

Water and Wastewater Study Combined





64<sup>th</sup> St. & Oak 5713 N. Cattletrack Road Final Basis Design Report - Sewer 3 engineering Job #: 5153 April 3, 2020 Case #: XX-XXXX-XX





### 64th St & Oak

### FINAL BASIS OF DESIGN REPORT - WASTEWATER

Prepared for:

K Hovnanian Great Western Homes, LLC 20830 N. Tatum Blvd., Suite 250 Phoenix, Arizona 85050 Contact: Chuck Chisholm Phone: (480) 824-4175



Expires 12/31/2021 Matthew J. Mancini, P.E.

April 3, 2020

#### Submittal to:

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

#### Prepared by:

3 engineering, L.L.C. 6370 E. Thomas Road, Suite 200 Scottsdale, Arizona 85251 Contact: Matthew J. Mancini, P.E.

#### Job Number 5153

4/30/2020

6370 E. Thomas Road, Suite #200, Scottsdale, Arizona 85251 · Phone (602) 334-4387 · Fax (602) 490-3230 · www.3engineering.com 7-ZN-2020



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Sewer Line ExhibitSE1
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#### 1. Introduction

The project site, 64<sup>th</sup> St & Oak, is located in Section 33, Township 2 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona within the City of Scottsdale. The project is located North of Oak Street, and West of 64<sup>th</sup> Street Road at 6300 E. Oak Street, Scottsdale, Arizona 85257. The site is bounded on the north by an existing commercial polo club, on the west by a residential neighborhood, on the south and east by a commercial property. See Appendix A for a site map.

The site is a proposed 89-lot single-family attached residential subdivision project.

#### 2. Design Documentation

The purpose of this design report is to verify that the existing City of Scottsdale sewer system can accommodate demands generated by the proposed project. Manning's Equation was used to model and analyze the proposed sewer system for compliance with the City of Scottsdale design requirements. Demands were calculated using the City of Scottsdale Design Standards & Policies Manual criteria. It is our opinion that this report is in accordance with the City of Scottsdale Design Standards & Policies Manual.

#### 3. Existing Conditions

The existing land is occupied by an operational medical facility with three (3) buildings, including existing parking & site improvements. See Appendix A for a site map. The topography has an approximate slope of one percent (1.40%) and has an overall general slope from southwest to northeast.

The site is bounded on the north by an existing commercial polo club, on the west by a residential neighborhood, on the south and east by a commercial property. There is an existing 8" sewer line adjacent to the site within Oak street that currently provides service to the existing site. This 8" sewer line will be used to service the proposed project; however, refer to Section 5 for discussion regarding existing capacities. See Exhibit SE1 for sewer line layout.

#### 4. Proposed Conditions

The project consists of an 89-lot single-family attached residential subdivision on approximately 10 acres. The site currently proposes a pool. Refer to Section 5 regarding discussion of the pool and requirements during construction document preparation. 8" sewer lines are proposed within the development to service the lots. Each proposed lot will have a 4" sewer line serving it from the 8" public sewer line. It is proposed that this project will tie into the existing 8" sewer line within Oak Street at the project's entrance. See Exhibit SE1 for the sewer system layout. All sewer lines shall be placed a minimum of six (6) feet horizontally from any structural footing or substantial improvement and shall not be placed within seven (7) feet from the trunk of any tree. The proposed sewer line is to be public onsite and will be owned and maintained by the City of Scottsdale. An easement shall be dedicated over the private street tract to allow for City access and maintenance.

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# 3@engineering

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civil engineering

#### 5. <u>Computations</u>

Based on coordination with the City of Scottsdale, this area of the City has sewer capacity issues and is in a moratorium for new development; however, the proposed development is replacing an existing commercial development that already places sewer demand on the existing system. The following demand criteria was used in determining system demands for the existing site:

- 1. Existing Building Area = 65,100 SF
- 2. Average Day Flow Rate = 0.40 gallons per day / SF
- 3. Design Flow = Peak Flow = Average Day flow x 3.0 = 0.40 x 3.0 = 1.20 gallons per day / SF

TABLE 1: EX. SEWER DEMANDS			
Ex. Building Area	65,100 SF		
Avg. daily demand	26,040 gpd		
Design Flow Rate	78,120 gpd		

Average daily demand: 65,100 SF x 0.40 gpd/SF = 26,040 gpd = 26,040 gpd/1440 mpd = 18.08 gpm

Peak Factor = 3 (per DS&PM)

Design flow rate = 3.0 x 26,040 gpd = 78,120 gpd = 78,120 gpd/1440 mpd = 54.25 gpm

The following demand criteria was used in determining system demands for the proposed site.

- 1. 89 lots
- 2. Persons per dwelling unit = 2.5 person/du
- 3. Average Day Flow Rate = 100 gallons per capita per day x 2.5 person/du = 250 gpd
- 4. Design Flow = Peak Flow = Average Day flow x 4.0 = 250 x 4 = 1,000 gpd

TABLE 2: ON-SITE SEWER DEMANDS		
Number of Lots	89	
Avg. daily demand	22,250 gpd	
Design Flow Rate	89,000 gpd	

Average daily demand: 89 lots x 250 gpd = 22,250 gpd = 22,250 gpd/1440 mpd = 15.45 gpm

Peak Factor = 4 (per DS&PM based on population)

Design flow rate = 4 x 22,250 gpd = 89,000 gpd = 89,000 gpd/1440 mpd = 61.81 gpm

Based on this comparison, the proposed development demand is 3,790 gpd (2.63 gpm) less during average day demand conditions, and only 10,880 gpd (7.56 gpm) more during peak demand conditions. This analysis comparison was coordinated with, and accepted by the City on 2/12/20. See email correspondence in Appendix B.





In addition to the proposed lots, the site currently proposes a 20,000 gallon +\- pool. In order to restrict additional demand to the existing City sewer system due to pool backwashing, backwash shall be contained in an 60,000 equalization tank (or as approved by the pool designer), and shall have a restricted and metered pump with a maximum discharge of 10 gpm or 14,400 gpd. The backwashing line shall be connected to a dedicated 4" service to the pool area that then connects to the 8-inch main line within the private streets of the site. The top of the mainline sewer shall be below the discharge invert of the p-trap of the tank line. In addition, no other sewer connections shall be connected to this pool sewer service or the equalization tank. As part of the final design plans for the pool, the following considerations and/or requirements must be made as part of the pool design:

- All relevant details on the pool backwash management system should be submitted including (if applicable) pump design flow and head loss calcs and corresponding pump cut sheet and pump curve showing the operating point (pressure/flow) of the pump at or near the maximum allowable sewer discharge flow rate.
- All relevant design details, criteria and specification for this system shall be shown on the submitted and sealed plans and reviewed and approved by Water Resources.
- Consideration should be given in final pool design to the equalization tank material and (if applicable) backwash waste metering pump with respect to the chlorine levels in the backwash flow and potential for rapid corrosion of concrete and metals. Plastic tanks and pump with plastic impeller and body pumps should be utilized (example Fibroc).
- Pump redundancy is at the discretion of the designer/owner however, controls, interlocks, or valves (e.g. 3-way valve) must prevent both pumps from discharging simultaneously and exceeding the maximum flow.
- Discharging to the sewer must involve:
  - For pumped line: an above the ground gooseneck pipe section with combination air/vacuum release valve at the top (example ARI), this prevents any possible back up or siphoning back to the tank
  - For a pumped or a gravity line: a p-trap below grade and adjacent to the equalization tank to prevent migration of sewage or sewer gases back into the equalization tank. (or if/as plumbing code addresses such a configuration)

For the purpose of design, the 10 gpm (14,400 gpd) of the pool shall be added to the peak demand of 61.81 gpm (89,000 gpd) for a total of 71.81 gpm (103,400 gpd). Manning's Equation was used to model and analyze the proposed sewer system for compliance with the City of Scottsdale design requirements. Manning's equation was based on a minimum sewer slope of 0.43% in order to maintain a velocity of 2.5 fps at d/D of 0.65. Refer to Appendix B for loading of the sewer line and Exhibit SE1 for the Sewer System Layout Exhibit.

