Drainage Reports

3 engineering

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78TH STREET & PRINCESS BOULEVARD APARTMENTS

Preliminary Drainage Report

3 engineering Job #: 1923

October 28, 2020

COS #: 29-DR-2020

Plan #

Case # 29-DR-2020

Q-S #

[X] Accepted

[ ] Corrections

N.Baronas 11/23/2020

Reviewed By Date

29-DR-2020

11/4/2020

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78TH STREET & PRINCESS BOULEVARD APARTMENTS

SCOTTSDALE, AZ 85255

PRELIMINARY DRAINAGE REPORT

Prepared for:

Mark-Taylor, Inc.
6623 N. Scottsdale Road
Scottsdale, Arizona 85250
Contact: Rob Orme
Phone: (480)281-5549

Daniel G. Mann, P.E.

October 28, 2020

Submittal to:
City of Scottsdale
7447 E. Indian School Road, Suite 105
Scottsdale, AZ 85251

Prepared by:
3 engineering, LLC
6370 E. Thomas Road, Suite #200
Scottsdale, Arizona 85251
Contact: Dan G. Mann, P.E.

Job Number 1923

3 engineering
planning civil engineering surveying

Table of Contents

Appendix

1. Introduction

The purpose of this report is to present the existing and proposed drainage plan for the project site, 78th Street & Princess Boulevard Apartments. It is our opinion the proposed grading and drainage concept is in accordance with the City of Scottsdale drainage requirements.

The project site, 78th Street and Princess Boulevard Apartments, is located in the northeast quarter of Section 35, Township 4 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona within the City of Scottsdale. The project is located at the northwest corner of 78th Street and Princess Boulevard, Scottsdale, Arizona 85255. The site is bounded on the north and west by vacant land, on the east by a 78th Street, and on the south by Princess Boulevard. See Appendix A for a vicinity map and Appendix G for offsite aerial photographs.

The existing zoning is P-C. The land is undeveloped. The City of Scottsdale 2001 General Plan shows the site as a Freeway Corridor/Regional Care. The proposed zoning is P-C. The site is a proposed 180-unit apartment complex. The site currently lies within the "Zone X-Shaded" and "Zone AO" floodplain designations.

2. Site Description

Existing

The project site currently consists of vacant, undeveloped land. There are adjacent right-of-way improvements east and south of the site. There is an offsite retention basin along the south end of the site and a linear retention basin directly north of the site. The existing topography of the site generally slopes from north to south at approximately 1.4 percent (1.4%). The site currently does not retain stormwater and discharges flows to the offsite retention along the south end of the site. See Appendix F for an aerial photograph of the site.

Federal Emergency Management Agency (FEMA) Designation

According to FEMA Flood Insurance Rate Map (FIRM) # 04013C1320L, dated October 16, 2013, the site is located within the "Zone X-Shaded" and "Zone AO" floodplain designation.

"Zone X-Shaded" is described as follows:

> "Areas of 0.2% annual chance of flood; areas of 1% annual chance of flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood."

"Zone AO" is described as follows:

> "Special flood hazard areas (SFHAS) subject to inundation by the 1-percent-annual-chance flood. Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined."

Refer to the updated Flood Insurance Rate Map information in Appendix B.

Proposed

The proposed project includes constructing a 180-unit multi-family apartment complex. The site also includes drive aisles, surface parking, garages, drainage facilities, and landscape. See the proposed improvements in the Onsite Drainage Area Map in Appendix H.

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3. ***Drainage Design - Offsite***

The site is protected from offsite flows with existing offsite improvements. The offsite analysis for this site is included in the Final Offsite Improvements Drainage Report for Hayden 50, prepared by Kimley Horn & Associates in December 2018, project no. 191769004, see Appendix L. The report discusses the interim and ultimate conditions for the site plus the area extending north to Mayo Boulevard and east to Hayden Road. Additionally, the site is located within the Master Drainage Report for Crossroads East Planning Unit VII, prepared by Kimley Horn & Associates in August 2018, See Appendix M.

The interim conditions include the development of Mayo Boulevard, 78th Street and Princess Boulevard. The construction for these improvements has been completed at the time of this report. The improvements also include drainage facilities that collect offsite runoff from north of the Loop 101 freeway in surface retention basins that attenuate post-development flows to match pre-development flows. There is an 82,100-c.f. linear surface retention basin north of the proposed site that extends along the entire width of the site. This basin captures all offsite runoff north of the site and conveys it to a 48" storm drain in 78th Street. The retention basin emergency overflow is at the southwest corner of the basin at an elevation of 1572.42. The overflow is conveyed south, within the property west of the site, to the proposed channel along Princess Boulevard. The 48" storm drain outlets to a retention basin at the northeast corner of 78th Street and Princess Boulevard. This basin outlets to a box culvert under 78th Street with an orifice plate. The box culvert outlets to a surface retention basin along the north side Princess Boulevard, south of the proposed site. The basin has a depth of 2.2-ft. The basin extends from 78th Street to Miller Road where it outlets to an existing natural wash north of Princess Boulevard, not exceeding pre-development flows. The wash ultimately conveys flows to the Reach 11 dikes.

The ultimate condition will occur at a future date when the existing wash north of Princess Boulevard, extending from the Miller Road roundabout to Scottsdale Road, is developed and expanded for the additional flows from the proposed improvements. When this occurs, the retention basins south of the site will be converted to a conveyance channel by removing the orifice plates in the box culvert under 78th Street and outlet pipes at the west end of the retention basin. According to the Hayden 50 drainage report, the ultimate discharge in the channel will be 365 cfs adjacent to the site.

There is an existing 50-ft drainage easement along the south end of the site that contains the retention basin/channel. The north 7.5-ft of the of the existing 50-ft easement will be released and the drainage easement will be reduced to 42.5-ft. The proposed site includes a retaining wall that is 44-ft north of the property line and is therefore outside of the proposed drainage easement. Per the Hayden 50 drainage report, the high water of the interim-condition basin is 2.2-ft above the bottom of the basin. Therefore, the high water is approximately 40-ft north of the property line and is contained within the proposed drainage easement. According to the Hayden 50 drainage report, the ultimate flow in the drainage channel is 365 cfs. A HEC-RAS analysis was performed with this flow on the channel, see results in Appendix E. The analysis shows that the water surface elevation is at most 41-ft north of the property line. Based on this information, the ultimate water surface is contained within the proposed drainage easement. See the Drainage Exhibit in Appendix H for high water and water surface lines.

Using ADWR State Standard 5-96, the erosion setback was calculated using setback = 1.0(Q100)^0.5 for straight channels. The erosions setback was determined to be 19.10' from the top of bank of the wash. A minimum erosion setback of 20' was used. There are proposed structures within the setback and are protected with the proposed retaining wall. Based on Arizona Department of Water Resources State Standard 5-96 Level I scour analysis, the scour depth was determined to be 2.35'. The minimum scour depth is 3' based on SSA 5-96. The

proposed retaining wall will be constructed within a portion of the erosion setback. The top of footing for this retaining wall is set a minimum 3' below the adjacent flowline of the wash. See Appendix E for scour calculations.

Hydraulic Parameters

HEC-Ras was used to analyze the existing channel south of the site that will be operational in the ultimate condition. The ultimate flow in the channel used was 365 cfs per the Hayden 50 Drainage Report. See results in Appendix E. The erosion setback was calculated with ADWR State Standard 5-96, and the scour depth was calculated using ADWR State Standard 5-96.

4. ***Drainage Design - Onsite***

The City of Scottsdale Design Standards and Policies Manual and the Drainage Design Manual for Maricopa County, Volume 1 was followed in designing on-site drainage facilities for the site. Refer to the Preliminary Grading and Drainage Plan in Appendix K, the Onsite Drainage Map in Appendix H and Inlet Area Exhibit in Appendix I for the following discussion.

The proposed site is not required to provide retention per the Master Drainage Report for Crossroads East Planning Unit VII, Appendix M. Onsite runoff will be collected in catch basins and underground storm drain pipes that convey flows to the Retention basin/channel north of Princess Boulevard. The retention basin along Princess Boulevard was designed to accommodate the post-development conditions of the site and will limit post-development discharges to match existing pre-development discharges. The site is required to treat the first flush runoff generated on the site prior to discharge. An OldCastle Dual Vortex Separator will be installed at both storm drain outlets. Each unit is sized for the corresponding first flush flow. The first flush flow for the west side of the site is 19.43 cfs and will be treated by a DVS-144C device. The first flush flow for the east side of the site is 7.73 cfs and will be treated by a DVS-96C device. See Appendix J, for stormdrain, catch basin, and Separator sizing calculations.

As previously noted, the site is located in FEMA "Zone AO" floodplain designation. The FEMA Firm map shows that the flood depth is 1-ft, see Appendix B. Per the City of Scottsdale DSPM, section 4-1.102, the lowest finish floor is required to be above the Regulatory Flood Depth (RFD). The RFD is determined as the Highest Adjacent Natural Grade (HAG) + AO depth no. + 1ft of freeboard. Therefore, each building is required to be two feet above the natural adjacent grade. See the Preliminary Grading Plans in Appendix K for a table of Building and HAG elevations. Additionally, the proposed finish floor elevations are greater than 14" above the site outfall of 1566, exceeding the Maricopa County Drainage Standard requirement.

Hydraulic Parameters

For onsite peak flows, the Rational Method will be used as follows:

$$Q = CiA$$

where:

C = Composite runoff coefficient = weighted by ground cover

i = Intensity corresponding to T_c

T_c = Time of concentration (10 minute minimum used)

A = Area in acres

The 100-year runoff coefficient for this development to be used is 0.95 for impervious areas and 0.45 for pervious areas per the Maricopa County Drainage Policies and Standards. The rainfall is based upon the NOAA Atlas 14, Volume 1, Version 5, dated 2011, 90% confidence interval, mean partial duration time series data.

Determination of Catch Basin capacity operating as a weir by using the following formula: $Q=C_w x P x d^{1.5}$ x (1-CF)

*w*here:

C_w = Weir coefficient (3.0)

Q = Discharge Capacity (cfs)
P = Inlet Perimeter
d = Flow depth
CF = Clogging Factor. 40% clogging (or 0.40) used

Please refer to APPENDIX J for catch basin computations.

Bentley Flowmaster V8i was used to calculate the capacity of the M.A.G. type "E" double catch basins at the front entrance on 78th Street for 100-year flows. There is a small bypass for each proposed inlet that is considered negligible. See results in APPENDIX J.

The on-site storm drain pipes are designed to accommodate flows resulting from the 100-year storm event. To calculate the capacity of the storm drain pipes, StormCAD V8i by Bentley Systems, Inc. was used, see results in Appendix J. The 100-year flow calculated for a given drainage area was assigned to the corresponding catch basin. Inlet areas are shown in the Inlet Area Exhibit in Appendix I. The tailwater for each outlet was set at the adjacent water surface elevation of the Princess Boulevard Channel from the HEC-RAS Analysis.

5. ***Special Conditions***

The site contains Jurisdictional 404 washes that have been previously disrupted. The elevations used for the Highest Adjacent Grades are based on 1993 historical contours provided by the City of Scottsdale. The historical elevations are pre-disturbed. A settlement agreement was reached with the Cops of Engineers and a Nationwide Permit Verification Letter was issued on August 2018. See Appendix D for letter.

6. ***Conclusions***

The following is a summary of the Southdale Preliminary Drainage Report.

- The site currently lies within the "Zone X" and "Zone AO" floodplain designation.
- No on-site retention is required for the site.
- The site provides treatment of the first flush storm water.
- The drainage facilities in the off-site improvements route off-site flows around the site.
- The finish floors are safe designed to be a minimum of 2-ft above the highest adjacent natural grade and 14-inches above the site outfall.

7. ***References***

1. City of Scottsdale, *Design Standards and Policies Manual,* 2018.

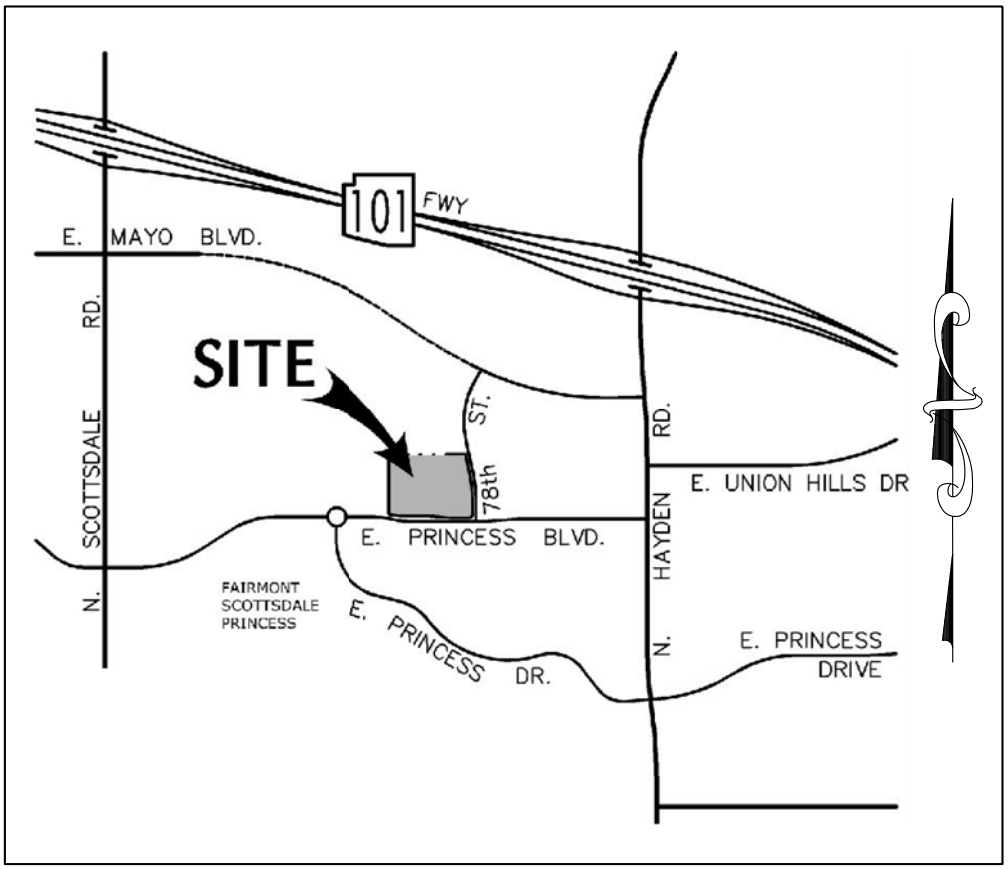
2. Maricopa County, Drainage Policies and Standards, August 2018.

3. Final Offsite Improvements Drainage Report for Hayden 50, Prepared by Kimley Horn & Associates, Project No. 191769004, December 2018.

4. Master Drainage Report for Crossroads East Planning Unit VII, Prepared by Kimley Horn & Associates, Project No. 191769004, August 2018.

APPENDIX A

Vicinity Map

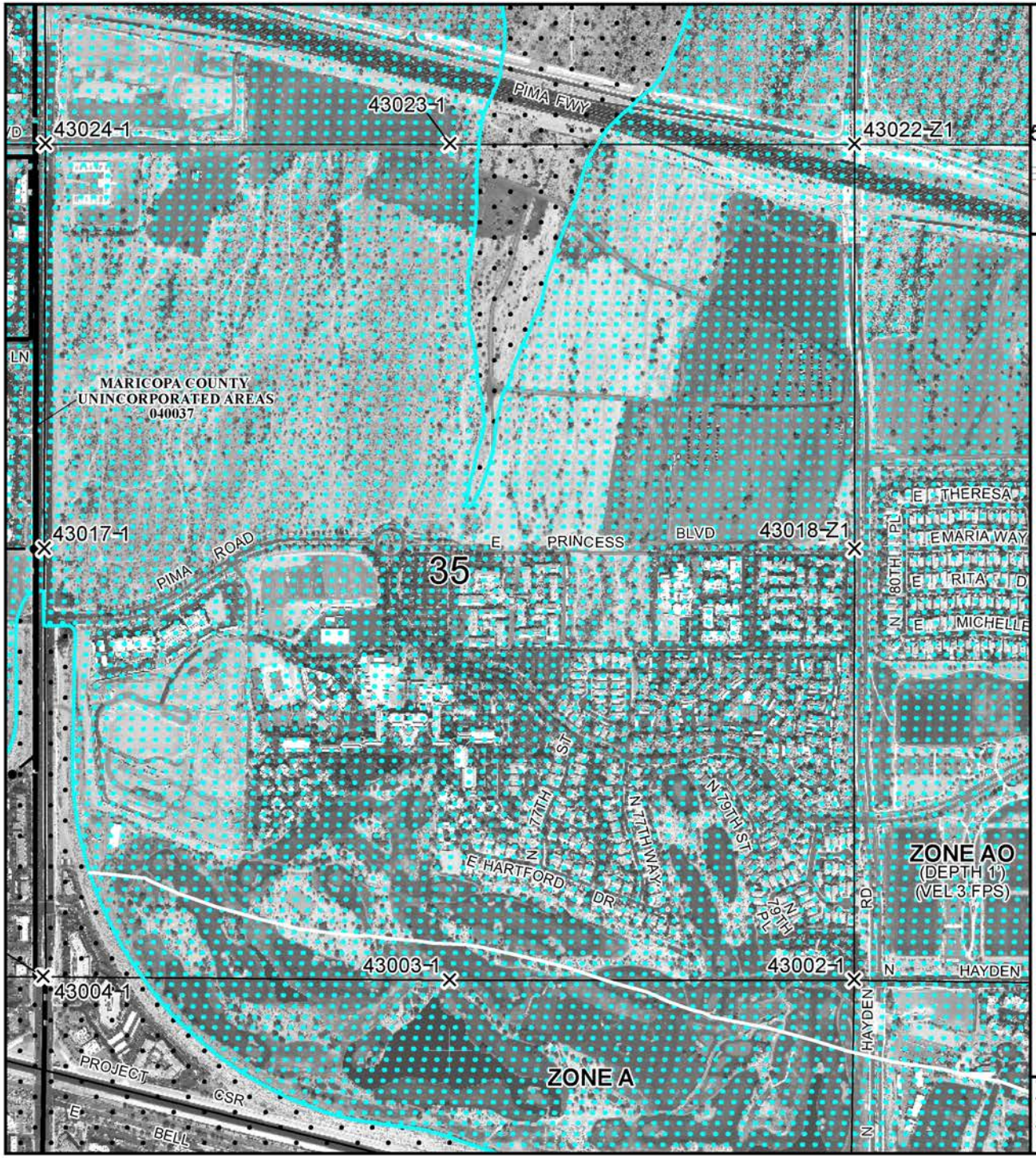


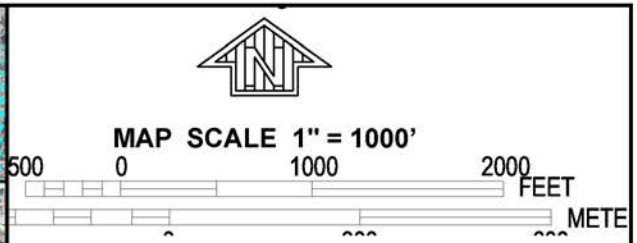
VICINITY MAP

N.T.S.

APPENDIX B

FEMA FIRM Map





PANEL 1320L

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1320 OF 4425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1320	L
PHOENIX, CITY OF	040051	1320	L
SCOTTSDALE, CITY OF	045012	1320	L

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

MAP NUMBER
04013C1320L

MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX C

Warning and Disclaimer of Liability

GRADING & DRAINAGE LANGUAGE

WARNING AND DISCLAIMER OF LIABILITY

The City's Stormwater and Floodplain Management Ordinance is intended to minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding.
The Stormwater and Floodplain Management Ordinance identifies floodplains, floodways, flood fringes and special flood hazard areas. However, a property outside these areas could be inundated by floods. Also, much of the city is a dynamic flood area; floodways, floodplains, flood fringes and special flood hazard areas may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY

The flood protection provided by the Stormwater and Floodplain Management Ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by constructed or natural causes. The Stormwater and Floodplain Management Ordinance does not create liability on the part of the city, any officer or employee thereof, or the federal, state or county government for any flood damages that result from reliance on the Ordinance or any administrative decision lawfully made thereunder.

Compliance with the Stormwater and Floodplain Management Ordinance does not ensure complete protection from flooding. Flood-related problems such as natural erosion, streambed meander, or constructed obstructions and diversions may occur and have an adverse effect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above.

331-PA-2020		07/13/2020
Plan Check #	Owner	Date

APPENDIX D

Nationwide Permit Verification Letter

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, U.S. ARMY CORPS OF ENGINEERS
3636 N CENTRAL AVENUE, SUITE 900
PHOENIX, ARIZONA 85012-1939

August 13, 2018

SUBJECT: Nationwide Permit (NWP) Verification

John Bridger
Executive Director
Phoenix Thunderbirds
7226 N. 16th Street, Suite 100
Phoenix, Arizona 85020

Dear Mr. Bridger:

I am responding to your request (SPL-2003-01623) to resolve the unauthorized activity by issuing an after the fact Department of the Army permit verification for your proposed project, Crossroads East. The proposed project is located at 33.6671°N, -111.9146°W, NAD 83, within the City of Scottsdale, Maricopa County, Arizona.

Because this project resulted in a discharge of 1.18 acres fill material into waters of the United States, a Department of the Army permit is required pursuant to Section 404 of the Clean Water Act (33 USC 1344; 33 CFR parts 323 and 330). I have determined that your proposed project, as constructed, would comply with Nationwide Permit (NWP) 32 (Completed Enforcement Actions). Specifically, your authorized work is shown in the enclosed figures.

For this NWP verification letter to be valid, you must comply with all of the terms and conditions in Enclosure 1. Furthermore, you must comply with the non-discretionary Special Conditions listed below:

1. Pemittee shall comply with all terms, conditions, and obligations of the Settlement Agreement executed on August 6, 2018. An executed copy of the Settlement Agreement is attached to this verification letter for your reference.

A NWP does not grant any property rights or exclusive privileges. Additionally, it does not authorize any injury to the property, rights of others, nor does it authorize interference with any existing or proposed Federal project. Furthermore, it does not obviate the need to obtain other Federal, state, or local authorizations required by law.

Thank you for participating in the Regulatory Program. If you have any questions, please contact Kathleen Tucker at (602) 230-6956 or via e-mail at Kathleen.A.Tucker@usace.army.mil. Please help me to evaluate and improve the regulatory experience for others by completing the customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

Sincerely,

Sallie Diebolt
Chief, Arizona Branch
Regulatory Division

Enclosures

LOS ANGELES DISTRICT
U.S. ARMY CORPS OF ENGINEERS

CERTIFICATE OF COMPLIANCE WITH DEPARTMENT OF THE ARMY NATIONWIDE PERMIT

Permit Number: *SPL-2003-01623-KAT*

Name of Permittee: Mr. Jim Lane, *City of Scottsdale*

Date of Issuance: *August 13, 2018*

Upon completion of the activity authorized by this permit and the mitigation required by this permit, sign this certificate, and return it by **ONE** of the following methods;

1) Email a digital scan of the signed certificate to Kathleen.A.Tucker@usace.army.mil

OR

2) Mail the signed certificate to

U.S. Army Corps of Engineers
ATTN: Regulatory Division SPL-2003-01623
3636 N CENTRAL AVENUE, SUITE 900
PHOENIX, ARIZONA 85012-1939

I hereby certify that the authorized work and any required compensatory mitigation has been completed in accordance with the NWP authorization, including all general, regional, or activity-specific conditions. Furthermore, if credits from a mitigation bank or in-lieu fee program were used to satisfy compensatory mitigation requirements I have attached the documentation required by 33 CFR 332.3(l)(3) to confirm that the appropriate number and resource type of credits have been secured.

_____ _____

Signature of Permittee Date

Control Point
33.653370
-111.907256

Control Point
33.653357
-111.900424

SR-101

23-113415

PJD 6

PJD 6A

PJD 7

PJD 5

PJD 4

PJD 3

PJD 2

PJD 1

Man-made channel constructed along Hayden Road

Union Hills Dr

82nd St

Perimeter Dr

Theresa Dr

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

IMPACTS TO WATERS OF THE U.S.

- Project Limits(~216 AC)
- Potentially Jurisdictional Waters of the U.S. (1.31 AC)
- Permanent Impacts to Jurisdictional Waters of the U.S. (1.18 AC)
- SLUP Boundary
- Photo Location/Direction
- Flow Direction

IMPACTS TO WATERS OF THE U.S.		
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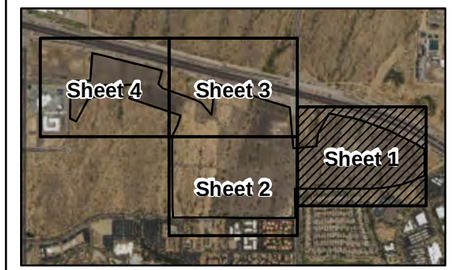
23-113415	City of Scottsdale	1.18
	TOTAL	**1.18**



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SCALE(V): N/A

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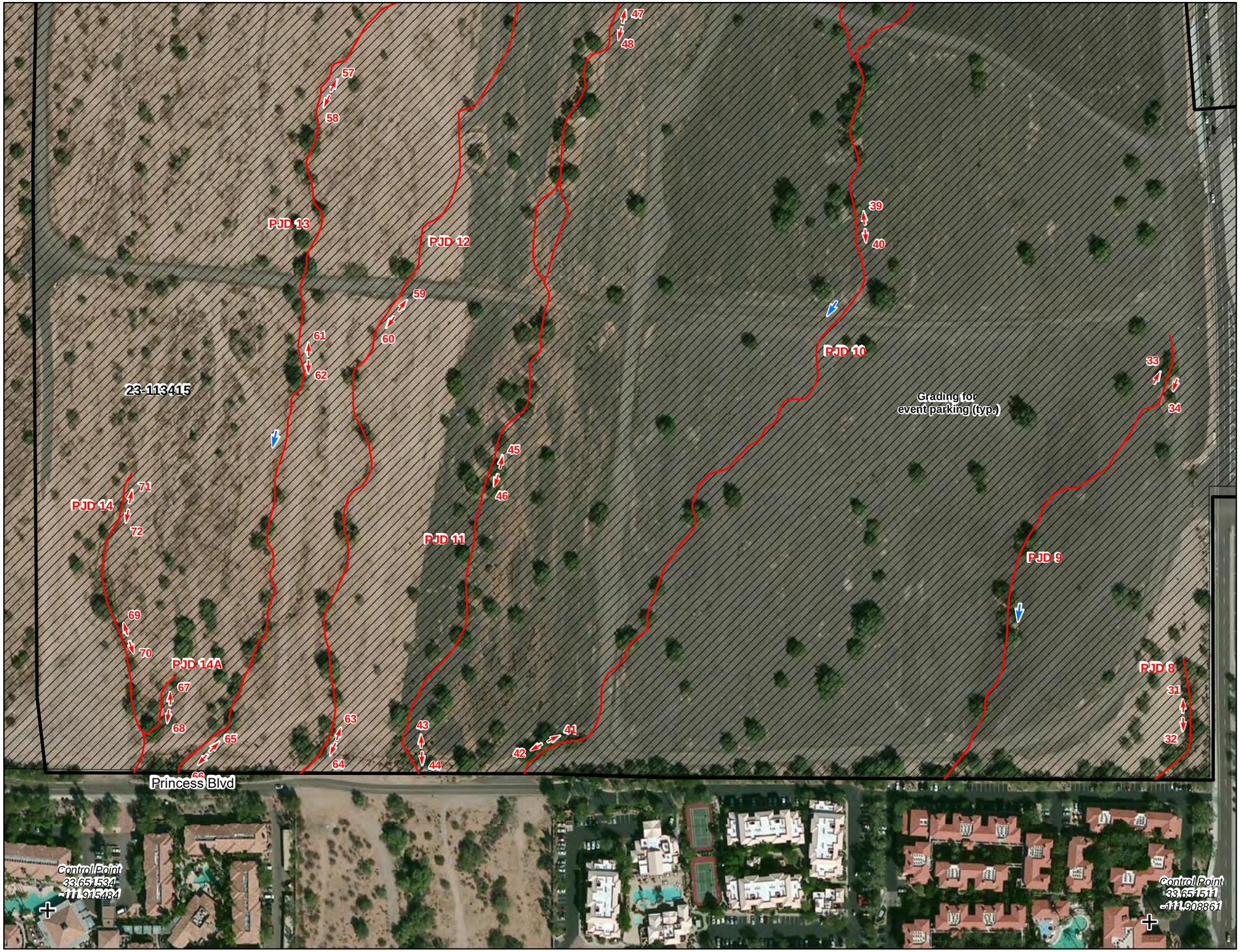
DRAWN BY: KIMLEY-HORN AND ASSOCIATES, INC., JASON GETZ
CHECKED BY: KIMLEY-HORN AND ASSOCIATES, INC., JENNIFER TREMAYNE

DATE: 2017

Aerial Source: USGS, 2015
Corresponding 7.5' Quadrangle: Currys Corner, AZ

29-DR-2020
11/4/2020



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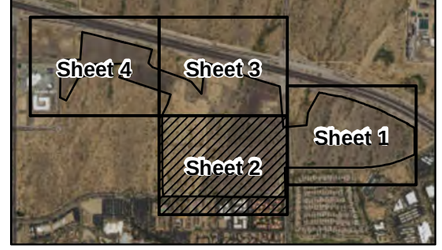

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29-DR-2020
11/4/2020

Control Point
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Control Point
33.655237
-111.908428

SR-101

23-113415

PJD 15

PJD 11A

PJD 11B

PJD 10A

PJD 10B

PJD 12

PJD 13

PJD 11

Hayden Rd

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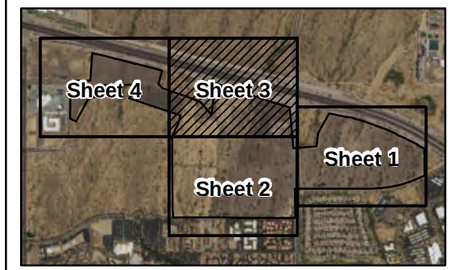

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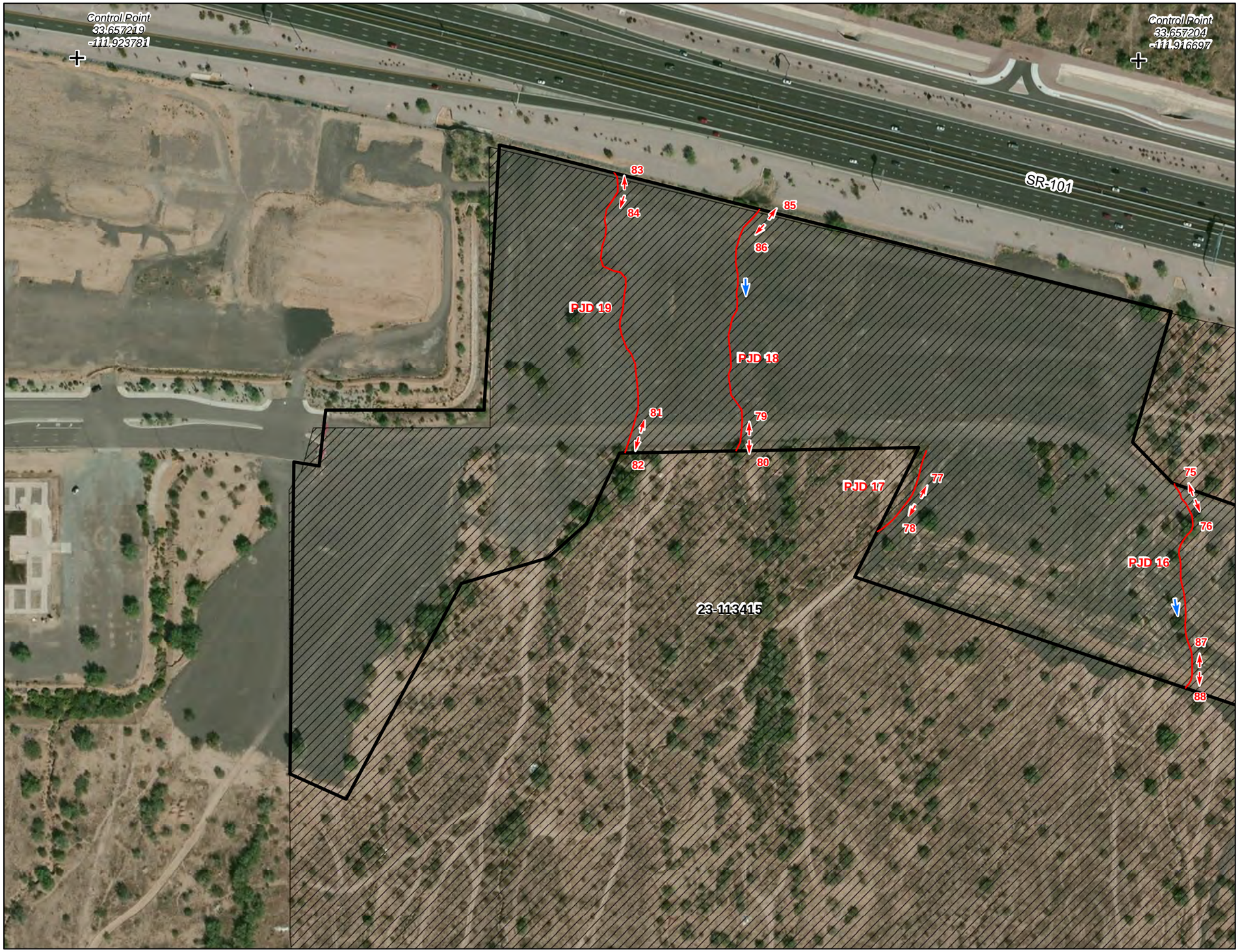

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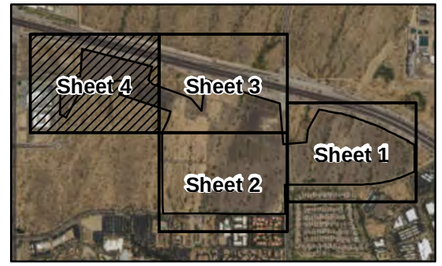

