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Registered Professional Engineer (Civil)
CERTIFICATE NO.
24449
KENNETH W.
ZELL
Date Signed 1/7/2025
ARIZONA, U.S.A.
EXPIRES 12/31/2025

PRELIMINARY DRAINAGE REPORT FOR TY JENKINS HANGAR 16061 N. 81ST STREET SCOTTSDALE, ARIZONA 85260

PREPARED FOR:

Larson Associates Architects
3807 N. 24th Street Suite 100
Phoenix, Arizona 85016

Job Number 24-013
September 30, 2024
Rev: January 7, 2025

at your service

INTRODUCTION

This Preliminary Drainage Statement addresses the drainage conditions for the Ty Jenkins Hangar project located at 16061 N 81st Street, Scottsdale, Arizona. The property is located within the southwest quarter of Section 1, Township 3 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona. The parcel for the Ty Jenkins Hangar is designated as Lot 34 of the North Scottsdale Airpark Unit 1 subdivision which is on the west side of the Scottsdale Airport runway.

The purpose of this preliminary drainage statement is to document that stormwater runoff has been considered in the planning of a project and that the public and its property will be protected from damage by runoff and flooding from the 100-year flood event. This applies to all properties adjacent to, or potentially impacted by, this development in addition to the property to be developed.

The project was designed in accordance with the 2018 City of Scottsdale Design Standards and Policy Manual.

EXISTING CONDITIONS

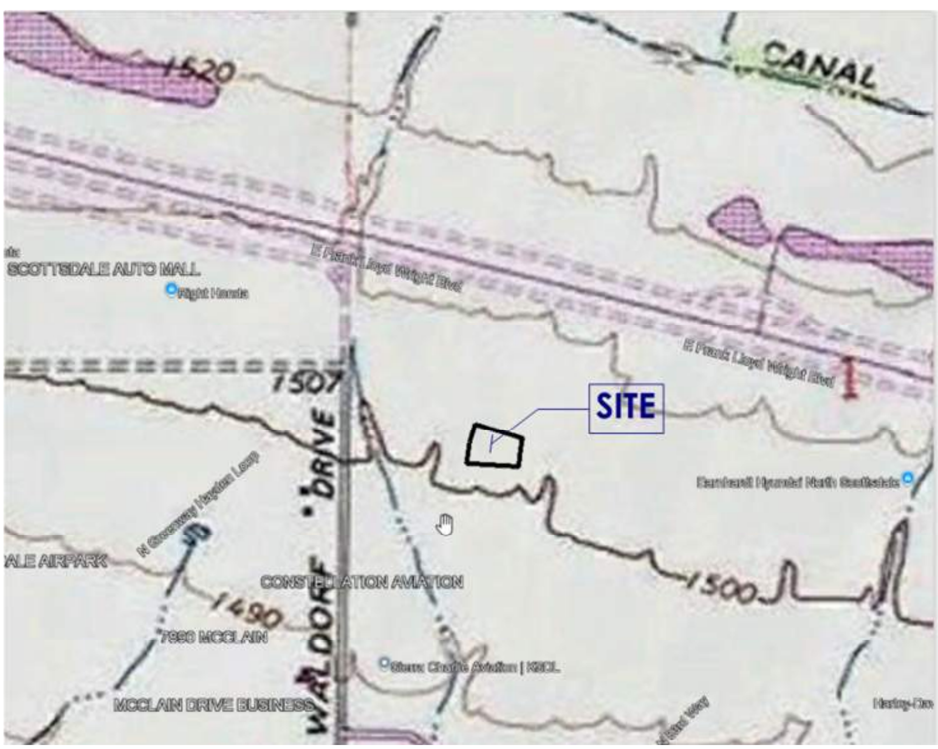
The parcel for the Ty Jenkins Hangar is designated as Lot 34 of the North Scottsdale Airpark Unit 1 subdivision recorded in Book 327 of Maps, Page 12 at the Maricopa County Recorder's Office.

Based on the Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Map Number 04013C1320L dated October 16th, 2013, this site is located in flood zone "Shaded X". FEMA defines flood zone "Shaded X" as, *"Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot, or drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood."*

The land in the Scottsdale Airpark area drains generally to the southwest. The properties in the North Scottsdale Airpark are required to provide stormwater retention with overflow into either the adjacent street or the adjacent taxiway. The Ty Jenkins Hangar lot is vacant and drains into the adjacent taxiway to the east.

See vicinity map below:

The general topography of the area slopes from northeast to southwest. As this area developed over time, the offsite runoff that historically affected this property was retained by prior commercial developments, and/or diverted by public streets. In addition, the Central Arizona Project canal is located approximately 820 feet northeast of the site. The canal effectively acts as a levee from the historic runoff generated from the McDowell Mountains. See USGS quadrangle map below:



Based on all of this information, it is a safe assertion that this project is not adversely affected from offsite stormwater runoff.