#### 6. <u>Summary</u>

The proposed site creates minimal to no impact on the existing sewer City sewer system due to the proposed project replacing an existing commercial development. The Peak Flow for the proposed site is 103,400 gpd. Based on the results from the sewer system analysis the proposed system has a capacity at d/D=0.65 of 268.99 gpm or 387,346 gpd. Therefore, there is adequate capacity to service the site. Any pool design shall comply with the criteria detail in Section 5, and backwashing shall be metered and restricted to 10 gpm (1,440 gpd).

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## APPENDIX A

### Vicinity Map

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# VICINITY MAP

N.T.S.

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## APPENDIX B

### Sewer Capacity Calculations

### Manning Formula Uniform Pipe Flow at Given Slope and Depth

8-inch Sewer Slope at d/D = 0.65 & V = 2.5 ft/s       Results         Set units:       m       mf       in         Pipe diameter, do       8       Velocity, v       2.4953         Manning roughness, n ?       8       Velocity head, hv       0.0968         Pressure slope, So       .013       Wetted perimeter       15.0039         Hydraulic radius       2.3052		64th St & Oak				
Set units:         m         m         ft         in           Pipe diameter, do         8         Velocity, v         2.4953           Manning roughness, n ?         8         Velocity head, hv         0.0968           In Image: I	8-inch Sewer Slope at d/D = 0.65 & V = 2.5 ft/s					
Set units:       m       m       ft       in       In       Flow, Q       268.9869         Pipe diameter, do       8       Velocity, v       2.4953         Manning roughness, n ?       8       Velocity head, hv       0.0968         In       In       In       In       In       In         Pressure slope, So       .43       Top width, T       7.6315		Results				
B         Velocity, v         2.4953           Pipe diameter, do         Image: Section of the	gpm 🔽	268.9869 gp	Flow, Q		units: m mm ft in	
Pipe diameter, d₀         Image: boot diameter, d₀         Velocity head, h₀         0.0968           Manning roughness, n ?         Flow area         34.5868           I.013         Wetted perimeter         15.0039           Pressure slope, S₀         I.43         Top width, T         7.6315	ft/sec 🗸	2.4953 ft/s	Velocity, v			
Manning roughness, n ?Flow area34.5868.013.013Wetted perimeter15.0039Hydraulic radius2.3052Pressure slope, S₀.43Top width, T7.6315	ft 🗸	0.0968 ft	Velocity head, $h_v$		Pipe diameter, d₀	
.013         Wetted perimeter         15.0039           Hydraulic radius         2.3052           Pressure slope, S₀         .43         Top width, T         7.6315	sq. in. 🗸	34.5868 sq	Flow area	Manning roughness, n ?		
Pressure slope, S0Hydraulic radius2.3052Top width, T7.6315	in 🗸	15.0039 in	Wetted perimeter	.013		
Pressure slope, S <sub>0</sub> Top width, T 7.6315	in 🗸	2.3052 in	Hydraulic radius			
	in 🗸	7.6315 in	Top width, T	.43	Pressure slope, S <sub>0</sub>	
% rise/run ✓ Froude number, F 0.72		0.72	Froude number, F	% rise/run 🗸		
Percent of (or ratio to) full depth (100% or 1 if flowing full) 65 % (tractive force), 0.0516 tau	psf 🗸	0.0516 ps	Shear stress (tractive force),	65 %	Percent of (or ratio to) full depth (100% or 1 if flowing full)	

#### **Matt Mancini**

From:	Dillon, Levi <ldillon@scottsdaleaz.gov></ldillon@scottsdaleaz.gov>
Sent:	Wednesday, February 12, 2020 4:42 PM
То:	Matt Mancini
Cc:	Chisholm, Chuck; Alex Stedman; Hayes, Eliana; Barnes, Jeff
Subject:	RE: 64th St & Oak

Hi Matt,

Yes, based on your demand calcs for proposed and existing developments, if you equalize the pool backwash waste flow and meter this volume into the existing frontage sewer at a max rate that ultimately enters Thomas Road sewer, then the proposed development should be acceptable from a sewer capacity perspective.

Here is some further guidance on the associated submittal and technical requirements: The instantaneous pool backwash flow rate to be assumed shall be 100gpm at a duration to be provided by your pool designer or MEP. The equalization tank should be sized for 3 to 4 consecutive pool backwash volumes (or as recommended by pool designer or MEP) and meter into the onsite or offsite sewer at a <u>maximum allowable discharge rate of 10gpm</u>.

#### In the basis of design report provide:

- 1. Full calculations of the pool single backwash volume including size of pool and filter size.
- 2. Also include determination of equalization tank volume and dimensions and include location on site plan.
- 3. No piping shall be shown in BOD or on plans that allow direct connection of filter backwash waste to the onsite or offsite sewer system (must be sent to tank).
- 4. No connection other than the pressurized line from (or to) the pump shall leave the equalization tank in BOD or plans.
  - a. Exception: If the equalization tank is completely above ground the flow can be limited/automatically controlled by appropriately sizing the discharge piping. In this case the average flow rate over the total time to drain the full tank must meet the maximum discharge rate. Complete sketch and hydraulic calculations showing this must be provided. In this case a discharge to a box style floor drain should be provided. Downstream connection requirements below still apply.
- 5. The backwash waste shall be discharged into a dedicated 4 or 6-inch lateral with no other sewer flows that connects to the mainline sewer. The top of the mainline sewer at the connection point shall be below the discharge invert of the p-trap.
- 6. All relevant details on the pool backwash management system should be submitted including (if applicable) pump design flow and head loss calcs and corresponding pump cut sheet and pump curve showing the operating point (pressure/flow) of the pump at or near the maximum allowable sewer discharge flow rate.

#### In design and plans:

1. All relevant design details, criteria and specification for this system shall be shown on the submitted and sealed plans and reviewed and approved by Water Resources.



- 2. Consideration should be given in final design to the equalization tank material and (if applicable) backwash waste metering pump with respect to the chlorine levels in the backwash flow and potential for rapid corrosion of concrete and metals. Plastic tanks and pump with plastic impeller and body pumps should be utilized (example Fibroc).
- 3. Secure and safe access to the backwash tank for periodic cleaning and/or pump removal/repair (if submersible type pump) should be provided.
- 4. Pump redundancy is at the discretion of the designer/owner however, controls, interlocks, or valves (e.g. 3-way valve) must prevent both pumps from discharging simultaneously and exceeding the maximum flow.
- 5. Discharging to the sewer must involve:
  - a. For pumped line: an above the ground gooseneck pipe section with combination air/vacuum release valve at the top (example ARI), this prevents any possible back up or siphoning back to the tank
  - b. For a pumped or a gravity line: a p-trap below grade and adjacent to the equalization tank to prevent migration of sewage or sewer gases back into the equalization tank. (or if/as plumbing code addresses such a configuration)
- 6. The backwash waste shall be discharged into a dedicated 4 or 6-inch lateral with no other sewer flows that connects to the mainline sewer. The top of the mainline sewer at the connection point shall be below the discharge invert of the p-trap.

