

**FINAL DRAINAGE REPORT  
FOR  
PLATTE SELF STORAGE  
COLORADO SPRINGS, COLORADO**

**AUGUST 2024**

Prepared For:  
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TNE Job No. 2419.00  
County Job No. PPR2418

**FINAL DRAINAGE REPORT  
FOR  
PLATTE SELF STORAGE  
COLORADO SPRINGS, COLORADO**

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**FINAL DRAINAGE REPORT  
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**DESIGN ENGINEER'S STATEMENT:**

The 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 applicable 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.

\_\_\_\_\_  
Dane Frank, P.E. 50207  
On behalf of Terra Nova Engineering, Inc.

\_\_\_\_\_  
Date

**OWNER/DEVELOPER'S STATEMENT:**

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

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name, Title

\_\_\_\_\_  
Business Name

\_\_\_\_\_  
Address

---

**EL PASO COUNTY:**

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

\_\_\_\_\_  
Joshua Palmer, P.E.  
County Engineer / ECM Administrator

\_\_\_\_\_  
Date

Conditions:

**FINAL DRAINAGE REPORT  
FOR  
PLATTE SELF STORAGE  
COLORADO SPRINGS, COLORADO**

**PURPOSE**

The purpose of this Final Drainage Report is to identify and analyze the proposed drainage patterns, determine proposed runoff quantities, size drainage structures for conveyance of developed runoff, and present solutions to drainage impacts on-site and off-site resulting from this development. The site has not previously been platted or studied.

**GENERAL DESCRIPTION**

This Final Drainage Report (FDR) is an analysis of approximately 17.22 acres of developed land located at 6001 E Platte Ave. The site is currently in use as and landscaping materials yard and is being developed as a mini storage facility. The site is in the northwest quarter of Section 18, Township 14 South, Range 65 West of the 6<sup>th</sup> Principal Meridian within El Paso County. The parcels are bounded to the north by Motel Road and E Platte Ave, to the east by two unplatted lots, to the south by an unplatted lot and LOT 2 COLORADO SPRINGS AIRPORT FIL NO 1B, and to the west by unplatted lots. (see vicinity map in appendix).

The site lies within the Sand Creek Basin, with storm runoff surface draining west across the site, before flowing onto the neighboring property where Sand Creek East Fork is located.

Soils for this project are delineated by the map in the appendix as Blakeland loamy sand (8), 1 to 9 percent slopes. Soils in the study area are shown as mapped by NRCS in the “Soils Survey of El Paso County Area” and contains soils of Hydrologic Group A.

The site is currently developed with mostly dirt surfaces, some gravel and asphalt areas, and minimal vegetation that is mostly native grasses around the perimeter. The site drains to the west, with an average slope of 6.6%.

## **EXISTING DRAINAGE CONDITIONS**

There are multiple existing buildings, a weight scale, miles of retaining or freestanding walls being used to create material storage areas, and a pond (low area that doesn't drain) on the site. Most of the west side of the site is bermed up before an embankment drops down, which results in little runoff leaving the site. The existing pond area is said to be largely paved (unconfirmed), so most runoff would leave the site by evaporation.

There are ten drainage basins, four of which are offsite. See attached Existing Drainage Map in the appendix.

### Offsite Basins

Basin OS-Z consists of 6.34 acres of existing dirt and gravel roads (construction yard) located on the eastern adjacent property and its runoff ( $Q_5=6.1$  cfs,  $Q_{100}=16.7$  cfs) sheet flows west to Design Point Z on the eastern property line of the site. This basin is offsite and runoff flows into Basin EX-C (discussed below).

Basin OS-Y consists of 8.15 acres of existing dirt and gravel roads (construction yard) and undeveloped native grasses located on the eastern adjacent property and its runoff ( $Q_5=3.6$  cfs,  $Q_{100}=15.4$  cfs) sheet flows southwest to Design Point Y on the eastern property line of the site. This basin is offsite and runoff flows into Basin EX-C (discussed below).

Basin OS-X consists of 1.20 acres of undeveloped native grass area located on the southern adjacent property and its runoff ( $Q_5=0.4$  cfs,  $Q_{100}=2.3$  cfs) sheet flows north to Design Point X on the southern property line of the site. This basin is offsite and runoff flows into Basin EX-C (discussed below).

Basin OS-W consists of 0.45 acres of undeveloped native grass area and asphalt pavement located on the northern adjacent property and its runoff ( $Q_5=0.5$  cfs,  $Q_{100}=1.3$  cfs) sheet flows southwest to Design Point W on the northern property line of the site. This basin is offsite and runoff flows into Basin EX-B (discussed below).

### Onsite Basins

Basin EX-A consists of 0.3 acres of landscaping areas and buildings located at the north side of the site and its runoff ( $Q_5=0.2$  cfs,  $Q_{100}=0.8$  cfs) sheet flows west to Design Point A on the northern property line of the site. This basin is offsite and runoff flows into Basin EX-C (discussed below).

Basin EX-B consists of 0.64 acres of landscaping areas, buildings, some pavement, and a swale located on the north side of the site and its runoff ( $Q_5=1.1$  cfs,  $Q_{100}=2.6$  cfs) sheet flows west to Design Point B, a low point on the northern property line of the site. This basin is onsite and runoff flows into the low point at Design Point B. Once the basin overtops, excess runoff flows north and then west and into Sand Creek.

Basin EX-C consists of 15.4 acres of the bulk of the site and includes buildings, roads, storage areas, and parking areas located central to the site and its runoff ( $Q_5=29.0$  cfs,  $Q_{100}=65.0$  cfs) sheet flows west to Design Point C at the low point of the existing low area that doesn't drain on the west side of the site.

Basin EX-D consists of 1.05 acres of primarily dirt storage/stockpile area located on the south side of the property and its runoff ( $Q_5=0.3$  cfs,  $Q_{100}=1.9$  cfs) sheet flows northwest to Design Point D on the eastern property line of the site, indicating that the runoff enters Basin OS-X. The combined flow ( $Q_5=0.7$  cfs,  $Q_{100}=4.2$  cfs) sheet flows north and into Basin EX-C.

Basin EX-E consists of 0.16 acres of earth embankment located on the west side of the site and its runoff ( $Q_5=0.1$  cfs,  $Q_{100}=0.5$  cfs) sheet flows west to Design Point E on the western property line of the site. This basin is onsite and runoff flows into Sand Creek.

Basin EX-F consists of 0.23 acres of earth embankment located on the northwest side of the site and its runoff ( $Q_5=0.1$  cfs,  $Q_{100}=0.7$  cfs) sheet flows northwest to Design Point F on the northwest property line of the site. This basin is onsite and runoff flows into Sand Creek.

## **PROPOSED DRAINAGE CONDITIONS**

Runoff in the developed conditions consists of 14 basins, four of which are offsite. Below is a description of the runoff in the developed conditions and how it will be safely routed, treated and detained. Basins on the west half of the site are proposed as undeveloped, but the proposed detention pond has been sized to account for their future commercial development.

### Offsite Basins

The offsite basins remain the same as in the existing condition.

### Onsite Basins

Basin PR-1 consists of 0.07 acres of landscaping area located behind proposed Building B and its runoff ( $Q_5=0.0$  cfs,  $Q_{100}=0.2$  cfs) sheet flows west to Design Point 1 on the northern property line of the site. This basin is onsite and runoff flows into Basin OS-W and into a proposed public 18" RCP culvert under Motel Road, eventually entering Design Point W (discussed in Existing Drainage Conditions).

Basin PR-2 consists of 0.13 acres of landscaping area located behind proposed Build A and its runoff ( $Q_5=0.1$  cfs,  $Q_{100}=0.4$  cfs) sheet flows northwest to Design Point 2 on the northern property line of the site. This basin is onsite and runoff flows into Basin OS-W and eventually to Design Point W (discussed in Existing Drainage Conditions).

Basin PR-3 consists of 5.12 acres of almost entirely buildings and pavement central to the site and its runoff ( $Q_5=23.1$  cfs,  $Q_{100}=41.4$  cfs) flows via concrete cross-pan and into various traffic-rated inlets to Design Point 3, a proposed private 20' D10-R sump inlet, on the central western boundary of the basin. The runoff is collected entirely in the inlet and storm system throughout the basin and is conveyed via Pipe Runs 6 (proposed private 30" RCP), 7 (proposed private 30" RCP), 8 (proposed private 30" RCP), 9 (proposed private 24" RCP), 10 (proposed private 24" RCP), and 13 (proposed private 24" RCP), to an inlet junction with Pipe Run 11 (discussed below) at Inlet #3, a proposed private CDOT Type 13 inlet. The combined runoff ( $Q_5=18.3$  cfs,  $Q_{100}=50.3$  cfs) is then routed west via Pipe Runs 4 & 5, a proposed private 42" RCP, to an inlet junction at Inlet #1, a proposed private 20' D10-R sump inlet. The combined runoff ( $Q_5=41.4$  cfs,  $Q_{100}=91.7$  cfs) is

then routed west via Pipe Runs 3 (proposed private 42" RCP), 2 (proposed private 48" RCP), and 1 (proposed private 48" RCP) to the proposed forebay for the proposed Pond 1 (discussed below). If any of these sump inlets become clogged, runoff will continue flowing in the concrete cross-pans until it is collected in the next downstream inlet. If the proposed 20' D10-R sump inlet becomes clogged, runoff will back-up downstream until it is captured in Inlet #2 (see proposed drainage map).

Please state if this proposed gravel yard will be treated by the pond. This currently provides multiple options for conveyance. Is the gravel yard a future development the pond is proposing to account for? If not and the gravel yard is proposed with this development it needs to be clear how the runoff will reach the Pond.

Basin PR-4 consists of 3.66 acres gravel yard, with the two future canopies included in the drainage calcs, located on the south side of the site and its runoff ( $Q_5=8.2$  cfs,  $Q_{100}=16.8$  cfs) sheet flows northwest to either Design Point 4, inlet #9, a proposed private 16' D10-R sump inlet, located on the south-central side of the site, or into the concrete cross-pans at the north side of the basin, flows west, and eventually into either Inlet #8, a proposed private CDOT Type 14 sump inlet or Inlet #9. Runoff is conveyed via Pipe Run 12, a proposed private 36" RCP, to an inlet junction at Inlet #8, a proposed private CDOT Type 13 inlet. The runoff ( $Q_5=8.2$  cfs,  $Q_{100}=16.8$  cfs) is then conveyed north via Pipe Run 11, a proposed private 36" RCP, to an inlet junction at Inlet #3 (discussed above). If either of these inlets become clogged, runoff will overtop and be collected in the opposite inlet.

Basin PR-5 consists of 0.56 acres of native grasses and a grass swale located at the south-central side of the site and its runoff ( $Q_5=0.1$  cfs,  $Q_{100}=0.9$  cfs) is conveyed via grass swale to Design Point 4. This swale also collects flows from Basin OS-X (discussed in Existing Drainage Conditions) in the amount of  $Q_5=0.4$  cfs and  $Q_{100}=2.3$  cfs. The combined runoff ( $Q_5=0.5$  cfs,  $Q_{100}=3.2$  cfs) flows over a proposed 1' deep 10'x20'  $D_{50}=12$ " riprap pad and into an existing swale just south of the south-central property line which eventually enters Sand Creek.

Basin PR-6 consists of 6.64 acres of the bulk of the western side of the site including the proposed private Pond 1 EDB (Design Point 6) and its runoff ( $Q_5=3.1$  cfs,  $Q_{100}=13.1$  cfs) sheet flows west and into the proposed pond. This pond also collects flow from the underground conveyance system from Pipe Run 1, a proposed private 48" RCP, in the amount of  $Q_5=41.4$  cfs and  $Q_{100}=91.7$  cfs. The combined runoff ( $Q_5=44.2$  cfs,  $Q_{100}=104.8$  cfs) enters the pond at Design Point 6 where it is treated for water quality and/or detained. The combined flow of the currently proposed development and future commercial development will be captured in a 2.657 acre-foot Extended



Detention Basin. Runoff entering the pond through the storm sewer system will be routed into a 702 cu-ft concrete lined forebay with a 1.5 feet high concrete cutoff wall. A 3-inch notch in the wall drains the flow to a 2' concrete trickle channel, then the runoff is routed to the 3.0' deep micropool which has a 6" deep initial surcharge area. The 32.96 acres tributary to the EDB are 44% impervious. Based upon this we need a WQCV of 0.523 ac-ft, an EURV volume of 1.091 ac-ft and 100-year volume of 1.044 ac-ft for a total volume needed of 2.657 ac-ft. The bottom of the micropool elevation is at 6199.50 while the top of the ISV elevation is at 6202.50. The WQCV orifice starts at 6202.00 with two 1-5/8 inch diameter holes spaced 20.40 inches apart, then one 1-1/2 inch diameter hole spaced 20.40 inches apart, then one 3.00" diameter spaced 8.40 inches apart. A 4'x4' outlet structure is set at 6210.00. The 100-year water elevation tops out at 6210.54. A 18" HDPE storm pipe will release  $Q_5=0.5$  cfs and  $Q_{100}=11.3$  cfs discharge to a stilling basin at the west property line, which will outfall onto the adjacent property. The following basins contribute flow to Design Point 6: OS-Z, OS-Y, PR-3, PR-4, PR-6, & PR-10.

Please add decision about the stilling basin providing a suitable outfall. The comment response document addressed this point but that text was not incorporated into the report text.

The estimated on-site discharge into Sand Creek in the existing condition is  $Q_5=30.8$  cfs and  $Q_{100}=71.5$  cfs. The estimated on-site discharge into Sand Creek in the proposed condition is  $Q_5=2.1$  cfs and  $Q_{100}=20.1$  cfs, indicating a decrease in discharge into Sand Creek of  $\%_5=93.2\%$  and  $\%_{100}=71.9\%$ . Include discussion of suitable outfall. Where do these flows go, does it handle flows, even if they are less, etc

Basin PR-7 consists of 0.34 acres of earth embankment located on the northwest side of the site and its runoff ( $Q_5=0.2$  cfs,  $Q_{100}=1.1$  cfs) sheet flows northwest, off-site, to Design Point 7, indicating that the runoff flows into Sand Creek.

Basin PR-8 consists of 0.30 acres of earth embankment located at the west side of the site, west of the proposed private Pond 1 EDB and its runoff ( $Q_5=0.2$  cfs,  $Q_{100}=1.0$  cfs) sheet flows west, off-site, to Design Point 8, indicating that the runoff flows into Sand Creek.

Basin PR-9 consists of 0.59 acres of earth embankment and flatter area located at the southwest corner of the site and its runoff ( $Q_5=0.2$  cfs,  $Q_{100}=1.5$  cfs) sheet flows west, off-site, to Design Point 9, indicating that the runoff flows into Sand Creek.

Basin PR-10 consists largely of embankment located at the east side of the site and its runoff ( $Q_5=0.3$  cfs and  $Q_{100}=1.4$  cfs) sheet flows west and toward Design Point 10, a proposed private CDOT Type 13 inlet, where it is completely captured and conveyed east via Pipe Run 13 where it connects into the storm system in Basin PR-3 (discussed above). In case of failure in the inlet, runoff will overtop the proposed retaining wall at the west side of the basin and follow drainage patterns as described in Basin PR-3.

There is one storm sewer system proposed on the site. This system collects runoff from the drain trench along the east property line and the two curb inlets in the mini-storage area and pipes the runoff to the detention pond. There are a series of area inlets along the storm pipe in the mini-storage area that are not required to capture runoff, but will lessen the surface flow along the central drive aisle. The storm pipes on the west side of the site have been sized to have some extra capacity so that the future commercial development can tie into them as well.

In an effort to protect receiving water and as part of the “four-step process to minimize adverse impacts of urbanization” this site was analyzed in the following manner:

1. Reduce Runoff- There is no runoff reduction in the proposed mini-storage area. The proposed parking area south of the mini-storage has been surfaced with gravel, which will reduce runoff. These items will reduce the volume of runoff using ponding and infiltration.
2. Stabilize Drainageways- There are no existing or proposed drainageways onsite. The Sand Creek East Fork is located west of the site; however, channel improvements have previously been constructed there.
3. Provide Water Quality Capture Volume (WQCV)- The Extended Detention Basin has been sized and designed to sufficiently capture the required WQCV and slowly release it through the outlet structure, thereby allowing solids and contaminants to settle out. There are a few on-site basins whose runoff is not treated in the proposed EDB. These areas consist mostly of earthen embankment. The runoff from these areas sheet flow over grassed earth, treating the runoff for water quality before it reaches Sand Creek.
4. Consider Need for Industrial and Commercial BMPs- The proposed development is an indoor mini storage facility; therefore, no Industrial and Commercial BMPs have been proposed.

Unresolved: Discuss exclusions to areas that do not drain to the proposed EDB

## **HYDROLOGIC CALCULATIONS**

Hydrologic 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 anticipated from design storms with 5-year and 100-year recurrence intervals. The Urban Drainage Criteria Manual was used to calculate the detention and water quality volume.

## **HYDRAULIC CALCULATIONS**

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County Storm Drainage Design Criteria Manual – Volumes 1 & 2, latest editions. The pertinent data sheets are included in the appendix of this report.

A culvert is proposed at one of the site entrances. Design calculations have been included for the proposed culvert.

Street runoff capacity calculations for the onsite drive isles have been included.

## **FLOODPLAIN STATEMENT**

No portion of this site is within a designated FEMA floodplain, as determined by FIRM Number 08041C0754 G, dated December 7, 2018 (see appendix).

## **WATER QUALITY**

The proposed detention basin provides water quality treatment for nearly all of the proposed development.

, Pond 1,



Runoff from basins PR-1, PR-2, PR-5, PR-7, PR-8, and PR-9 are not captured by the proposed detention pond. Basins PR-1 and PR-2 are landscaping areas along the property line with no impervious area. Basin PR-5 is an undeveloped area with a swale that directs offsite flow back offsite, with no impervious area. Basins PR-7 and PR-8 are earth embankments on the downstream edge of the site that drop 10-15 feet in elevation, with no impervious area. Basin PR-9 is part flatter undeveloped area and part earth embankment on the downstream edge of the site that doesn't flow

1.99 ac

toward the detention pond, with no impervious area. The combined area of these basins is 1.69 acres, with zero impervious area. See the Water Quality Treatment Map for treatment area types, exclusions, and an area summary table.

Please provide map, it is not provided in the drainage map appendices.

### CONSTRUCTION COST OPINION

#### Public Reimbursable

None

Unresolved from Submittal 1: All disturbed areas are required to be accounted for with treatment or water quality exclusions, not impervious areas. See ECM Section I.7.1.B for possible exclusions including

#### Public Non-Reimbursable

None

If the areas are proposed to act as "runoff reduction" water quality treatment areas, they need to be identified as separate pervious areas with supporting calculations and identified clearly on the plans. Vegetation in RPAs and SPAs should have a uniform density of at least 80%. In the Drainage Report, runoff reduction calculations (UD-BMP spreadsheet or equivalent) shall be included. In the Drainage Report, include a figure delineating all proposed UIA, RPA, and SPA areas to be utilized for runoff reduction.

#### Private Non-Reimbursable

1. 48" RCP	260 LF	\$ 245	\$ 63,700
2. 42" RCP	80 LF	\$ 201	\$ 16,080
3. 36" RCP	385 LF	\$ 151	\$ 58,135
4. 30" RCP	170 LF	\$ 123	\$ 20,910
5. 24" RCP	115 LF	\$ 98	\$ 11,270
6. 18" HDPE	36 LF	\$ 50	\$ 1,800
7. 6' Manhole	1 EA	\$ 10,000	\$ 10,000
8. 7' Manhole	1 EA	\$ 14,000	\$ 14,000
9. CDOT Type C Area Inlet	9 EA	\$ 6,037	\$ 54,333
10. 16' D-10-R Curb Inlet	1 EA	\$ 13,835	\$ 13,835
11. 20' D-10-R Curb Inlet	1 EA	\$ 20,000	\$ 20,000
12. Concrete Drain Trench	710 LF	\$ 200	\$ 142,000

#### EDB (Pond 1)

13. Concrete Forebays	1 EA	\$ 7,000	\$ 7,000
14. Trickle Channel	73 LF	\$ 80	\$ 5,840
15. 4'x4' Outlet Structure	1 EA	\$ 4,000	\$ 4,000
16. Micropool	1 EA	\$ 5,000	\$ 5,000
17. Pond Earthworks	3,157 CY	\$ 6	\$ 18,942
18. Spillway	1 EA	\$ 7,000	\$ 7,000

19. Reseed/Stabilization	1 EA	\$ 2,000	\$ 2,000
20. Aggregate Base Course	306 CY	\$ 66	\$ 20,196
21. Stilling Basin	1 EA	\$ 5,000	\$ 5,000
			<b>Total \$ 501,041</b>

**DRAINAGE FEES**

This drainage report is part of a site development application; therefore, no drainage fees are due.

**MAINTENANCE**

The Extended Detention Basin is private and will be maintained by the property owner. The proposed storm sewers are private and will be maintained by the property owner.

**SUMMARY**

Development of this site will not adversely affect the surrounding development. Site runoff and storm drain appurtenances from the development will not adversely affect the downstream and surrounding developments and will be safely routed to the proposed extended detention basin and runoff reduced to the allowable pre-developed rates while slowly treating the water quality capture volume.

