


# WATER AND WASTEWATER BASIS OF DESIGN REPORT

2<sup>nd</sup> Street & Bishop Lane  
Scottsdale, Arizona

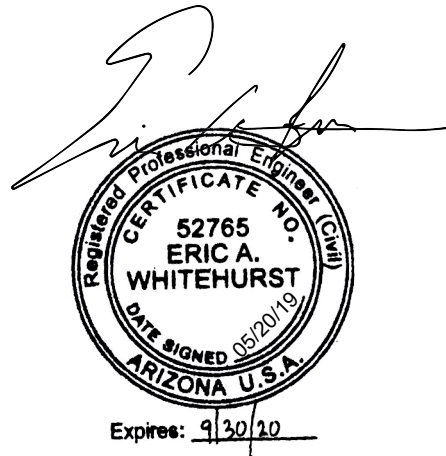
Prepared for:

The Morgan Group, Inc.  
3001 Brighton Blvd., Suite 445  
Denver, CO 80216

Prepared by:

<b>PRELIMINARY Basis of Design Report</b> <input type="checkbox"/> ACCEPTED <input type="checkbox"/> ACCEPTED AS NOTED <input checked="" type="checkbox"/> REVISE AND RESUBMIT	 <p>CITY OF <b>SCOTTSDALE</b> SCOTTSDALE <b>WATER</b> 9379 E San Salvador Dr. Scottsdale, AZ 85258</p>
<p>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.</p>	
BY Idillon	DATE 7/30/2019

Address comments on the following page and throughout and resubmit.



Address the comments below and herein and resubmit:

- 1) Sewer:** An in-lieu agreement needs to be executed as the Osborn sewer system is over-allocated and no capacity is available in Osborn. The City is in the planning stages of a parallel sewer. This development will be expected to pay an in lieu of construction fee to cover a fair share of the new sewer's cost. A fair share will be proportional to both the length of new sewer utilized by the development and the portion of the new sewer design capacity used under peak conditions. Provide this basic information as part of this design report. This is a Water Resource Department policy/requirement.
- 2) Sewer and Water :** This existing fronting water main to the west is 4" and needs to be upsized to City standard minimum size of 6". Additionally, the clearance between existing water and sewer is currently non-compliant so the new water main has to be positioned with 6feet clear from the sewer line, roughly 7ft from center line to centerline. An additional 4ft water and sewer line easement will be needed on the northwestern corner of the property converting to a 2ft easement and extending to the southwest corner of the parcel so that the total water and sewer line corridor is 20 feet wide at all points along the western side of the property. If other utilities need to be accommodated the spacing and utility corridor width will need to be analyzed further. Alternatively, all water services currently fed from the alley could be relocated to Marshall and Bishop and the 4" water line formally abandoned. DS&PM 6-1.400, B, 4
- 3) Water:** You cannot manifold service line and/or water meters to reduce development fees. 1 building=1 meter. If meter is 3" or over a meter vault must be provided per City detail. Revise utility plan. 6-1.416, E
- 4) Water:** Min fire flow is 2,500gpm for high rise building. Redo modeling with revised fire flow. DS&PM 6-1.501
- 5) Sewer:** Provide off-site hydraulic analysis based on City slopes down to the confluence with 10" piping (just east of Goldwater and Bishop Ln) and provide results. Use DS&PM peak values for other existing contributing properties. Use City sewer information (quarter section maps) to conduct sewer analysis. DS&PM 7-1.200
- 6) Water:** hydraulic analysis of peak hour needs to account for pressure at highest finished floor. If pressure is inadequate state that City pressure will be boosted. DS&PM 6-1.202, G, 6, D
- 7) Tapping sleeve** not allowed/possible when leg is same size as main. Use tee. 6-1.408
- 8) Tapping into the 8" ACP line in 2nd Street** will require replacement of the section of main with DIP. DS&PM 6-1.408
- 9) Refer and address comments on utility plan.**
- 10) Provide a separate water and sewer report, not combined.**



# 2<sup>ND</sup> STREET & BISHOP LANE

WATER AND WASTEWATER BASIS OF DESIGN REPORT

MAY 2019

Prepared By:

**Kimley»»Horn**

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Appendix B – Preliminary Utility Plan

Appendix C – Fire Flow Requirements from 2015 IFC

Appendix D – Fire Flow Test and Water CAD Results and Layout

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## 1.0 INTRODUCTION

Kimley-Horn and Associates, Inc. has prepared this Water and Wastewater Basis of Design Report for the proposed luxury apartment development at the southwest corner of 2<sup>nd</sup> Street and Bishop Lane in Scottsdale, Arizona. This report will demonstrate that the proposed project conforms to the City of Scottsdale design requirements.

2<sup>nd</sup> Street & Bishop Lane, the “project”, encompasses approximately 1.13 ± net acres and contains a 210,857 square foot, eight-story apartment with a 93,372 square foot two-level underground parking garage. The project lies within a portion of the Northeast Quarter of Section 27, Township 2 North, Range 4 East of the Gila and Salt River Baseline and Meridian in Maricopa County, Arizona. More specifically, the project is bounded by East 2<sup>nd</sup> Street to the north followed by North Bishop Lane to the east followed by Moe Tavassoli Oriental Rugs to the south, and a public alley followed by existing commercial buildings to the west. The site slopes from the northwest to the southeast at approximately 1.0%. See **Appendix A** for the Vicinity Map.

## 2.0 DOMESTIC WATER ANALYSIS

### 2.1 INTENT AND SCOPE

The intent of this section is to evaluate the potable water infrastructure for the proposed development. As a result of this analysis, it will be determined if the potable water infrastructure is capable of satisfying the projected water demands for the proposed development in accordance with the City of Scottsdale Design Standards & Policies Manual (**Reference 1**) and the 2015 International Fire Code (**Reference 2**) for fire prevention.

### 2.2 GENERAL THEORY

The water system modeling program Water CAD, developed by Haestad Methods, is used to model the water system servicing the proposed development. The program uses the fluid mechanic head loss theory known as the Hazen-Williams method. This is the typical method used to evaluate water distribution systems.

### 2.3 DOMESTIC WATER SUPPLY

must be full size tee  
when diameters are  
equal.

There is an existing 8-inch ACP and 16-inch DIP water main located in East 2<sup>nd</sup> Street north of the site. The existing 8-inch ACP water main connects to an existing 6-inch ACP water main in North Bishop Lane east of the site and to an existing 4-inch DIP water main in the ally west of the site. There is an existing 8-inch ACP water main located in North Goldwater Boulevard approximately 310 feet south of the site.

A proposed 8-inch DIP private fire line will connect to the existing 8-inch ACP water main north of the site via an 8-inch by 8-inch tapping sleeve and valve. Two 2-inch domestic services that combine into a 3-inch onsite line will also connect to the existing 8-inch ACP water main north of the site. Refer to **Appendix B** for the Preliminary Utility Plan.

