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WATER • WASTEWATER • RECYCLED WATER

CONSULTING ENGINEERS

WATER SYSTEM ANALYSIS
FOR THE
ONE ALEXANDRIA NORTH PROJECT
IN THE CITY OF SAN DIEGO
PTS NO. 691942

September 23, 2022

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WATER SYSTEM ANALYSIS
FOR THE
ONE ALEXANDRIA NORTH PROJECT
IN THE CITY OF SAN DIEGO
PTS NO. 691942

September 23, 2022

09-23-22

Prepared by:
Dexter Wilson Engineering, Inc.
2234 Faraday Avenue
Carlsbad, CA 92008
760-438-4422

Job No. 1104-002

DEXTER WILSON ENGINEERING, INC.

DEXTER S. WILSON, P.E.
ANDREW M. OVEN, P.E.
NATALIE J. FRASCHETTI, P.E.
STEVEN J. HENDERSON, P.E.
FERNANDO FREGOSO, P.E.
KATHLEEN L. HEITT, P.E.

September 23, 2022 1104-002

Rick Engineering Company
5020 Friars Road
San Diego, CA 92110

Attention: Carlos Avila, Project Manager

Subject: Water System Analysis for the One Alexandria North Project

Introduction

The One Alexandria North project is located in the Torrey Pines area of the City of San Diego. The project is situated east of North Torrey Pines Road and approximately 1,700 feet north of Callan Road. Figure 1 provides a vicinity map for the project.

The One Alexandria North project involves redevelopment of the project area with a campus that will include a two-building research and development (R&D) campus with supporting amenity uses, a Central Utility Plant (CUP) service yard, and a parking structure. The total project gross floor area at buildout will be 256,500 square feet.

The project area currently includes two existing two-story buildings totaling approximately 133,660 square feet, amenities, and a helipad. Both existing buildings (located at 11255 N. Torrey Pines Road and 11355 N. Torrey Pines Road) will be demolished along with the existing amenities and helipad.

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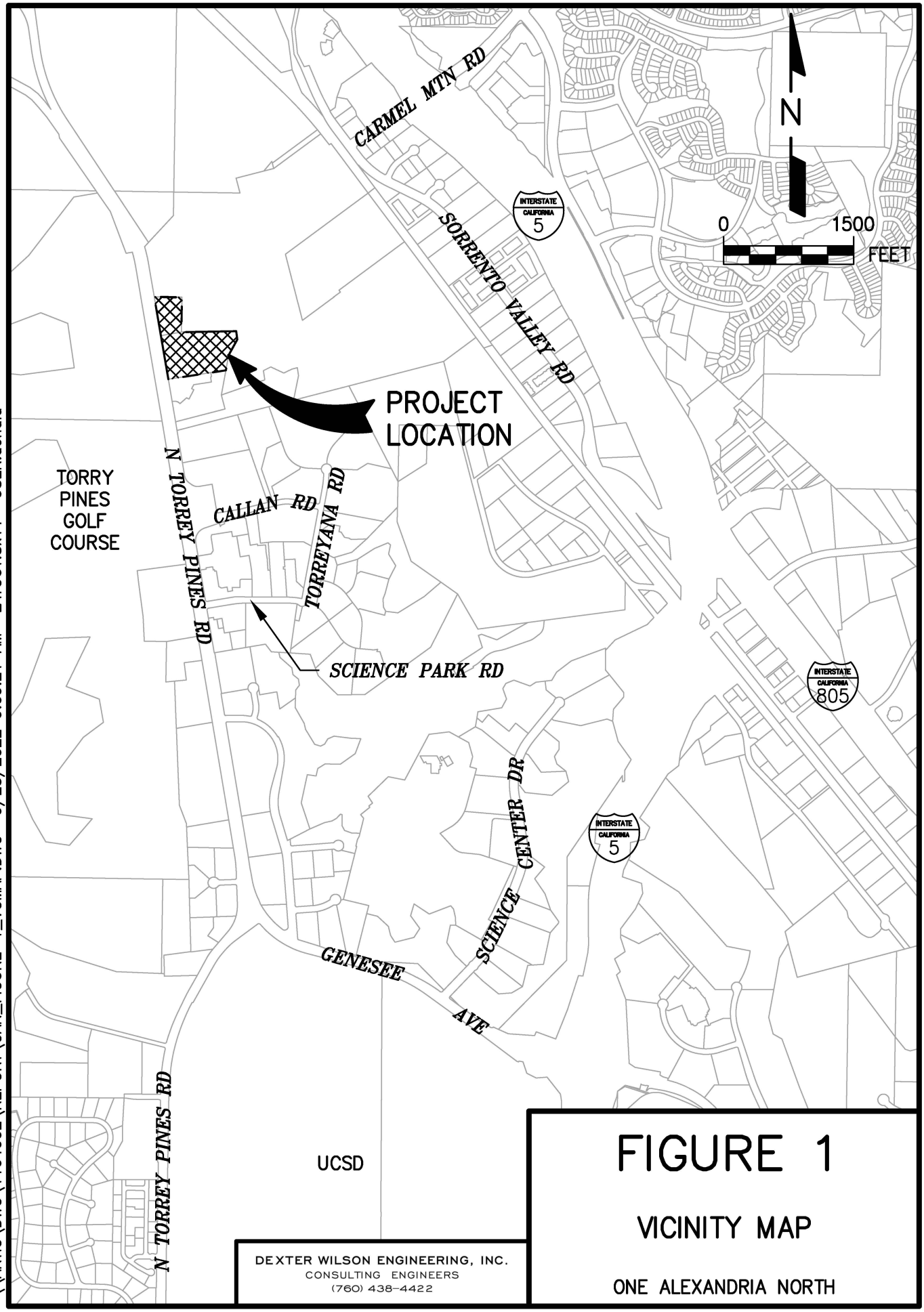

\\ARTIC\DWG\1104002\REPORT\OAN_FIGURE-1_VCMAP.DWG 9/23/2022 9:09:21 AM LAYOUT:8x11 USER:donald

FIGURE 1

VICINITY MAP

ONE ALEXANDRIA NORTH

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One Alexandria North will receive water service from the City of San Diego. The purpose of this letter report is to present the sizing and configuration of the private domestic water system and the private fire protection system serving proposed the proposed buildings for the One Alexandria North project. Recycled water service is also described.

Private Water System Design Criteria

Water service for the One Alexandria North project will consist of five separate private water systems; two will be for private domestic water service, two will be for private fire protection service, and the fifth will be for recycled water service.

