

### WATER DISTRIBUTION SYSTEM

## **BASIS OF DESIGN REPORT**

FOR

## SCOTTSDALE FIRE STATION 616 10905 E. Loving Tree Lane Scottsdale, Arizona 85262



BY rrahman

DATE 10/2/2018

OWNER: City of Scottsdale 7447 E. Indian School Road Scottsdale, AZ 85251



March 9, 2018 Revised March 12, 2018 Revised April 26, 2018 Revised May 16, 2018

#### **PREPARED BY:**

ENGINEERING AND ENVIRONMENTAL CONSULTANTS, INC. 7740 N. 16<sup>TH</sup> Street Phoenix, AZ 85020 PH: 602-248-7702 FAX: 602-248-7851

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**39-DR-2018** 08/29/18

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- Average Day
- Maximum Day
- Peak Hour
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- Fire Demand at 30 psi

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City of Scottsdale Water Demand Table 6-1.2 City of Scottsdale Water Quarter Section Maps 64-53, 64-54

### **INTRODUCTION**

The proposed Scottsdale Fire Station # 616 is located at 10905 E. Loving Tree Lane and lies within the North Half of Section 28, Township 6 North, Range 5 East of the Gila and Salt River Base & Meridian, Maricopa County Arizona. The legal description for the property is as follows: Lot 2A "Minor Subdivision Plat Linsenmeyer West Land Division 2", as recorded in Book 1110, Page 13, Records of Maricopa County, Arizona. The site is bordered to the north by Cave Creek Road, to the east, south and west by existing residential properties. The Assessor's Parcel Number for this property is 219-60-912A. Based on the information provided on the Maricopa County Assessor's Maps, the site has a Latitude of 33.838909°N and a Longitude 111.848099°W at the approximate center of the site. The elevations of the site range from 3013.00 to 3049.00 above sea level. A vicinity map is provided in the "FIGURES" section of this report.

### **EXISTING CONDITIONS**

The property is currently zoned R1-43 ESL single family and is approximately 144,687 square feet, or 3.32 acres (net area). There is an existing 8" DIP waterline pipe located on the north side of Loving Tree Lane adjacent to the proposed site. The 8" waterline flows south along the east property line of the Fire Station site and then west along the south property line before exiting in a southwesterly direction at the approximate mid-point of the south property line. The waterline continues southwesterly within 107th Place along the south side of the centerline of 107<sup>th</sup> Place. A City of Scottsdale Sewer Quarter Section Map has been provided within the "FIGURES" section of this report.

#### PROPOSED CONDITIONS

The proposed Fire Station will require a new 6" DIP fireline tap to be located at the northeast corner of the site near the Loving Tree Land cul-de-dac. The new fireline will provide service to the new Fire Station. A new onsite fire hydrant will also be installed on the Fire Station site. The fire hydrant will be served by a new 6" DIP tap located along the south boundary of the site. Domestic and landscape water services and meters will also be provided for the Fire Station site.

## WATER ANALYSIS DATA

Per City of Scottsdale DS&PM manual, Figure 6-1.2 Average Day Water Demands in Gallons per day, this projects Commercial/Retail Demand is based on 0.7 gpd/sf for inside use and 0.1 gpd/sf for outsite use for a total of 0.8 gpd/sf.

Building Area = 7,100 sf

Average Day Demand = 0.8 gpd x 7,100 sf = 5680 gpd or 3.94 gpm Maximum Day Demand = Average Day Demand x 2 = 11,360 gpd or 7.88 gpm Peak Hour = Maximum Day Demand x 3.5 = 19,880 gpd or 13.79 gpm Fire Flow Demand = 1500 gpm with 30 psi residual Maximum Day with Fire Demand = 1507.88 gpm

The City of Scottsdale requirement for fire flow conditions is 1500 GPM at 30 psi. Based on the existing Fire Hydrant Flow Test Results and an EPANET water model, at 1500 GPM the resulting pressure at the proposed fire hydrant will be 24 psi which does not meet the 30 psi requirement.