Residual and static pressures were obtained from a flow test performed on two fire hydrants (one flow and one pressure) in East 2<sup>nd</sup> Street, by EJ Flow Tests on May 5<sup>th</sup>, 2019. The tested fire hydrants were selected due to the proximity to the proposed building. See **Appendix D** for the Fire Flow Test results.

## 2.4 INTERNATIONAL FIRE CODE, 2015

According to the City of Scottsdale Fire Department, the 2015 International Fire Code (IFC) with City of Scottsdale Amendments is currently the governing code with respect to fire protection requirements. The IFC evaluates the building construction type, occupancy descriptions, and square footage to set minimum fire flow requirements with regards to a particular development.

The proposed building and garage are Construction Type I-B. Per Table B105.1(2) of **Reference 2**, the required fire flow is 6,000 gallons per minute. A reduction in fire-flow of 75% percent is allowed when the building is equipped with an approved fire sprinkler system. The apartment building and parking garage will be equipped with an approved fire sprinkler system. The minimum fire flow requirements per the IFC 2015 for the proposed building are shown in Table 1. Table 1 also shows the required building fire flow based upon a maximum fire flow reduction of 75% allowed by the IFC 2015. See **Appendix C** for IFC 2015 Appendix B.

**Table 1 Required Building Fire Flows**

Building	Building Construction Type	Building Area (sf)	Required Fire Flow per IFC 2015 (gpm)	Reduction	Actual Required Fire Flow with Reduction (gpm)
Apartment & Garage	I-B	304,229	6,000	75%	1,500



area, which encourages greater height and density. As such, it is not adjacent to the Old Town boundary. While not built to the maximum 150-foot building height Type-3 permits, the project, at 87 feet, is ideally scaled for the location and context and provides a series of stepbacks as it rises to full height. The appropriate design and scale will

from narrative, this is a high-rise (75ft to finished floor) and requires 2,500gpm fire flow minimum per DS&PM. Revise modeling if necessary.

## 2.5 WATER DEMANDS

According to the guidelines provided in Figure 6-1.2 of **Reference 1**, the proposed development will add the following demands to the existing water system for Average Day Demand (ADD), Maximum Day Demand (MDD), and Peak Hour Demand (PHD):

**Table 2: Domestic Water Demands**

Building	Building Area (SF)	# DUs	Total Demand <sup>1</sup> (GPM/DU)	ADD (GPM)	MDD <sup>2</sup> (GPM)	PHD <sup>3</sup> (GPM)
Building 1 + Garage	304,229	199	0.27	53.73	107.46	188.06



**Notes:**

1. For high density condominium land use, average day demand is 185.3 gpd/du or 0.27 gpm/du.
2. Maximum day demand defined as 2 times the average day demand.
3. Peak hour demand defined as 3.5 times the average day demand.

Two water analyses were performed to evaluate the existing adjacent off-site water infrastructure and the proposed on-site water system:

1. Peak Hour
2. Maximum Day Demand + Fire Flow

Claim needs to be made that development will have domestic booster pumps to supply adequate pressure/flow to the entire building. CO does not take responsibility for the design of this system

The system was analyzed for the worst-case scenario to ensure that the existing and proposed public water infrastructure can maintain a minimum pressure of 50 psi for the Peak Hour demand, and 30 psi for the Maximum Day plus Fire Flow demand. See Appendix D for water model layout to identify nodes and pipes.

See **Appendix D** for the Fire Flow Test and Water CAD Analysis and Layout. A summary of the water analysis results for the project is tabulated below:

**Table 3 Domestic Water Model Result Summary**

Criteria	Peak Hour Demand	Constraint	Peak Hour Pressure at Demand	Node with Minimum Pressure
Minimum Pressure	188 gpm	50 psi	64.0 psi	BLDG DW
Meets Criteria?	-	-	Yes	

at highest finished floor? At 87 feet up this would be 26psi. Present this information

**Table 4 Fire Flow Water Model Result Summary**

Criteria	Max Day + Fire Flow Demand	Constraint	Max Day + Fire Flow Pressure at Demand	Node with Minimum Pressure
Minimum System Pressure	1,607 gpm	30 psi	58.0 psi	BLDG DW
Meets Criteria?	-	-	Yes	

Need to revise calcs for 2,500gpm min fire flow.

Table 5 Fire Hydrant Flow Water Model Result Summary

Criteria	Fire Flow Demand	Constraint	Fire Flow Pressure at Demand	Meets Criteria?
Hydrant 1	1,500 gpm	20 psi	62.0 psi	YES
Hydrant 2	1,500 gpm	20 psi	66.0 psi	YES

Need to revise calcs for 2,500gpm min fire flow.

but no off-site analysis was provided

## 3.0 WASTEWATER COLLECTION SYSTEM

### 3.1 INTENT AND SCOPE

The intent of this section is to evaluate the proposed sewer infrastructure and wastewater design flows for the development. As a result of this analysis, it will be determined if the sewer infrastructure is capable supporting the proposed development in accordance with the City of Scottsdale Design Standards & Policies Manual (**Reference 1**).

### 3.2 SEWER INFRASTRUCTURE

There is an existing 8-inch sewer main in the alley west of the site. An 8-inch VCP sewer main also exists in North Bishop Lane to the east of the site.

A proposed 6-inch PVC sewer service with a slope of 8.00% will connect to the existing 8-inch sewer main in the alley west of the site. Refer to **Appendix B** for the Preliminary Utility Plan.

seems high

### 3.3 WASTEWATER DESIGN FLOWS

The following calculations are based on information provided in Section 7-1.403 of **Reference 1**:

**Table 3: Wastewater Design Flow**

Building	Building Area (SF)	# Units	Average Daily Flow <sup>1</sup> (GPD)	Peak Flow <sup>2</sup> (GPD)	Peak Flow (GPM)	Peak Flow <sup>3</sup> w/ Pool Backwash (GPM)
Apartment and Garage	304,229	199	27,860	125,370	87	187

**Notes:**

1. Wastewater flows are based on 140 gallons per unit per day for high density condominium land use.
2. Design peaking factor for high density condominium is 4.5.
3. 100 GPM maximum design assumption. Backwash pump and pipe sizing will be done by the pool designer under separate permit.

### 3.4 ANALYSIS

Sanitary sewer lines will be designed to maintain a maximum depth to diameter ratio (d/D) of 0.65 and minimum full flow velocity of 2.5 ft/sec and a maximum full flow velocity of 10.0 ft/sec in the ultimate peak flow condition. To verify the proposed 6-inch sewer on-site has adequate capacity to serve the project, design flows were analyzed with Flow Master using minimum and maximum pipe design slopes. The sewer capacity for a six-inch pipe at the minimum design slope of 1.10% is 264 gpm. Pool backwash shall be connected to the sanitary sewer system and not discharge to the storm drain system. For the purpose of the design we have assumed a pool backwash flow rate of 100 gpm. Actual backwash discharge rate shall not exceed 100 gpm. Backwash pump and pipe sizing will be done by the pool designer under separate permit. Refer to **Appendix E** for the Sewer Capacity Calculations.

provide off-site hydraulic analysis based on City slopes down to the confluence with 10" piping (just east of Goldwater and Bishop Ln) and provide results. Use DS&PM values for other existing contributing properties.