The domestic water systems will be sized in accordance with the 2019 California Plumbing Code.

The fire protection component of the water system is designed based on the required fire flow for the project which was estimated using Table 2-3 in Book 2 of the City of San Diego Design Guidelines and Standards. Per 2-3 of the City of San Diego Design Guidelines and Standards, the fire flow requirement for the project is estimated to be 6,000 gpm as the R&D campus most closely resembles an industrial land use. During fire flow demands, residual pressure must be greater than 20 psi in the water system.

The recycled water system is described in this report for informational purposes. Sizing of the landscape irrigation will be by the project landscape architect. The dedicated recycled water line to the Central Utility Plant will be confirmed by the project MEP.

Existing Water System

The existing potable water system in the vicinity of the One Alexandria North project is presented on Figure 2. The project site is within the City of San Diego North City 610 Pressure Zone water system. There is an existing 12-inch public potable water line that traverses the One Alexandria North site from the west end of the site to the southeast end of the site. This 12-inch public potable water line is located within a 15-foot City of San Diego easement. Near the west end of the project site, the existing 12-inch public potable water line connects to an existing 24-inch potable transmission line located in North Torrey Pines Road. Near the southeast end of the site, the existing 12-inch public potable water line extends south to an existing 12-inch public potable water loop that serves existing properties south of the One Alexandria North project. The east side of the project site includes an existing 4-inch public potable water line that is connected to the onsite 12-inch public potable water line.

There are existing service laterals and meters that serve the existing buildings within the project site that will be removed and can be exchanged for capacity credit with the City of San Diego and the San Diego County Water Authority. The capacity credit can be applied towards water meter acquisitions for One Alexandria North.

Water Service Overview

Water service to the project will be from the City of San Diego North City 610 Pressure Zone water system. Bottom floor elevations (basement or level 1) within the project boundary range from 389 feet to 429 feet. This results in a maximum static water pressure range of 78 psi to 95 psi for the project. When static pressure exceeds 80 psi for a building, the California Plumbing Code requires a pressure regulating valve at the building supply. A pressure regulating valve will be required for all buildings except for Building B4.

LEGEND

PROJECT BOUNDARY

EXISTING 610 ZONE PUBLIC WATER LINE

EXISTING 610 ZONE PUBLIC WATER LINE TO BE REMOVED

EXISTING PUBLIC FIRE HYDRANT

EXISTING PUBLIC FIRE HYDRANT TO BE REMOVED

N

0 150 FEET

EXISTING HELIPAD

EXISTING CITY OF SAN DIEGO WATER AND SEWER EASEMENT TO BE VACATED

EXISTING AMENITIES

11255 N TORREY PINES RD

11355 N TORREY PINES RD

N TORREY PINES RD

EX.4"

EX.12"

EX.24"

EX.10"

EX.6"

FIGURE 2

EXISTING WATER SYSTEM

ONE ALEXANDRIA NORTH

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To accommodate the proposed development, the existing 12-inch public potable water line that traverses the site will be relocated within the project site and the existing 4-inch public potable water line within the site will be removed. To do so a portion of the existing easement for the existing 12-inch line will be vacated and a new easement will be provided for the relocated line. The relocation of the existing 12-inch public potable water line will not have a negative impact on the existing water system as the new public potable water line will be of the same size and will be reconnected in such a way that will allow it to retain its function as a looped water line.

The private domestic water systems will connect to the relocated 12-inch public water line within the site. The private domestic water systems will serve the proposed buildings within the project and will consist of a master domestic water meter followed by a reduced pressure principle backflow preventer. Sizing of the private domestic water systems is discussed in more detail later in this report.

The private fire protection systems will connect to the relocated 12-inch public water line within the site and the existing 12-inch public water line within the northwest portion of the project site just east of North Torrey Pines Road. Each connection will include a reduced pressure detector assembly backflow preventer. Sizing of the private fire protection systems is discussed in more detail later in this report.

Within the project site, the private fire protection systems will supply private fire hydrants and building fire sprinkler laterals. Fire sprinkler laterals shall be sized by the project fire sprinkler designer and are outside the scope of work for this report.

The onsite recycled water system will supply onsite landscape irrigation. It is anticipated that the CUP cooling towers will also use recycled water; however, this must be confirmed by the CUP designer. The domestic water system sizing presented later in this report conservatively assumes the cooling towers will utilize potable water.

Available Potable Water System Pressure

The available water system pressure in the vicinity of the One Alexandria North project was estimated based on fire hydrant flow test data provided by the City of San Diego. The fire hydrant flow test data is based on hydraulic modeling done by the City of San Diego.

The fire hydrant flow test was completed for an existing fire hydrant connected to the 12-inch pipeline within the northwest portion of the project site just east of North Torrey Pines Road. The fire hydrant flow test data for each fire hydrant is provided in Appendix A for reference.

Using the data provided by the hydrant flow test, an extrapolation calculation was done to determine the available pressure and hydraulic grade line at various flow values for the fire hydrant. The extrapolation calculations for each fire hydrant are provided at the end of Appendix A.

The extrapolation calculation indicate that the fire hydrant tested can deliver 2,733 gpm at 20 psi. The One Alexandria North project has an estimated fire flow requirement of 6,000 gpm at 20 psi; thus, it is evident that the existing public water system cannot supply a 6,000 gpm fire flow at 20 psi residual within the project site.

Fire Flow Requirement. The fire flow requirement for the site is estimated based on planning criteria. The actual fire flow requirement for the project may be lower as it will be based on the California Fire Code which takes into account building square footages, construction types, and fire sprinkler designs to determine a fire flow requirement. Once building sizes, construction types, and fire sprinkler designs for each building within the project are finalized, the fire flow requirement will need to be revisited to determine whether public and/or private improvements will be required to provide adequate flow and pressure for fire protection within the site. The analyses presented later in this report for the private fire protection system determine the maximum fire flow that can be provided given the available pressure in the existing water system.

Potable Water System Meter Sizing

Two master potable water meters will provide domestic water service to the proposed buildings within the One Alexandria North project. One meter will provide service to the Southern Buildings (Buildings B1, B2, B3, and the CUP) and the second meter will provide service to the Northern Buildings (Building B4 and the proposed parking structure). The master meter size was determined based on the total number of Water Fixture Units (WFUs) that will be supplied through the meter and the CUP water demand. Irrigation internal to the project is assumed to be connected separately; therefore, only domestic and CUP demands are being met by the potable water service meters.

