe Run 3	16.00	CIRCULAR	30.00 in	30.00 in	27.00 in	27.00 in	30.00 in	30.00 in	4.91	
Pipe Run 2	8.40	CIRCULAR	24.00 in	24.00 in	18.00 in	18.00 in	24.00 in	24.00 in	3.14	
Pipe Run 1	8.40	CIRCULAR	24.00 in	24.00 in	18.00 in	18.00 in	24.00 in	24.00 in	3.14	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6268.44

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
Pipe Run 3	6266.88	6268.00	0.00	0.00	6268.44	6269.35	6268.77	1.12	6269.89
Pipe Run 2	6268.20	6268.39	0.01	0.05	6269.81	6269.81	6269.96	0.04	6270.01
Pipe Run 1	6268.59	6269.33	0.06	0.00	6269.87	6270.36	6270.08	0.70	6270.77

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

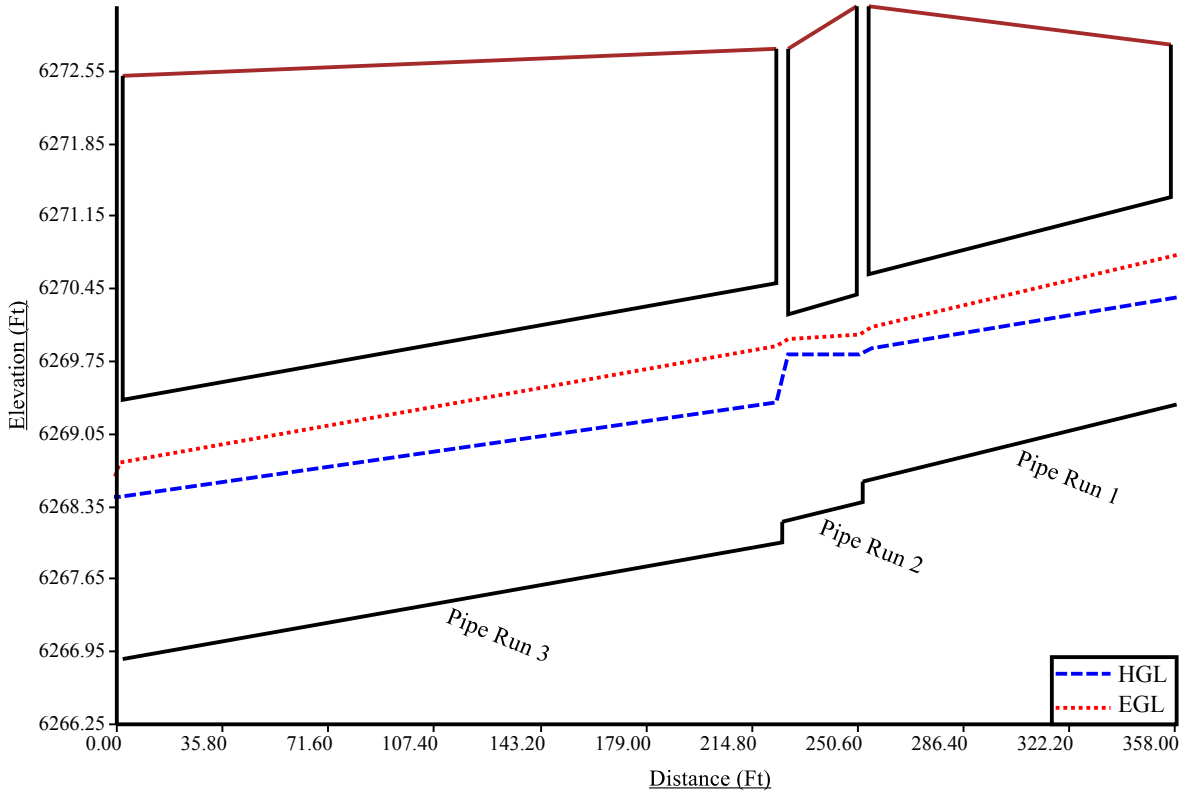
					Downstream			Upstream				

Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
Pipe Run 3	225.00	3.50	6.00	6.08	9.75	6.42	2.83	8.02	5.55	1.97	321.28	
Pipe Run 2	27.20	3.00	4.00	5.50	8.12	5.14	2.31	8.56	5.36	2.53	31.15	
Pipe Run 1	106.20	3.00	4.00	5.50	8.17	5.17	2.33	5.94	4.05	1.22	103.32	

Total earth volume for sewer trenches = 456 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
    - Four inches for pipes less than 33 inches.
    - Six inches for pipes less than 60 inches.
    - Eight inches for all larger sizes.