PREPARED BY:  
**TERRA NOVA ENGINEERING, INC.**

Unresolved:  
 Provide discussion earlier  
 in report discussing  
 suitable outfall location.

Dane Frank, P.E.  
 Project Engineer

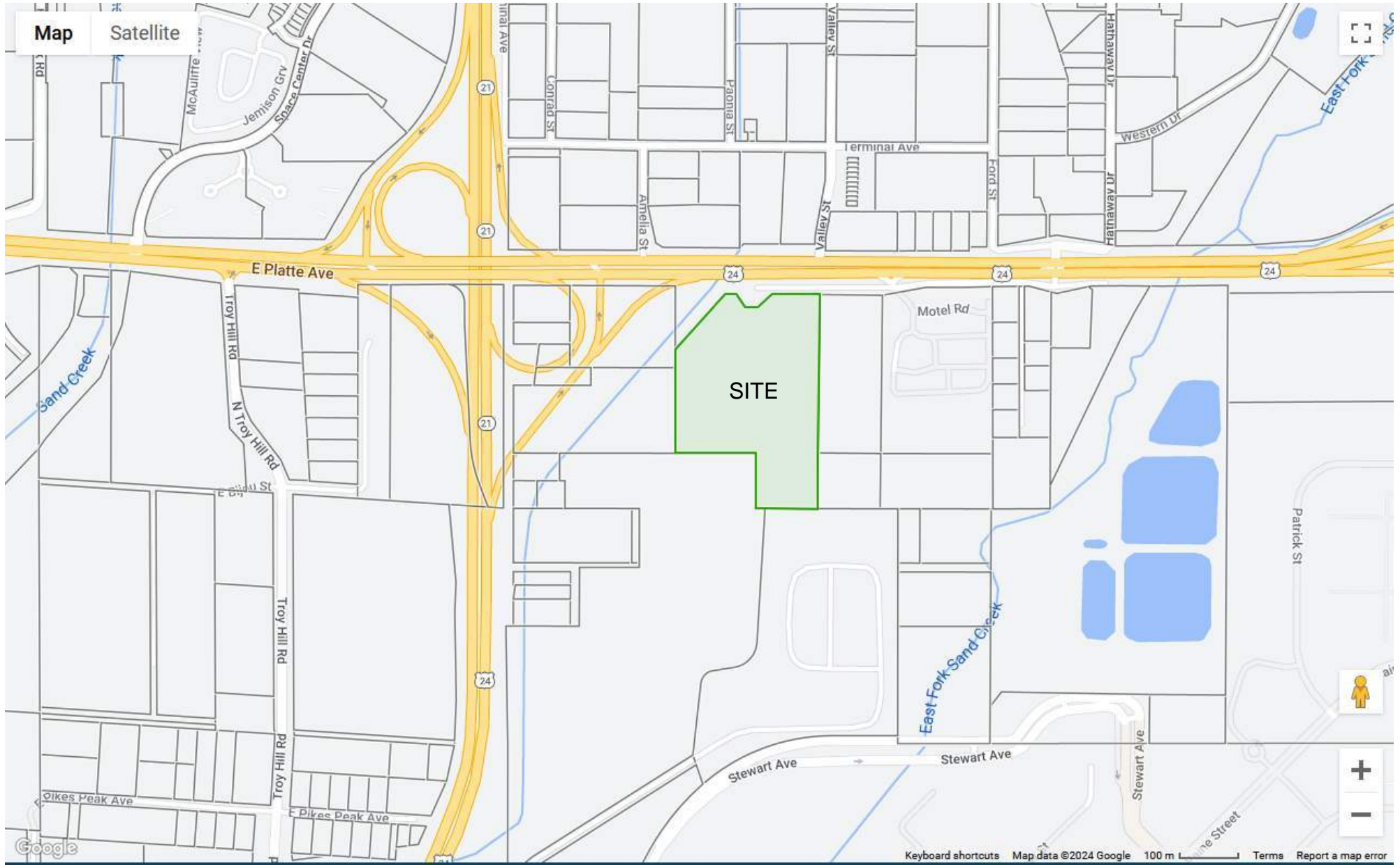
Jobs/2419.00/Drainage/241900 FDR.doc

Unresolved:  
 Include reference section,  
 listing any previous reports  
 used/reviewed, as well as any  
 manuals used.

## **BIBLIOGRAPHY**

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

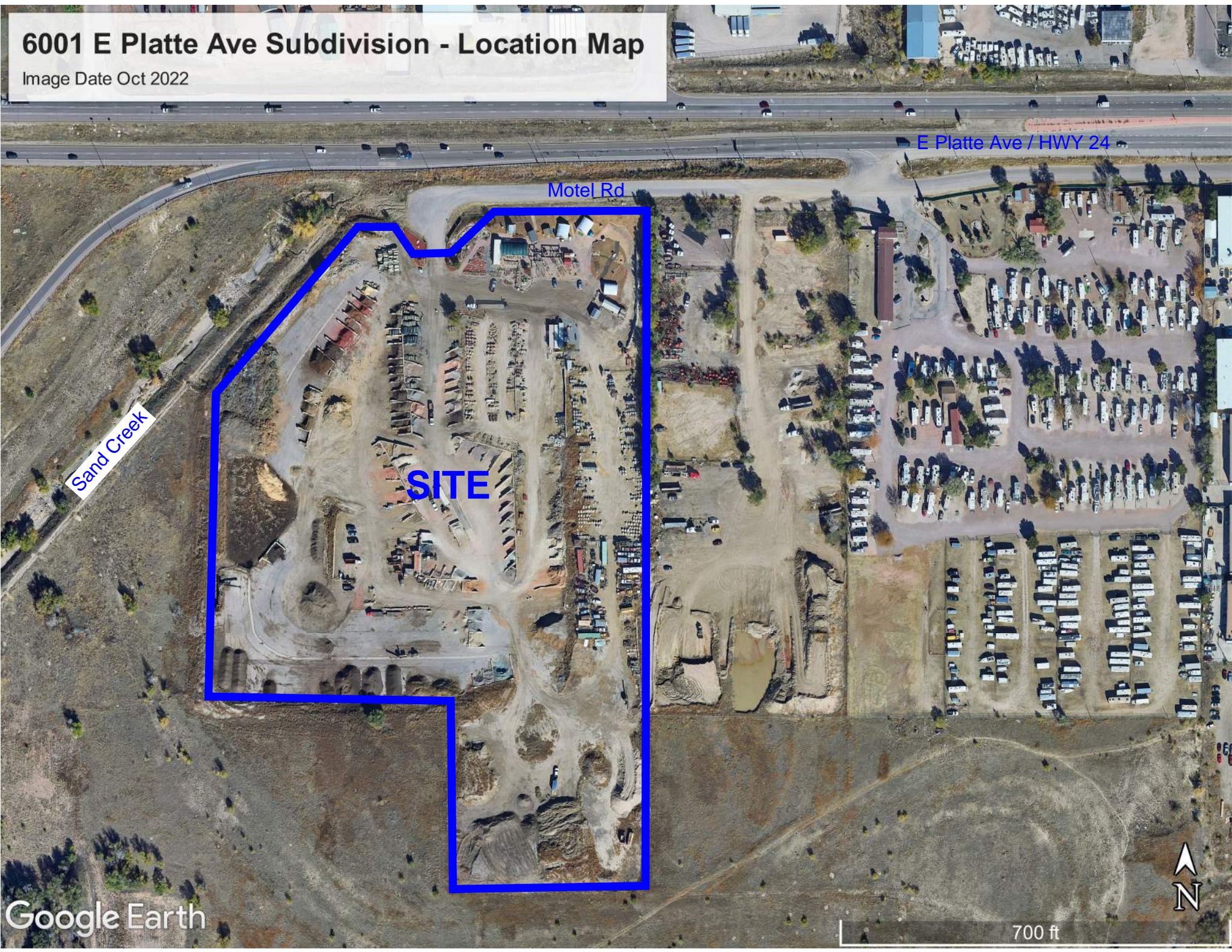
## **VICINITY MAP**





# 6001 E Platte Ave Subdivision - Location Map

Image Date Oct 2022



E Platte Ave / HWY 24

Motel Rd

Sand Creek

**SITE**

Google Earth

700 ft



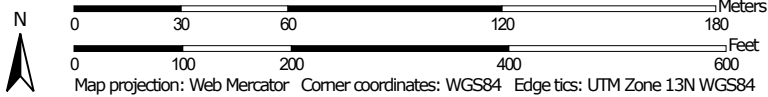
## **NRCS SOILS MAP**

Soil Map—El Paso County Area, Colorado



Soil Map may not be valid at this scale.

Map Scale: 1:2,120 if printed on A portrait (8.5" x 11") sheet.



## MAP LEGEND

### Area of Interest (AOI)

Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

**Warning:** Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL:  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado  
 Survey Area Data: Version 21, Aug 24, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	16.5	100.0%
<b>Totals for Area of Interest</b>		<b>16.5</b>	<b>100.0%</b>

## El Paso County Area, Colorado

### 8—Blakeland loamy sand, 1 to 9 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369v  
*Elevation:* 4,600 to 5,800 feet  
*Mean annual precipitation:* 14 to 16 inches  
*Mean annual air temperature:* 46 to 48 degrees F  
*Frost-free period:* 125 to 145 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Blakeland and similar soils:* 98 percent  
*Minor components:* 2 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Blakeland

##### Setting

*Landform:* Hills, flats  
*Landform position (three-dimensional):* Side slope, talus  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

##### Typical profile

*A - 0 to 11 inches:* loamy sand  
*AC - 11 to 27 inches:* loamy sand  
*C - 27 to 60 inches:* sand

##### Properties and qualities

*Slope:* 1 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Somewhat excessively drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum content:* 5 percent  
*Available water supply, 0 to 60 inches:* Low (about 4.5 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 6e  
***Hydrologic Soil Group:* A**  
*Ecological site:* R049XB210CO - Sandy Foothill  
*Hydric soil rating:* No

### **Minor Components**

#### **Other soils**

*Percent of map unit:* 1 percent

*Hydric soil rating:* No

#### **Pleasant**

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

## **Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 21, Aug 24, 2023

**FEMA FIRM MAP**



**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or floodway data have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only to landward of 0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on the FIRM.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, horizontal projection or UTM zones could result in the production of FIRMAs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and/or elevation referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services  
 NOAA, NGS12  
 National Geodetic Survey  
 SSMC-3, #6202  
 1315 East-West Highway  
 Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3422 or visit its website at <http://www.ngs.noaa.gov>.

**Base Map** information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Group, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date stream channel configurations and floodplain delineations than those shown on the previous FIRM for this jurisdiction. The floodways and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodway.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or disannexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

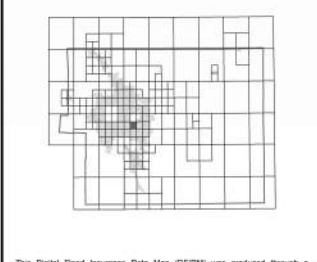
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by fax at 1-800-368-9620 and its website at <http://www.fema.gov>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfp>.

**El Paso County Vertical Datum Offset Table**

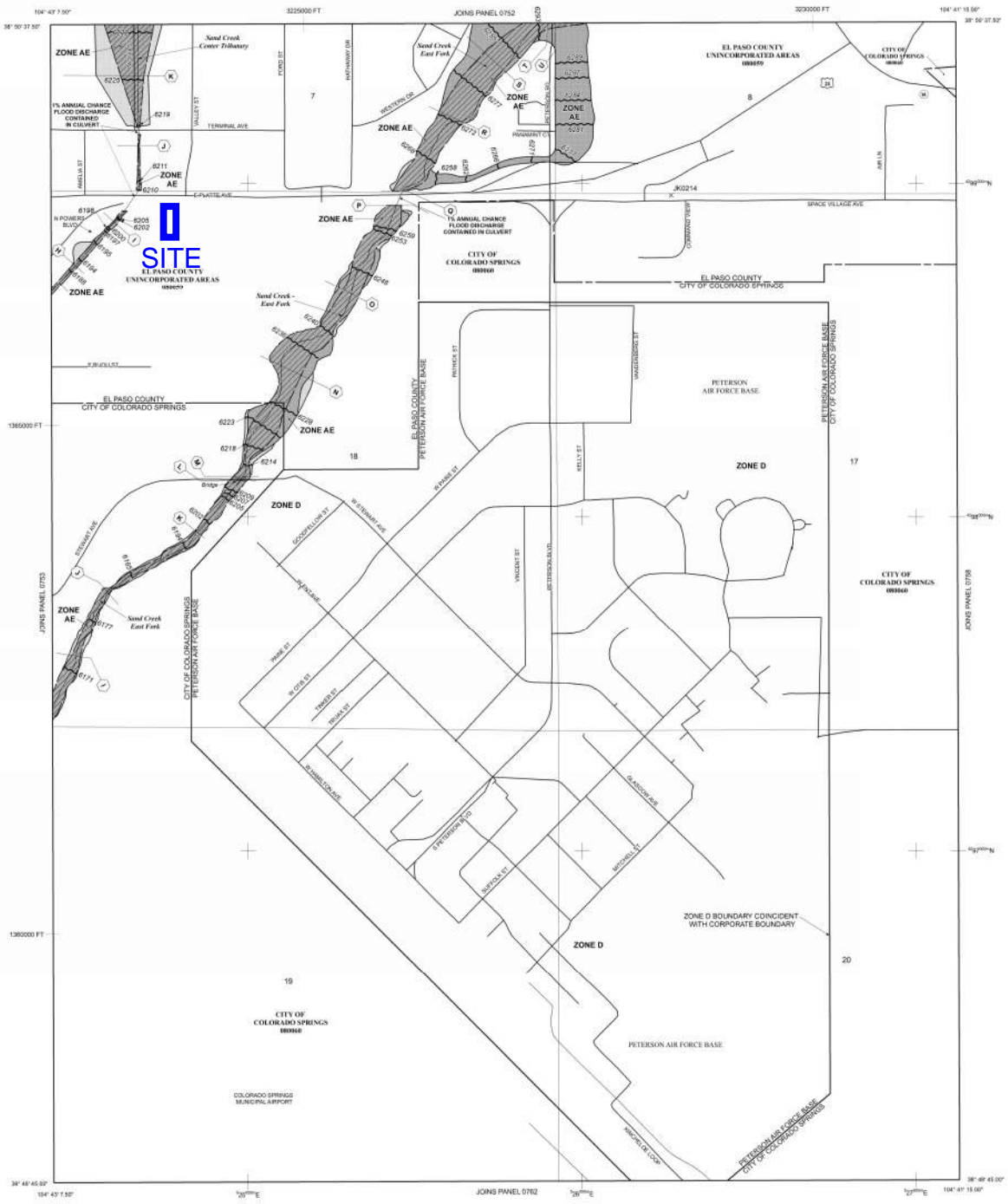
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM OR STREAM VERTICAL DATUM CONVERSION INFORMATION.	

**Panel Location Map**



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 14 SOUTH, RANGE 66 WEST.

**LEGEND**

**SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone AE, Zone AH, Zone AO, Zone AR, Zone AV, and Zone VE. The base flood elevation is the water-surface elevation of the 1% annual chance flood.

**Zone AE** No Base Flood Elevations determined.  
 Base Flood Elevations determined.

**Zone AH** Flood depths of 1 to 3 feet (usually areas of ponding). Base Flood Elevations determined.

**Zone AO** Flood depths of 1 to 3 feet (usually areas of ponding); average depths determined. For areas of unusual flat flooring, vehicles also determined.

**Zone AR** Special Flood Hazard Area normally protected from the 1% annual chance flood by a flood control system that was subsequently destroyed. Zone AR includes that the former flood control system is being retained to provide protection from the 1% annual chance flood.

**Zone AV** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

**Zone VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of obstructions so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**

**Zone X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depth of 1 foot or less; or 1% of 1% annual chance flood with areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.

**Other Areas**

**Zone X** Areas determined to be outside the 0.2% annual chance floodplain.

**Zone D** Areas in which flood heights are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary  
 Floodway boundary  
 Zone D boundary  
 CBRS and OPA boundary

Boundary defining Special Flood Hazard Area of different base flood elevations, flood depths or flood velocities  
 Base Flood Elevation line and value: elevation in feet  
 Base Flood Elevation value where uniform within zone; elevation in feet

\* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

Cross section line

Transect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)  
 200-meter Universal Transverse Mercator grid lines, zone 13

3000-foot grid scale - Colorado State Plane coordinate system, central zone (PROJCS=8303)  
 Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIS report)

1:1.5  
 River file

MAP REPOSITORIES  
 Refer to Map Repository list on Map Index

EFFECTIVE DATE OF COUNTRYWIDE FLOOD INSURANCE RATE MAP  
 MARCH 17, 1997

EFFECTIVE DATES OF REVISIONS TO THIS PANEL  
 DECEMBER 7, 2018: To update elevations, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate atmospheric model updates from the Flood Insurance Study report for this jurisdiction.

The community map repository prior to community redesign, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 500 1000 FEET  
 0 150 300 METERS

**NFP** PANEL 0754G

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

PANEL 754 OF 1300  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

COMMUNITY	NUMBER	PANEL	STATUS
COLORADO SPRINGS CITY OF	0888	074	A
EL PASO COUNTY	0888	074	A

Notes: This map was released on 06/13/2020 to make it consistent with updates. It replaces any previous versions. See the Product User Guide for more information on this version of the map.

Notes to User: The Map Number shown below should be used when ordering this map. The Community Number shown above should be used in insurance applications for the subject community.

**MAP NUMBER**  
 08041C0754G

**MAP REVISED**  
 DECEMBER 7, 2018

Federal Emergency Management Agency

## **HYDROLOGIC CALCULATIONS**

**PLATTE SELF STORAGE  
AREA RUNOFF COEFFICIENT (C) SUMMARY**

**EXISTING**

BASIN	TOTAL AREA (Acres)	DEVELOPED / IMPERVIOUS			UNDEVELOPED / NON-IMPERVIOUS			WEIGHTED		WEIGHTED CA	
		AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	C <sub>100</sub>	CA <sub>5</sub>	CA <sub>100</sub>
<i>OS-Z</i>	6.34	1.90	0.90	0.96	4.44	0.08	0.35	0.33	0.53	2.07	3.38
<i>OS-Y</i>	8.15	0.82	0.90	0.96	7.33	0.08	0.35	0.16	0.41	1.32	3.35
<i>OS-X</i>	1.20	0.02	0.90	0.96	1.18	0.08	0.35	0.09	0.36	0.11	0.43
<i>OS-W</i>	0.45	0.11	0.90	0.96	0.34	0.08	0.35	0.28	0.50	0.13	0.22
<i>EX-A</i>	0.30	0.05	0.90	0.96	0.25	0.08	0.35	0.22	0.45	0.07	0.14
<i>EX-B</i>	0.64	0.29	0.90	0.96	0.35	0.08	0.35	0.45	0.63	0.29	0.40
<i>EX-C</i>	15.4	7.70	0.90	0.96	7.70	0.08	0.35	0.49	0.66	7.55	10.09
<i>EX-D</i>	1.05	0.02	0.90	0.96	1.03	0.08	0.35	0.10	0.36	0.10	0.38
<i>EX-E</i>	0.16	0.00	0.90	0.96	0.16	0.08	0.35	0.08	0.35	0.01	0.06
<i>EX-F</i>	0.23	0.00	0.90	0.96	0.23	0.08	0.35	0.08	0.35	0.02	0.08
<b>Total</b>	33.92	10.91									
										Calc:	DLF
										Date:	8/5/2024
										Checked:	JS

Please keep existing items together and proposed together, as was done in previous submittal.