A summary of the water fixtures for the Southern Buildings was provided by DEC Engineers (see Appendix B). The water fixture unit count for the Northern Buildings was estimated based on similar buildings proposed for the One Alexandria Square project (PTS No. 660043) south of One Alexandria North. Table 1 presents a summary of the Water Fixture Unit count for the proposed buildings within the One Alexandria North project.

TABLE 1
ONE ALEXANDRIA NORTH PROJECT
WATER FIXTURE UNIT SUMMARY

Building Description	Water Fixture Units
Southern Buildings (B1, B2, B3, CUP)	90 [1]
Northern Buildings (B4, Parking Structure)	20 [2]

1. Based on WFU estimate provided by the project MEP.
2. Estimated based on similar buildings proposed for the One Alexandria Square project (PTS No. 660043).

The WFU count for the Northern Buildings is 90 and the WFU count for the Southern Buildings is 20. Using Chart A 103.1 (1) from the California Plumbing Code, the WFU data was converted to maximum expected demand. Based on Chart A 103.1 (1), 90 WFUs converts to a maximum expected demand of 65 gpm and 20 WFUs converts to a maximum expected demand of 35 gpm.

The project will include a Central Utility Plant (CUP) with a cooling tower that will have a peak demand of 97 gpm per Appendix B. Thus, the total maximum expected demand for the meter serving the Southern Buildings is 162 gpm (65 gpm + 97 gpm = 162 gpm) and the maximum expected demand for the meter serving the Northern Buildings is 35 gpm.

Once the maximum expected demand for the proposed buildings was established, the required meter sizes were determined using the City of San Diego meter sizing criteria presented in Appendix C.

For the Southern Buildings, the maximum expected demand of 162 gpm will require a 3-inch meter which has a maximum allowable capacity of 280 gpm. When a meter 3-inch or larger is required, it is the City of San Diego's standard practice to install two smaller meters (next size down), in lieu of a single larger meter, for redundancy. Thus, two 2-inch meters will be installed for the Southern Buildings. Each meter will have its own 2-inch water service lateral and will be followed by a 2-inch reduced pressure principle backflow preventer. The meter sizing for the Southern Buildings assumes that the CUP cooling towers will use potable water. Meter sizing will need to be revisited once final architectural plans for the Southern Buildings become available and/or it is determined that the CUP will utilize recycled water rather than potable water.

For the Northern Buildings, the maximum expected demand of 35 gpm will require a 1-inch meter which has a maximum allowable capacity of 40 gpm. The meter will have a 1-inch water service lateral and will be followed by a 1-inch reduced pressure principle backflow preventer. Once final architectural plans for the Northern Buildings become available, the WFU count for the Southern Building will need to be revisited to provide a final meter size.

Proposed Private Domestic Water Systems

The configuration and recommended sizes for the private domestic water systems are presented in Figure 3. The private domestic water system piping for One Alexandria North is sized in accordance with the 2019 California Plumbing Code and is based on the maximum expected demand for the domestic water systems. Velocities within the private domestic water system are limited to a maximum pipeline velocity of eight feet per second (8 fps). Table 2 presents the maximum number of WFUs that can be served by a given pipe diameter without exceeding a velocity of 8 fps.

TABLE 2
SIZE OF PRIVATE DOMESTIC SYSTEM PIPING
BASED ON NUMBER OF
WATER FIXTURE UNITS SERVED

Number of Water Fixture Units	Minimum System Pipe Size[1]
0 – 14	¾-inch
15 – 29	1-inch
30 – 53	1 ¼-inch
54 – 105	1 ½-inch
106 – 270	2-inch
271 – 500	2 ½-inch
501 – 780	3-inch
781 – 1,920	4-inch
1,921 – 3,575	5-inch
3,576 – 6,175	6-inch
6,176 – 13,986	8-inch

[1] Based on velocity of 8 fps

With bottom elevations (basement or Level 1) ranging from 389 feet to 429 feet, maximum working pressures onsite are estimated to range from 53 psi to 71 psi (supply hydraulic grade line of 587 feet and assumes 15 psi loss through meter and backflow). The private domestic water system sizing will need to be confirmed once final architectural plans become available.

LEGEND

- PROJECT BOUNDARY
- EXISTING 610 ZONE PUBLIC WATER LINE
- EXISTING 610 ZONE PUBLIC WATER LINE TO BE REMOVED
- PROPOSED 610 ZONE PUBLIC WATER LINE
- PROPOSED PRIVATE DOMESTIC WATER LINE
- EXISTING PUBLIC FIRE HYDRANT
- EXISTING PUBLIC FIRE HYDRANT TO BE REMOVED
- PROPOSED PUBLIC FIRE HYDRANT
- PROPOSED METER
- PROPOSED BACKFLOW PREVENTER

PROPOSED WATER AND SEWER ACCESS EASEMENT TO BE DEDICATED TO CITY OF SAN DIEGO

EXISTING CITY OF SAN DIEGO WATER AND SEWER EASEMENT TO BE VACATED

(2) PROPOSED 2" METERS AND BACKFLOW PREVENTERS

CONNECT TO EXISTING 12" LINE

PROPOSED 1" METER AND BACKFLOW PREVENTER

CONNECT TO EXISTING 12" LINE

N

0 150 FEET

NOTE:
METER ASSEMBLIES SHOWN ARE BASED ON PRELIMINARY METER SIZING. METER SIZES AND CONFIGURATIONS WILL BE CONFIRMED UPON FINAL BUILDING DESIGN.

B1 B2 B3 B4 PS1 CUP

N TORREY PINES RD

FIGURE 3

PROPOSED PRIVATE DOMESTIC WATER SYSTEM

ONE ALEXANDRIA NORTH

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Proposed Private Fire Protection Systems

The proposed private fire protection systems for the One Alexandria North project are presented in Figure 4. The private fire protection system for the Southern Buildings will make two connections to the existing potable water system: one connection will be made to the proposed 12-inch public potable water line near the southeast corner of the site and a second connection will be made to the existing 12-inch public water line near the northwest corner of the site. The private fire protection system for the Northern Buildings will make one connection to the proposed 12-inch public potable water line near the northwest corner of the site. All private fire hydrants and private fire sprinkler laterals within the One Alexandria North project will be connected to the private fire protection system.

As previously mentioned, the estimated fire flow requirement of 6,000 gpm for the project is not achievable. To determine the maximum fire flow available within the site, a water system computer model was generated for the project's fire protection system.