Per DSPM Section 6-1.406, the 30 psi requirement accounts for 10 psi of safety factor for aging infrastructure and flexibility in locating pressure zone boundaries. The resulting 24 psi at 1500 gpm flow accounts for 4 psi of safety factor only. It is anticipated that once the construction of BPS 157 and BPS 158 are completed (tentatively by December 2018) and are in operation, the residual pressure condition at the site will be improved and City's hydraulic model supports this assumption. Water Resources (WR) also assumes that the Construction of the Fire Station will start after BPSs 157 & 158 are in operation and the residual pressure condition may be acceptable and WR approves the Basis of Design Report. WR suggests that the fire line and the sprinkler system shall be designed and sized based on current residual pressure condition and an 8" fire line may be warranted. Size and design of fire line and the sprinkler system will require coordination with City's Fire Department.

## APPENDIX "A"



## APPENDIX "B"

# **E**•J

## Flow Test Summary

Project Name:	EJFT 18042-4
Project Address:	10905 E Loving Tree Ln, Scottsdale, AZ 85262
Date of Flow Test:	2018-03-09
Time of Flow Test:	8:56 AM
Data Reliable Until:	2018-09-09
Conducted By:	Austin Gourley & Eder Cueva (EJ Flow Tests) 602.999.7637
Witnessed By:	Jim Demarbiex (City of Scottsdale) 602.541.0586
City Forces Contacted:	City of Scottsdale (602.541.0586)
Permit Number:	C54851

Note

#### **Raw Flow Test Data**

Static Pressure:	93.0 PSI
Residual Pressure:	66.0 PSI
Flowing GPM:	1,101
GPM @ 20 PSI:	1,883

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

Pitot Pressure (1):	43	PSI
Coefficient of Discharge (1):	0.9	
Hydrant Orifice Diameter (1):	2.5	inches

#### Data with a 21 PSI Safety Factor

Static Pressure:	72.0 PSI
Residual Pressure:	45.0 PSI
Flowing GPM:	1,101
GPM @ 20 PSI:	1,568

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



#### EJ Flow Tests, LLC 21505 North 78th Ave. | Suite 130 | Peoria, Arizona 85382 | (602) 999-7637 | www.ejengineering.com John L. Echeverri | NICET Level IV 078493 SME | C-16 FP Contractor ROC 271705 AZ | NFPA CFPS 1915

## E-J | Flow Test Summary

#### **Static-Residual Hydrant**



### **Approximate Project Site**

Flow Hydrant (only hydrant F1 shown for clarity)





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



#### EJ Flow Tests, LLC

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# E·J

# Flow Test Summary

Project Name: Project Address: Date of Flow Test: Time of Flow Test: Data Reliable Until: Conducted By: Witnessed By: City Forces Contacted: Permit Number: EJFT 18042-3 10905 E Loving Tree Ln, Scottsdale, AZ 85262 2018-03-09 8:50 AM 2018-09-09 Austin Gourley & Eder Cueva (EJ Flow Tests) 602.999.7637 Jim Demarbiex (City of Scottsdale) 602.541.0586 City of Scottsdale (602.541.0586) C54851

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

Note

#### **Raw Flow Test Data**

Static Pressure:	103.0 PSI
Residual Pressure:	40.0 PSI
Flowing GPM:	1,183
GPM @ 20 PSI:	1,373

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

Pitot Pressure (1):11PSICoefficient of Discharge (1):0.9Hydrant Orifice Diameter (1):4inchesAdditional Coefficient 0.83 on orifice #1

#### Data with a 31 PSI Safety Factor

Static Pressure:	72.0 PSI
Residual Pressure:	9.0 PSI
Flowing GPM:	1,183
GPM @ 20 PSI:	1,066



Project Site

Static-Residual Hydrant

Flow Hydrant

Distance Between F<sub>1</sub> and R 778 ft (measured linearly)

Static-Residual Elevation 3009 ft (above sea level)

Flow Hydrant (F<sub>1</sub>) Elevation 3041 ft (above sea level)

Elevation & distance values are approximate

#### EJ Flow Tests, LLC 21505 North 78th Ave. | Suite 130 | Peorla, Arizona 85382 | (602) 999-7637 | www.ejengineering.com John L. Echeverri | NICET Level IV 078493 SME | C-16 FP Contractor ROC 271705 AZ | NFPA CFPS 1915

## E-J | Flow Test Summary

### **Static-Residual Hydrant**



## **Approximate Project Site**

Flow Hydrant (only hydrant F1 shown for clarity)