**PLATTE SELF STORAGE  
AREA RUNOFF COEFFICIENT (C) SUMMARY**

**PROPOSED**

BASIN	TOTAL AREA (Acres)	DEVELOPED / IMPERVIOUS			UNDEVELOPED / NON-IMPERVIOUS			WEIGHTED		WEIGHTED CA	
		AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	C <sub>100</sub>	CA <sub>5</sub>	CA <sub>100</sub>
<i>OS-Z</i>	6.34	1.90	0.90	0.96	4.44	0.08	0.35	0.33	0.53	2.07	3.38
<i>OS-Y</i>	8.15	0.82	0.90	0.96	7.33	0.08	0.35	0.16	0.41	1.32	3.35
<i>OS-X</i>	1.20	0.02	0.90	0.96	1.18	0.08	0.35	0.09	0.36	0.11	0.43
<i>OS-W</i>	0.45	0.11	0.90	0.96	0.34	0.08	0.35	0.28	0.50	0.13	0.22
<i>PR-1</i>	0.07	0.00	0.90	0.96	0.07	0.08	0.35	0.08	0.35	0.01	0.02
<i>PR-2</i>	0.13	0.00	0.90	0.96	0.13	0.08	0.35	0.08	0.35	0.01	0.05
<i>PR-3</i>	5.12	5.12	0.90	0.96	0.00	0.08	0.35	0.90	0.96	4.61	4.92
<i>PR-4</i>	3.66	2.38	0.90	0.96	1.28	0.08	0.35	0.61	0.75	2.24	2.73
<i>PR-5</i>	0.56	0.01	0.90	0.96	0.55	0.08	0.35	0.09	0.36	0.05	0.20
<i>PR-6</i>	6.64	0.66	0.90	0.96	5.98	0.08	0.35	0.16	0.41	1.07	2.73
<i>PR-7</i>	0.34	0.01	0.90	0.96	0.33	0.08	0.35	0.10	0.37	0.04	0.13
<i>PR-8</i>	0.30	0.01	0.90	0.96	0.29	0.08	0.35	0.11	0.37	0.03	0.11
<i>PR-9</i>	0.59	0.01	0.90	0.96	0.58	0.08	0.35	0.09	0.36	0.06	0.21
<i>PR-10</i>	0.40	0.04	0.90	0.96	0.36	0.08	0.35	0.16	0.41	0.06	0.16
<b>Total</b>	<b>33.95</b>	<b>11.09</b>									

<b>Calc:</b>	DLF
<b>Date:</b>	8/5/2024
<b>Checked:</b>	JS

# PLATTE SELF STORAGE RUNOFF SUMMARY

## EXISTING

BASIN	AREA TOTAL (Acres)	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				T <sub>c</sub>	INTENSITY		TOTAL FLOWS	
		C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	Length (ft)	Slope (ft/ft)	T <sub>t</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	I <sub>5</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>5</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)
		<small>* For Calcs See Runoff Summary</small>														
<b>OS-Z</b>	6.34	0.33	0.53	0.33	300	0.02	19.3	230	2.0%	1.4	2.7	22.0	2.9	4.9	6.1	16.7
<b>OS-Y</b>	8.15	0.16	0.41	0.16	300	0.03	20.4	505	3.0%	1.7	4.9	25.3	2.7	4.6	3.6	15.4
<b>OS-X</b>	1.20	0.09	0.36	0.09	300	0.05	18.5	0	5.0%	2.2	0.0	18.5	3.2	5.4	0.4	2.3
<b>OS-W</b>	0.45	0.28	0.50	0.28	300	0.07	13.5	160	7.0%	2.6	1.0	14.5	3.6	6.0	0.5	1.3
<b>EX-A</b>	0.30	0.22	0.45	0.22	300	0.07	14.5	0	7.0%	2.6	0.0	14.5	3.6	6.0	0.2	0.8
<b>EX-B</b>	0.64	0.45	0.63	0.45	300	0.07	10.7	250	7.0%	2.6	1.6	12.2	3.8	6.4	1.1	2.6
<b>EX-C</b>	15.4	0.49	0.66	0.49	300	0.07	10.0	330	7.0%	2.6	2.1	12.1	3.8	6.4	29.0	65.0
<b>EX-D</b>	1.05	0.10	0.36	0.10	300	0.03	21.9	40	3.0%	1.7	0.4	22.2	2.9	4.9	0.3	1.9
<b>EX-E</b>	0.16	0.08	0.35	0.08	30	0.40	3.0	0	40.0%	6.3	0.0	5.0	5.2	8.7	0.1	0.5
<b>EX-F</b>	0.23	0.08	0.35	0.08	35	0.24	3.8	0	24.0%	4.9	0.0	5.0	5.2	8.7	0.1	0.7

<b>Calc:</b>	DLF
<b>Date:</b>	8/5/2024
<b>Checked:</b>	JS

## PLATTE SELF STORAGE RUNOFF SUMMARY

### PROPOSED

BASIN	AREA TOTAL (Acres)	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				T <sub>c</sub>	INTENSITY		TOTAL FLOWS	
		C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	Length (ft)	Slope (ft/ft)	T <sub>t</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	I <sub>5</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>5</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)
		* For Calcs See Runoff Summary														
<i>OS-Z</i>	6.34	0.33	0.53	0.33	300	0.02	19.3	230	2.0%	1.4	2.7	22.0	2.9	4.9	6.1	16.7
<i>OS-Y</i>	8.15	0.16	0.41	0.16	300	0.03	20.4	505	3.0%	1.7	4.9	25.3	2.7	4.6	3.6	15.4
<i>OS-X</i>	1.20	0.09	0.36	0.09	300	0.05	18.5	0	5.0%	2.2	0.0	18.5	3.2	5.4	0.4	2.3
<i>OS-W</i>	0.45	0.28	0.50	0.28	300	0.07	13.5	160	7.0%	2.6	1.0	14.5	3.6	6.0	0.5	1.3
<i>PR-1</i>	0.07	0.08	0.35	0.08	100	0.08	9.3	0	8.0%	2.8	0.0	9.3	4.2	7.1	0.0	0.2
<i>PR-2</i>	0.13	0.08	0.35	0.08	45	0.25	4.3	0	25.0%	5.0	0.0	5.0	5.2	8.7	0.1	0.4
<i>PR-3</i>	5.12	0.90	0.96	0.90	100	0.02	2.9	450	2.0%	2.8	2.7	5.5	5.0	8.4	23.1	41.4
<i>PR-4</i>	3.66	0.61	0.75	0.61	100	0.02	7.0	400	2.0%	1.0	6.7	13.7	3.7	6.1	8.2	16.8
<i>PR-5</i>	0.56	0.09	0.36	0.09	300	0.02	25.0	0	2.0%	1.0	0.0	25.0	2.8	4.6	0.1	0.9
<i>PR-6</i>	6.64	0.16	0.41	0.16	300	0.02	23.3	0	2.0%	1.0	0.0	23.3	2.9	4.8	3.1	13.1
<i>PR-7</i>	0.34	0.10	0.37	0.10	25	0.33	2.8	0	33.0%	4.0	0.0	5.0	5.2	8.7	0.2	1.1
<i>PR-8</i>	0.30	0.11	0.37	0.11	35	0.33	3.3	0	33.0%	4.0	0.0	5.0	5.2	8.7	0.2	1.0
<i>PR-9</i>	0.59	0.09	0.36	0.09	100	0.06	10.1	0	6.0%	1.7	0.0	10.1	4.1	6.9	0.2	1.5
<i>PR-10</i>	0.40	0.16	0.41	0.16	10	0.33	1.7	350	1.0%	2.0	2.9	5.0	5.2	8.7	0.3	1.4

Calc:	DLF
Date:	8/5/2024
Checked:	JS

# ***PLATTE SELF STORAGE SURFACE ROUTING SUMMARY***

## **EXISTING**

<i><b>Design Point(s)</b></i>	<i><b>Contributing Basins</b></i>	<i><b>Area</b></i> <i>(ac)</i>	<i><b>Flow (cfs)</b></i>	
			<i><b>Q<sub>5</sub></b></i>	<i><b>Q<sub>100</sub></b></i>
<i><b>Z</b></i>	<b>OS-Z</b>	6.34	6.1	16.7
<i><b>Y</b></i>	<b>OS-Y</b>	8.15	3.6	15.4
<i><b>X</b></i>	<b>OS-X &amp; DP D</b>	2.25	0.7	4.2
<i><b>W</b></i>	<b>OS-W &amp; DP A</b>	0.75	0.7	2.2
<i><b>A</b></i>	<b>EX-A</b>	0.30	0.2	0.8
<i><b>B</b></i>	<b>EX-B &amp; DP W</b>	1.39	1.8	4.7
<i><b>C</b></i>	<b>EX-C, DP D, DP X, &amp; DP Y</b>	26.85	33.6	86.5
<i><b>D</b></i>	<b>EX-D</b>	1.05	0.3	1.9
<i><b>E</b></i>	<b>EX-E</b>	0.16	0.1	0.5
<i><b>F</b></i>	<b>EX-F</b>	0.23	0.1	0.7

<b>Calc:</b>	DLF
<b>Date:</b>	8/5/2024
<b>Checked:</b>	JS

# ***PLATTE SELF STORAGE SURFACE ROUTING SUMMARY***

## **PROPOSED**

<i>Design Point(s)</i>	<i>Contributing Basins</i>	<i>Area (ac)</i>	<i>Flow (cfs)</i>	
			<i>Q<sub>5</sub></i>	<i>Q<sub>100</sub></i>
<b>1</b>	<b>PR-1</b>	0.07	0.0	0.2
<b>2</b>	<b>PR-2</b>	0.13	0.1	0.4
<b>3</b>	<b>PR-3, DP 4, &amp; DP 10</b>	23.67	41.4	91.7
<b>4</b>	<b>PR-4 &amp; DP Y</b>	11.81	11.8	32.2
<b>5</b>	<b>PR-5 &amp; DP X</b>	1.76	0.5	3.3
<b>6</b>	<b>PR-6 &amp; DP 3</b>	30.31	44.4	104.8
<b>7</b>	<b>PR-7</b>	0.34	0.2	1.1
<b>8</b>	<b>PR-8</b>	0.30	0.2	1.0
<b>9</b>	<b>PR-9</b>	0.59	0.2	1.5
<b>10</b>	<b>PR-10 &amp; DP Z</b>	6.74	6.4	18.1
<b>W</b>	<b>OS-W, DP 1 &amp; DP 2</b>	0.65	0.5	1.9
<b>X</b>	<b>OS-X</b>	1.20	0.4	2.3
<b>Y</b>	<b>OS-Y</b>	8.15	3.6	15.4
<b>Z</b>	<b>OS-Z</b>	6.34	6.1	16.7

<b>Calc:</b>	DLF
<b>Date:</b>	8/5/2024
<b>Checked:</b>	JS



# ***PLATTE SELF STORAGE PIPE ROUTING SUMMARY***

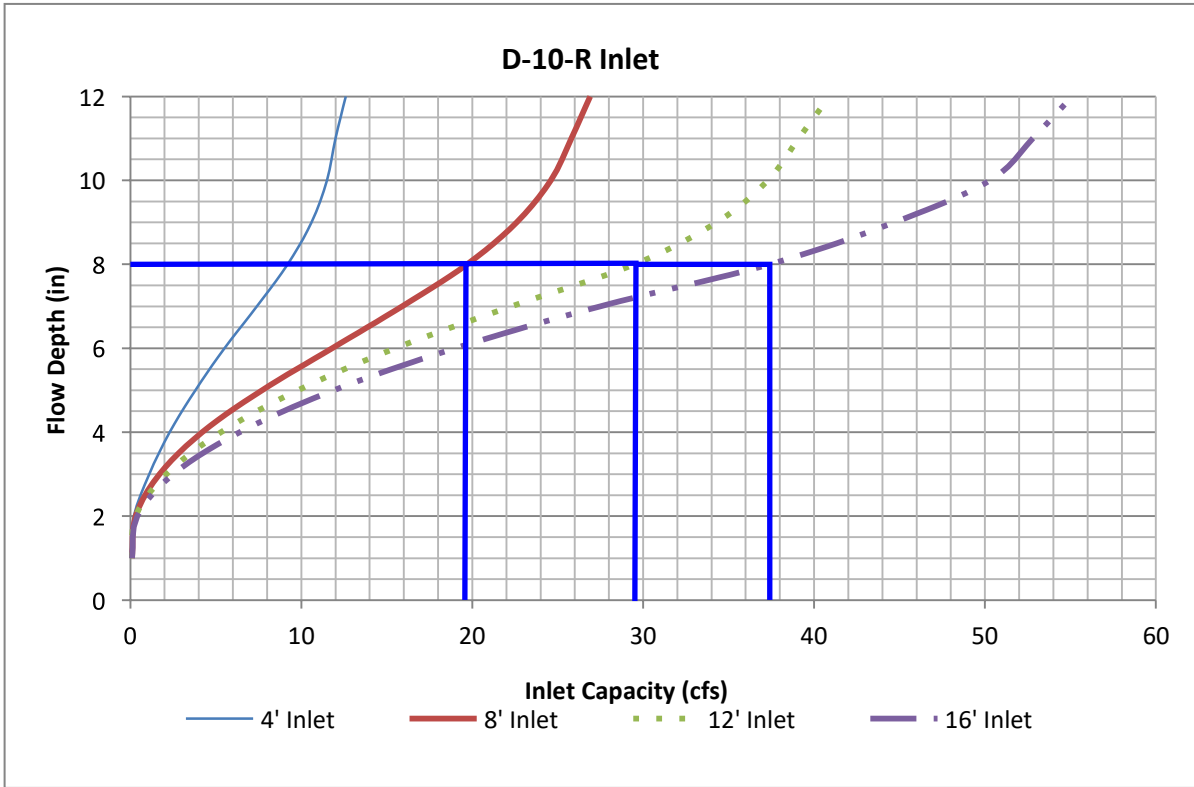
<b><i>Pipe Run</i></b>	<b><i>Inlet #</i></b>	<b><i>Contributing Flow Sources</i></b>	<b><i>5 Year Flow (cfs)</i></b>	<b><i>100 Year Flow (cfs)</i></b>	<b><i>Slope</i></b>	<b><i>Pipe Size &amp; Type</i></b>	<b><i>Owner</i></b>
<b><i>PR#1</i></b>	-	PR#2	59.6	142.1	2.7%	48" RCP	PVT
<b><i>PR#2</i></b>	-	PR#3	59.6	142.1	2.2%	48" RCP	PVT
<b><i>PR#3</i></b>	#1	DP 3 & PR#4	59.6	142.1	2.2%	42" RCP	PVT
<b><i>PR#4</i></b>	#2	PR#5	18.3	50.3	1.7%	42" RCP	PVT
<b><i>PR#5</i></b>	#3	PR#6 & PR#11	18.3	50.3	2.1%	42" RCP	PVT
<b><i>PR#6</i></b>	#4	PR#7	6.4	18.1	5.0%	30" RCP	PVT
<b><i>PR#7</i></b>	#5	PR#8	6.4	18.1	1.9%	30" RCP	PVT
<b><i>PR#8</i></b>	#6	PR#9	6.4	18.1	1.9%	30" RCP	PVT
<b><i>PR#9</i></b>	#7	PR#10	6.4	18.1	1.9%	24" RCP	PVT
<b><i>PR#10</i></b>	#10	PR#13	6.4	18.1	1.7%	24" RCP	PVT
<b><i>PR#13</i></b>	#11	DP 10	6.4	18.1	1.9%	24" RCP	PVT
<b><i>PR#11</i></b>	#8	PR#12	11.8	32.2	1.0%	36" RCP	PVT
<b><i>PR#12</i></b>	#9	DP 4	11.8	32.2	1.0%	36" RCP	PVT
<b><i>PR#90</i></b>	-	Pond outlet	0.5	11.3	1.4%	18" HDPE	PVT

<b>Calc:</b>	DLF
<b>Date:</b>	8/5/2024
<b>Checked:</b>	JS

## **HYDRAULIC CALCULATIONS**

**Figure 8-12. Inlet Capacity Chart Sump Conditions, Curb Opening (D-10-R) Inlet**



- A 8' inlet has a capacity of 19.5 cfs.
- A 12' inlet has a capacity of 29.5 cfs.
- A 16' inlet has a capacity of 37.0 cfs.
- Combining 8' and 12' inlets would give a capacity of 49 cfs for a 20' inlet.

D-10-R inlets are used in the city. County uses CDOT Type R inlets. Please revise

MHFD Inlet spreadsheet has all 3 inlet types available (Type R, Type C and Type 13). Suggest using that spreadsheet for inlet design.

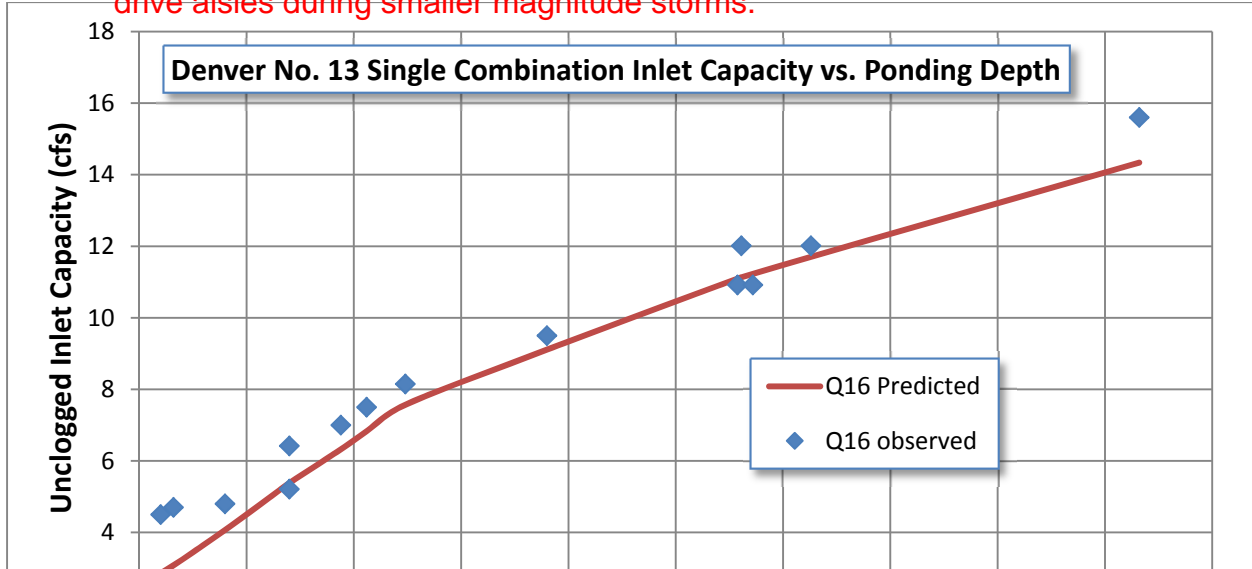


# URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

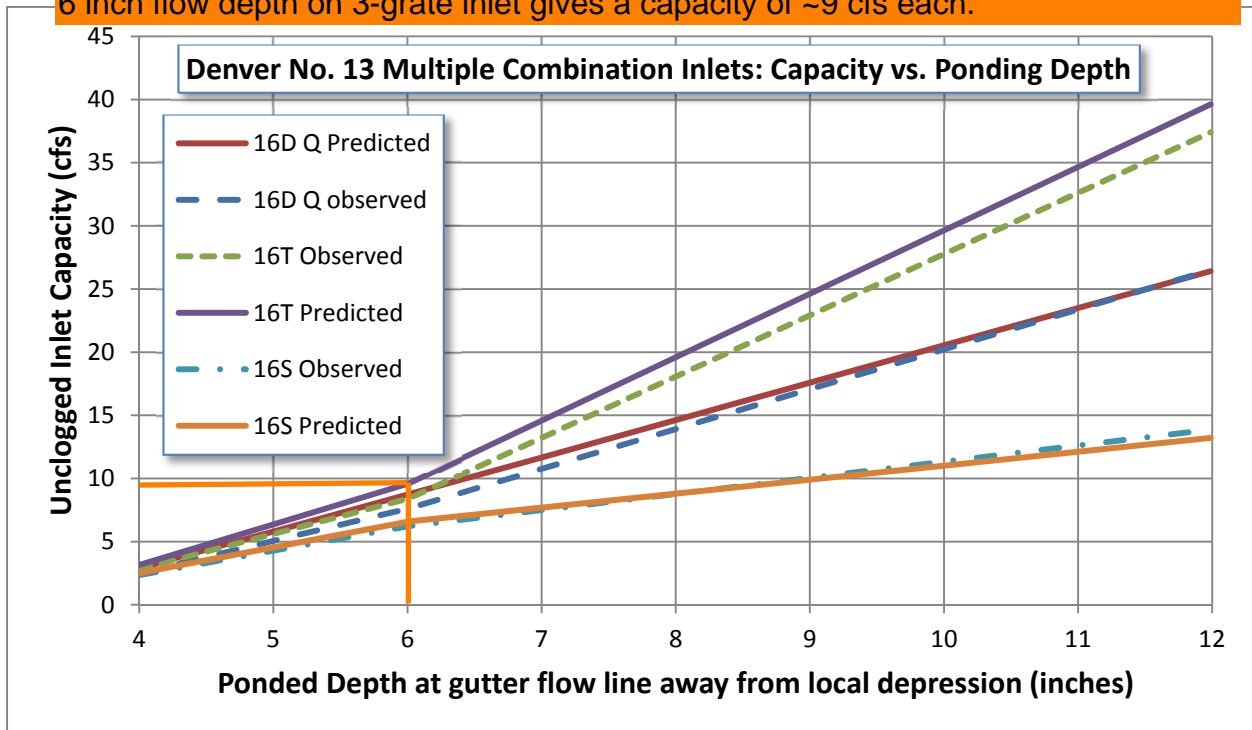
Paul A. Hindman, Executive Director  
 2480 W. 26th Avenue, Suite 156B  
 Denver, CO 80211-5304

Telephone 303-455-6277  
 Fax 303-455-7880  
 www.udfcd.org

**Note to County Reviewer:** The type 13 area inlets on this project have zero flow requirements (even with 100% bypass on them the storm system still functions properly). They are being used for junctions and to reduce the amount of runoff in the drive aisles during smaller magnitude storms.



**Platte Storage**  
 Basin PR-3 Q100=41.4 cfs  
 7 proposed 3-grate Type 13 inlets proposed in basin; proposed D10-R excluded from calculation to be conservative.  
 41.4 cfs/7 inlets=5.9 cfs per inlet  
 6 inch flow depth on 3-grate inlet gives a capacity of ~9 cfs each.