Thanks,

Levi C. Dillon, P.E. | Sr. Water Resources Engineer



"Water Sustainability through Stewardship, Innovation and People"

Contact Info Direct: (480) 312-5319 Main office: (480) 312-5685 Fax: (480) 312-5615 Mailing/Office Address Water Resources Administration 9379 E. San Salvador Dr. Scottsdale, AZ. 85258

#### Sending me an attachment over 5MB? Please use the link below:

https://securemail.scottsdaleaz.gov/dropbox/ldillon@scottsdaleaz.gov

From: Matt Mancini <matt@3engineering.com>
Sent: Wednesday, February 12, 2020 2:50 PM
To: Dillon, Levi <LDillon@Scottsdaleaz.gov>
Cc: Chisholm, Chuck <CChisholm@KHOV.COM>; Alex Stedman@rviplanning.com>

#### A External Email: Please use caution if opening links or attachments!

Levi,

Thanks for taking my call today to discuss the 64<sup>th</sup> Street & Oak project. As discussed I would like to present you with the sewer demand calculation comparison between the existing medical office and the single family attached development KHOV is proposing. Please see the following based on the DS&PM:

Ex. Medial Office:

Building Area = 65,100 SF Unit Demand = 0.4 gpd/SF Avg. Demand = 65,100 x 0.4 = 26,040 gpd (18.08 gpm) Peak Factor = 3 Peak Demand = 3 x 26,040 = 78,120 gpd (54.25 gpm)

Prop. Single Family Residential:

Units = 89 Person per unit = 2.5 p/uPersons =  $89 \times 2.5 = 223$ Unit Demand = 100 gpppd Average Demand 22,300 gpd (15.49 gpm) Peak Factor = 4 Peak Demand = 89,200 gpd (61.94 gpm)

As you can see the Average day demand of the proposed development is less by 3,740 gpd (2.60 gpm), and the Peak is only more by11,080 gpd (7.70 gpm). The proposed development will contain a pool, and based on our conversation you would allow backwashing to be stored in a tank and metered out at a low GPM rate.

As discussed, having City buy-in at this stage in the development process is integral for the KHOV's feasibility of the project; So, please let us know your initial thoughts on this comparison, as based on the above it is our opinion the development would not adversely affect the existing system. Thank you in advance for your time, as we look forward to hearing back from you.

Sincerely,

Matthew J. Mancini, P.E. | Vice President

6370 E. Thomas Rd., Suite # 200 | Scottsdale, AZ 85251 O: (602) 334-4387 x-103 | D: (602) 730-6847 | C: (602) 309-2257 | F: (602) 490-3230 matt@3engineering.com | www.3engineering.com





Address the comments below and herein within a resubmitted preliminary basis of design report:

**1) STIPULATION:** Pool backwash equalization to be performed per guidance provided by Water Resources division and included within the report. Maximum instantaneous pool backwash waste flow discharged to sewer shall be 10gpm routed as indicated to a dedicated pipeline connected to a public sewer. DS&PM 7-1.202, G, 5.

2) Provide offsite hydraulic capacity analysis between site and Thomas Rd. DS&PM 7-1.200. Refer to comments on report page 3. A d/D of 0.8 is allowed on special case basis for offsite sewer flows up to Thomas Rd in 8" pipeline

3) Minimum slope required on 8-inch sewer pipe is 0.52".
2.5fps @ d/D=1.0. Revise report and calcs.

4) Per DS&PM 7-1.200 in final BOD utility plan:

-Provide all underground utilities on site plan and indicate horizontal and vertical clearances and any special crossing details.

-Clearly indicate demolition of any existing sewer infrastructure (taps/service lines, etc.). Existing unused taps can be capped at the property line.

-Indicate locations and sizes of all individual services.5) Address applicable comments on utility plan.

Source for the series of the s

Preliminary in rezoning, not final

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### 64th St & Oak

### FINAL BASIS OF DESIGN REPORT - WASTEWATER

Prepared for:

K Hovnanian Great Western Homes, LLC 20830 N. Tatum Blvd., Suite 250 Phoenix, Arizona 85050 Contact: Chuck Chisholm Phone: (480) 824-4175



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Sewer Line ExhibitSE1
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**Proposed Conditions** 

detail off-site analysis before Thomas as

The project consists of an 89-lot single-family attached residential subdivision on approximately 10 acres. The site currently proposes a pool. Refer to Section 5 regarding discussion of the pool and requirements during construction document preparation. 8" sewer lines are proposed within the development to service the lots. Each proposed lot will have a 4" sewer line serving it from the 8" public sewer line. It is proposed that this project will tie into the existing 8" sewer line within Oak Street at the project's entrance. See Exhibit SE1 for the sewer system layout. All sewer lines shall be placed a minimum of six (6) feet horizontally from any structural footing or substantial improvement and shall not be placed within seven (7) feet from the trunk of any tree. The proposed sewer line is to be public onsite and will be owned and maintained by the City of Scottsdale. An easement shall be dedicated over the private street tract to allow for City access and maintenance.

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Desig	n flow rate = 3.0 x 26,040 gpd = 78,120 gpd = 78,120 gpd/1440 mpd = <mark>54.25 gpm</mark> <b>&lt;</b>		– peaks /	
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#### this was based on Thomas Rd having little to no capacity, but it also addresses the offsite analysis before it gets to Thomas

In addition to the proposed lots, the site currently proposes a 20,000 gallon +\- pool. In order to restrict additional demand to the existing City sewer system due to pool backwashing, backwash shall be contained in an 60,000 equalization tank (or as approved by the pool designer), and shall have a restricted and metered pump with a maximum discharge of 10 gpm or 14,400 gpd. The backwashing line shall be connected to a dedicated 4" service to the pool area that then connects to the 8-inch main line within the private streets of the site. The top of the mainline sewer shall be below the discharge invert of the p-trap of the tank line. In addition, no other sewer connections shall be connected to this pool sewer service or the equalization tank. As part of the final design plans for the pool, the following considerations and/or requirements must be made as part of the pool design:

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0.52% required for 8-inch pipe @ d/D=1.0 and 2.5fps

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For the purpose of design, the 10 gpm (14,400 gpd) of the pool shall be added to the peak demand of 61.81 gpm (89,000 gpd) for a total of 71.81 gpm (103,400 gpd). Manning's Equation was used to model and analyze the proposed sever system for compliance with the City of Scotts dale design requirements. Manning's equation was based on a minimum sewer slope of 0.43% in order to maintain a velocity of 2.5 fps at d/D of 0.65. Refer to Appendix B for loading of the sever line and Exhibit SE1 for the Sewer System Layout Exhibit.

#### 6. Summary

also add 250single family homes for offsite analysis= 173gpm peak + 72 proposed = 245gpm peak approaching Thomas Rd. Close enough to max capacity of 238gpm per below. BASIN WILL BE AT MAX SEWER CAPACITY (unless verified in the future with flow monitoring), eve then Thomas Rd is at capacity so it would limit (unless further verificaton is done in the future)

The proposed site creates minimal to no impact on the existing sewer City sewer system due to the proposed project replacing an existing commercial development. The Peak Flow for the proposed site is 103,400 gpd. Based on the results from the sewer system analysis the proposed system has a capacity at d/D=0.65 of 268.99 gpm or 387,346 gpd. Therefore, there is adequate capacity to service the site. Any pool design shall comply with the criteria detail in Section 5, and backwashing shall be metered and restricted to 10 gpm (1,440 gpd).

297gpm assuming 8" sewer and 0.52% slope. Long segment of 8" sewer approaching Thomas on canal is only 0.2%. Sewer capacity only 184gpm. Can allow 0.8 d/D as special case condition due to basin small size, largely built-out condition, low I&I potential. Thus, offsite capacity is 238gpm.

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## APPENDIX A

### Vicinity Map

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# VICINITY MAP

N.T.S.

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## APPENDIX B

### Sewer Capacity Calculations



#### **Matt Mancini**

From:	Dillon, Levi <ldillon@scottsdaleaz.gov></ldillon@scottsdaleaz.gov>
Sent:	Wednesday, February 12, 2020 4:42 PM
То:	Matt Mancini
Cc:	Chisholm, Chuck; Alex Stedman; Hayes, Eliana; Barnes, Jeff
Subject:	RE: 64th St & Oak

Hi Matt,

Yes, based on your demand calcs for proposed and existing developments, if you equalize the pool backwash waste flow and meter this volume into the existing frontage sewer at a max rate that ultimately enters Thomas Road sewer, then the proposed development should be acceptable from a sewer capacity perspective.