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29-DR-2020
11/4/2020

APPENDIX E

Offsite Drainage Calculations

Scour

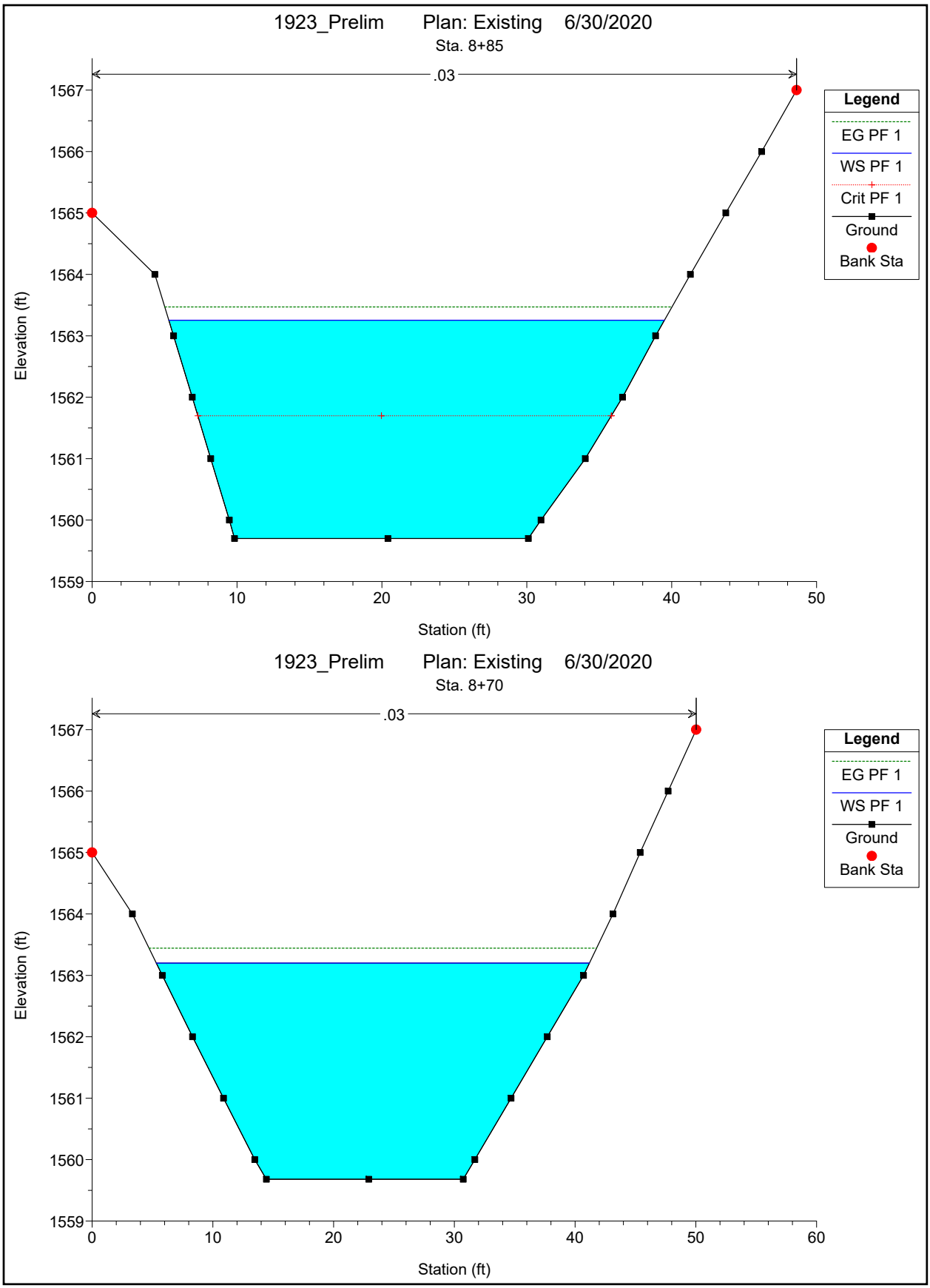
Area	Q_{100}	dgs	dts	Scour
	(cfs)	(ft)	(ft)	(ft)
2	365.00	1.66	0.69	2.35
				3' Minimum

ds = dgs + dlts
dgs = 0.157(Q100)^0.4
dts = 0.02(Q100)^0.6

Q = flow

HEC-RAS Plan: Exist River: 1 Reach: 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	885	PF 1	365.00	1559.70	1563.25	1561.70	1563.47	0.001506	3.73	97.73	34.20	0.39
1	870	PF 1	365.00	1559.68	1563.20		1563.44	0.001886	3.95	92.37	35.87	0.43
1	800	PF 1	365.00	1559.59	1562.98		1563.28	0.002555	4.39	83.11	34.67	0.50
1	700	PF 1	365.00	1559.47	1562.75		1563.03	0.002397	4.25	85.98	36.05	0.48
1	600	PF 1	365.00	1559.34	1562.59		1562.81	0.001811	3.76	97.03	39.66	0.42
1	500	PF 1	365.00	1559.22	1562.47		1562.64	0.001282	3.24	112.48	44.39	0.36
1	400	PF 1	365.00	1559.09	1562.35		1562.51	0.001262	3.22	113.18	44.56	0.36
1	300	PF 1	365.00	1558.97	1562.22		1562.38	0.001268	3.23	113.02	44.57	0.36
1	200	PF 1	365.00	1558.84	1562.09		1562.26	0.001267	3.23	113.05	44.57	0.36
1	100	PF 1	365.00	1558.71	1561.97		1562.13	0.001259	3.22	113.23	44.53	0.36
1	0.00	PF 1	365.00	1558.58	1561.84	1560.32	1562.00	0.001252	3.22	113.44	44.56	0.36



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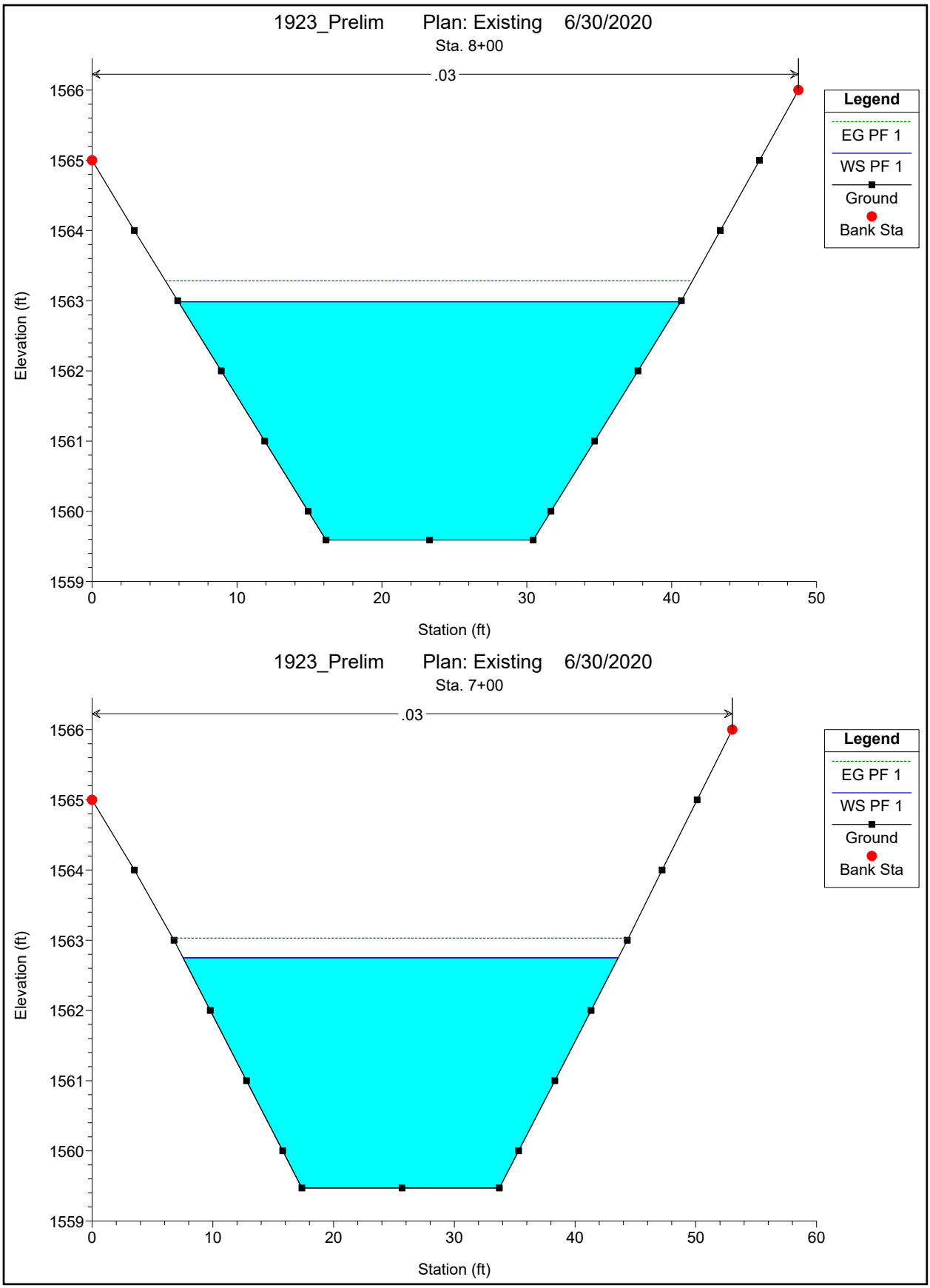
11/4/2020



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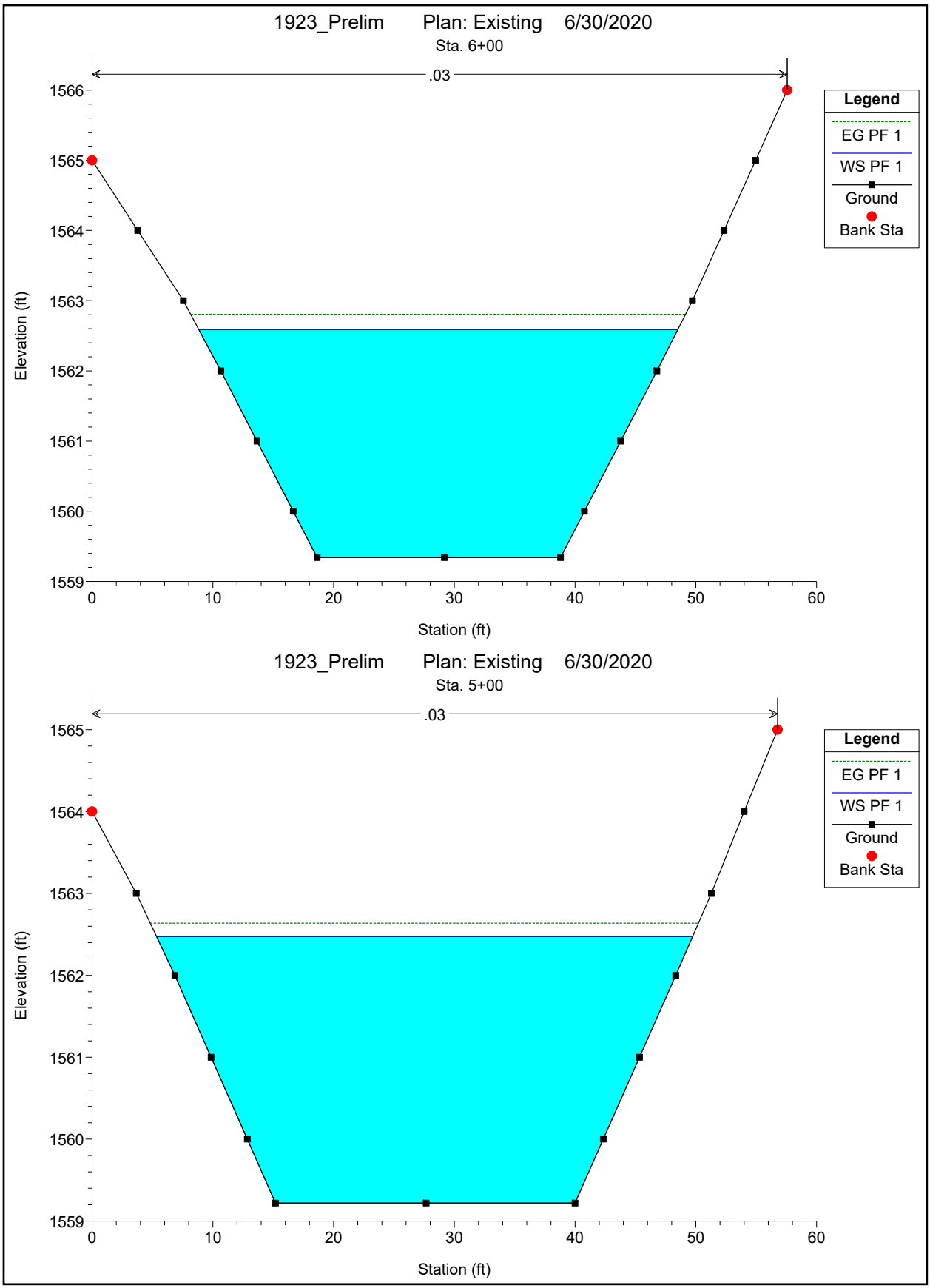
11/4/2020



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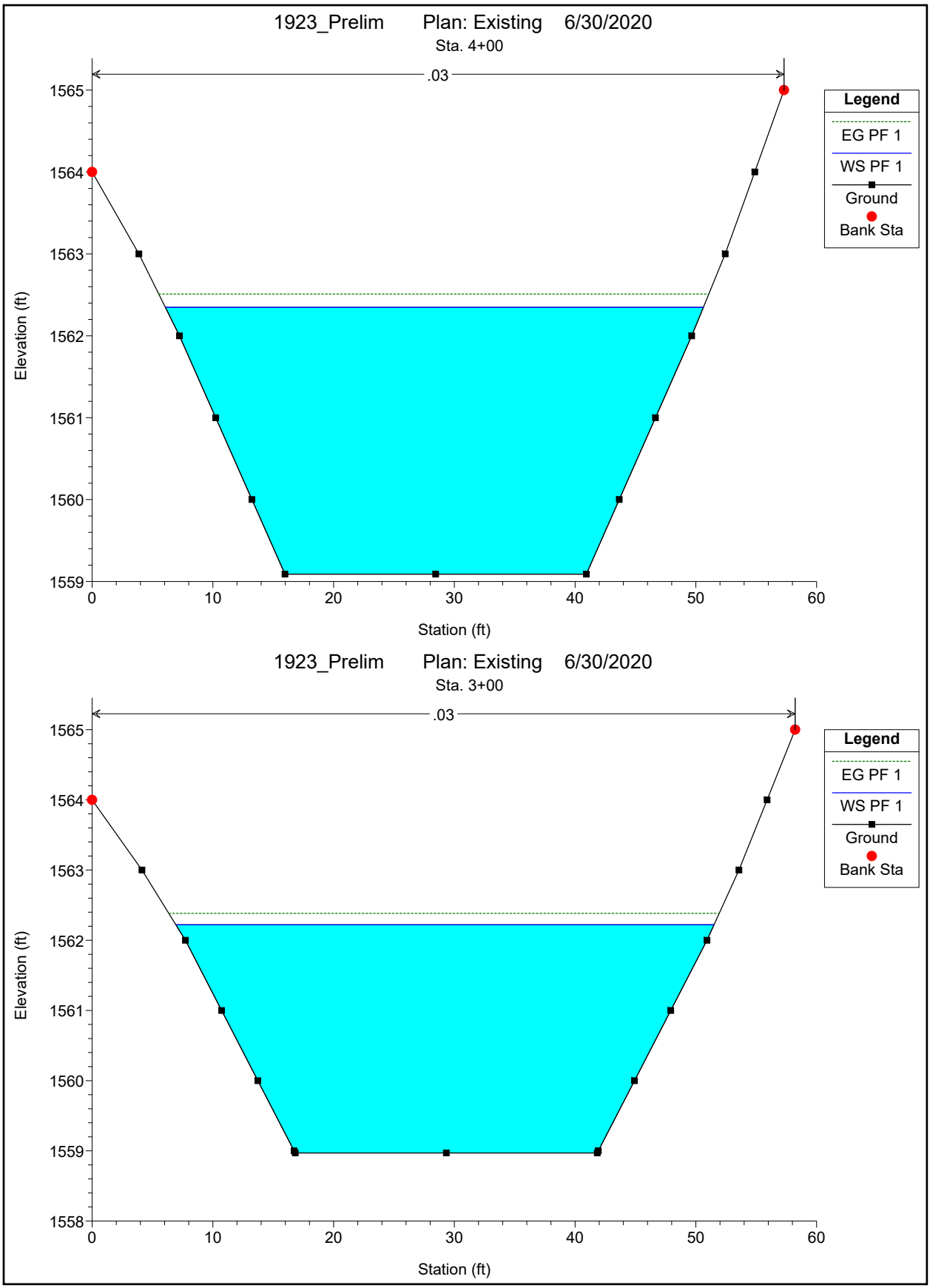
11/4/2020



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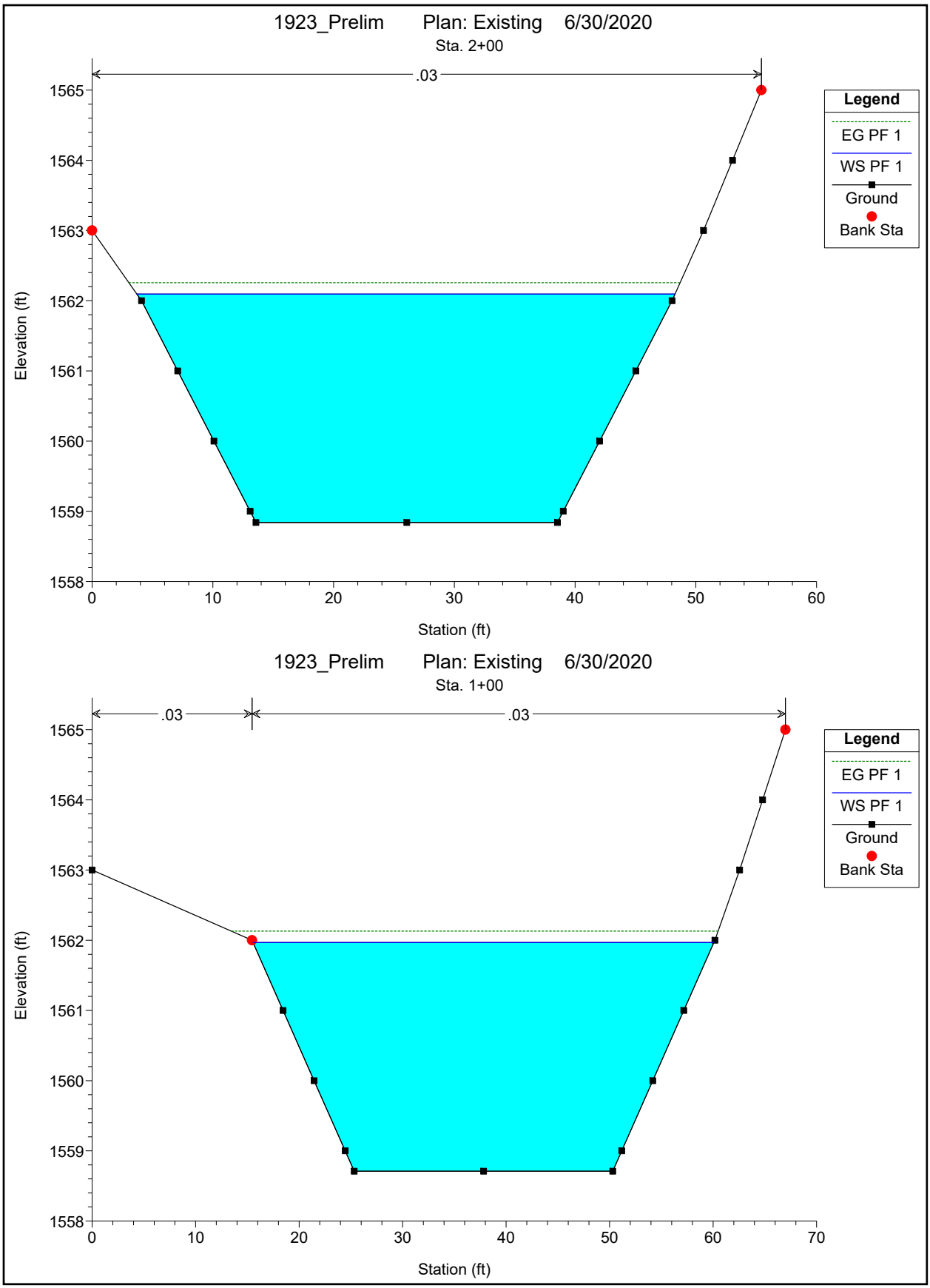
11/4/2020



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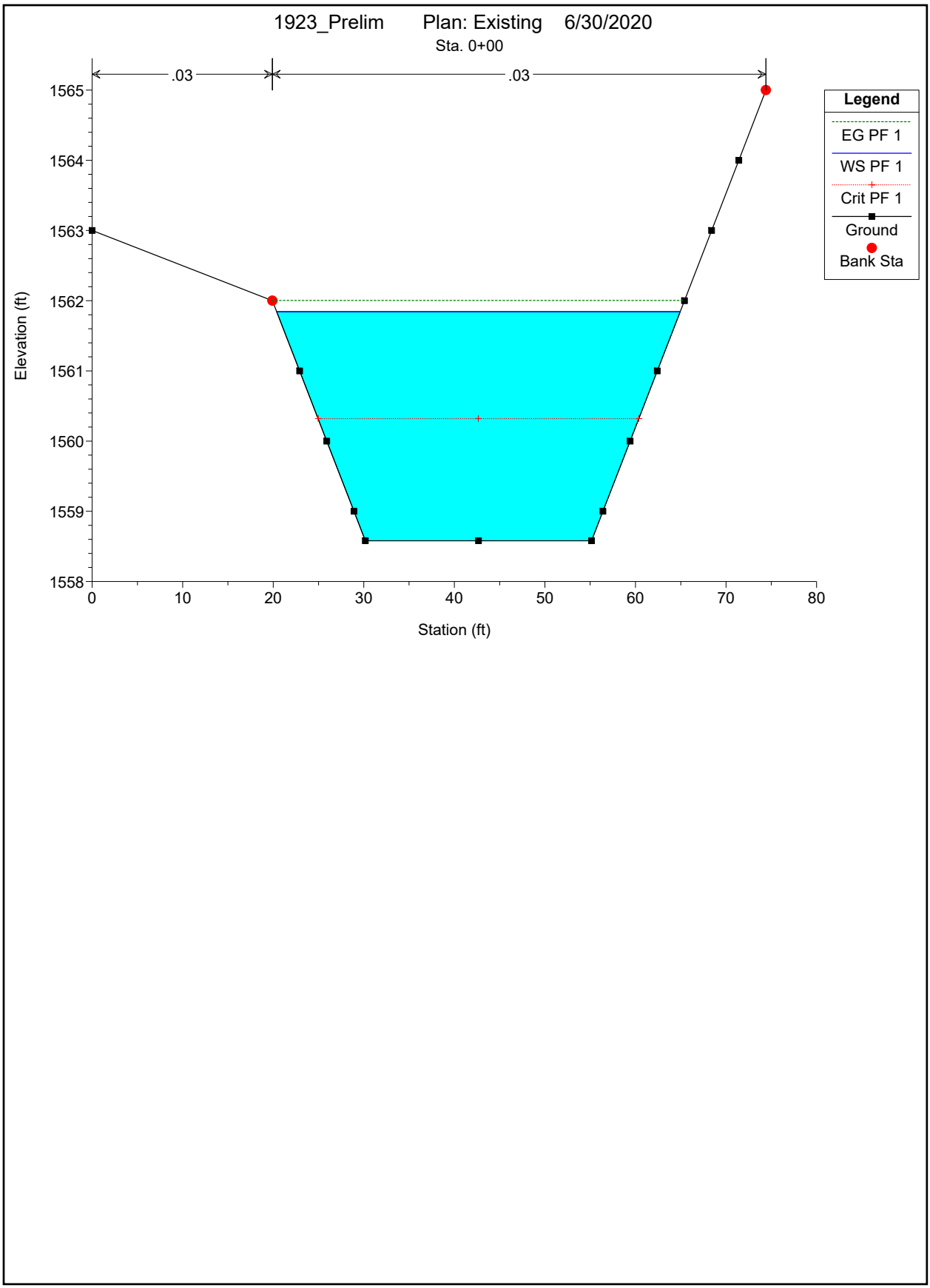
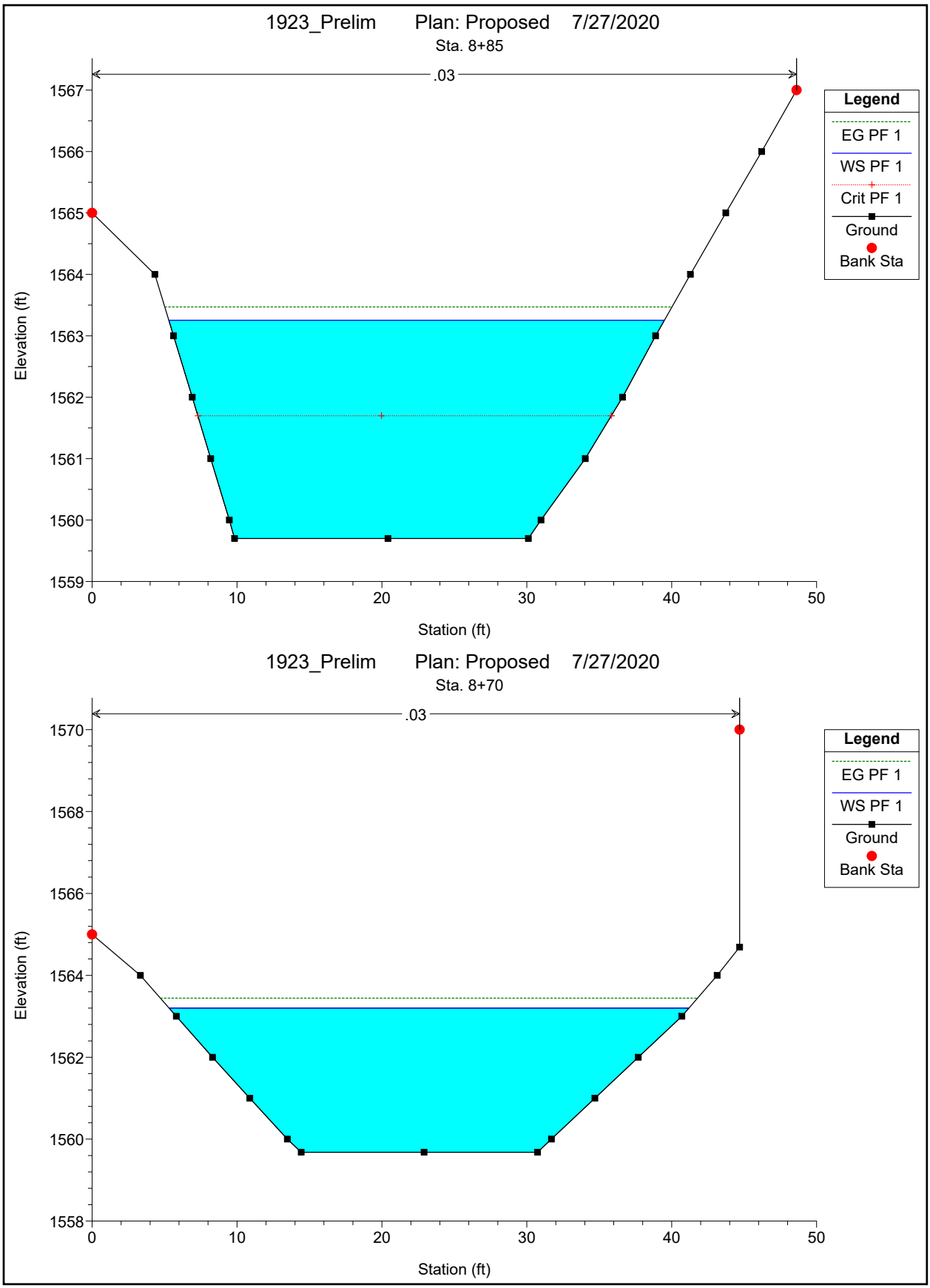
11/4/2020


1923_Prelim Plan: Existing 6/30/2020
Sta. 0+00
.03
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1565
1564
1563
1562
1561
1560
1559
1558
0
10
20
30
40
50
60
70
80

HEC-RAS Plan: Prop River: 1 Reach: 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	885	PF 1	365.00	1559.70	1563.25	1561.70	1563.47	0.001506	3.73	97.73	34.20	0.39
1	870	PF 1	365.00	1559.68	1563.20		1563.44	0.001886	3.95	92.37	35.87	0.43
1	800	PF 1	365.00	1559.59	1562.98		1563.28	0.002555	4.39	83.11	34.67	0.50
1	700	PF 1	365.00	1559.47	1562.75		1563.03	0.002397	4.25	85.98	36.05	0.48
1	600	PF 1	365.00	1559.34	1562.59		1562.81	0.001811	3.76	97.03	39.66	0.42
1	500	PF 1	365.00	1559.22	1562.47		1562.64	0.001282	3.24	112.48	44.39	0.36
1	400	PF 1	365.00	1559.09	1562.35		1562.51	0.001262	3.22	113.18	44.56	0.36
1	300	PF 1	365.00	1558.97	1562.22		1562.38	0.001268	3.23	113.02	44.57	0.36
1	200	PF 1	365.00	1558.84	1562.09		1562.26	0.001267	3.23	113.05	44.57	0.36
1	100	PF 1	365.00	1558.71	1561.97		1562.13	0.001259	3.22	113.23	44.53	0.36
1	0.00	PF 1	365.00	1558.58	1561.84	1560.32	1562.00	0.001252	3.22	113.44	44.56	0.36



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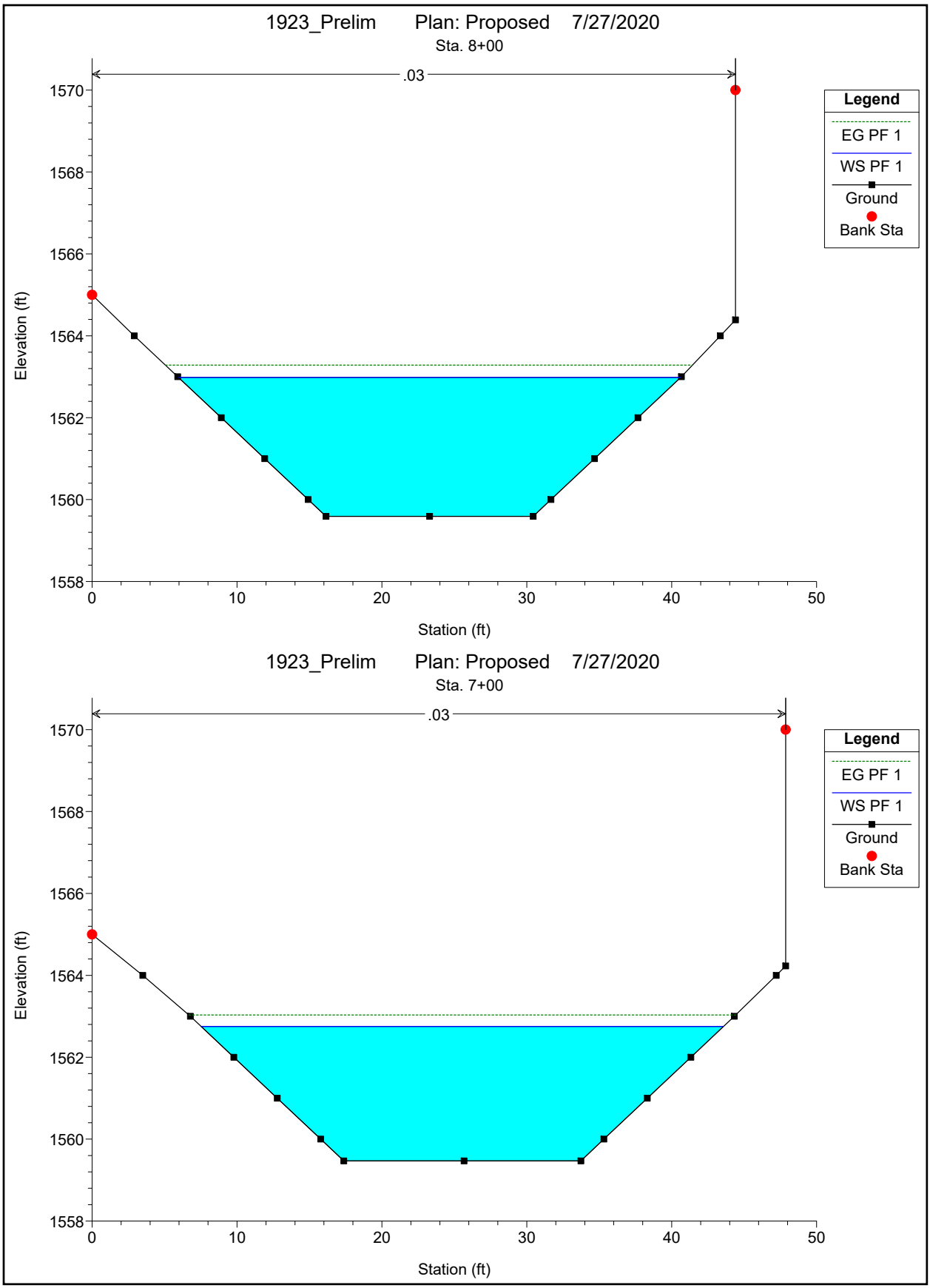
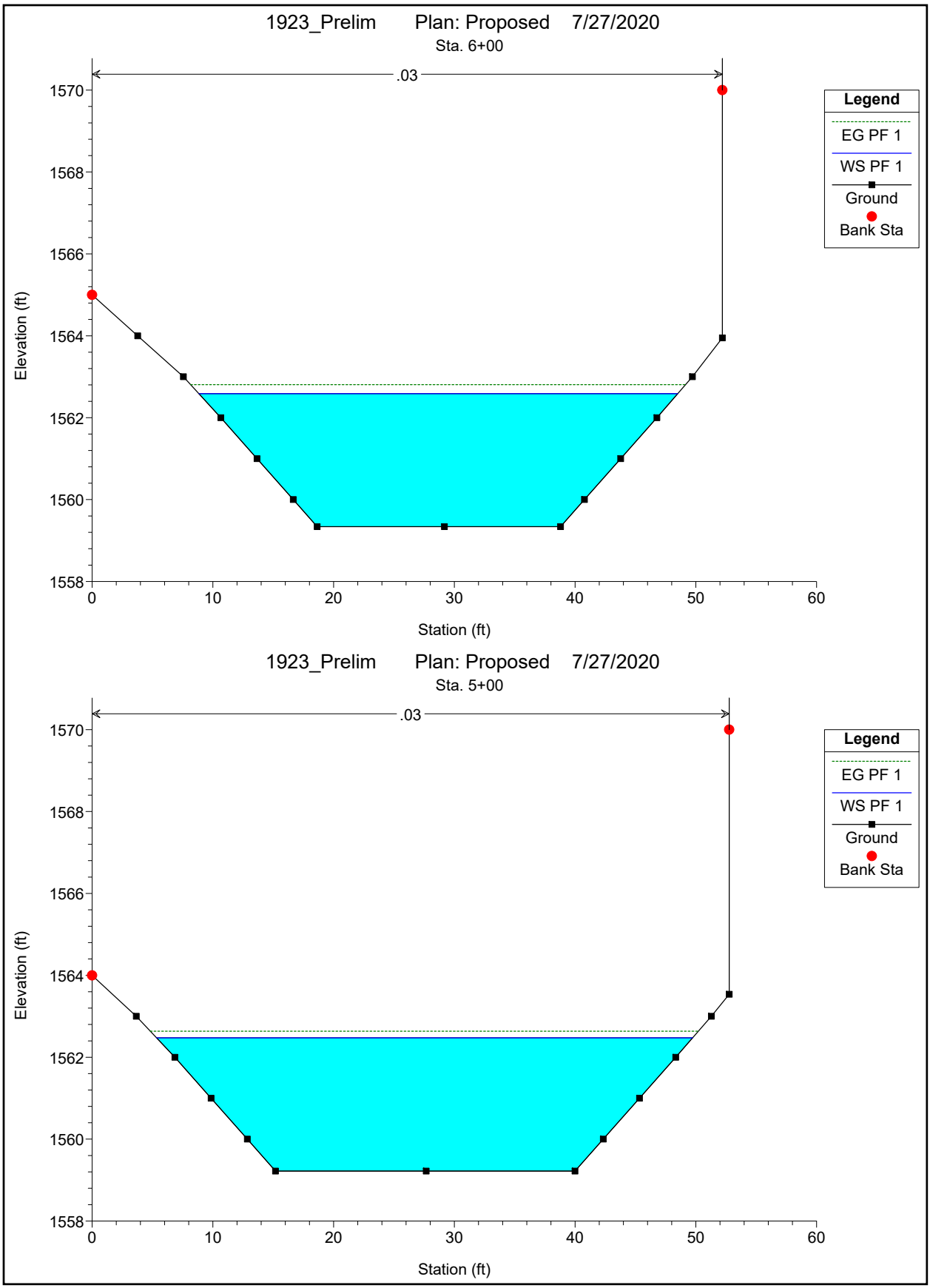
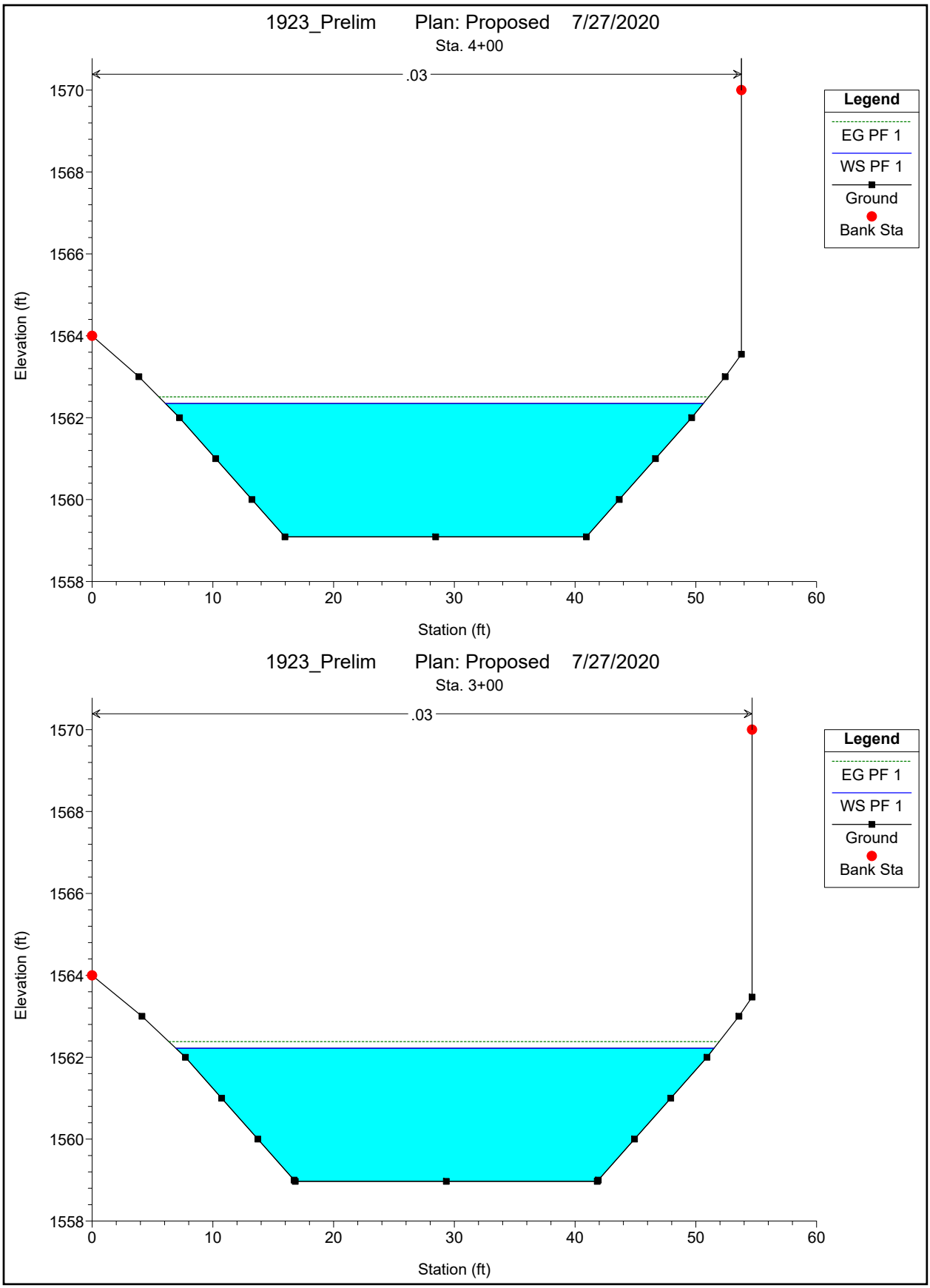
11/4/2020



