



Water Study

WATER BASIS OF DESIGN REPORT FOR SAFARI PHASE II RESIDENTIAL

PREPARED FOR

HIGH STREET RESIDENTIAL
2231 E. CAMELBACK ROAD, STE 102
PHOENIX, AZ 85016

**PRELIMINARY Basis of Design
Report**

- ACCEPTED
 ACCEPTED AS NOTED
 REVISE AND RESUBMIT



Disclaimer: If accepted, the preliminary approval is granted under the condition that a final basis of design report will also be submitted for city review and approval (typically during the DR or PP case). The final report shall incorporate further water or sewer design and analysis requirements as defined in the city design standards and policy manual and address those items noted in the preliminary review comments (both separate and included herein). The final report shall be submitted and approved prior to the plan review submission.

For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY Idillon DATE 10/2/2018

address comments
throughout for final
BOD.

PREPARED BY

VICENTE RUIZ, P.E.
DAVID EVANS & ASSOCIATES, INC.
4600 E WASHINGTON STREET, SUITE 250
PHOENIX, AZ 85034
(602) 678-5151

AUGUST 2018

DEA PROJECT NO. ESGA0002



GER 6/30/19

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	<u>TITLE</u>
1	City of Scottsdale Water Quarter Section Map
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A	Vicinity Map
B	Fire Hydrant Flow Test Results
C	Fire Flow Calculation Table
D	Water Demand Table
E	Water Modeling Output



A. INTRODUCTION

This basis of design report was completed under a contract with ESGA Architects, for High Street Residential, owner and developer of Safari Phase II Residential. The project will consist of 2 multistory story apartment buildings with 160 units. The water infrastructure that will support this project was built in 2006 as part of the Safari Phase I development. The site is also a part of the development agreement with the adjacent Bluesky Project. The site was previously approved through DRB for a project known as Peacock in July 2017, with the same number of residential units.

1. Project Location

The Safari Phase II project is located within the northwest quarter of Section 23 of Township 2 North, Range 4 East of the Gila and Salt River Base and Meridian within City of Scottsdale, AZ. The site is approximately 2.08 acres and irregularly shaped. It is generally bound by 72nd Place to the west, existing Safari Drive Phase 1 condominium units to the south, 72nd Way to the east, and Coolidge Street to the north. The area's street system in relationship to the location of the site is illustrated in Appendix A, the project's vicinity map.

2. Site Zoning

The zoning of the Safari Ph II site is discussed in Section C.1 of this report.

3. General Plan

The Safari Ph II project will provide strong support for the goals and policies of the City's General Plan. It will be consistent with the Downtown Plan and reflect its vision, goals, and policies. It will support the City's efforts to "boldly look to its metropolitan future" through the development of an urban oasis that brings to life the City's vision for:

- Mixed-use urban neighborhoods
- World class planning, architecture, and design
- Sustainability
- Connectivity and walkability
- Economic vitality, and
- Worldwide recognition as the premier destination in the United States

Not applicable, use
COS standards

B. DESIGN DOCUMENTATION

1. Design Procedures

The analysis of the proposed water system was done in compliance with the City of Scottsdale Design Standards & Policies Manual.

The proposed water distribution system will serve the project in accordance with City of Scottsdale design standards and the **ADEQ Engineering Bulletin 10.**

The estimated Average Day Demand of the Safari Phase II project was determined based on the following Average Day Demand values. All of the values below include both inside use and outside use demands.

- Residential Units = ~~185.3 gallons per unit per day~~

use gpm values in
2018 DS&PM Ch6

The Maximum Day Demand was calculated using a factor of 2.0 times the Average Day Demand. The Peak Hour Demand was determined by multiplying the Average Day Demand by 3.5.

2. Software

Water demands were determined using a Microsoft Excel spreadsheet. DEA created a WaterCAD™ model of the proposed water system. WaterCAD is a water distribution system modeling software created by Haestad Methods. To run WaterCAD, a user inputs the water system map, waterline sizes, and demand locations. WaterCAD connects these elements as a system and uses mathematical equations to determine flow directions, flow magnitudes and pressures for the water system modeled.

C. EXISTING CONDITIONS

1. Zoning and Land Use

The site falls under the Downtown Regional Multiple Use Type 2 Land Use designation. The site is currently zoned Downtown Regional Commercial Office, Type 2, Planned Block Development Downtown Overlay (D/RCO-2 PBD DO) with amended development standards.

2. Existing Topography, Vegetation, and Landform Features

Generally, the existing topography slopes in a southeasterly direction at approximately 0.40%, with approximately 1 feet of fall across the property. The site in its existing condition is generally an unimproved dirt lot. The site shares the boundary with existing Safari Drive condominiums Phase 1 located to the south and east of the site. The future Bluesky parcel is located to the west across 72nd Place. The entrance road also provides access to a commercial development located to the north of the site.

3. Existing Utilities

There is existing water infrastructure located within the adjacent streets as illustrated on the City of Scottsdale Quarter Section map provided in the Appendix. This infrastructure includes an existing 6-inch ACP and an existing 16-inch DIP waterline within Scottsdale Road. There is also an existing 8-inch DIP waterline within Coolidge Street. An 8-inch waterline is located within the northern portion of 72nd Place and connects to the waterline in Coolidge Street. The fire hydrant at the end of this line will be relocated at the end of 72nd Place and another existing hydrant is relocated at the NE of north building as shown on the Concept Water and Sewer Plan. Existing 6 inch stubs for fire are provided along Coolidge, as well as a 4 inch water line.