## 4.0 CONCLUSION

### Water

The proposed and existing on-site water system as outlined by this analysis appears adequate and sufficient to meet the required fire flow demand for the proposed 2<sup>nd</sup> Street and Bishop Lane development near the southwest corner of 2<sup>nd</sup> Street and Bishop Lane in Scottsdale, Arizona.

### Wastewater

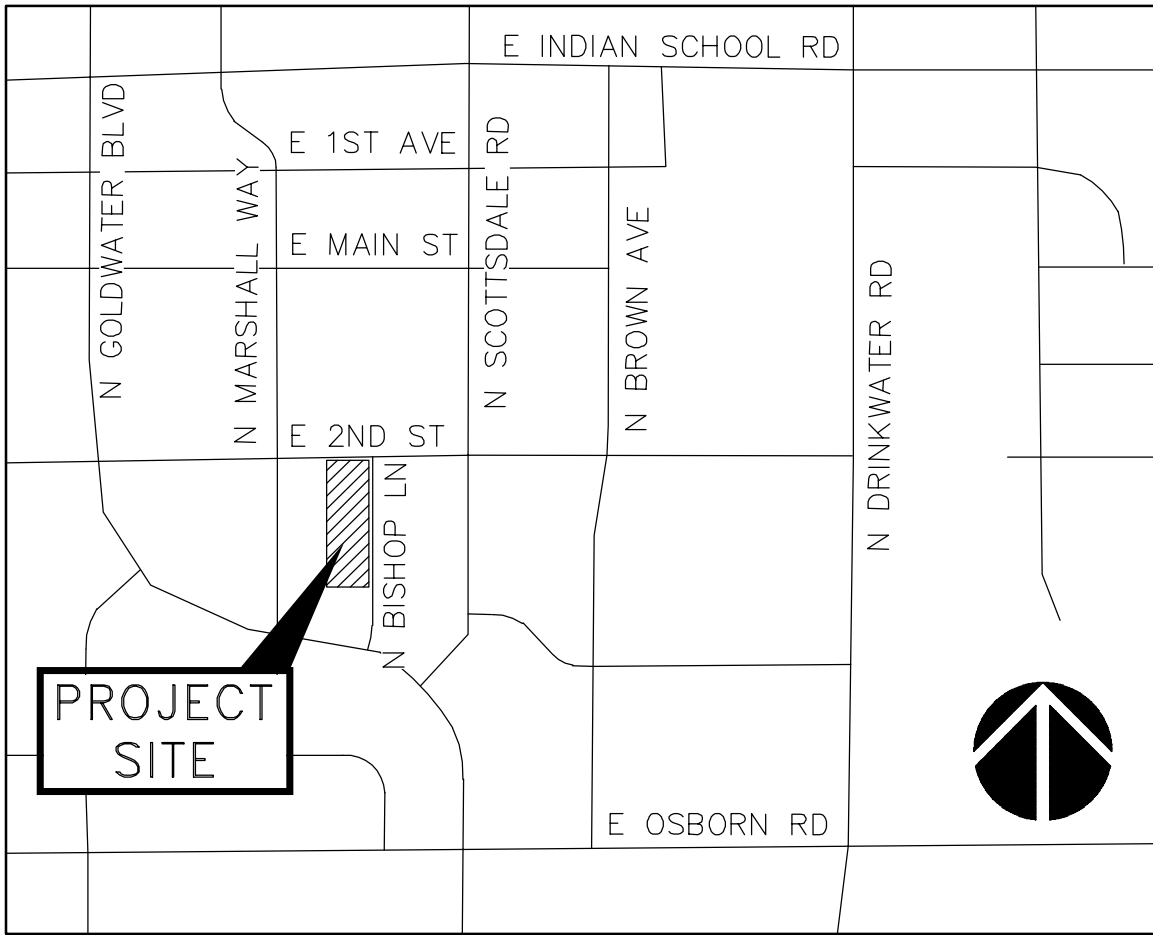
This development proposes to connect the building sewer services to the existing 8-inch sewer main in the alley west of the site. The proposed 6-inch PVC private sanitary sewer service has adequate capacity for the flows generated by the proposed building and its associated uses. Refer to Appendix B for the Sewer Capacity Calculations.

expand, provide  
off-site analysis, refer  
to specific  
modeling/analysis  
result values

## 5.0 REFERENCES

1. City of Scottsdale, *Design Standards and Policies Manual*. 2018.
2. International Code Council, *2015 International Fire Code*. May 2014.

## Appendix A – Vicinity Map



## VICINITY MAP

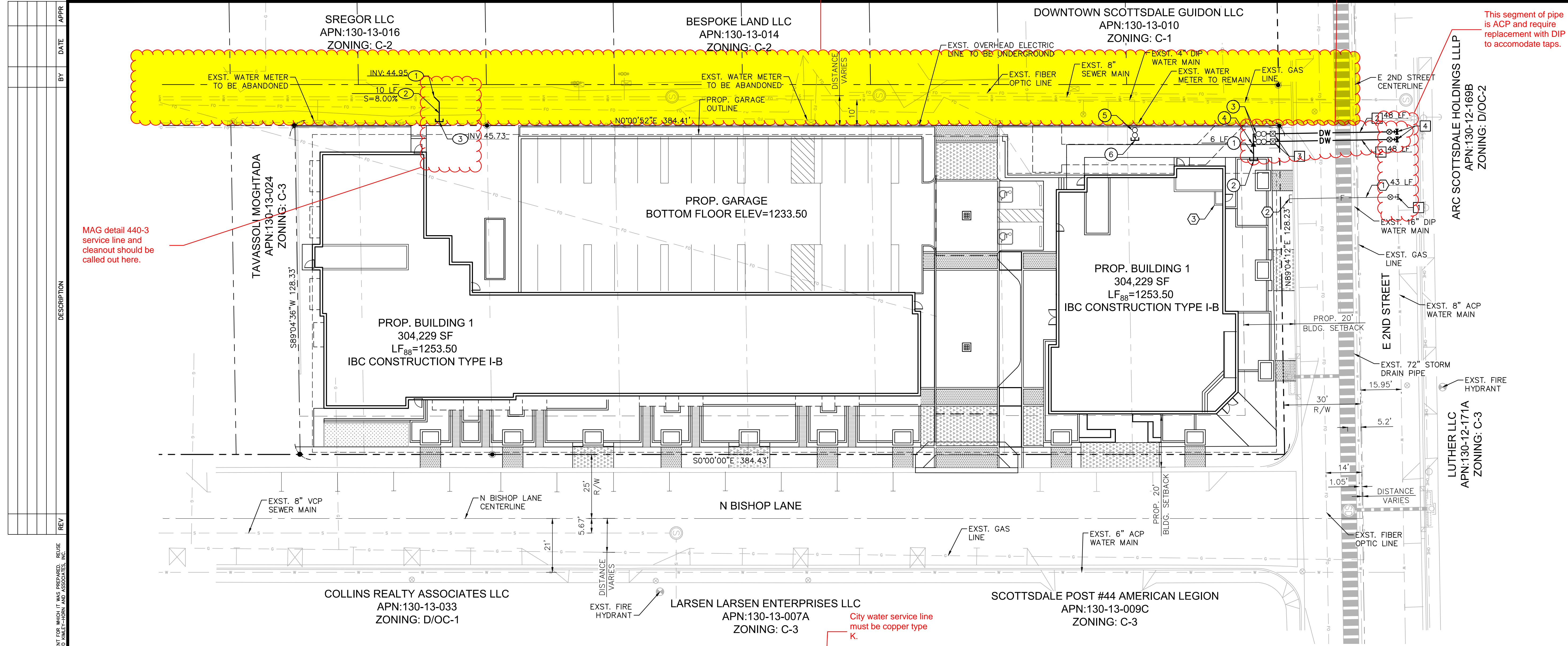
SCOTTSDALE, AZ  
N.T.S.