1745.00 5YR Profile



Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 5/6/2019 1:45:18 PM	# UDSewer Results Summary **Project Title:** 1745.00 A Storage Place (100 YR) **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in): 2.52
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 15.00
Maximum Depth to Rise Ratio: 0.80
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 3.0

Backwater Calculations:

Tailwater Elevation (ft): 6268.84

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	**Ground Elevation (ft)**	**Total Known Flow (cfs)**	**Local Contribution (cfs)**	**Drainage Area (Ac.)**	**Runoff Coefficient**	**5yr Coefficient**	**Overland Length (ft)**	**Overland Slope (%)**	**Gutter Length (ft)**	**Gutter Velocity (fps)**
Powers Blvd	6272.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Ditch										
Pipe Run 3	6272.76	30.20	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
Pipe Run 2	6273.17	15.80	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
Pipe Run 1	6272.80	15.80	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	**Overland Time (min)**	**Gutter Time (min)**	**Basin Tc (min)**	**Intensity (in/hr)**	**Local Contrib (cfs)**	**Coeff. Area**	**Intensity (in/hr)**	**Manhole Tc (min)**	**Peak Flow (cfs)**	**Comment**
Powers Blvd Ditch	0.00	0.00	0.00	0.00	0.00	3.00	10.07	2.18	30.20	
Pipe Run 3	0.00	0.00	5.00	8.55	8.55	3.00	10.07	2.18	30.20	Used Minimum Tc
Pipe Run 2	0.00	0.00	5.00	8.55	8.55	2.00	7.90	6.58	15.80	Used Minimum Tc
Pipe Run 1	0.00	0.00	5.00	8.55	8.55	1.00	15.80	-3.14	15.80	Used Minimum Tc

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	**Sewer Length (ft)**	**Downstream Invert (ft)**	**Slope (%)**	**Upstream Invert (ft)**	**Mannings n**	**Bend Loss**	**Lateral Loss**	**Cross Section**	**Rise (ft or in)**	**Span (ft or in)**
Pipe Run 3	225.00	6266.88	0.5	6268.00	0.013	0.03	1.00	CIRCULAR	30.00 in	30.00 in
Pipe Run 2	27.20	6268.20	0.7	6268.39	0.012	0.13	1.00	CIRCULAR	24.00 in	24.00 in
Pipe Run 1	106.20	6268.59	0.7	6269.33	0.012	0.52	1.00	CIRCULAR	24.00 in	24.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
Pipe Run 3	29.08	5.92	30.00	6.15	30.00	6.15	0.00	Pressurized	30.20	225.00	
Pipe Run 2	20.56	6.54	17.20	6.56	15.78	7.22	1.18	Pressurized	15.80	27.20	
Pipe Run 1	20.56	6.54	17.20	6.56	15.78	7.22	1.18	Pressurized	15.80	106.20	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
Pipe Run 3	30.20	CIRCULAR	30.00 in	30.00 in	33.00 in	33.00 in	30.00 in	30.00 in	4.91	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise
Pipe Run 2	15.80	CIRCULAR	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	3.14	
Pipe Run 1	15.80	CIRCULAR	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	3.14	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6268.84

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
Pipe Run 3	6266.88	6268.00	0.00	0.00	6269.38	6270.59	6269.96	1.21	6271.18
Pipe Run 2	6268.20	6268.39	0.05	0.19	6271.03	6271.14	6271.42	0.11	6271.53
Pipe Run 1	6268.59	6269.33	0.20	0.00	6271.35	6271.79	6271.74	0.44	6272.18