PROPOSED DRAINAGE PLAN

The Ty Jenkins Hangar lot will be designed to retain the runoff from the 100-year, 2-hour storm. The retention will be provided in an underground stormwater storage tank, constructed of 14 gage aluminized corrugated steel pipe with 5" x 1" corrugations. The stormwater storage tank will be installed under the parking drive area. The stored water will be disposed of by a drywell. In the event of a storm greater than the 100 year, 2 hour storm the excess water will overflow into 81st Street.

Based on the net area of the lot (52,527) square feet) and given the precipitation depth for the 100-year, 2-hour storm event (2.24"), the city will require the project to retain 8,432 cubic feet of stormwater. Per Chapter 4 of the city's DSPM, the weighted "C" factor for commercial facilities is 0.86 and was used in the stormwater storage requirement calculation. Since the project will include fueling operations for aircraft, to be in compliance with ADEQ's General Permit 2.04 for fuel facilities, the required storage volume is equal to 110% of the calculated storage amount plus the volume from the largest anticipated spill. ADEQ leaves the spill volume up to the discretion of the owner. For this project, the largest anticipated fuel spill was set at 3000 gallons (401 cubic feet). Given the above, this project will need to retain 9,676 cubic feet of stormwater volume.

Based on the proposed grading plan, the required storage volume will be provided underground in 10-foot diameter pipes. Using 125 linear feet of the pipe will provide 9,817 cubic feet of storage.

A new Envibro-type drywell system will be used to drain the retained stormwater volume. The drywell will be located under the new aircraft apron. The drywell will be a Torrent Resources Envibro-Max system. Per the manufacturer, the unit is capable of processing up to 100 gallons per minute (0.22-cfs). Based on this processing rate, the drainage system can drain in 12.3 hours.

The site outfall location is at the southwest corner of the lot into 81st Street. The outfall elevation is 1506.4. Given that the finished floor of the new office building is at 1508.73, this places it 2.3 -feet above the outfall elevation adequately protecting it from flooding.

Based on the above information, the proposed grading plan is in conformance with the city's stormwater requirements, and the building is adequately protected from the runoff given the 100-year storm event. See the Appendix for the supporting calculations, and exhibits.

APPENDIX

FEMA MAP

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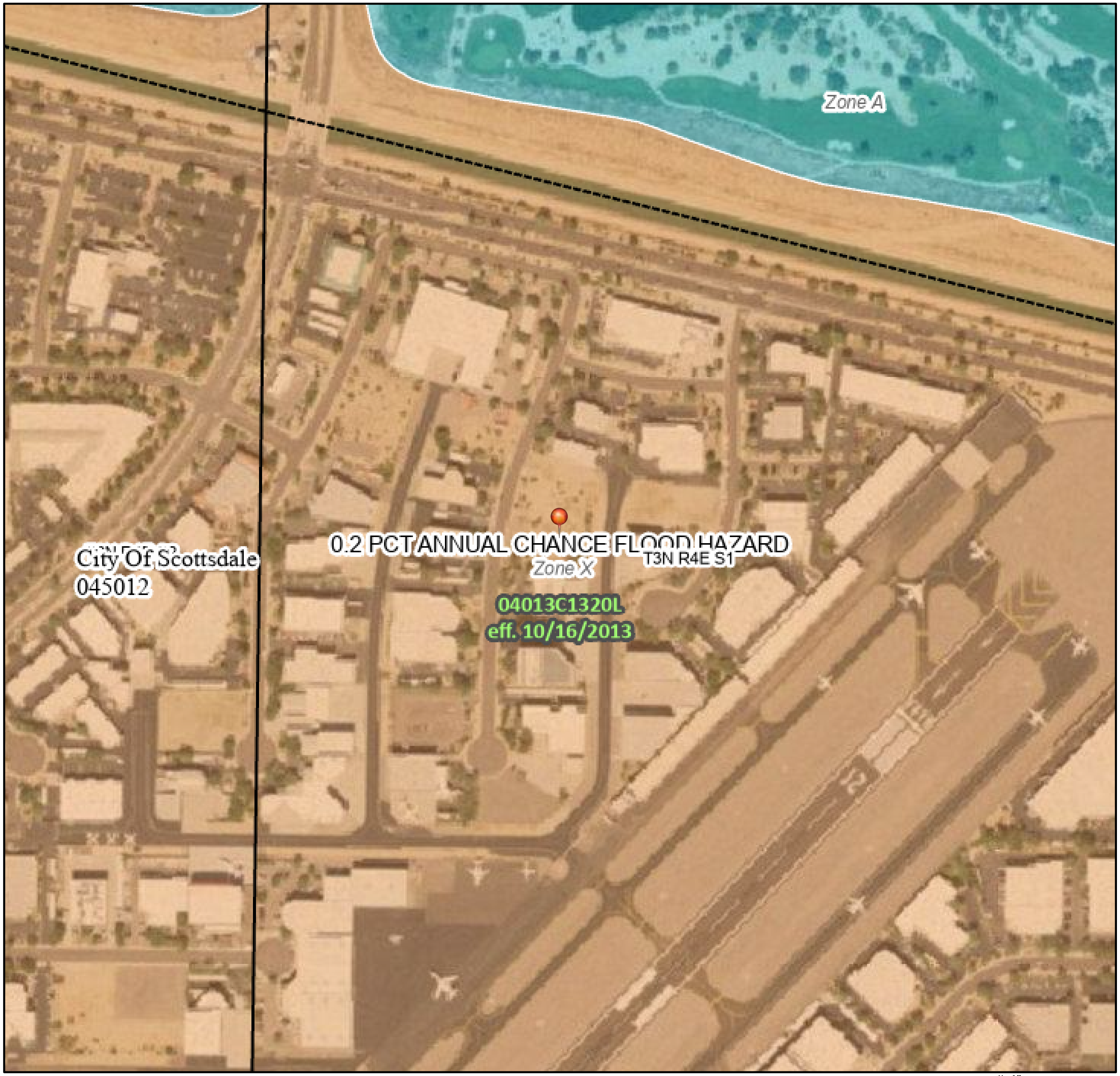
FEMA