## Appendix B –Utility Plan

This existing fronting water main is 4" and needs to be upsized to City standard minimum size of 6". Additionally, the clearance between existing water and sewer is currently non-compliant so the new water main has to be positioned with 6feet clear from the sewer line, roughly 7ft from center line to centerline. An additional 4ft water and sewer line easement will be needed on the northwestern corner of the property converting to a 2ft easement and extending to the southwest corner of the parcel so that the total water and sewer line corridor is 20 feet wide at all points along the western side of the property. If other utilities need to be accommodated the spacing and utility corridor width will need to be analyzed further. Alternatively, all water services currently fed from the alley could be relocated to Marshall and Bishop and the 4" water line formally abandoned.

You cannot manifold meters. 1 building=1 meter. If meter is 3" or over a meter vault must be provided per City detail.

This segment of pipe is ACP and require replacement with DIP to accommodate taps.



MAG detail 440-3 service line and cleanout should be called out here.

City water service line must be copper type K.

what is in the vault. BFP must be out in the open and accessible/visible for City maintenance.

**DEVELOPER/OWNER**  
THE MORGAN GROUP  
3001 BRIGHTON BLVD, SUITE 445  
DENVER, CO 80216  
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PH: (602) 944-5500  
CONTACT: ERIC WHITEHURST, PE

**BENCHMARK**  
FOUND 3" CITY OF SCOTTSDALE BRASS CAP IN HANDHOLE AT THE INTERSECTION OF OSBORN ROAD AND SCOTTSDALE ROAD.

GDACS DATA  
NAVD88  
ELEVATION = 1246.52'

**LEGEND**

---	PROPERTY LINE	---	EXISTING STORM DRAIN
---	RIGHT OF WAY LINE	○	EXISTING SANITARY SEWER MANHOLE
---	STREET CENTERLINE	○	PROPOSED SANITARY SEWER MANHOLE
---	EASEMENT LINE	○	PROPOSED SANITARY SEWER CLEANOUT
---	EXISTING SEWER MAIN	○	EXISTING FIRE HYDRANT
---	EXISTING WATER MAIN	○	PROPOSED FIRE HYDRANT
---	PROPOSED WATER MAIN	○	PROPOSED CATCH BASIN
---	PROPOSED SEWER MAIN	○	
---	PROPOSED STORM DRAIN	○	

**LAND SURVEYOR**  
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7301 EAST EVANS ROAD  
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PH: (480) 922-0780  
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PHOENIX, ARIZONA 85018  
PH: (602) 952-8280  
CONTACT: RANDALL MARTINEZ

**BASIS OF BEARING**  
THE CENTERLINE OF 2ND STREET AS IN BOOK 32, PAGE 50, MARICOPA COUNTY RECORDS. SAID LINE BEARS N89°03'00"E.

**PUBLIC WATER MAIN NOTES**

- INSTALL 8"x8" TAPPING SLEEVE AND VALVE.
- INSTALL 2" CLASS 350 DIP WATER MAIN POLYWRAPPED, LENGTH PER PLAN, MINIMUM 3' COVER, BEDDING AND BACKFILL PER COS STD DET 2201.
- INSTALL WATER SERVICE LINE CONNECTION WITH 2" DOMESTIC WATER METER PER COS STD DET 2330, METER BOX PER MAG STD DET 320. METER TO BE INSTALLED BY CITY FORCES.
- INSTALL 8"x2" TAPPING SLEEVE AND VALVE.

**PRIVATE FIRELINE NOTES**

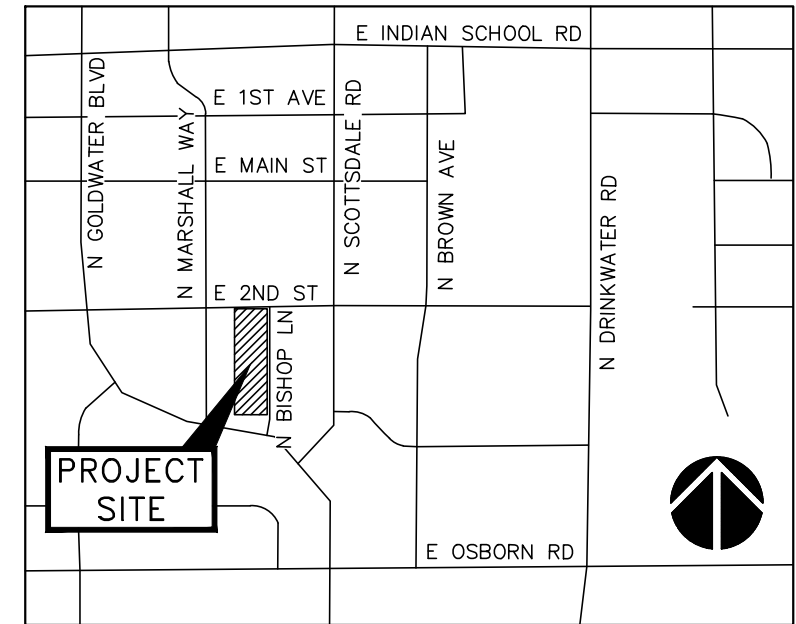
- INSTALL 8" CLASS 350 DIP WATER MAIN POLYWRAPPED WITH TRACER WIRE, LENGTH PER PLAN, MINIMUM 3' COVER, BEDDING AND BACKFILL PER COS STD DET 2201.
- BUILDING FIRELINE CONNECTION. INSTALL FIRELINE RISER AND BACKFLOW PREVENTOR PER COS STD DET 2369 IN FIRE RISER ROOM, REF FIRE SPRINKLER PLANS FOR CONTINUATION.
- BUILDING FIRE RISER ROOM WITH INTERNAL BACKFLOW PREVENTOR.