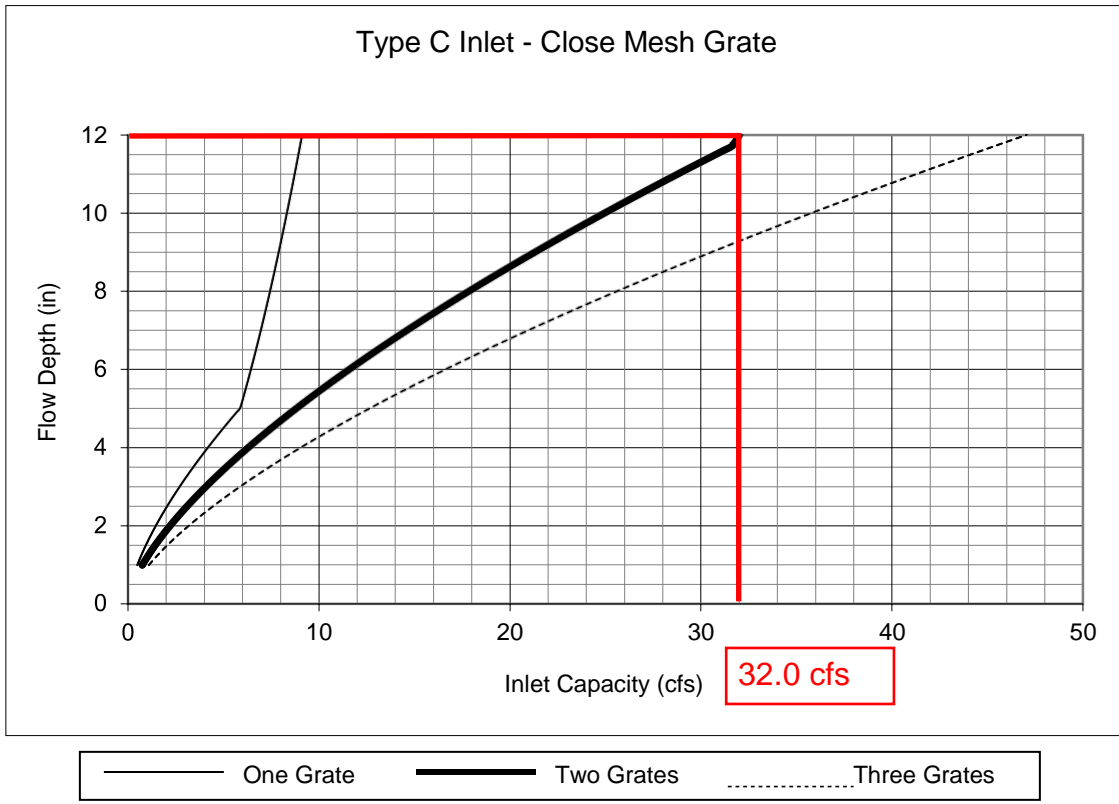


**Figure 8-10. Inlet Capacity Chart Sump Conditions, Area (Type C) Inlet**

Platte Storage Final Drainage Report

Inlet #11: Q5=6.4 cfs; Q100=18.1 cfs  
 Double-grate inlet capacity=30.0 cfs

Thus, inlet has sufficient capacity.



Notes:  
 1. The standard inlet parameters must apply to use these charts.

**Unresolved:**  
 Please provide swale ID. Please ensure IDs match the ID labeled on the proposed drainage map.

**MANNING'S EQUATION for OPEN CHANNEL FLOW**

**Project:** Platte Self Storage      **Location:** Mini-Storage 30' V Drive Aisles at 1% - Capacity  
**By:** Dane Frank      **Date:** 4/2/2024  
**Chk By:**      **Date:**      version 12-2004

Mannings Formula

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

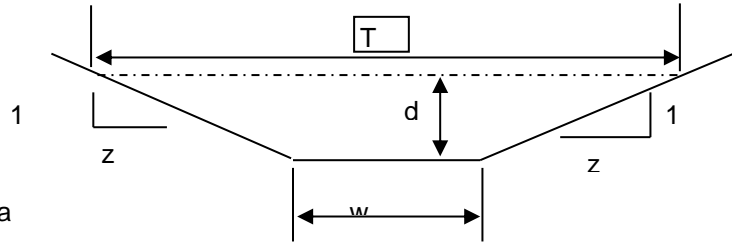
$$R = A/P$$

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



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

$$Q = V \times A$$

INPUT	
z (sideslope)=	20
z (sideslope)=	20
b (btm width, ft)=	0
d (depth, ft)=	0.25
S (slope, ft/ft)	0.01
n <sub>low</sub> =	0.013
n <sub>high</sub> =	0.013

Clear Data  
 Entry Cells

Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Low N		High N		T =	Dm =
				Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.25	1.25	10.01	0.12	2.85511683	3.5689	2.855117	3.5689	10	0.125

Sc low = 0.0049    Sc high = 0.0049

s<sub>c</sub> = critical slope ft / ft

T = top width of the stream

d<sub>m</sub> = a/T = mean depth of flow

.7 Sc	1.3 Sc	.7 Sc	1.3 Sc
0.0035	0.0064	0.0035	0.0064

**MANNING'S EQUATION for OPEN CHANNEL FLOW**

Project: **Platte Self Storage** Location: **Mini-Storage Drive Aisles at 2% - Capacity**  
 By: **Dane Frank** Date: **3/27/2024**  
 Chk By: \_\_\_\_\_ Date: \_\_\_\_\_ version 12-2004

Mannings Formula

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

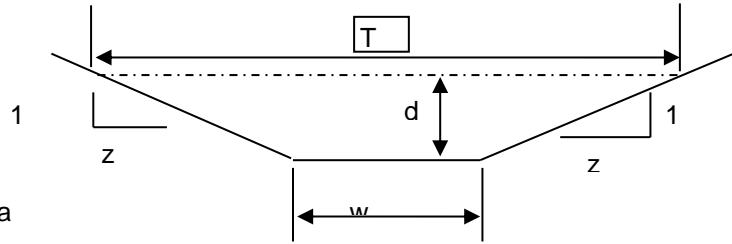
$$R = A/P$$

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



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

$$Q = V \times A$$

INPUT

z (sideslope)= 33.3  
 z (sideslope)= 33.3  
 b (btm width, ft)= 0  
 d (depth, ft)= 0.35  
 S (slope, ft/ft) 0.02  
 n low = 0.013  
 n high = 0.013

Clear Data  
Entry Cells

Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Low N		High N		T =	Dm =
				Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.35	4.08	23.32	0.17	5.0558412	20.624	5.055841	20.624	23.31	0.175

Sc low = 0.0044 Sc high = 0.0044

s<sub>c</sub> = critical slope ft / ft

T = top width of the stream

d<sub>m</sub> = a/T = mean depth of flow

.7 Sc	1.3 Sc	.7 Sc	1.3 Sc
0.0031	0.0057	0.0031	0.0057

**MANNING'S EQUATION for OPEN CHANNEL FLOW**

Project: **Platte Self Storage** Location: **East Drain Trench (need Q=9.1 cfs)**  
 By: **John Fornander** Date: **4/19/2024**  
 Chk By: \_\_\_\_\_ Date: \_\_\_\_\_ version 12-2004

Mannings Formula

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

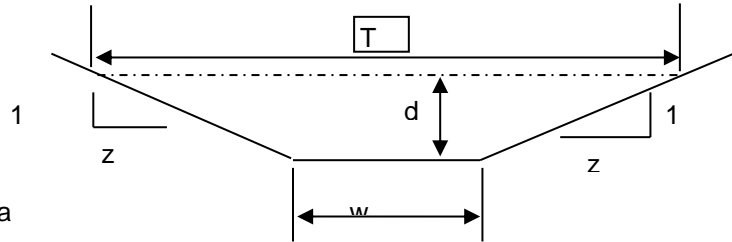
$$R = A/P$$

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



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

$$Q = V \times A$$

INPUT

z (sideslope)= 0  
 z (sideslope)= 0  
 b (btm width, ft)= 1.5  
 d (depth, ft)= 1  
 S (slope, ft/ft) 0.01  
 n low = 0.013  
 n high = 0.013

Clear Data  
Entry Cells

Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Low N		High N		T =	Dm =
				Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
1	1.50	3.50	0.43	6.49748573	9.74623	6.497486	9.74623	1.5	1.000

Sc low = 0.0076 Sc high = 0.0076

s<sub>c</sub> = critical slope ft / ft

T = top width of the stream

d<sub>m</sub> = a/T = mean depth of flow

.7 Sc	1.3 Sc	.7 Sc	1.3 Sc
0.0053	0.0099	0.0053	0.0099



**MANNING'S EQUATION for OPEN CHANNEL FLOW**

Project: **Platte Self Storage** Location: **Bldg AH Drive Aisle (need Q=3.6 cfs)**  
 By: **John F** Date: **4/2/2024**  
 Chk By: \_\_\_\_\_ Date: \_\_\_\_\_ version 12-2004

Mannings Formula

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

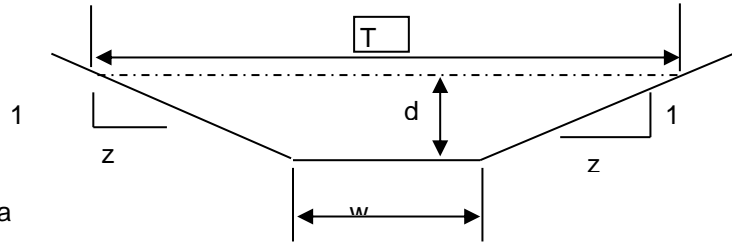
$$R = A/P$$

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



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

$$Q = V \times A$$

INPUT

z (sideslope)= 14.3  
 z (sideslope)= 16  
 b (btm width, ft)= 0  
 d (depth, ft)= 0.35  
 S (slope, ft/ft) 0.01  
 n low = 0.013  
 n high = 0.013

Clear Data  
Entry Cells

Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Low N		High N		T =	Dm =
				Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.35	1.86	10.63	0.17	3.570899	6.62714	3.570899	6.62714	10.605	0.175

Sc low = 0.0044 Sc high = 0.0044

s<sub>c</sub> = critical slope ft / ft

T = top width of the stream

d<sub>m</sub> = a/T = mean depth of flow

.7 Sc	1.3 Sc	.7 Sc	1.3 Sc
0.0031	0.0057	0.0031	0.0057

**MANNING'S EQUATION for OPEN CHANNEL FLOW**

Project: **Platte Self Storage** Location: **Bldg N+RV Drive Aisel (need Q=31 cfs)**  
 By: **John F** Date: **4/2/2024**  
 Chk By: \_\_\_\_\_ Date: \_\_\_\_\_ version 12-2004

Mannings Formula

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

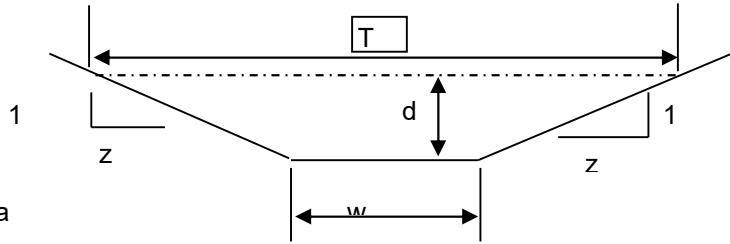
$$R = A/P$$

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



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

$$Q = V \times A$$

INPUT

z (sideslope)= 7.1  
 z (sideslope)= 14.7  
 b (btm width, ft)= 0  
 d (depth, ft)= 0.7  
 S (slope, ft/ft) 0.01  
 n<sub>low</sub> = 0.013  
 n<sub>high</sub> = 0.013

Clear Data  
Entry Cells

Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Low N		High N		T =	Dm =
				Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.7	5.34	15.33	0.35	5.65883356	30.2238	5.658834	30.2238	15.26	0.350

Sc low = 0.0035 Sc high = 0.0035

s<sub>c</sub> = critical slope ft / ft

T = top width of the stream

d<sub>m</sub> = a/T = mean depth of flow

.7 Sc	1.3 Sc	.7 Sc	1.3 Sc
0.0025	0.0046	0.0025	0.0046

**MANNING'S EQUATION for OPEN CHANNEL FLOW**

Project: **Platte Self Storage** Location: **Bldg Central Drive Aisel (need Q=41.3 cfs)**  
 By: **John F** Date: **4/2/2024**  
 Chk By: \_\_\_\_\_ Date: \_\_\_\_\_ version 12-2004

Mannings Formula

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

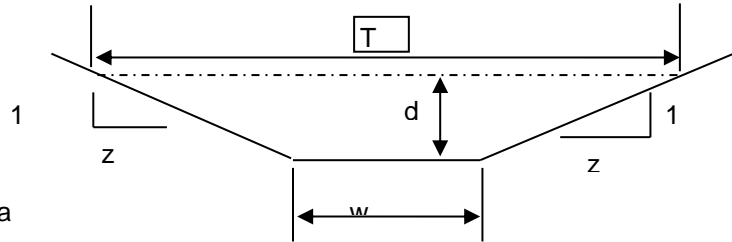
$$R = A/P$$

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



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

$$Q = V \times A$$

INPUT

z (sideslope)= 33  
 z (sideslope)= 33  
 b (btm width, ft)= 0  
 d (depth, ft)= 0.5  
 S (slope, ft/ft) 0.02  
 n low = 0.013  
 n high = 0.013

Clear Data  
Entry Cells

Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Low N		High N		T =	Dm =
				Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.5	8.25	33.02	0.25	6.41304341	52.9076	6.413043	52.9076	33	0.250

Sc low = 0.0039 Sc high = 0.0039

s<sub>c</sub> = critical slope ft / ft

T = top width of the stream

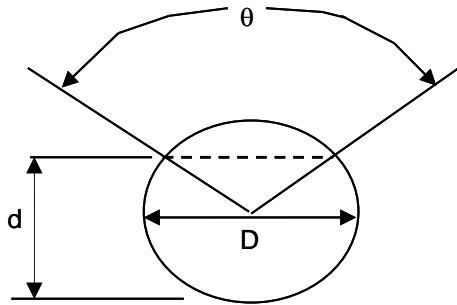
d<sub>m</sub> = a/T = mean depth of flow

.7 Sc	1.3 Sc	.7 Sc	1.3 Sc
0.0027	0.0051	0.0027	0.0051

# MANNING'S EQUATION FOR PIPE FLOW

Project: Platte Self Storage Location: Driveway Culvert (need Q=2 cfs)  
 By: Dane Frank Date: 4/5/2024  
 Chk. By: Date: mdo version 12.8.00

Clear Data  
Entry Cells



Mannings Formula

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

R=A/P  
 A=cross sectional area  
 P=wetted perimeter  
 S=slope of channel  
 n=Manning's roughness coefficient

INPUT

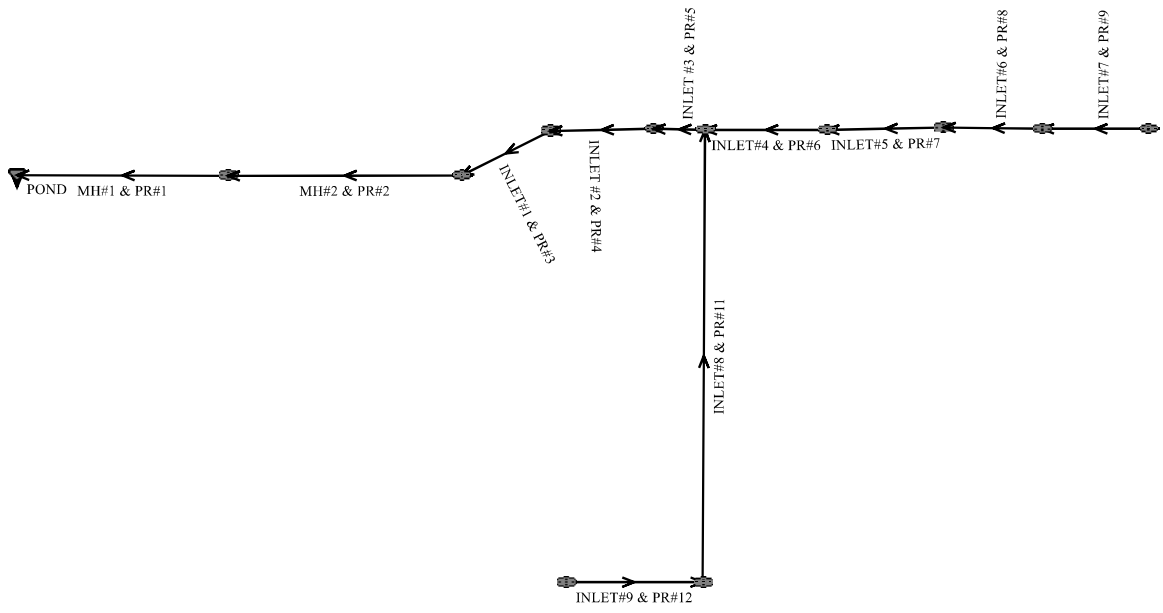
D= 18 inches  
 d= 18 inches  
 n= 0.013 mannings coeff  
 theta= 0.0 degrees  
 S= 0.04 slope in/in

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

$$Q = V \times A$$

Solution to Mannings Equation					Manning's n-values	
Area, ft <sup>2</sup>	Wetted Perimeter, ft	Hydraulic Radius, ft	velocity ft/s	flow, cfs		
1.77	4.71	0.38	11.89	21.01	PVC	0.01
					PE (<9" dia)	0.015
					PE (>12" dia)	0.02
					PE(9-12" dia)	0.017
					CMP	0.025
					ADS N12	0.012
					HCMP	0.023
					Conc	0.013

Created by: Mike O'Shea



<p><b>Program:</b> UDSEWER Math Model Interface 2.1.1.4</p> <p><b>Run Date:</b> 8/14/2024 2:40:30 PM</p>	<h2 style="margin: 0;">UDSewer Results Summary</h2> <p><b>Project Title:</b> 6001 E Platte Storage - 5 Year <b>Project Description:</b> East System</p>
--	---

## System Input Summary

### Rainfall Parameters

**Rainfall Return Period:** 5  
**Rainfall Calculation Method:** Formula

**One Hour Depth (in):** 1.50  
**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):** 300  
**Maximum Urban Overland Len. (ft):** 100  
**Used UDFCD Tc. Maximum:** Yes

### Sizer Constraints

**Minimum Sewer Size (in):** 6.00  
**Maximum Depth to Rise Ratio:** 0.90  
**Maximum Flow Velocity (fps):** 18.0  
**Minimum Flow Velocity (fps):** 3.0

### Backwater Calculations:

**Tailwater Elevation (ft):** 6208.12

## 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)
POND	6211.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH#1 & PR#1	6220.00	59.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MH#2 & PR#2	6223.50	59.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#1 & PR#3	6233.50	59.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #2 & PR#4	6234.00	18.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #3 & PR#5	6234.40	18.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#8 & PR#11	6237.45	11.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#9 & PR#12	6236.85	11.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#4 & PR#6	6235.60	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#5 & PR#7	6236.80	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#6 & PR#8	6238.10	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#7 & PR#9	6239.30	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#10 & PR#10	6239.85	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TRENCH & PR#13	6240.35	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

### Manhole Output Summary:

Element Name	Local Contribution					Total Design Flow				Comment
	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)	
POND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59.60	
MH#1 & PR#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59.60	
MH#2 & PR#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59.60	
INLET#1 & PR#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59.60	
INLET #2 & PR#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.30	
INLET #3 & PR#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.30	
INLET#8 & PR#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.80	
INLET#9 & PR#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.80	
INLET#4 & PR#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.40	
INLET#5 & PR#7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.40	
INLET#6 & PR#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.40	
INLET#7 & PR#9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.40	
INLET#10 & PR#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.40	
TRENCH & PR#13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.40	

### Sewer Input Summary:

Element Name	Sewer Length (ft)	Elevation			Loss Coefficients			Given Dimensions		
		Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
MH#1 & PR#1	29.50	6204.99	2.7	6205.80	0.013	0.03	0.00	CIRCULAR	48.00 in	48.00 in
MH#2 & PR#2	222.50	6211.01	2.2	6216.00	0.013	0.05	0.00	CIRCULAR	48.00 in	48.00 in
INLET#1 & PR#3	45.00	6216.81	2.2	6217.80	0.013	0.24	0.00	CIRCULAR	42.00 in	42.00 in
INLET #2 & PR#4	24.00	6225.49	1.7	6225.90	0.013	0.24	0.00	CIRCULAR	42.00 in	42.00 in
INLET #3 & PR#5	7.00	6226.00	2.1	6226.15	0.013	0.05	0.00	CIRCULAR	42.00 in	42.00 in
INLET#8 & PR#11	352.00	6227.73	1.0	6231.25	0.013	1.00	0.25	CIRCULAR	36.00 in	36.00 in
INLET#9 & PR#12	31.00	6231.54	1.0	6231.85	0.013	1.00	0.00	CIRCULAR	36.00 in	36.00 in
INLET#4 & PR#6	47.00	6228.15	5.0	6230.50	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#5 & PR#7	57.00	6230.62	1.9	6231.70	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#6 & PR#8	62.00	6231.82	1.9	6233.00	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#7 & PR#9	57.00	6233.62	1.9	6234.70	0.013	0.05	0.00	CIRCULAR	24.00 in	24.00 in
INLET#10 & PR#10	24.00	6234.99	1.7	6235.40	0.013	0.11	0.00	CIRCULAR	24.00 in	24.00 in
TRENCH & PR#13	32.00	6235.69	1.9	6236.30	0.013	0.11	0.00	CIRCULAR	24.00 in	24.00 in