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CALCULATIONS

2. A rainfall runoff model using the USACE's HEC 1 Flood Hydrograph Package (generally used for watersheds that are larger than 160 acres, irregular in shape and contour, or if routing of flows is necessary).

B. **Watershed Conditions**

Watersheds are subject to change. Grading and drainage plans shall consider all watershed conditions that would result in the greatest peak discharge rate, to:

1. Size drainage facilities, and
2. Determine lowest floor elevations.

C. **Split-Flow Conditions**

Projects in northern parts of Scottsdale must address split-flow channel conditions where applicable. These splits in the alluvial channels usually include highly erosive soils and are generally unstable and unpredictable. In setting lowest floor elevations relative to upstream splits, assume that 100% of the flow could go either direction in any given flood event. For infrastructure design, the estimate of the actual split, based on a hydraulic analysis of the current channel cross sections, must include a minimum safety factor of 30% of the total flow. If there are extenuating factors affecting the stability of the split, the safety factor should be increased accordingly.

D. **Environmentally Sensitive Lands**

For special considerations regarding Environmentally Sensitive Lands, refer to the City Zoning Ordinance and DSPM Chapter 2 Section 2-2. Modification of natural watercourses with a flow of 50 cfs or greater are addressed in the City Zoning Ordinance.

E. **The Rational Method**

1. Precipitation. Precipitation input is rainfall intensity, "i," and can be obtained directly from NOAA 14.
2. Time of Concentration. Time of concentration "t_c" is the total time of travel from the most hydraulically remote part of the watershed to the concentration point of interest. The calculation of "t_c" must follow FCDMC Hydrology Manual procedures.
3. Runoff Coefficients. Use Fig. 4-1.5, Runoff Coefficients for Use with Rational Method, or equivalent to obtain the runoff coefficients or "C" values. Composite "C" values for the appropriate zoning category or weighted average values calculated for the specific site are both acceptable approaches.

RUNOFF COEFFICIENTS – "C" VALUE

LAND USE	**STORM FREQUENCY**		
Composite Area-wide Values	2-25 Year	50 Yea r	100 Yea r
Commercial & Industrial Areas	0.80	0.83	0.86
Residential Areas – Single Family, slopes 10% or less			
R1-190	0.33	0.50	0.53
R1-130	0.35	0.51	0.59

Required Stormwater Storage Volume

Vr	=	[(P/12)*A*C] * 1.10 + LAFS

Vr	=	Volume Required, Cubic Feet
P	=	Precipitation Amount, Inches
A	=	Net Area of Property, Square Feet
C	=	Runoff Coefficient, 86%
LAFS	=	Largest Anticipated Fuel Spill (3,000Gallons or 401 CF)
Vr	=	[(2.24in/12in/ft)(52527sf)(0.86)]*1.1+401
	=	9,676 CF

Provided Stormwater Storage Volume

Retention is provided in an underground storage tank.