29-DR-2020
11/4/2020



29-DR-2020
11/4/2020



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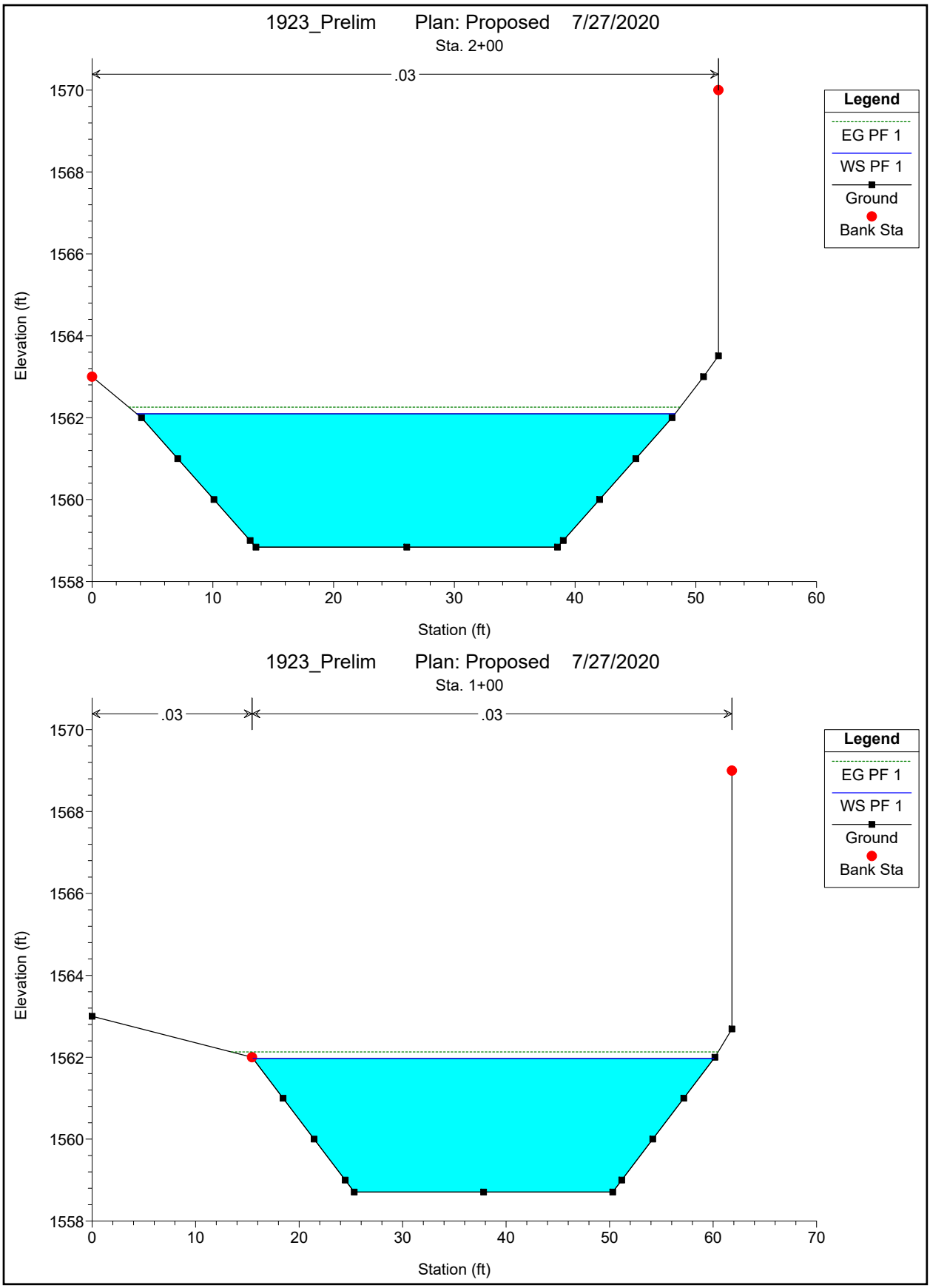
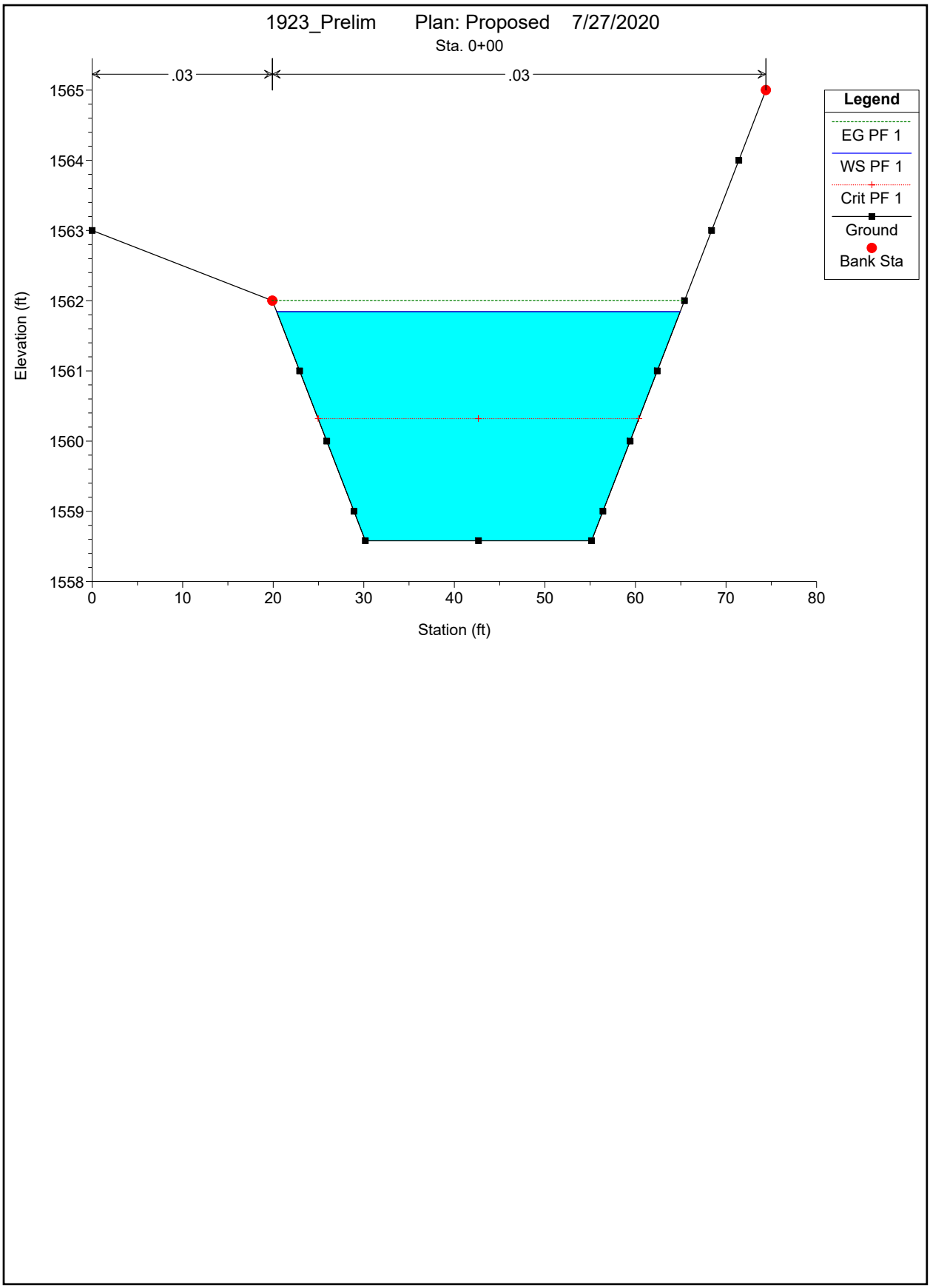
11/4/2020



29-DR-2020
11/4/2020



29-DR-2020
11/4/2020

APPENDIX F

Aerial Site Photographs

1"= 100'

29-DR-2020

11/4/2020

78TH ST. & PRINCESS BLVD. APARTMENTS

NWC 78TH ST. & PRINCESS BLVD., SCOTTSDALE, AZ 85255

AERIAL SITE PHOTOGRAPH

3engineering
planning civil engineering surveying

3 ENGINEERING, LLC
6370 E. THOMAS ROAD, SUITE # 200- PHOENIX, ARIZONA 85251
PHONE: (602) 334-4387 - FAX: (602) 490-3230
WWW.3ENGINEERING.COM

DATE:	PROJECT NO.
07/02/20	1923

APPENDIX G

Offsite Aerial Photographs

78TH ST. & PRINCESS BLVD. APARTMENTS

NWC 78TH ST. & PRINCESS BLVD., SCOTTSDALE, AZ 85255

OFFSITE AERIAL SITE PHOTOGRAPH

1"=600'

29-DR-2020

11/4/2020

3engineering
planning civil engineering surveying

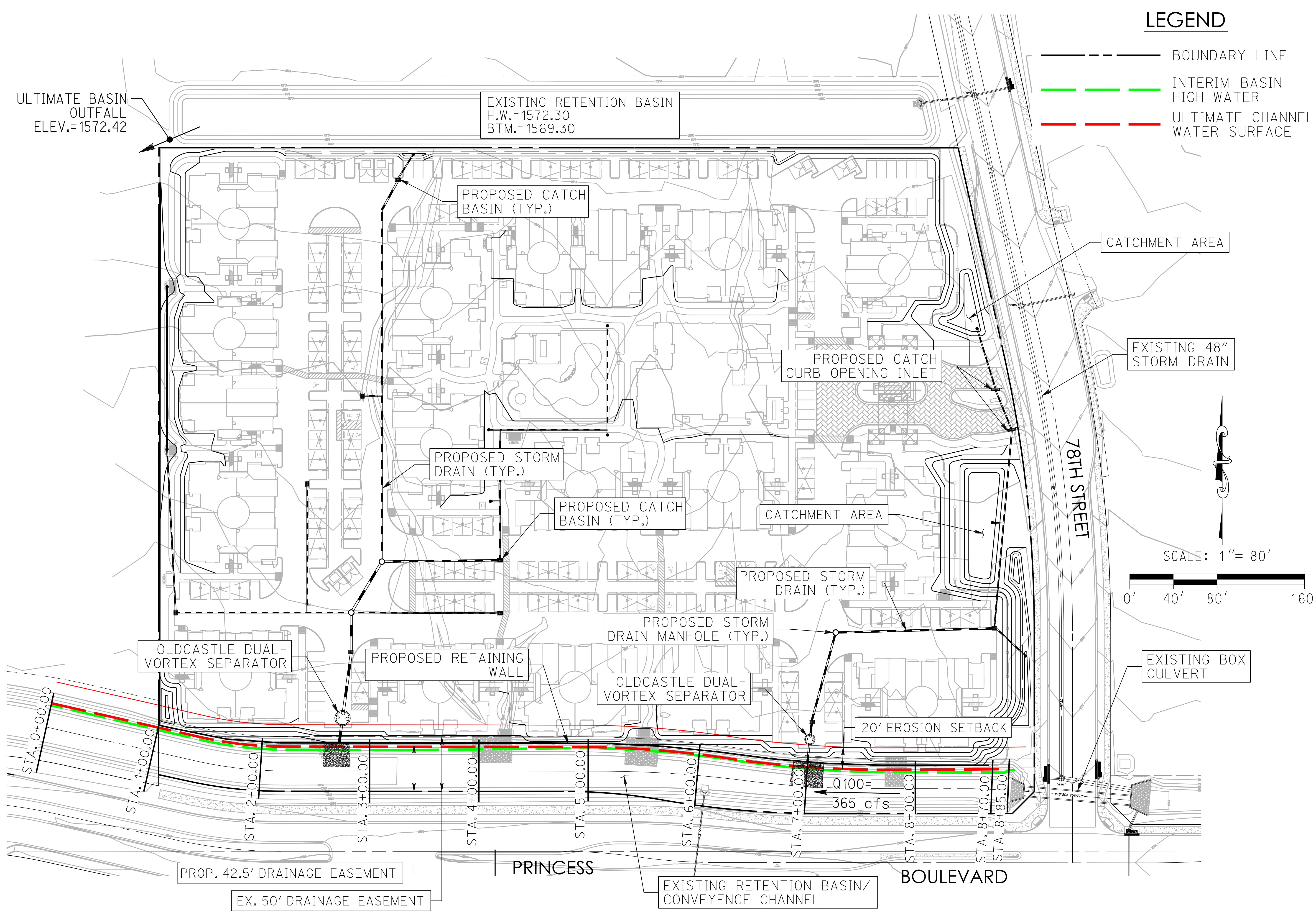
3 ENGINEERING, LLC
6370 E. THOMAS ROAD, SUITE 200, PHOENIX, ARIZONA 85251
PHONE: (602) 346-5847 FAX: (602) 490-5230
WWW.3ENGINEERING.COM

DATE: 07/02/20

PROJECT NO. 1923

APPENDIX H

Onsite Drainage Area Map


LEGEND
BOUNDARY LINE
INTERIM BASIN HIGH WATER
ULTIMATE CHANNEL WATER SURFACE
ULTIMATE BASIN OUTFALL ELEV.=1572.42
EXISTING RETENTION BASIN H.W.=1572.30 BTM.=1569.30
PROPOSED CATCH BASIN (TYP.)
CATCHMENT AREA
PROPOSED CATCH CURB OPENING INLET
EXISTING 48" STORM DRAIN
78TH STREET
PROPOSED STORM DRAIN (TYP.)
PROPOSED CATCH BASIN (TYP.)
CATCHMENT AREA
SCALE: 1"= 80'
0' 40' 80' 160'
PROPOSED STORM DRAIN (TYP.)
PROPOSED STORM DRAIN MANHOLE (TYP.)
OLDCASTLE DUAL-VORTEX SEPARATOR
PROPOSED RETAINING WALL
OLDCASTLE DUAL-VORTEX SEPARATOR
EXISTING BOX CULVERT
20' EROSION SETBACK
Q100= 365 cfs
STA. 0+00.00
STA. 1+00.00
STA. 2+00.00
STA. 3+00.00
STA. 4+00.00
STA. 5+00.00
STA. 6+00.00
STA. 7+00.00
STA. 8+00.00
STA. 8+70.00
STA. 8+85.00
PRINCESS
BOULEVARD
PROP. 42.5' DRAINAGE EASEMENT
EX. 50' DRAINAGE EASEMENT
EXISTING RETENTION BASIN/ CONVEYENCE CHANNEL

78TH ST. & PRINCESS BLVD. APARTMENTS

NWC 78TH ST. & PRINCESS BLVD., SCOTTSDALE, AZ 85255

DRAINAGE EXHIBIT

3 engineering
planning civil engineering surveying

3 ENGINEERING, LLC.
6370 E. THOMAS ROAD, SUITE # 200 - SCOTTSDALE, ARIZONA 85251
PHONE: (602) 334-4387 - FAX: (602) 490-3230
WWW.3ENGINEERING.COM

DATE: 10/28/20

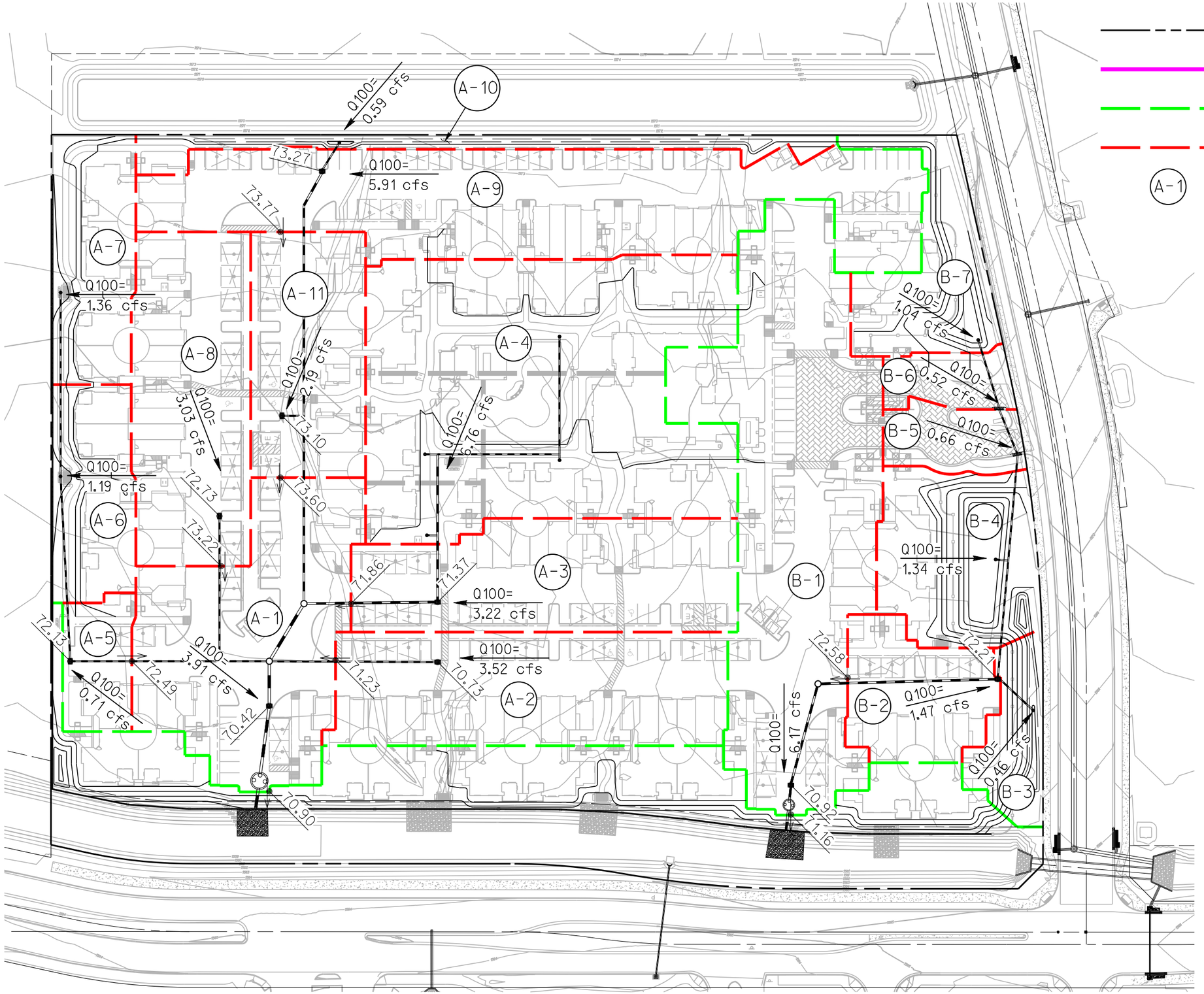
PROJECT NO.

29-DR-2020
11/4/2020

APPENDIX I

Inlet Area Exhibit

29-DR-2020
11/4/2020



LEGEND

- BOUNDARY LINE
- DRAINAGE BOUNDARY
- FIRST FLUSH SUB-BOUNDARY
- DRAINAGE SUB-BOUNDARY
- (A-1) DRAINAGE INLET AREA

SCALE: 1"= 80'

0' 40' 80' 160'

78TH ST. & PRINCESS BLVD. APARTMENTS
NWC 78TH ST. & PRINCESS BLVD., SCOTTSDALE, AZ 85255

INLET AREA EXHIBIT

3engineering
civil engineering
planning
surveying

3 ENGINEERING, LLC
6370 E. THOMAS ROAD, SUITE 200 - SCOTTSDALE, ARIZONA 85251
PHONE: (602) 335-8757 - FAX: (602) 496-5280
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DATE: 10/28/20

PROJECT NO.

29-DR-2020
11/4/2020

APPENDIX J

Onsite Drainage Calculations

Post-Development Rational Method Calculations

Sub-Area	Area	C_{10}	C_{100}	Tc	i_{10}	i_{100}	Q_{10}	Q_{100}
	(acre)	(weighted)	(weighted)	(min)	(in/hr)	(in/hr)	(cfs)	(cfs)
A-1	0.77	0.81	0.86	10	3.77	5.92	2.35	3.91
A-2	0.67	0.84	0.89	10	3.77	5.92	2.11	3.52
A-3	0.61	0.84	0.89	10	3.77	5.92	1.93	3.22
A-4	1.41	0.76	0.81	10	3.77	5.92	4.04	6.76
A-5	0.14	0.81	0.86	10	3.77	5.92	0.42	0.71
A-6	0.27	0.71	0.76	10	3.77	5.92	0.71	1.19
A-7	0.31	0.69	0.74	10	3.77	5.92	0.81	1.36
A-8	0.59	0.82	0.87	10	3.77	5.92	1.82	3.03
A-9	1.11	0.85	0.90	10	3.77	5.92	3.55	5.91
A-10	0.18	0.51	0.56	10	3.77	5.92	0.34	0.59
A-11	0.42	0.82	0.87	10	3.77	5.92	1.31	2.19
B-1	1.22	0.80	0.85	10	3.77	5.92	3.70	6.17
B-2	0.27	0.86	0.91	10	3.77	5.92	0.88	1.47
B-3	0.16	0.45	0.50	10	3.77	5.92	0.26	0.46
B-4	0.40	0.52	0.57	10	3.77	5.92	0.78	1.34
B-5	0.13	0.79	0.84	10	3.77	5.92	0.40	0.66
B-6	0.10	0.80	0.85	10	3.77	5.92	0.31	0.52
B-7	0.30	0.55	0.60	10	3.77	5.92	0.61	1.04

First Flush Flow Calculations

Sub-Area	Area	C_{100}	Rainfall Intensity (I)	Tc	First Flush Flow	OldCastle DVS Size
	(acre)		(in)	(min)	(cfs)	
A	6.48	1.00	3.00	10	19.43	DVS-144C
B	2.58	1.00	3.00	10	7.73	DVS-96C

Per City of Phoenix Storm Water Policies and Standards Manual Section 6.8.3:

$Q = C \times I \times A$

Where: Q = First Flush Discharge, cfs
C= Runoff coefficient, 1.00 for first flush
A = contributing area in Acres
Tc = Time of concentration, 10 minute minimum
I = Rainfall Intensity = (0.5 inches/hour x 60 minutes/hour) / Tc

Weighted C Coefficient Calculations

	Overall Area (s.f.)	Building & Parking Area (s.f.)	Landscape Area (s.f.)	Overall Area (Ac.)	C_{10}	C_{100}
A-1	33,373	27,563	5,810	0.77	0.81	0.86
A-2	29,193	25,495	3,698	0.67	0.84	0.89
A-3	26,643	23,365	3,278	0.61	0.84	0.89
A-4	61,419	44,135	17,284	1.41	0.76	0.81
A-5	6,079	4,937	1,142	0.14	0.81	0.86
A-6	11,577	7,159	4,418	0.27	0.71	0.76
A-7	13,518	7,828	5,690	0.31	0.69	0.74
A-8	25,596	21,560	4,036	0.59	0.82	0.87
A-9	48,535	43,274	5,261	1.11	0.85	0.90
A-10	7,812	1,647	6,165	0.18	0.51	0.56
A-11	18,419	15,637	2,782	0.42	0.82	0.87
B-1	53,156	42,935	10,222	1.22	0.80	0.85
B-2	11,802	10,949	853	0.27	0.86	0.91
B-3	6,796	669	6,127	0.16	0.45	0.50
B-4	17,337	4,066	13,271	0.40	0.52	0.57
B-5	5,778	4,533	1,244	0.13	0.79	0.84
B-6	4,517	3,630	887	0.10	0.80	0.85
B-7	12,875	3,782	9,093	0.30	0.55	0.60

C=((Building & Hardscape Area x 0.95) + (Landscape Area x 0.45)) / Overall Area

C_{100} Building & Hardscape = 0.95
C_{100} Landscape = 0.45

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11/4/2020

Grated Inlet Capacity - Weir Condition

Inlet Type	Inlet	Q_{100}	Inlet Capacity w/ 40% Clogging	d	Cw	P
		(cfs)	(cfs)	(ft)		(ft)
M.A.G. type "F"	A-1	3.91	7.53	0.50	3	11.83
M.A.G. type "F"	A-2	3.52	7.53	0.50	3	11.83
M.A.G. type "F"	A-3	3.22	7.30	0.49	3	11.83
(4) 24" ADS Dome Grate	A-4	6.76	15.99	0.50	3	25.12
M.A.G. type "F"	A-5	0.71	4.60	0.36	3	11.83
24" ADS Dome Grate	A-6	1.19	4.00	0.50	3	6.28
24" ADS Dome Grate	A-7	1.36	4.00	0.50	3	6.28
M.A.G. type "F"	A-8	3.03	7.30	0.49	3	11.83
M.A.G. type "F"	A-9	5.91	7.53	0.50	3	11.83
24" ADS Dome Grate	A-10	0.59	4.00	0.50	3	6.28
24" ADS Dome Grate	A-11	2.19	4.00	0.50	3	6.28
M.A.G. type "F"	B-1	6.17	7.53	0.50	3	11.83
M.A.G. type "F"	B-2	1.47	4.79	0.37	3	11.83
24" ADS Dome Grate	B-3	0.46	4.00	0.50	3	6.28
24" ADS Dome Grate	B-4	1.34	4.00	0.50	3	6.28
M.A.G. type "E"	B-5	See Flowmaster Calculations				
M.A.G. type "E"	B-6	See Flowmaster Calculations				
24" ADS Dome Grate	B-7	1.04	4.00	0.50	3	6.28

$Q=Cw*P*d^{1.5}$

Cw= 3.0 weir coefficient
Q = discharge capacity
P = inlet perimeter
d = flow depth

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.6488°, Longitude: -111.914°
Elevation: 1569.63 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**2.35** (1.94-2.88)	**3.06** (2.57-3.76)	**4.13** (3.43-5.04)	**4.96** (4.08-6.04)	**6.06** (4.92-7.36)	**6.91** (5.53-8.32)	**7.79** (6.13-9.35)	**8.65** (6.71-10.4)	**9.82** (7.42-11.8)	**10.7** (7.93-12.9)
10-min	**1.79** (1.48-2.18)	**2.33** (1.95-2.86)	**3.14** (2.60-3.84)	**3.77** (3.11-4.59)	**4.61** (3.74-5.59)	**5.26** (4.22-6.32)	**5.92** (4.66-7.11)	**6.58** (5.10-7.90)	**7.48** (5.65-8.98)	**8.15** (6.04-9.82)
15-min	**1.48** (1.22-1.80)	**1.92** (1.61-2.36)	**2.60** (2.15-3.17)	**3.12** (2.57-3.79)	**3.81** (3.10-4.62)	**4.34** (3.48-5.23)	**4.89** (3.85-5.88)	**5.44** (4.22-6.52)	**6.18** (4.66-7.42)	**6.74** (4.99-8.11)
30-min	**0.992** (0.826-1.22)	**1.30** (1.09-1.59)	**1.75** (1.45-2.14)	**2.10** (1.73-2.55)	**2.57** (2.08-3.11)	**2.93** (2.35-3.52)	**3.30** (2.59-3.96)	**3.66** (2.84-4.39)	**4.16** (3.14-5.00)	**4.54** (3.36-5.46)
60-min	**0.614** (0.511-0.752)	**0.802** (0.671-0.984)	**1.08** (0.897-1.32)	**1.30** (1.07-1.58)	**1.59** (1.29-1.93)	**1.81** (1.45-2.18)	**2.04** (1.61-2.45)	**2.27** (1.76-2.72)	**2.57** (1.94-3.09)	**2.81** (2.08-3.38)
2-hr	**0.358** (0.302-0.430)	**0.464** (0.391-0.556)	**0.617** (0.518-0.737)	**0.734** (0.610-0.876)	**0.896** (0.736-1.06)	**1.02** (0.824-1.20)	**1.14** (0.910-1.35)	**1.27** (0.994-1.49)	**1.44** (1.10-1.70)	**1.57** (1.18-1.86)
3-hr	**0.264** (0.222-0.323)	**0.338** (0.286-0.415)	**0.441** (0.371-0.539)	**0.523** (0.436-0.636)	**0.638** (0.523-0.770)	**0.730** (0.591-0.876)	**0.824** (0.655-0.989)	**0.925** (0.722-1.11)	**1.06** (0.804-1.27)	**1.17** (0.866-1.40)
6-hr	**0.159** (0.137-0.189)	**0.201** (0.173-0.239)	**0.257** (0.219-0.303)	**0.301** (0.255-0.354)	**0.361** (0.302-0.423)	**0.408** (0.336-0.477)	**0.457** (0.371-0.532)	**0.507** (0.404-0.592)	**0.575** (0.446-0.670)	**0.628** (0.476-0.734)
12-hr	**0.089** (0.077-0.105)	**0.112** (0.097-0.132)	**0.142** (0.122-0.166)	**0.165** (0.141-0.193)	**0.196** (0.165-0.228)	**0.220** (0.183-0.256)	**0.245** (0.201-0.284)	**0.270** (0.219-0.313)	**0.303** (0.240-0.353)	**0.329** (0.255-0.386)
24-hr	**0.052** (0.046-0.061)	**0.066** (0.058-0.077)	**0.086** (0.075-0.100)	**0.101** (0.088-0.117)	**0.123** (0.106-0.142)	**0.140** (0.119-0.161)	**0.158** (0.133-0.182)	**0.176** (0.147-0.203)	**0.202** (0.166-0.234)	**0.223** (0.180-0.259)
2-day	**0.028** (0.025-0.033)	**0.036** (0.031-0.042)	**0.047** (0.041-0.055)	**0.056** (0.048-0.065)	**0.068** (0.059-0.079)	**0.078** (0.066-0.090)	**0.089** (0.074-0.102)	**0.099** (0.083-0.115)	**0.114** (0.094-0.133)	**0.126** (0.102-0.148)
3-day	**0.020** (0.018-0.023)	**0.026** (0.023-0.030)	**0.034** (0.030-0.039)	**0.041** (0.035-0.047)	**0.050** (0.043-0.057)	**0.058** (0.049-0.066)	**0.066** (0.056-0.075)	**0.074** (0.062-0.085)	**0.086** (0.071-0.099)	**0.096** (0.078-0.111)
4-day	**0.016** (0.014-0.019)	**0.021** (0.018-0.024)	**0.028** (0.024-0.031)	**0.033** (0.029-0.038)	**0.041** (0.036-0.046)	**0.047** (0.041-0.054)	**0.054** (0.046-0.062)	**0.061** (0.052-0.070)	**0.072** (0.060-0.082)	**0.080** (0.066-0.093)
7-day	**0.010** (0.009-0.012)	**0.013** (0.012-0.015)	**0.018** (0.016-0.020)	**0.021** (0.019-0.024)	**0.027** (0.023-0.030)	**0.031** (0.026-0.035)	**0.035** (0.030-0.040)	**0.040** (0.034-0.046)	**0.047** (0.039-0.054)	**0.052** (0.043-0.060)
10-day	**0.008** (0.007-0.009)	**0.010** (0.009-0.012)	**0.014** (0.012-0.015)	**0.016** (0.014-0.018)	**0.020** (0.017-0.023)	**0.023** (0.020-0.026)	**0.026** (0.023-0.030)	**0.030** (0.025-0.034)	**0.035** (0.029-0.040)	**0.039** (0.032-0.045)
20-day	**0.005** (0.004-0.006)	**0.006** (0.006-0.007)	**0.008** (0.007-0.010)	**0.010** (0.009-0.011)	**0.012** (0.011-0.014)	**0.014** (0.012-0.016)	**0.015** (0.013-0.018)	**0.017** (0.015-0.020)	**0.020** (0.017-0.023)	**0.021** (0.018-0.025)
30-day	**0.004** (0.003-0.004)	**0.005** (0.004-0.006)	**0.007** (0.006-0.007)	**0.008** (0.007-0.009)	**0.009** (0.008-0.011)	**0.011** (0.009-0.012)	**0.012** (0.010-0.014)	**0.013** (0.012-0.015)	**0.015** (0.013-0.017)	**0.017** (0.014-0.019)
45-day	**0.003** (0.003-0.003)	**0.004** (0.003-0.004)	**0.005** (0.005-0.006)	**0.006** (0.005-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.010** (0.009-0.012)	**0.012** (0.010-0.013)	**0.013** (0.011-0.014)
60-day	**0.003** (0.002-0.003)	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.005** (0.004-0.006)	**0.006** (0.005-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.008** (0.007-0.009)	**0.009** (0.008-0.011)	**0.010** (0.009-0.011)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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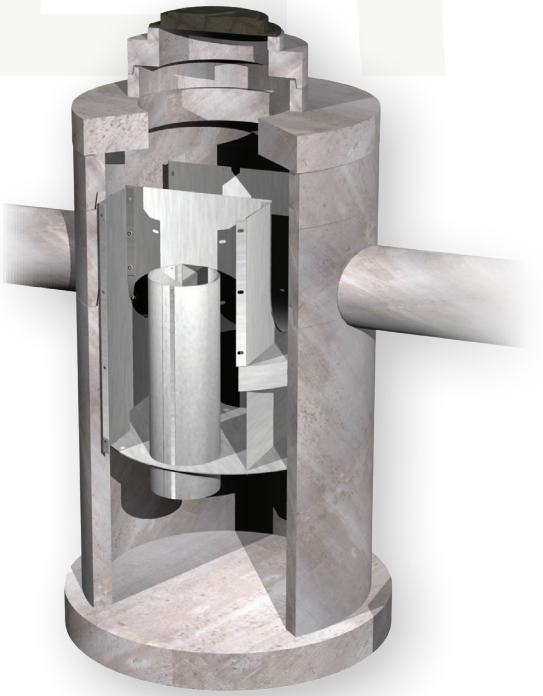
CYCLONIC Separation



Enhanced Gravity Separation of Stormwater Pollutants in a Compact Configuration

Dual-Vortex Efficiency

Particle settling is enhanced by circular flow patterns and a highly circuitous flow path created by two independent vortex cylinders.