Model Development. Analysis using the KYPIPE computer software program developed by the University of Kentucky determined residual pressures throughout the fire protection system. This computer software utilizes the Hazen-Williams equation for determining headloss in pipes. The Hazen-Williams "C" value used for all pipe sizes in our analysis is 120.

Fitting and Valve Losses. To simulate minor losses through pipe fittings and valves, minor loss coefficients or "k" values for all fittings associated with pipes were included in the hydraulic model.

Backflow Assembly Losses. Reduced pressure detector assembly backflow preventers were modeled as loss element nodes. A loss element node uses a flow-versus-pressure-loss curve to determine the pressure loss at a given flow. Appendix D presents a candidate reduced pressure detector assembly backflow preventer. The backflow preventer manufacturer literature includes charts that show pressure loss as a function of flow. These charts were used to develop the flow-versus-pressure-loss curve for the loss element node. The pressure losses are reflected in the computer modeling as losses calculated in feet.

LEGEND

PROJECT BOUNDARY

EXISTING 610 ZONE PUBLIC WATER LINE

EXISTING 610 ZONE PUBLIC WATER LINE TO BE REMOVED

PROPOSED 610 ZONE PUBLIC WATER LINE

PROPOSED PRIVATE FIRE PROTECTION LINE

EXISTING PUBLIC FIRE HYDRANT

EXISTING PUBLIC FIRE HYDRANT TO BE REMOVED

PROPOSED PUBLIC FIRE HYDRANT

PROPOSED PRIVATE FIRE HYDRANT

PROPOSED BACKFLOW PREVENTER

PROPOSED WATER AND SEWER ACCESS EASEMENT TO BE DEDICATED TO CITY OF SAN DIEGO

DEFERRED PARTIAL VACATION OF A PORTION OF EX. 15' SEWER AND WATER EASEMENT(S) AS A CONDITION OF THIS PERMIT

PROPOSED 8" BACKFLOW PREVENTER

CONNECT TO EXISTING 12" LINE

FIRE SPRINKLER LATERAL, TYP.

PROPOSED 8" BACKFLOW PREVENTER

PORTION OF EX. 15' SEWER AND WATER EASEMENT(S) TO REMAIN

CONNECT TO EXISTING 12" LINE

PROPOSED 8" BACKFLOW PREVENTER

B1

B2

B3

B4

CUP

PS1

EX.4"

EX.12"

EX.24"

EX.10"

EX.6"

12"

8"

N TORREY PINES RD

0 150 FEET

NOTE:
FIRE SPRINKLER LATERALS TO BE SIZED BY FIRE SPRINKLER DESIGNER.

FIGURE 4

PROPOSED PRIVATE FIRE PROTECTION SYSTEM

ONE ALEXANDRIA NORTH

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CONSULTING ENGINEERS
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Fire Protection System Analysis. Appendix E presents the computer modeling results for the private fire protection system. Exhibit A shows the Node and Pipe Diagram for the private fire protection system model. Based on the model results a maximum fire flow of 2,100 gpm is available within the project site.

The proposed private fire protection system for the Southern Buildings consists of two 8-inch fire service laterals each with an 8-inch reduced pressure detector assembly backflow preventer and a 12-inch loop onsite to maximize available fire flow to the site. The proposed private fire protection system for the Northern Buildings consists of one 8-inch fire service lateral with an 8-inch reduced pressure detector assembly backflow preventer and a 12-inch water line to maximize available fire flow to the site.

Once building sizes, construction types, and fire sprinkler designs for each building within the project are finalized, a fire flow requirement can be provided for the project. If the new required fire flow is less than or equal to 2,100 gpm, then the proposed fire protection system shown on Figure 4 will be adequate. If the new required fire flow is greater than 2,100 gpm, then the fire flow test data provided by the City of San Diego should be confirmed (via additional City of San Diego model runs or by conducting a physical fire hydrant flow test in the field) to determine potential water system improvements accordingly.

Proposed Private Recycled Water System

Recycled water use onsite is proposed for landscape irrigation service. It is anticipated that the CUP cooling towers will also use recycled water; however, this must be confirmed by the CUP designer. One connection to the existing offsite recycled water main in North Torrey Pines Road is proposed.

Recycled water service will be from the City's 640 Pressure Zone. With site elevations of approximately 419 feet, onsite working pressures (assuming 20 psi loss through meter and backflow) are anticipated to be approximately 75 psi.

Conclusions and Recommendations

The following recommendations and conclusions are presented based upon the private water system analyses performed for the One Alexandria North project.

1. The One Alexandria North project will consist of four buildings (Buildings B1, B2, B3, and B4), a parking structure, and a Central Utility Plant nine proposed buildings.

2. Water service to the project will be provided by the City of San Diego North City 610 Pressure Zone public water system.

3. Bottom floor elevations (basement or level 1) within the project boundary range from 389 feet to 429 feet. This results in a maximum static water pressure range of 78 psi to 95 psi for the project. When static pressure exceeds 80 psi for a building, the California Plumbing Code requires a pressure regulating valve at the building supply. A pressure regulating valve will be required for all buildings except for Building B4.

4. With bottom elevations (basement or Level 1) ranging from 389 feet to 429 feet, maximum working pressures for the proposed domestic water system onsite are estimated to range from 53 psi to 71 psi.

5. The existing domestic water service laterals that will be removed will include water meters that can be exchanged for capacity credit with the City of San Diego and the San Diego County Water Authority and can be applied towards water meter acquisitions for One Alexandria North.

6. In order to accommodate the proposed development an existing 12-inch public potable water line will be relocated through the site and a 4-inch public potable water line will be removed.

7. Figure 3 presents the proposed private domestic water system for the project. System sizing will need to be confirmed once final architectural plans become available.

8. Figure 4 presents the proposed private fire protection system for the project.

9. The fire flow available within the project site is 2,100 gpm. This is less than the planning criteria value of 6,000 gpm. Once building sizes, construction types, and fire sprinkler designs for each building within the project are finalized, the fire flow requirement will need to be determined using the California Fire Code.

10. If the final fire flow requirement is less than or equal to 2,100 gpm, then the proposed fire protection system shown on Figure 4 will be adequate.

11. If the new fire flow requirement is greater than 2,100 gpm, then the fire flow test data provided by the City of San Diego should be confirmed to ensure there are no City modeling discrepancies to determine the required offsite and onsite water system improvements accordingly.

12. For recycled water service, one connection will be made to the City's 640 Pressure Zone Recycled Water System. The connection will include a meter and backflow preventer to be sized by the project landscape architect.