V_{prov}	=	(A)(L)
A	=	Cross Sectional Area of Tank, SF
L	=	Length of Tank, FT
V_{prov}	=	(78.5 SF)(125 FT)
	=	9,817 CF

Disposal of Stored Stormwater

N	=	Number of drywells needed.
N	=	V/(R*3600sec/hr x36hr)
V	=	Retention Basin Design Volume in cubic feet.
R	=	Perc rate for drywells in cubic feet per second.
N	=	9817 CF/(0.22 CFSs * 3600sec/hr * 36hr)
	=	0.34

Use one drywell

Ty Jenkins Hangar

Rational Method Runoff Calculations

Design Storm: 100-year, 5-minute

Location	C	TC (min)	i (in/hr)	A (acres)	Q (cfs)	Volume (cf)
CB1	0.95	5	7.5	0.072862	0.52	156
CB2	0.95	5	7.5	0.028722	0.20	61
CB3A*	0.95	5	7.5	0.178358	1.27	381
CB4	0.95	5	7.5	0.118219	0.84	253
CB5	0.95	5	7.5	0.268405	1.91	574
CB6	0.95	5	7.5	0.072319	0.52	155
CB7	0.95	5	7.5	0.272218	1.94	582

* CB3A functions as a junction box only, grate elevation is above the basin overflow

Q = CiA
Q = Peak runoff, cubic feet per second.
C = Coefficient of runoff.
i = intensity of rainfall, Inches per hour.
A = Area contributing to runoff, acres.
V = Runoff Volume, Cubic Feet,
= TCx60xCiA

Ty Jenkins Hangar
Valley Gutter

Location	"n" Factor	Street Slope	Cross Slope	Depth of flow	Spread	Flow Area	Wetted Perimeter	Velocity (1)	Q (2)
CB6	0.015	0.00500	0.0150	0.10	6.67	0.67	13.33	0.95	0.63

(1) $V=(1.486/n)*(a/p)^{.667}*(s^{.5})$

(2) $Q = (1.486/n)*(a^{1.667}/p^{.667})*(s^{.5})$

Worksheet for P1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011
Channel Slope	0.011 ft/ft
Diameter	12.0 in
Discharge	0.52 cfs

Results

Normal Depth	2.8 in
Flow Area	0.1 ft²
Wetted Perimeter	1.0 ft
Hydraulic Radius	1.7 in
Top Width	0.84 ft
Critical Depth	3.6 in
Percent Full	23.2 %
Critical Slope	0.004 ft/ft
Velocity	3.76 ft/s
Velocity Head	0.22 ft
Specific Energy	0.45 ft
Froude Number	1.638
Maximum Discharge	4.72 cfs
Discharge Full	4.39 cfs
Slope Full	0.000 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	23.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.8 in
Critical Depth	3.6 in
Channel Slope	0.011 ft/ft
Critical Slope	0.004 ft/ft

P2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011
Channel Slope	0.006 ft/ft
Diameter	12.0 in
Discharge	0.72 cfs

Results

Normal Depth	3.9 in
Flow Area	0.2 ft²
Wetted Perimeter	1.2 ft
Hydraulic Radius	2.2 in
Top Width	0.94 ft
Critical Depth	4.2 in
Percent Full	32.4 %
Critical Slope	0.004 ft/ft
Velocity	3.27 ft/s
Velocity Head	0.17 ft
Specific Energy	0.49 ft
Froude Number	1.190
Maximum Discharge	3.42 cfs
Discharge Full	3.18 cfs
Slope Full	0.000 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	32.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.9 in
Critical Depth	4.2 in
Channel Slope	0.006 ft/ft
Critical Slope	0.004 ft/ft

P3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011
Channel Slope	0.005 ft/ft
Diameter	12.0 in
Discharge	1.99 cfs

Results

Normal Depth	7.3 in
Flow Area	0.5 ft²
Wetted Perimeter	1.8 ft
Hydraulic Radius	3.4 in
Top Width	0.98 ft
Critical Depth	7.2 in
Percent Full	61.1 %
Critical Slope	0.005 ft/ft
Velocity	3.96 ft/s
Velocity Head	0.24 ft
Specific Energy	0.85 ft
Froude Number	0.972
Maximum Discharge	3.10 cfs
Discharge Full	2.88 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	34.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	7.3 in
Critical Depth	7.2 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

P4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011
Channel Slope	0.011 ft/ft
Diameter	12.0 in
Discharge	1.99 cfs