Here is some further guidance on the associated submittal and technical requirements: The instantaneous pool backwash flow rate to be assumed shall be 100gpm at a duration to be provided by your pool designer or MEP. The equalization tank should be sized for 3 to 4 consecutive pool backwash volumes (or as recommended by pool designer or MEP) and meter into the onsite or offsite sewer at a <u>maximum allowable discharge rate of 10gpm</u>.

#### In the basis of design report provide:

- 1. Full calculations of the pool single backwash volume including size of pool and filter size.
- 2. Also include determination of equalization tank volume and dimensions and include location on site plan.
- 3. No piping shall be shown in BOD or on plans that allow direct connection of filter backwash waste to the onsite or offsite sewer system (must be sent to tank).
- 4. No connection other than the pressurized line from (or to) the pump shall leave the equalization tank in BOD or plans.
  - a. Exception: If the equalization tank is completely above ground the flow can be limited/automatically controlled by appropriately sizing the discharge piping. In this case the average flow rate over the total time to drain the full tank must meet the maximum discharge rate. Complete sketch and hydraulic calculations showing this must be provided. In this case a discharge to a box style floor drain should be provided. Downstream connection requirements below still apply.
- 5. The backwash waste shall be discharged into a dedicated 4 or 6-inch lateral with no other sewer flows that connects to the mainline sewer. The top of the mainline sewer at the connection point shall be below the discharge invert of the p-trap.
- 6. All relevant details on the pool backwash management system should be submitted including (if applicable) pump design flow and head loss calcs and corresponding pump cut sheet and pump curve showing the operating point (pressure/flow) of the pump at or near the maximum allowable sewer discharge flow rate.

#### In design and plans:

1. All relevant design details, criteria and specification for this system shall be shown on the submitted and sealed plans and reviewed and approved by Water Resources.



- 2. Consideration should be given in final design to the equalization tank material and (if applicable) backwash waste metering pump with respect to the chlorine levels in the backwash flow and potential for rapid corrosion of concrete and metals. Plastic tanks and pump with plastic impeller and body pumps should be utilized (example Fibroc).
- 3. Secure and safe access to the backwash tank for periodic cleaning and/or pump removal/repair (if submersible type pump) should be provided.
- 4. Pump redundancy is at the discretion of the designer/owner however, controls, interlocks, or valves (e.g. 3-way valve) must prevent both pumps from discharging simultaneously and exceeding the maximum flow.
- 5. Discharging to the sewer must involve:
  - a. For pumped line: an above the ground gooseneck pipe section with combination air/vacuum release valve at the top (example ARI), this prevents any possible back up or siphoning back to the tank
  - b. For a pumped or a gravity line: a p-trap below grade and adjacent to the equalization tank to prevent migration of sewage or sewer gases back into the equalization tank. (or if/as plumbing code addresses such a configuration)
- 6. The backwash waste shall be discharged into a dedicated 4 or 6-inch lateral with no other sewer flows that connects to the mainline sewer. The top of the mainline sewer at the connection point shall be below the discharge invert of the p-trap.

Thanks,

Levi C. Dillon, P.E. | Sr. Water Resources Engineer



"Water Sustainability through Stewardship, Innovation and People"

Contact Info Direct: (480) 312-5319 Main office: (480) 312-5685 Fax: (480) 312-5615 Mailing/Office Address Water Resources Administration 9379 E. San Salvador Dr. Scottsdale, AZ. 85258

#### Sending me an attachment over 5MB? Please use the link below:

https://securemail.scottsdaleaz.gov/dropbox/ldillon@scottsdaleaz.gov

From: Matt Mancini <matt@3engineering.com>
Sent: Wednesday, February 12, 2020 2:50 PM
To: Dillon, Levi <LDillon@Scottsdaleaz.gov>
Cc: Chisholm, Chuck <CChisholm@KHOV.COM>; Alex Stedman@rviplanning.com>

#### A External Email: Please use caution if opening links or attachments!

Levi,

Thanks for taking my call today to discuss the 64<sup>th</sup> Street & Oak project. As discussed I would like to present you with the sewer demand calculation comparison between the existing medical office and the single family attached development KHOV is proposing. Please see the following based on the DS&PM:

Ex. Medial Office:

Building Area = 65,100 SF Unit Demand = 0.4 gpd/SF Avg. Demand = 65,100 x 0.4 = 26,040 gpd (18.08 gpm) Peak Factor = 3 Peak Demand = 3 x 26,040 = 78,120 gpd (54.25 gpm)

Prop. Single Family Residential:

Units = 89 Person per unit = 2.5 p/uPersons =  $89 \times 2.5 = 223$ Unit Demand = 100 gpppd Average Demand 22,300 gpd (15.49 gpm) Peak Factor = 4 Peak Demand = 89,200 gpd (61.94 gpm)

As you can see the Average day demand of the proposed development is less by 3,740 gpd (2.60 gpm), and the Peak is only more by11,080 gpd (7.70 gpm). The proposed development will contain a pool, and based on our conversation you would allow backwashing to be stored in a tank and metered out at a low GPM rate.

As discussed, having City buy-in at this stage in the development process is integral for the KHOV's feasibility of the project; So, please let us know your initial thoughts on this comparison, as based on the above it is our opinion the development would not adversely affect the existing system. Thank you in advance for your time, as we look forward to hearing back from you.

Sincerely,

Matthew J. Mancini, P.E. / Vice President

6370 E. Thomas Rd., Suite # 200 | Scottsdale, AZ 85251 O: (602) 334-4387 x-103 | D: (602) 730-6847 | C: (602) 309-2257 | F: (602) 490-3230 matt@3engineering.com | www.3engineering.com







64<sup>th</sup> St. & Oak Final Basis Design Report - Water 3 engineering Job #: 5153 April 3, 2020 Case #: XX-XXXX-XX



### 64th St & Oak

### FINAL BASIS OF DESIGN REPORT - WATER

Prepared for:

K Hovnanian Great Western Homes, LLC 20830 N. Tatum Blvd., Suite 250 Phoenix, Arizona 85050 Contact: Chuck Chisholm Phone: (480) 824-4175



Expires 12/31/2021 Matthew J. Mancini, P.E.

April 3, 2020

#### Submittal to:

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

#### Prepared by:

3 engineering, L.L.C. 6370 E. Thomas Road, Suite 200 Scottsdale, Arizona 85251 Contact: Matthew J. Mancini, P.E.

#### Job Number 5153

4/30/2020

6370 E. Camelback Road, Suite #200, Scottsdale, Arizona 85251 · Phone (602) 334-4387 · Fax (602) 490-3230 · www.3encineering.com



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3.	Existing Conditions	1
4.	Proposed Conditions	1
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#### <u>Tables</u>

TABLE 1: On-Site Water Demands
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#### **Appendices**

Vicinity MapA	١
Fire Flow Test E	;
WaterCAD ModelC	,

#### **Exhibits**

Water Exhibit	И	/E1
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#### 1. Introduction

The project site, 64<sup>th</sup> St & Oak, is located in Section 33, Township 2 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona within the City of Scottsdale. The project is located North of Oak Street, and West of 64th Street Road at 6300 E. Oak Street, Scottsdale, Arizona 85257. The site is bounded on the north by an existing commercial polo club, on the west by a residential neighborhood, on the south and east by a commercial property. See Appendix A for a site map.

The site is a proposed 89-lot single-family attached residential subdivision project.