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

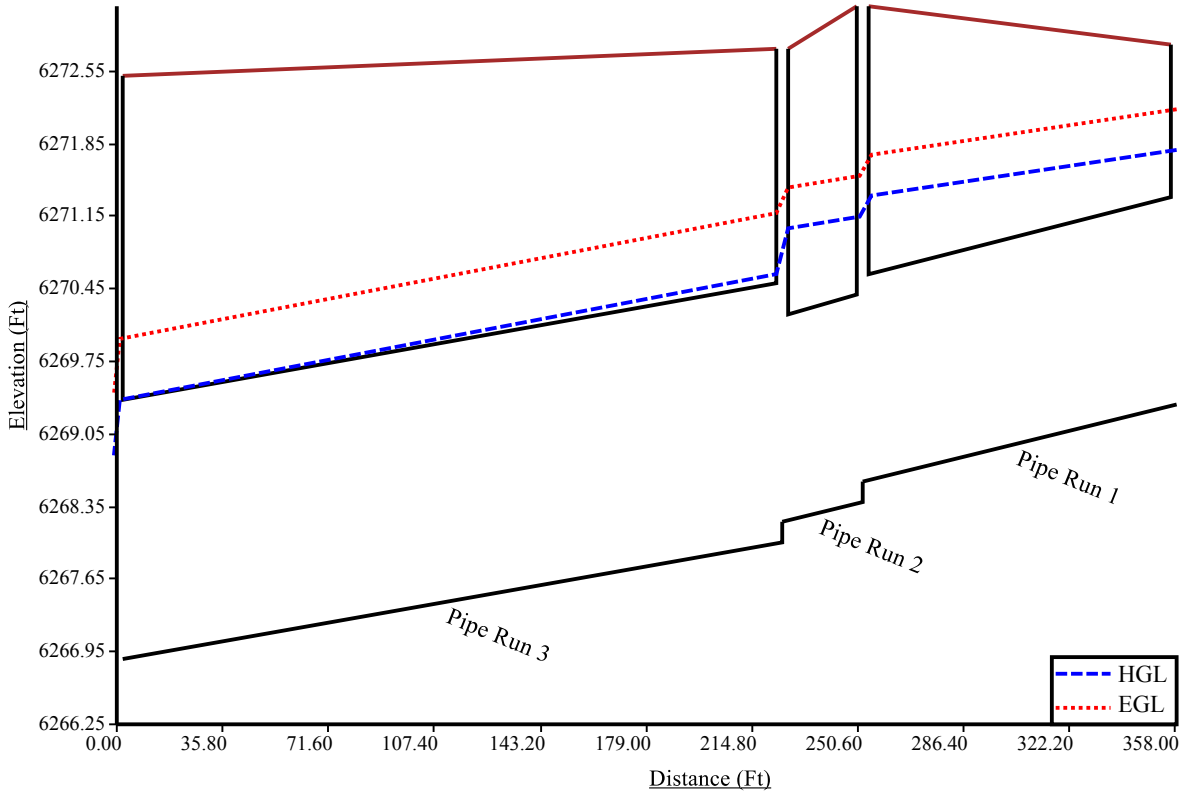
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
Pipe Run 3	225.00	3.50	6.00	6.08	9.75	6.42	2.83	8.02	5.55	1.97	321.28	
Pipe Run 2	27.20	3.00	4.00	5.50	8.12	5.14	2.31	8.56	5.36	2.53	31.15	
Pipe Run 1	106.20	3.00	4.00	5.50	8.17	5.17	2.33	5.94	4.05	1.22	103.32	

Total earth volume for sewer trenches = 456 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
    - Four inches for pipes less than 33 inches.
    - Six inches for pipes less than 60 inches.
    - Eight inches for all larger sizes.

1745.00 100 Yr Profile



DRAINAGE MAPS

721 S. 23RD ST.
COLORADO SPRINGS, CO. 80904

OFFICE: 719-635-6422
FAX: 719-635-6426
www.tnesinc.com

GRADING LEGEND

EXISTING CONTOURS – MINOR	6132
EXISTING CONTOURS – MAJOR	6130
CONCRETE EDGE	CE
UNDERGROUND LOCATES (YELLOW FLAGS)	ULL(Y)
UNDERGROUND LINE LOCATES (RED FLAGS)	ULL(R)
UNDERGROUND LINE LOCATES (BLUE FLAGS)	ULL(B)
UNDERGROUND LINE LOCATES (ORANGE FLAGS)	ULL(O)
PROPOSED FINISHED GROUND	FG
PROPOSED FINISHED SURFACE	FS
PROPOSED FLOWLINE	FL
SPOT ELEVATION	SE
ASPHALT EDGE	AE
LOW POINT	LP
HIGH POINT	HP
EXISTING ELEVATION	12.00*
GRADE & DIRECTION	2.2%
TERRAIN STRING	TS
BOUNDARY MONUMENT	BM
INLET GRATED	IG
PROPOSED CONTOUR	S2
EXISTING SPOT GRADE	× EX 7314.00
PROPOSED SPOT GRADE	× 7314.00