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



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# **E**•J

# Flow Test Summary

Project Name: Project Address: Date of Flow Test: Time of Flow Test: Data Reliable Until: Conducted By: Witnessed By: City Forces Contacted: Permit Number: EJFT 18042-2 10905 E Loving Tree Ln, Scottsdale, AZ 85262 2018-03-09 8:20 AM 2018-09-09 Austin Gourley & Eder Cueva (EJ Flow Tests) 602.999.7637 Jim Demarbiex (City of Scottsdale) 602.541.0586 City of Scottsdale (602.541.0586) C54851

Closed valves were found after this flow test was conducted.

Note

#### **Raw Flow Test Data**

 Static Pressure:
 93.0 PSI

 Residual Pressure:
 40.0 PSI

 Flowing GPM:
 1,128

 GPM @ 20 PSI:
 1,341

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

Pitot Pressure (1):10PSICoefficient of Discharge (1):0.9Hydrant Orifice Diameter (1):4inchesAdditional Coefficient 0.83 on orifice #1

#### Data with a 21 PSI Safety Factor

Static Pressure:	72.0 PSI
Residual Pressure:	19.0 PSI
Flowing GPM:	1,128
GPM @ 20 PSI:	1,116



Project Site

Static-Residual Hydrant

Flow Hydrant

Distance Between F<sub>1</sub> and R 778 ft (measured linearly)

Static-Residual Elevation 3009 ft (above sea level)

Flow Hydrant (F<sub>1</sub>) Elevation 3041 ft (above sea level)

Elevation & distance values are approximate

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## E-J Flow Test Summary

#### **Static-Residual Hydrant**



## **Approximate Project Site**

Flow Hydrant (only hydrant F1 shown for clarity)





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



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# **E**•J

# Flow Test Summary

Project Name:
Project Address:
Date of Flow Test:
Time of Flow Test:
Data Reliable Until:
Conducted By:
Witnessed By:
City Forces Contacted:
Permit Number:

EJFT 18042-1 10905 E Loving Tree Ln, Scottsdale, AZ 85262 2018-03-09 8:15 AM 2018-09-09 Austin Gourley & Eder Cueva (EJ Flow Tests) 602.999.7637 Jim Demarbiex (City of Scottsdale) 602.541.0586 City of Scottsdale (602.541.0586) C54851

Closed valves were found after this flow test was conducted.

#### Note

#### Raw Flow Test Data

Static Pressure:96.0 PSIResidual Pressure:56.0 PSIFlowing GPM:874GPM @ 20 PSI:1,235

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

Pitot Pressure (1):6PSICoefficient of Discharge (1):0.9Hydrant Orifice Diameter (1):4inchesAdditional Coefficient 0.83 on orifice #1

#### Data with a 24 PSI Safety Factor

Static Pressure:	72.0 PSI
Residual Pressure:	32.0 PSI
Flowing GPM:	874
GPM @ 20 PSI:	1,007



#### Project Site

Static-Residual Hydrant

Flow Hydrant

Distance Between F<sub>1</sub> and R 777 ft (measured linearly)

Static-Residual Elevation 3009 ft (above sea level)

Flow Hydrant (F<sub>1</sub>) Elevation 3041 ft (above sea level)

Elevation & distance values are approximate

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### **Static-Residual Hydrant**



### **Approximate Project Site**

Flow Hydrant (only hydrant F1 shown for clarity)





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



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## APPENDIX "C"



🛄 Network Table - Nodes				
Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
June H2	3004	0.00	3218.78	<b>33.06</b>
JuneJUB	3016	0.00	3218.78	87.86
JuneJU5	3016	0.00	3218.78	87.86
June H3	3027	0.00	3218.78	83.10
June JU4	3020	0.00	3218.78	86.13
June JU3	3034	0.00	3218.78	80.07
June JU2	3034	0.00	3218.78	80.07
June JU1	3037	0.00	3218.78	78.77
Junc H1	2037	0.00	3218.78	78.77
June JU7	3004	0.00	3218.78	93.06
Resvr RE2	3004	-0.01	3004.00	0.00