### Sewer Flow Summary:

Element Name	Full Flow Capacity		Critical Flow		Normal Flow				Flow (cfs)	Surcharged Length (ft)	Comment
	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition			
MH#1 & PR#1	238.60	18.99	27.91	7.86	16.35	15.78	2.79	Supercritical	59.60	0.00	
MH#2 & PR#2	215.70	17.16	27.91	7.86	17.25	14.67	2.51	Supercritical	59.60	0.00	
INLET#1 & PR#3	149.63	15.55	29.02	8.40	18.43	14.67	2.39	Supercritical	59.60	0.00	
INLET #2 & PR#4	131.53	13.67	15.69	5.58	10.58	9.62	2.14	Supercritical	18.30	0.00	
INLET #3 & PR#5	146.19	15.19	15.69	5.58	10.03	10.37	2.38	Supercritical	18.30	0.00	
INLET#8 & PR#11	66.88	9.46	13.08	5.09	10.24	7.13	1.61	Supercritical	11.80	0.00	
INLET#9 & PR#12	66.88	9.46	13.08	5.09	10.24	7.13	1.61	Supercritical	11.80	0.00	
INLET#4 & PR#6	91.96	18.73	10.05	4.44	5.36	10.77	3.41	Supercritical	6.40	0.00	
INLET#5 & PR#7	56.69	11.55	10.05	4.44	6.81	7.65	2.13	Supercritical	6.40	0.00	



INLET#6 & PR#8	56.69	11.55	10.05	4.44	6.81	7.65	2.13	Supercritical	6.40	0.00	
INLET#7 & PR#9	31.27	9.95	10.75	4.70	7.37	7.82	2.07	Supercritical	6.40	0.00	
INLET#10 & PR#10	29.58	9.41	10.75	4.70	7.58	7.52	1.96	Supercritical	6.40	0.00	
TRENCH & PR#13	31.27	9.95	10.75	4.70	7.37	7.82	2.07	Supercritical	6.40	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:

Element Name	Peak Flow (cfs)	Cross Section	Existing		Calculated		Used			Comment
			Rise	Span	Rise	Span	Rise	Span	Area (ft <sup>2</sup> )	
MH#1 & PR#1	59.60	CIRCULAR	48.00 in	48.00 in	30.00 in	30.00 in	48.00 in	48.00 in	12.57	
MH#2 & PR#2	59.60	CIRCULAR	48.00 in	48.00 in	30.00 in	30.00 in	48.00 in	48.00 in	12.57	
INLET#1 & PR#3	59.60	CIRCULAR	42.00 in	42.00 in	30.00 in	30.00 in	42.00 in	42.00 in	9.62	
INLET #2 & PR#4	18.30	CIRCULAR	42.00 in	42.00 in	21.00 in	21.00 in	42.00 in	42.00 in	9.62	
INLET #3 & PR#5	18.30	CIRCULAR	42.00 in	42.00 in	21.00 in	21.00 in	42.00 in	42.00 in	9.62	
INLET#8 & PR#11	11.80	CIRCULAR	36.00 in	36.00 in	21.00 in	21.00 in	36.00 in	36.00 in	7.07	
INLET#9 & PR#12	11.80	CIRCULAR	36.00 in	36.00 in	21.00 in	21.00 in	36.00 in	36.00 in	7.07	
INLET#4 & PR#6	6.40	CIRCULAR	30.00 in	30.00 in	12.00 in	12.00 in	30.00 in	30.00 in	4.91	
INLET#5 & PR#7	6.40	CIRCULAR	30.00 in	30.00 in	15.00 in	15.00 in	30.00 in	30.00 in	4.91	
INLET#6 & PR#8	6.40	CIRCULAR	30.00 in	30.00 in	15.00 in	15.00 in	30.00 in	30.00 in	4.91	
INLET#7 & PR#9	6.40	CIRCULAR	24.00 in	24.00 in	15.00 in	15.00 in	24.00 in	24.00 in	3.14	
INLET#10 & PR#10	6.40	CIRCULAR	24.00 in	24.00 in	15.00 in	15.00 in	24.00 in	24.00 in	3.14	
TRENCH & PR#13	6.40	CIRCULAR	24.00 in	24.00 in	15.00 in	15.00 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 were calculated using the 'Used' parameters.

### Grade Line Summary:

Tailwater Elevation (ft): 6208.12

Element Name	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
	Downstream (ft)	Upstream (ft)	Bend Loss	Lateral Loss	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss	Upstream (ft)

			(ft)	(ft)				(ft)	
MH#1 & PR#1	6204.99	6205.80	0.00	0.00	6208.12	6209.87	6210.22	0.00	6210.22
MH#2 & PR#2	6211.01	6216.00	0.02	0.00	6212.45	6218.33	6215.79	3.50	6219.29
INLET#1 & PR#3	6216.81	6217.80	0.14	0.00	6218.47	6221.05	6221.69	0.00	6221.69
INLET #2 & PR#4	6225.49	6225.90	0.01	0.00	6226.49	6227.21	6227.50	0.19	6227.69
INLET #3 & PR#5	6226.00	6226.15	0.00	0.00	6227.21	6228.39	6228.51	0.00	6228.51
INLET#8 & PR#11	6227.73	6231.25	0.04	0.05	6228.58	6232.34	6229.37	3.37	6232.74
INLET#9 & PR#12	6231.54	6231.85	0.04	0.00	6232.39	6232.94	6233.18	0.16	6233.34
INLET#4 & PR#6	6228.15	6230.50	0.00	0.00	6228.60	6231.34	6230.40	1.25	6231.64
INLET#5 & PR#7	6230.62	6231.70	0.00	0.00	6231.34	6232.54	6232.09	0.75	6232.84
INLET#6 & PR#8	6231.82	6233.00	0.00	0.00	6232.54	6233.84	6233.30	0.85	6234.14
INLET#7 & PR#9	6233.62	6234.70	0.00	0.00	6234.23	6235.60	6235.18	0.76	6235.94
INLET#10 & PR#10	6234.99	6235.40	0.01	0.00	6235.62	6236.30	6236.50	0.14	6236.64
TRENCH & PR#13	6235.69	6236.30	0.01	0.00	6236.31	6237.20	6237.26	0.28	6237.54

- 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<sub>fi</sub> ^ 2/(2\*g)
- Lateral loss = V<sub>fo</sub> ^ 2/(2\*g)- Junction Loss K \* V<sub>fi</sub> ^ 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 1.00 ft

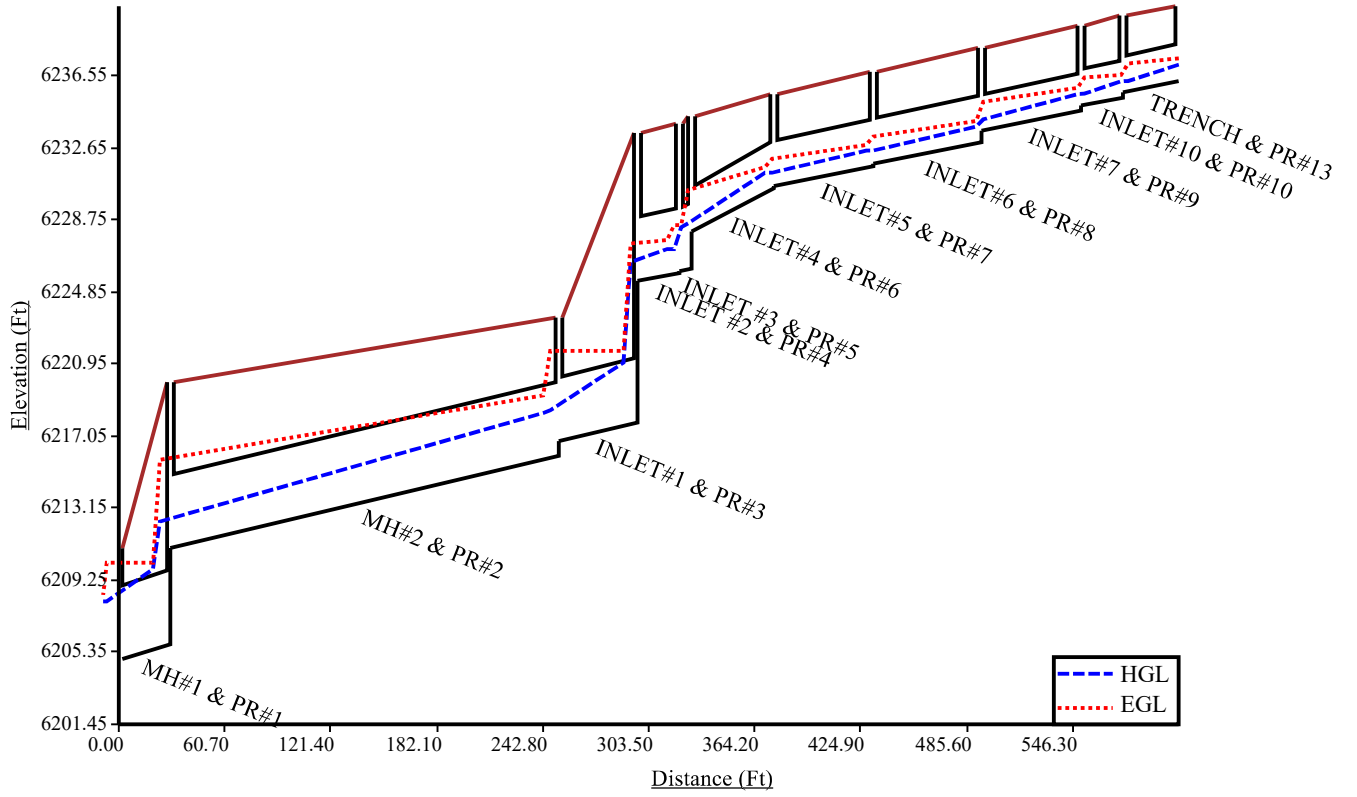
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Downstream			Upstream			Volume (cu. yd)	Comment
					Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)		
MH#1 & PR#1	29.50	5.00	6.00	7.83	9.02	6.93	1.59	25.40	15.12	9.78	136.67	
MH#2 & PR#2	222.50	5.00	6.00	7.83	14.98	9.91	4.57	12.00	8.42	3.08	661.92	
INLET#1 & PR#3	45.00	4.50	6.00	7.25	10.88	7.57	2.82	28.90	16.58	11.83	246.24	
INLET #2 & PR#4	24.00	4.50	6.00	7.25	13.52	8.88	4.13	13.70	8.98	4.23	66.53	
INLET #3 & PR#5	7.00	4.50	6.00	7.25	13.49	8.87	4.12	14.00	9.13	4.38	19.65	
INLET#8 & PR#11	352.00	4.00	6.00	6.67	11.34	7.50	3.34	10.40	7.03	2.87	690.02	

INLET#9 & PR#12	31.00	4.00	6.00	6.67	9.82	6.74	2.58	8.00	5.83	1.67	49.82	
INLET#4 & PR#6	47.00	3.50	6.00	6.08	11.00	7.04	3.46	8.70	5.89	2.31	75.23	
INLET#5 & PR#7	57.00	3.50	6.00	6.08	8.47	5.77	2.19	8.70	5.89	2.31	78.22	
INLET#6 & PR#8	62.00	3.50	6.00	6.08	8.46	5.77	2.19	8.70	5.89	2.31	85.03	
INLET#7 & PR#9	57.00	3.00	4.00	5.50	7.97	5.07	2.23	8.20	5.18	2.35	63.03	
INLET#10 & PR#10	24.00	3.00	4.00	5.50	7.62	4.89	2.06	7.90	5.03	2.20	25.40	
TRENCH & PR#13	32.00	3.00	4.00	5.50	7.32	4.74	1.91	7.10	4.63	1.80	31.42	

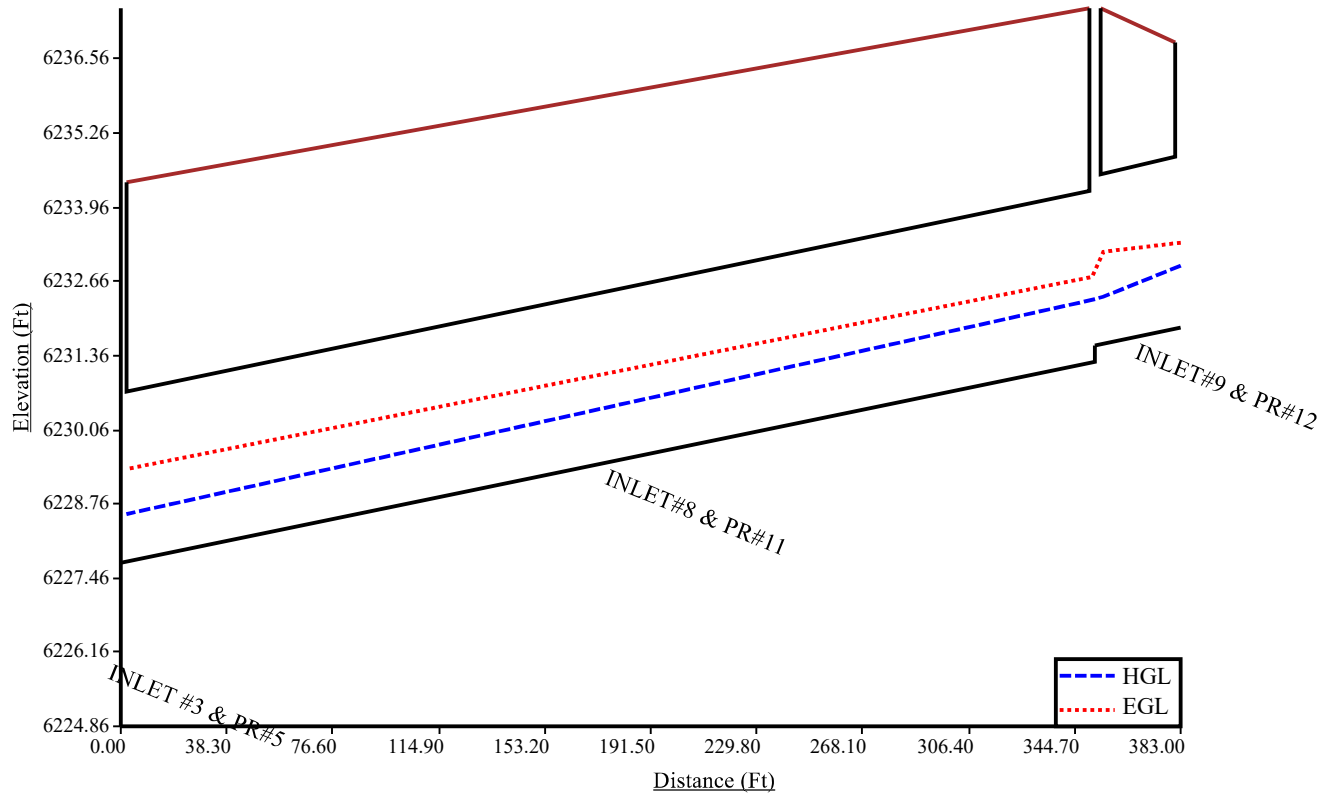
**Total earth volume for sewer trenches = 2229 cubic yards.**

- 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.

# Main Run



# South run



<p><b>Program:</b> UDSEWER Math Model Interface 2.1.1.4</p> <p><b>Run Date:</b> 8/14/2024 2:43:08 PM</p>	<h2 style="margin: 0;">UDSewer Results Summary</h2> <p><b>Project Title:</b> 6001 E Platte Storage - 100 Year <b>Project Description:</b> East System</p>
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## 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):** 300  
**Maximum Urban Overland Len. (ft):** 100  
**Used UDFCD Tc. Maximum:** Yes

### Sizer Constraints

**Minimum Sewer Size (in):** 6.00  
**Maximum Depth to Rise Ratio:** 0.90  
**Maximum Flow Velocity (fps):** 18.0  
**Minimum Flow Velocity (fps):** 3.0

### Backwater Calculations:

**Tailwater Elevation (ft):** 6210.54

## 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)
POND	6211.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH#1 & PR#1	6220.00	142.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MH#2 & PR#2	6223.50	142.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#1 & PR#3	6233.50	142.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #2 & PR#4	6234.00	50.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #3 & PR#5	6234.40	50.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#8 & PR#11	6237.45	32.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#9 & PR#12	6236.85	32.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#4 & PR#6	6235.60	18.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#5 & PR#7	6236.80	18.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#6 & PR#8	6238.10	18.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#7 & PR#9	6239.30	18.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#10 & PR#10	6239.85	18.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TRENCH & PR#13	6240.35	18.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

### Manhole Output Summary:

Element Name	Local Contribution					Total Design Flow				Comment
	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)	
POND	0.00	0.00	0.00	0.00	0.00	12.13	11.72	0.04	142.10	
MH#1 & PR#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	142.10	
MH#2 & PR#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	142.10	
INLET#1 & PR#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	142.10	
INLET #2 & PR#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.30	
INLET #3 & PR#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.30	
INLET#8 & PR#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.20	
INLET#9 & PR#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.20	
INLET#4 & PR#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.10	
INLET#5 & PR#7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.10	
INLET#6 & PR#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.10	
INLET#7 & PR#9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.10	
INLET#10 & PR#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.10	
TRENCH & PR#13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.10	

### Sewer Input Summary:

Element Name	Sewer Length (ft)	Elevation			Loss Coefficients			Given Dimensions		
		Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
MH#1 & PR#1	29.50	6205.00	2.7	6205.80	0.013	0.03	0.00	CIRCULAR	48.00 in	48.00 in
MH#2 & PR#2	222.50	6211.01	2.2	6216.00	0.013	0.05	0.00	CIRCULAR	48.00 in	48.00 in
INLET#1 & PR#3	45.00	6216.81	2.2	6217.80	0.013	0.24	0.00	CIRCULAR	42.00 in	42.00 in
INLET #2 & PR#4	24.00	6225.49	1.7	6225.90	0.013	0.24	0.00	CIRCULAR	42.00 in	42.00 in
INLET #3 & PR#5	7.00	6226.00	2.1	6226.15	0.013	0.05	0.00	CIRCULAR	42.00 in	42.00 in
INLET#8 & PR#11	352.00	6227.73	1.0	6231.25	0.013	1.00	0.25	CIRCULAR	36.00 in	36.00 in
INLET#9 & PR#12	31.00	6231.54	1.0	6231.85	0.013	1.00	0.00	CIRCULAR	36.00 in	36.00 in
INLET#4 & PR#6	47.00	6228.15	5.0	6230.50	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#5 & PR#7	57.00	6230.62	1.9	6231.70	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#6 & PR#8	62.00	6231.82	1.9	6233.00	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#7 & PR#9	57.00	6233.62	1.9	6234.70	0.013	0.05	0.00	CIRCULAR	24.00 in	24.00 in
INLET#10 & PR#10	24.00	6234.99	1.7	6235.40	0.013	0.11	0.00	CIRCULAR	24.00 in	24.00 in
TRENCH & PR#13	32.00	6235.69	1.9	6236.30	0.013	0.11	0.00	CIRCULAR	24.00 in	24.00 in

### Sewer Flow Summary:

Element Name	Full Flow Capacity		Critical Flow		Normal Flow				Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number					
MH#1 & PR#1	237.16	18.87	42.35	12.11	26.77	19.72	2.58	Pressurized	142.10	29.50	Velocity is Too High	
MH#2 & PR#2	215.70	17.16	42.35	12.11	28.43	18.33	2.30	Supercritical	142.10	0.00	Velocity is Too High	
INLET#1 & PR#3	149.63	15.55	40.34	14.97	32.67	17.70	1.88	Supercritical Jump	142.10	14.94		
INLET #2 & PR#4	131.53	13.67	26.60	7.83	18.01	12.76	2.11	Supercritical	50.30	0.00		
INLET #3 & PR#5	146.19	15.19	26.60	7.83	16.99	13.79	2.36	Supercritical	50.30	0.00		
INLET#8 & PR#11	66.88	9.46	22.09	7.08	17.61	9.37	1.54	Supercritical	32.20	0.00		
INLET#9 & PR#12	66.88	9.46	22.09	7.08	17.61	9.37	1.54	Supercritical	32.20	0.00		
INLET#4 & PR#6	91.96	18.73	17.29	6.18	9.02	14.56	3.49	Supercritical	18.10	0.00		
INLET#5 & PR#7	56.69	11.55	17.29	6.18	11.65	10.27	2.13	Supercritical	18.10	0.00		



INLET#6 & PR#8	56.69	11.55	17.29	6.18	11.65	10.27	2.13	Supercritical	18.10	0.00	
INLET#7 & PR#9	31.27	9.95	18.39	7.01	13.11	10.32	1.94	Supercritical	18.10	0.00	
INLET#10 & PR#10	29.58	9.41	18.39	7.01	13.57	9.89	1.81	Supercritical	18.10	0.00	
TRENCH & PR#13	31.27	9.95	18.39	7.01	13.11	10.32	1.94	Supercritical	18.10	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:

Element Name	Peak Flow (cfs)	Cross Section	Existing		Calculated		Used			Comment
			Rise	Span	Rise	Span	Rise	Span	Area (ft <sup>2</sup> )	
MH#1 & PR#1	142.10	CIRCULAR	48.00 in	48.00 in	42.00 in	42.00 in	48.00 in	48.00 in	12.57	
MH#2 & PR#2	142.10	CIRCULAR	48.00 in	48.00 in	42.00 in	42.00 in	48.00 in	48.00 in	12.57	
INLET#1 & PR#3	142.10	CIRCULAR	42.00 in	42.00 in	42.00 in	42.00 in	42.00 in	42.00 in	9.62	
INLET #2 & PR#4	50.30	CIRCULAR	42.00 in	42.00 in	30.00 in	30.00 in	42.00 in	42.00 in	9.62	
INLET #3 & PR#5	50.30	CIRCULAR	42.00 in	42.00 in	30.00 in	30.00 in	42.00 in	42.00 in	9.62	
INLET#8 & PR#11	32.20	CIRCULAR	36.00 in	36.00 in	30.00 in	30.00 in	36.00 in	36.00 in	7.07	
INLET#9 & PR#12	32.20	CIRCULAR	36.00 in	36.00 in	30.00 in	30.00 in	36.00 in	36.00 in	7.07	
INLET#4 & PR#6	18.10	CIRCULAR	30.00 in	30.00 in	18.00 in	18.00 in	30.00 in	30.00 in	4.91	
INLET#5 & PR#7	18.10	CIRCULAR	30.00 in	30.00 in	21.00 in	21.00 in	30.00 in	30.00 in	4.91	
INLET#6 & PR#8	18.10	CIRCULAR	30.00 in	30.00 in	21.00 in	21.00 in	30.00 in	30.00 in	4.91	
INLET#7 & PR#9	18.10	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	
INLET#10 & PR#10	18.10	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	
TRENCH & PR#13	18.10	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 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 were calculated using the 'Used' parameters.