LEGEND

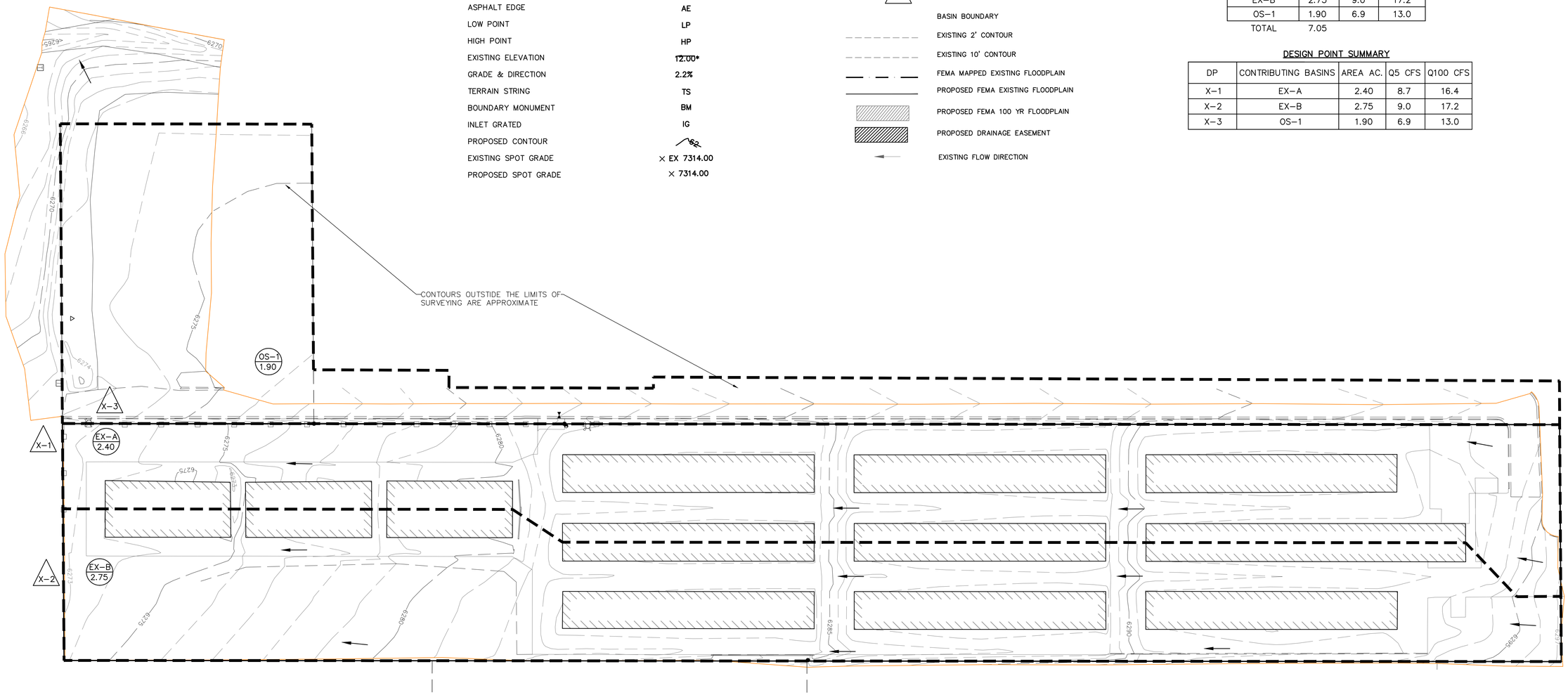
- P–7 / 12.22 — BASIN DESIGNATION / AREA IN BASIN (AC)
- D — DESIGN POINT
- BASIN BOUNDARY
- EXISTING 2' CONTOUR
- EXISTING 10' CONTOUR
- FEMA MAPPED EXISTING FLOODPLAIN
- PROPOSED FEMA EXISTING FLOODPLAIN
- PROPOSED FEMA 100 YR FLOODPLAIN
- PROPOSED DRAINAGE EASEMENT
- EXISTING FLOW DIRECTION