	16535_WM (BASE) 051518	3 AD.rpt
Page 1	90 <u>19</u>	5/15/2018 4:08:53 PM
******	******	*******
*	EPANET	*
*	Hydraulic and Water Quali	ty *
*	Analysis for Pipe Network	s *
*	Version 2.0	*
******	*************	*******

Input File: 16535\_WM (BASE) 051518.net

f

## AVERAGE DAY DEMAND

Link - Node Ta	ble:							
Link ID	Start Node	End Node	2		Length ft	Dian	neter in	
PI1 PI2 PI3 PI4 PI5 PI11 PI12 PI6 PI7 PU2	JU1 JU2 JU3 JU4 JU5 JU1 JU5 JU6 JU7 RE2	JU2 JU3 JU4 JU5 JU6 H1 H3 JU7 H2 JU7			106.62 102.48 151.31 94.84 138.12 21.47 53.28 278.48 278.48 21.74 #N/A		8 8 8 8 6 6 8 6 #N/A	Pump
Energy Usage:								
Pump	Usage Factor E	Avg. ffic.	Kw-hr /Mgal		λ∨g. Kw	Peak Kw		Cost /day
PU2	100.00	75.00	899.68	(	0.21	0.21		0.00
				[	Demand Char Fotal Cos	arge: t:		0.00
Node Results:								
Node ID	Deman GP	id He M	ead Pr ft	essure psi	Quality	y 		
H2 JU6 JU5 H3 JU4 JU3 JU2 JU1 H1 JU7 RE2	0.0 0.0 0.0 0.0 3.9 0.0 0.0 0.0 0.0 0.0	0         3218           0         3218	78 78 78 78 78 78 78 78 78 78 78 78 78 7	93.06 87.86 87.86 83.10 86.13 80.06 78.76 93.06 0.00		) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ( ) ) ) )	ervoir	
Page 2								
Link Results:								

Link ID	16 Flow GPM	5535_WM (BA VelocityU fps	ASE) 051518 nit Headloss ft/Kft	AD.rpt s Status	
PI1	0.00	0.00	0.00	Open	
PI2	0.00	0.00	0.00	Open	
PI3	-3.94	0.03	0.00	Open	
PI4	-3.94	0.03	0.00	Open	
PI5	-3.94	0.03	0.00	Open	
PI11	0.00	0.00	0.00	Open	
PI12	0.00	0.00	0.00	Open	
PI6	-3.94	0.03	0.00	Open	
PI7	0.00	0.00	0.00	Open	
PU2	3.94	0.00	-214.78	Open Pump	

	16535_WM (BASE) 051518	MD.rpt
Page 1		5/15/2018 4:09:27 PM
*****	*********	*******
*	EPANET	*
*	Hydraulic and Water Qualit	Y *
*	Analysis for Pipe Networks	*
*	Version 2.0	*
******	******	*****************

Input File: 16535\_WM (BASE) 051518.net

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## MAXIMUM DAY DEMAND

Link - Node Tal	ble:						
Link ID	Start Node	Enc Noc	i ie		Length ft	Diameter in	
PI1 PI2 PI3 PI4 PI5 PI11 PI12 PI6 PI7 PU2 Energy Usage:	JU1 JU2 JU3 JU4 JU5 JU1 JU5 JU6 JU7 RE2	302 304 304 306 H1 H3 307 H2 307	7		106.62 102.48 151.31 94.84 138.12 21.47 53.28 278.48 21.74 #N/A	8 8 8 6 6 6 8 6 8 6 8 7 8	Pump
 Pump	Usage Factor E	Avg. ffic.	Kw- /Mc	hr Jal	Avg. Kw	Peak Kw	Cost /day
PU2	100.00	75.00	899.	66	0.43	0.43	0.00
Node Results:					Demand Ch Total Cos	arge: t:	0.00 0.00
Node ID	Deman GP	d H M	lead ft	Pressure psi	Qualit	у	
H2 JU6 JU5 H3 JU4 JU3 JU2 JU1 H1 JU7 RE2	0.0 0.0 0.0 0.0 7.8 0.0 7.8 0.0 0.0 0.0 0.0 0.0 0.0	0 3218 0 3218 0 3218 0 3218 0 3218 8 3218 0 3218 0 3218 0 3218 0 3218 0 3218 0 3218 9 3004	3.77 3.77 3.77 3.77 3.77 3.77 3.77 3.77	93.06 87.86 87.86 83.10 86.13 80.06 80.06 78.76 78.76 93.06 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Page 2							
Link Results:							