#### 2. Design Documentation

The purpose of this design report is to verify that the existing City of Scottsdale water system can accommodate demands generated by the proposed project. Demands were calculated using the City of Scottsdale Design Standards & Policies Manual. It is our opinion that this report is in accordance with the City of Scottsdale Standards.

#### 3. Existing Conditions

The existing land is occupied by an operational medical facility with three (3) buildings, including existing parking & site improvements. See Appendix A for a site map. The topography has an approximate slope of one percent (1.40%) and has an overall general slope from southwest to northeast.

The site is bounded on the north by an existing commercial polo club, on the west by a residential neighborhood, on the south and east by a commercial property. There is an existing 8" water line adjacent to the site within Oak street that currently provides service to the existing site. This 8" water line will be used to service the proposed project. See Exhibit WE1 for the water line layout.

#### 4. Proposed Conditions

The project consists of an 89-lot single-family attached residential subdivision on approximately 10 acres. There is a proposed public 8" water line through the development to service the lots. See WE1 for the proposed water system layout. All water lines shall be placed a minimum of six (6) feet horizontally from any structural footing or substantial improvement, and shall not be placed within seven (7) feet from the trunk of any tree. The fire flow demand for the site is 1,500 gpm based on Chapter 6 of the City of Scottsdale's Design Standards & Policies Manual. The proposed water line is to be public within the site and is to be owned and maintained by the City.

#### 5. <u>Computations</u>

The following demand criteria were used in determining the system demands for the proposed site.

- Average Day Demand = 227.6 gallons per lot/day = 227.6 x 89 = 20,256 gpd or 14.07 gpm 1.
- Max Day Demand = 2.0 x Avg. Day = 2.0 x 20,256 gpd = 40,512 gpd or 28.14 gpm 2.
- 3. Peak Hour Demand = 3.5 x Avg. Day = 3.5 x 20,256 gpd = 70,896 gpd or 49.23 gpm

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TABLE 1: ON-SITE WATER DEMANDS			
Lots	89		
Fire flow	1,500 gpm		
Max Day Demand Flow	28.14 gpm		
Fire flow + Peak Flow	1,528.14 gpm		

#### 6. Summary

The Max Day Plus Fire Flow for the proposed site is 1,528.14 gpm. Per the fire flow test (Appendix B) the existing system has 3,556 gpm available at 20 psi. Based on the WaterCAD analysis in Appendix C, the existing water infrastructure provides adequate demand capacity and pressure for the proposed site during Average Day, Max Day, Peak Hour, and Max Day Plus Fire Flow Conditions.





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## APPENDIX A

# Vicinity Map




# VICINITY MAP

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## APPENDIX B

## Fire Flow Test



### HYDRANT FLOW TEST REPORT

Arizona Flow Testing Projec Flow Test Permit No.: Date and time flow test cond Data is current and reliable of Conducted by: Coordinated by: <b>Raw Test Data</b> Static Pressure: (Measured in pounds per sq Pitot Pressure: (Measured in pounds per sq	t No.: 20113 C61665 lucted: March 20, 202 until: September 20 Floyd Vaugha Ray Padilla – ( 68.0 PSI uare inch) 28.0 PSI uare inch) uare inch)	20 at 7:35 AM ), 2020 in – Arizona Flow Testing, LL City of Scottsdale-Inspector ( Data with 10% Safety F Static Pressure: (Measured in pounds per Residual Pressure: (Measured in pounds per	AC (480-250-8154) (602-541-0586) <b>Factor</b> <b>61.2 PSI</b> r square inch) <b>43.2 PSI</b> r square inch)
Diffuser Orifice Diameter: Or (Measured in inches)	ne 4-inch Pollard Diffuser	Distance between hydrar Main size: Not Provide	nts: Approx.: 490 feet d
Flowing GPM: (Measured in gallons per mi	<b>2,274 GPM</b> nute)	Flowing GPM:	2,274 GPM
GPM @ 20 PSI:	3,892 GPM	GPM @ 20 PSI:	3,556 GPM
Flow Test Location	Nort	h T	Legend
Project Site 6210 East Oak Street		w.c.	North 64 <sup>th</sup> Street
Flow Fire Hydrant			Pressure Fire Hydrant
East Oak Street	sting LIC 480-250 8154	www.azflowtest.com_flovd@	azflowtest com

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4/30/2020

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## APPENDIX C

## WaterCAD Model

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### Scenario: Average Day



5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Junction Table (5153.wtg)

ID	Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-3	100.00	<none></none>	0	235.87	58.8
38	Hydrant 05	95.00	<none></none>	4	235.87	60.9
29	J-2	95.00	<none></none>	0	235.87	60.9
31	J-4	94.90	<none></none>	0	235.87	61.0
37	Hydrant 04	94.85	<none></none>	4	235.87	61.0
36	J-9	94.60	<none></none>	0	235.87	61.1
32	J-5	94.50	<none></none>	0	235.87	61.2
33	Hydrant 02	94.50	<none></none>	4	235.87	61.2
28	Hydrant 01	94.50	<none></none>	0	235.87	61.2
35	Hydrant 03	94.00	<none></none>	4	235.87	61.4
34	J-7	93.80	<none></none>	0	235.87	61.5

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Pipe Table (5153.wtg)

ID	Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
47	P-9	487	Hydrant 05	Hydrant 04	8.0	Ductile Iron	130.0	0	0.00
64	P-15	1	PMP-1	Hydrant 01	48.0	Ductile Iron	130.0	14	0.00
63	P-14	1	R-1	PMP-1	48.0	Ductile Iron	130.0	14	0.00
49	P-11	370	J-9	Hydrant 03	8.0	Ductile Iron	130.0	-1	0.01
43	P-5	33	Hydrant 02	J-5	8.0	Ductile Iron	130.0	1	0.01
44	P-6	208	J-5	J-4	8.0	Ductile Iron	130.0	-2	0.01
50	P-12	285	J-5	J-9	8.0	Ductile Iron	130.0	3	0.02
48	P-10	82	Hydrant 04	J-9	8.0	Ductile Iron	130.0	-4	0.02
46	P-8	287	J-4	Hydrant 05	8.0	Ductile Iron	130.0	4	0.02
51	P-13	283	J-7	Hydrant 03	8.0	Ductile Iron	130.0	4	0.03
42	P-4	193	J-7	Hydrant 02	8.0	Ductile Iron	130.0	4	0.03
39	P-1	455	J-3	J-2	8.0	Asbestos Cement	140.0	-5	0.03
45	P-7	175	J-3	J-4	8.0	Ductile Iron	130.0	5	0.03
41	P-3	160	J-2	J-7	8.0	Ductile Iron	130.0	9	0.06
40	P-2	114	J-2	Hydrant 01	8.0	Asbestos Cement	140.0	-14	0.09
Headle	oss ent								

### Current Time: 0.000 hours

(ft/ft) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

5153.wtg 3/26/2020

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Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Pump Table (5153.wtg)

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
61	PMP-1	94.50	Fire Flow 032020	On	94.50	235.87	14	141.37

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Reservoir Table (5153.wtg)

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
60	R-1	94.50	<none></none>	14	94.50

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### Scenario: Max Day



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### FlexTable: Junction Table (5153.wtg)

ID	Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-3	100.00	<none></none>	0	235.85	58.8
38	Hydrant 05	95.00	<none></none>	7	235.85	60.9
29	J-2	95.00	<none></none>	0	235.86	60.9
31	J-4	94.90	<none></none>	0	235.85	61.0
37	Hydrant 04	94.85	<none></none>	7	235.85	61.0
36	J-9	94.60	<none></none>	0	235.85	61.1
32	J-5	94.50	<none></none>	0	235.85	61.2
33	Hydrant 02	94.50	<none></none>	7	235.85	61.2
28	Hydrant 01	94.50	<none></none>	0	235.86	61.2
35	Hydrant 03	94.00	<none></none>	7	235.85	61.4
34	J-7	93.80	<none></none>	0	235.85	61.5