### Grade Line Summary:

Tailwater Elevation (ft): 6210.54

Element Name	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
	Downstream (ft)	Upstream (ft)	Bend Loss	Lateral Loss	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss	Upstream (ft)

			(ft)	(ft)				(ft)	
MH#1 & PR#1	6205.00	6205.80	0.00	0.00	6210.54	6210.83	6212.53	0.29	6212.81
MH#2 & PR#2	6211.01	6216.00	0.10	0.00	6213.38	6219.53	6218.60	3.21	6221.81
INLET#1 & PR#3	6216.81	6217.80	0.81	0.00	6220.34	6221.16	6223.70	0.94	6224.64
INLET #2 & PR#4	6225.49	6225.90	0.10	0.00	6227.28	6228.12	6228.89	0.18	6229.07
INLET #3 & PR#5	6226.00	6226.15	0.02	0.00	6228.14	6229.95	6230.37	0.00	6230.37
INLET#8 & PR#11	6227.73	6231.25	0.32	0.34	6230.71	6233.09	6231.04	2.83	6233.87
INLET#9 & PR#12	6231.54	6231.85	0.32	0.00	6233.41	6233.69	6234.37	0.10	6234.47
INLET#4 & PR#6	6228.15	6230.50	0.01	0.00	6229.96	6231.94	6232.19	0.34	6232.53
INLET#5 & PR#7	6230.62	6231.70	0.01	0.00	6231.95	6233.14	6233.23	0.51	6233.73
INLET#6 & PR#8	6231.82	6233.00	0.01	0.00	6233.15	6234.44	6234.43	0.60	6235.03
INLET#7 & PR#9	6233.62	6234.70	0.03	0.00	6234.71	6236.23	6236.36	0.63	6236.99
INLET#10 & PR#10	6234.99	6235.40	0.06	0.00	6236.29	6236.93	6237.64	0.06	6237.69
TRENCH & PR#13	6235.69	6236.30	0.06	0.00	6236.99	6237.83	6238.44	0.16	6238.59

- 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<sub>fi</sub> ^ 2/(2\*g)
- Lateral loss = V<sub>fo</sub> ^ 2/(2\*g)- Junction Loss K \* V<sub>fi</sub> ^ 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 1.00 ft

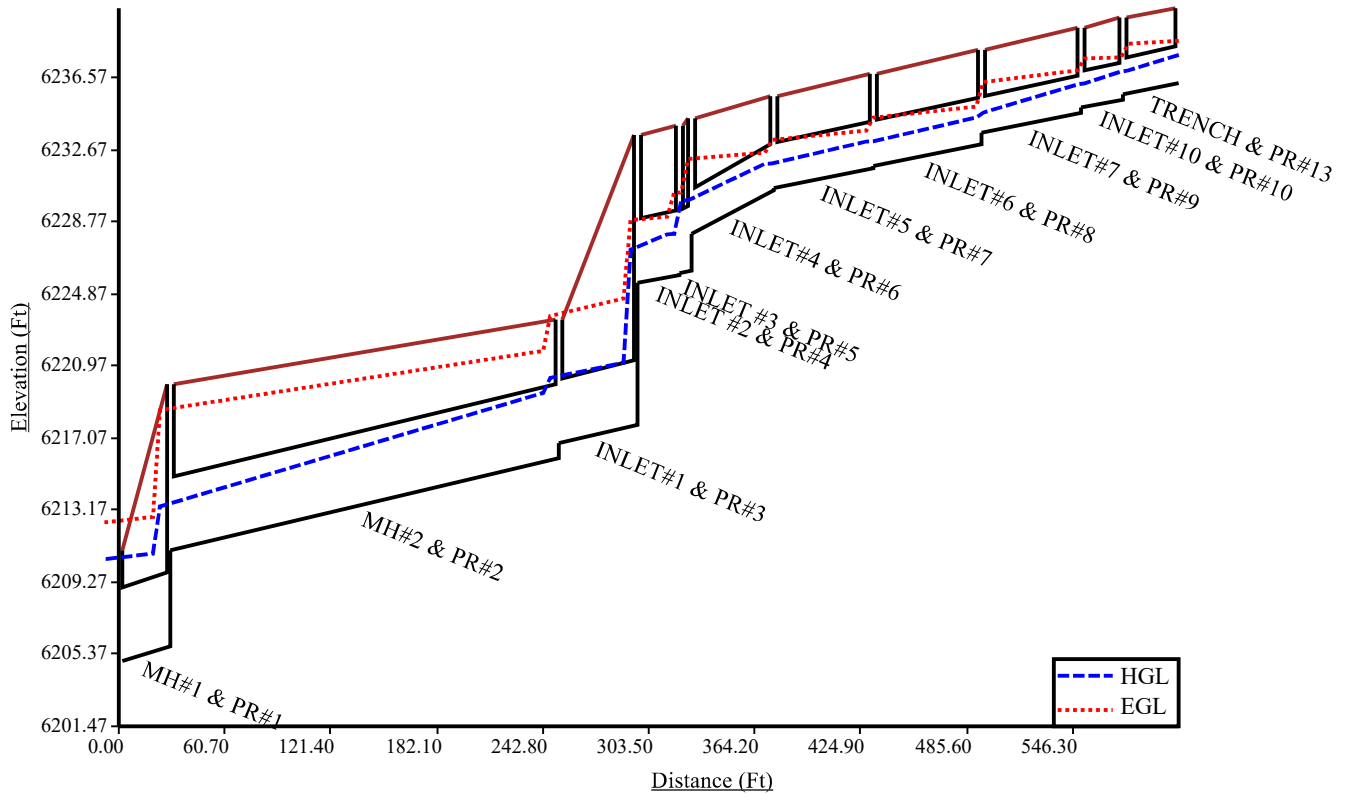
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Downstream			Upstream			Volume (cu. yd)	Comment
					Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)		
MH#1 & PR#1	29.50	5.00	6.00	7.83	9.00	6.92	1.58	25.40	15.12	9.78	136.62	
MH#2 & PR#2	222.50	5.00	6.00	7.83	14.98	9.91	4.57	12.00	8.42	3.08	661.92	
INLET#1 & PR#3	45.00	4.50	6.00	7.25	10.88	7.57	2.82	28.90	16.58	11.83	246.24	
INLET #2 & PR#4	24.00	4.50	6.00	7.25	13.52	8.88	4.13	13.70	8.98	4.23	66.53	
INLET #3 & PR#5	7.00	4.50	6.00	7.25	13.49	8.87	4.12	14.00	9.13	4.38	19.65	
INLET#8 & PR#11	352.00	4.00	6.00	6.67	11.34	7.50	3.34	10.40	7.03	2.87	690.02	

INLET#9 & PR#12	31.00	4.00	6.00	6.67	9.82	6.74	2.58	8.00	5.83	1.67	49.82	
INLET#4 & PR#6	47.00	3.50	6.00	6.08	11.00	7.04	3.46	8.70	5.89	2.31	75.23	
INLET#5 & PR#7	57.00	3.50	6.00	6.08	8.47	5.77	2.19	8.70	5.89	2.31	78.22	
INLET#6 & PR#8	62.00	3.50	6.00	6.08	8.46	5.77	2.19	8.70	5.89	2.31	85.03	
INLET#7 & PR#9	57.00	3.00	4.00	5.50	7.97	5.07	2.23	8.20	5.18	2.35	63.03	
INLET#10 & PR#10	24.00	3.00	4.00	5.50	7.62	4.89	2.06	7.90	5.03	2.20	25.40	
TRENCH & PR#13	32.00	3.00	4.00	5.50	7.32	4.74	1.91	7.10	4.63	1.80	31.42	

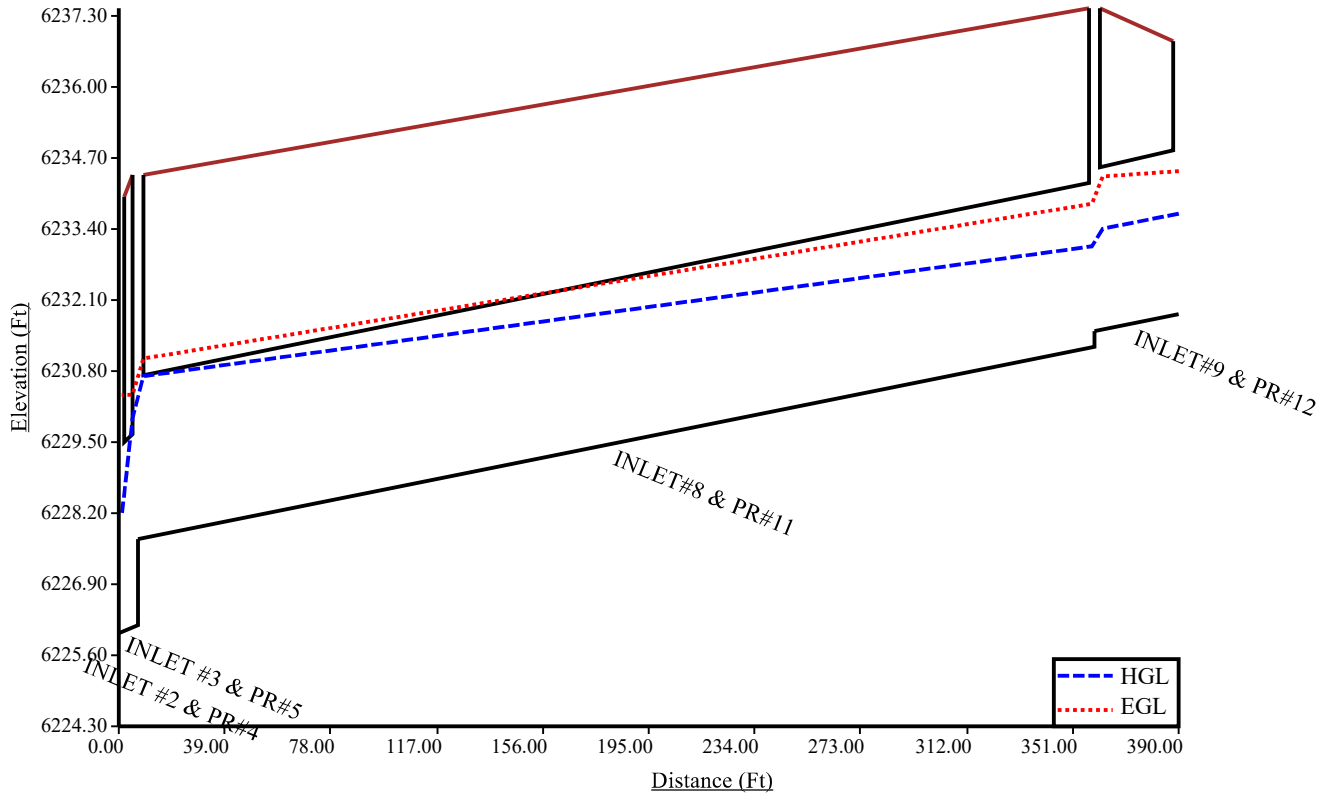
**Total earth volume for sewer trenches = 2229 cubic yards.**

- 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.

main run



# South Run





<p><b>Program:</b> UDSEWER Math Model Interface 2.1.1.4</p> <p><b>Run Date:</b> 8/14/2024 2:47:18 PM</p>	<h2 style="margin: 0;">UDSewer Results Summary</h2> <p><b>Project Title:</b> 6001 E Platte Storage - 5 Year <b>Project Description:</b> Pond Outlet System</p>
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## System Input Summary

### Rainfall Parameters

**Rainfall Return Period:** 5  
**Rainfall Calculation Method:** Formula

**One Hour Depth (in):** 1.50  
**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):** 300  
**Maximum Urban Overland Len. (ft):** 100  
**Used UDFCD Tc. Maximum:** Yes

### Sizer Constraints

**Minimum Sewer Size (in):** 6.00  
**Maximum Depth to Rise Ratio:** 0.90  
**Maximum Flow Velocity (fps):** 18.0  
**Minimum Flow Velocity (fps):** 3.0

### Backwater Calculations:

**Tailwater Elevation (ft):** 0.00

## 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)
STILLING BASIN	6201.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

POND OUTLET & PR#90	6209.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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### Manhole Output Summary:

Element Name	Local Contribution					Total Design Flow				Comment
	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)	
STILLING BASIN	0.00	0.00	0.00	0.00	0.00	0.08	5.96	2.28	0.50	
POND OUTLET & PR#90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	Surface Water Present (Downstream)

### Sewer Input Summary:

Element Name	Sewer Length (ft)	Elevation			Loss Coefficients			Given Dimensions		
		Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
POND OUTLET & PR#90	38.63	6201.00	1.3	6201.50	0.012	0.03	0.00	CIRCULAR	18.00 in	18.00 in

### Sewer Flow Summary:

Element Name	Full Flow Capacity		Critical Flow		Normal Flow				Flow (cfs)	Surcharged Length (ft)	Comment
	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition			
POND OUTLET & PR#90	12.98	7.35	3.14	2.42	2.41	3.54	1.68	Supercritical	0.50	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:

Element Name	Peak Flow (cfs)	Cross Section	Existing		Calculated		Used			Comment
			Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	
POND OUTLET & PR#90	0.50	CIRCULAR	18.00 in	18.00 in	6.00 in	6.00 in	18.00 in	18.00 in	1.77	



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

## Grade Line Summary:

Tailwater Elevation (ft): 0.00

Element Name	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
POND OUTLET & PR#90	6201.00	6201.50	0.00	0.00	6201.20	6201.76	6201.40	0.46	6201.85

- 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<sub>fi</sub> ^ 2 / (2 \* g)
- Lateral loss = V<sub>fo</sub> ^ 2 / (2 \* g) - Junction Loss K \* V<sub>fi</sub> ^ 2 / (2 \* g).
- Friction loss is always Upstream EGL - Downstream EGL.

## Excavation Estimate:

The trench side slope is 1.0 ft/ft

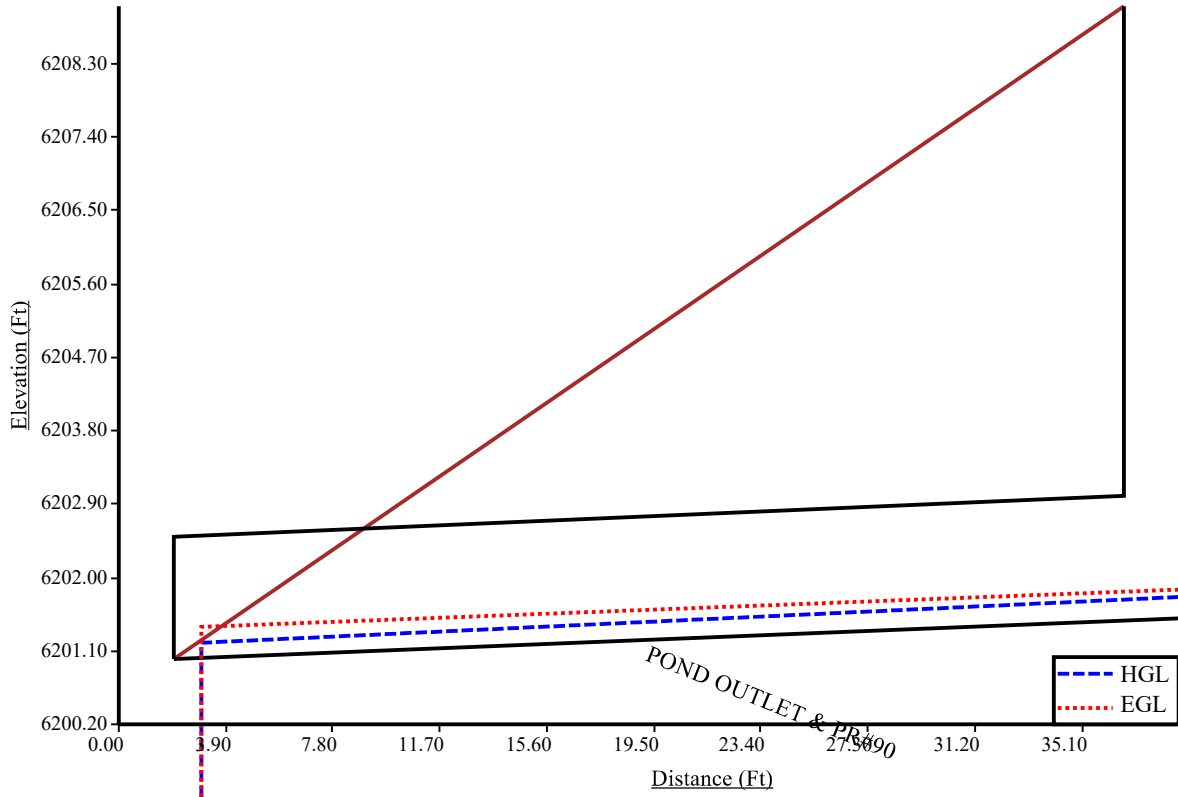
The minimum trench width is 1.00 ft

Element Name	Length (ft)	Wall (in)	Bedding (in)	Downstream				Upstream			Volume (cu. yd)	Comment
				Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)		
POND OUTLET & PR#90	38.63	2.50	4.00	4.92	0.00	0.54	0.00	14.50	8.04	5.79	46.61	Sewer Too Shallow

Total earth volume for sewer trenches = 47 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.

# Pond Outlet



Why do these lines drop off? Verify input information

<p><b>Program:</b> UDSEWER Math Model Interface 2.1.1.4</p> <p><b>Run Date:</b> 8/14/2024 2:48:16 PM</p>	<h2 style="margin: 0;">UDSewer Results Summary</h2> <p><b>Project Title:</b> 6001 E Platte Storage - 100 Year <b>Project Description:</b> Pond Outlet System</p>
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## 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):** 300  
**Maximum Urban Overland Len. (ft):** 100  
**Used UDFCD Tc. Maximum:** Yes

### Sizer Constraints

**Minimum Sewer Size (in):** 6.00  
**Maximum Depth to Rise Ratio:** 0.90  
**Maximum Flow Velocity (fps):** 18.0  
**Minimum Flow Velocity (fps):** 3.0

### Backwater Calculations:

**Tailwater Elevation (ft):** 6201.00

## 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)
STILLING BASIN	6201.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

POND OUTLET & PR#90	6209.00	11.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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### Manhole Output Summary:

Element Name	Local Contribution					Total Design Flow				Comment
	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)	
STILLING BASIN	0.00	0.00	0.00	0.00	0.00	0.97	11.66	0.10	11.30	
POND OUTLET & PR#90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.30	Surface Water Present (Downstream)

### Sewer Input Summary:

Element Name	Sewer Length (ft)	Elevation			Loss Coefficients			Given Dimensions		
		Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
POND OUTLET & PR#90	38.63	6201.00	1.3	6201.50	0.012	0.03	0.00	CIRCULAR	18.00 in	18.00 in

### Sewer Flow Summary:

Element Name	Full Flow Capacity		Critical Flow		Normal Flow				Flow (cfs)	Surcharged Length (ft)	Comment
	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition			
POND OUTLET & PR#90	12.98	7.35	15.41	7.02	12.99	8.28	1.45	Supercritical	11.30	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:

Element Name	Peak Flow (cfs)	Cross Section	Existing		Calculated		Used			Comment
			Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	
POND OUTLET & PR#90	11.30	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

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

## Grade Line Summary:

Tailwater Elevation (ft): 6201.00

Element Name	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
POND OUTLET & PR#90	6201.00	6201.50	0.00	0.00	6202.08	6202.78	6203.15	0.40	6203.55

- 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

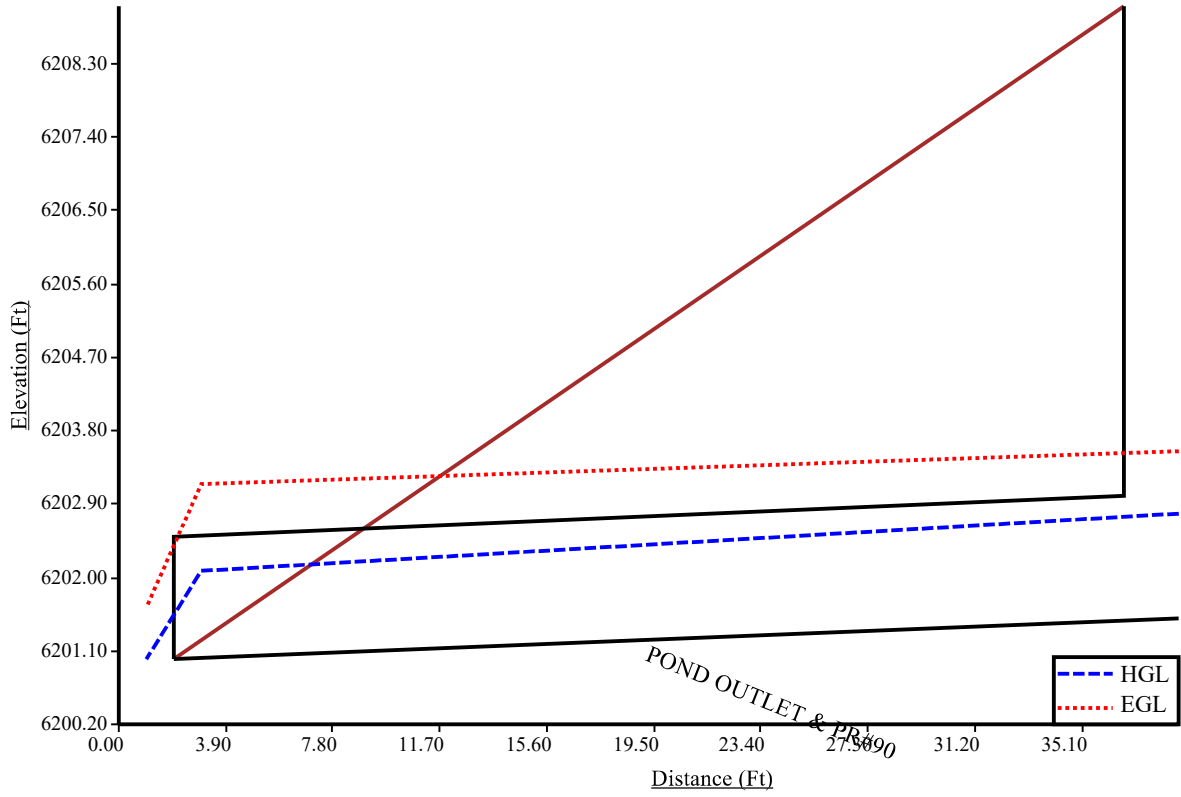
The minimum trench width is 1.00 ft

Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Downstream			Upstream			Volume (cu. yd)	Comment
					Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)		
POND OUTLET & PR#90	38.63	2.50	4.00	4.92	0.00	0.54	0.00	14.50	8.04	5.79	46.61	Sewer Too Shallow

Total earth volume for sewer trenches = 47 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:  $(\text{equivalent diameter in inches} / 12) + 1$  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.