Page 1

Link ID	165 Flow GPM	VelocityUni fps	E) 051518 M t Headloss ft/Kft	D.rpt Status	
PI1 PI2 PI3 PI4 PI5 PI11 PI12 PI6 PI7 PU2	0.00 -7.88 -7.88 -7.88 0.00 0.00 -7.88 0.00 -7.88 0.00 7.89	0.00 0.05 0.05 0.05 0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Open Open Open Open Open Open Open Open	×

\_ \_ . \_ . \_

16535\_WM (BASE) 051518 PH.rpt e 1 5/15/2018 4:09:58 PM Page 1 ÷ \* EPANET Hydraulic and Water Quality Analysis for Pipe Networks ÷ \* ÷ \* ÷ Version 2.0 Input File: 16535\_WM (BASE) 051518.net PEAK HOUR DEMAND Link - Node Table: Start End Length Diameter Node Node ft in Link ID \_\_\_\_ 
 JU1
 JU2

 JU2
 JU3

 JU3
 JU4

 JU4
 JU5

 JU5
 JU6

 JU1
 H1

 JU5
 H3
 วบ2 วบ3 วบ4 106.62 8 PI1 102.48 151.31 PI2 8 PI3 8 94.84 8 PI4 8 6 PI5 138.12 PI11 21.47 53.28 6 278.48 8 21.74 6 #N/A #N/A Pump PI12 JU7 H2 **JU6** PI6 278.48 PI7 JU7 **JU7** PU2 RE2 Energy Usage: -----Usage Avg. Kw-hr Avg. Peak Cost Factor Effic. /Mgal Kw Kw /day Pump ----\_\_\_\_\_ \_\_\_\_\_ PU2 100.00 75.00 899.61 0.74 0.74 0.00 \_\_\_\_\_ Demand Charge: 0.00 Total Cost: 0.00 Node Results: \_\_\_\_\_ \_\_\_\_\_ Demand Head Pressure Quality GPM ft psi Node ID \_\_\_\_\_ 0.00 3218.76 93.06 0.00 0.00 3218.76 87.86 0.00 0.00 3218.76 87.86 0.00 0.00 3218.76 83.09 0.00 0.00 3218.76 86.12 0.00 13.79 3218.76 80.06 0.00 13.79 3218.76 80.06 0.00 0.00 3218.76 78.76 0.00 0.00 3218.76 78.76 0.00 0.00 3218.76 93.06 0.00 -13.80 3004.00 0.00 0.00 Reservoir H2 **JU6** JU5 Н3 JU4 JU3 JU2 JU1 H1 JU7 -13.80 RE2 Page 2 Link Results: Link Flow VelocityUnit Headloss Status GPM fps ft/Kft ID

2

Page 1

	16535_	WM (BASE)	051518 PI	H.rpt
PI1	0.00	0.00	0.00	Öpen
PI2	0.00	0.00	0.00	Open
PI3 -	·13.79	0.09	0.01	Open
PI4 -	-13.79	0.09	0.01	Open
PI5 -	-13.80	0.09	0.01	Open
PI11	0.00	0.00	0.00	Open
PI12	0.00	0.00	0.00	Open
PI6 -	-13.80	0.09	0.01	Open
PI7	0.00	0.00	0.00	Open
PU2	13.80	0.00 -2	14.76	Open Pump

	16535_WM (BASE)	051518 MDF.rpt	
Page 1		5/15/201	8 3:56:46 PM
*****	********	***********	******
*	EPANET	-	*
*	Hydraulic and Water	' Quality	*
*	Analysis for Pipe N	letworks	*
*	Version 2.0		*
*******	******	******	******

Input File: 16535\_WM (BASE) 051518.net

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MAXIMUM DAY DEMAND WITH FIRE FLOW (1500GPM)