4. Existing Master Plans or Design Reports

A *Water Basis of Design Report for Safari Drive* was prepared by DEA in 2006 for the Safari Drive condominiums. Phase 1 of Safari Drive has been constructed.

5. Certified Flow Testing

A fire flow test was performed for this project on fire hydrants adjacent to the project site. The results and location of the test are provided in Appendix B.

D. PROPOSED CONDITIONS

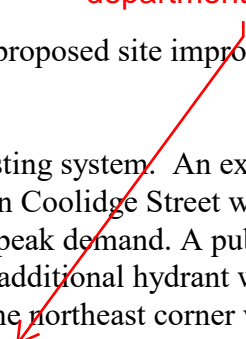
1. Site Plan

Exhibit 2 Concept Water and Sewer Plan illustrates the proposed site improvements.

2. Proposed Connections

Exhibit 2 illustrates the proposed connections to the existing system. An existing 4-inch domestic line connected to the existing 8-inch line within Coolidge Street was provided, however, only a 2 inch line would be required based on peak demand. A public hydrant will be relocated closer to the southern residential building. An additional hydrant will be added at the northwest corner of the site, and an existing hydrant at the northeast corner will be adjusted to avoid the new sidewalk ramp, **Additionally, two 6-inch fire lines, with a valve on main between, will connect to the existing 8-inch main within Coolidge Street.** A booster pump will be provided in the south building to supply pressure to upper floors.

Confirm with fire department



Private water service lines will be installed under landscaping. Backflow prevention assemblies will be installed on private waterlines.

3. Water Zone, Fire Flow, and System Pressures

The Safari Ph II development lies within the City of Scottsdale Water Zone 1-A per the 2008 *Integrated Water Master Plan* prepared by Carollo. This zone serves areas with ground

elevations from 1250 feet to 1330 feet. The finished floor (FF) elevation of the first level of the main building is at 1280.50.

The static pressure within the 8-inch waterline in Coolidge is approximately 100 psi based on the flow test performed by FPES. A maximum static pressure of 72 psi will be used for modeling purposes as required by the City of Scottsdale *Design Standards and Policies Manual*. The buildings will incorporate private booster pumps to supply water to the upper floors and will be designed to maintain a minimum residual pressure of 50 psi at the highest finished floor level under normal operating conditions. The building system will maintain a minimum pressure of 20 psi under fire flow conditions.

The building area is 265,000 sf and will be fully sprinkled. The garage will be fully sprinkled and will be of Type IB construction.

The *Design Standards and Policies Manual* dictates that the minimum fire flow for commercial structures is 1,500 gpm. Additionally, up to a 75% reduction may be taken when the building is supplied with an approved automatic sprinkler system. Based on this information and the table provided in Appendix C, the fire flow for the Safari Phase II development will be 2,000 gpm with a residual pressure of 30 psi at the fire node.

E. COMPUTATIONS

1. Computer Calculations

A hard copy of the demand calculations and the WaterCAD output for this report has been provided in Appendices D and E.

2. Demand Summary

Table E.2.1 summarizes the water demands for the Safari Ph II project. A detailed demand table that breaks down the values listed below is provided in Appendix D.

TABLE E.2.1 – WATER DEMAND SUMMARY

Phase	Average Day (gpm)	Max Day (gpm)	Peak Hour (gpm)
Safari Ph II	41.5	82.6	144.4

use gpm values in 2018 DS&PM Ch6, adjust values as required

Why is min pressure at J-3? Should be J-7. Check and correct this.

3. Water Modeling Results

Average Day, Max Day, Max Day + FF, and Peak Hour demand scenarios were analyzed for Safari Ph II. The water demand for the Safari Phase II development was modeled at the same location (J-9) that it was originally modeled in the *Water Basis of Design Report for Safari Drive*. This location conforms to the location of the single water service that was proposed for the Safari Phase II project.

The WaterCAD output for the most conservative scenarios (Max Day + FF and Peak Hour) for the proposed water system modeled can be found in Appendix E. This output includes system pressures, pipe velocities, demands, and headloss information for each of the two phases modeled.

All pressures in the model are at street level. The lowest pressure available in the system during the Peak Hour Scenario is 72 psi. Based on the City’s criteria requiring 50 psi at the buildings’ highest levels, any building requiring water above two stories will require a private booster pump system.

The following table summarizes the expected pressures during the Safari Phase II scenario. The pressures at each junction are 72 psi for the average day and peak hour scenarios.

TABLE E.3.1 – PHASE 1 PRESSURE SUMMARY

Model Scenario		Min	Max	Ave
Average Day	Pressure (psi)	72	72	72
	Node	Multiple, See Output	Multiple, See Output	-
Max Day plus FF	Pressure (psi)	41	71	56
	Node	J-3	J-5	-
Peak Hour	Pressure (psi)	72	72	72
	Node	Multiple, See Output	Multiple, See Output	-

All nodes pass the Max Day + Fire Flow scenario with all pressures greater than or equal to 30 psi.

All non-fire flow headlosses are less than 10 ft/1000ft. Detailed modeling output has been provided in Appendix E. Based on the modeling results, the existing infrastructure and proposed water line improvements can support the project.