**PRIVATE DOMESTIC WATER NOTES**

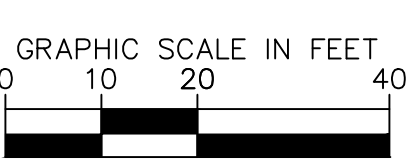
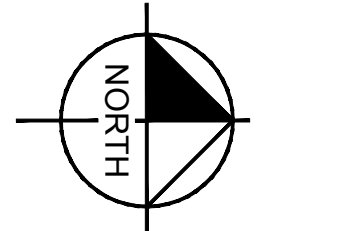
- INSTALL 3" SCH 40 PVC DOMESTIC WATER SERVICE, LENGTH PER PLAN.
- BUILDING DOMESTIC WATER CONNECTION, REF MEP PLANS FOR CONTINUATION.
- INSTALL 2" DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY AND VAULT PER COS STD DET 2352.
- INSTALL 2" X 3" REDUCER.
- IRRIGATION WATER DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY PER COS STD DET 2352. REF IRRIGATION PLANS FOR CONTINUATION.
- IRRIGATION WATER CONNECTION, REF IRRIGATION PLANS FOR CONTINUATION.

**PRIVATE SEWER NOTES**

- INSTALL "WYE" CONNECTION TO EXISTING SEWER SEWER MAIN, INVERT PER PLAN.
- INSTALL 6" SDR 35 PVC SEWER SERVICE, LENGTH AND SLOPE PER PLAN. BEDDING AND BACKFILL PER COS STD DET 2201.
- CONNECT TO BUILDING SEWER AT TWO-WAY CLEANOUT, INVERT PER PLAN. REF MEP PLANS FOR CONTINUATION.



VICINITY MAP  
PHOENIX, AZ  
N.T.S.



- NOTES:**
- ADD 1200' TO ALL ELEVATIONS.
  - ALL ELEVATIONS ARE INVERT ELEVATIONS, UNLESS OTHERWISE NOTED.



**Kimley-Horn**  
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SWC N BISHOP LANE AND E 2ND STREET  
**PRELIMINARY UTILITY PLAN**  
SCOTTSDALE, ARIZONA

PROJECT No.  
291347001  
SCALE (H): 1"=20'  
SCALE (V): NONE  
DRAWN BY: CHS  
DESIGN BY: CHS  
CHECK BY: EAW  
DATE: 05/20/19

**PRELIMINARY**  
FOR REVIEW ONLY  
NOT FOR CONSTRUCTION  
**Kimley-Horn**  
ENGINEER E. WHITEHURST  
PE NO. 52765, DATE 05/19

347001Pr-UT.dwg  
**UT1**  
1 OF 1 SHEETS

K:\DWG\_Civil\2019\2019-04-24-St. & Bishop\CAD\2019\2019-UT.dwg, Layout1/UT1  
May 20, 2019 - 1:01pm jmw:swr  
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O.S.: 16-44 COS PROJECT #:890-PA-2018

# Appendix C – Fire Flow Requirements from 2015 IFC

## SECTION B105 FIRE-FLOW REQUIREMENTS FOR BUILDINGS

### B105.1 One- and two-family dwellings.

The minimum fire-flow and flow duration requirements for one- and two-family *dwellings* having a fire-flow calculation area that does not exceed 3,600 square feet (344.5 m<sup>2</sup>) shall be 1,000 gallons per minute (3785.4 L/min) for 1 hour. Fire-flow and flow duration for *dwellings* having a fire-flow calculation area in excess of 3,600 square feet (344.5m<sup>2</sup>) shall not be less than that specified in Table B105.1.

**Exception:** A reduction in required fire-flow of 50 percent, as *approved*, is allowed when the building is equipped with an *approved automatic sprinkler system*.

**TABLE B105.1 MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS**

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute) <sup>b</sup>	FLOW DURATION (hours)
Type IA and IB <sup>a</sup>	Type IIA and IIIA <sup>a</sup>	Type IV and V-A <sup>a</sup>	Type IIB and IIIB <sup>a</sup>	Type V- B <sup>a</sup>		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701- 30,200	12,701- 17,000	8,201- 10,900	5,901-7,900	3,601- 4,800	1,750	
30,201- 38,700	17,001- 21,800	10,901- 12,900	7,901-9,800	4,801- 6,200	2,000	
38,701- 48,300	21,801- 24,200	12,901- 17,400	9,801-12,600	6,201- 7,700	2,250	
48,301- 59,000	24,201- 33,200	17,401- 21,300	12,601- 15,400	7,701- 9,400	2,500	
59,001- 70,900	33,201- 39,700	21,301- 25,500	15,401- 18,400	9,401- 11,300	2,750	
70,901- 83,700	39,701- 47,100	25,501- 30,100	18,401- 21,800	11,301- 13,400	3,000	3
83,701- 97,700	47,101- 54,900	30,101- 35,200	21,801- 25,900	13,401- 15,600	3,250	
97,701- 112,700	54,901- 63,400	35,201- 40,600	25,901- 29,300	15,601- 18,000	3,500	
112,701- 128,700	63,401- 72,400	40,601- 46,400	29,301- 33,500	18,001- 20,600	3,750	
128,701- 145,900	72,401- 82,100	46,401- 52,500	33,501- 37,900	20,601- 23,300	4,000	4
145,901- 164,200	82,101- 92,400	52,501- 59,100	37,901- 42,700	23,301- 26,300	4,250	
164,201-	92,401-	59,101-	42,701-	26,301-	4,500	

183,400	103,100	66,000	47,700	29,300	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750
295,901- Greater	166,501- Greater	106,501- 115,800	77,001- 83,700	47,401- 51,500	6,000
—	—	115,801- 125,500	83,701- 90,600	51,501- 55,700	6,250
—	—	125,501- 135,500	90,601- 97,900	55,701- 60,200	6,500
—	—	135,501- 145,800	97,901- 106,800	60,201- 64,800	6,750
—	—	145,801- 156,700	106,801- 113,200	64,801- 69,600	7,000
—	—	156,701- 167,900	113,201- 121,300	69,601- 74,600	7,250
—	—	167,901- 179,400	121,301- 129,600	74,601- 79,800	7,500
—	—	179,401- 191,400	129,601- 138,300	79,801- 85,100	7,750
—	—	191,401- Greater	138,301- Greater	85,101- Greater	8,000

For SI: 1 square foot = 0.0929 m<sup>2</sup>, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

- a. Types of construction are based on the *International Building Code*.
- b. Measured at 20 psi residual pressure.

**B105.2 Buildings other than one- and two-family dwellings.**

The minimum fire-flow and flow duration for buildings other than one- and two-family dwellings shall be as specified in Table B105.1.

**Exception:** A reduction in required fire-flow of up to 75 percent, as *approved*, is allowed when the building is provided with an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2. The resulting fire-flow shall not be less than 1,500 gallons per minute (5678 L/min) for the prescribed duration as specified in Table B105.1.