13. This report presents the sizing and general schematic layout of the proposed private water systems. The design engineer for these systems should incorporate valves, fittings, and appurtenances as needed for proper installation and long-term operation of the private water system.

14. Given the proposed use of recycled water onsite, additional valves are recommended to minimize shutdown areas during cross connection testing.

15. If PVC pipe is used for the private water lines within the project, we recommend pipes 4-inch through 12-inch diameter to be AWWA C900, DR-18 (Class 235) for both the private domestic water system and the private fire protection system piping. Pipes smaller than 4-inch in diameter should be solvent welded Schedule 40 PVC; as an alternative, copper piping may be used.

Thank you for the opportunity to assist you with the water system planning for this project. If you have any questions regarding the information presented in this report, please do not hesitate to call.

Dexter Wilson Engineering, Inc.

Fernando Fregoso, P.E.

Attachments

FF:ah

APPENDIX A

FIRE HYDRANT FLOW TEST DATA
AND
EXTRAPOLATION CALCULATIONS

City of San Diego
Development Services
Attention: **Hydrant Flow Request**
1222 First Ave., MS-401
San Diego, CA 92101
(619) 446-5000

Hydrant Flow Request

FORM
DS-160
October 2016

Fill out the information below completely for all sprinkler system flow requests, including NFPA 13, 13D and 13R systems. E-mail form to: DSDHydrantFlow@sandiego.gov, or mail request to the above address.

Please print or type legibly.

Company Requesting Hydrant Flow:
Dexter Wilson Engineering

Telephone No: 760-438-4422
Fax No:
E-mail Address: Fernando@dwilsoneng.com

Project Number for the Building Permits:

Location of Hydrants:
North Torrey Pines Road

Cross Street:
City: San Diego
State: CA
ZIP Code: 92037

FOR CITY USE ONLY

Facility Sequence Number: (FSN): 517624

Static: 65.7 PSI
Elevation: 437' FEET

Pitot: model PSI
Residual: 56.1 PSI

Date: 12/20/2021
Flow: 1176 GPM

Researched in database by: O. Paraiso

The information provided above is based upon a water model. It is the contractor's responsibility to confirm the available static pressure at the system point of connection. If a discrepancy is noticed at that time, notify DSDHydrantFlow@sandiego.gov as soon as possible.

Please draw an accurate map for fire hydrant data

Fire Hydrant Flow Test Date 12/20/2021

Input Flow Test Results

Static Pressure	65.7 PSI			
Residual Pressure	56.1 PSI			
Hydrant Flow	1176 GPM			
Actual Hydrant Elevation	Feet	HGL	Feet	
Estimated Hydrant Elevation	437 Feet	HGL	588.6 Feet	

Equation $\Delta H = k\,Q^{1.85}$

k = 4.62651E-05

Extrapolated Calculations

Q, gpm	Residual Pressure	Available HGL
200	65.3 psi	587.8 ft
700	62.0 psi	580.1 ft
900	59.8 psi	575.1 ft
1100	57.2 psi	569.1 ft
1300	54.1 psi	562.0 ft
1500	50.6 psi	553.9 ft
1700	46.7 psi	544.8 ft
1900	42.4 psi	534.8 ft
2000	40.1 psi	529.5 ft
2100	37.6 psi	523.9 ft
2300	32.5 psi	512.0 ft
2500	27.0 psi	499.2 ft
2700	21.0 psi	485.5 ft
2900	14.7 psi	471.0 ft
3100	8.0 psi	455.5 ft
3300	0.9 psi	439.2 ft
3500	-6.5 psi	422.0 ft
3700	-14.3 psi	404.0 ft
3900	-22.5 psi	385.1 ft
4000	-26.7 psi	375.3 ft
4100	-31.1 psi	365.3 ft
4300	-40.0 psi	344.8 ft
4500	-49.2 psi	323.4 ft
5000	-74.0 psi	266.3 ft
5760	-115.8 psi	169.8 ft
5750	-115.2 psi	171.2 ft

Residual Pressure, psi	Available Flow, gpm
0 psi	3,326
10 psi	3,042
20 psi	2,733
30 psi	2,392
40 psi	2,003
50 psi	1,534
60 psi	887
70 psi	Residual Pressure Exceeds Static Pressure
80 psi	Residual Pressure Exceeds Static Pressure
90 psi	Residual Pressure Exceeds Static Pressure
100 psi	Residual Pressure Exceeds Static Pressure
110 psi	Residual Pressure Exceeds Static Pressure
120 psi	Residual Pressure Exceeds Static Pressure
130 psi	Residual Pressure Exceeds Static Pressure
140 psi	Residual Pressure Exceeds Static Pressure
150 psi	Residual Pressure Exceeds Static Pressure
160 psi	Residual Pressure Exceeds Static Pressure
170 psi	Residual Pressure Exceeds Static Pressure
180 psi	Residual Pressure Exceeds Static Pressure
190 psi	Residual Pressure Exceeds Static Pressure