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Pipe Table (5153.wtg)

ID	Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
47	P-9	487	Hydrant 05	Hydrant 04	8.0	Ductile Iron	130.0	0	0.00
64	P-15	1	PMP-1	Hydrant 01	48.0	Ductile Iron	130.0	28	0.00
63	P-14	1	R-1	PMP-1	48.0	Ductile Iron	130.0	28	0.00
49	P-11	370	J-9	Hydrant 03	8.0	Ductile Iron	130.0	-2	0.01
43	P-5	33	Hydrant 02	J-5	8.0	Ductile Iron	130.0	2	0.01
44	P-6	208	J-5	J-4	8.0	Ductile Iron	130.0	-3	0.02
50	P-12	285	J-5	J-9	8.0	Ductile Iron	130.0	5	0.03
48	P-10	82	Hydrant 04	J-9	8.0	Ductile Iron	130.0	-7	0.04
46	P-8	287	J-4	Hydrant 05	8.0	Ductile Iron	130.0	7	0.05
51	P-13	283	J-7	Hydrant 03	8.0	Ductile Iron	130.0	9	0.06
42	P-4	193	J-7	Hydrant 02	8.0	Ductile Iron	130.0	9	0.06
39	P-1	455	J-3	J-2	8.0	Asbestos Cement	140.0	-10	0.07
45	P-7	175	J-3	J-4	8.0	Ductile Iron	130.0	10	0.07
41	P-3	160	J-2	J-7	8.0	Ductile Iron	130.0	18	0.11
40	P-2	114	J-2	Hydrant 01	8.0	Asbestos Cement	140.0	-28	0.18
Head	OSS								

### Current Time: 0.000 hours

Gradient

(ft/ft) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000

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Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Pump Table (5153.wtg)

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
61	PMP-1	94.50	Fire Flow 032020	On	94.50	235.86	28	141.36

### Current Time: 0.000 hours

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### FlexTable: Reservoir Table (5153.wtg)

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
60	R-1	94.50	<none></none>	28	94.50

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### Scenario: Peak Hour



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### FlexTable: Junction Table (5153.wtg)

ID	Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-3	100.00	<none></none>	0	235.82	58.8
38	Hydrant 05	95.00	<none></none>	12	235.82	60.9
29	J-2	95.00	<none></none>	0	235.83	60.9
31	J-4	94.90	<none></none>	0	235.82	61.0
37	Hydrant 04	94.85	<none></none>	12	235.82	61.0
36	J-9	94.60	<none></none>	0	235.82	61.1
32	J-5	94.50	<none></none>	0	235.82	61.1
33	Hydrant 02	94.50	<none></none>	12	235.82	61.1
28	Hydrant 01	94.50	<none></none>	0	235.84	61.1
35	Hydrant 03	94.00	<none></none>	12	235.82	61.4
34	J-7	93.80	<none></none>	0	235.82	61.4

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Pipe Table (5153.wtg)

ID	Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
47	P-9	487	Hydrant 05	Hydrant 04	8.0	Ductile Iron	130.0	0	0.00
64	P-15	1	PMP-1	Hydrant 01	48.0	Ductile Iron	130.0	49	0.01
63	P-14	1	R-1	PMP-1	48.0	Ductile Iron	130.0	49	0.01
49	P-11	370	J-9	Hydrant 03	8.0	Ductile Iron	130.0	-3	0.02
43	P-5	33	Hydrant 02	J-5	8.0	Ductile Iron	130.0	3	0.02
44	P-6	208	J-5	J-4	8.0	Ductile Iron	130.0	-6	0.04
50	P-12	285	J-5	J-9	8.0	Ductile Iron	130.0	9	0.06
48	P-10	82	Hydrant 04	J-9	8.0	Ductile Iron	130.0	-12	0.08
46	P-8	287	J-4	Hydrant 05	8.0	Ductile Iron	130.0	12	0.08
51	P-13	283	J-7	Hydrant 03	8.0	Ductile Iron	130.0	16	0.10
42	P-4	193	J-7	Hydrant 02	8.0	Ductile Iron	130.0	16	0.10
39	P-1	455	J-3	J-2	8.0	Asbestos Cement	140.0	-18	0.11
45	P-7	175	J-3	J-4	8.0	Ductile Iron	130.0	18	0.11
41	P-3	160	J-2	J-7	8.0	Ductile Iron	130.0	31	0.20
40	P-2	114	J-2	Hydrant 01	8.0	Asbestos Cement	140.0	-49	0.31
Head	OSS								

### Current Time: 0.000 hours

Gradient

(ft/ft) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000

5153.wtg 3/26/2020

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Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Pump Table (5153.wtg)

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
61	PMP-1	94.50	Fire Flow 032020	On	94.50	235.84	49	141.34

#### Current Time: 0.000 hours

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### FlexTable: Reservoir Table (5153.wtg)

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
60	R-1	94.50	<none></none>	49	94.50

### Current Time: 0.000 hours

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Scenario: Max Day + Fire Flow



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### Fire Flow Node FlexTable: Fire Flow Report (5153.wtg)

Label	Satisfies Fire Flow Constraints?	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (Zone)	Junction w/ Minimum Pressure (System)
Hydrant 05	True	2,697	1,507	20.0	20.0	Hydrant 04	Hydrant 04
Hydrant 04	True	2,759	1,507	20.0	20.0	J-9	J-9
Hydrant 03	True	2,780	1,507	20.0	20.0	J-9	J-9
J-3	True	2,786	1,500	20.0	20.0	J-4	J-4
J-9	True	2,822	1,500	20.0	20.0	Hydrant 04	Hydrant 04
J-4	True	2,874	1,500	20.0	20.1	J-3	J-3
Hydrant 02	True	2,894	1,507	20.0	20.0	J-5	J-5
J-5	True	2,899	1,500	20.0	20.0	Hydrant 02	Hydrant 02
J-7	True	2,978	1,500	20.0	20.3	J-3	J-3
J-2	True	3,093	1,500	20.0	22.2	J-3	J-3
Hydrant 01	True	3,415	1,500	20.0	22.4	J-3	J-3

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1



4/30/2020



## 64th St & Oak

### FINAL BASIS OF DESIGN REPORT - WATER

Prepared for:

K Hovnanian Great Western Homes, LLC 20830 N. Tatum Blvd., Suite 250 Phoenix, Arizona 85050 Contact: Chuck Chisholm Phone: (480) 824-4175



Expires 12/31/2021 Matthew J. Mancini, P.E.

April 3, 2020

### Submittal to:

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

### Prepared by:

3 engineering, L.L.C. 6370 E. Thomas Road, Suite 200 Scottsdale, Arizona 85251 Contact: Matthew J. Mancini, P.E.

### Job Number 5153

4/30/2020

6370 E. Camelback Road, Suite #200, Scottsdale, Arizona 85251 · Phone (602) 334-4387 · Fax (602) 490-3230 · www.3encineering.com



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2.	Design Documnetation	1
3.	Existing Conditions	1
4.	Proposed Conditions	1
5.	Computations	1
6.	Summary	2

### <u>Tables</u>

TABLE 1: On-Site Water Demands
--------------------------------

### **Appendices**

Vicinity MapA	١
Fire Flow Test E	;
WaterCAD ModelC	,

### **Exhibits**

Water Exhibit	И	/E1
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### 1. Introduction

The project site, 64<sup>th</sup> St & Oak, is located in Section 33, Township 2 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona within the City of Scottsdale. The project is located North of Oak Street, and West of 64th Street Road at 6300 E. Oak Street, Scottsdale, Arizona 85257. The site is bounded on the north by an existing commercial polo club, on the west by a residential neighborhood, on the south and east by a commercial property. See Appendix A for a site map.