DRAINAGE BASIN SUMMARY

BASIN NAME	AREA (ACRES)	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
EX–A	2.40	8.7	16.4
EX–B	2.75	9.0	17.2
OS–1	1.90	6.9	13.0
TOTAL	7.05		

DESIGN POINT SUMMARY

DP	CONTRIBUTING BASINS	AREA AC.	Q5 CFS	Q100 CFS
X–1	EX–A	2.40	8.7	16.4
X–2	EX–B	2.75	9.0	17.2
X–3	OS–1	1.90	6.9	13.0



1 NEW SITE PLAN
1" = 40'

Terra Nova Engineering, Inc
Creative Civil Engineering Solutions

Design Development Consultants @
T-BONE CONSTRUCTION INC
GENERAL CONTRACTOR
1310 FORD STREET
COLORADO SPRINGS, CO 80915
(719) 570-1456

Revisions

#	DESCRIPTION	DATE

D1-7133

A STORAGE PLACE

5835 OMAHA BOULEVARD
COLORADO SPRINGS, CO

SD

DATE	6 MAY 2019
CHECKED	LD
DRAWN BY	JF

EXISTING DRAINAGE MAP

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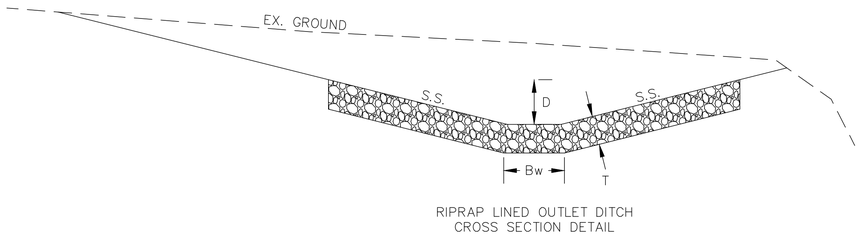
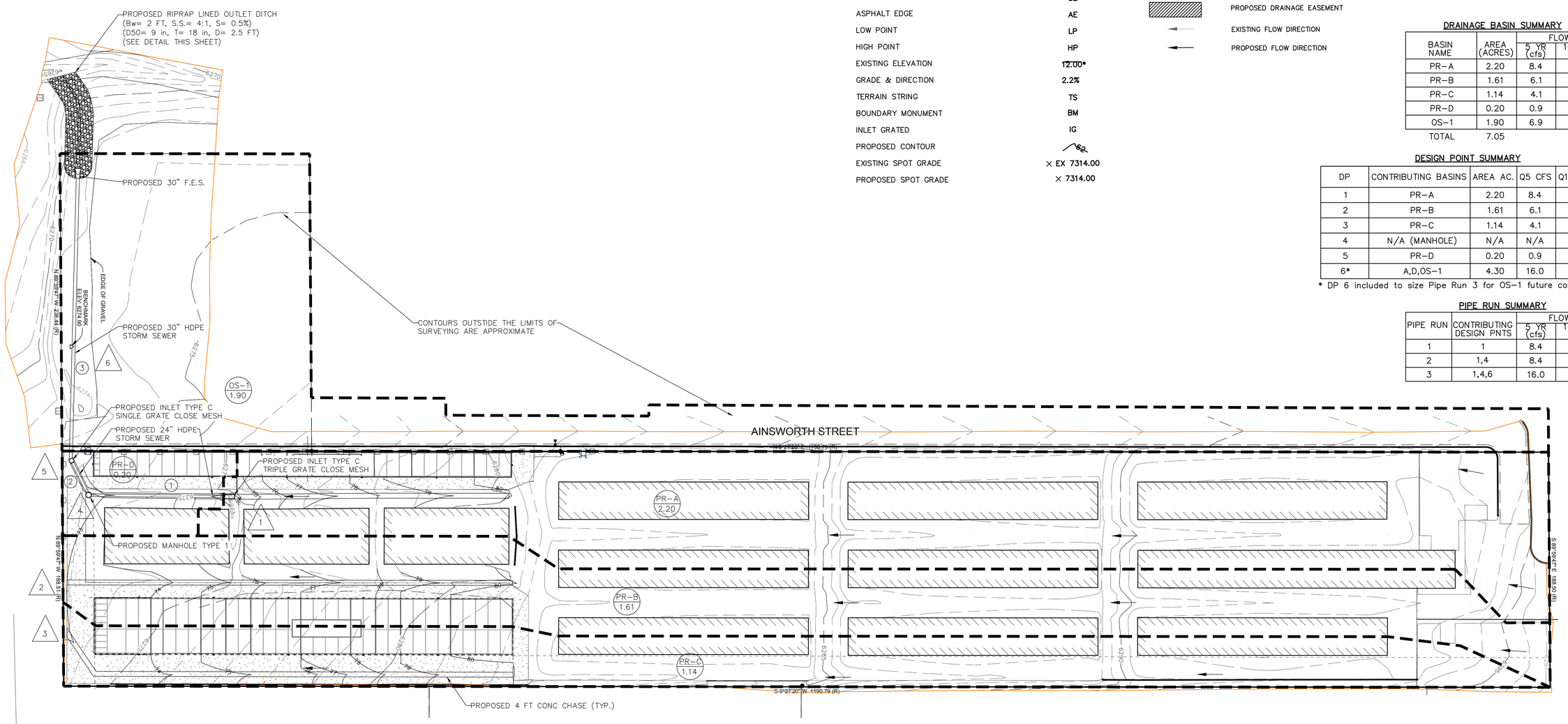