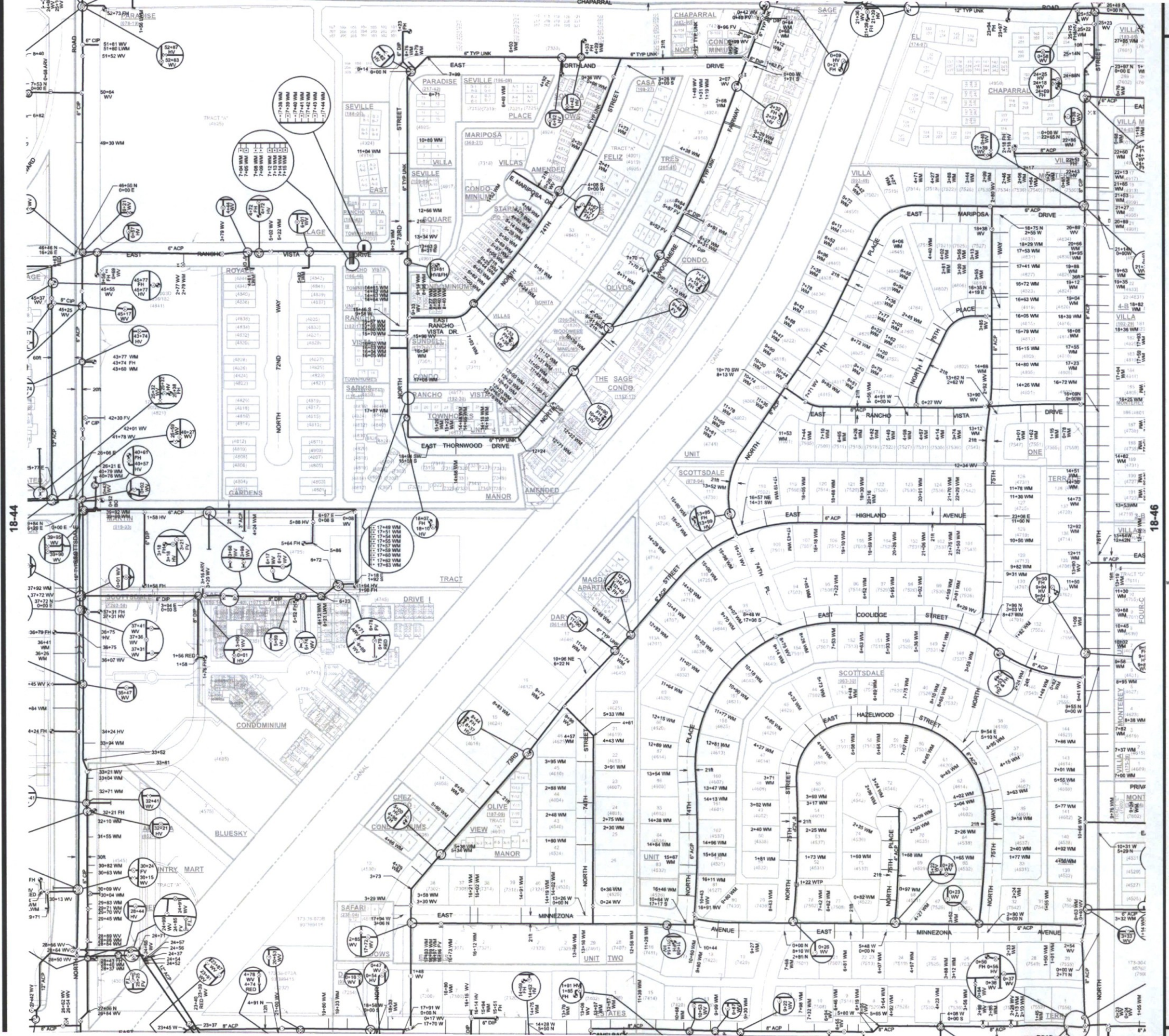
F. SUMMARY

The proposed Safari Ph II water distribution system is illustrated on Exhibit 2. New water services, a new fire line, and a new hydrant will be installed as part of this project. Two existing fire hydrants will be relocated, as well.

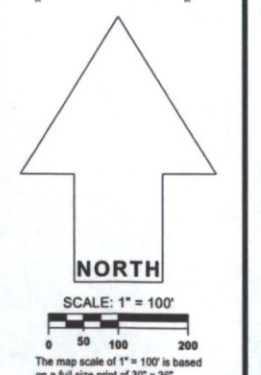
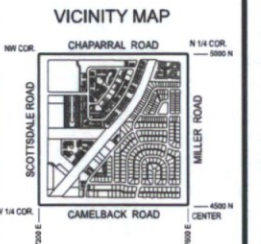
The proposed water improvements meet all City of Scottsdale pressure, velocity, and headloss requirements. It is recommended that the Safari Ph II water distribution system improvements be designed as dictated in this report.

APPENDIX A
CITY OF SCOTTSDALE WATER QUARTER SECTION MAP

NOTICE
 PREPARED FOR GENERAL INFORMATION PURPOSES ONLY. THE CITY OF SCOTTSDALE WARRANTS ITS ACCURACY, COMPLETENESS OR FITNESS FOR ANY PARTICULAR PURPOSE. IT SHOULD NOT BE RELIED UPON WITHOUT FIELD VERIFICATION.
 THE CITY OF SCOTTSDALE



- LEGEND:**
- Air Release Valve
 - Non-potable Air Release Valve
 - Blowoff
 - Cap
 - Cathodic Protection
 - Fire Drain
 - Fire Hydrant
 - Non-GPS Point
 - Pressure Reducing Valve
 - Pump
 - Reducer
 - Sample Station
 - Water Manhole
 - Non-Potable Manhole
 - Well
 - Valve
 - Non-potable Valve
 - Vault
 - Water Main
 - Non-Potable Main
 - Fire / Private Main
 - Non-Scottsdale Main
 - Not found per improvement plans
 - Not found per improvement plans and/or G.S. maps
 - Found in field no reference
 - Map Error Point



WATER
QUARTER SECTION MAP
18-45
 NW 1/4 SEC. 23 T2N R4E

APPENDIX B
FIRE HYDRANT FLOW TEST RESULTS



4242 W. Topeka Dr. | Glendale, Arizona 85308
 P: (623) 587-1844 | F: (623) 587-7992
 E-mail: FPES@Cox.Net

HYDRANT FLOW TEST SUMMARY REPORT

PROJECT LOCATION: 4733 N. SCOTTSDALE RD.