The site is a proposed 89-lot single-family attached residential subdivision project.

### 2. Design Documentation

The purpose of this design report is to verify that the existing City of Scottsdale water system can accommodate demands generated by the proposed project. Demands were calculated using the City of Scottsdale Design Standards & Policies Manual. It is our opinion that this report is in accordance with the City of Scottsdale Standards.

### 3. Existing Conditions

The existing land is occupied by an operational medical facility with three (3) buildings, including existing parking & site improvements. See Appendix A for a site map. The topography has an approximate slope of one percent (1.40%) and has an overall general slope from southwest to northeast.

The site is bounded on the north by an existing commercial polo club, on the west by a residential neighborhood, on the south and east by a commercial property. There is an existing 8" water line adjacent to the site within Oak street that currently provides service to the existing site. This 8" water line will be used to service the proposed project. See Exhibit WE1 for the water line layout.

### 4. Proposed Conditions

The project consists of an 89-lot single-family attached residential subdivision on approximately 10 acres. There is a proposed public 8" water line through the development to service the lots. See WE1 for the proposed water system layout. All water lines shall be placed a minimum of six (6) feet horizontally from any structural footing or substantial improvement, and shall not be placed within seven (7) feet from the trunk of any tree. The fire flow demand for the site is 1,500 gpm based on Chapter 6 of the City of Scottsdale's Design Standards & Policies Manual. The proposed water line is to be public within the site and is to be owned and maintained by the City.

### 5. <u>Computations</u>

Use gpm values from DS&PM Figure 6-1.2 for modeling purposes. 89X 0.33gpm= 29.4gpm, 29.4X3.5= 103gpm

The following demand criteria were used in determining the system demands for the proposed site.

Y	YY		$\sim$
•	1.	Average Day Demand = 227.6 gallons per lot/day = 227.6 k 89 = 20,256 gpd or 14.07 gpm	)
•	2.	Max Day Demand = 2.0 x Avg. Day = 2.0 x 20,256 gpd = 40,512 gpd or 28.14 gpm	
•	3.	Peak Hour Demand = 3.5 x Avg. Day = 3.5 x 20,256 gpd = 70,896 gpd or 49.23 gpm	)
			5
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Page | 1







Oak\Reports\Water\5153\_exb\_WE01.dgn ∞ St C:\My SecuriSync\Projects\_5000\5153\_64th

3 engineering surveying planning

## APPENDIX A

## Vicinity Map





# VICINITY MAP

N.T.S.

3 engineering surveying planning

## APPENDIX B

## Fire Flow Test



## **Arizona Flow Testing LLC**

Provide associated supply curve graph. Correlate to pump curve used in modeling. -----

7-ZN-2020

4/30/2020

### HYDRANT FLOW TEST REPORT

	Project Name: Project Address: Client Project No.: Arizona Flow Testing P Flow Test Permit No.: Date and time flow test Data is current and reli Conducted by: Coordinated by:	roject No.: conducted: able until:	64th & Oak 6210 East Oal 5153 20113 C61665 March 20, 202 September 20 Floyd Vaugha Ray Padilla – (	k Street, Scottsdale, Arizona, 8 20 at 7:35 AM ), 2020 n – Arizona Flow Testing, LLC City of Scottsdale-Inspector (6	35257 C (480-250-8154) 502-541-0586)
<sup>×</sup> 3	<u> </u>	* * * * * *	<u> </u>		$\left( \frac{1}{2} \right)$
2	<u>Raw Test Data</u>			Data with 10% Safety Fa	<u>ictor</u>
E	Static Pressure: (Measured in pounds p	68.0 PSI er square inch)	[	Static Pressure: (Measured in pounds per :	61.2 PSI square inch)
Ę	Residual Pressure: (Measured in pounds p	<b>50.0 PS</b> er square inch)	I	Residual Pressure: (Measured in pounds per	43.2 PSI square inch)
ξ	Pitot Pressure:	28.0 PS	ĺ	Adjust pump curve pressure according	v }
7	(Measured in pounds p	er square inch)		,	
	Diffuser Orifice Diamet (Measured in inches)	er: One 4-inch Polla	ard Diffuser	Distance between hydrant Main size: Not Provided	ts: Approx.: 490 feet
3	Coefficient of Diffuser:	0.9			3
	Flowing GPM: (Measured in gallons po	<b>2,27</b> 4 er minute)	ł GPM	Flowing GPM:	2,274 GPM
2	GPM @ 20 PSI:	3,892	2 GPM	GPM @ 20 PSI:	3,556 GPM
	Flow Test Location	·····	Nort		
6210 Flo	Project Site 0 East Oak Street w Fire Hydrant	title Map extended: www.ententer.			North 64 <sup>th</sup> Street Pressure Fire Hydrant
	Arizona Flo	w Testing LLC 480	)-250-8154 w	ww.azflowtest.com floyd@a	zflowtest.com

3 engineering surveying

## APPENDIX C

## WaterCAD Model

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### Scenario: Average Day



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### FlexTable: Junction Table (5153.wtg)

ID	Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-3	100.00	<none></none>	0	235.87	58.8
38	Hydrant 05	95.00	<none></none>	4	235.87	60.9
29	J-2	95.00	<none></none>	0	235.87	60.9
31	J-4	94.90	<none></none>	0	235.87	61.0
37	Hydrant 04	94.85	<none></none>	4	235.87	61.0
36	J-9	94.60	<none></none>	0	235.87	61.1
32	J-5	94.50	<none></none>	0	235.87	61.2
33	Hydrant 02	94.50	<none></none>	4	235.87	61.2
28	Hydrant 01	94.50	<none></none>	0	235.87	61.2
35	Hydrant 03	94.00	<none></none>	4	235.87	61.4
34	J-7	93.80	<none></none>	0	235.87	61.5

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Pipe Table (5153.wtg)

ID	Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
47	P-9	487	Hydrant 05	Hydrant 04	8.0	Ductile Iron	130.0	0	0.00
64	P-15	1	PMP-1	Hydrant 01	48.0	Ductile Iron	130.0	14	0.00
63	P-14	1	R-1	PMP-1	48.0	Ductile Iron	130.0	14	0.00
49	P-11	370	J-9	Hydrant 03	8.0	Ductile Iron	130.0	-1	0.01
43	P-5	33	Hydrant 02	J-5	8.0	Ductile Iron	130.0	1	0.01
44	P-6	208	J-5	J-4	8.0	Ductile Iron	130.0	-2	0.01
50	P-12	285	J-5	J-9	8.0	Ductile Iron	130.0	3	0.02
48	P-10	82	Hydrant 04	J-9	8.0	Ductile Iron	130.0	-4	0.02
46	P-8	287	J-4	Hydrant 05	8.0	Ductile Iron	130.0	4	0.02
51	P-13	283	J-7	Hydrant 03	8.0	Ductile Iron	130.0	4	0.03
42	P-4	193	J-7	Hydrant 02	8.0	Ductile Iron	130.0	4	0.03
39	P-1	455	J-3	J-2	8.0	Asbestos Cement	140.0	-5	0.03
45	P-7	175	J-3	J-4	8.0	Ductile Iron	130.0	5	0.03
41	P-3	160	J-2	J-7	8.0	Ductile Iron	130.0	9	0.06
40	P-2	114	J-2	Hydrant 01	8.0	Asbestos Cement	140.0	-14	0.09
Headle	oss ent								

### Current Time: 0.000 hours

(ft/ft) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

0.000

5153.wtg 3/26/2020

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Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### FlexTable: Pump Table (5153.wtg)

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
61	PMP-1	94.50	Fire Flow 032020	On	94.50	235.87	14	141.37

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1
## FlexTable: Reservoir Table (5153.wtg)

ID	ID Label		Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)	
60	R-1	94.50	<none></none>	14	94.50	

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

## Scenario: Max Day



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## FlexTable: Junction Table (5153.wtg)