Settled particles are collected in the isolated bottom storage area, while floating trash, debris and petroleum hydrocarbons are retained in the cylinders and upper storage areas.

During peak events, flows in excess of design treatment overtop the bypass weir and exit the system without entering the cylinders and lower storage area, thereby eliminating re-entrainment issues.

FEATURES:

- Maintenance Accessible Design
- Economical Installation
- Access Options
- Online System Capability
- Durable Construction
- Proven Performance
- Treatment Train

BENEFITS:

- Open access to accumulated floatables and sediment storage area
- Prepackaged and provided as compact round or square manholes
- Multiple access options (manhole cover or optional hinged lid)
- Internal high-flow bypass weir system provides for online or offline configurations
- Stainless-steel components installed in a reinforced concrete structure
- Third party tested and certified
- Can be installed upstream of infiltration, detention and retention systems or other treatment BMP's

Oldcastle Infrastructure™
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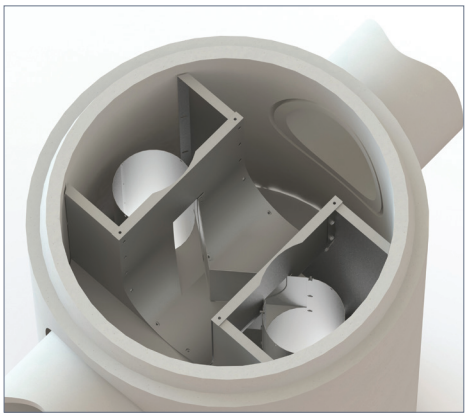
CYCLONIC
Separation

Dual-Vortex Separator Offers an Innovative, Economical Alternative for Removal of Suspended Pollutants from Stormwater Runoff

How it Works

STEP 1

Independent Vortex Cylinders & Control Weir - Flows are directed to the two independent vortex cylinders where particle settling is enhanced by circular flow patterns.

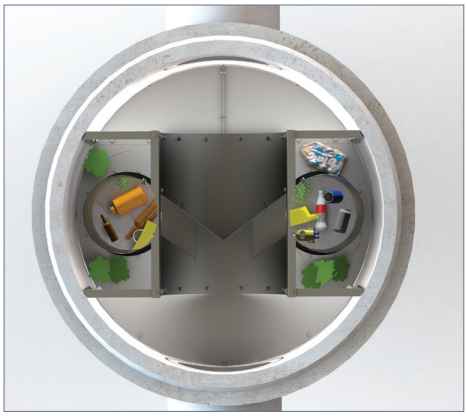


STEP 2

Captured Floatables - Floating trash, debris and petroleum hydrocarbons accumulate at the top of the two cylinders where they are held until transfer into the upper storage area by peak storm events.

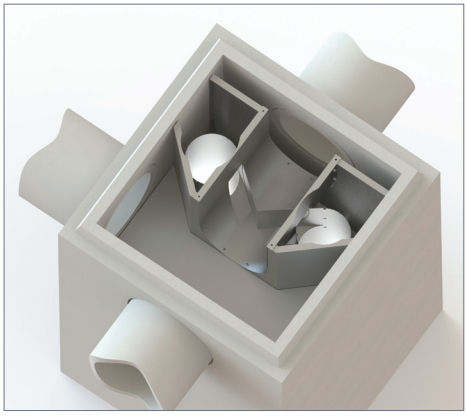
STEP 3

Removal of Total Suspended Solids (TSS) - Particle settling is enhanced by the circular flow patterns and a highly circuitous flow path created by two independent vortex cylinders. Sediments are collected and retained in the isolated bottom storage area.



STEP 4

High-Flow Bypass - Flows in excess of the design treatment overtop the bypass weir and exit the system without entering the cylinders and re-entraining captured pollutants.



MODELS AND NOMINAL DIMENSIONS							
Model No.	Structure Diameter (ft.)	Standard Sump Depth* (ft.)	Minimum Rim to Invert Depth (ft.)	Sediment Storage* (cubic feet)	Oil and Floatable Storage (cubic feet)	NJCAT Treatment Flow Rate (cfs)	Maximum Treatment Flow Rate (cfs)
DVS-36	3	4.5	2.5	11	6	0.56	0.56
DVS-48	4	5.0	3.0	19	15	1.00	1.25
DVS-60	5	5.5	3.5	29	29	1.56	2.50
DVS-72	6	6.5	4.5	42	49	2.25	4.25
DVS-84	7	7.0	5.0	58	79	3.06	6.50
DVS-96	8	8.0	5.5	75	116	4.00	9.50
DVS-120	10	10.0	7.0	118	226	6.25	16.80
DVS-144	12	11.5	8.0	170	388	9.00	26.40

*Depth of unit can be increased to add storage capacity.

Available Options

Square configurations accept multiple inlet pipes or meet other special site conditions.

Flume inlet control for grated inlet applications.

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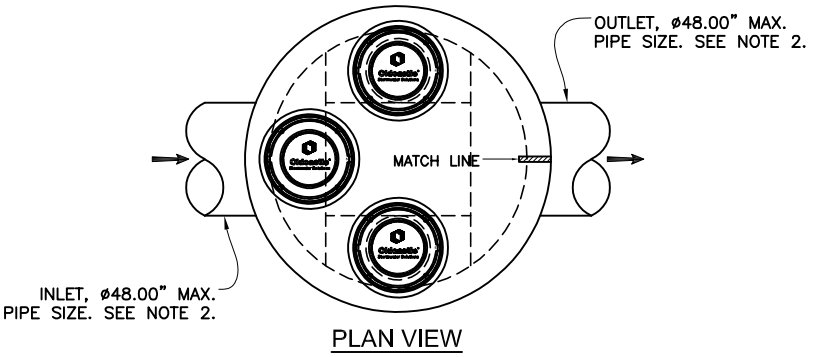
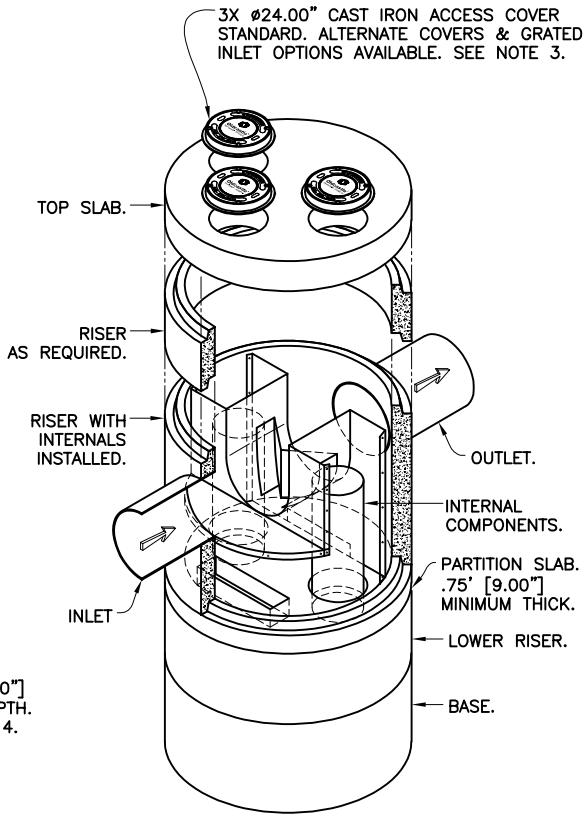
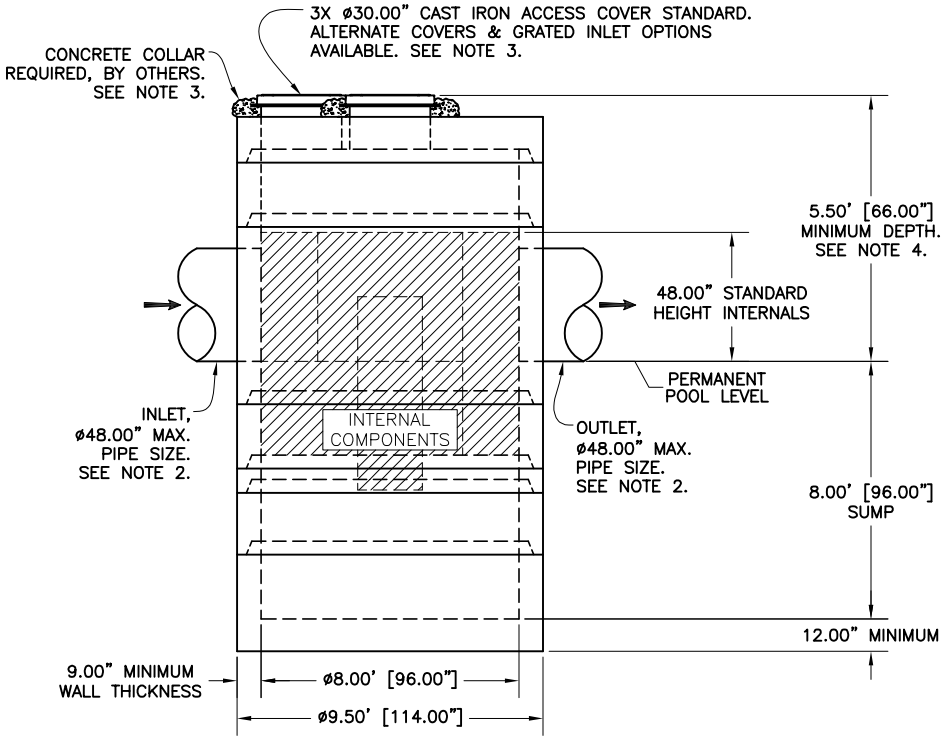


PLAN VIEW



ISOMETRIC VIEW

SCALE 3/4



ELEVATION VIEW

NOTES:

1. TREATMENT CAPACITY IS DEPENDENT ON LOCAL REGULATORY REQUIREMENTS. BYPASS CAPACITY IS DEPENDENT ON OUTLET PIPE DIAMETER. CONTACT OLDCASTLE INFRASTRUCTURE, INC. FOR PROJECT–SPECIFIC TREATMENT AND BYPASS SIZING RECOMMENDATIONS.
2. STANDARD INLET/OUTLET PIPE CONFIGURATION TO ENTER AND EXIT STRUCTURE AT 180°. SPECIAL ANGLED CONFIGURATIONS AVAILABLE.
3. ACCESS COVER(S) MAY BE FIELD ADJUSTED TO GRADE. INLET GRATES & ALTERNATE COVER OPTIONS ARE AVAILABLE.
4. FOR DEPTHS LESS THAN THE MINIMUM SHOWN CONTACT OLDCASTLE INFRASTRUCTURE, INC.
5. STRUCTURE SHALL MEET AASHTO HS–20–44 DESIGN LOADING. CONCRETE COMPONENTS MANUFACTURED IN ACCORDANCE WITH ASTM C478 AND C497.
6. UPON REQUEST, OLDCASTLE INFRASTRUCTURE, INC. CAN PROVIDE A PROJECT–SPECIFIC DRAWING WITH DETAILED DIMENSIONS, PICK WEIGHTS, AND SPECIALS (AS REQUIRED).

Hydrodynamic Separation

DVS-96C

Dual-Vortex Separator

Circular Structure

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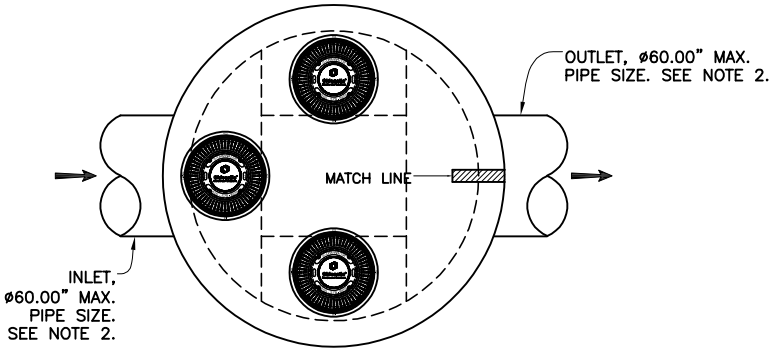
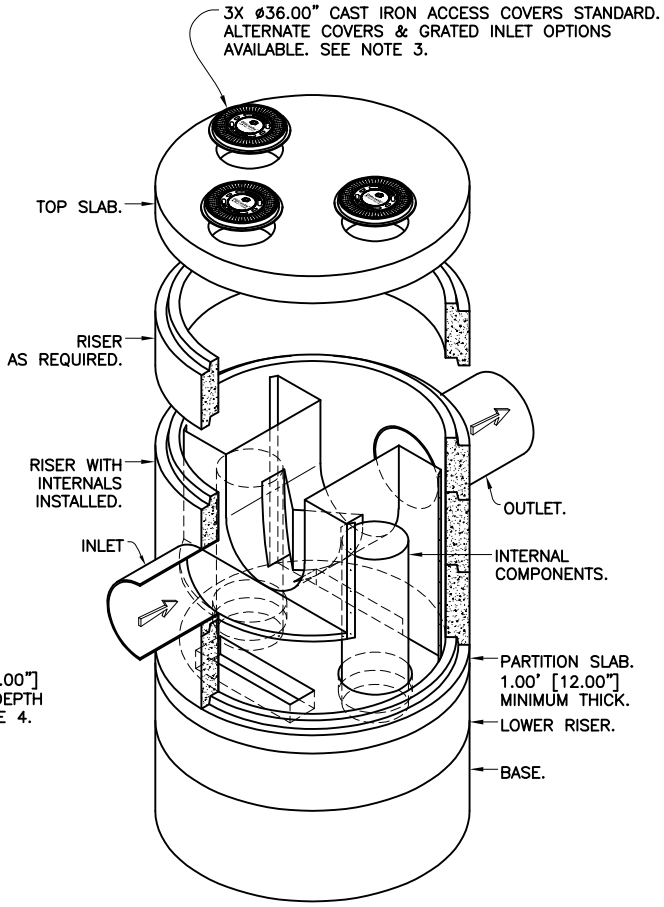
DRAWING NO.	REV	ECO	DATE
DVS-96C	E	ECO–0152 JPR 1/10/19	JPR 4/25/

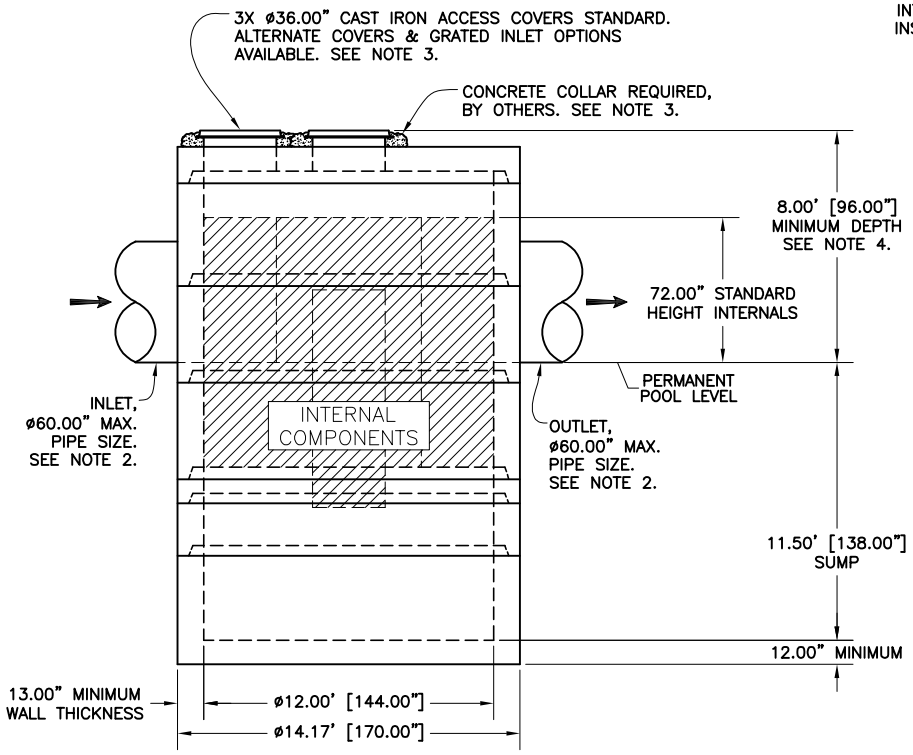
29-DR-2020
11/4/2020



PLAN VIEW



ISOMETRIC VIEW
SCALE 3/4



ELEVATION VIEW

NOTES:

1. TREATMENT CAPACITY IS DEPENDENT ON LOCAL REGULATORY REQUIREMENTS. BYPASS CAPACITY IS DEPENDENT ON OUTLET PIPE DIAMETER. CONTACT OLDCASTLE INFRASTRUCTURE, INC. FOR PROJECT–SPECIFIC TREATMENT AND BYPASS SIZING RECOMMENDATIONS.
2. STANDARD INLET/OUTLET PIPE CONFIGURATION TO ENTER AND EXIT STRUCTURE AT 180°. SPECIAL ANGLED CONFIGURATIONS AVAILABLE.
3. ACCESS COVER(S) MAY BE FIELD ADJUSTED TO GRADE. INLET GRATES & ALTERNATE COVER OPTIONS ARE AVAILABLE.
4. FOR DEPTHS LESS THAN THE MINIMUM SHOWN CONTACT OLDCASTLE INFRASTRUCTURE, INC.
5. STRUCTURE SHALL MEET AASHTO HS–20–44 DESIGN LOADING. CONCRETE COMPONENTS MANUFACTURED IN ACCORDANCE WITH ASTM C478 AND C497.
6. UPON REQUEST, OLDCASTLE INFRASTRUCTURE, INC. CAN PROVIDE A PROJECT–SPECIFIC DRAWING WITH DETAILED DIMENSIONS, PICK WEIGHTS, AND SPECIALS (AS REQUIRED).

Hydrodynamic Separation

DVS-144C

Dual-Vortex Separator

Circular Structure

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DRAWING NO.	REV	ECO	DATE
DVS-144C	E	ECO–0152 JPR 1/10/19	JPR 4/25/

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11/4/2020

Cross Section for Inlet B-5

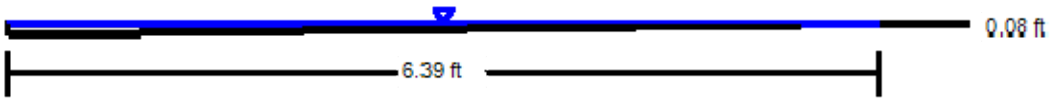
Project Description

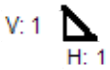
Solve For	Efficiency

Input Data

Discharge		0.66	ft³/s
Slope		3.00000	%
Gutter Width		1.63	ft
Gutter Cross Slope		1.20	%
Road Cross Slope		1.20	%
Roughness Coefficient		0.013	
Local Depression		1.00	in
Local Depression Width		1.63	ft
Efficiency		73.92	%
Grate Width		1.29	ft
Grate Length		6.00	ft
Grate Type	Curved Vaned		
Clogging		40.00	%
Curb Opening Length		6.70	ft

Cross Section Image





Worksheet for Inlet B-5

Project Description

Solve For	Efficiency

Input Data

Discharge		0.66	ft³/s
Slope		3.00000	%
Gutter Width		1.63	ft
Gutter Cross Slope		1.20	%
Road Cross Slope		1.20	%
Roughness Coefficient		0.013	
Local Depression		1.00	in
Local Depression Width		1.63	ft
Grate Width		1.29	ft
Grate Length		6.00	ft
Grate Type	Curved Vaned		
Clogging		40.00	%
Curb Opening Length		6.70	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	73.92	%
Intercepted Flow	0.49	ft³/s
Bypass Flow	0.17	ft³/s
Spread	6.39	ft
Depth	0.08	ft
Flow Area	0.25	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.69	ft/s
Splash Over Velocity	7.85	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.20	
Grate Flow Ratio	0.45	
Equivalent Cross Slope	0.03975	ft/ft
Active Grate Length	3.60	ft
Length Factor	0.19	
Total Interception Length	16.50	ft

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11/4/2020

Cross Section for Inlet B-6

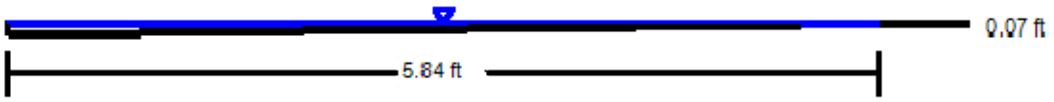
Project Description

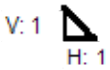
Solve For	Efficiency

Input Data

Discharge		0.52	ft³/s
Slope		3.00000	%
Gutter Width		1.63	ft
Gutter Cross Slope		1.20	%
Road Cross Slope		1.20	%
Roughness Coefficient		0.013	
Local Depression		1.00	in
Local Depression Width		1.63	ft
Efficiency		78.38	%
Grate Width		1.29	ft
Grate Length		6.00	ft
Grate Type	Curved Vaned		
Clogging		40.00	%
Curb Opening Length		6.70	ft

Cross Section Image





Worksheet for Inlet B-6

Project Description

Solve For	Efficiency

Input Data

Discharge		0.52	ft³/s
Slope		3.00000	%
Gutter Width		1.63	ft
Gutter Cross Slope		1.20	%
Road Cross Slope		1.20	%
Roughness Coefficient		0.013	
Local Depression		1.00	in
Local Depression Width		1.63	ft
Grate Width		1.29	ft
Grate Length		6.00	ft
Grate Type	Curved Vaned		
Clogging		40.00	%
Curb Opening Length		6.70	ft

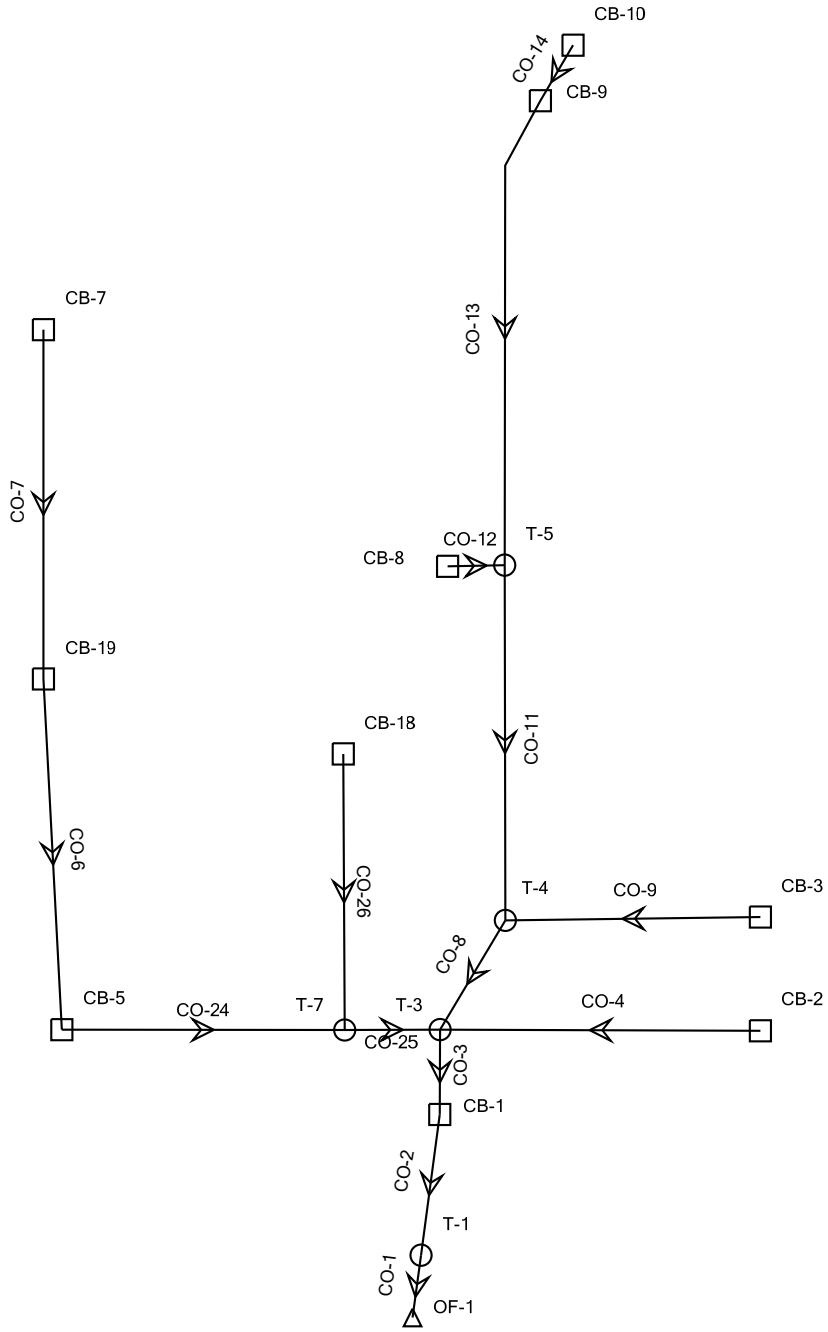
Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	78.38	%
Intercepted Flow	0.41	ft³/s
Bypass Flow	0.11	ft³/s
Spread	5.84	ft
Depth	0.07	ft
Flow Area	0.20	ft²
Gutter Depression	0.00	ft
Total Depression	0.08	ft
Velocity	2.54	ft/s
Splash Over Velocity	7.85	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.22	
Grate Flow Ratio	0.49	
Equivalent Cross Slope	0.04168	ft/ft
Active Grate Length	3.60	ft
Length Factor	0.21	
Total Interception Length	14.51	ft

Scenario: Base



Conduit FlexTable: Combined Pipe/Node Report (1923_west.stc)

Label	Start Node	Stop Node	Length (Unified) (ft)	Total Flow (ft^3/s)	Rise (Unified) (in)	Capacity (Full Flow) (ft^3/s)	Velocity (Average) (ft/s)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Slope (ft/ft)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CO-7	CB-7	CB-19	147.0	1.36	12.0	2.51	1.73	68.00	67.27	0.005	0.013	70.28	70.07
CO-6	CB-19	CB-5	147.0	2.55	12.0	2.51	3.25	67.27	66.54	0.005	0.013	70.07	69.32
CO-24	CB-5	T-7	120.0	3.26	12.0	2.52	4.15	66.54	65.94	0.005	0.013	69.32	68.31
CO-26	CB-18	T-7	116.0	3.03	12.0	5.52	7.20	68.73	65.94	0.024	0.013	69.48	68.31
CO-25	T-7	T-3	40.0	6.29	12.0	2.53	8.01	65.94	65.74	0.005	0.013	68.31	67.06
CO-4	CB-2	T-3	134.0	3.52	12.0	3.06	4.48	66.73	65.74	0.007	0.013	68.37	67.06
CO-9	CB-3	T-4	106.0	9.98	18.0	7.63	5.65	66.87	66.31	0.005	0.013	68.61	67.53
CO-14	CB-10	CB-9	25.0	0.59	12.0	2.47	2.58	69.00	68.88	0.005	0.013	69.41	69.40
CO-13	CB-9	T-5	200.0	6.50	18.0	8.03	5.06	68.38	67.21	0.006	0.013	69.40	68.56
CO-12	CB-8	T-5	17.0	2.19	12.0	7.97	8.66	68.56	67.71	0.050	0.013	69.19	68.56
CO-11	T-5	T-4	152.0	8.69	18.0	8.08	5.07	67.21	66.31	0.006	0.013	68.56	67.45
CO-8	T-4	T-3	54.0	18.67	24.0	31.84	10.54	65.81	64.74	0.020	0.013	67.37	67.06
CO-3	T-3	CB-1	35.0	28.48	24.0	15.77	9.07	64.74	64.57	0.005	0.013	67.06	66.46
CO-2	CB-1	T-1	54.0	32.39	24.0	37.32	13.38	64.57	63.10	0.027	0.013	66.46	64.64
CO-1	T-1	OF-1	17.0	32.39	24.0	37.21	13.34	63.10	62.64	0.027	0.013	64.99	64.30

FlexTable: Catch Basin Table (1923_west.stc)

Label	Station (Calculated) (ft)	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Additional) (ft³/s)	Carryover Additional Flow (ft³/s)	Flow (Known) (ft³/s)	Inlet Type	Maximum Inflow (ft³/s)
CB-1	0+71	70.42	True	70.42	64.57	3.91	0.00	0.00	Percent Capture	0.00
CB-2	2+40	70.73	True	70.73	66.73	3.52	0.00	0.00	Percent Capture	0.00
CB-3	2+66	71.37	True	71.37	66.87	9.98	0.00	0.00	Percent Capture	0.00
CB-5	2+66	72.13	True	72.13	66.54	0.71	0.00	0.00	Percent Capture	0.00
CB-7	5+60	72.00	True	72.00	68.00	1.36	0.00	0.00	Percent Capture	0.00
CB-8	3+29	73.10	True	73.10	68.56	2.19	0.00	0.00	Percent Capture	0.00
CB-9	5+12	73.27	True	73.27	68.38	5.91	0.00	0.00	Percent Capture	0.00
CB-10	5+37	73.00	True	73.00	69.00	0.59	0.00	0.00	Percent Capture	0.00
CB-18	2+62	72.73	True	72.73	68.73	3.03	0.00	0.00	Percent Capture	0.00
CB-19	4+13	72.00	True	72.00	67.27	1.19	0.00	0.00	Percent Capture	0.00

Capture Efficiency (%)	Inlet Location	Desired Sump Depth (ft)	Depth (In) (ft)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	System Fixed Flow (ft³/s)
100.0	On Grade	0.00	1.89	1.89	66.46	66.46	32.39
100.0	On Grade	0.00	1.64	1.64	68.37	68.37	3.52
100.0	On Grade	0.00	1.74	1.74	68.61	68.61	9.98
100.0	On Grade	0.00	2.78	2.78	69.32	69.32	3.26
100.0	On Grade	0.00	2.28	2.28	70.28	70.28	1.36
100.0	On Grade	0.00	0.63	0.63	69.19	69.19	2.19
100.0	On Grade	0.00	1.02	1.02	69.40	69.40	6.50
100.0	On Grade	0.00	0.41	0.41	69.41	69.41	0.59
100.0	On Grade	0.00	0.75	0.75	69.48	69.48	3.03
100.0	On Grade	0.00	2.80	2.80	70.07	70.07	2.55

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FlexTable: Outfall Table (1923_west.stc)

Label	Station (ft)	Elevation (Ground) (ft)	Set Rim to Ground Elevation	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (Tailwater) (ft)	Flow (Outfall) (ft³/s)
OF-1	0+00	69.00	True	62.64	User Defined Tailwater	62.17	32.39