Link - Node Ta	ble:						
Link ID	Start Node	Enc	l le		Length ft	Diameter in	
PI1 PI2 PI3 PI4 PI5 PI11 PI12 PI6 PI7 PU2	JU1 JU2 JU3 JU4 JU5 JU1 JU5 JU6 JU7 RE2	JU2 JU2 JU4 JU5 H1 H3 JU7 H2 JU7	7		106.62 102.48 151.31 94.84 138.12 21.47 53.28 278.48 21.74 #N/A	8 8 8 8 8 6 6 8 6 8 6 8 6 8 6 8 6	Pump
Energy Usage:							
Pump	Usage Factor	Avg. Effic.	Kw-hı /Mga	r A I	.vg. Kw	Peak Kw	Cost /day
PU2	100.00	75.00	431.83	3 39	.07 3	9.07	0.00
				D T	emand Cha otal Cost	rge: :	0.00
Node Results:							
Node ID	Dema G	nd F PM	lead Pi ft	ressure psi	Quality		
H2 JU6 JU5 H3 JU4 JU3 JU2 JU1 H1 JU7 RE2	0. 0. 1500. 7. 0. 0. 0. 0. 0. 0. 0. 0. 0.	00 3107 00 3096 00 3090 00 3082 00 3082 00 3090 00 3090 00 3090 00 3090 00 3090 00 3090 00 3107 88 3004	2.09 5.21 0.81 2.44 0.81 0.81 0.81 0.81 0.81 7.09 4.00	44.67 34.75 32.41 24.02 30.68 24.62 23.32 23.32 44.67 0.00	$\begin{array}{c} 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\end{array}$	Reservoi	
Page 2							
Link Results:							

Page 1

Link ID	16 Flow GPM	535_WM (BAS VelocityUr fps	SE) 051518 M nit Headloss ft/Kft	NDF.rpt 5 Status	
PI1	0.00	0.00	0.00	Open	
PI2	0.00	0.00	0.00	Open	
PI3	-7.88	0.05	0.00	Open	
PI4	-7.88	0.05	0.00	Open	
PI5	-1507.88	9.62	39.08	Open	
PI11	0.00	0.00	0.00	Open	
PI12	1500.00	17.02	157.16	Open	
PIG	-1507.88	9.62	39.08	Open	
PI7	0.00	0.00	0.00	Open	
PU2	1507.88	0.00	-103.09	Open Pump	

4

	16535_WM	(BASE)	051518	F30psi	.rpt		
Page 1				5/1	5/2018	4:12:07	PM
******	******	******	******	******	*****	*****	***
*	E	PANE	т				*
*	Hydraulic	and Wat	er Oual	itv			*
*	Analysis f	or Pipe	Networ	ks			*
*	í Vers	sion 2.0					*
*******	******	******	*****	*****	*****	******	***

Input File: 16535\_WM (BASE) 051518.net

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MAXIMUM GPM AT 30 PSI

Link	- Node Tal	ble:									
Link ID		Start Node		End Node			Le	ngth ft	Dia	meter in	
PI1 PI2 PI3 PI4 PI5 PI11 PI12 PI6 PI7 PU2		JU1 JU2 JU3 JU5 JU1 JU5 JU5 JU6 JU7 RE2		JU2 JU3 JU4 JU5 JU6 H1 H3 JU7 H2 JU7			10 10 15 9 13 27 27 2	6.62 2.48 1.31 4.84 8.12 1.47 3.28 8.48 1.74 #N/A		8 8 8 8 8 6 6 8 6 8 6 8 6 8 6 8 6	Pump
Energ	y Usage:										
Pump		Usage Factor	Avg. Effic.		Kw-h /Mga	r 1	Avg. Kw		Peak Kw		Cost /day
PU2		100.00	75.00	)	479.4	7 4	10.94	4	0.94		0.00
Node	Results:						Deman Total	d Cha Cost	rge: :		0.00
Node ID		Dema G	nd PM	Не	ad P ft	ressure psi	e Qu	ality			
H2 JU6 JU5 H3 JU4 JU3 JU2 JU1 H1 JU7 RE2		0. 0. 1423. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	00 00 00 00 00 00 00 00 00 00 00 01	3118. 3108. 3103. 3096. 3103. 3103. 3103. 3103. 3103. 3103. 3103. 3103.	46 69 84 24 84 84 84 84 84 00	49.60 40.16 38.06 30.00 36.33 30.26 28.96 28.96 49.60 0.00		$\begin{array}{c} 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ \end{array}$	Res	ervoir	
Page	2										
Link	Results:										
Link		Fl	ow Ve	eloci	tyUni Pa	t Headi ge 1	oss	Sta	tus		