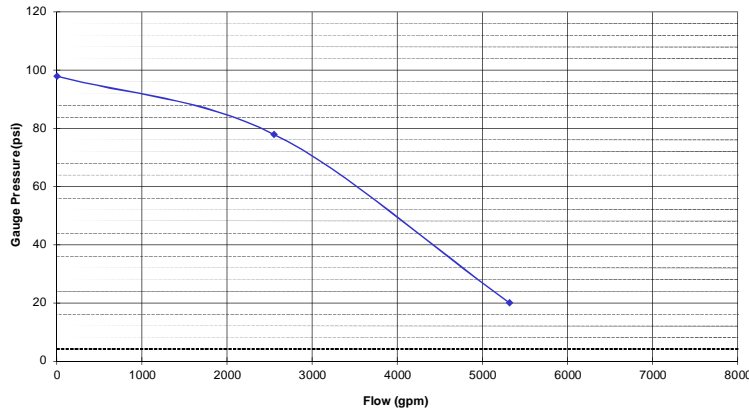
WITNESSED BY: BRIAN DICK - FIELD ENGINEERING SUPERVISOR for the CITY OF SCOTTSDALE (#C56034)

DATE: 08/15/18

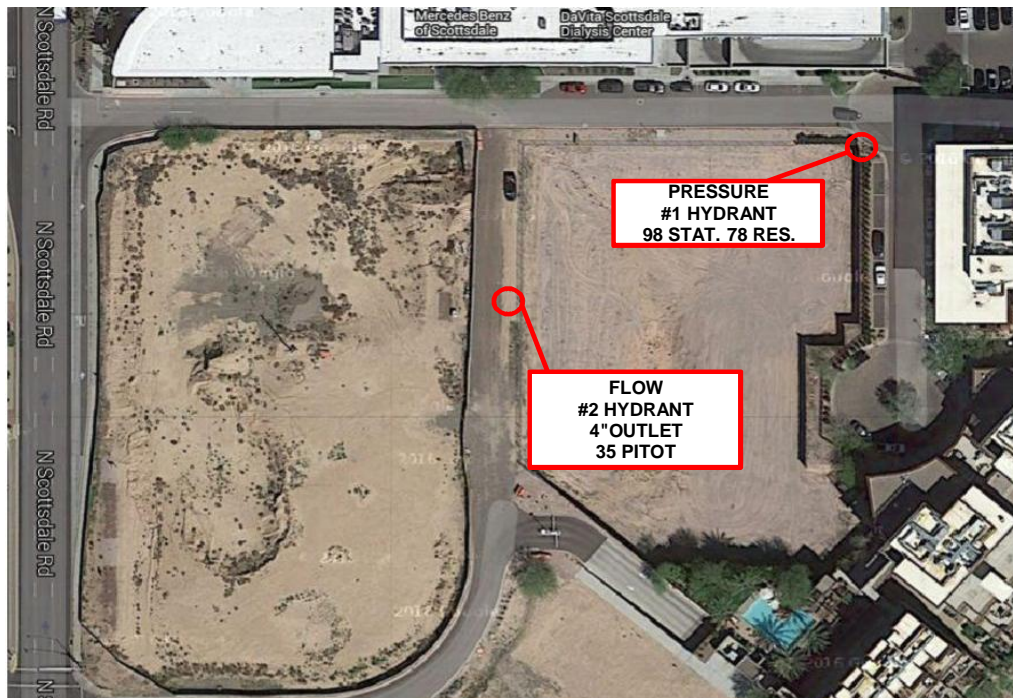
TIME: 7:30AM

Observed Test Data								
Hydrant Designation	Hydrant Number	Flow Opening	*Static Pressure	*Residual Pressure	Pitot Pressure	**Coefficient	Coefficient Steamer use .83	Flow (GPM)
Pressure; R	Hydrant #1		98	78				
Flow, F1	Hydrant #2	4			35	0.95	0.95	2549
Flow, F2	Hydrant #2							0
TOTAL:								2549

Note: If steamer connection was used for the flow test (without stream straightener), An additional Coefficient must be used with a factor of .83. *Static and residual pressures must be adjusted for elevation change (+0.0 FT.) to site. **Use .95 Coefficient when stream straightener is utilized



Available flow @ 20 PSI
5316 GPM



ACCEPTED BY: _____

DATE: _____

APPENDIX C
FIRE FLOW CALCULATION TABLE

Fire Flow Node FlexTable: Fire Flow Report

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Velocity of Maximum Pipe (ft/s)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated Zone Lower Limit @ Total Flow Needed) (psi)
J-1	True	2,000	2,001	2,000	2,001	71	J-5	P-3	13.04	J-5	71
J-7	True	2,000	2,001	2,000	2,001	41	J-3	P-3	13.04	J-3	50

Why is min pressure at J-3? Should be J-7. Check and correct this.