APPENDIX B

WATER FIXTURE UNIT COUNT
AND
CUP COOLING TOWER DEMAND ESTIMATE

PLUMBING FIXTURE DEMAND CALC

PROJECT	OAN - Core and Shell
DATE	12/22/2021
CALCULATION BY	Omar Varela

FIXTURE UNIT SUMMARY

PLUMBING CODES REFRENCED:	**CPC**			**FLUSH TYPE:**		**FLUSH VALVE**	
FIXTURE	QTY	COLD WATER		HOT WATER		WASTE	
		FU/FIX	FUs	FU/FIX	FUs	FU/FIX	FUs
BAR SINK, PRIVATE		1		1		1	
BAR SINK, PUBLIC		2		2		2	
BATHTUB 3/4" INCH FILL VALVE		10		10		2	
BATHTUB OR COMBINATION BATH/SHOWER		4		4		2	
BIDET (1-1/2" TRAP)		1		1		2	
BIDET (1-1/4" TRAP)		1		1		1	
CLINICAL FAUCET SINK		3		3		6	
CLINICAL FLUSHOMETER VALVE		8		8		6	
CLOTHES WASHER		4		4		3	
DENTAL UNIT, CUSPIDOR		1		1		1	
DISHWASHER, DOMESTIC		1.5		1.5		2	
DRINKING FOUNTAIN OR WATER COOLER (ASSEMBLY)		0.75		0.75		1	
DRINKING FOUNTAIN OR WATER COOLER (PRIVATE/PUBLIC)		0.5		0.5		0.5	
EMERGENCY EYE WASH		0.5		0.5		0.5	
HOSE BIBB (ADDITIONAL)	1	1	1	1	1	0	0
HOSE BIBB (FIRST)	5	2.5	12.5	2.5	12.5	0	0
KITCHEN SINK, DOMESTIC		1.5		1.5		2	
LAUNDRY SINK		1.5		1.5		2	
LAVATORY	16	1	16	1	16	1	16
LAWN SPRINKLER, EACH HEAD		1		1		0	
MOBILE HOME, EACH (MINIMUM)		12		12		6	
SHOWER PER HEAD	10	2	20	2	20	1	10
SINK, SERVICE OR MOP BASIN (PRIVATE)		1.5		1.5		3	
SINK, SERVICE OR MOP BASIN (PUBLIC)		3		3		3	
URINAL, 1.0 GPF FLUSHOMETER VALVE (ASSEMBLY)		5		5		5	
URINAL, 1.0 GPF FLUSHOMETER VALVE (PRIVATE)		3		3		2	
URINAL, 1.0 GPF FLUSHOMETER VALVE (PUBLIC)		4		4		2	
WASH FOUNTAIN (1-1/2" TRAP)		4		4		2	
WASH FOUNTAIN (2" TRAP)		4		4		3	
WASH, EACH SET OF FAUCETS		2		2		2	
WATER CLOSET, 1.6 GPF FLUSHOMETER VALVE (ASSEMBLY)		8		0		6	
WATER CLOSET, 1.6 GPF FLUSHOMETER VALVE (PRIVATE)		5		0		3	
WATER CLOSET, 1.6 GPF FLUSHOMETER VALVE (PUBLIC)	8	5	40	0	0	4	32
TOTAL QTY:	40	**TOTAL CW FUs:**	**90**	**TOTAL HW FUs:**	**50**	**TOTAL WASTE FUs:**	**58**

PLUMBING FIXTURE DEMAND CALC

PROJECT	OAN - Core and Shell
DATE	12/22/2021
CALCULATION BY	Omar Varela

**All formulas and calculations were referenced from Domestic Water Heating Design Manual, ASPE*

TOTAL FLOW (GPM)	
SOURCE	FLOW (GPM)
COOLING TOWER	97
CAGE WASHER	
GLASS WASHER	
STRILIZER	
DI/RO SKID	
DEMAND FLOW FROM FIXTURES	**64.6**
TOTAL FLOW (GPM)	**161.6**

WATER PRESSURE CALCULATIONS	
FLUSH TYPE	FLUSH VALVE
SOFTWATER/FILTER	
NUMBER OF STORIES	
BUILDING HEIGHT (FT.)	
AVG. WATER PRESSURE IN STREET (PSI)	
METER PRESSURE LOSS (PSI)	
BACKFLOW PREVENTOR PRESSURE LOSS (PSI)	
AVAILABLE BUILDING PRESSURE (PSI)	
PRESSURE REGULATOR/BOOSTER PUMP	
STATIC PRESSURE LOSS (BUILDING HEIGHT*0.43) (PSI)	
MINIMUM PRESSURE REQUIRED AT REMOTE FIXTURE	
AVAILABLE PRESSURE FOR WATER SYSTEM (PSI)	
MAXIMUM LENGTH OF WATER SYSTEM (FT.)	
TDL OF WATER SYSTEM (LENGTH*1.3) (FT.)	
ALLOWABLE PRESSURE DROP PER 100 FEET OF LENGTH	

MINIMUM PIPE DIAMETER FOR WASTE				
WASTE FUs	SLOPE PER FOOT			
58	1/16"	1/8"	1/4"	1/2"
DIA. (IN)	8"	4"	4"	4"

COLD WATER PIPE SCHEDULE (8 FT/SEC)				
PIPE SIZE	GPM (MAX)	VELOCITY (FT/SEC)	FIXTURE UNITS	
			FLUSH TANK	FLUSH VALVE
1/2"	-	-	-	-
3/4"	-	-	-	-
1"	-	-	-	-
1-1/4"	-	-	-	-
1-1/2"	-	-	-	-
2"	-	-	-	-
2-1/2"	-	-	-	-
3"	-	-	-	-
4"	-	-	-	-

HOT WATER PIPE SCHEDULE (5 FT/SEC)				
PIPE SIZE	GPM (MAX)	VELOCITY (FT/SEC)	FIXTURE UNITS	
			FLUSH TANK	FLUSH VALVE
1/2"	-	-	-	-
3/4"	-	-	-	-
1"	-	-	-	-
1-1/4"	-	-	-	-
1-1/2"	-	-	-	-
2"	-	-	-	-
2-1/2"	-	-	-	-
3"	-	-	-	-
4"	-	-	-	-

APPENDIX C

CITY OF SAN DIEGO
ALLOWABLE DOMESTIC METER CAPACITIES

2015 AWWA Standards for Water Meter Capacities

Meter Size	City of San Diego 1973 AWWA Table		2015 AWWA Standards	
	Max Capacity per AWWA (gpm)	City Uses 80% of Max Capacity (gpm)	Max Capacity per AWWA (gpm)	City Uses 80% of Max Capacity (gpm)
Displacement Type Meters - AWWA C700-15				
5/8 x 3/4	20	16	20	16
3/4	30	24	30	24
1	50	40	50	40
1-1/2	100	80	100	80
2	160	128	160	128
Compound Type Meters - AWWA C702-15				
3	320	250	350	280
4	500	400	600	480
6	1,000	800	1,350	1,080
8	1,600	1,280	1,600	1,280
Turbine Type Meters - AWWA C701-15 Class II				
3	350	280	435	348
4	600	480	750	600
6	1,250	1,000	1,600	1,280
8			2,800	2,240
10			4,200	3,360
12			5,300	4,240
16			7,800	6,240
20			12,000	9,600

APPENDIX D

CANDIDATE REDUCED PRESSURE DETECTOR ASSEMBLY BACKFLOW PREVENTER

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

LEAD FREE*

Series LF957RPDA, LF957NRPDA, LF957ZRPDA

Reduced Pressure Detector Assemblies

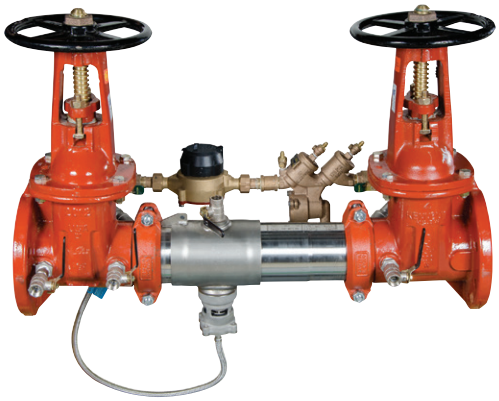
Sizes: 2½" – 10"

Series LF957RPDA, LF957NRPDA, LF957ZRPDA Reduced Pressure Detector Assemblies provide protection to the potable water system from contamination in accordance with national plumbing codes. The LF957RPDA, LF957NRPDA, LF957ZRPDA are normally used in health hazard applications to protect against backsiphonage and backpressure. The Watts LF957RPDA, LF957NRPDA, LF957ZRPDA are used to monitor unauthorized use of water from the fire protection system. They feature Lead Free* construction to comply with Lead Free* installation requirements.