Results

Normal Depth	5.7 in
Flow Area	0.4 ft²
Wetted Perimeter	1.5 ft
Hydraulic Radius	2.9 in
Top Width	1.00 ft
Critical Depth	7.2 in
Percent Full	47.5 %
Critical Slope	0.005 ft/ft
Velocity	5.42 ft/s
Velocity Head	0.46 ft
Specific Energy	0.93 ft
Froude Number	1.574
Maximum Discharge	4.68 cfs
Discharge Full	4.35 cfs
Slope Full	0.002 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	47.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.7 in
Critical Depth	7.2 in
Channel Slope	0.011 ft/ft
Critical Slope	0.005 ft/ft

P5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011
Channel Slope	0.010 ft/ft
Diameter	12.0 in
Discharge	2.83 cfs

Results

Normal Depth	7.1 in
Flow Area	0.5 ft²
Wetted Perimeter	1.8 ft
Hydraulic Radius	3.3 in
Top Width	0.98 ft
Critical Depth	8.7 in
Percent Full	59.3 %
Critical Slope	0.006 ft/ft
Velocity	5.83 ft/s
Velocity Head	0.53 ft
Specific Energy	1.12 ft
Froude Number	1.463
Maximum Discharge	4.61 cfs
Discharge Full	4.29 cfs
Slope Full	0.005 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	59.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	7.1 in
Critical Depth	8.7 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

P6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011
Channel Slope	0.015 ft/ft
Diameter	12.0 in
Discharge	2.23 cfs

Results

Normal Depth	5.5 in
Flow Area	0.4 ft²
Wetted Perimeter	1.5 ft
Hydraulic Radius	2.8 in
Top Width	1.00 ft
Critical Depth	7.7 in
Percent Full	45.9 %
Critical Slope	0.005 ft/ft
Velocity	6.34 ft/s
Velocity Head	0.62 ft
Specific Energy	1.08 ft
Froude Number	1.882
Maximum Discharge	5.56 cfs
Discharge Full	5.17 cfs
Slope Full	0.003 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	45.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.5 in
Critical Depth	7.7 in
Channel Slope	0.015 ft/ft
Critical Slope	0.005 ft/ft

P7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011
Channel Slope	0.006 ft/ft
Diameter	12.0 in
Discharge	2.56 cfs

Results

Normal Depth	8.0 in
Flow Area	0.6 ft²
Wetted Perimeter	1.9 ft
Hydraulic Radius	3.5 in
Top Width	0.94 ft
Critical Depth	8.2 in
Percent Full	66.5 %
Critical Slope	0.006 ft/ft
Velocity	4.61 ft/s
Velocity Head	0.33 ft
Specific Energy	1.00 ft
Froude Number	1.061
Maximum Discharge	3.53 cfs
Discharge Full	3.28 cfs
Slope Full	0.004 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	66.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.0 in
Critical Depth	8.2 in
Channel Slope	0.006 ft/ft
Critical Slope	0.006 ft/ft

P8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011
Channel Slope	0.010 ft/ft
Diameter	15.0 in
Discharge	4.47 cfs

Results

Normal Depth	8.2 in
Flow Area	0.7 ft²
Wetted Perimeter	2.1 ft
Hydraulic Radius	4.0 in
Top Width	1.24 ft
Critical Depth	10.3 in
Percent Full	55.0 %
Critical Slope	0.005 ft/ft
Velocity	6.47 ft/s
Velocity Head	0.65 ft
Specific Energy	1.34 ft
Froude Number	1.529
Maximum Discharge	8.21 cfs
Discharge Full	7.63 cfs
Slope Full	0.003 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	55.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.2 in
Critical Depth	10.3 in
Channel Slope	0.010 ft/ft
Critical Slope	0.005 ft/ft

Grate Inlet On Grade -CB1

Project Description

Solve For	Efficiency

Input Data

Discharge	0.52 cfs
Slope	0.000 ft/ft
Gutter Width	6.10 ft
Gutter Cross Slope	0.001 ft/ft
Road Cross Slope	0.001 ft/ft
Roughness Coefficient	0.013
Grate Width	2.00 ft
Grate Length	3.4 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options

Grate Flow Option	Exclude None

Results

Efficiency	99.68 %
Intercepted Flow	0.52 cfs
Bypass Flow	0.00 cfs
Spread	452.5 ft
Depth	5.4 in
Flow Area	102.4 ft²
Gutter Depression	0.0 in
Total Depression	0.0 in
Velocity	0.01 ft/s
Splash Over Velocity	7.49 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.997
Grate Flow Ratio	0.012
Active Grate Length	1.7 ft

Ditch Inlet In Sag -CB2

Project Description

Solve For	Spread

Input Data

Discharge	0.20 cfs
Left Side Slope	5.000 H:V
Right Side Slope	4.000 H:V
Bottom Width	2.00 ft
Grate Width	2.00 ft
Grate Length	3.4 ft
Local Depression	0.0 in
Local Depression Width	0.0 in
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Results