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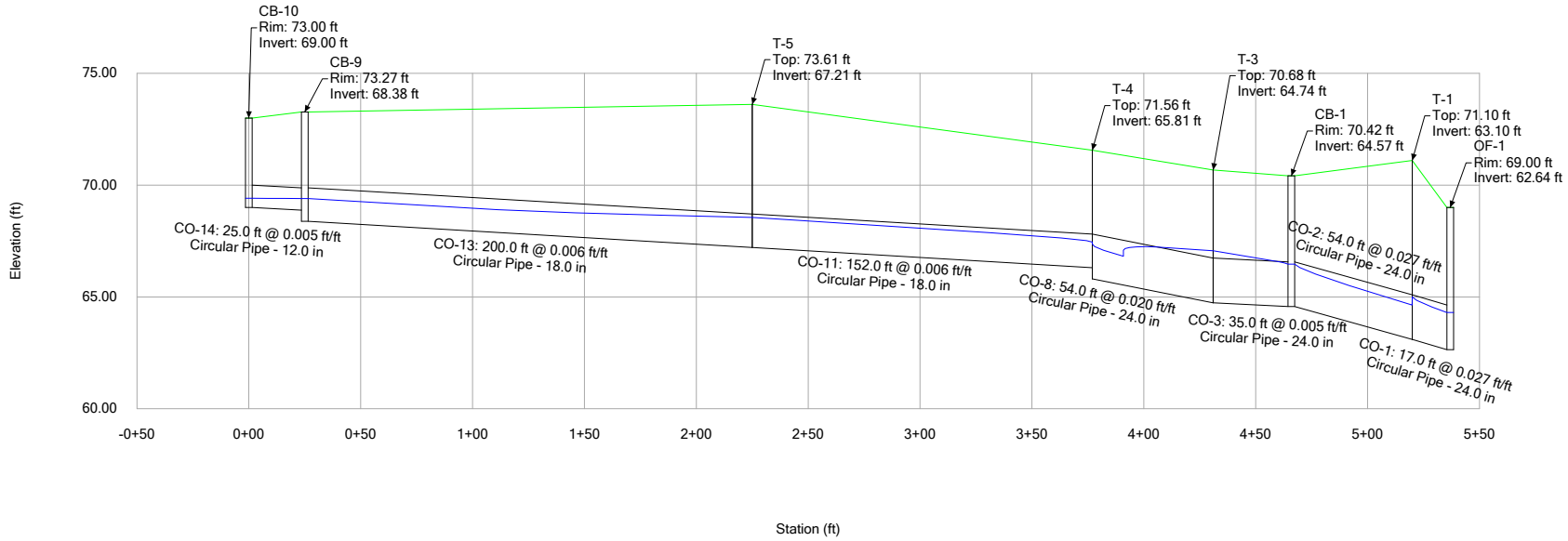
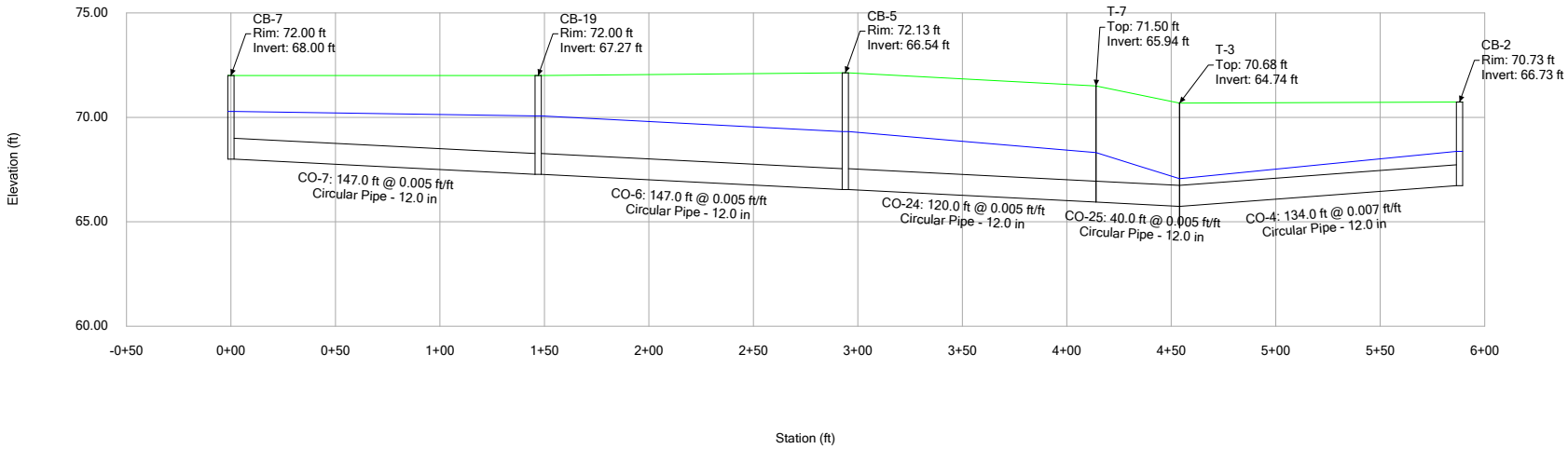
FlexTable: Transition Table (1923_west.stc)

Label	Elevation (Ground) (ft)	Elevation (Top) (ft)	Elevation (Invert) (ft)	Transition Length (ft)	Headloss Method	Hydraulic Grade Line (Out) (ft)	System Fixed Flow (ft^3/s)
T-1	71.10	71.10	63.10	0.0	Absolute	64.99	32.39
T-3	70.68	70.68	64.74	0.0	Absolute	67.06	28.48
T-4	71.56	71.56	65.81	0.0	Absolute	67.37	18.67
T-5	73.61	73.61	67.21	0.0	Absolute	68.56	8.69
T-7	71.50	71.50	65.94	0.0	Absolute	68.31	6.29

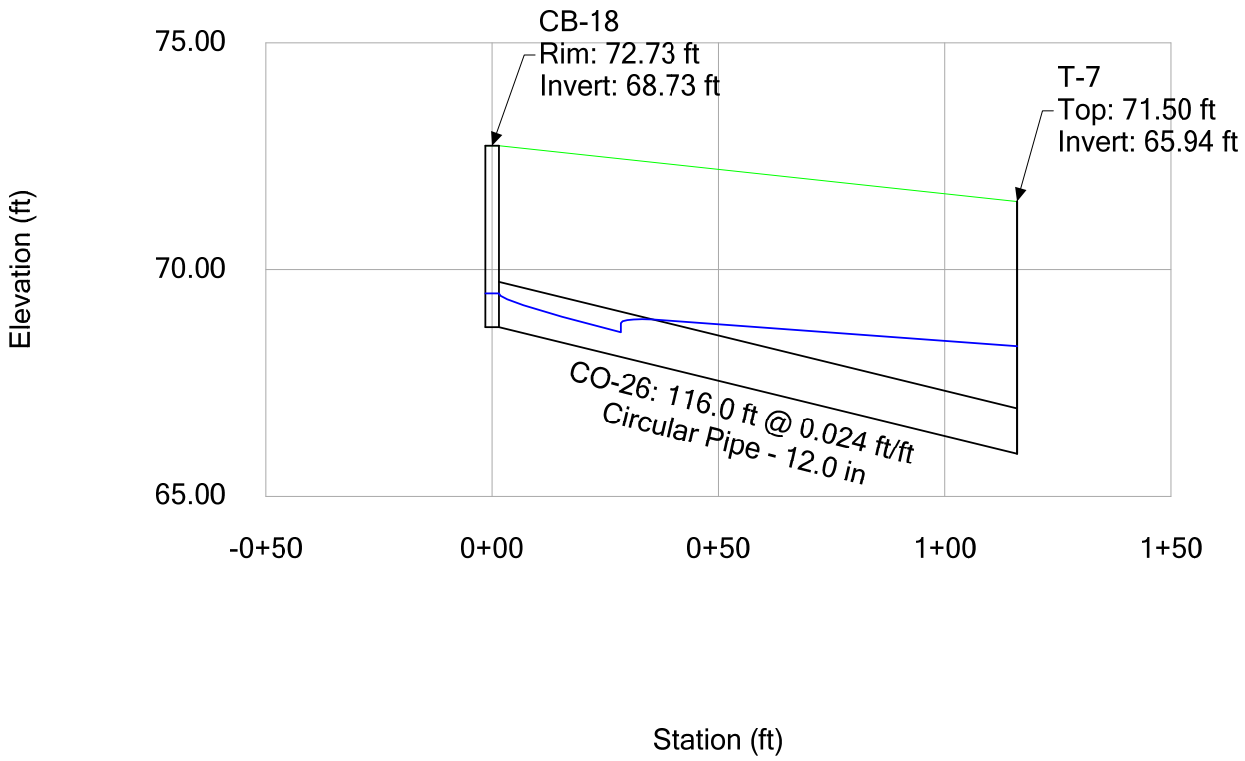
Profile Report
Engineering Profile - Profile - 1 (1923_west.stc)



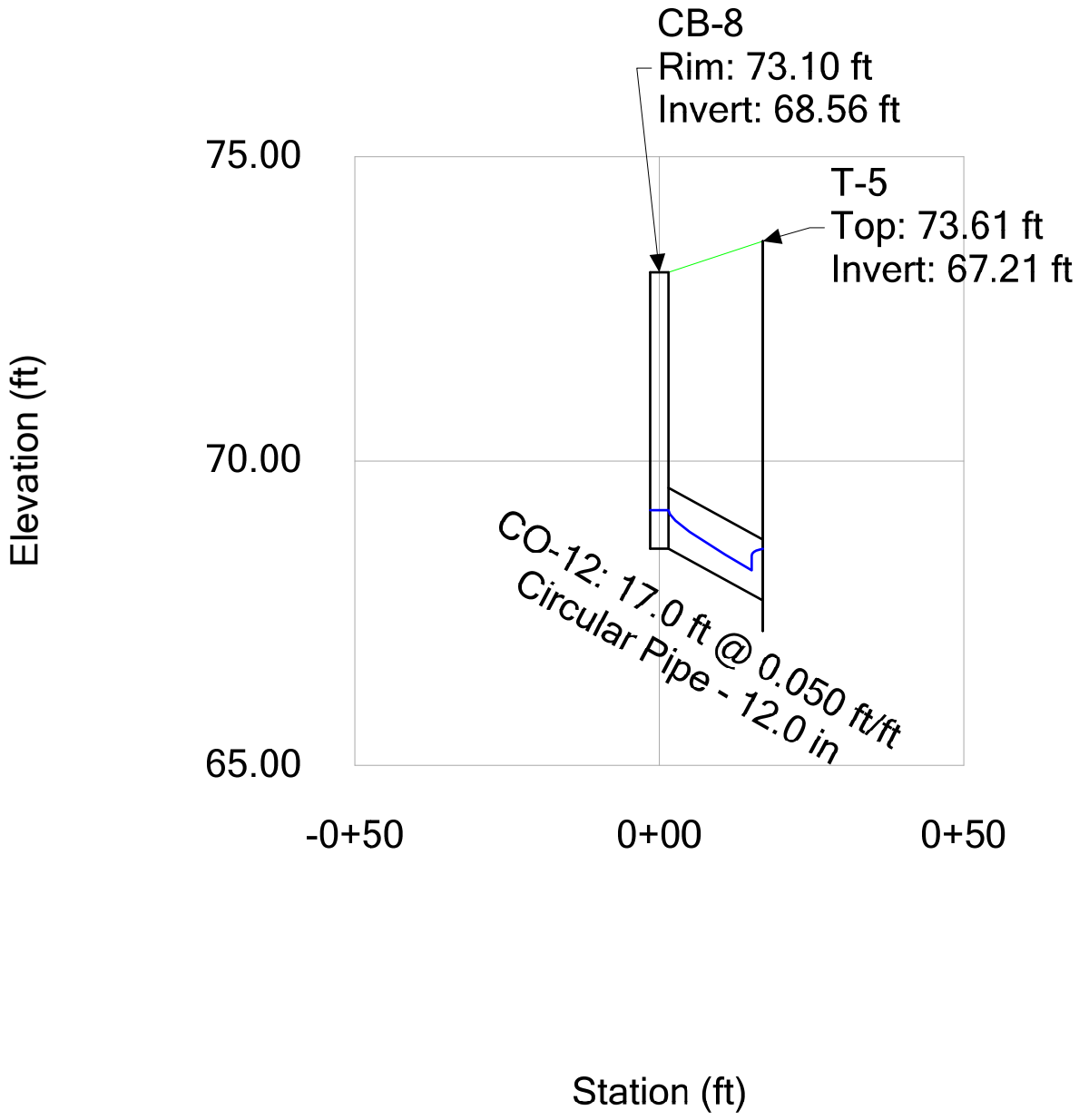
Profile Report
Engineering Profile - Profile - 2 (1923_west.stc)



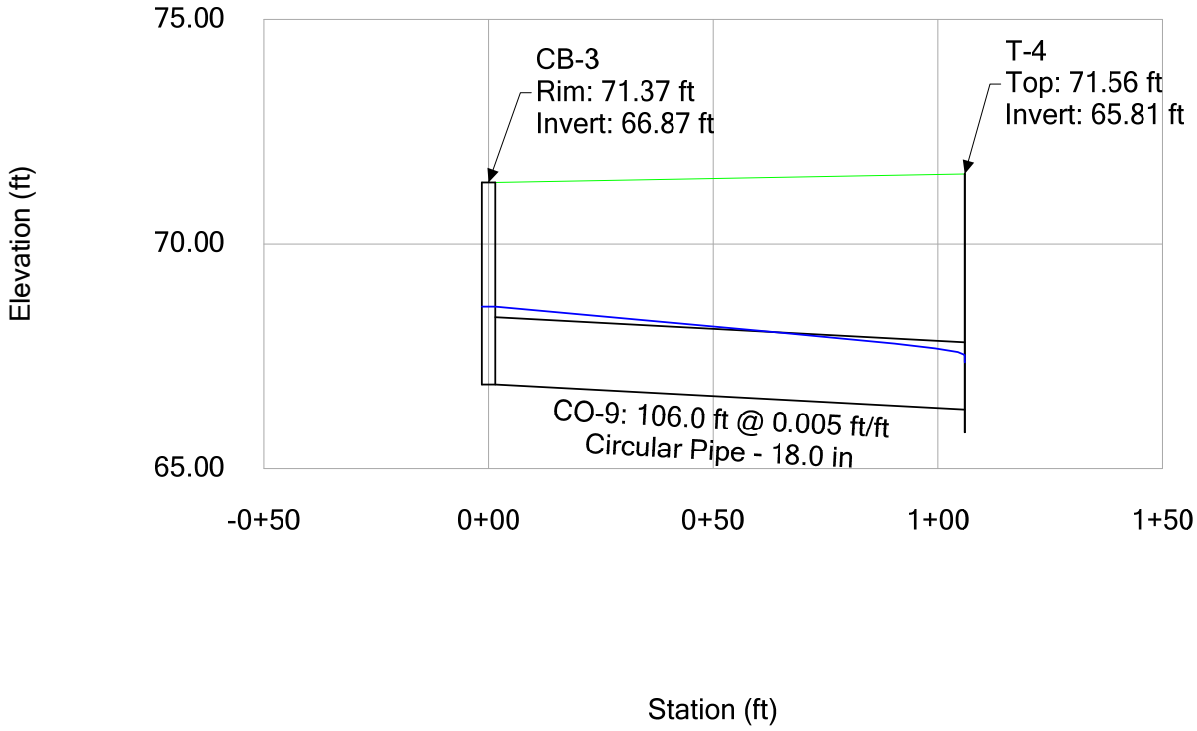
Profile Report
Engineering Profile - Profile - 3 (1923_west.stc)



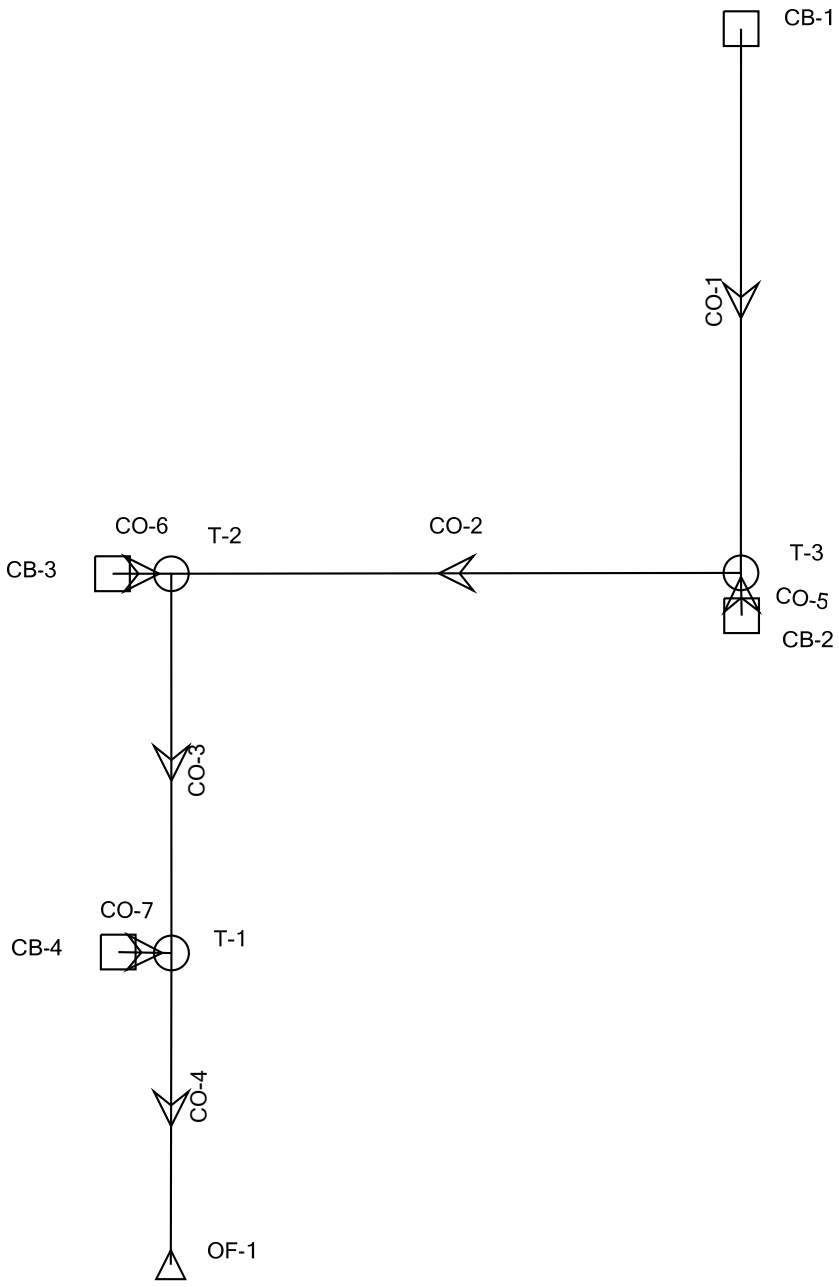
Profile Report
Engineering Profile - Profile - 4 (1923_west.stc)



Profile Report
Engineering Profile - Profile - 5 (1923_west.stc)



Scenario: Base



Conduit FlexTable: Combined Pipe/Node Report (1923_Pool_Area.stc)

Label	Start Node	Stop Node	Length (Unified) (ft)	Total Flow (ft^3/s)	Rise (Unified) (in)	Capacity (Full Flow) (ft^3/s)	Velocity (Average) (ft/s)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Slope (ft/ft)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CO-7	CB-4	T-1	8.0	0.50	12.0	7.97	5.66	68.13	67.73	0.050	0.013	68.83	68.83
CO-1	CB-1	T-3	94.0	2.94	12.0	2.92	3.74	69.46	68.83	0.007	0.013	71.98	71.34
CO-5	CB-2	T-3	4.0	2.39	12.0	7.97	3.04	69.03	68.83	0.050	0.013	71.35	71.34
CO-2	T-3	T-2	98.0	5.33	12.0	2.92	6.79	68.83	68.17	0.007	0.013	71.34	69.10
CO-6	CB-3	T-2	9.0	0.93	12.0	7.97	6.78	68.62	68.17	0.050	0.013	69.02	69.03
CO-3	T-2	T-1	65.0	6.26	18.0	8.64	5.33	67.67	67.23	0.007	0.013	69.03	68.83
CO-4	T-1	OF-1	53.0	6.76	18.0	8.66	3.83	67.23	66.87	0.007	0.013	68.83	68.61

FlexTable: Catch Basin Table (1923_Pool_Area.stc)

Label	Station (Calculated) (ft)	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Additional) (ft³/s)	Carryover Additional Flow (ft³/s)	Flow (Known) (ft³/s)	Inlet Type	Maximum Inflow (ft³/s)
CB-1	3+10	73.80	True	73.80	69.46	2.94	0.00	0.00	Percent Capture	0.00
CB-2	2+20	72.50	True	72.50	69.03	2.39	0.00	0.00	Percent Capture	0.00
CB-3	1+27	73.00	True	73.00	68.62	0.93	0.00	0.00	Percent Capture	0.00
CB-4	0+61	73.00	True	73.00	68.13	0.50	0.00	0.00	Percent Capture	0.00

Capture Efficiency (%)	Inlet Location	Desired Sump Depth (ft)	Depth (In) (ft)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	System Fixed Flow (ft³/s)
100.0	On Grade	0.00	2.52	2.52	71.98	71.98	2.94
100.0	On Grade	0.00	2.32	2.32	71.35	71.35	2.39
100.0	On Grade	0.00	0.40	0.40	69.02	69.02	0.93
100.0	On Grade	0.00	0.70	0.70	68.83	68.83	0.50

FlexTable: Outfall Table (1923_Pool_Area.stc)

Label	Station (ft)	Elevation (Ground) (ft)	Set Rim to Ground Elevation	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (Tailwater) (ft)	Flow (Outfall) (ft³/s)
OF-1	0+00	71.37	True	66.87	User Defined Tailwater	68.61	6.76

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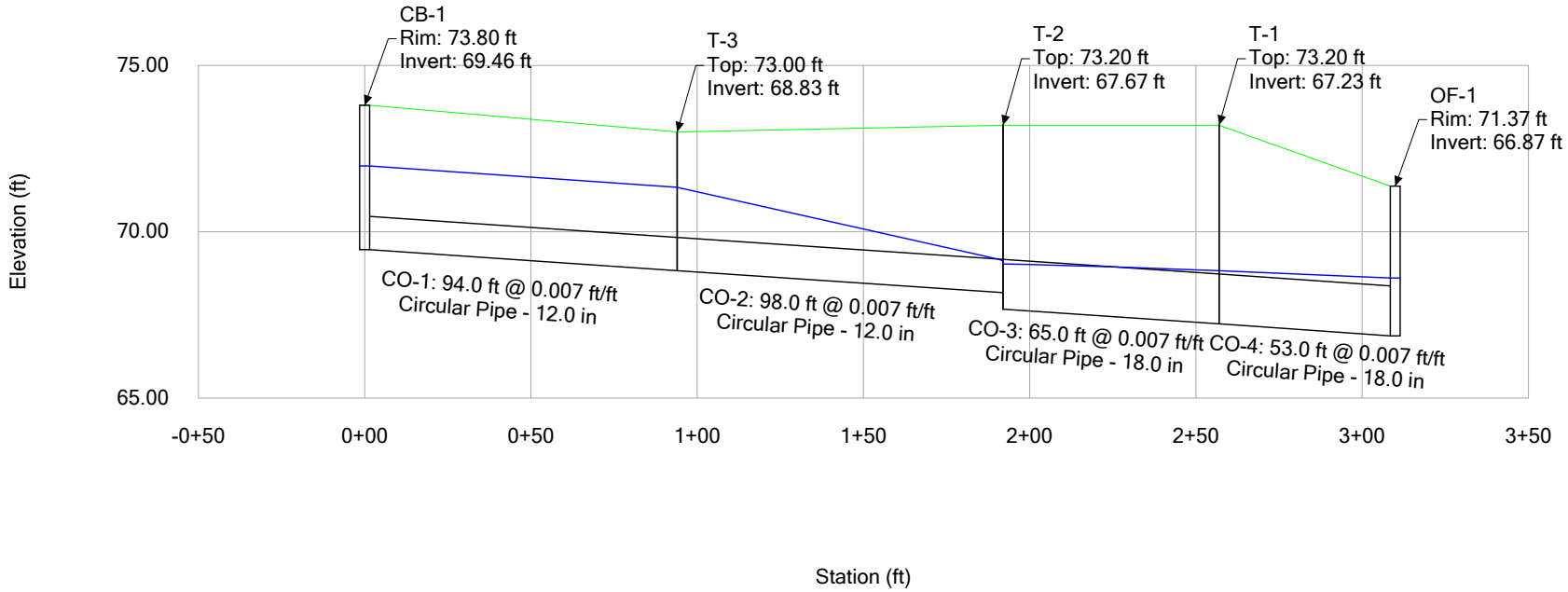
FlexTable: Transition Table (1923_Pool_Area.stc)

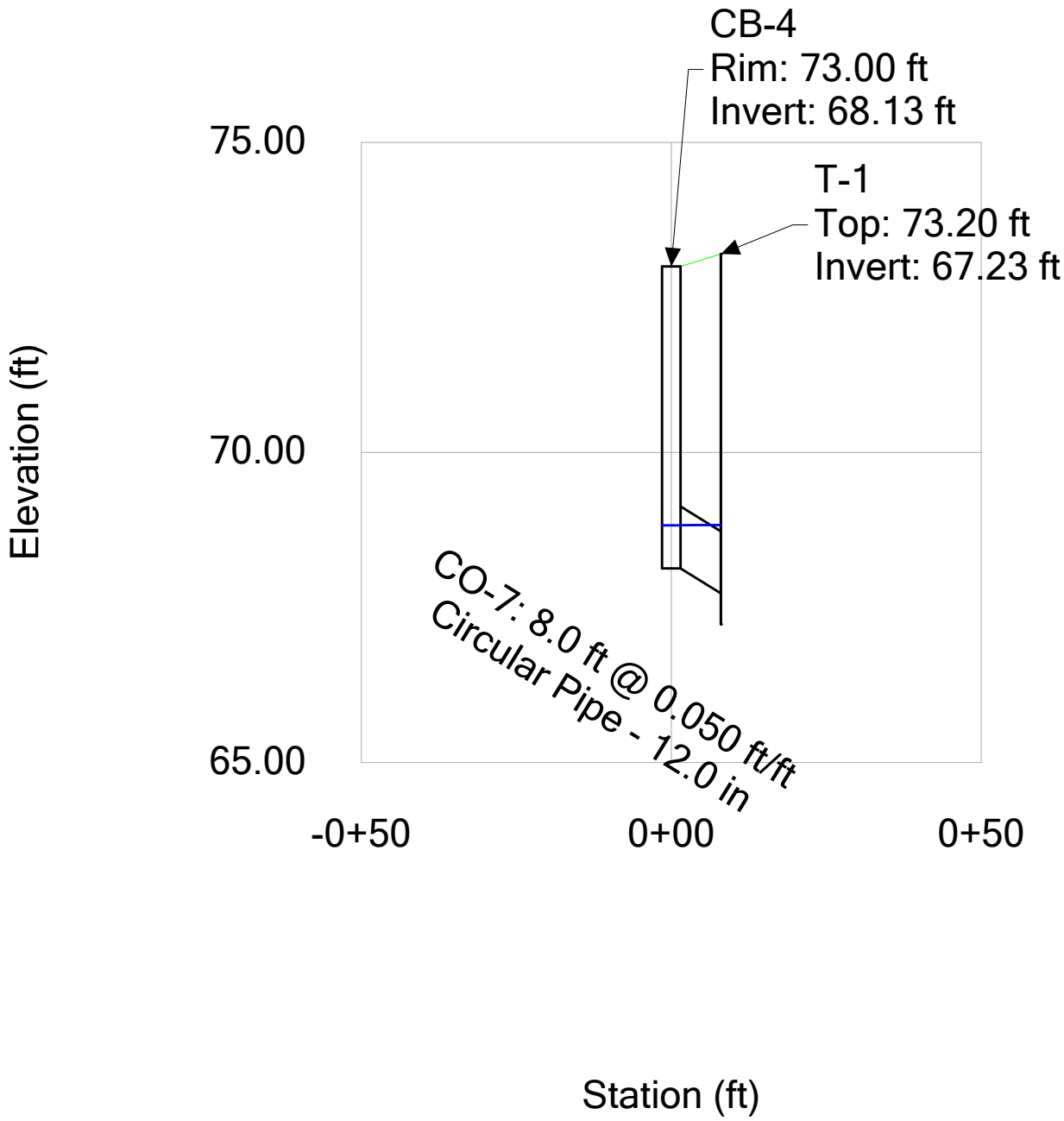
Label	Elevation (Ground) (ft)	Elevation (Top) (ft)	Elevation (Invert) (ft)	Transition Length (ft)	Headloss Method	Hydraulic Grade Line (Out) (ft)	System Fixed Flow (ft^3/s)
T-1	73.20	73.20	67.23	0.0	Absolute	68.83	6.76
T-2	73.20	73.20	67.67	0.0	Absolute	69.03	6.26
T-3	73.00	73.00	68.83	0.0	Absolute	71.34	5.33

Profile Report
Engineering Profile - Profile - 1 (1923_Pool_Area.stc)

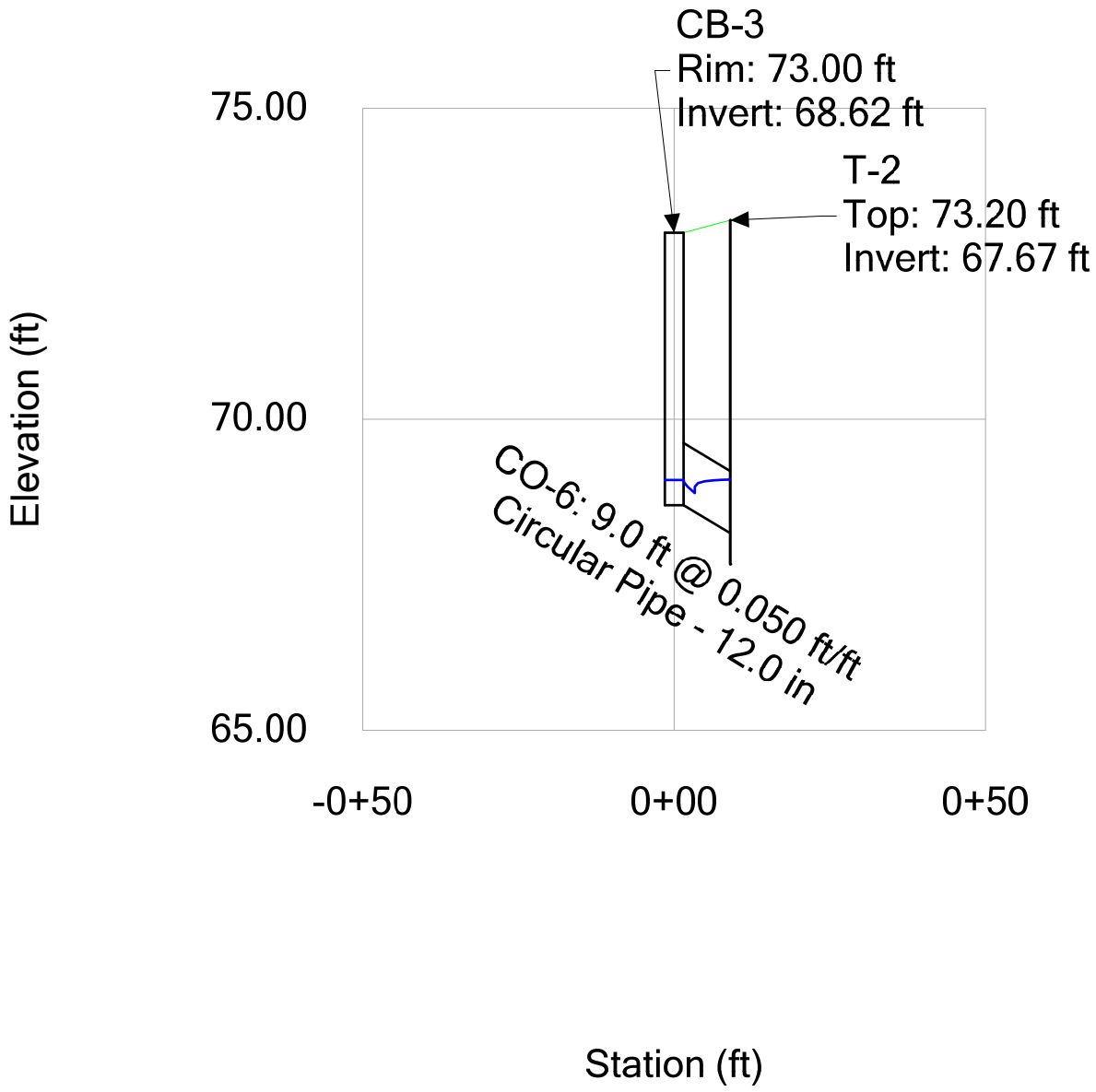


Profile Report

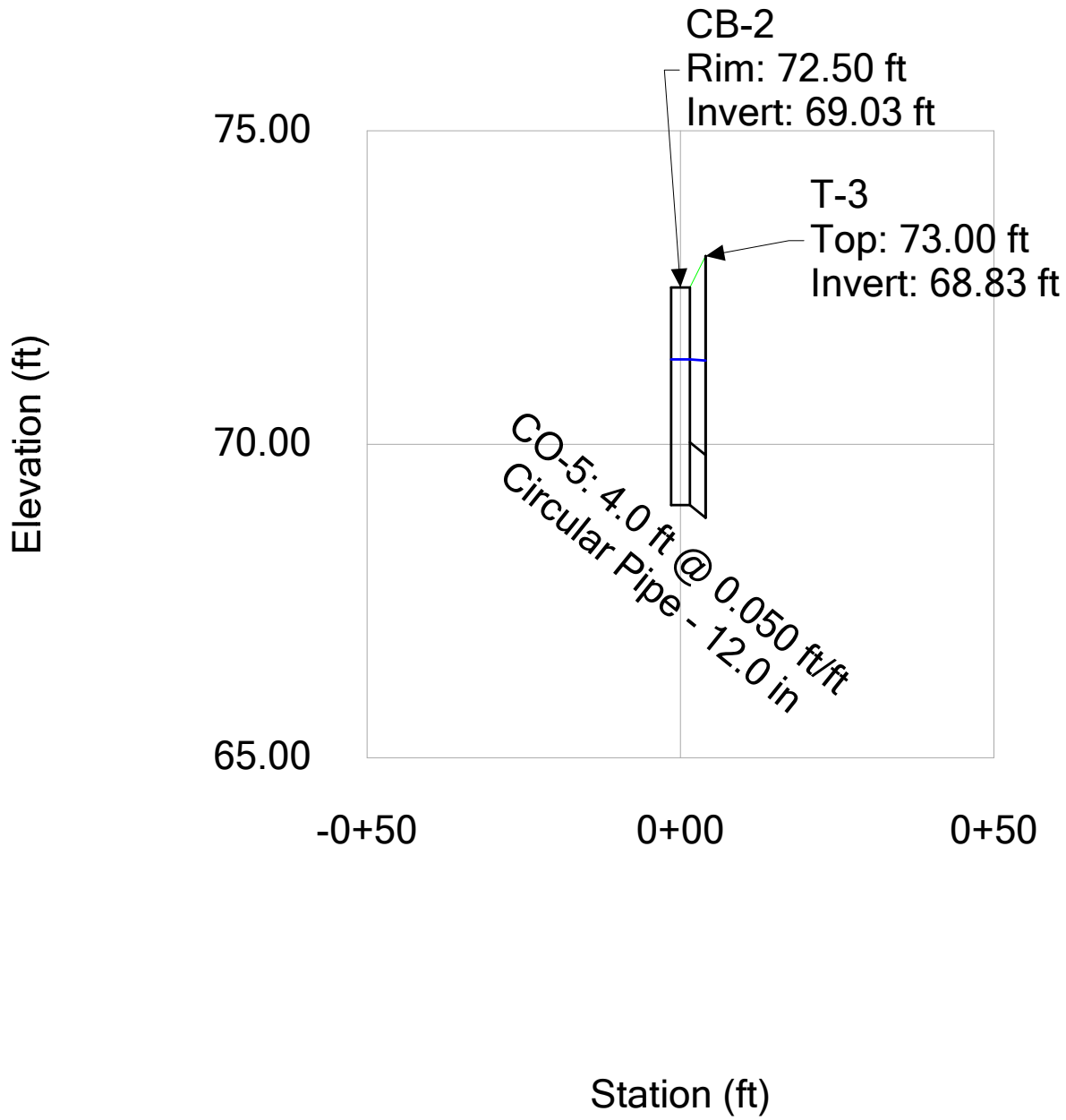
Engineering Profile - Profile - 2 (1923_Pool_Area.stc)