ID	Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-3	100.00	<none></none>	0	235.85	58.8
38	Hydrant 05	95.00	<none></none>	7	235.85	60.9
29	J-2	95.00	<none></none>	0	235.86	60.9
31	J-4	94.90	<none></none>	0	235.85	61.0
37	Hydrant 04	94.85	<none></none>	7	235.85	61.0
36	J-9	94.60	<none></none>	0	235.85	61.1
32	J-5	94.50	<none></none>	0	235.85	61.2
33	Hydrant 02	94.50	<none></none>	7	235.85	61.2
28	Hydrant 01	94.50	<none></none>	0	235.86	61.2
35	Hydrant 03	94.00	<none></none>	7	235.85	61.4
34	J-7	93.80	<none></none>	0	235.85	61.5

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

## FlexTable: Pipe Table (5153.wtg)

ID	Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
47	P-9	487	Hydrant 05	Hydrant 04	8.0	Ductile Iron	130.0	0	0.00
64	P-15	1	PMP-1	Hydrant 01	48.0	Ductile Iron	130.0	28	0.00
63	P-14	1	R-1	PMP-1	48.0	Ductile Iron	130.0	28	0.00
49	P-11	370	J-9	Hydrant 03	8.0	Ductile Iron	130.0	-2	0.01
43	P-5	33	Hydrant 02	J-5	8.0	Ductile Iron	130.0	2	0.01
44	P-6	208	J-5	J-4	8.0	Ductile Iron	130.0	-3	0.02
50	P-12	285	J-5	J-9	8.0	Ductile Iron	130.0	5	0.03
48	P-10	82	Hydrant 04	J-9	8.0	Ductile Iron	130.0	-7	0.04
46	P-8	287	J-4	Hydrant 05	8.0	Ductile Iron	130.0	7	0.05
51	P-13	283	J-7	Hydrant 03	8.0	Ductile Iron	130.0	9	0.06
42	P-4	193	J-7	Hydrant 02	8.0	Ductile Iron	130.0	9	0.06
39	P-1	455	J-3	J-2	8.0	Asbestos Cement	140.0	-10	0.07
45	P-7	175	J-3	J-4	8.0	Ductile Iron	130.0	10	0.07
41	P-3	160	J-2	J-7	8.0	Ductile Iron	130.0	18	0.11
40	P-2	114	J-2	Hydrant 01	8.0	Asbestos Cement	140.0	-28	0.18
Head	OSS								

### Current Time: 0.000 hours

Gradient

(ft/ft) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

0.000

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Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1



## FlexTable: Pump Table (5153.wtg)

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
61	PMP-1	94.50	Fire Flow 032020	On	94.50	235.86	28	141.36

#### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

## FlexTable: Reservoir Table (5153.wtg)

ID	ID Label		Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)	
60	R-1	94.50	<none></none>	28	94.50	

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

### Scenario: Peak Hour



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## FlexTable: Junction Table (5153.wtg)

ID	Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-3	100.00	<none></none>	0	235.82	58.8
38	Hydrant 05	95.00	<none></none>	12	235.82	60.9
29	J-2	95.00	<none></none>	0	235.83	60.9
31	J-4	94.90	<none></none>	0	235.82	61.0
37	Hydrant 04	94.85	<none></none>	12	235.82	61.0
36	J-9	94.60	<none></none>	0	235.82	61.1
32	J-5	94.50	<none></none>	0	235.82	61.1
33	Hydrant 02	94.50	<none></none>	12	235.82	61.1
28	Hydrant 01	94.50	<none></none>	0	235.84	61.1
35	Hydrant 03	94.00	<none></none>	12	235.82	61.4
34	J-7	93.80	<none></none>	0	235.82	61.4

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

## FlexTable: Pipe Table (5153.wtg)

ID	Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)
47	P-9	487	Hydrant 05	Hydrant 04	8.0	Ductile Iron	130.0	0	0.00
64	P-15	1	PMP-1	Hydrant 01	48.0	Ductile Iron	130.0	49	0.01
63	P-14	1	R-1	PMP-1	48.0	Ductile Iron	130.0	49	0.01
49	P-11	370	J-9	Hydrant 03	8.0	Ductile Iron	130.0	-3	0.02
43	P-5	33	Hydrant 02	J-5	8.0	Ductile Iron	130.0	3	0.02
44	P-6	208	J-5	J-4	8.0	Ductile Iron	130.0	-6	0.04
50	P-12	285	J-5	J-9	8.0	Ductile Iron	130.0	9	0.06
48	P-10	82	Hydrant 04	J-9	8.0	Ductile Iron	130.0	-12	0.08
46	P-8	287	J-4	Hydrant 05	8.0	Ductile Iron	130.0	12	0.08
51	P-13	283	J-7	Hydrant 03	8.0	Ductile Iron	130.0	16	0.10
42	P-4	193	J-7	Hydrant 02	8.0	Ductile Iron	130.0	16	0.10
39	P-1	455	J-3	J-2	8.0	Asbestos Cement	140.0	-18	0.11
45	P-7	175	J-3	J-4	8.0	Ductile Iron	130.0	18	0.11
41	P-3	160	J-2	J-7	8.0	Ductile Iron	130.0	31	0.20
40	P-2	114	J-2	Hydrant 01	8.0	Asbestos Cement	140.0	-49	0.31
Head	OSS								

### Current Time: 0.000 hours

Gradient

(ft/ft) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000

5153.wtg 3/26/2020

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Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1



### Current Time: 0.000 hours

FlexTable: Pump Table (5153.wtg)

This does not define the pump curve. Minimum of 2 points required. Pump curve should be defined by hydrant flow test as defined per DS&PM. Hydrant flow test should provide supply curve. Provide verifiable pump curve.

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## FlexTable: Reservoir Table (5153.wtg)

ID	ID Label		Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)	
60	R-1	94.50	<none></none>	49	94.50	

### Current Time: 0.000 hours

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

# Scenario: Max Day + Fire Flow



5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1

## Fire Flow Node FlexTable: Fire Flow Report (5153.wtg)

Label	Satisfies Fire Flow Constraints?	Fir (Av	e Flow ailable) gpm)	Flow (Total Needed) (gpm)	Pressure (Residual Lower Limit)	Pressure (Calculated Residual)	Junction w/ Minimum Pressure (Zone)	Junction w/ Minimum Pressure (System)
Hydrant 05	True	7	2,697	1,507	20.0	20.0	Hydrant 04	Hydrant 04
Hydrant 04	True	7	2,759	1,507	20.0	20.0	J <del>)</del> 9	J-9
Hydrant 03	True	6	2,780	1,507	20.0	20.0	Ĵ <u>-</u> 9	J-9
J-3	True	(	2,786	1,500	20.0	20.0	<b>5</b> 4	J-4
J-9	True	7	2,822	1,500	20.0	20.0	Hydrant 04	Hydrant 04
J-4	True	$\boldsymbol{\lambda}$	2,874	1,500	20.0	20.1	<u></u> 3	J-3
Hydrant 02	True	6	2,894	1,507	20.0	20.0	J <mark>)</mark> -5	J-5
J-5	True	6	2,899	1,500	20.0	20.0	Hydrant 02	Hydrant 02
J-7	True	(	2,978	1,500	20.0	20.3	<b>3</b> -3	J-3
J-2	True	6	3,093	1,500	20.0	22.2	<b>-</b> 3-3	J-3
Hydrant 01	True	7	3,415	1,500	20.0	22.4	<b>7</b> -3	J-3
		G.		<u> </u>	yu	<u> </u>	)	

#### Current Time: 0.000 hours

Scottsdale requires 30psi min for fire flow. Revise analysis for final BOD.

5153.wtg 3/26/2020 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley WaterCAD V8i (SELECTseries 3) [08.11.03.17] Page 1 of 1