APPENDIX D
WATER DEMAND TABLE

WATER DEMANDS

SAFARI SCOTTSDALE

Building	Phase	Land Use and Description	Area Sq. Ft.	Dwellings Served	Average	Average	Max. Day Factor	Maximum	Peak Hour Factor	Peak
					Daily Demand Per Unit (gpd)	Daily Demand Based on 12 Hr Day (gpm)		Daily Demand (gpm)		Hour Demand (gpm)
	1	Residential Units		160	185.3	20.6	2.0	41.2	3.5	72.1
Main Total						20.6		41.2		72.1

2?, should also incorporate Phase 1.

APPENDIX E
WATER MODELING OUTPUT

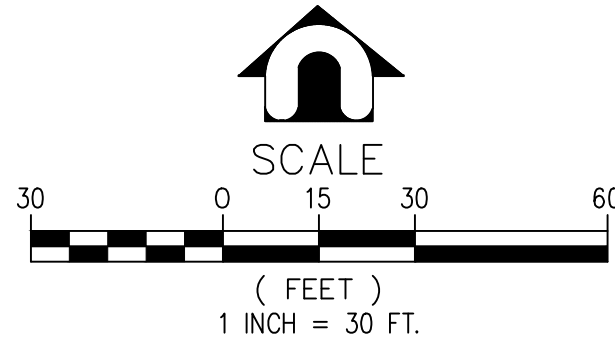
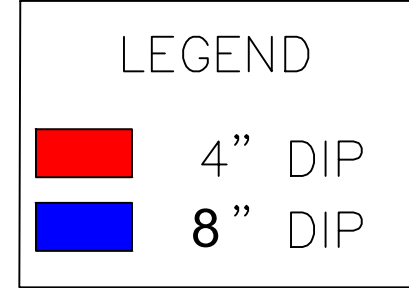
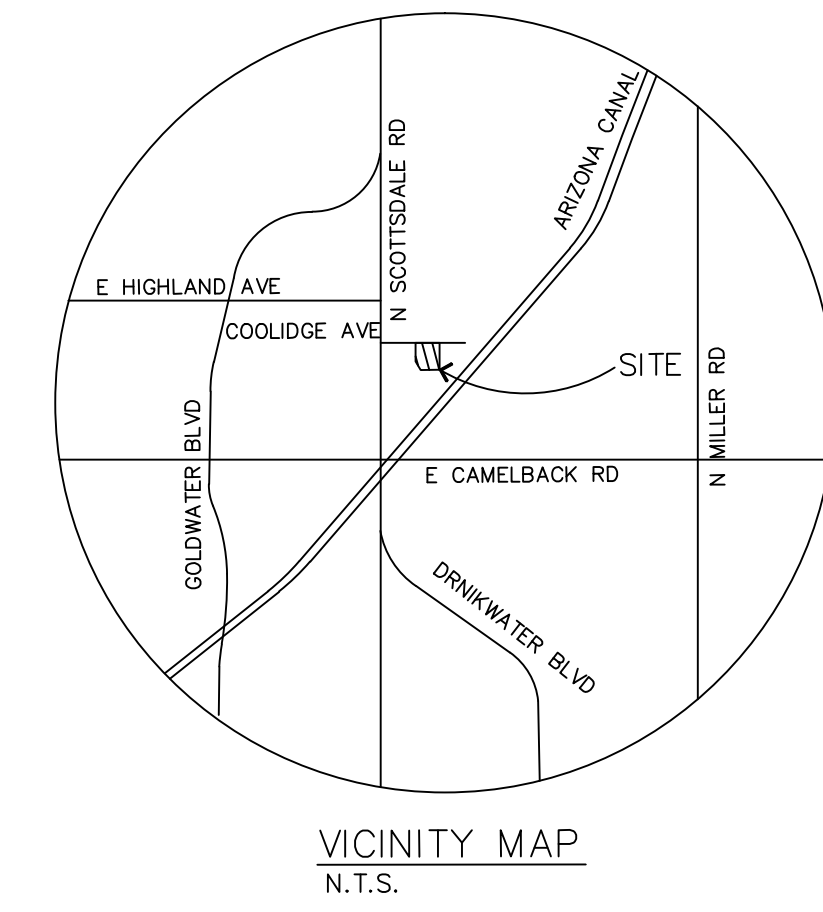
WATER MODEL EXHIBIT FOR SAFARI PHASE II RESIDENTIAL CITY OF SCOTTSDALE, ARIZONA

DEVELOPER/OWNER

HIGH STREET RESIDENTIAL
2231 E. CAMELBACK ROAD, STE 102
PHOENIX, ARIZONA 85016
PHONE: (602) 222-4000
CONTACT: PAUL TUCHIN
EMAIL: PTUCHIN@TRAMMELLCROW.COM