Spread	2.3 ft
Depth	0.5 in
Wetted Perimeter	2.4 ft
Top Width	2.35 ft
Open Grate Area	3.1 ft^2
Active Grate Weir Length	8.8 ft

Ditch Inlet In Sag -CB3

Project Description	
Solve For	Spread

Input Data	
Discharge	1.27 cfs
Left Side Slope	5.000 H:V
Right Side Slope	4.000 H:V
Bottom Width	2.00 ft
Grate Width	2.00 ft
Grate Length	6.8 ft
Local Depression	0.0 in
Local Depression Width	0.0 in
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Results	
Spread	2.8 ft
Depth	1.1 in
Wetted Perimeter	2.8 ft
Top Width	2.81 ft
Open Grate Area	6.1 ft²
Active Grate Weir Length	15.6 ft

Ditch Inlet In Sag -CB4

Project Description	
Solve For	Spread

Input Data	
Discharge	0.84 cfs
Left Side Slope	85.700 H:V
Right Side Slope	51.600 H:V
Bottom Width	2.50 ft
Grate Width	2.50 ft
Grate Length	2.5 ft
Local Depression	0.0 in
Local Depression Width	0.0 in
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Results	
Spread	17.8 ft
Depth	1.3 in
Wetted Perimeter	17.8 ft
Top Width	17.84 ft
Open Grate Area	2.8 ft²
Active Grate Weir Length	7.5 ft

Ditch Inlet In Sag -CB5

Project Description

Solve For	Spread

Input Data

Discharge	1.91 cfs
Left Side Slope	50.270 H:V
Right Side Slope	26.220 H:V
Bottom Width	2.00 ft
Grate Width	2.00 ft
Grate Length	6.8 ft
Local Depression	0.0 in
Local Depression Width	0.0 in
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Results

Spread	11.1 ft
Depth	1.4 in
Wetted Perimeter	11.1 ft
Top Width	11.07 ft
Open Grate Area	6.1 ft²
Active Grate Weir Length	15.6 ft

Ditch Inlet On Grade - CB6

Project Description

Solve For	Efficiency

Input Data

Roughness Coefficient	0.011
Slope	0.005 ft/ft
Left Side Slope	69.900 H:V
Right Side Slope	86.670 H:V
Bottom Width	2.00 ft
Discharge	0.52 cfs
Grate Width	2.00 ft
Grate Length	3.4 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options

Grate Flow Option	Exclude None

Results

Efficiency	41.87 %
Intercepted Flow	0.22 cfs
Bypass Flow	0.30 cfs
Flow Area	0.5 ft²
Wetted Perimeter	12.2 ft
Top Width	12.21 ft
Velocity	1.12 ft/s
Splash Over Velocity	7.48 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.191
Grate Flow Ratio	0.282
Active Grate Length	1.7 ft
Critical Depth	0.8 in
Critical Slope	0.005 ft/ft
Froude Number	1.016
Flow Type	Supercritical
Specific Energy	0.08 ft
Velocity Head	0.02 ft
Depth	0.8 in