Features

- Lead Free* construction
- Extremely compact design
- 70% lighter than traditional designs
- 304 (Schedule 40) stainless steel housing & sleeve
- Groove fittings allow integral pipeline adjustment
- Patented torsion spring check provides lowest pressure loss
- Unmatched ease of serviceability
- Replaceable check disc rubber
- Available with grooved butterfly valve shutoffs
- Bottom mounted cast stainless steel relief valve
- Metered bypass to detect leakage or theft of water from the fire sprinkler system

***The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.**



LF957RPDA-OSY

Specifications

The Lead Free* Reduced Pressure Detector Assembly shall consist of two independent torsion spring check modules, a differential pressure relief valve located between and below the two modules, two drip tight shutoff valves, and required torsion spring check modules and relief valve shall be contained within a sleeve accessible single housing constructed from 304 (Sch 40) stainless steel pipe with groove end connections. Torsion spring checks shall have reversible elastomer discs and in operation produce drip tight closure against reverse flow caused by backpressure or backsiphonage. The Lead Free* Reduced Pressure Detector Assemblies shall comply with state codes and standards, where applicable, requiring reduced lead content. The bypass assembly consists of a meter registering either gallon or cubic measurements, a double check assembly and required test cocks. Assembly shall be Watts Series LF957RPDA, LF957NRPDA, LF957ZRPDA.

NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

WATTS®

Available Models

Suffix:

OSY – UL/FM outside stem and yoke, resilient seated gate valves

BFG – UL/FM grooved gear operated butterfly valves with tamper switch

*OSY FxG – Flanged inlet gate connection and grooved outlet gate connection

*OSY GxF – Grooved inlet gate connection and flanged outlet gate connection

*OSY GxG – Grooved inlet gate connection and grooved outlet gate connection

Available with grooved NRS gate valves - consult factory†
Post indicator plate and operating nut available - consult factory†
†Consult factory for dimensions

Materials

Housing & Sleeve: 304 (Schedule 40) Stainless Steel
Elastomers: EPDM, Silicone and Buna 'N'
Torsion Spring Checks: Noryl®, Stainless Steel
Check Discs: Reversible Silicone or EPDM
Test Cocks: Lead Free* Bronze Body
Pins & Fasteners: 300 Series Stainless Steel
Springs: Stainless Steel

Pressure — Temperature

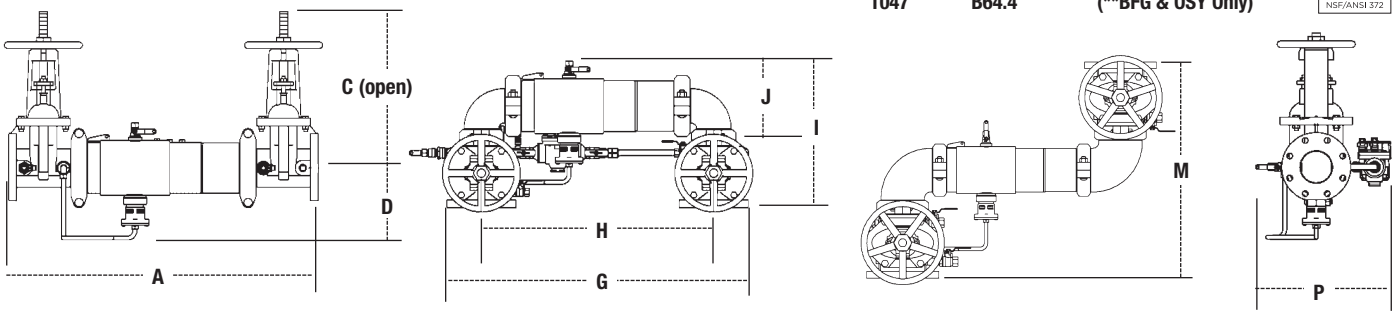
Temperature Range: 33°F – 110°F (0.5°C – 43°C)
Maximum Working Pressure: 175psi (12.1 bar)

Approvals

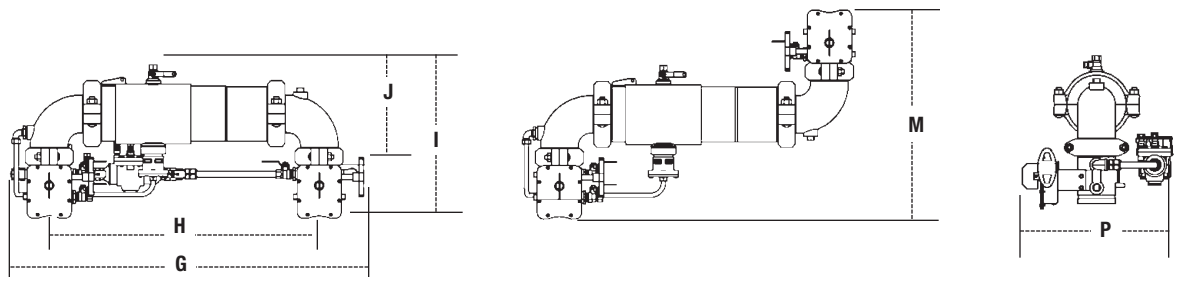
- Approved by the Foundation for Cross-Connection Control and Hydraulic Research at The University of Southern California (FCCCHR-USC)
  (Excluding 6", 8", and 10" 'N' and 'Z' Pattern)
- AWWA C511-97