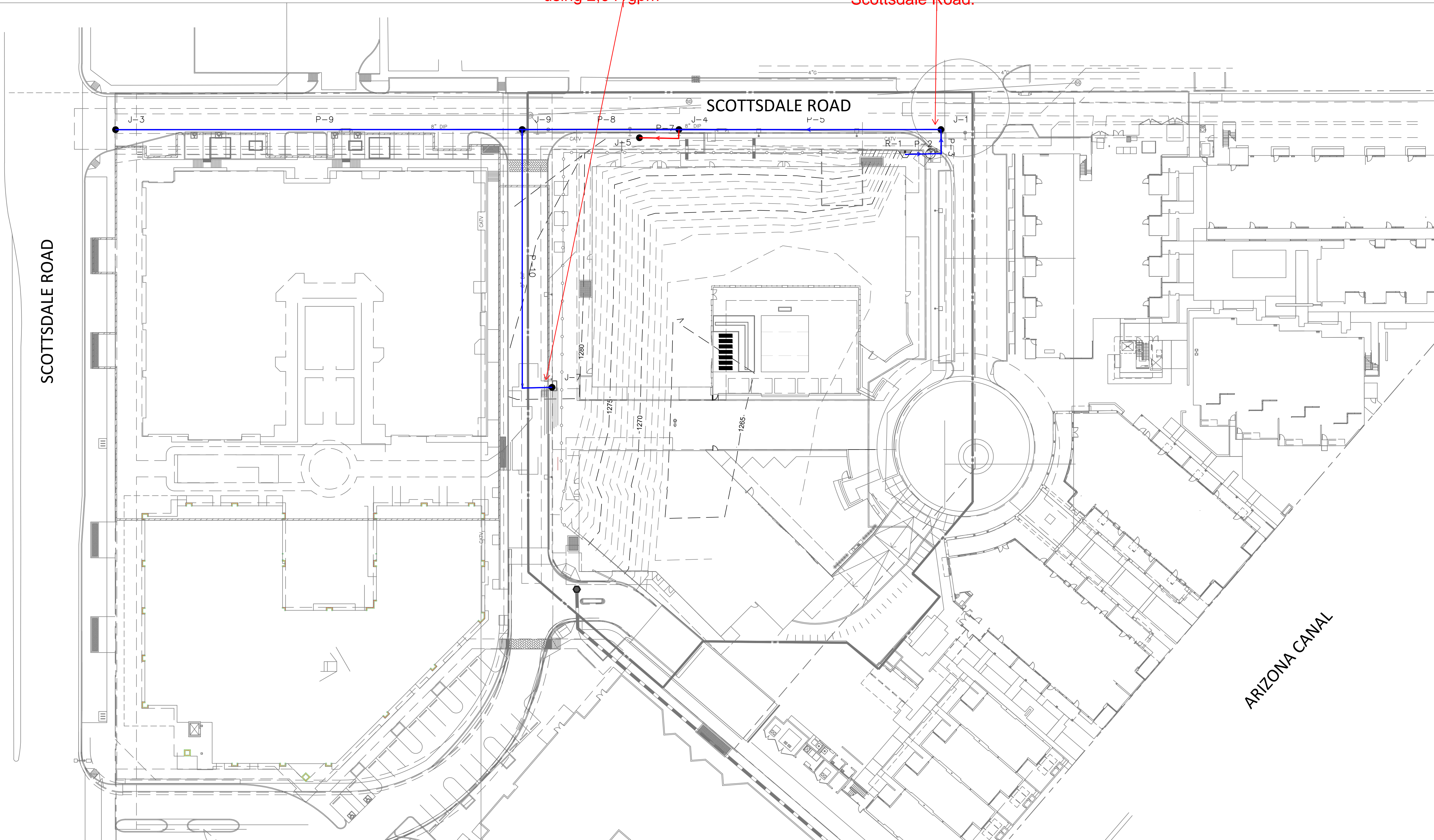
ENGINEER

DAVID EVANS AND ASSOCIATES, INC.
4600 EAST WASHINGTON STREET, SUITE 250
PHOENIX, AZ 85034
CONTACT: VICENTE RUIZ
PHONE: (602) 474-9001



Adjust residual
pressure pressure
back to Scottsdale
Road from J-9 to J-3
using 2,041 gpm

Pump needs to be
connected at J-3, not
J-1, adjust pressure
results accordingly and
incorporate into supply
curve. Assume all flow
is coming from
Scottsdale Road.



PROJECT MANAGER: _____ P.E.

DESIGNED BY: VRR

DRAWN BY: NPC

CHECKED BY: VRR

DATE: 06/05/2017

DAVID EVANS AND ASSOCIATES INC.
4600 E WASHINGTON ST, SUITE 250
Phoenix, Arizona 85034
Phone: 602.678.5151



EXP: 6/30/2019

CONCEPT WATER & SEWER PLAN FOR
PEACOCK SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

SCALE:
1" = 40'

SECTION: 23
TWNHP: 2N
RANGE: 4E

JOB NO.:
DECO0018

SHEET
OF 1



OS #17-44, 17-45, 18-44, 18-45

AVG DAY
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
34	J-1	0.00	0	166.32	72
39	J-3	0.00	0	166.32	72
44	J-4	0.00	0	166.32	72
47	J-5	0.00	21	166.30	72
55	J-7	0.00	0	166.32	72
57	J-9	0.00	0	166.32	72

AVG DAY
FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Length (ft)
37	P-2	16	R-1	PMP-1	8.0	Ductile Iron	130.0	0.000	21	0.13	1
38	P-3	21	PMP-1	J-1	8.0	Ductile Iron	130.0	0.220	21	0.13	21
45	P-5	160	J-1	J-4	8.0	Ductile Iron	130.0	4.100	21	0.13	160
49	P-7	29	J-5	J-4	4.0	Ductile Iron	130.0	0.000	-21	0.53	29
58	P-8	96	J-4	J-9	8.0	Ductile Iron	130.0	8.200	0	0.00	96
59	P-9	249	J-9	J-3	8.0	Ductile Iron	130.0	1.800	0	0.00	249
60	P-10	177	J-7	J-9	8.0	Ductile Iron	130.0	3.200	0	0.00	177

AVG DAY
FlexTable: Pump Table

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
33	PMP-1	0.00	Pump Definition - 1	On	0.00	166.32	21	166.32