# Pond Outlet



## **DETENTION CALCULATIONS**

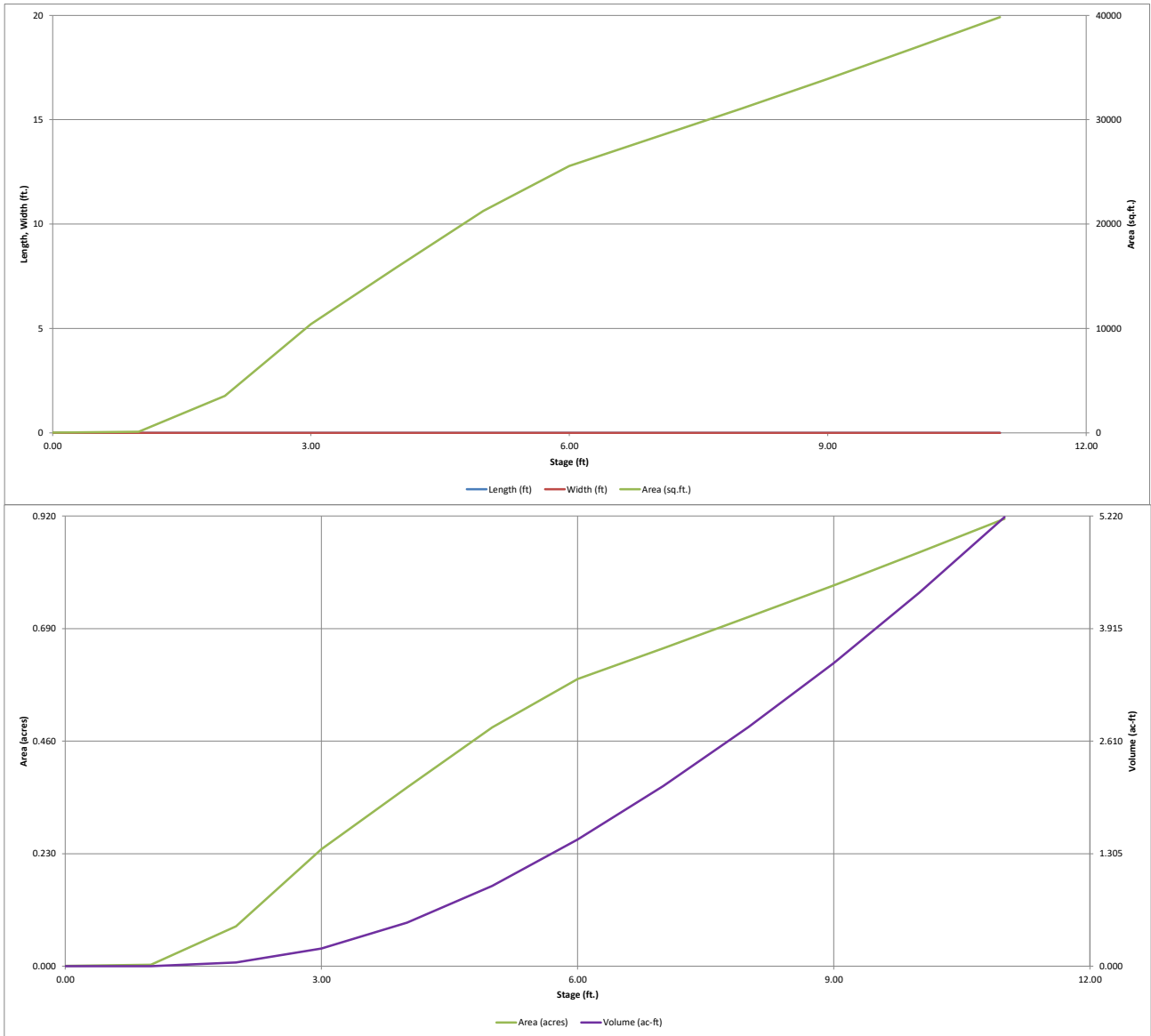
Provide spillway riprap sizing calcs





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

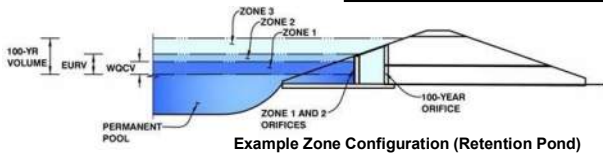
*MHFD-Detention, Version 4.04 (February 2021)*



# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

**Project:** Platte Self Storage  
**Basin ID:** Private EDB Pond 1



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.05	0.523	Orifice Plate
Zone 2 (EURV)	6.24	1.091	Orifice Plate
Zone 3 (100-year)	7.84	1.044	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>2.657</b>	

**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 Diameter =  inches

Calculated Parameters for Underdrain  
 Underdrain Orifice Area =  ft<sup>2</sup>  
 Underdrain Orifice Centroid =  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 =  ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Orifice Plate =  ft (relative to basin bottom at Stage = 0 ft)  
 Orifice Plate: Orifice Vertical Spacing =  inches  
 Orifice Plate: Orifice Area per Row =  inches

Calculated Parameters for Plate  
 WQ Orifice Area per Row =  ft<sup>2</sup>  
 Elliptical Half-Width =  feet  
 Elliptical Slot Centroid =  feet  
 Elliptical Slot Area =  ft<sup>2</sup>

**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	1.70	3.40	4.10				
Orifice Area (sq. inches)	1.64	1.64	1.50	3.00				
	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 <sup>2</sup>
Vertical Orifice Centroid =	N/A	N/A	feet

**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	
Overflow Weir Front Edge Height, Ho =	8.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Close Mesh Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir  

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H <sub>u</sub> =	8.00	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	10.11	N/A	
Overflow Grate Open Area w/o Debris =	12.66	N/A	ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	6.33	N/A	ft <sup>2</sup>

**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 =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	12.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate  

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.25	N/A	ft <sup>2</sup>
Outlet Orifice Centroid =	0.56	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.91	N/A	radians

**User Input:** Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway  
 Spillway Design Flow Depth =  feet  
 Stage at Top of Freeboard =  feet  
 Basin Area at Top of Freeboard =  acres  
 Basin Volume at Top of Freeboard =  acre-ft

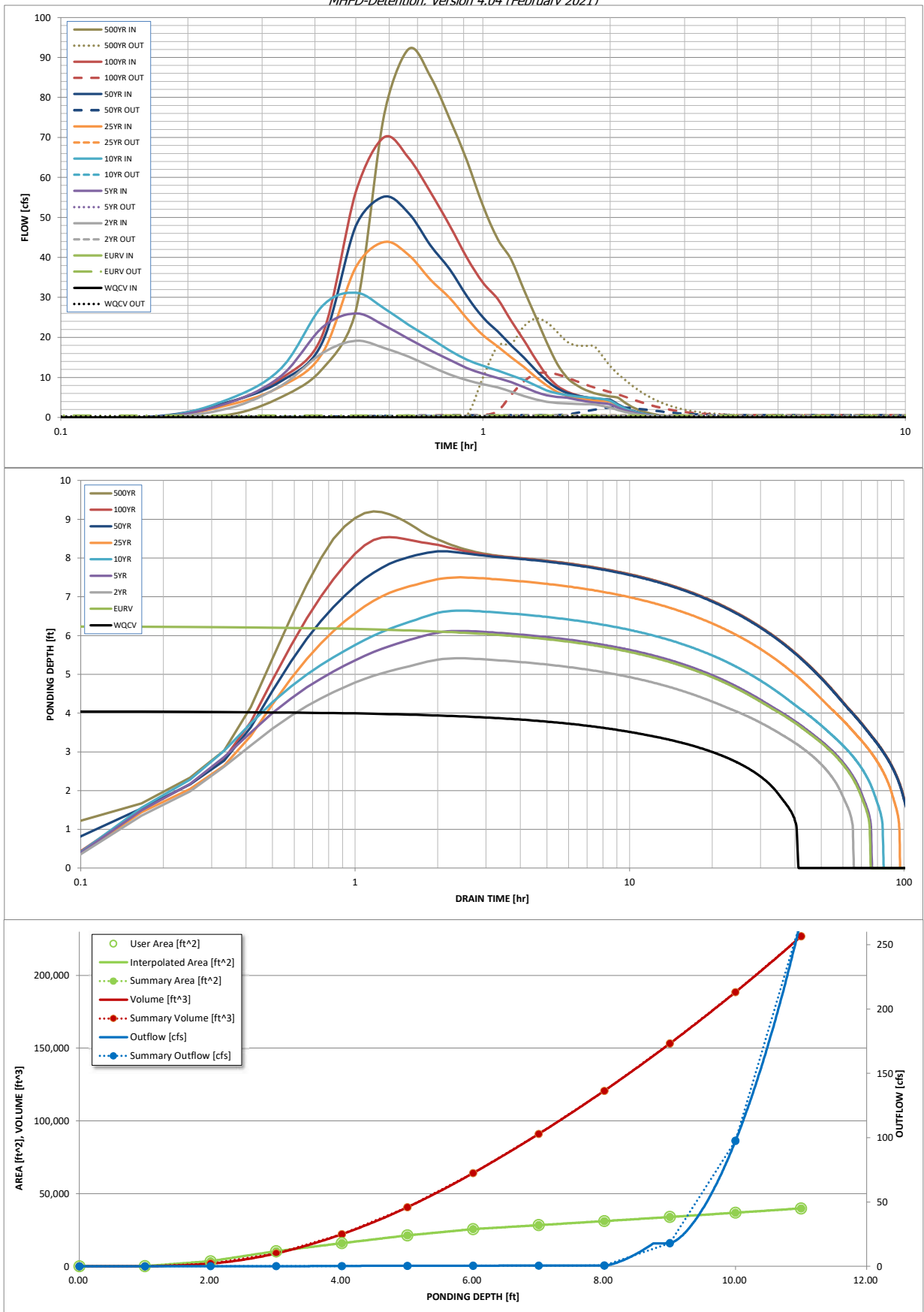
## Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
One-Hour Rainfall Depth (in) =			1.211	1.620	1.947	2.517	3.072	3.789	4.970
CUHP Runoff Volume (acre-ft) =	0.523	1.613	1.211	1.620	1.947	2.517	3.072	3.789	4.970
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.211	1.620	1.947	2.517	3.072	3.789	4.970
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.6	0.8	7.3	14.6	23.9	38.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.02	0.22	0.44	0.72	1.16
Peak Inflow Q (cfs) =	N/A	N/A	19.2	26.0	31.2	43.9	55.2	70.0	92.1
Peak Outflow Q (cfs) =	0.2	0.5	0.4	0.5	0.5	0.6	2.6	11.3	24.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.6	0.1	0.2	0.5	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.2	0.8	1.4
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	68	60	69	76	87	93	92	89
Time to Drain 99% of Inflow Volume (hours) =	<b>40</b>	72	63	73	81	92	100	99	98
Maximum Ponding Depth (ft) =	4.05	6.24	5.41	6.12	6.64	7.50	8.18	8.54	9.20
Area at Maximum Ponding Depth (acres) =	0.37	0.60	0.53	0.59	0.63	0.68	0.72	0.75	0.79
Maximum Volume Stored (acre-ft) =	0.525	1.614	1.142	1.536	1.859	2.415	2.893	3.166	3.674

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*



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: \_\_\_\_\_

## Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	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]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.03	0.66
	0:15:00	0.00	0.00	2.27	3.69	4.60	3.10	3.88	3.81	5.09
	0:20:00	0.00	0.00	8.02	10.49	12.38	7.83	9.14	9.83	12.14
	0:25:00	0.00	0.00	16.13	22.55	27.91	16.07	18.80	20.60	26.68
	0:30:00	0.00	0.00	19.18	26.02	31.21	37.55	47.86	56.38	75.62
	0:35:00	0.00	0.00	17.36	23.00	27.26	43.88	55.22	70.03	92.12
	0:40:00	0.00	0.00	15.18	19.64	23.14	40.61	51.10	64.86	85.34
	0:45:00	0.00	0.00	12.77	16.77	19.82	34.47	43.10	56.39	74.76
	0:50:00	0.00	0.00	10.79	14.42	16.76	29.92	37.10	48.05	64.17
	0:55:00	0.00	0.00	9.29	12.33	14.41	24.68	30.26	39.87	52.86
	1:00:00	0.00	0.00	8.30	10.93	12.92	20.54	24.98	33.66	44.60
	1:05:00	0.00	0.00	7.52	9.85	11.70	17.75	21.50	29.62	39.47
	1:10:00	0.00	0.00	6.41	8.81	10.51	15.03	18.05	24.14	31.88
	1:15:00	0.00	0.00	5.37	7.57	9.36	12.61	14.98	19.30	25.17
	1:20:00	0.00	0.00	4.51	6.37	8.01	10.11	11.85	14.55	18.75
	1:25:00	0.00	0.00	3.93	5.55	6.76	8.01	9.20	10.53	13.35
	1:30:00	0.00	0.00	3.62	5.13	6.04	6.37	7.25	7.90	9.93
	1:35:00	0.00	0.00	3.47	4.91	5.59	5.42	6.13	6.45	8.03
	1:40:00	0.00	0.00	3.38	4.42	5.26	4.86	5.48	5.59	6.86
	1:45:00	0.00	0.00	3.32	4.03	5.03	4.48	5.05	5.02	6.10
	1:50:00	0.00	0.00	3.27	3.75	4.86	4.24	4.77	4.64	5.58
	1:55:00	0.00	0.00	2.86	3.54	4.63	4.07	4.57	4.36	5.21
	2:00:00	0.00	0.00	2.52	3.28	4.21	3.95	4.44	4.19	4.98
	2:05:00	0.00	0.00	1.89	2.47	3.14	2.97	3.33	3.13	3.71
	2:10:00	0.00	0.00	1.38	1.79	2.27	2.14	2.40	2.26	2.67
	2:15:00	0.00	0.00	1.00	1.30	1.64	1.55	1.73	1.64	1.94
	2:20:00	0.00	0.00	0.72	0.93	1.18	1.11	1.24	1.18	1.39
	2:25:00	0.00	0.00	0.51	0.64	0.83	0.78	0.87	0.82	0.97
	2:30:00	0.00	0.00	0.35	0.44	0.57	0.54	0.60	0.57	0.67
	2:35:00	0.00	0.00	0.23	0.30	0.39	0.37	0.41	0.39	0.46
	2:40:00	0.00	0.00	0.14	0.19	0.24	0.24	0.26	0.24	0.28
	2:45:00	0.00	0.00	0.07	0.11	0.13	0.13	0.14	0.13	0.15
	2:50:00	0.00	0.00	0.03	0.05	0.05	0.06	0.06	0.05	0.06
	2:55:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





## Forebay Wall Notch

Notch to releae 2% of the undetained 100-year peak discharge.

$$\begin{aligned} 100\text{-y peak discharge} &= \mathbf{23.9} \text{ cfs} \\ 2.0\% &= \mathbf{0.48} \text{ cfs} \end{aligned}$$

The general form of the equation for horizontal crested weirs is  $Q = CLH^{3/2}$  where:

Q = Weir flow discharge (cfs)	<b>0.48</b>	
C = Weir flow coefficient	3.4	
H = Depth of flow over the weir (ft)	1.50	Opening Height
L = Length of the weir (ft)	<b>0.08</b>	Length
L = Length of the weir (in)	<b>1</b>	

Minimim notch length is 3" per standards

**Notch to releae 2% of the undetained 100-year peak discharge is 3" wide by 18" high (min allowed)**

**MANNING'S EQUATION for OPEN CHANNEL FLOW**

Project: **Platte Self Storage** Location: **2' TRICKEL CHANNEL**  
 By: **JS** Date: **4/29/2024**  
 Chk By: **DF** Date: **4/29/2024** version 12-2004

Mannings Formula

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

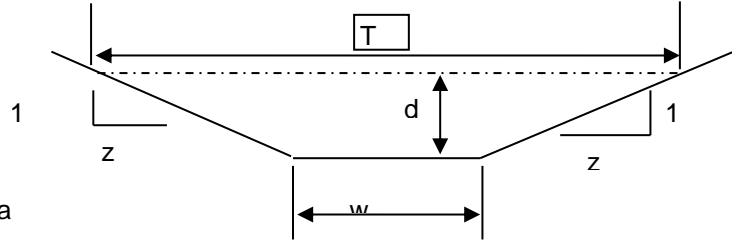
$$R = A/P$$

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



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

$$Q = V \times A$$

INPUT

z (sideslope)= 0  
 z (sideslope)= 0  
 b (btm width, ft)= 2  
 d (depth, ft)= 0.5  
 S (slope, ft/ft) 0.01  
 n low = 0.013  
 n high = 0.013

Clear Data  
Entry Cells

Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Low N		High N		T =	Dm =
				Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.5	1.00	3.00	0.33	5.49513943	5.49514	5.495139	5.49514	2	0.500

Sc low = 0.0053 Sc high = 0.0053

s<sub>c</sub> = critical slope ft / ft

T = top width of the stream

d<sub>m</sub> = a/T = mean depth of flow

.7 Sc	1.3 Sc	.7 Sc	1.3 Sc
0.0037	0.0069	0.0037	0.0069



Unresolved from Submittal 1: We need to know how much of the proposed area of disturbance (not just the impervious surfaces) is treated vs untreated and if there are any exclusions that apply to the untreated areas. So please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PBMP (pond, runoff reduction, etc.) and those disturbed areas that are not treated by a PBMP, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 and exclusions listed in ECM App I.7.1.B.#). An accompanying summary table on this map would also be very helpful (example provided):

### DRAINAGE MAPS

Water Quality Treatment Summary Table							
Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Trib to Pond A (ac)	Disturbed Area Treated via Runoff Reduction (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.C.1 (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.B.# (ac)	Applicable WQ Exclusions (App I.7.1.B.#)
A	4.50	4.50	4.50				
B	1.25	1.25		1.25			
C	6.00	4.00				4.00	ECM App I.7.1.B.5
D	2.50	2.50	1.00		0.50	1.00	ECM App I.7.1.B.7
E	3.00		3.00				
F	8.25						
<b>Total</b>	<b>25.50</b>	<b>12.25</b>	<b>8.50</b>	<b>1.25</b>	<b>0.50</b>	<b>5.00</b>	
Comments		[For each row, the sum of the values in Columns 4-7 must be greater than or equal to the value in Column 3 above.]	[Values in this column can be more than Column 3 if over-treating non-disturbed areas of the same land-use.]	[See RR calc spreadsheet.]	[Total must be <20% of site and <1ac.]		
		<b>Total Proposed Disturbed Area (ac)</b>	<b>Total Proposed Treated Area (ac)</b>		<b>Total Proposed Disturbed Area Excluded from WQ (ac)</b>		<b>Minimum Area to be Treated (ac)</b>
		12.25	9.75		5.50		6.75