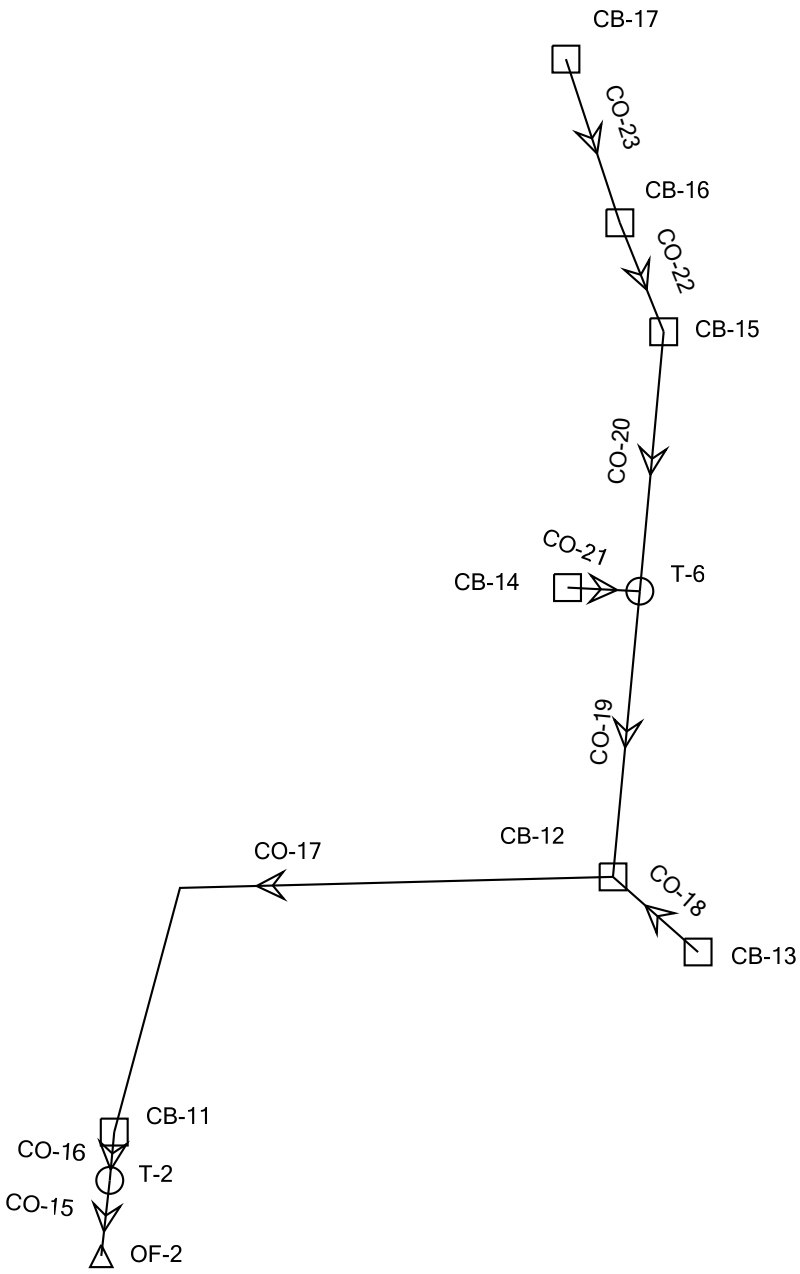
Profile Report
Engineering Profile - Profile - 3 (1923_Pool_Area.stc)



Profile Report
Engineering Profile - Profile - 4 (1923_Pool_Area.stc)



Scenario: Base



Conduit FlexTable: Combined Pipe/Node Report (1923_east.stc)

Label	Start Node	Stop Node	Length (Unified) (ft)	Total Flow (ft^3/s)	Rise (Unified) (in)	Capacity (Full Flow) (ft^3/s)	Velocity (Average) (ft/s)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Slope (ft/ft)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CO-23	CB-17	CB-16	56.0	1.04	12.0	2.52	3.05	67.88	67.60	0.005	0.013	68.33	68.13
CO-22	CB-16	CB-15	38.0	1.56	12.0	3.96	4.75	67.60	67.13	0.012	0.013	68.13	67.77
CO-20	CB-15	T-6	85.0	2.22	12.0	4.03	5.26	67.13	66.04	0.013	0.013	67.77	66.85
CO-21	CB-14	T-6	9.0	1.34	12.0	2.66	3.39	66.09	66.04	0.006	0.013	66.85	66.85
CO-19	T-6	CB-12	95.0	3.56	12.0	4.04	5.80	66.04	64.82	0.013	0.013	66.85	65.55
CO-18	CB-13	CB-12	36.0	0.46	12.0	2.52	2.44	65.00	64.82	0.005	0.013	65.32	65.31
CO-17	CB-12	CB-11	228.0	5.49	18.0	7.43	4.60	64.32	63.18	0.005	0.013	65.31	64.78
CO-16	CB-11	T-2	11.0	11.66	18.0	7.76	6.60	63.18	63.12	0.005	0.013	64.78	64.64
CO-15	T-2	OF-2	17.0	11.66	18.0	7.64	6.60	63.12	63.03	0.005	0.013	64.64	64.33

FlexTable: Catch Basin Table (1923_east.stc)

Label	Station (Calculated) (ft)	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Additional) (ft³/s)	Carryover Additional Flow (ft³/s)	Flow (Known) (ft³/s)	Inlet Type	Maximum Inflow (ft³/s)
CB-11	0+28	70.92	True	70.92	63.18	6.17	0.00	0.00	Percent Capture	0.00
CB-12	2+56	72.21	True	72.21	64.32	1.47	0.00	0.00	Percent Capture	0.00
CB-13	2+92	67.00	True	67.00	65.00	0.46	0.00	0.00	Percent Capture	0.00
CB-14	3+60	68.00	True	68.00	66.09	1.34	0.00	0.00	Percent Capture	0.00
CB-15	4+36	71.13	True	71.13	67.13	0.66	0.00	0.00	Percent Capture	0.00
CB-16	4+74	71.60	True	71.60	67.60	0.52	0.00	0.00	Percent Capture	0.00
CB-17	5+30	71.00	True	71.00	67.88	1.04	0.00	0.00	Percent Capture	0.00

Capture Efficiency (%)	Inlet Location	Desired Sump Depth (ft)	Depth (In) (ft)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	System Fixed Flow (ft³/s)
100.0	On Grade	0.00	1.60	1.60	64.78	64.78	11.66
100.0	On Grade	0.00	0.99	0.99	65.31	65.31	5.49
100.0	On Grade	0.00	0.32	0.32	65.32	65.32	0.46
100.0	On Grade	0.00	0.76	0.76	66.85	66.85	1.34
100.0	On Grade	0.00	0.64	0.64	67.77	67.77	2.22
100.0	On Grade	0.00	0.53	0.53	68.13	68.13	1.56
100.0	On Grade	0.00	0.45	0.45	68.33	68.33	1.04

FlexTable: Outfall Table (1923_east.stc)

Label	Station (ft)	Elevation (Ground) (ft)	Set Rim to Ground Elevation	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (Tailwater) (ft)	Flow (Outfall) (ft³/s)
OF-2	0+00	70.00	True	63.03	User Defined Tailwater	62.75	11.66

FlexTable: Transition Table (1923_east.stc)

Label	Elevation (Ground) (ft)	Elevation (Top) (ft)	Elevation (Invert) (ft)	Transition Length (ft)	Headloss Method	Hydraulic Grade Line (Out) (ft)	System Fixed Flow (ft^3/s)
T-2	71.08	71.08	63.12	0.0	Absolute	64.64	11.66
T-6	69.00	69.00	66.04	0.0	Absolute	66.85	3.56

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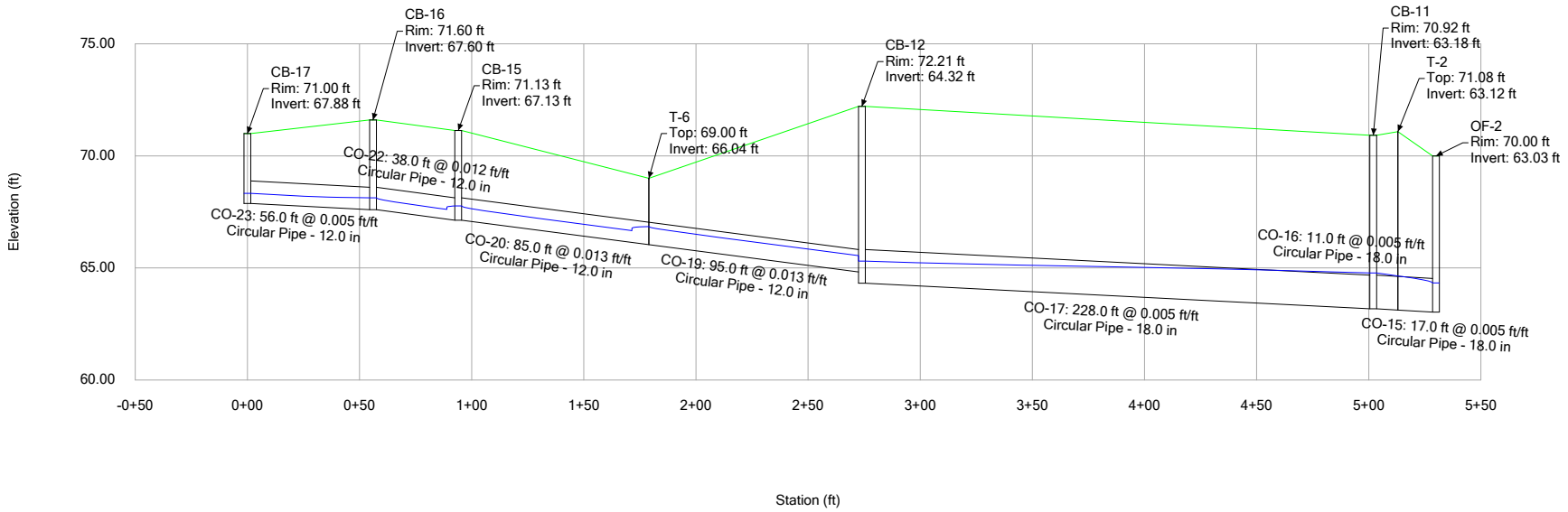
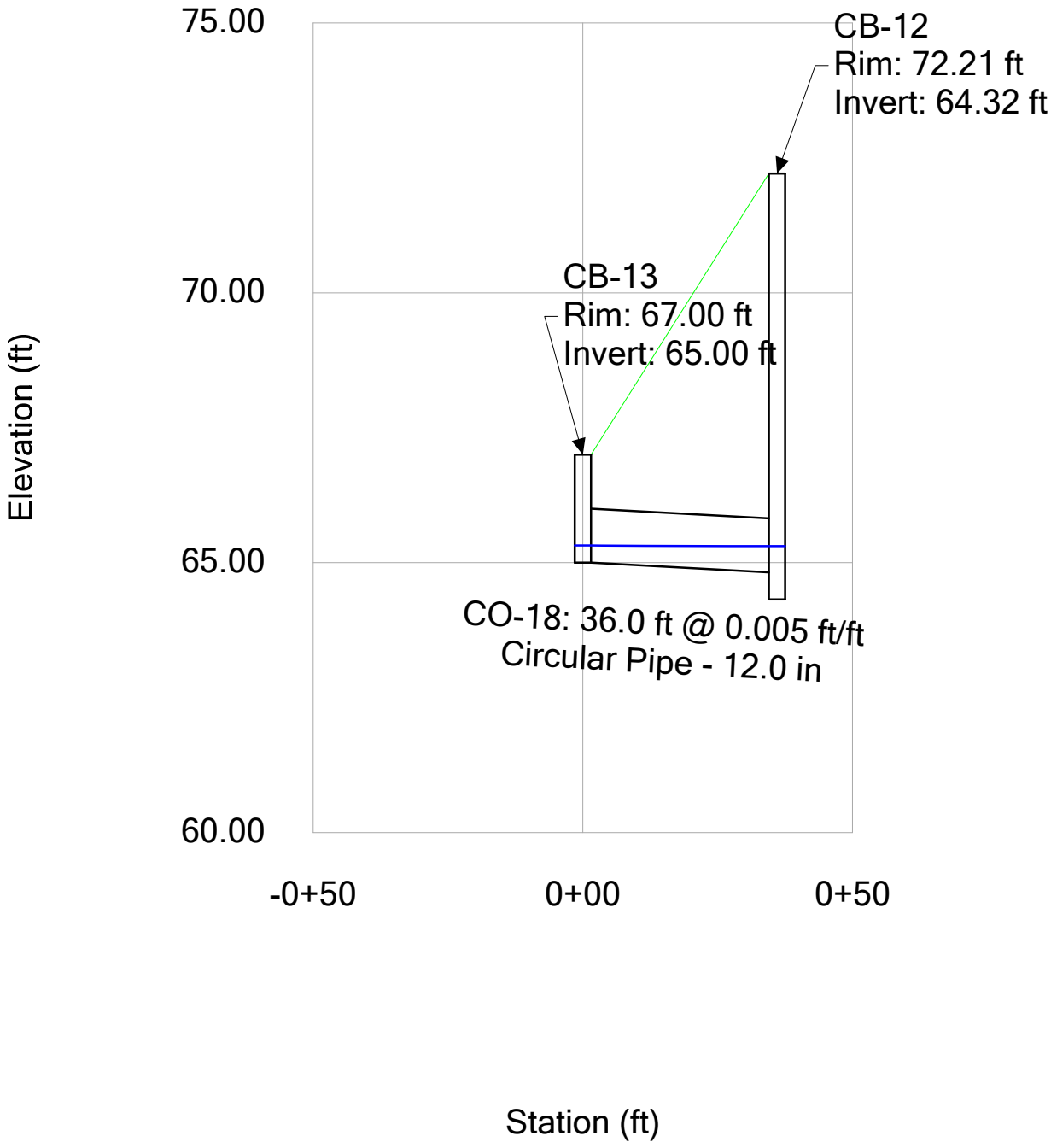
Profile Report
Engineering Profile - Profile - 1 (1923_east.stc)

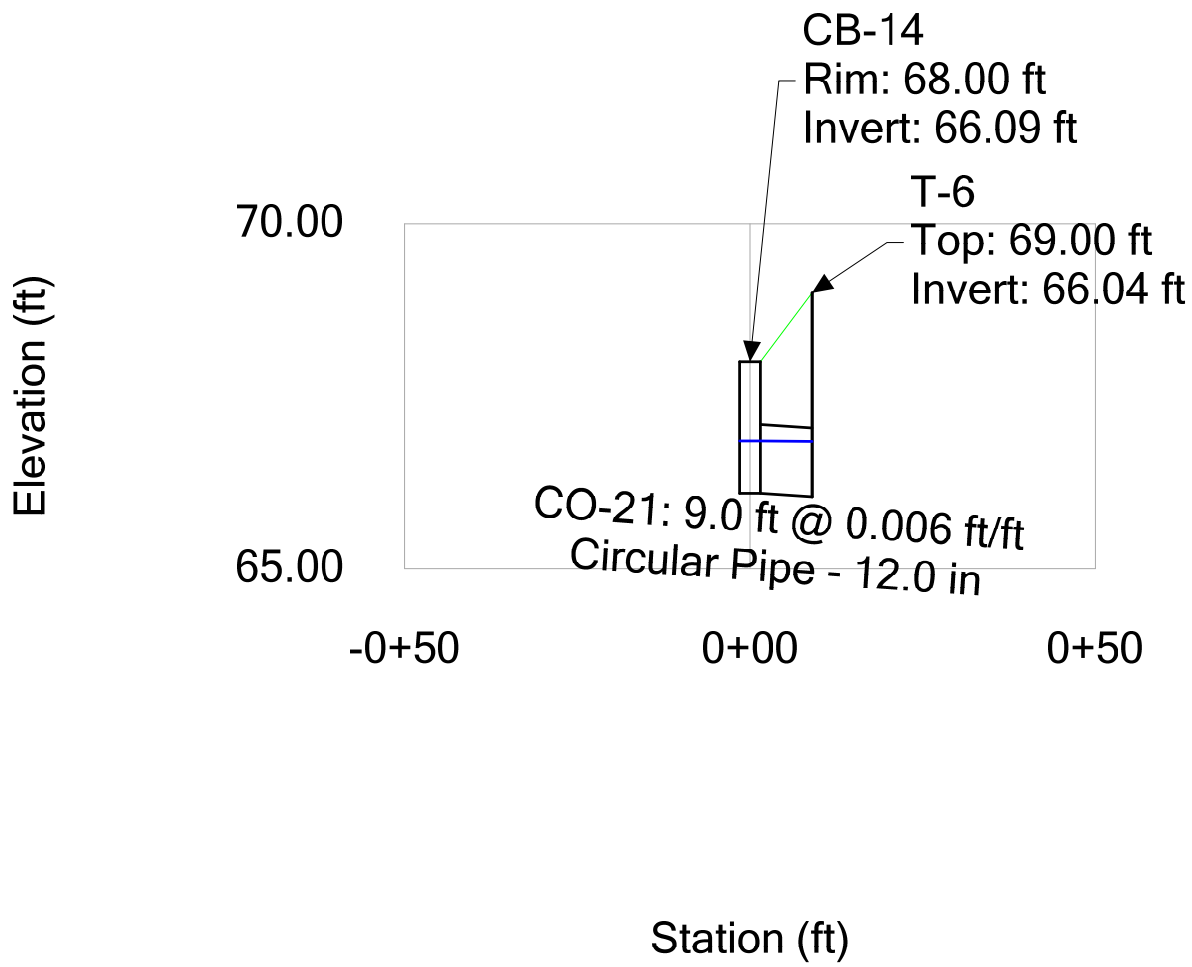


Profile Report

Engineering Profile - Profile - 2 (1923_east.stc)



Profile Report
Engineering Profile - Profile - 3 (1923_east.stc)



APPENDIX K

Preliminary Grading and Drainage Plans

PRELIMINARY GRADING & DRAINAGE PLAN FOR

78TH ST. & PRINCESS BLVD. APARTMENTS

NWC 78TH ST. & PRINCESS BLVD., SCOTTSDALE, AZ 85255

LOCATED IN A PORTION OF THE NORTHEAST QUARTER OF SECTION 35, TOWNSHIP 4 NORTH, RANGE 4 EAST
OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA

LEGAL DESCRIPTION:

LOT 1, OF HAYDEN 50, ACCORDING TO THE PLAT OF RECORD IN THE OFFICE OF THE COUNTY RECORDER IN BOOK 1447 OF MAPS, PAGE 40, RECORDS OF MARICOPA COUNTY, ARIZONA AND THEREAFTER CERTIFICATE OF CORRECTION RECORDED IN 2019-232626 AND IN 2019-392368, OF OFFICIAL RECORDS.

GENERAL NOTES FOR PUBLIC WORKS CONSTRUCTION:

1. ALL CONSTRUCTION IN THE PUBLIC RIGHTS-OF-WAY OR IN EASEMENTS GRANTED FOR PUBLIC USE MUST CONFORM TO THE LATEST MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) UNIFORM STANDARD SPECIFICATIONS AND UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION AS AMENDED BY THE LATEST VERSION OF THE CITY OF SCOTTSDALE STANDARD SPECIFICATIONS AND SUPPLEMENTAL STANDARD DETAILS. IF THERE IS A CONFLICT, THE CITY'S SUPPLEMENTAL STANDARD DETAILS WILL GOVERN.
2. THE CITY ONLY APPROVES THE SCOPE, NOT THE DETAIL OF ENGINEERING DESIGNS; THEREFORE IF CONSTRUCTION QUANTITIES ARE SHOWN ON THESE PLANS, THEY ARE NOT VERIFIED BY THE CITY.
3. THE APPROVAL OF PLANS IS VALID FOR SIX (6) MONTHS. IF ASSOCIATED PERMIT HAS NOT BEEN ISSUED WITHIN THIS TIME FRAME, THE PLANS MUST BE RESUBMITTED TO THE CITY FOR RE-APPROVAL.
4. A CITY INSPECTOR WILL INSPECT ALL WORKS WITHIN THE CITY OF SCOTTSDALE. NOTIFY INSPECTION SERVICES 72 HOURS BEFORE BEGINNING WORK.
5. WHENEVER EXCAVATION IS NECESSARY, CALL THE BLUE STAKE CENTER, 811, TWO WORKING DAYS BEFORE EXCAVATION BEGINS.
6. PERMISSION TO WORK IN THE RIGHT-OF-WAY (PWR) PERMITS ARE REQUIRED FOR ALL WORKS WITHIN THE RIGHTS-OF-WAY AND EASEMENTS GRANTED FOR PUBLIC PURPOSES. COPIES OF ALL PERMITS MUST BE RETAINED ON-SITE AND BE AVAILABLE FOR INSPECTION AT ALL TIMES. FAILURE TO PRODUCE THE REQUIRED PERMITS WILL RESULT IN IMMEDIATE SUSPENSION OF ALL WORK UNTIL THE PROPER PERMIT DOCUMENTATION IS OBTAINED.

BUILDING	BUILDING LIVABLE FLOOR (LF)	GARAGE ELEVATION	HAG ELEVATION	RFD ELEVATION
A	1574.60	NA	1571.70	1573.70
B	1574.20	1573.50	1570.20	1572.20
C	1574.30	1573.60	1570.10	1572.10
D	1573.60	1572.90	1569.00	1571.00
E	1573.40	1572.70	1568.20	1570.20
F	1572.90	1572.20	1567.30	1569.30
G	1573.70	1573.00	1570.10	1572.10
H	1572.40	1571.70	1567.70	1569.70
I	1573.40	1572.70	1567.80	1569.80
J	1574.80	1574.10	1569.40	1571.40
K	1574.70	1574.00	1570.40	1572.40
L	1574.90	1574.20	1571.10	1573.10
M	1575.70	1575.00	1572.90	1574.90
N	1575.20	1574.50	1572.10	1574.10
O	1575.70	1575.00	1572.80	1574.80
P	1576.10	1575.40	1573.30	1575.30
Q	1576.00	1575.30	1572.60	1574.60
GUARD SHACK	1574.60	NA	1571.20	1573.20
CASITA	1574.60	NA	1571.00	1573.00

NOTES:

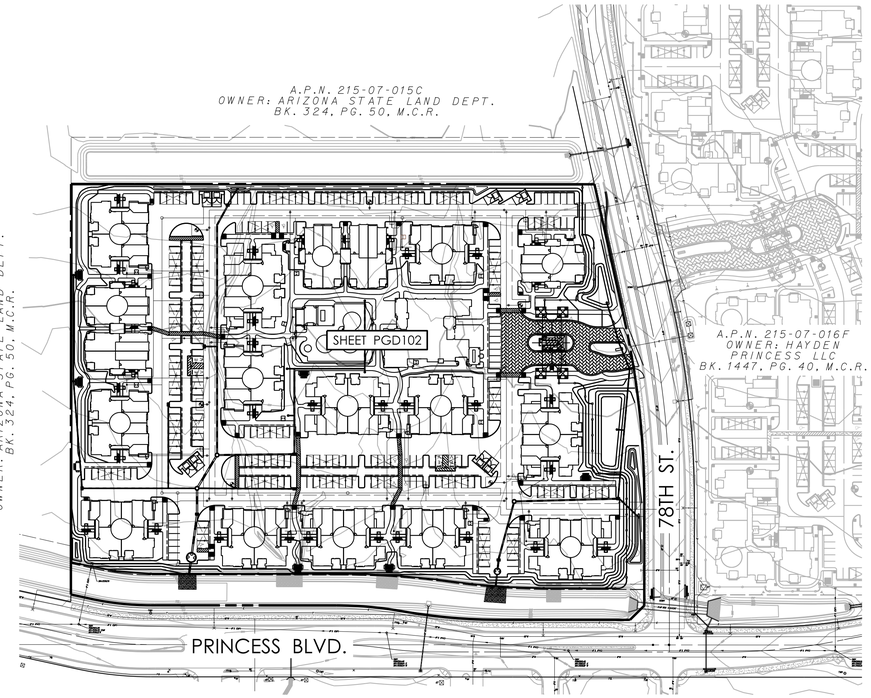
1. THE GARAGE ELEVATION HAS BEEN SET TO 2' OR GREATER ABOVE THE HAG.
2. ALL BUILDINGS WILL REQUIRE FEMA ELEVATION CERTIFICATES.
3. EXISTING CONTOURS ARE BASED ON 1993 DATA PROVIDED BY THE CITY OF SCOTTSDALE.
4. ALL ELECTROMECHANICAL EQUIPMENT TO BE SET AT OR ABOVE RFD.

UTILITY	UTILITY COMPANY	NAME OF COMPANY REPRESENTATIVE	TELEPHONE NUMBER	DATE SIGNED
ELECTRIC	APS			
TELEPHONE	CENTURY LINK			
NATURAL GAS	SOUTHWEST GAS			
CABLE TV	COX COMMUNICATIONS			
OTHER	A.T.&T.			
OTHER				

ENGINEER'S CERTIFICATION

I DANIEL G. MANN, AS THE ENGINEER OF RECORD FOR THIS DEVELOPMENT, HEREBY CERTIFY THAT ALL UTILITY COMPANIES LISTED ABOVE HAVE BEEN PROVIDED FINAL IMPROVEMENT PLANS FOR REVIEW, AND THAT ALL CONFLICTS IDENTIFIED BY THE UTILITIES HAVE BEEN RESOLVED. IN ADDITION "NO CONFLICT" FORMS HAVE BEEN OBTAINED FROM EACH UTILITY COMPANY AND ARE INCLUDED IN THIS SUBMITTAL.

SIGNATURE DATE



SITE MAP
N.T.S.

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
PGD101	COVER SHEET - PRELIMINARY GRADING & DRAINAGE PLAN
PGD102	PRELIMINARY GRADING & DRAINAGE PLAN
PGD103	FLOODPLAIN ELEVATION EXHIBIT

FLOOD INSURANCE RATE MAP (FIRM) INFORMATION:

COMMUNITY NUMBER	PANEL NUMBER	PANEL DATE	SUFFIX	FIRM DATE	FIRM ZONE	BASE FLOOD ELEVATION
045012	1320	OCTOBER 16, 2013	L	SEPTEMBER 18, 2020	AO	DEPTH: 1 FT VELOCITY: 3FPS

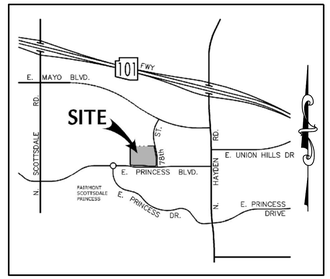
ENGINEER'S CERTIFICATION:

THE LOWEST FINISH FLOOR ELEVATION(S) AND/OR FLOOD PROOFING ELEVATION(S) ON THIS PLAN ARE SUFFICIENTLY HIGH TO PROVIDE PROTECTION FROM FLOODING CAUSED BY A 100-YEAR STORM, AND ARE IN ACCORDANCE WITH SCOTTSDALE REVISED CODE, CHAPTER 37 - FLOODPLAIN AND STORMWATER REGULATION.

EARTHWORK:

FOR ESTIMATING ONLY.
ENGINEER MAKES NO GUARANTEE OF ACCURACY.
NO SHRINK OR SWELL IS ASSUMED.

EARTHWORK QUANTITIES		
DESCRIPTION	QTY.	UNIT
CUT (RAW)	153	C.Y.
FILL (RAW)	55,510	C.Y.



VICINITY MAP
N.T.S.

PARCEL ADDRESS:

NWC 78TH ST. & PRINCESS BLVD.
SCOTTSDALE, ARIZONA 85255

ASSESSORS PARCEL NUMBER:

215-07-016E

PROJECT SCOPE:

THE SCOPE OF THIS PROJECT IS A NEW MULTI-FAMILY RESIDENTIAL APARTMENT COMPLEX WITH 180 UNITS ALSO WITH UTILITY IMPROVEMENTS AND LANDSCAPE.

DRAINAGE STATEMENT:

THE SITE DOES NOT PROVIDE RETENTION. TREATMENT IS PROVIDED FOR THE FIRST FLUSH STORM EVENT.

OWNER:

PRINCESS & 78TH LLC
6623 NORTH SCOTTSDALE ROAD
SCOTTSDALE, ARIZONA 85250

CONTACT: CHRIS BRONZINA
PHONE: (480) 991-9111

DEVELOPER:

MARK-TAYLOR, INC.
6623 NORTH SCOTTSDALE ROAD
SCOTTSDALE, ARIZONA 85250

CONTACT: ROB ORME
PHONE: (480) 281-5549
EMAIL: RORME@MARK-TAYLOR.COM

ARCHITECT:

ARCHITECTURAL DESIGN GROUP
6623 N. SCOTTSDALE ROAD
SCOTTSDALE, ARIZONA 85250

CONTACT: ROB ORME
PHONE: (480) 281-5549
EMAIL: RORME@MARK-TAYLOR.COM

ENGINEER:

3 ENGINEERING
6370 E. THOMAS ROAD, SUITE #200
SCOTTSDALE, ARIZONA 85251

CONTACT: DANIEL G. MANN, P.E.
PHONE: (602) 334-4387
EMAIL: DAN@3ENGINEERING.COM

LOT AREA:

GROSS AREA:	12.09 ACRES
NET AREA:	10.70 ACRES
DISTURBED AREA:	10.70 ACRES

BENCHMARK:

PER SURVY INNOVATION GROUP, THE BENCHMARK IS AN ALUMINUM CAP IN HANDHOLE, LOCATED AT THE INTERSECTION OF HAYDEN ROAD & BELL ROAD, WEST OF HAYDEN IN GOLF COURSE, (NOT SECTION CORNER).

ELEVATION = 1542.865 (NAVD'88)
CITY OF SCOTTSDALE DATUM

I HEREBY CERTIFY THAT ALL ELEVATIONS REPRESENTED ON THIS PLAN ARE BASED ON THE ELEVATION DATUM FOR THE CITY OF SCOTTSDALE BENCHMARK PROVIDED ABOVE.

ENGINEER 10/28/2020 DATE

LEGEND

	INDICATES PROPERTY / BOUNDARY LINE
1560	INDICATES EXISTING CONTOUR ELEVATION
58	INDICATES PROPOSED CONTOUR ELEVATION
+ TC: 59.13 G: 58.64	INDICATES EXISTING TOP OF CURB ELEVATION INDICATES EXISTING GUTTER ELEVATION
+ 62.52	INDICATES EXISTING GROUND ELEVATION
+ P: 60.11	INDICATES EXISTING PAVEMENT ELEVATION
+ C: 56.69	INDICATES EXISTING CONCRETE ELEVATION
15.9	INDICATES PROPOSED GROUND ELEVATION
1%	INDICATES DIRECTION OF FLOW & SLOPE
GB	INDICATES GRADE BREAK
P=	INDICATES PROPOSED PAVEMENT ELEVATION
C=	INDICATES PROPOSED TOP OF CONC. ELEVATION
G=	INDICATES PROPOSED GUTTER ELEVATION
LF_{88}=	INDICATES LOWEST FINISH FLOOR ELEVATION
W	INDICATES PROPOSED WATERLINE
S	INDICATES PROPOSED SEWERLINE
	INDICATES PROPOSED METER
	INDICATES PROPOSED SEWER CLEANOUT
	INDICATES PROPOSED CATCH BASIN
	INDICATES PROPOSED STORM DRAIN PIPE
	INDICATES PROPOSED STORM DRAIN MANHOLE
	INDICATES PROPOSED FIRE HYDRANT
FH	INDICATES EXISTING FIRE HYDRANT
24" SD	INDICATES EXISTING STORM DRAIN PIPE
8" S	INDICATES EXISTING SEWER LINE & SIZE
12" W (ACP) WV	INDICATES EXISTING WATER LINE,VALVE & SIZE
E	INDICATES EXISTING BURIED ELECTRIC CONDUIT
G	INDICATES EXISTING GAS LINE
OHE	INDICATES EXISTING OVERHEAD ELECTRIC
PP	INDICATES EXISTING POWER POLE
LP	INDICATES EXISTING LIGHT POLE
ET	INDICATES EXISTING ELECTRIC TRANSFORMER
EB	INDICATES EXISTING ELECTRIC BOX
WM	INDICATES EXISTING WATER METER
BWV	INDICATES EXISTING BACKFLOW PREVENTER VALVE

BASIS OF BEARING

THE BASIS OF BEARING IS THE EAST LINE OF THE NORTHEAST QUARTER OF SECTION 35, TOWNSHIP 4 NORTH, RANGE 4 EAST, AS SHOWN IN BOOK 1447 OF MAPS, PAGE 40, MARICOPA COUNTY RECORDS. SAID LINE BEARS SOUTH 00 DEGREES 00 MINUTES 07 SECONDS WEST.

ENGINEER'S STATEMENT:

THE ENGINEER OF RECORD ON THESE PLANS HAS RECEIVED A COPY OF THE APPROVED STIPULATIONS FOR THIS PROJECT AND HAS DESIGNED THESE PLANS IN CONFORMANCE WITH THE APPROVED STIPULATIONS

AS-BUILT CERTIFICATION:

I HEREBY CERTIFY THAT THE RECORD DRAWING MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION OR AS NOTED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED ENGINEER/LAND SURVEYOR DATE

REGISTRATION NUMBER

CIVIL APPROVAL			
REVIEW & RECOMMENDED APRROVAL BY:			
PAVING		TRAFFIC	
G & D		PLANNING	
W & S		FIRE	
RET. WALLS			

ENGINEERING COORDINATION MGR. (OR DESIGNEE) DATE

Contact Arizona 811 at least two full working days before you begin excavation
Call 811 or click Arizona811.com

SNOISIA3d

78TH ST. & PRINCESS BLVD. APARTMENTS
NWC 78TH ST. & PRINCESS BLVD., SCOTTSDALE, AZ 85255
PRELIMINARY GRADING & DRAINAGE PLAN

Registered Professional Engineer
CERTIFICATE NO. 46857
DANIEL G. MANN
10/28/20
ARIZONA, U.S.A.