FlexTable: Reservoir Table

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
32	R-1	0.00	21	0.00

MAX DAY + FF

FlexTable: Reservoir Table

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
32	R-1	0.00	41	0.00

Fire Flow Node FlexTable: Fire Flow Report

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)	Pipe w/ Maximum Velocity	Velocity of Maximum Pipe (ft/s)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated Zone Lower Limit @ Total Flow Needed) (psi)
J-1	True	2,000	2,001	2,000	2,001	71	J-5	P-3	13.04	J-5	71
J-7	True	2,000	2,001	2,000	2,001	41	J-3	P-3	13.04	J-3	50

MAX DAY + FF
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
34	J-1	0.00	0	166.32	72
39	J-3	0.00	0	166.31	72
44	J-4	0.00	0	166.31	72
47	J-5	0.00	41	166.26	72
55	J-7	0.00	0	166.31	72
57	J-9	0.00	0	166.31	72

MAX DAY + FF
FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Length (ft)
37	P-2	16	R-1	PMP-1	8.0	Ductile Iron	130.0	0.000	41	0.26	1
38	P-3	21	PMP-1	J-1	8.0	Ductile Iron	130.0	0.220	41	0.26	21
45	P-5	160	J-1	J-4	8.0	Ductile Iron	130.0	4.100	41	0.26	160
49	P-7	29	J-5	J-4	4.0	Ductile Iron	130.0	0.000	-41	1.05	29
58	P-8	96	J-4	J-9	8.0	Ductile Iron	130.0	8.200	0	0.00	96
59	P-9	249	J-9	J-3	8.0	Ductile Iron	130.0	1.800	0	0.00	249
60	P-10	177	J-7	J-9	8.0	Ductile Iron	130.0	3.200	0	0.00	177

MAX DAY + FF

FlexTable: Pump Table

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
33	PMP-1	0.00	Pump Definition - 1	On	0.00	166.32	41	166.32

Peak Hour
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
34	J-1	0.00	0	166.32	72
39	J-3	0.00	0	166.28	72
44	J-4	0.00	0	166.28	72
47	J-5	0.00	72	166.16	72
55	J-7	0.00	0	166.28	72
57	J-9	0.00	0	166.28	72

**Peak Hour
FlexTable: Pipe Table**

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Length (ft)
37	P-2	16	R-1	PMP-1	8.0	Ductile Iron	130.0	0.000	72	0.46	1
38	P-3	21	PMP-1	J-1	8.0	Ductile Iron	130.0	0.220	72	0.46	21
45	P-5	160	J-1	J-4	8.0	Ductile Iron	130.0	4.100	72	0.46	160
49	P-7	29	J-5	J-4	4.0	Ductile Iron	130.0	0.000	-72	1.84	29
58	P-8	96	J-4	J-9	8.0	Ductile Iron	130.0	8.200	0	0.00	96
59	P-9	249	J-9	J-3	8.0	Ductile Iron	130.0	1.800	0	0.00	249
60	P-10	177	J-7	J-9	8.0	Ductile Iron	130.0	3.200	0	0.00	177

Peak Hour
FlexTable: Pump Table

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
33	PMP-1	0.00	Pump Definition - 1	On	0.00	166.32	72	166.32

CONCEPTUAL WATER & SEWER PLAN FOR SAFARI PHASE II RESIDENTIAL CITY OF SCOTTSDALE, ARIZONA

PROVIDED BY VICENTE RUIZ TO LEVI DILLON VIA EMAIL ON 10/1/18.

LEGEND

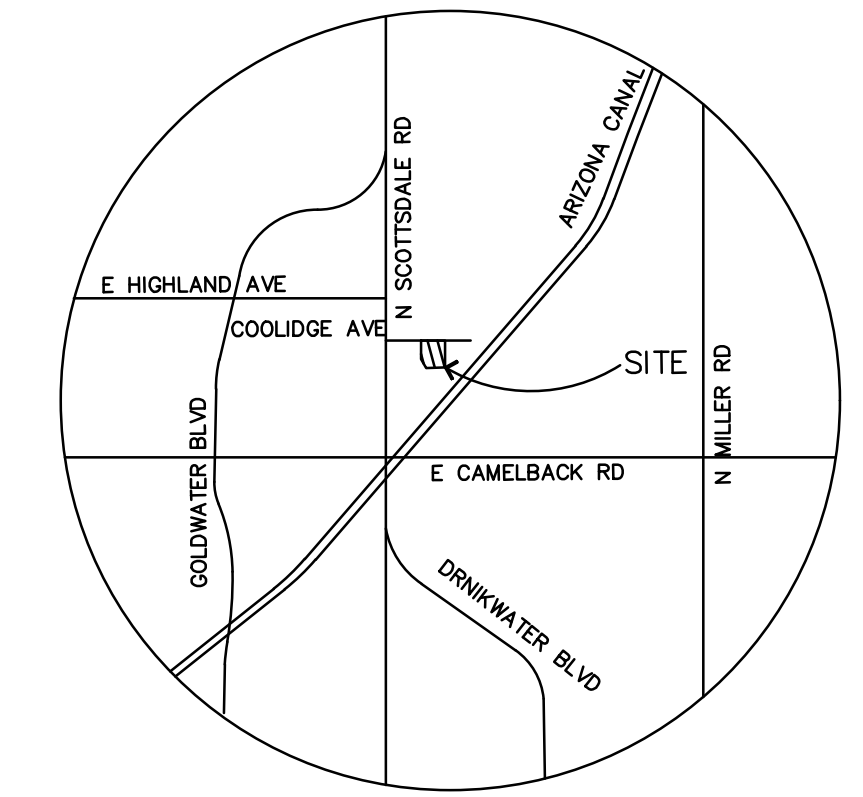
	EXISTING SEWER MANHOLE
	EXISTING SEWER LINE
	EXISTING WATER LINE
	PROPOSED WATER
	PROPOSED SEWER
	PROPOSED STORM DRAIN
	PROPOSED 4" STAND PIPE
	PROPOSED FIRE DEPARTMENT CONNECTION
	PROPOSED FIRE HYDRANT
	PROPOSED SEWER MANHOLE