# PLATTE SELF STORAGE

## SITE DEVELOPMENT PLAN

### EXISTING DRAINAGE MAP

#### AUGUST 2024

#### LEGEND

- BASIN DESIGNATION  
AREA IN BASIN (AC)  
PERCENT IMPERVIOUS
- DESIGN POINT
- BASIN BOUNDARY
- EXISTING 1' CONTOUR
- GROUND SURFACE FLOW DIRECTION
- ROAD AND DITCH FLOW DIRECTION
- TIME OF CONCENTRATION PATH

#### NOTES

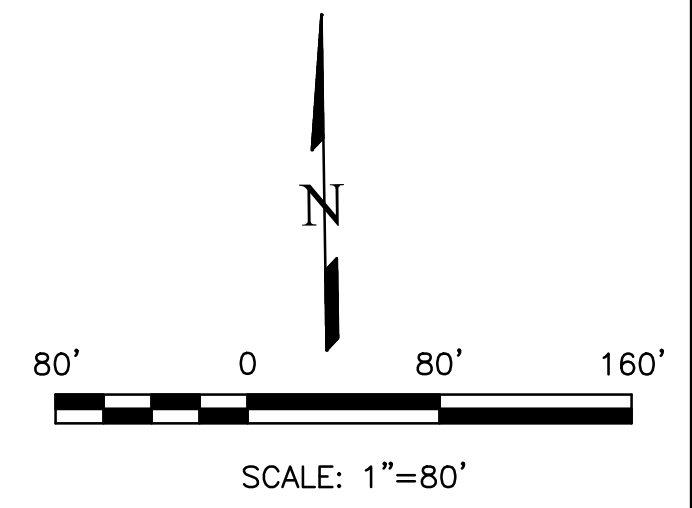
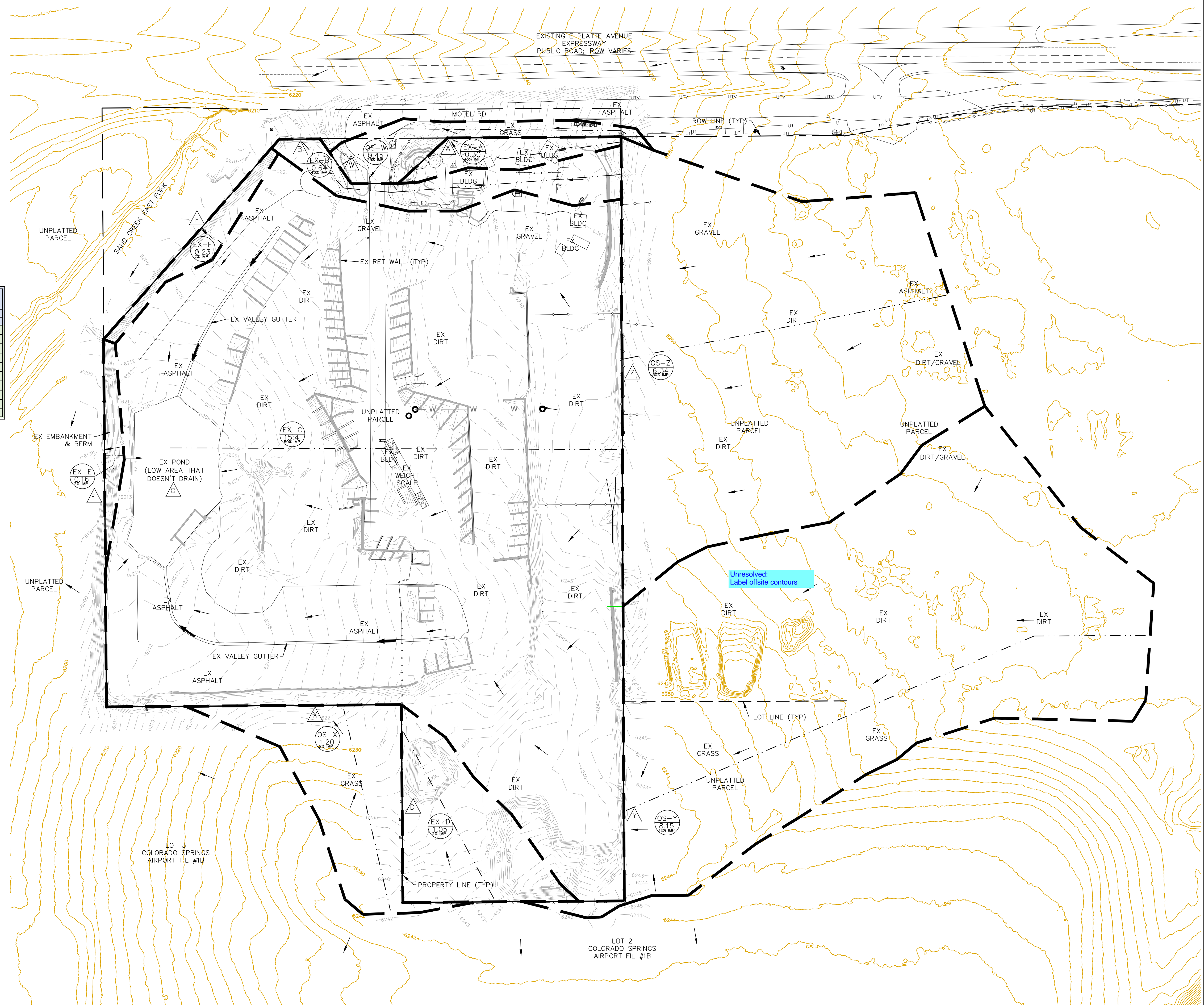
1. BROWN GROUND SURFACE CONTOURS ARE LIDAR DATA DOWNLOADED FROM THE COLORADO HAZARD MAPPING & RISK MAP PORTAL, DATA SET: 2018 3DEP EAST CO EL PASO. THIS DATA IS APPROXIMATE. LIDAR DATA IS FROM 2018 AND AT 2' INTERVALS.
2. THE EXISTING SITE IS A LANDSCAPING MATERIALS YARD. GROUND SURFACES ARE DIRT, GRAVEL, AND ASPHALT. THE EDGE OF ASPHALT IS OFTEN COVERED BY DIRT/GRAVEL AND IT'S EXTENTS ARE ONLY ROUGHLY KNOWN.

#### BASIN SUMMARY

BASIN	AREA TOTAL		WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				TC	INTENSITY	TOTAL FLOWS	
	CS	C100	CS	C100	Length	Slope	Tt	Length	Slope	Velocity	Tt	TOTAL			IS	T100
OS-Z	6.34	0.33	0.53	0.33	300	0.02	19.2	230	2.0%	1.4	2.7	22.0	2.9	4.9	6.1	16.7
OS-Y	8.15	0.16	0.41	0.16	300	0.03	20.4	505	3.0%	1.7	4.9	25.3	2.7	4.6	3.6	15.4
OS-X	1.20	0.09	0.36	0.09	300	0.05	18.5	0	5.0%	2.2	0.0	18.5	3.2	5.4	0.4	2.3
OS-W	0.45	0.28	0.50	0.28	300	0.07	13.5	160	7.0%	2.6	1.0	14.5	3.6	6.0	0.5	1.3
EX-A	0.30	0.22	0.45	0.22	300	0.07	14.5	0	7.0%	2.6	0.0	14.5	3.6	6.0	0.2	0.8
EX-B	0.64	0.45	0.63	0.45	300	0.07	10.7	250	7.0%	2.6	1.6	12.2	3.8	6.4	1.1	2.6
EX-C	15.4	0.49	0.66	0.49	300	0.07	10.0	330	7.0%	2.6	2.1	12.1	3.8	6.4	29.0	65.0
EX-D	1.05	0.10	0.36	0.10	300	0.03	21.9	40	3.0%	1.7	0.4	22.2	2.9	4.9	0.3	1.9
EX-E	0.16	0.08	0.35	0.08	30	0.40	3.0	0	40.0%	6.3	0.0	5.0	5.2	8.7	0.1	0.5
EX-F	0.23	0.08	0.35	0.08	35	0.24	3.8	0	24.0%	4.9	0.0	5.0	5.2	8.7	0.1	0.7

#### DESIGN POINT SUMMARY

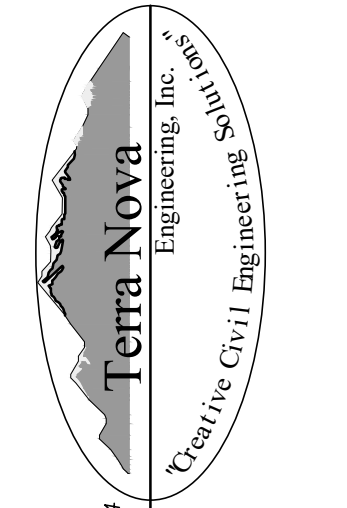
Design Point(s)	Contributing Basins	Area (ac)	Flow (cfs)	
			Q5	Q100
Z	OS-Z	6.34	6.1	16.7
Y	OS-Y	8.15	3.6	15.4
X	OS-X & DP D	2.25	0.7	4.2
W	OS-W & DP A	0.75	0.7	2.2
A	EX-A	0.30	0.2	0.8
B	EX-B & DP W	1.39	1.8	4.7
C	EX-C, DP D, DP X, & DP Y	26.85	33.6	86.5
D	EX-D	1.05	0.3	1.9
E	EX-E	0.16	0.1	0.5
F	EX-F	0.23	0.1	0.7



REVISIONS	NO.	DESCRIPTION	DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE RELEVANT AGENCIES, THE TERRA NOVA ENGINEERING, INC. APPROVES THEIR USE ONLY FOR THE PROJECT AND FOR THE PURPOSES AUTHORIZED BY WRITTEN AUTHORIZATION.

PREPARED FOR:  
**RMG-ROCKY MOUNTAIN GROUP**  
ATTN:  
5085 LIST DR, #200  
COLORADO SPRINGS, CO 80919  
719.548.0600



721 S. 23RD STREET  
COLORADO SPRINGS, CO 80904  
OFFICE: 719-635-6422  
FAX: 719-635-6426  
www.tnainc.com

PLATTE SELF STORAGE

EXISTING DRAINAGE MAP

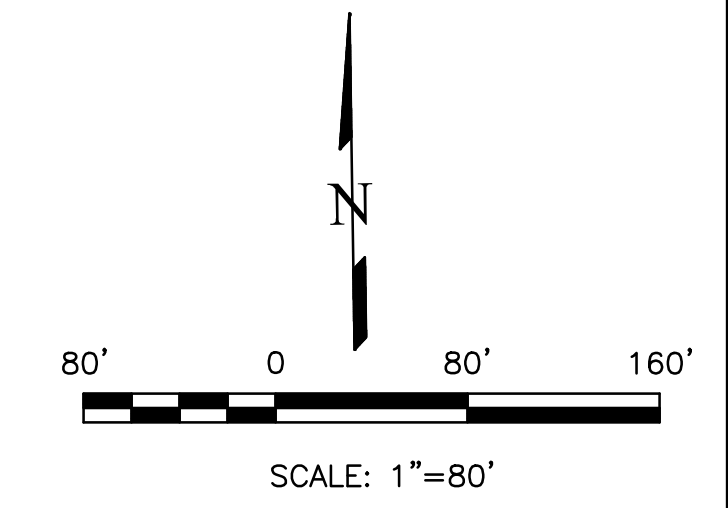
DESIGNED BY DLF  
DRAWN BY DLF  
CHECKED BY LD  
H-SCALE AS SHOWN  
V-SCALE N/A  
JOB NO. 2419.00  
DATE ISSUED 08/14/24  
SHEET NO. 1 OF 3

# PLATTE SELF STORAGE

## SITE DEVELOPMENT PLAN

# PROPOSED DRAINAGE MAP

### AUGUST 2024



#### LEGEND

- BASIN DESIGNATION  
AREA IN BASIN (AC)  
PERCENT IMPERVIOUS
- DESIGN POINT
- BASIN BOUNDARY
- EXISTING 1' CONTOUR
- PROPOSED CONTOURS - 1'
- EXISTING PROPERTY LINE
- PROPOSED FENCE
- PROPOSED RETAINING WALL
- PROPOSED RIPRAP
- GROUND SURFACE FLOW DIRECTION
- ROAD AND DITCH FLOW DIRECTION
- TIME OF CONCENTRATION PATH
- SWALE IDENTIFIER

#### NOTES

1. BROWN GROUND SURFACE CONTOURS ARE LIDAR DATA DOWNLOADED FROM THE COLORADO HAZARD MAPPING & RISK MAP PORTAL, DATA SET: 2018 3DEP EAST CO EL PASO. THIS DATA IS APPROXIMATE. LIDAR DATA IS FROM 2018 AND AT 2' INTERVALS.

Unresolved:  
Provide calculations in appendix for sizing of stilling basin

Unresolved:  
Please show & label all drainage easements.

Unresolved:  
Provide calculation in appendix for swale

Unresolved:  
Provide calculations in appendix for sizing of riprap and length, width, depth of outlet protection

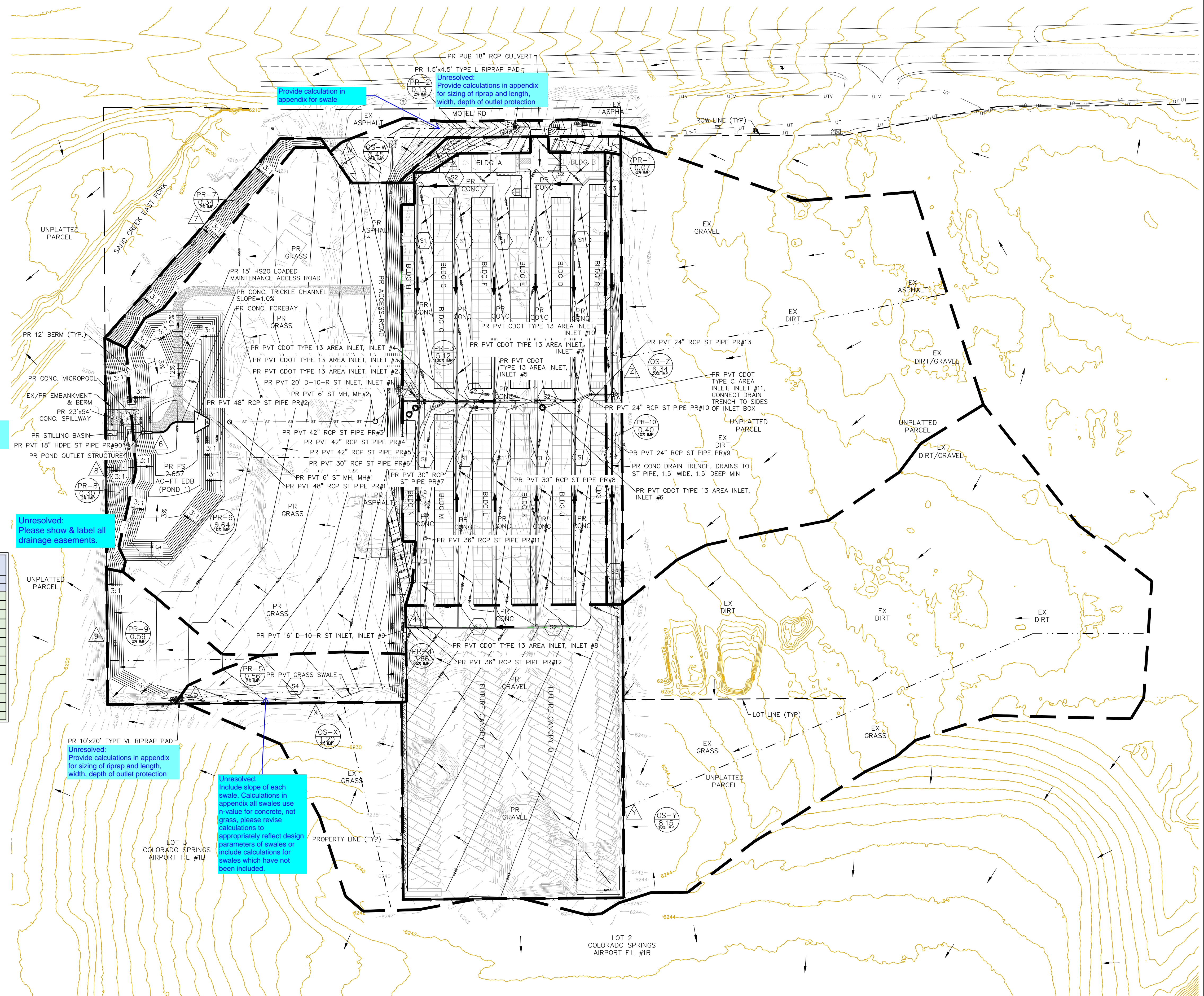
Unresolved:  
Include slope of each swale. Calculations in appendix all swales use n-value for concrete, not grass, please revise calculations to appropriately reflect design parameters of swales or include calculations for swales which have not been included.

#### BASIN SUMMARY

BASIN	AREA TOTAL		WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				TC	INTENSITY	TOTAL FLOWS	
	CS	C100	CS	C100	Length	Slope	Ti	Length	Slope	Velocity	Ti	TOTAL			IS	T100
OS-Z	6.34	0.33	0.53	0.33	300	0.02	19.2	230	2.0%	1.4	2.7	22.0	2.9	4.9	6.1	16.7
OS-Y	8.15	0.16	0.41	0.16	300	0.03	20.4	595	3.0%	1.7	4.9	25.3	2.7	4.6	3.6	15.4
OS-X	1.20	0.09	0.36	0.09	300	0.05	18.5	0	5.0%	2.2	0.0	18.5	3.2	5.4	0.4	2.3
OS-W	0.45	0.28	0.50	0.28	300	0.07	13.5	160	7.0%	2.6	1.0	14.5	3.6	6.0	0.5	1.3
PR-1	0.07	0.08	0.35	0.08	100	0.08	9.3	0	8.0%	2.8	0.0	9.3	4.2	7.1	0.0	0.2
PR-2	0.13	0.08	0.35	0.08	45	0.25	4.3	0	25.0%	5.0	0.0	5.0	5.2	8.7	0.1	0.4
PR-3	5.12	0.90	0.96	0.90	100	0.02	2.9	450	2.0%	2.8	2.7	5.5	5.0	8.4	23.1	41.4
PR-4	3.66	0.61	0.75	0.61	100	0.02	7.0	400	2.0%	1.0	6.7	13.7	3.7	6.1	8.2	16.8
PR-5	0.56	0.09	0.36	0.09	300	0.02	25.0	0	2.0%	1.0	0.0	25.0	2.8	4.6	0.1	0.9
PR-6	6.64	0.16	0.41	0.16	300	0.02	23.3	0	2.0%	1.0	0.0	23.3	2.9	4.8	3.1	13.1
PR-7	0.34	0.10	0.37	0.10	25	0.33	2.8	0	33.0%	4.0	0.0	5.0	5.2	8.7	0.2	1.1
PR-8	0.30	0.11	0.37	0.11	35	0.33	3.3	0	33.0%	4.0	0.0	5.0	5.2	8.7	0.2	1.0
PR-9	0.59	0.09	0.36	0.09	100	0.06	10.1	0	6.0%	1.7	0.0	10.1	4.1	6.9	0.2	1.5
PR-10	0.40	0.16	0.41	0.16	10	0.33	1.7	350	1.0%	2.0	2.9	5.0	5.2	8.7	0.3	1.4

#### DESIGN POINT SUMMARY

Design Point(s)	Contributing Basins	Area (ac)	Flow (cfs)	
			Q5	Q100
1	PR-1	0.07	0.0	0.2
2	PR-2	0.13	0.1	0.4
3	PR-3, DP 4, & DP 10	23.67	41.4	91.7
4	PR-4 & DP Y	11.81	11.8	32.2
5	PR-5 & DP X	1.76	0.5	3.3
6	PR-6 & DP 3	30.31	44.4	104.8
7	PR-7	0.34	0.2	1.1
8	PR-8	0.30	0.2	1.0
9	PR-9	0.59	0.2	1.5
10	PR-10 & DP Z	6.74	6.4	18.1
W	OS-W	0.45	0.5	1.3
X	OS-X	1.20	0.4	2.3
Y	OS-Y	8.15	3.6	15.4
Z	OS-Z	6.34	6.1	16.7



REVISIONS NO. DESCRIPTION  UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE REVIEWING AGENCIES FOR THE TERRA NOVA ENGINEERING, INC. APPROVES THEIR USE ONLY FOR THE PROJECT AND SITE SPECIFICALLY IDENTIFIED BY WRITTEN AUTHORIZATION.	PREPARED FOR: <b>RMG-ROCKY MOUNTAIN GROUP</b> ATTN: 5085 LIST DR, #200 COLORADO SPRINGS, CO 80919 719.548.0600	DESIGNED BY DLF DRAWN BY DLF CHECKED BY LD H-SCALE AS SHOWN V-SCALE N/A JOB NO. 2419.00 DATE ISSUED 08/14/24 SHEET NO. 2 OF 3	721 S. 23RD STREET COLORADO SPRINGS, CO 80904 OFFICE: 719-635-6422 FAX: 719-635-6426 www.tnva.com	Terra Nova Engineering, Inc. Civil Engineering	PLATTE SELF STORAGE PROPOSED DRAINAGE MAP
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