3engineering
civil engineering
surveying
planning

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CAD TECH:	PHEBE V.
DESIGNER:	D. MANN
ENGINEER:	D. MANN

3 ENGINEERING, LLC
6370 E. THOMAS ROAD
SUITE # 200
SCOTTSDALE, ARIZONA 85251
PHONE: (602) 334-4387
FAX: (602) 490-3230
WWW.3ENGINEERING.COM

DATE: 10/28/20

PROJECT NO.
1923

SHEET NO.
PGD101
1 of 3

Q.S.#39-45 29-DR-2020

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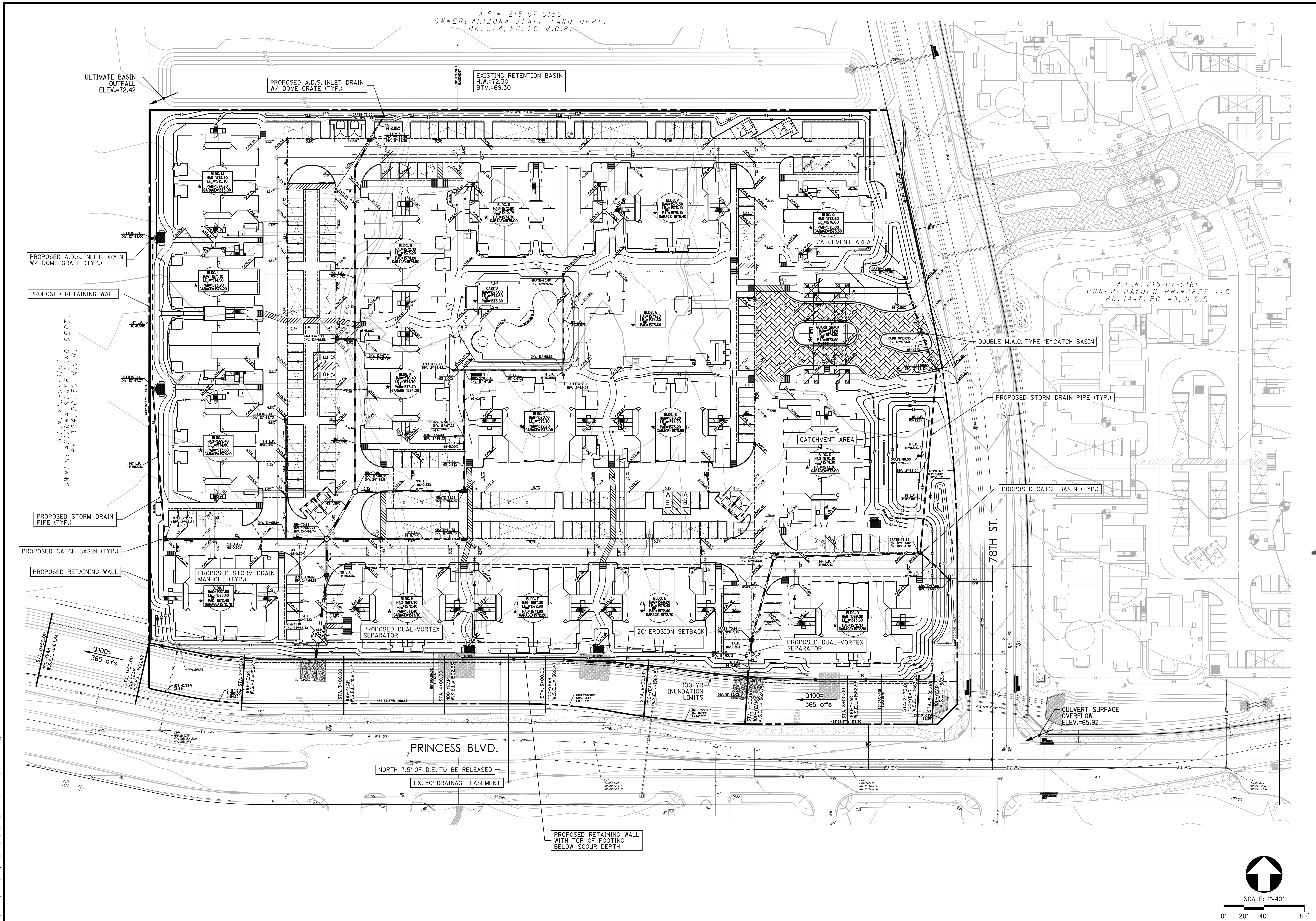
29-DR-2020
11/4/2020


A.P.N. 215-07-015C
OWNER: ARIZONA STATE LAND DEPT.
BK. 324, PG. 50, M.C.R.
ULTIMATE BASIN OUTFALL ELEV.=72.42
PROPOSED A.D.S. INLET DRAIN W/ DOME GRATE (TYP.)
EXISTING RETENTION BASIN H.W.=72.30 BTM.=69.30
PROPOSED A.D.S. INLET DRAIN W/ DOME GRATE (TYP.)
PROPOSED RETAINING WALL
A.P.N. 215-07-015C
OWNER: ARIZONA STATE LAND DEPT.
BK. 324, PG. 50, M.C.R.
PROPOSED STORM DRAIN PIPE (TYP.)
PROPOSED CATCH BASIN (TYP.)
PROPOSED RETAINING WALL
PROPOSED STORM DRAIN MANHOLE (TYP.)
CATCHMENT AREA
A.P.N. 215-07-016F
OWNER: HAYDEN PRINCESS LLC
BK. 1447, PG. 40, M.C.R.
DOUBLE M.A.G. TYPE "E" CATCH BASIN
PROPOSED STORM DRAIN PIPE (TYP.)
CATCHMENT AREA
PROPOSED CATCH BASIN (TYP.)
78TH ST.
PROPOSED DUAL-VORTEX SEPARATOR
20' EROSION SETBACK
PROPOSED DUAL-VORTEX SEPARATOR
Q100= 365 cfs
100-YR INUNDATION LIMITS
Q100= 365 cfs
CULVERT SURFACE OVERFLOW ELEV.=65.92
PRINCESS BLVD.
NORTH 7.5' OF D.E. TO BE RELEASED
EX. 50' DRAINAGE EASEMENT
PROPOSED RETAINING WALL WITH TOP OF FOOTING BELOW SCOUR DEPTH
SCALE: 1"=40'
0' 20' 40' 80'

Contact Arizona 811 at least two full working days before you begin excavation
Call 811 or click Arizona811.com

78TH ST. & PRINCESS BLVD. APARTMENTS

NWC 78TH ST. & PRINCESS BLVD., SCOTTSDALE, AZ 85255

PRELIMINARY GRADING & DRAINAGE PLAN

Registered Professional Engineer
CERTIFICATE NO. 46857
DANIEL G. MANN
10/28/20
ARIZONA, U.S.A.

3engineering
planning | civil engineering | surveying

ENGINEER: D. MANN | DESIGNER: D. MANN | CAD TECH: PHILLIE V.

3 ENGINEERING, LLC
6370 E. THOMAS ROAD
SUITE # 200
SCOTTSDALE, ARIZONA 85251
PHONE: (602) 334-4387
FAX: (602) 490-3230
WWW.3ENGINEERING.COM

DATE: 10/28/20

PROJECT NO. 1923

SHEET NO. PGD102
2 of 3

Q.S. #39-45 29-DR-2020

29-DR-2020
11/4/2020

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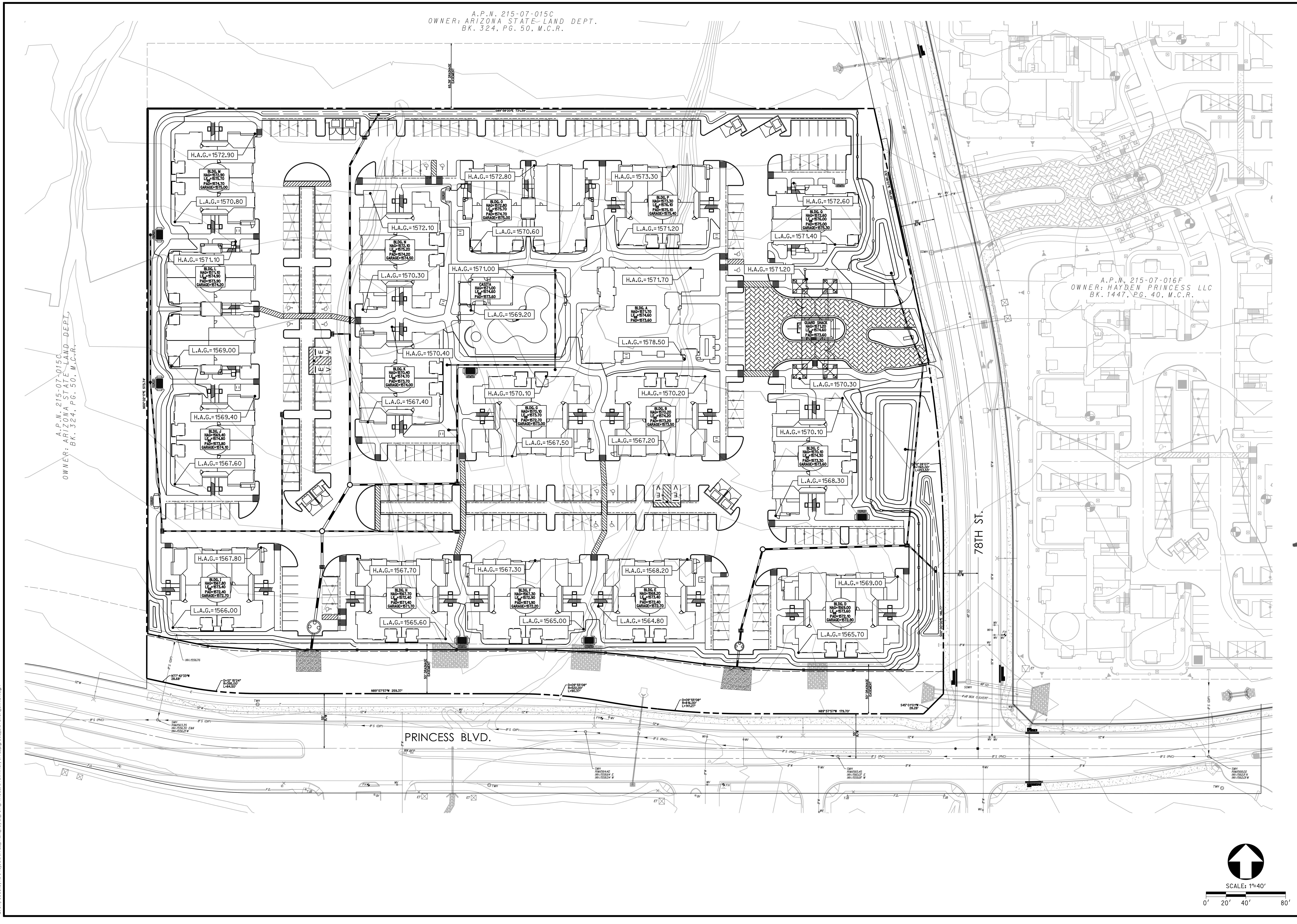

Contact Arizona 811 at least two full working days before you begin excavation
Call 811 or click Arizona811.com

78TH ST. & PRINCESS BLVD. APARTMENTS
NWC 78TH ST. & PRINCESS BLVD., SCOTTSDALE, AZ 85255
FLOODPLAIN ELEVATION EXHIBIT

Registered Professional Engineer
CERTIFICATE NO. 46857
DANIEL G. MANN
10/28/20
ARIZONA, U.S.A.

3engineering
planning | civil engineering | surveying

ENGINEER: D. MANN | DESIGNER: D. MANN | CAD TECH: PHILLIE V.

3 ENGINEERING, LLC
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SUITE # 200
SCOTTSDALE, ARIZONA 85251
PHONE: (602) 334-4387
FAX: (602) 490-3230
WWW.3ENGINEERING.COM

DATE: 10/28/20

PROJECT NO.
1923

SHEET NO.
PGD103
3 of 3

Q.S. #39-45 29-DR-2020

29-DR-2020
11/4/2020

APPENDIX L

Hayden 50 Offsite Drainage Report

FINAL OFFSITE IMPROVEMENTS DRAINAGE REPORT

Hayden 50

Prepared for:

Mark-Taylor Residential
6623 N. Scottsdale Road
Scottsdale, AZ 85250

Plan # 4817-18-2
Case # _____
Q-S # _____
[X] Accepted
[ ] Corrections
N.Baronas 12-31-18
Reviewed By Date

Prepared by:

Kimley»Horn

191769004
December 2018

29-DR-2020
11/4/2020

Hayden 50

FINAL OFFSITE IMPROVEMENTS DRAINAGE REPORT

Expires 06/30/19

DECEMBER 2018

Prepared By:

Kimley»Horn

29-DR-2020
11/4/2020

Kimley»Horn

Contents

Appendices

Expires 06/30/19

Figures

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

Mark-Taylor Residential is proposing the development of a portion of Crossroads East Planning Unit VII (Planning Unit VII) at the northwest corner of Hayden Road and Princess Boulevard (the Site). Offsite infrastructure is required for the development. Offsite infrastructure is anticipated to consist of perimeter roadway and utility improvements for future multi-family and commercial development.

1.2 SITE LOCATION

The proposed development encompasses approximately 37+ net acres in a portion of the Northeast Quarter of Section 35, Township 4 North, Range 4 East of the Gila and Salt River Base and Meridian in Maricopa County, Arizona. It is a portion of Planning Unit VII (111+ acres). The improvements associated with the offsite infrastructure are in Princess Boulevard, the new 78th Street and Mayo Boulevard connectors. See **Appendix A** for the Site Location Map.

1.3 PURPOSE

This report is intended to satisfy City of Scottsdale requirements and demonstrate conformance to the Master Drainage Report for the offsite portion Crossroads East Planning Unit VII. This report also is in conformance with other surrounding developments in the area associated with Crossroads East. This report provides a description of the current storm water drainage patterns and systems and a description of the required and proposed interim drainage offsite improvements. This report does not include onsite improvements associated with the Sale Parcel.

1.4 OBJECTIVES

This report provides a drainage plan for the Sale parcel that is intended to meet the drainage standards and guidelines of the City of Scottsdale (City) and the Flood Control District of Maricopa County (FCDMC). This report will demonstrate the following:

1. Offsite storm water approaching the Site from the north in pre-project conditions, passes through the Site while a portion flows over Princess Boulevard and the remaining is conveyed west in a pre-project undeveloped channel on the north side of Princess Boulevard.

2. Offsite runoff approaching the Site from the north in proposed conditions passes through the Site overland in the east and west portions of the site and through storm drain in the center of the Site. In the interim condition, once runoff reaches Princess Boulevard a portion matching that of pre-project conditions, overtops Princess Boulevard. The remaining runoff is conveyed west in a series of connected basins before discharging west through culverts at a roundabout at Miller Road.

3. The proposed development meets pre- versus post-peak discharges along Princess Boulevard for the interim condition.

4. The proposed development is designed for the ultimate condition where all runoff will be conveyed west. The ultimate condition is contingent on further development to the west.

2.0 PRE-PROJECT DRAINAGE CONDITIONS

2.1 PRE-PROJECT OFFSITE DRAINAGE CONDITIONS

Offsite runoff from north of State Route 101 (SR101) is routed through several culverts along SR101. The vacant land north of SR101 is being developed concurrently with this site. The land north of SR 101 is being developed by Nationwide and designed by Hubbard Engineering. Major infrastructure associated with this development will be completed prior to the completion of the Sale parcel. The infrastructure associated with the Nationwide development will re-route runoff to one of the culverts crossing SR 101. Refer to **Figure 3** in **Appendix A**. It was decided at a meeting on November 5, 2018 with the City and Hubbard Engineering that this condition would be considered Pre-Project. Therefore, output hydrographs from Hubbard Engineering's hydrology model were used to quantify offsite runoff crossing under SR101. This runoff along with other offsite runoff south of 101 is routed through the Site. The majority of the runoff is routed through the Site in four sub-basins, DA05, DA10, DA20, and DA30, to Princess Boulevard where it overtops the road and passes through the residential developments on the south side of Princess Boulevard.

The existing washes that route the offsite hydrographs are unlined and non-uniform. Hydrograph OFF05 is routed through pre-project onsite drainage area DA05. The runoff surface flows through the pre-project drainage area until it reaches Princess Boulevard. At this point, the runoff overtops the road and is discharged south into the residential development. Similarly, OFF10 and OFF20 surface flow through pre-project onsite drainage areas DA10 and DA20 before over topping Princess Boulevard into the residential developments south of Princess Boulevard.

Runoff produced by hydrograph OFF30 surface flows through pre-project onsite drainage area DA30 before concentrating in the pre-project natural channel north of Princess Boulevard. A portion of the runoff overtops Princess Boulevard (DS30), while the rest is diverted west along Princess Boulevard (DD30). The pre-project channel conveys runoff to the west toward the intersection of Scottsdale Road and Princess Boulevard. The wash eventually crosses Princess Boulevard in pre-project box culverts where it discharges into the impoundment pool for the Reach 11 dikes. Refer to **Figure 3** in **Appendix A** for the Pre-Project Conditions Exhibit.

2.2 CONTEXT RELATIVE TO ADJACENT PROJECTS AND IMPROVEMENTS

Improvements associated with this report are for the offsite infrastructure required for the Sale Parcel. The Sale Parcel is located north of Princess Boulevard, west of Hayden Road, south of the proposed alignment of Mayo Boulevard, and east of the proposed 78th Street alignment. See **Figure 1** in **Appendix A** for the Location Map. The improvements associated with this report are located in the Crossroads East Drainage infrastructure watershed. Extensive coordination was done with the Nationwide development north of SR 101. The design associated with the Nationwide development altered the plan shown in the Crossroads East Drainage Infrastructure plan. Because the Site is downstream of the Nationwide development the revised design was accommodated in this report. The improvements made with this report consider these future improvements. However, because upstream and downstream development has not yet occurred,

improvements with this development are considered interim. The interim condition was designed to meet pre-development conditions.

2.3 FEMA FLOOD HAZARD AREAS

The sale parcel is located in Flood Zone “AO” according to the Flood Insurance Rate Map 04013C1320L, dated October 16, 2013. Zone “AO” is designated by FEMA as “areas of flood depths of 1 foot (usually sheet flow on sloping terrain) average depths determined for areas of alluvial fan flooding, velocities also determined.” Refer to **Appendix A** for the FEMA FIRMette map for the site.

3.0 PROPOSED OFFSITE IMPROVEMENTS DRAINAGE PLAN

3.1 PROPOSED OFFSITE CONDITIONS

The offsite watershed immediately to the north of the Site is composed primarily of undeveloped desert with the SR101 running east-west, parallel to the Site.

3.1.1 Interim condition

Runoff from OFF05, reaches the north side of Mayo Boulevard. Mayo Boulevard will direct the offsite runoff to four (4) 24" HDPE culverts under Mayo Boulevard. The culverts will discharge on the south side of Mayo Boulevard and will sheet flow south across subbasin DA30 to Basin C. Basin C will collect the runoff and discharge it into a 48" storm drain that runs south to Basin D. In the ultimate condition Basin C may be removed, but discharge will still need to be conveyed south in the 48" storm drain which has been sized for ultimate condition flows. Basin D is located in the ultimate Princess Boulevard Channel.

Runoff from OFF10 will be collected in a small basin north of Mayo Boulevard. The runoff is then discharged into a 48" diameter storm drain in the new 78th Street to Basin E. Basin E will be in the dedicated area where the ultimate Princess Boulevard channel is located. The majority of the runoff will fill linear basins, D and E, and then overtop Princess Boulevard (DTEF) in the interim condition. The remainder will be conveyed in the basins to a 36" orifice plate that enable flow to cross beneath 78th Street in the interim condition. The orifice plate will be attached to an 8'x4' concrete box culvert.

Offsite runoff north of SR101 crosses the freeway through one culvert. The runoff (OFF06 and OFF07) is being routed to the culvert with the concurrently developed Nationwide development. Runoff from OFF06 and OFF07will be conveyed overland through drainage areas DA20, DA25, and DA35 before reaching Basin FG. Basin FG has been sized to meet pre- versus post- discharges south and west in the interim condition. A portion of the runoff will overtop Princess Boulevard (DS30) and be discharged south into the existing parking lot. The west end of the basin will discharge the remaining flow in the linear basin through six (6) 24" culverts that will return the pre-project amount of flow to the discharge point west of the Site. Refer to **Figure 4**.

3.1.2 Ultimate Condition

When all improvements downstream of the Site associated with the Crossroads East Drainage Infrastructure plan are completed, basins C, D, E, and FG will be converted to channel conveyance. This will be achieved by removing the small pipes in Basin D, the orifice plate on the box culvert under 78th Street and the six (6) 24" culverts and outlet structure at the west end of Basin FG. Basin FG will also be modified by excavating additional conveyance area west of 78th Street.

3.2 PROPOSED OFFSITE IMPROVEMENTS HYDROLOGY

With the exception of concentration points along the west end on the project, the peak discharges in the post-development condition are less than or equal to the pre-development conditions. Increases are negligible. Additionally, runoff overtopping Princess Boulevard into a residential area will be less than the current condition. This is due to the improvements being made with the Nationwide development and the Powerline Channel. The following, **Table 1**, shows the pre- versus post- discharges along with the ultimate condition for the 2-year, 10-year, and 100-year storm events. Refer to **Figure 7** for right-of-way drainage area delineation map.

Table 1. Peak Discharge Summary

HEC-1 Combination Point (Pre/Post/Ult)	**Combination Point Description**	Pre Q_2 [cfs]	Post Q_2 [cfs]	Ult Q_2 [cfs]	Pre Q_{10} [cfs]	Post Q_{10} [cfs]	Ult Q_{10} [cfs]	Pre Q_{100} [cfs]	Post Q_{100} [cfs]	Ult Q_{100} [cfs]
CP05/DTDE/*	Eastern South Boundary	4	3	0	33	34	0	86	86	0
CP10/DTEF/*	Middle South Boundary	4	0	0	30	28	0	81	79	0
DD30/DDFF/CP35	West Discharge Point in Pre-Project Channel	24	72	118	94	150	269	251	236	546
DS30+CP20/DTFF/CP35	Western South Boundary	10	0	118	36	0	269	89	109	546

3.3 PROPOSED OFFSITE IMPROVEMENT HYDRAULICS

Offsite storm drain hydraulics have been designed for 78th Street and Princess Boulevard. A 48" diameter storm drain main line conveys offsite flow and local runoff from 78th Street south from Mayo Boulevard to Princess Boulevard. Flow-by and sump inlets are designed on 78th Street and Princess Boulevard to meet the 10-year spread requirements and the 100-year depth requirements in the City of Scottsdale Design Standards and Policies (DSPM). Inlets in sump are sized using Figure 3.29 from the FHWA HEC-12 dated 1984. Curb cuts were sized using the weir equation. A 50% clogging factor was applied with both analyses. Flow-by catch basins were sized in FlowMaster with a 20% clogging factor. Refer to **Appendix C** for the inlet and curb cut sizing nomographs and calculations. StormCAD analysis for the 100-year storm event is also included in **Appendix C**, and standard loses are applied and pipes are sized to ensure the 100-year HGL remains below proposed grade to prevent flooding.

Hydraulic calculations for the Mayo Boulevard offsite culverts and storm drain were completed in the Federal Highway Administration's HY-8 software and Bentley's StormCAD, respectively. Tailwater elevations were set to the basin depths. Culverts are sized for 100-year flows to prevent overtopping of Mayo Boulevard. The culvert under 78th Street was sized for the ultimate condition using the HY-8 software. Time to drain calculations were completed to ensure the sump condition caused by the culvert crossing under 78th Street will drain within 36 hours. An assumed percolation rate of 1.5 inches per hour was used for the time to drain calculations. Refer to **Appendix C** for hydraulic calculations.

3.4 PRE- AND POST-DEVELOPMENT RUNOFF CHARACTERISTICS AT CONCENTRATION POINTS

Storm water east of the hydrologic divide will be conveyed to the surface basins and discharged along the southern boundary of the parcel, after which it will flow west in the pre-project channel along the north side of Princess Boulevard, consistent with the current drainage patterns and the Crossroads East Planning Unit IV Master Drainage Report. Storm water discharge from the surface basins will be controlled using pipe sizing and orifice plates in the interim condition. Post-development storm water discharge is limited to the pre-development flow at the concentration points. Additionally, runoff crossing Princess Boulevard in the interim condition will be significantly less than the current condition. This is due to the improvements associated with the Nationwide development. The basins will be converted to channels in the ultimate condition. Therefore, no runoff will cross over Princess Boulevard in the ultimate condition.

3.5 PROJECT PHASING

The interim improvements will be constructed in a single phase. The onsite development for the Sale Parcel will then be constructed. The ultimate condition of the channel north of Princess Boulevard will be constructed at a future date when additional development occurs. In the ultimate condition the channel from 78th Street to the Miller Road roundabout, north of Princess, will have to be excavated out to a depth that allows for positive drainage beneath 78th Street to the pre-project channel west of the Miller Road roundabout. At this time the (2) 15" pipes and the 36" orifice plate will need to be removed from the interim basins to convert the basins to a channel.

4.0 SPECIAL CONDITIONS

No special conditions are relevant to the proposed Site development.

5.0 DATA ANALYSIS METHODS

5.1 HYDROLOGIC PROCEDURES, PARAMETER SELECTION, AND ASSUMPTIONS

Offsite hydrographs from the Nationwide development were used for the pre- and post-project models. The hydrographs were added to the models as inflow hydrographs. Only the 100-year hydrographs were obtained from the Nationwide development. Therefore, ratios from Table 6.1 of FCDMC Hydrology were used for the 2-year and 10-year storm events. These ratios were only applied to the inflow hydrographs from the Nationwide development. **Table 2** is a summary of ratios used.

Table 2. Ratios to 100-Year Flood Hydrographs for the 2-Year and 10-Year Recurrence Interval Floods

Recurrence Interval	Ratio %
2	10
10	35

Drainage Design Management Software for Windows (DDMSW) was used to produce the Green and Ampt parameters and the network for the HEC-1 model. All other hydrologic calculations were completed in HEC-1.

Green and Ampt rainfall loss parameters were estimated using DDMSW, the City parameters, and the FCMDC Drainage Policies and Standards. The Clark Unit hydrograph was used. The pre-project land use is undeveloped desert. **Table 3** is a summary of the land use parameters used for the hydrologic model. The values shown were taken from the FCMDC Drainage Policies and Standards.

Table 3. Land Use Parameters

Land Use Code	Land Use Category	IA [in]	R_{timp} [%]	Cover [%]	D_{theta} [cfs]	Kb [cfs]
190	Very High Density Residential-Multi Family (> 15 du/ac)	0.25	45	50	Normal	Min
NDR	Undeveloped Desert Rangeland, Little Topographic Relief	0.35	0	20	Dry	Max

Two soil types were identified for the Site using the web soil survey from the National Resource Conservation Service (NRCS). **Table 4** summarizes the soil parameters used.

Table 4. Soil Parameters

Soil ID	XKSAT	Rock %
64555	0.270	0
64590	0.390	0

Routes for storm drains were not modeled as they typically cause instability in the model and do not provided any additional benefit. Routes for overland flow through the undeveloped portions of the Site were modeled as natural overland flow routes. Routes are denoted by “RD” followed by a character from where the flow starts and a character from where the flow is discharged. For example, flow from offsite cross section OFF05 being routed to basin C, the route is named RD5C. Refer to **Appendix B** for HEC-1 results.

At most other concentration points along the southern boundary of the Site, the amount of water overtopping Princess Boulevard is less than or equal the pre-development condition discharges.

5.3 STORM WATER STORAGE CALCULATION METHODS AND ASSUMPTIONS

Runoff from the offsite improvements is not retained. Runoff from the offsite improvements is routed to the detention facilities along Princess Boulevard. The detention basins are an interim condition. The runoff from offsite improvements will continue to discharge at similar locations when the basins are converted to a channel. **Table 5** provides a summary of the storage volumes for each basin. These basins have volume provided tables in **Appendix A**.

Table 5. Storage Basin Summary Table

Basin ID	Volume Provided (ac-ft)	Contributing Watershed ID	Volume Required (ac-ft)
T1	0.09	85	0.04
T2	0.09	65	0.03
B	1.88	OFF06, DA20	N/A
C	1.14	OFF05, DA30	N/A
D	0.48	OFF05, DA30 DA08	N/A
E	0.30	OFF05, DA30 DA08, OFF10, DA10	N/A
FG	6.89	OFF05, DA30 DA08, OFF10, DA10, OFF06, DA20, DA25, OFF07, DA35	N/A

6.0 CONCLUSION

- Per a meeting with the City and adjacent engineer, the pre-project condition is with major infrastructure in place on the Nationwide development.
- Offsite storm water east of 78th Street will be conveyed via overland flow to five (3) 24" HDPE culverts under Mayo Boulevard, a 48" storm drain through the proposed site, and a proposed 48" storm drain in 78th Street to the basins north of Princess Boulevard meeting pre- versus post-requirements in the interim condition.
- Offsite storm water west of 78th Street will be conveyed via overland flow to the proposed Basin FG, north of Princess Boulevard, meeting pre- versus post- requirements in the interim condition.
- Runoff will ultimately discharge south over Princess Boulevard or west through the proposed six (6) 24" culverts that discharge into the pre-project channel north of the roundabout. This is similar to the pre-project condition.
- The proposed drainage design meets the City's requirements for the interim condition and allows for improvements to be made as needed for the ultimate condition.

7.0 REFERENCES

City of Scottsdale, *Design Standards and Policies Manual,* Chapter 4: Grading and Drainage, January 2018.

Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map (FIRM) of Maricopa County, Arizona and Incorporated Areas*, Panel 1320 of 4425, Map Number 0413C1320L, October 16, 2013.

Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Hydrology Volume*, August 2013.

Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Hydraulics Volume*, August 2013.

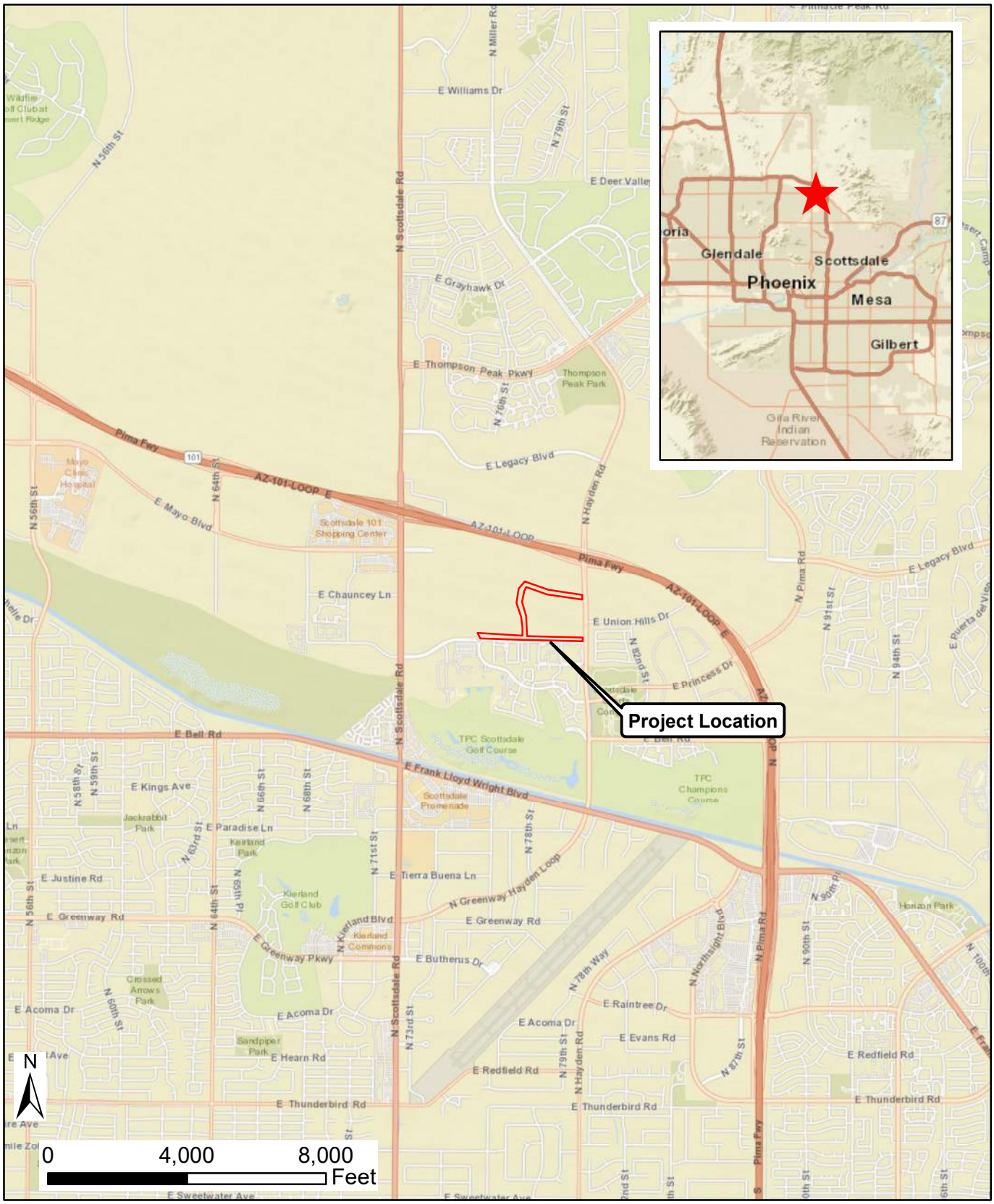
Hubbard Engineering, *Hydrologic Modeling for Nationwide Development*, November 2018

Kimley-Horn and Associates, Inc, *Master Drainage Report - Crossroads East Planning Unit VII*, August 2018.

T.Y.LIN International, *Crossroads East Drainage Infrastructure,* July 2015.

T.Y.LIN International, *Pinnacle Peak South Area Drainage Master Study,* July 2013.