ID	16535_WM GPM	(BASE) fps	051518 ft/kft	F30psi.rpt
PI1 PI2 PI3 PI4 PI5 PI11 PI12 PI6 PI7 PU2	0.00 0.00 0.00 -1423.00 1423.00 1423.00 1423.00 0.00 1423.01	0.00 0.00 0.00 9.08 0.00 16.15 9.08 0.00 0.00	0.00 0.00 0.00 35.11 0.00 142.54 35.11 0.00 -114.46	Open Open Open Open Open Open Open Open

## APPENDIX "D"

- a. Node pressures (psi or HGL elevation)
- b. Pipe flow (gpm)
- c. Flow direction arrows
- d. Pipe flow velocity in feet per second (fps)
- e. Each pipe segment's head loss rate (ft. /1,000ft or psi/ft.)
- f. PRVs: Upstream and downstream pressures (psi or HGL elevation)
- g. Tanks: Inflow and outflow (gpm)
- h. Shows all units for the values presented or provide a legend on the diagram page that indicates the units used

## AVERAGE DAY WATER DEMANDS (1)

	AN ICOS	s):(7)		Unication	IC DED L'HA	LITE CODE OF	21/21
IN GALLONS PER L	J) <sup>(2)</sup>	IN GALLONS PER MINUTE (GPM) (2007					
Land Use	and Use Inside Use		Outside Total Use Use		Outside Use	Total Use	Units
Residential Dema	nd per D	welling U	nit	The second secon	P. C. L		
< 2 dwelling unit per acre (DU/ac)	208.9	276.7	485.6	0.30	0.39	0.69	per unit
2 – 2.9 DU/ac	193.7	276.7	470.4	0.27	0.39	0.66	per unit
3 – 7.9 DU/ac	175.9	72.3	248.2	0.25	0.11	0.36	per unit
8 – 11.9 DU/ac	155.3	72.3	227.6	0.22	0.11	0.33	per unit
12 – 22 DU/ac	155.3	72.3	227.6	0.22	0.11	0.33	per unit
High Density Condominium (condo)	155.3	30	185.3	0.22	0.05	0.27	per unit
Resort Hotel (includes site amenities)	401.7	44.6	446.3	0.56	0.07	0.63	per room
Service and Emplo	oyment			11			
Restaurant	1.2	0.1	1.3	1.67E-03	1.39E-04	1.81E-03	per square foot (sq.ft.)
Commercial/ Retail	0.7	0.1	0.8	9.73E-04	1.39E-04	1.11E-03	per sq.ft.

### **CHAPTER 6**

AVERAGE	DAY	'WA	TER D	ΡËΛ	ANDS	(1)

IN GALLONS PER D	D) <sup>(2)</sup>	IN GALLONS PER MINUTE (GPM) (2)(3)					
Commercial High Rise	0.5	0.1	0.6	6.95E-04	1.39E-04	8.34E-04	per sq.ft.
Office	0.5	0.1	0.6	6.95E-04	1.39E-04	8.34E-04	per sq.ft.
Institutional	670	670	1340	0.94	0.94	1.88	per acre
Industrial	873	154	1027	1.22	0.22	1.44	per acre
Research and Development	1092	192	1284	1.52	0.27	1.79	per acre
Special Use Areas							
Natural Area Open Space	0	0	0	0.0	0.0	0.0	per acre
Developed Open Space – Parks	0	1786	1786	0.0	2.49	2.49	per acre
Developed Open Space – Golf Course	0	4285	4285	0.0	5.96	5.96	per acre

Notes:

(1) These values shall not be used directly for service line or water meter sizing.
(2) Gallon per day values are provided for reference only. The instantaneous gallon per minute flow rates presented are intended for use in the required hydraulic modeling scenarios. The gpm values assume a 12-hour active water use period per 24-hour day. In large or specialty developments or master plans the hydraulic analysis criteria and parameters should be discussed with the Water Resources Department. Seasonal peaking should also be considered. Upon review, the Water Resources Department reserves the right to designate flows to be used in hydraulic modeling scenarios that may be different from those presented here.