Ditch Inlet In Sag -CB7

Project Description

Solve For	Spread

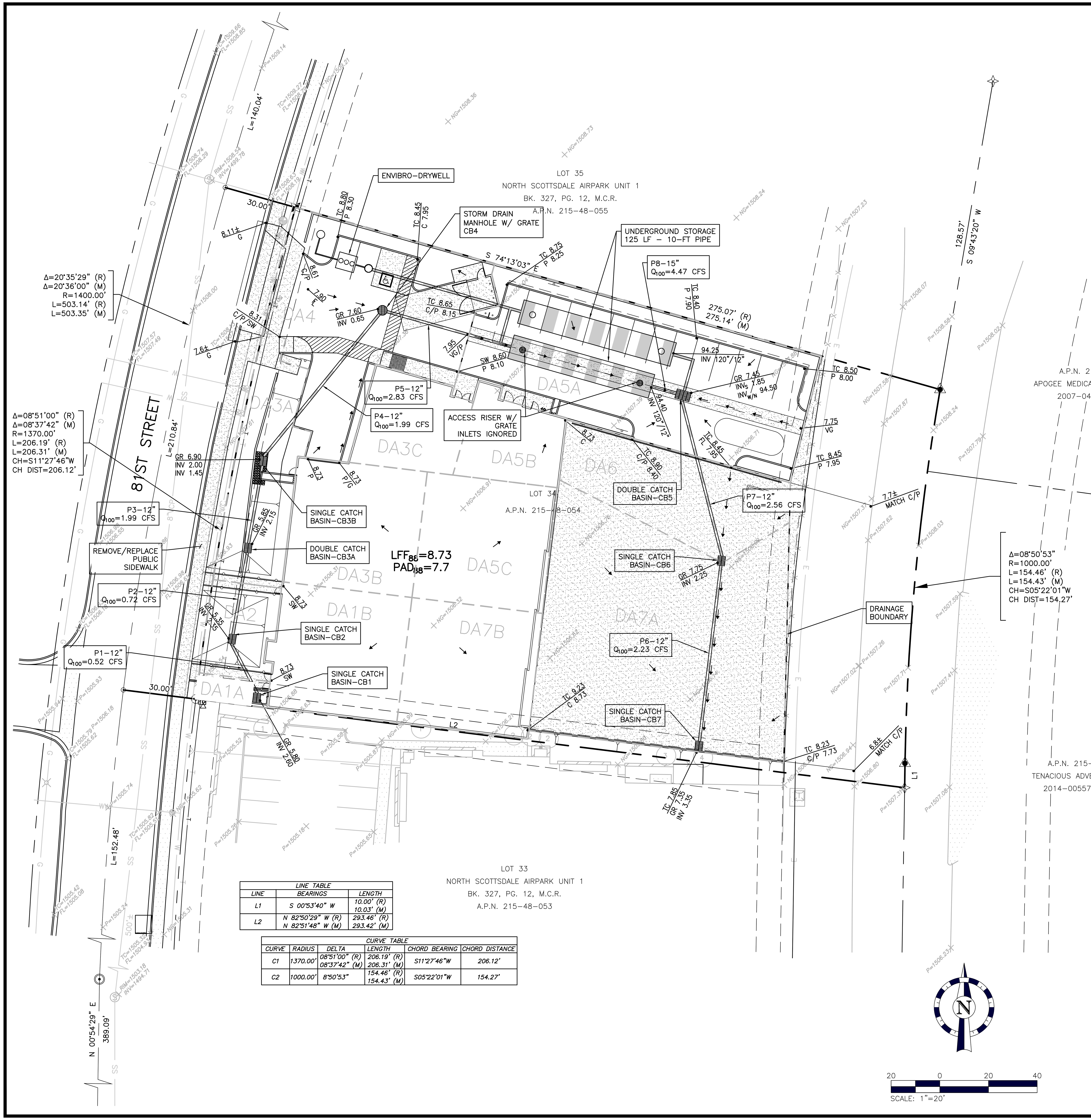
Input Data

Discharge	2.23 cfs
Left Side Slope	50.000 H:V
Right Side Slope	94.700 H:V
Bottom Width	2.00 ft
Grate Width	2.00 ft
Grate Length	3.4 ft
Local Depression	0.0 in
Local Depression Width	0.0 in
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Results

Spread	29.8 ft
Depth	2.3 in
Wetted Perimeter	29.8 ft
Top Width	29.81 ft
Open Grate Area	3.1 ft²
Active Grate Weir Length	8.8 ft

DRAINAGE EXHIBIT



DRAINAGE STATEMENT

RETENTION FOR THIS PARCEL IS PROVIDED FOR THE 100–YEAR, 2–HOUR STORM EVENT. BASED ON THE FUELING OPERATIONS ASSOCIATED WITH THIS PROJECT, ADEQ REQUIRES THE SITE TO PROVIDED 110% OF THE REQUIRED VOLUME PLUS THE VOLUME FROM THE LARGEST ANTICIPATED FUEL SPILL. SINCE ADEQ DOES NOT DEFINE THE SPILL VOLUME REQUIRED IN THE CALCULATION, WE HAVE ASSUMED THE SPILL TO BE 3000 GALLONS. A FULL DRAINAGE STATEMENT IS ON FILE WITH THE CITY OF SCOTTSDALE FOR THIS PROJECT.

RETENTION CALCULATIONS

100–YEAR, 2–HOUR EVENT

$$V_{REQ} = \frac{(C)(P)(A)(1.1)}{12} + 401$$

C = 0.86
P = 2.24"
A = 52,527 S.F.
LARGEST ANTICIPATED FUEL SPILL = 3000 GAL (401 CF)

V_{REQ} = 9,676 C.F.

VOLUME PROVIDED IN 125 L.F. 10' DIAMETER PIPE:

$V_{PROV} = (\Pi)(R^2)(L)$

R = 5'
L = 125'

V_{PROV} = 9,817 C.F.