Appendix A – Figures



Kimley»Horn Expect More. Experience Better.	**Hayden 50** **Offsite Improvements**	**Scottsdale, AZ**
	Figure 1. Location Map	

29-DR-2020
11/4/2020

National Flood Hazard Layer FIRMette

FEMA

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth
- Regulatory Floodway *Zone AE, AO, AH, VE, AR*

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/9/2018 at 12:07:00 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

29-DR-2020

11/4/2020

Note: Hydrograph OFF20 taken from Nationwide Improvement Development

Note: Pre-Project condition includes to be constructed improvements upstream of the 101 for Nationwide and Powerline Channel

OFF30
Q2= 23 cfs
Q10= 70 cfs
Q100= 225 cfs

OFF20
Q2= 7 cfs
Q10= 20 cfs
Q100= 75 cfs

OFF10
Q2= 6 cfs
Q10= 17 cfs
Q100= 59 cfs

OFF05
Q2= 2 cfs
Q10= 17 cfs
Q100= 45 cfs

OFF10

OFF05

DA30

DA20

DA10

DA05

RTO30

RTO20

RTO10

RTO05

DD30
Q2= 24 cfs
Q10= 94 cfs
Q100 = 291 cfs

DS30
Q2= 0 cfs
Q10= 0 cfs
Q100 = 0 cfs

CP30
Q2= 24 cfs
Q10= 94 cfs
Q100= 251 cfs

CP20
Q2= 10 cfs
Q10= 36 cfs
Q100= 89 cfs

CP10
Q2= 4 cfs
Q10= 30 cfs
Q100= 81 cfs

CP05
Q2= 4 cfs
Q10= 33 cfs
Q100= 86 cfs

Legend

- Existing CP
- EG Topo
- Proposed Routes
- ModelOutflow
- Existing Offsite Flows
- Existing Subbasins
- Existing Flowpath

FLO-2D Output

Peak 100 Year Discharge [cfs]

- 0 - 5
- 5-10
- 10-20
- 20-30
- 30-40
- 40-50
- 50-100

0 200 400 600 Feet

N

Kimley»Horn
2018 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

SCALE(H):1"= 200'
SCALE(V): N/A
DESIGNED BY: JRT
DRAWN BY: JRT
CHECKED BY: ZRS
DATE: 11/2018

CITY OF SCOTTSDALE
CROSSROADS EAST PLANNING UNIT VII
PRE-PROJECT CONDITIONS DRAINAGE MAP
FIGURE 3

PROJECT NO.
191822001

DRAWING NAME
FIGURE 3

SR 101

SR 101

Note: Hydrograph OFF06 taken from Nationwide Improvement Development

OFF07
Q2= 23 cfs
Q10= 79 cfs
Q100= 225 cfs

OFF06
Q2= 17 cfs
Q10= 46 cfs
Q100= 114 cfs

OFF10
Q2= 5 cfs
Q10= 12 cfs
Q100= 32 cfs

OFF05
Q2= 2 cfs
Q10= 17 cfs
Q100= 48 cfs

OFF10

OFF05

Hayden

Mayo Boulevard

DA35

DA20

ROFF06

ROFF07

RD1E

PROPOSED 48" STORM DRAIN

(3) PROPOSED 24" CULVERTS

DA30

RD5C

CP20

CP30

DA10

PROPOSED 48" STORM DRAIN

PROPOSED 8'x4' BOX CULVERT WITH 36" DIAMETER ORIFICE PLATE

DA25

DA08

DDFF
Q2= 71 cfs
Q10= 151 cfs
Q100= 236 cfs
Into Princess Blvd Channel

CP35

BASIN FG

78th Street

CP25

CPE

BASIN E

BASIN D

CP08

(6) PROPOSED 24" CULVERTS

DTFF
Q2= 0 cfs
Q10= 0 cfs
Q100= 96 cfs

(2) PROPOSED 15" CULVERTS

DTEF
Q2= 4 cfs
Q10= 27 cfs
Q100= 79 cfs

DTDE
Q2= 7 cfs
Q10= 34 cfs
Q100= 86 cfs

Legend

- Proposed CPs
- Interim Subbasins
- Sheet Flow Across Princess Blvd
- Interim Offsite Flows
- Proposed Routes
- Proposed Flowpath
- Remainder Parcel
- Sale Parcel

0 200 400 600 Feet

N

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Phoenix, Arizona 85020 (602) 944-5500
Engineering, Planning and Environmental Consultants

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CITY OF SCOTTSDALE
CROSSROADS EAST PLANNING UNIT VII
INTERIM CONDITIONS DRAINAGE MAP
FIGURE 4

PROJECT NO. 191822001

DRAWING NAME FIGURE 4

29-DR-2020
11/4/2020

Note: Hydrograph OFF06 taken from Nationwide Improvement Development

SR 101

SR 101

Hayden

OFF07
Q2= 29 cfs
Q10= 69 cfs
Q100= 252 cfs

OFF06
Q2= 9 cfs
Q10= 28 cfs
Q100= 90 cfs

OFF10
Q2= 10 cfs
Q10= 29 cfs
Q100= 64 cfs

OFF05
Q2= 16 cfs
Q10= 35 cfs
Q100= 67 cfs

OFF10

OFF05

DA35

DA20

DA30

DA10

DA25

DA08

ROFF07

ROFF06

RD1E

RD5C

RD2535

RDE25

RD8E

CP35

CP25

CP20

CPE

CP30

CP08

Legend

- Proposed CPs
- Ultimate Offsite Flows
- Routes_Ultimate
- Ultimate Subbasins
- Ultimate Flowpath
- Remainder Parcel
- Sale Parcel

0 200 400 600 Feet

N

N

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CITY OF SCOTTSDALE
CROSSROADS EAST PLANNING UNIT VII
ULTIMATE CONDITIONS DRAINAGE MAP
FIGURE 5

PROJECT NO.
191822001

DRAWING NAME
FIGURE 5

29-DR-2020
11/4/2020

NORTH

INTERIM CONDITION
BASIN C
HWE: 76.6
BOT: 74.0
VOLp: 49,490 CF

CB-20

SALE PARCEL IMPROVEMENTS

PROPOSED 48"
STORM DRAIN

PROPOSED 48"
STORM DRAIN

78TH STREET

CB-35

INTERIM CONDITION
BASIN E
HWE: 65.0
BOT: 62.0
VOLp: 13,148 CF

DRAINAGE
EASEMENT

INTERIM CONDITION
BASIN D
HWE: 68.4
BOT: 66.0
VOLp: 20,747 CF

DRAINAGE
EASEMENT

CB-30

30'

PRINCESS BOULEVARD

CB-20

(2) PROPOSED
15" CULVERT

RIGHT OF WAY

CB-15

PROPOSED
8'x4' CULVERT

NO.	REVISION	DATE

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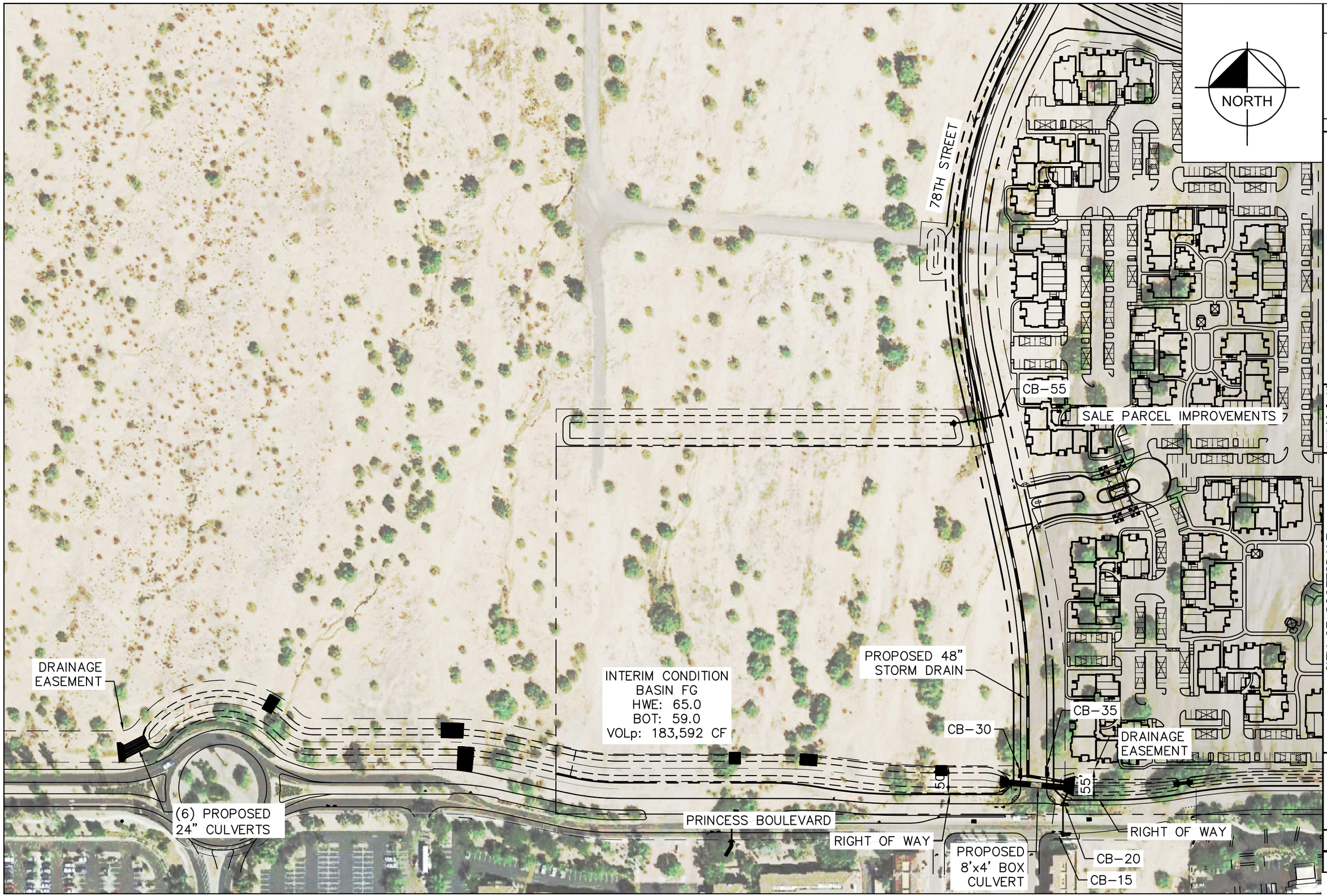
DATE: 8/2018

CITY OF SCOTTSDALE
CROSSROADS EAST PLANNING UNIT VII
INTERIM CONDITIONS BASINS
FIGURE 5a

PROJECT NO.
191769004

DRAWING NAME
FIGURE 6a

29-DR-2020
11/4/2020



NO.	REVISION	DATE

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SCALE (V): NONE
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DRAWN BY: JRT
CHECKED BY: ZRS
DATE: 8/2018

CITY OF SCOTTSDALE
CROSSROADS EAST PLANNING UNIT VII
INTERIM CONDITIONS BASINS
FIGURE 5b

PROJECT NO.
191769004

DRAWING NAME
FIGURE 6b

29-DR-2020
11/4/2020

LEGEND

- PROPERTY LINE
- RIGHT OF WAY LINE
- STREET CENTERLINE
- 12 PROPOSED CONTOUR
- 2 EXISTING CONTOURS
- (00) DRAINAGE AREA ID
- DRAINAGE AREA BOUNDARY
- DRAINAGE FLOW DIRECTION

Q_{100}=32 CFS

CB–75
Q_{100}=2.7 CFS

CO–85
Q_{100}=1.1 CFS

Q_{100}=45 CFS

MAYO BOULEVARD

CO–90
Q_{100}=3.6 CFS

HAYDEN CB–1
Q_{100}=4.3 CFS

HAYDEN ROAD

Q_{100}=67 CFS

CB–55
Q_{100}=1.65 CFS

Q_{100}=23 CFS

78TH STREET

OS–1
Q_{100}=10.5 CFS

CB–05
Q_{100}=7.24 CFS

CB–30
Q_{100}=1.67 CFS

CB–35
Q_{100}=2.75 CFS

CB–20
Q_{100}=2.27 CFS

Q_{100}=33 CFS

Q_{100}=15 CFS

CB–15
Q_{100}=2.96 CFS

PRINCESS DRIVE

PRINCESS DRIVE

GRAPHIC SCALE IN FEET
0 40 80 160

NORTH

FIGURE 7: ROW DRAINAGE AREA DELINEATION

Kimley»Horn

K:\PHX_Civil\191769004 – Hayden 50\CADD\Off–Site Improvement Plans\Y769004DR.dwg Nov 21, 2018 traver.jones

APPENDIX M

Crossroads East Unit VII Master Drainage Report

MASTER DRAINAGE REPORT

CROSSROADS EAST PLANNING UNIT VII

Prepared for:

Princess Hayden LLC
6623 North Scottsdale Road
Scottsdale, AZ 85250

Plan # _____
Case # 124-SA-2018
Q-S # _____
☒ Accepted
☐ Corrections
N. Baronas 8-15-18
Reviewed By Date

Prepared by:

Kimley-Horn and Associates
191769004
August 2018

Kimley»Horn

MASTER DRAINAGE REPORT

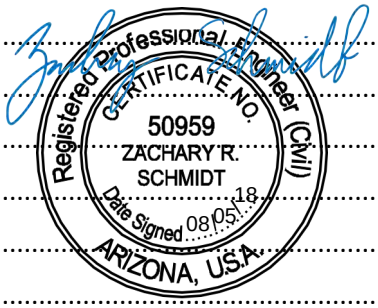
CROSSROADS EAST PLANNING UNIT VII

AUGUST 2018

Prepared By:

Kimley»Horn

Table of Contents



Expires 06/30/19

Figures

Tables

Appendices

INTRODUCTION

SITE LOCATION

This Master Drainage report has been prepared for the proposed Cross Roads East Planning Unit VII (Site). The Site is approximately 111 acres and is bound to the east by Hayden Road, to the west by the future Miller Road alignment, to the north by the future Mayo Boulevard alignment and to the south by Princess Boulevard. The Site is in a portion of Arizona State Land Department (ASLD) owned land. Parcels to the north and west of the Site are currently undeveloped. Residential and commercial developments are on the south side of Princess Boulevard. East of Hayden Road the parcels are undeveloped north of Mayo Boulevard and residential south of Mayo Boulevard. The Site is located within Section 35 of Township 4 North, Range 4 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. Refer to **Figure 1** for the Location Map.

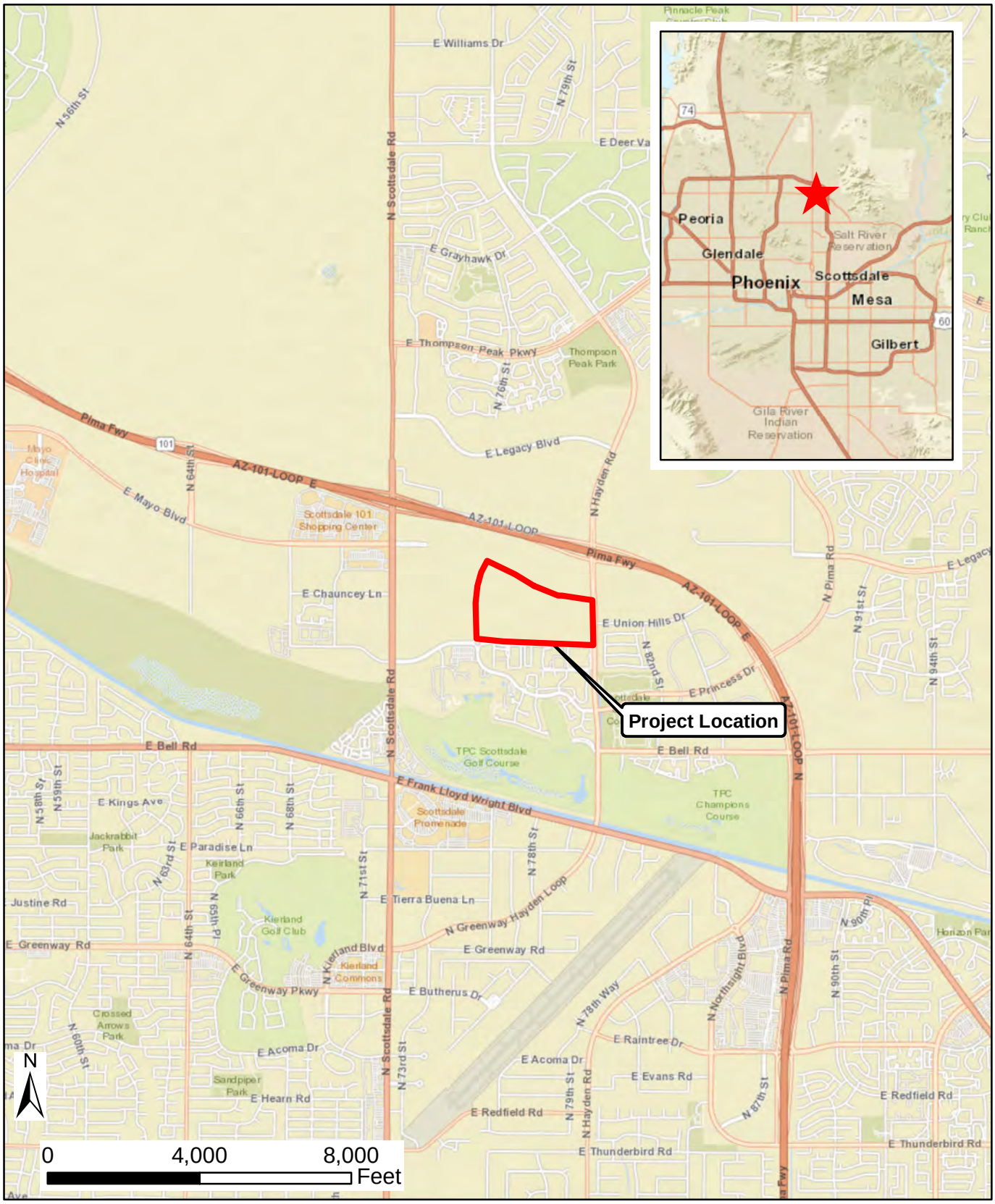
PROJECT SIZE AND TYPE

The proposed site is located within the City of Scottsdale (City) and falls under the City's Environmentally Sensitive Lands Ordinance (ESLO). Currently, the property is undeveloped desert rangeland. This report is being prepared to provide a master drainage plan for the Site. The basis for this master drainage plan incorporates recommended improvements from the Crossroads East Drainage Infrastructure Design Concept Report (Crossroads DCR) completed by the City and ASLD. Approximately 47 acres of the Site was purchased from ASLD by Princess Hayden LLC. This portion of the development is hereinafter known as Sale Parcel. The remaining portion of the Site is known as Remainder Parcel. The Remainder Parcel is owned by ASLD and will developed in the future. Drainage improvements associated with the Remainder Parcel will follow the requirements set forth in this report. The Sale parcel is a proposed 10-acre senior living and 37-acre multi-family residential development. The Remainder Parcel is 64 acres.

PURPOSE AND OBJECTIVES

This report establishes drainage parameters and criteria for the master planning of the Site. This report establishes a general hydrologic plan for the development of the Site by:

- Demonstrating compliance with the City's Design Standards & Polices Manual (DSPM) and the Crossroads DCR.
- Quantifying offsite runoff being conveyed through the existing Site
- Determining a preliminary hydrologic analysis for onsite and offsite runoff that meet the pre- versus post-development requirements for the City



Kimley»Horn Expect More. Experience Better.	**Crossroads East**	**Scottsdale, AZ**
	Figure 1. Location Map	

29-DR-2020
11/4/2020

DESCRIPTION OF EXISTING DRAINAGE CONDITIONS AND CHARACTERISTICS

EXISTING ONSITE CONDITIONS

The Site, both Sale and Remainder Parcels, consist of undeveloped natural desert. The area generally slopes north to south. Runoff from the Site sheet flows to the south across Princess Boulevard, exiting the Site. Refer to **Figure 3**.

EXISTING OFFSITE DRAINAGE CONDITIONS

Offsite runoff from north of State Route 101 (SR101) is routed through several culverts along SR101. A majority of the runoff is routed through the Site in four sub-basins to Princess Boulevard where it overtops the road and passes through the residential developments on the south side of Princess Boulevard. A small portion of the runoff reaches the existing channel that starts near the future intersection of Miller Road and Princess Boulevard. The existing channel is unlined and non-uniform. The channel conveys runoff to the west toward the intersection of Scottsdale Road and Princess Boulevard. At the intersection approximately 270 cfs continues west and 90 cfs is diverted south over Princess Boulevard. The channel eventually crosses Princess Boulevard in existing box culverts where it discharges into the impoundment pool for the Reach 11 dikes.

CONTEXT RELATIVE TO ADJACENT PROJECTS AND IMPROVEMENTS

The Site is located in the Crossroads DCR. The intent of the Crossroads DCR was to identify regional drainage infrastructure needed for the area and integrating those projects with future ASLD development. The goal of the drainage infrastructure was to provide large conveyance facilities for the area to outfall to in lieu of a sheet flow condition similar to the existing condition. The conveyance facilities are the responsibilities of the developers per the ASLD land purchase agreements. While there are several other improvements impacting the Site, the major planned infrastructure directly impacting the Site are the Miller Road and the Princess Boulevard channels. Each of these are uniform lined channels that will convey runoff to the west and the intersection of Princess Boulevard and Scottsdale Road. The Site, both Sale and Remainder Parcels, will be responsible for constructing these channels. However, because downstream facilities have not been constructed, the Site will only be required to dedicate space for these facilities and construct them in the future. In the interim condition, the Site will maintain pre- vs post-conditions.

FLOOD HAZARD ZONES ON PROPERTY, FIRM MAPS

The Site is located within one flood zone as shown on Flood Insurance Rate Map (FIRM) panel number 04013C1320L dated October 16, 2013. The Site is in “Zone AO (Depth 1 feet), (Velocity 3 feet/second)”. Zone AO is defined as “Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.” Refer to **Figure 2.**

National Flood Hazard Layer FIRMette

FEMA

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

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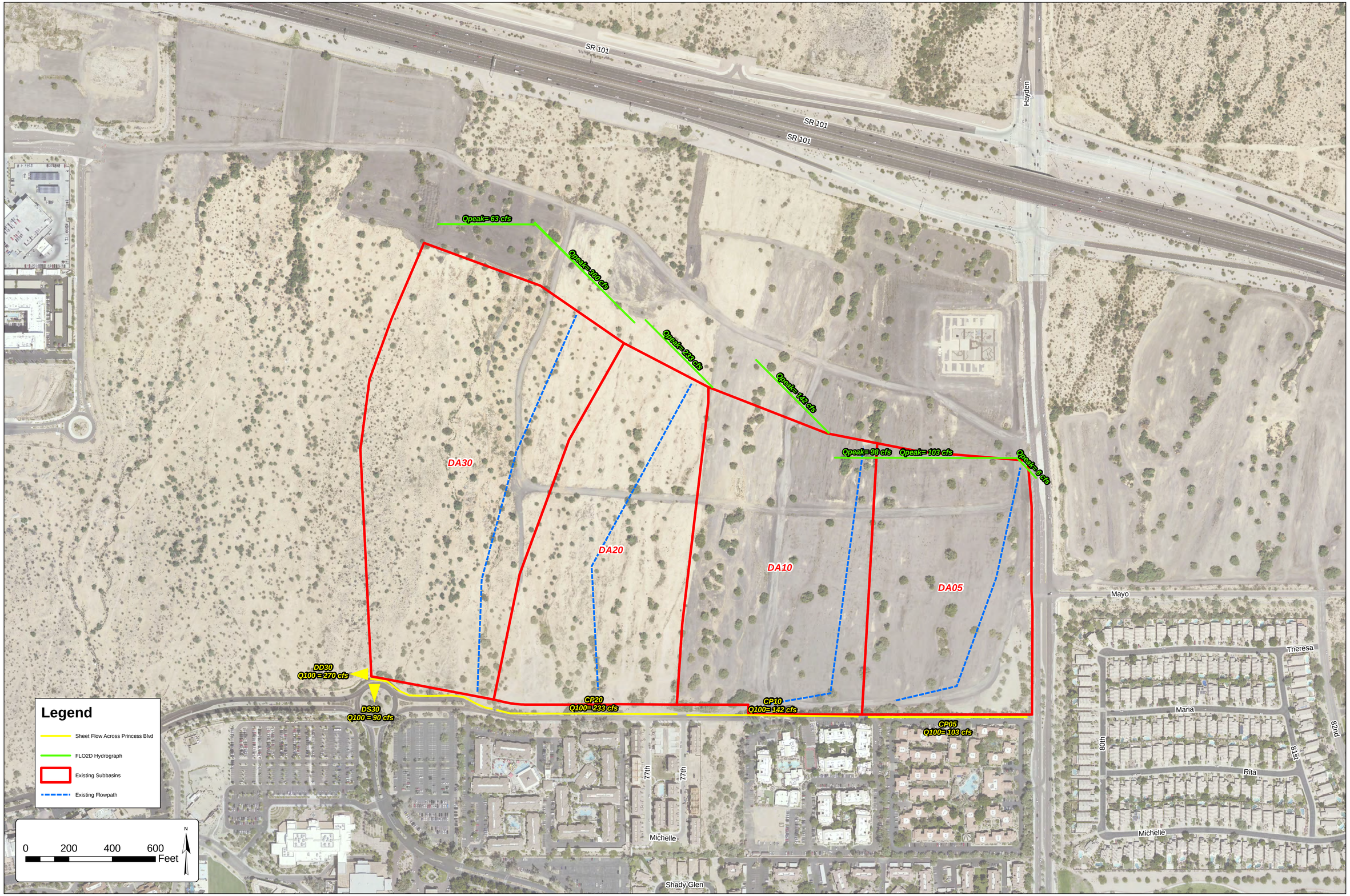
29-DR-2020

11/4/2020



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2017 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

SCALE(H):1"=	200'
SCALE(V):	N/A
DESIGNED BY:	JRT
DRAWN BY:	CEO
CHECKED BY:	ZRS
DATE:	5/2018

CITY OF SCOTTSDALE
CROSSROADS EAST PLANNING UNIT VII
EXISTING CONDITIONS
FIGURE 3

PROJECT NO.
191822001

DRAWING NAME
FIGURE 3

PROPOSED DRAINAGE PLAN

PROPOSED OFFSITE DRAINAGE PLAN

SALE PARCEL

Offsite runoff from the SR101 culverts will reach the north side of the Sale Parcel along the future Mayo Boulevard alignment. A long linear detention basin (Basin A) will be used to capture and convey this runoff in a large diameter storm drain in the future 78th Street to Basin FG. Basin FG will be in the dedicated area where the ultimate Princess Boulevard channel will be constructed. In the interim condition, an outfall structure will be constructed at the west end of Basin FG to maintain post-development discharges at a level equal to or less than the pre-development condition. The outfall structure will also release runoff to the west at a level less than the capacity of the existing Princess Boulevard channel. The Basin FG outfall structure and detention basin will be converted to a conveyance facility when the downstream ultimate Princess Boulevard channel is constructed. Two 6-foot x 3-foot box culverts will be needed to convey 158 cfs, from drainage areas DA08, DA10, and DA30 in the 100-year, interim condition, from Basin E, underneath 78th Street, to Basin FG. These box culverts will be designed and constructed with the future 78th Street infrastructure improvements. When all improvements associated with the Crossroads DCR are completed north of SR 101, no offsite runoff will be reaching the Site. Therefore, facilities associated with Basin A and the storm drain in 78th Street will not be needed in the future to convey offsite runoff. The storm drain can be used for future parcel drainage north of Mayo Boulevard. Refer to **Figure 4**.

REMAINDER PARCEL

Runoff from sub-basins DA20 and DA30 on Remainder Parcel will be routed through the Sale Parcel. Basin C will route runoff from DA30 on the Remainder Parcel to Basin E along Princess Boulevard. An inlet structure connected to the storm drain in 78th Street will capture runoff from DA20 on the Remainder Parcel.

The western portion (DA35) of the Remainder Parcel will be required to pass the offsite runoff from the SR 101 reaching the parcel. The design concept used to pass the offsite runoff will be required to meet pre- vs post development conditions. In the proposed condition five (5) 24-inch diameter culverts discharge 270 cfs west into the existing channel maintain the pre vs post discharge west. This design will be completed with the development of the parcel. Refer to **Figure 4**.

PROPOSED ONSITE DRAINAGE PLAN

SALE PARCEL

Runoff generated from the Sale Parcel will be routed to the adjacent detention basins (Basin E, Basin FG, and Basin D). Outlet structures in the detention basins will be completed with the final design of the development. The Sale Parcel will not be required to store the DSPM required 100-yr, 2-hr storm event.

However, the Sale Parcel will treat the first flush runoff from the site before discharging into the conveyance facilities identified in the Crossroads DCR. Inline treatment structures will be used to treat the first flush. First flush treatment design will be completed with the final design. Refer to **Figure 4**.

REMAINDER PARCEL

The Remainder Parcel will be required to meet pre- vs post-development conditions. The Remainder Parcel is owned by ASLD and will be developed in the future. The methods used to meet pre- vs post-conditions will be developed when the parcel is developed. The Remainder Parcel will be required to treat the first flush runoff prior to discharging into the ultimate channels.

PROPOSED HYDROLOGY

SALE PARCEL

Runoff from the Sale Parcel on the Site will maintain post-development peak discharges at or below pre-development conditions at exit points. Runoff is routed to detention basins to attenuate peak flows. Basin FG extends a significant distance along Princess Boulevard. Therefore, comparison for Basin FG crosses multiple pre-project discharge locations (CP20 and CP30). A summary of the pre- and post-development peak discharges is provided in **Table 1**. Refer to **Appendix A** and **Appendix B** for the detailed hydrologic model results.

Table 1. Peak Discharge Summary

HEC-1 Combination Point (Pre/Post)	Pre Q_{100} [cfs]	Post Q_{100} [cfs]
CP05/DTDE	103	48
CP10/DTEF	142	76
CP20+CP30/DTFF	593	563

REMAINDER PARCEL

Runoff from the Remainder Parcel will be required to maintain post-development peak discharges at or below pre-development conditions at the exit points of the Site. Offsite runoff reaching the Remainder Parcels was determined using the Pinnacle Peak South Area Drainage Master Study (ADMS) FLO-2D model. The max discharges reaching and existing the Site are shown on **Figure 3** and **Figure 4.**

SR 101

SR 101

SR 101

Hayden

Qpeak=330 cfs

Qpeak=229 cfs

Qpeak=242 cfs

BASINA

RDAB

DA35

DA20

DA30

(2) PROPOSED 48" STORM DRAINS

BASINB

DA10

BASINC

DA25

DA08

DDFF
Q100= 270 cfs
Into Princess Blvd Channel

78th Street

PROPOSED 15" CULVERT

(5) PROPOSED 24" CULVERTS

BASINF

BASINE

BASIND

Princess

DTFF
Q100=563 cfs

DTEF
Q100=76 cfs

DTDE
Q100=48 cfs

(2) PROPOSED 6'x3' BOX CULVERTS

77th

77th

77th

77th

Michelle

Shady Glen

Mayo

Theresa

Maria

80th

81st

82nd

Rita

Michelle

Legend

- Proposed Storage
- Sheet Flow Across Princess Blvd
- FLO2D Hydrograph
- Proposed Subbasins
- Proposed Pipe
- Proposed Flowpath
- Remainder Parcel
- Sale Parcel

Q100 [cfs]

- 0 - 5 cfs
- 5-20 cfs
- 20-50 cfs
- 50-70 cfs
- 70-100 cfs
- 100-150 cfs
- 150-300 cfs

0 200 400 600 Feet

N

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SCALE(H):1"=	200'
SCALE(V):	N/A
DESIGNED BY:	JRT
DRAWN BY:	CEO
CHECKED BY:	ZRS
DATE:	5/2018

CITY OF SCOTTSDALE
CROSSROADS EAST PLANNING UNIT VII
PROPOSED CONDITIONS
FIGURE 4

PROJECT NO.
191822001

DRAWING NAME
FIGURE 3

29-DR-2020
11/4/2020

DATA ANALYSIS METHODS

HYDROLOGY

The FLO-2D models prepared as part of the Pinnacle Peak South ADMS were used to estimate the amount of runoff reaching the Site. Hydrographs from the FLO-2D model were used for the offsite modeling. The 100-year, 24-hour with no walls model was used. FLO-2D cross sections were cut to more accurately quantify the offsite flow impacting the specific onsite drainage areas. The cross sections are shown on **Figure 3** and **Figure 4**. Hydrographs for each cross section were combined where needed, and then the FLO-2D hydrographs were input into U.S. Army Corps of Engineers HEC-1 hydrologic computer program. The HEC-1 model was used to route the offsite and onsite 100-year peak discharges. The hydrologic model prepared for this report uses rainfall depths from National Oceanic and Atmospheric Administration Atlas 14 (NOAA 14). The six-hour storm duration was used for this project due to the size of the contributing watershed. Refer to **Appendix A**. The Drainage Design Management System for Windows (DDMSW) program was used to develop the hydrologic parameters for the onsite drainage areas and offsite drainage areas east of the Site. The DDMSW model was exported to create the HEC-1 model. Placeholders for the Flo-2D hydrographs were added to the DDMSW model to maintain the overall structure of the HEC-1 file before the Flo-2D hydrograph values were added.

Green and Ampt rainfall loss parameters were estimated using DDMSW, DS&PM and FCDMC Drainage Design Manual – Drainage Policies and Standards, see **Table 2**. The Clark unit hydrograph was used. Existing land use types for the HEC-1 models were based on aerial photography. The existing land use is undeveloped desert. The post-development condition land use for the Sale Parcel is being developed for senior living (C-2) and multi-family (R-5). Land use maps for the existing and proposed development conditions are provided in **Appendix A** and **Appendix B**, respectively**. Table 2** is a summary of the land use parameters used in the hydrologic models.

Table 2. Green & Ampt Parameters

Land Use Code	Land Use Category	IA [in]	R_{timp} [%]	Cover [%]	D_{theta} [cfs]	Kb [cfs]
190	Very High Density Multi-Family	0.25	45	50	Normal	Min
210	Specialty Commercial	0.10	80	65	Normal	Min
NDR	Undeveloped Desert Rangeland	0.35	0	20	Dry	Low

Two (2) soil types were identified for the onsite and offsite sub-basins using the web soil survey from the National Resource Conservation Service (NRCS). Maps showing the soil type is shown in **Appendix A** and **Appendix B.** A list of the soils found in the watershed is shown below:

- Gilman Loams (64555)
- Momoli Gravelly Sandy Loam, 1 to 5 percent slopes (64590)

CONCLUSIONS

- Crossroads East Planning Unit VII (Site) is in Crossroads East DCR area. Crossroads East DCR identified regional flood control facilities to be constructed by development. Significant flood control facilities associated with the Site include the Princess Boulevard channel and Miller Road channel. Because regional flood control facilities are dependent on downstream development, the Site must be designed to meet pre- vs post-development conditions.

- The Site is split into two parcels. The Sale Parcel was purchased from ASLD and will be developed. The land use for the Sale Parcel is senior living (C-2) and multi-family (R-5). The Remainder Parcel is owned by ASLD and will be developed in the future.

- Offsite runoff from north of SR101 is conveyed under SR101 in multiple culverts. In the existing condition, the runoff overtops Princess Boulevard toward the residential developments. The offsite runoff will be routed through the Site maintaining pre- vs post-development conditions. Detention basins and storm drain will be used to route the runoff through the Site. Detention basins located in the dedicated areas for the Princess Boulevard channel will be converted to conveyance facilities determined in the Crossroads DCR when downstream facilities are constructed.

- The Site will not be required to store the DSPM required 100-year, 2-hour retention volume. Each parcel on the Site will be required to treat the first flush runoff before discharging into the ultimate flood control facilities.

REFERENCES

City of Scottsdale, *Crossroads East Drainage Infrastructure Design Concept Report*, July 2015

City of Scottsdale, *Design Standards and Policies Manual,* 2018.

City of Scottsdale, *Pinnacle Peak South Area Drainage Master South*, July 2013.

Federal Emergency Management Agency, Flood Insurance Rate Map Panel No 04013C1320L, dated October, 2012.

Flood Control District of Maricopa County, *Drainage Design Manual – Hydrology*, updated August 15, 2013.

Flood Control District of Maricopa County, *Drainage Design Manual – Drainage Policies and Standards*, updated June 2016.