RIPRAP LINED OUTLET DITCH
CROSS SECTION DETAIL



NOTES:

ALL PROPOSED PIPES ARE PRIVATE UNLESS OTHERWISE DESIGNATED.

TOTAL DISTURBED AREA IS 0.95 ACRES

GRADING LEGEND

EXISTING CONTOURS – MINOR	6132
EXISTING CONTOURS – MAJOR	6130
CONCRETE EDGE	CE
UNDERGROUND LOCATES (YELLOW FLAGS)	ULL(Y)
UNDERGROUND LINE LOCATES (RED FLAGS)	ULL(R)
UNDERGROUND LINE LOCATES (BLUE FLAGS)	ULL(B)
UNDERGROUND LINE LOCATES (ORANGE FLAGS)	ULL(O)
PROPOSED FINISHED GROUND	FG
PROPOSED FINISHED SURFACE	FS
PROPOSED FLOWLINE	FL
SPOT ELEVATION	SE
ASPHALT EDGE	AE
LOW POINT	LP
HIGH POINT	HP
EXISTING ELEVATION	12.00*
GRADE & DIRECTION	2.2%
TERRAIN STRING	TS
BOUNDARY MONUMENT	BM
INLET GRATED	IG
PROPOSED CONTOUR	62
EXISTING SPOT GRADE	× EX 7314.00
PROPOSED SPOT GRADE	× 7314.00

LEGEND

P-7 / 12.22	BASIN DESIGNATION / AREA IN BASIN (AC)
D	DESIGN POINT
	BASIN BOUNDARY
	EXISTING 2' CONTOUR
	EXISTING 10' CONTOUR
	FEMA MAPPED EXISTING FLOODPLAIN
	PROPOSED FEMA EXISTING FLOODPLAIN
	PROPOSED FEMA 100 YR FLOODPLAIN
	PROPOSED DRAINAGE EASEMENT
	EXISTING FLOW DIRECTION
	PROPOSED FLOW DIRECTION

DRAINAGE BASIN SUMMARY

BASIN NAME	AREA (ACRES)	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
PR-A	2.20	8.4	15.8
PR-B	1.61	6.1	11.3
PR-C	1.14	4.1	7.7
PR-D	0.20	0.9	1.7
OS-1	1.90	6.9	13.0
TOTAL	7.05		

DESIGN POINT SUMMARY

DP	CONTRIBUTING BASINS	AREA AC.	Q5 CFS	Q100 CFS
1	PR-A	2.20	8.4	15.8
2	PR-B	1.61	6.1	11.3
3	PR-C	1.14	4.1	7.7
4	N/A (MANHOLE)	N/A	N/A	N/A
5	PR-D	0.20	0.9	1.7
6*	A,D,OS-1	4.30	16.0	30.2

* DP 6 included to size Pipe Run 3 for OS-1 future conditions

PIPE RUN SUMMARY

PIPE RUN	CONTRIBUTING DESIGN PNTS	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
1	1	8.4	15.8
2	1,4	8.4	15.8
3	1,4,6	16.0	30.2

1 NEW SITE PLAN
1" = 40'

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(719) 570-1456
T-BONE CONSTRUCTION INC
GENERAL CONTRACTOR

Revisions

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COLORADO SPRINGS, CO

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PROPOSED DRAINAGE MAP

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