CATCH BASINS							
LOCATION	DRAINAGE AREA ID	DRAINAGE AREA (ACRES)	CATCH BASIN TYPE	Q_{100} (CFS)	Q INTERCEPTED W/ CLOGGING FACTOR	DEPTH OVER GRATE (IN)
CB1	1A & 1B	0.0729	SINGLE MAG 535	0.52	N/A	5.4
CB2	2	0.0287	SINGLE MAG 535	0.2	N/A	0.5
CB3A	3A & 3B	0.1784	DOUBLE MAG 535	1.27	N/A	1.1
CB4	4	0.1182	GRATED MANHOLE COVER	0.84	N/A	1.3
CB5	5A, 5B, & 5C	0.2684	DOUBLE MAG 535	1.91	N/A	1.4
CB6	6	0.0723	SINGLE MAG 535	0.52	0.22	0.8
CB7	7A, 7B, & OVERFLOW FROM 6	0.2722	SINGLE MAG 535	2.23	N/A	2.3

NOTES:

PEAK FLOWS FOR THE PURPOSE OF CATCH BASIN SIZING ASSUMED A RUNOFF FACTOR OF 0.95, ASSUMED A TIME OF CONCENTRATION OF 5 MINUTES, AND USED AN INTENSITY OF 7.5"/HOUR.

ALL INLETS OPERATING IN SAG HAVE 50% CLOGGING FACTOR.

CB3B IS A JUNCTION BOX. THE GRATED TOP IS FOR OVERFLOW ONLY.

DA6 BYPASS FLOW IS 0.30 CFS. THIS FLOW IS ROUTED TO CB7.

STORM DRAIN PIPES						
LOCATION	Q_{100} (CFS)	SIZE	SLOPE (%)	DEPTH OF FLOW (IN)	VELOCITY (FT/SEC)	% FULL
P1	0.52	12"	1.087%	2.8	3.76	23.2
P2	0.72	12"	0.5714%	3.9	3.27	32.4
P3	1.99	12"	0.4688%	7.3	3.96	61.1
P4	1.99	12"	1.0667%	5.7	5.42	47.5
P5	2.83	12"	1.0377%	7.1	5.83	59.3
P6	2.23	12"	1.5068%	5.5	6.34	45.9
P7	2.56	12"	0.6061%	8.0	4.61	66.5
P8	4.47	15"	1.0000%	8.2	6.47	55.0

NOTES:

PIPES WERE SIZED USING GRAVITY FLOW ASSUMPTIONS AND LIMITED THE DEPTH OF FLOW TO 75% OF THE PIPE CAPACITY. IN ACTUALITY, THE STORM SEWER WILL OPERATE UNDER PRESSURE FLOW AS THE UNDERGROUND STORAGE PIPE FILLS WITH RUNOFF. IF THE SYSTEM WAS DESIGNED WITH PRESSURE FLOW, THE PIPE SIZES COULD BE REDUCED. DESIGNING THE SYSTEM USING GRAVITY FLOW ASSUMPTIONS RESULTS IN A HIGHER SAFETY FACTOR AGAINST SURCHARGING.

LINE TABLE		
LINE	BEARINGS	LENGTH
L1	S 00°53'40" W	10.00' (R) 10.03' (M)
L2	N 82°50'29" W (R) N 82°51'48" W (M)	293.46' (R) 293.42' (M)

CURVE TABLE					
CURVE	RADIUS	DELTA	LENGTH	CHORD BEARING	CHORD DISTANCE
C1	1370.00'	08°51'00" (R) 08°37'42" (M)	206.19' (R) 206.31' (M)	S11°27'46"W	206.12'
C2	1000.00'	8°50'53"	154.46' (R) 154.43' (M)	S05°22'01"W	154.27'

SCALE: 1"=20'

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com

ZELL COMPANY L.L.C. CIVIL ENGINEERING
PO Box 2191
Litchfield Park, Arizona 85340
Phone: 623•547•2500

Registered Professional Engineer (Civil) Certificate No. 24449 KENNETH W. ZELL
Date Signed 01-07-2025
ARIZONA, U.S.A.
EXPIRES 12/31/2025

REV	DATE	DESCRIPTION	BY

PROJECT: TY JENKINS HANGAR
LOCATION: SCOTTSDALE, ARIZONA 85260
DRAWN BY: RR
DESIGNED BY: KZ
REVIEWED BY: KZ
DATE: OCT 2024
TITLE: DESIGN REVIEW –CIVIL PLAN DRASINAGE EXHIBIT
SITE ADDRESS: 16061 N. 81ST STREET, SCOTTSDALE, AZ
SCALE: 1:20
JOB NO.: 24–013
SHEET 1 OF 1

Plot Date/Time: 1/8/2025 12:37 PM Layout Name: DE
Full File Path: T:\draft_users\cad01-drafting\24-013 Ty Jenkins Hangar\24-013.dwg