## Appendix D – Fire Flow Test and Water CAD Results and Layout



# Flow Test Summary

Project Name: EJFT 19096  
Project Address: 7125 E 2nd St, Scottsdale, AZ 85251  
Date of Flow Test: 2019-05-03  
Time of Flow Test: 7:34 AM  
Data Reliable Until: 2019-11-03  
Conducted By: Eder Cueva & Tayler Lynch (EJ Flow Tests) 602.999.7637  
Witnessed By: Ray Padilla (City of Scottsdale) 602.541.0586  
City Forces Contacted: City of Scottsdale (602.541.0586)  
Permit Number: C58183

**Note** Scottsdale requires a max static pressure of 72 psi for safety factor

## Raw Flow Test Data

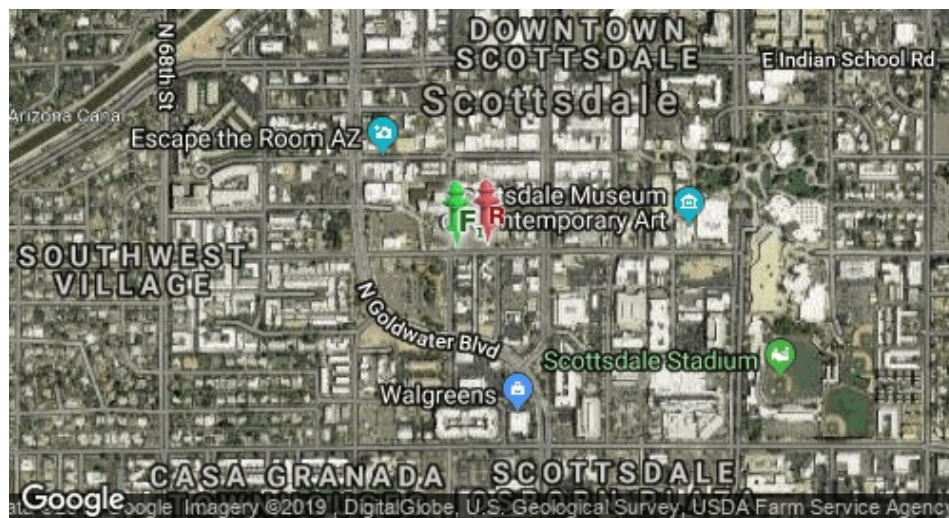
Static Pressure: 88.0 PSI  
Residual Pressure: 82.0 PSI  
Flowing GPM: 1,575  
GPM @ 20 PSI: 5,841


## Data with a 16 PSI Safety Factor

Static Pressure: 72.0 PSI  
Residual Pressure: 66.0 PSI  
Flowing GPM: 1,575  
GPM @ 20 PSI: 5,054

## Hydrant F<sub>1</sub>

Pitot Pressure (1): 22 PSI  
Coefficient of Discharge (1): 0.9  
Hydrant Orifice Diameter (1): 2.5 inches  
Pitot Pressure (2): 22 PSI  
Coefficient of Discharge (2): 0.9  
Hydrant Orifice Diameter (2): 2.5 inches



 Static-Residual Hydrant

 Flow Hydrant

Distance Between F<sub>1</sub> and R  
204 ft (measured linearly)

Static-Residual Elevation  
1257 ft (above sea level)

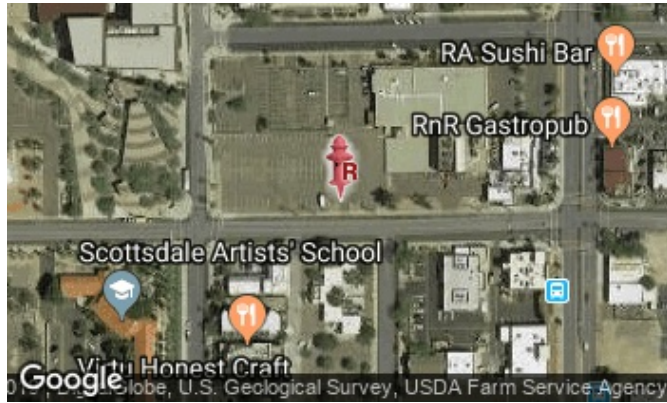
Flow Hydrant (F<sub>1</sub>) Elevation  
1257 ft (above sea level)

Elevation & distance values are approximate

EJ Flow Tests, LLC

21505 North 78th Ave. | Suite 130 | Peoria, Arizona 85382 | (602) 999-7637 | [www.ejengineering.com](http://www.ejengineering.com)  
John L. Echeverri | NICET Level IV 078493 SME | C-16 FP Contractor ROC 271705 AZ | NFPA CFPS 1915  
[www.flowtestsummary.com](http://www.flowtestsummary.com)

## Static-Residual Hydrant



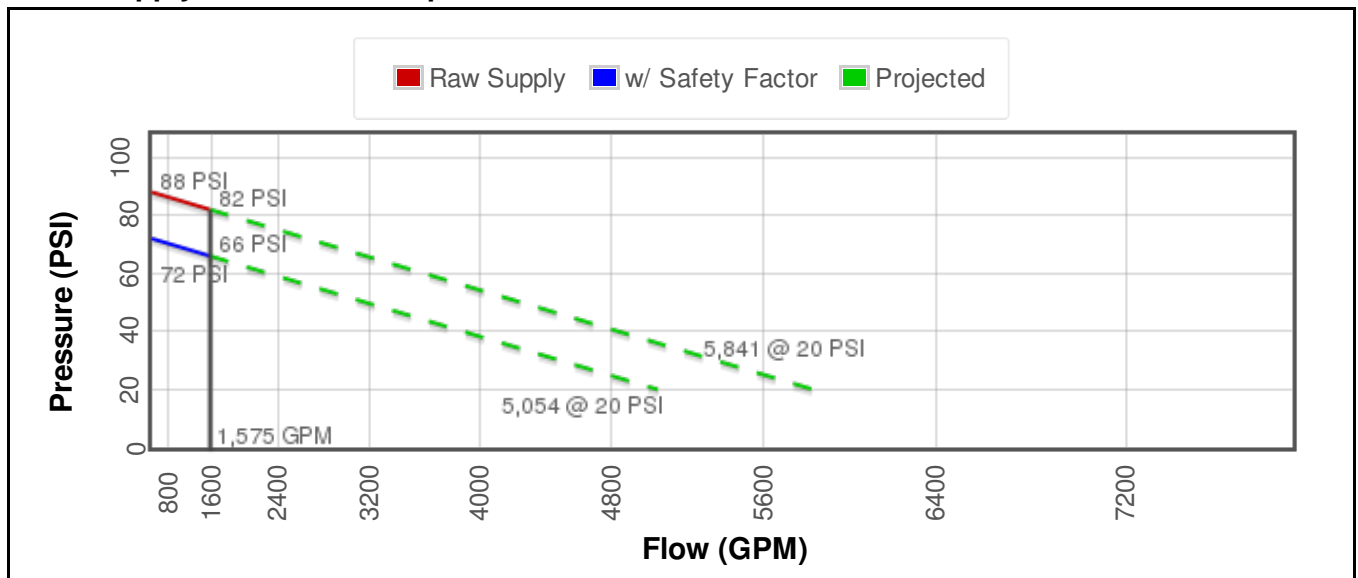
## Flow Hydrant (only hydrant F1 shown for clarity)