(3) The hydraulic modeling peaking factors used in select modeling scenarios are to be applied to the gpm values shown here. Max day and peak hour peaking factors can be found in Section 6-1.404.

#### FIGURE 6-1.2 AVERAGE DAY WATER DEMANDS

I. Summary

CHAPTER 7

Qmax = Qavg x [1+ (14 / (4+P1/2))]

P = Population / 1,000

Residential densities are to assume 2.5 persons per dwelling unit. Multifamily densities exceeding 22 dwelling units per acre can assume 1.7 to 2.2 persons per unit.

### **B.** Commercial and Industrial

Wastewater flows for uses other than those listed below shall be based upon known regional or accepted engineering reference sources approved by the Water Resources Department.

LAND USE	DEMAND (gpd)	DESIGN PEAKING FACTOR
Commercial/Retail	0.5 per sq. ft.	3
Office	0.4 per sq. ft.	3
Restaurant	1.2 per sq. ft.	6
High Density Condominium (Condo)	140 per unit	4.5
Resort Hotel (includes site amenities)	380 per room.	4.5
School: without cafeteria	30 per student	6
School: with cafeteria	50 per student	6
Cultural	0.1 per sq. ft.	3
Clubhouse for Subdivision Golf Course	100 per patron x 2 patrons per du per day	4.5
Fitness Center/ Spa/ Health club	0.8 per sq. ft.	3.5

FIGURE 7-1.2 AVERAGE DAY SEWER DEMAND IN GALLONS PER DAY & PEAKING FACTORS BY LAND USE

## HYDRAULIC DESIGN

No public SS lines will be less than 8 inches in diameter unless permission is received in writing from the Water Resources Department.

SS lines shall be designed and constructed to give mean full flow velocities equal to or greater than 2.5 fps, based upon Manning's Formula, using an "n" value of 0.013. To prevent abrasion and erosion of the pipe material, the maximum velocity will be limited to 10 fps at estimated peak flow. Where velocities exceed this maximum figure, submit a hydraulic analysis along with construction recommendations to the Water Resources Department for consideration. In no case will velocities greater than 15 fps be allowed.

Actual velocities shall be analyzed for minimum, average day and peak day design flow conditions for each reach of pipe.

The SS system shall be designed to achieve uniform flow velocities through consistent slopes. Abrupt changes in slope shall be evaluated for hydraulic jump.

The depth to diameter ratio (d/D) for gravity SS pipes <u>12 inches in diameter and less</u> shall not exceed 0.65 in the ultimate peak flow condition. This d/D ratio includes an allowance for system infiltration and inflow.

## 7-1.404

#### **APPENDIX A - SEWER CAPACITY: CITY OF SCOTTSDALE FIRE STATION 616**

TABLE 1 MINIMUM PIPE CAPACITY ANALYSIS

Analysis Condition	LINE SIZE	AREA (FT <sup>2</sup> )	PERIMETER (FT)	R <sub>H</sub>	SLOPE (FT./FT.)	CAPACITY (CFS)	CAPACITY (CFS) AT (d/D=0.65)	Velocity
Standard	8" LINE	0.349	2.094	0.167	0.0052	0.874	0.601	2.50

Minimum Line Slope 8" = 0.0052 ft./ft.

 $\hat{\mathbf{x}}$ 

+

#### MAXIMUM PIPE CAPACITY ANALYSIS

Analysis Condition	LINE SIZE	AREA (FT <sup>2</sup> )	PERIMETER (FT)	R <sub>H</sub>	SLOPE (FT./FT.)	CAPACITY (CFS)	CAPACITY (CFS) AT (d/D=0.65)	Velocity
Standard	8" LINE	0.349	2.094	0.167	0.082	3.470	2.387	9.94

Maximum Line Slope 8" = 0.0820 ft./ft.

#### PEAK FLOWS VS. PIPE CAPACITY ANALYSIS

PIPE (MH# - MH#)	LINE SIZE (IN.)	#OF UNITS	POPULATION	AVE. DAILY FLOW (GPD)	PEAKING FACTOR	PEAK FLOW (CFS)	CAPACITY (CFS) MIN SLOPE	CAPACITY (CFS) AT (d/D=0.65)
EXMH#A - EXMH#B	8			3,550	3.00	0.0165	0.874	0.601