DEVELOPER/OWNER

HIGH STREET RESIDENTIAL
2231 E. CAMELBACK ROAD, STE 102
PHOENIX, ARIZONA 85016
PHONE: (602) 222-4000
CONTACT: PAUL TUCHIN
EMAIL: PTUCHIN@TRAMMELLCROW.COM

ENGINEER

DAVID EVANS AND ASSOCIATES, INC.
4600 EAST WASHINGTON STREET, SUITE 250
PHOENIX, AZ 85034
CONTACT: VICENTE RUIZ
PHONE: (602) 474-9001



VICINITY MAP
N.T.S.

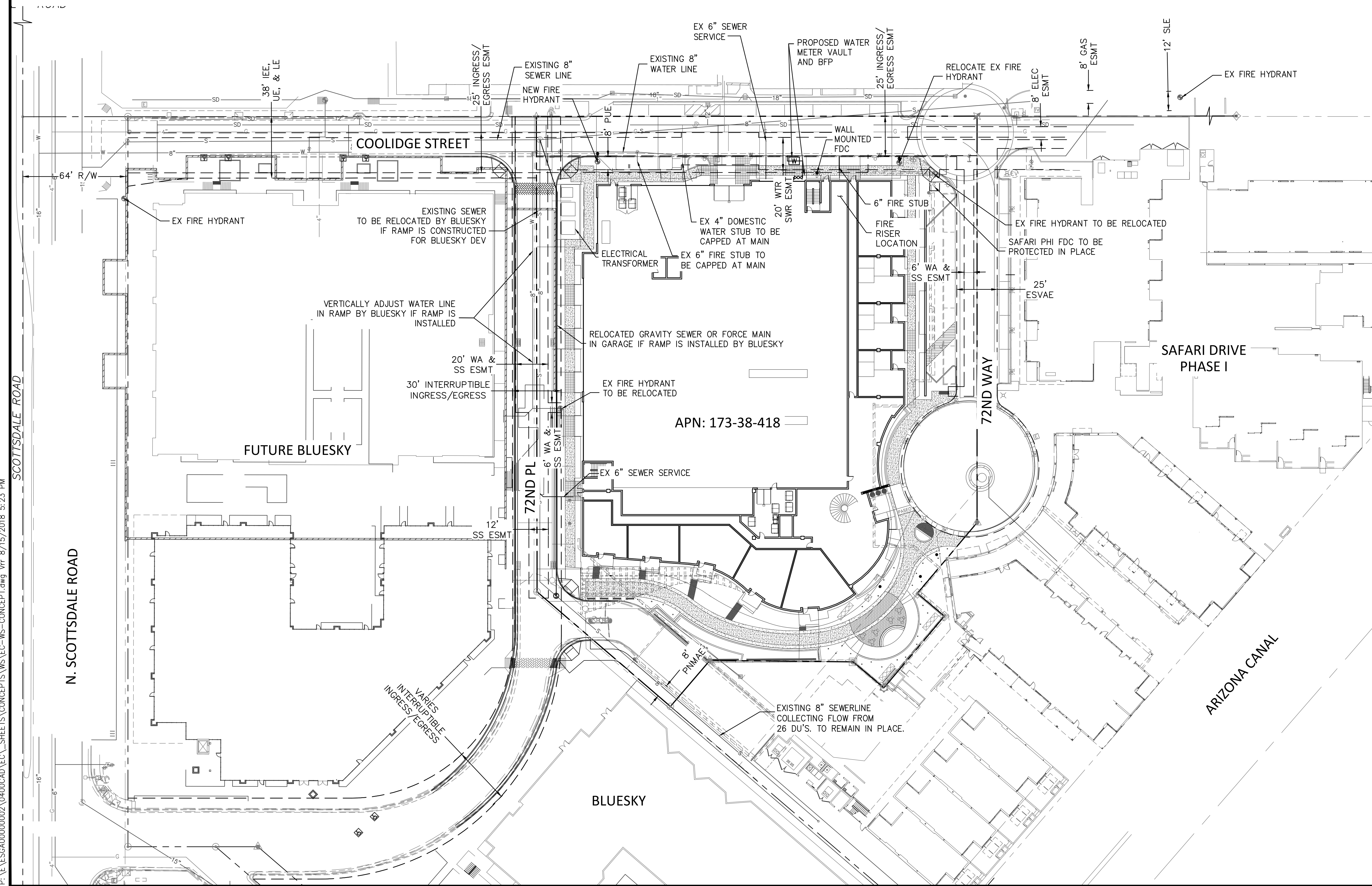
DESIGNED BY: VRR	PROJECT MANAGER:
DRAWN BY: NPC	
CHECKED BY: VRR	
DATE: 08/17/18	

DAVID EVANS AND ASSOCIATES INC.
4600 E WASHINGTON ST, SUITE 250
Phoenix, Arizona 85034
Phone: 602.678.5151



CONCEPT WATER & SEWER PLAN FOR SAFARI PHASE II RESIDENTIAL SCOTTSDALE, ARIZONA 85251

SCALE:
1" = 30'
SECTION: 23
TWNHP: 2N
RANGE: 4E
JOB NO.:
ESGA0002
SHEET
1 OF 1



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US #17-44, 17-45, 18-44, 18-45