## Approximate Project Site



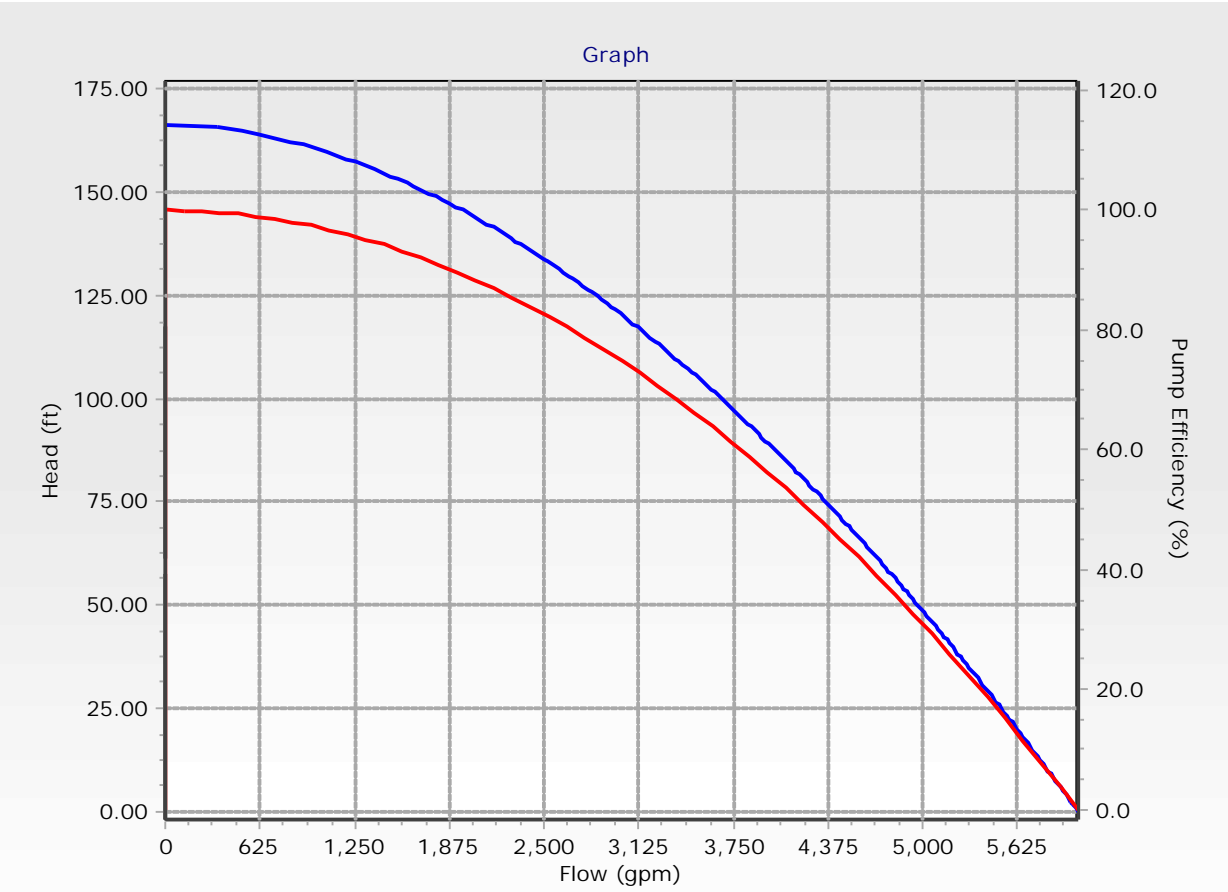
## Water Supply Curve N<sup>1.85</sup> Graph



## Pump Definition Detailed Report: 2nd & Bishop

Element Details			
ID	64	Notes	
Label	2nd & Bishop		
Pump Definition Type			
Pump Definition Type	Standard (3 Point)	Design Head	152.46 ft
Shutoff Flow	0 gpm	Maximum Operating Flow	5,054 gpm
Shutoff Head	166.32 ft	Maximum Operating Head	46.20 ft
Design Flow	1,575 gpm		
Pump Efficiency Type			
Pump Efficiency Type	Best Efficiency Point	Motor Efficiency	100.0 %
BEP Efficiency	100.0 %	Is Variable Speed Drive?	False
BEP Flow	0 gpm		
Transient (Physical)			
Inertia (Pump and Motor)	0.000 lb·ft <sup>2</sup>	Specific Speed	SI=25, US=1280
Speed (Full)	0 rpm	Reverse Spin Allowed?	True

# Pump Definition Detailed Report: 2nd & Bishop



### FlexTable: Junction Table

#### Active Scenario: Maximum Day Demand + Fire Flow

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Pressure (Minimum) (psi)	Flow (Total Available) (gpm)	Flow (Total Needed) (gpm)	Fire Flow (Available) (gpm)
J-1	54.75	0	203.31	64	64	(N/A)	(N/A)	(N/A)
J-2	54.72	0	203.44	64	64	(N/A)	(N/A)	(N/A)
J-3	54.54	0	206.76	66	66	(N/A)	(N/A)	(N/A)
BLDG DW	55.37	107	189.71	58	58	(N/A)	(N/A)	(N/A)
FIRE	55.35	1,500	200.89	63	63	(N/A)	(N/A)	(N/A)
J-12	56.50	0	203.31	64	64	(N/A)	(N/A)	(N/A)

revise to 2,500 gpm  
min fire flow

2,500 min fire flow

FlexTable: Pipe Table  
Active Scenario: Maximum Day Demand + Fire Flow

Label	Start Node	Stop Node	Diameter (in)	Length (Scaled) (ft)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)
P-3	J-2	J-1	8.0	4	Asbestos Cement	140.0	1,500	9.57	0.14
P-4	J-3	J-2	8.0	86	Asbestos Cement	140.0	1,607	10.26	3.32
P-5	H-2	J-3	8.0	16	Ductile Iron	130.0	0	0.00	0.00
P-8	J-1	FIRE	8.0	62	Ductile Iron	130.0	1,500	9.57	2.42
P-9	PMP-1	J-3	100.0	15	Ductile Iron	130.0	1,607	0.07	0.00
P-10	R-1	PMP-1	100.0	18	Ductile Iron	130.0	1,607	0.07	0.00
P-6	J-2	GPV-1	3.0	52	Ductile Iron	130.0	107	4.88	1.81
P-7	GPV-1	BLDG DW	3.0	10	Ductile Iron	130.0	107	4.88	0.37
P-1	H-1	J-12	8.0	18	Ductile Iron	130.0	0	0.00	0.00
P-2	J-12	J-1	8.0	150	Asbestos Cement	140.0	0	0.00	0.00

adjust for highest  
finished floor  
elevation

FlexTable: Junction Table  
Active Scenario: Peak Hour Demand

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Pressure (Minimum) (psi)	Flow (Total Available) (gpm)	Flow (Total Needed) (gpm)	Fire Flow (Available) (gpm)
J-1	54.75	0	220.82	72	72	(N/A)	(N/A)	(N/A)
J-2	54.72	0	220.82	72	72	(N/A)	(N/A)	(N/A)
J-3	54.54	0	220.88	72	72	(N/A)	(N/A)	(N/A)
BLDG DW	55.37	188	203.13	64	64	(N/A)	(N/A)	(N/A)
FIRE	55.35	0	220.82	72	72	(N/A)	(N/A)	(N/A)
J-12	56.50	0	220.82	71	71	(N/A)	(N/A)	(N/A)

FlexTable: Pipe Table  
Active Scenario: Peak Hour Demand

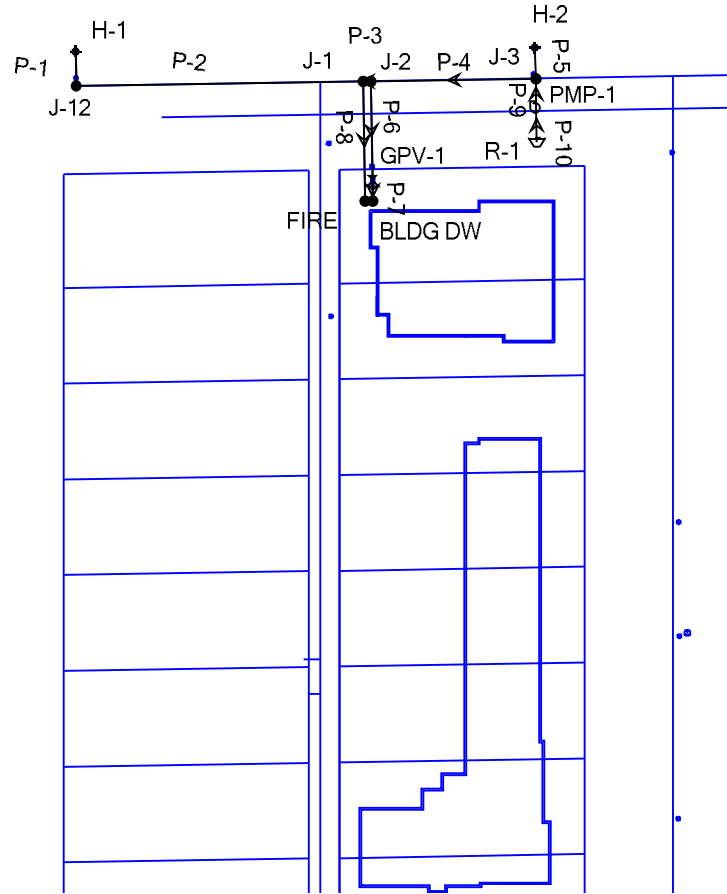
Label	Start Node	Stop Node	Diameter (in)	Length (Scaled) (ft)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)
P-3	J-2	J-1	8.0	4	Asbestos Cement	140.0	0	0.00	0.00
P-4	J-3	J-2	8.0	86	Asbestos Cement	140.0	188	1.20	0.06
P-5	H-2	J-3	8.0	16	Ductile Iron	130.0	0	0.00	0.00
P-8	J-1	FIRE	8.0	62	Ductile Iron	130.0	0	0.00	0.00
P-9	PMP-1	J-3	100.0	15	Ductile Iron	130.0	188	0.01	0.00
P-10	R-1	PMP-1	100.0	18	Ductile Iron	130.0	188	0.01	0.00
P-6	J-2	GPV-1	3.0	52	Ductile Iron	130.0	188	8.54	5.11
P-7	GPV-1	BLDG DW	3.0	10	Ductile Iron	130.0	188	8.54	1.03
P-1	H-1	J-12	8.0	18	Ductile Iron	130.0	0	0.00	0.00
P-2	J-12	J-1	8.0	150	Asbestos Cement	140.0	0	0.00	0.00

## Fire Flow Node FlexTable: Fire Flow Report

### Active Scenario: Fire Flow

Label	Elevation (ft)	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Calculated Residual @ Total Flow Needed) (psi)	Pressure (Residual Lower Limit) (psi)	Junction w/ Minimum Pressure (System)	Satisfies Fire Flow Constraints?
H-1	57.00	1,500	1,567	62	20	BLDG DW	True
H-2	54.83	1,500	1,567	66	20	BLDG DW	True
J-1	54.75	1,500	(N/A)	(N/A)	20	(N/A)	False
J-2	54.72	1,500	(N/A)	(N/A)	20	(N/A)	False
J-3	54.54	1,500	(N/A)	(N/A)	20	(N/A)	False
BLDG DW	55.37	1,500	(N/A)	(N/A)	20	(N/A)	False
FIRE	55.35	1,500	1,567	64	20	BLDG DW	True
J-12	56.50	1,500	(N/A)	(N/A)	20	(N/A)	False

# WaterCAD Layout



# Appendix E – Sewer Capacity Calculations

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## Worksheet for 6" Service (min design slope)

---

### Project Description

Friction Method	Manning Formula
Solve For	Discharge

### Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01100	ft/ft
Normal Depth	6.00	in
Diameter	6.00	in

### Results

Discharge	264.12	gal/min
Flow Area	0.20	ft <sup>2</sup>
Wetted Perimeter	1.57	ft
Hydraulic Radius	1.50	in
Top Width	0.00	ft
Critical Depth	0.39	ft
Percent Full	100.0	%
Critical Slope	0.01209	ft/ft
Velocity	3.00	ft/s
Velocity Head	0.14	ft
Specific Energy	0.64	ft
Froude Number	0.00	
Maximum Discharge	0.63	ft <sup>3</sup> /s
Discharge Full	0.59	ft <sup>3</sup> /s
Slope Full	0.01100	ft/ft
Flow Type	SubCritical	

### GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

---

## Worksheet for 6" Service (min design slope)

---

### GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.00	in
Critical Depth	0.39	ft
Channel Slope	0.01100	ft/ft
Critical Slope	0.01209	ft/ft

## Worksheet for 6" Service (max design slope)

### Project Description

Friction Method	Manning Formula
Solve For	Discharge

### Input Data

Roughness Coefficient	0.013	
Channel Slope	0.08000	ft/ft
Normal Depth	6.00	in
Diameter	6.00	in

### Results

Discharge	712.28	gal/min
Flow Area	0.20	ft <sup>2</sup>
Wetted Perimeter	1.57	ft
Hydraulic Radius	1.50	in
Top Width	0.00	ft
Critical Depth	0.50	ft
Percent Full	100.0	%
Critical Slope	0.07385	ft/ft
Velocity	8.08	ft/s
Velocity Head	1.02	ft
Specific Energy	1.52	ft
Froude Number	0.00	
Maximum Discharge	1.71	ft <sup>3</sup> /s
Discharge Full	1.59	ft <sup>3</sup> /s
Slope Full	0.08000	ft/ft
Flow Type	SubCritical	

### GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

---

## Worksheet for 6" Service (max design slope)

---

### GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.00	in
Critical Depth	0.50	ft
Channel Slope	0.08000	ft/ft
Critical Slope	0.07385	ft/ft