1047 B64.4 (**BFG & OSY Only)

Dimensions — Weight



SIZE	DIMENSIONS																		WEIGHT			
	A		C (OSY)		D		G		H		I		J		M		P		957RPDA		957NRPDA	
in.	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kgs.*	*lbs.*	*kgs.*
2½	30¾	781	16⅜	416	6½	165	29 1/16	738	21½	546	15½	393	8 13/16	223	21¼	540	13 3/16	335	142	64	150	68
3	31¾	806	18⅞	479	6 11/16	170	30¼	768	22¼	565	17⅛	435	9 3/16	233	23	584	14½	368	162	73	175	79
4	33¾	857	22¾	578	7	178	33	838	23½	597	18½	470	9 15/16	252	26¼	667	15 3/16	386	178	81	201	91
6	43½	1105	30⅛	765	8½	216	44¾	1137	33¼	845	23 3/16	589	13 1/16	332	32¼	819	19	483	312	142	353	160
8	49¾	1264	37¾	959	9 11/16	246	54⅛	1375	40⅛	1019	27 7/16	697	15 11/16	399	36⅞	937	21 3/16	538	497	225	572	259
10	57¾	1467	45¾	1162	11 3/16	285	66	1676	49½	1257	32½	826	17 5/16	440	44½	1124	24	610	797	362	964	437



LF957NRPDABFG, LF957ZRPDABFG

SIZE	DIMENSIONS												WEIGHT	
	G		H		I		J		M		P		957RPDABFG	
in.	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kgs.*
2½	32½	826	23	584	15½	394	9½	241	19¾	502	15 13/16	402	81	37
3	34	864	24	610	16 5/16	414	10 1/16	256	21¼	540	16⅛	410	84	38
4	35⅝	905	25½	648	17 3/16	437	10 15/16	279	23½	597	16⅝	422	101	46
6	46½	1181	35¼	895	20½	521	13½	343	27¼	692	19	483	174	79

Noryl® is a registered trademark of SABIC Innovative Plastics™.

Capacity

Series LF957RPDA, LF957NRPDA, LF957ZRPDA flow curves as tested by Underwriters Laboratory.
(Excluding 6" Z Pattern configuration)

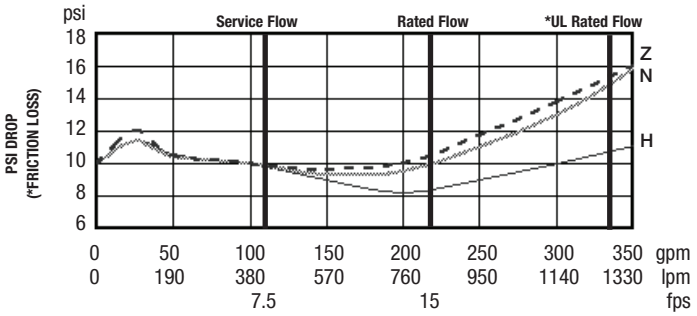
Flow characteristics collected using butterfly shutoff valves

——— Horizontal ——— N-Pattern - - - - - - Z-Pattern

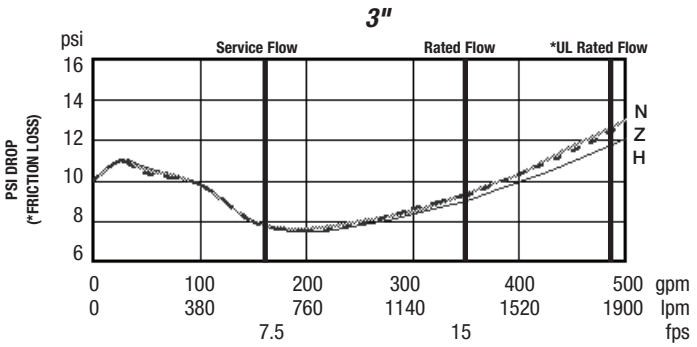
Flow capacity chart identifies valve performance based upon rated water velocity up to 25fps

- Service Flow is typically determined by a rated velocity of 7.5fps based upon schedule 40 pipe.
- Rated Flow identifies maximum continuous duty performance determined by AWWA.
- UL Flow Rate is 150% of Rated Flow and is not recommended for continuous duty.
- AWWA Manual M22 [Appendix C] recommends that the maximum water velocity in services be not more than 10fps.

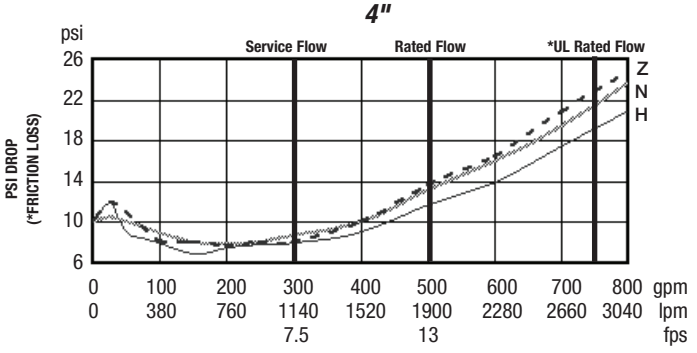
2½"



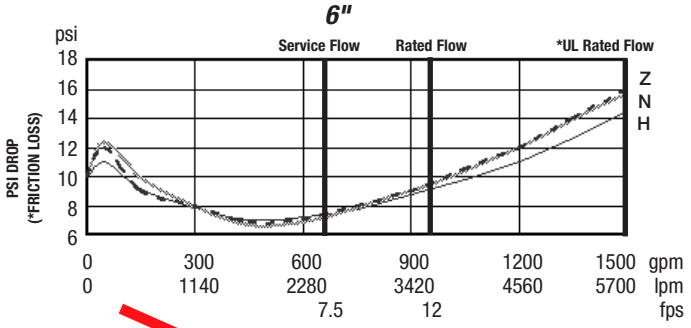
3"



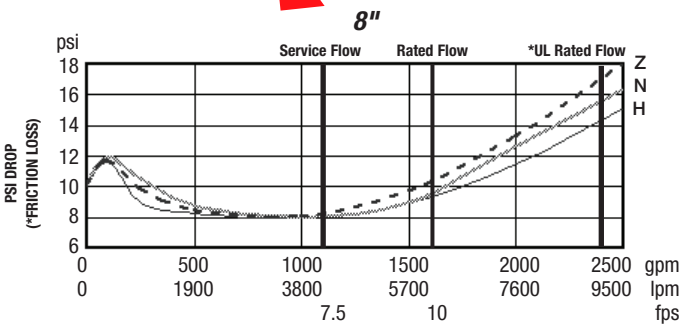
4"



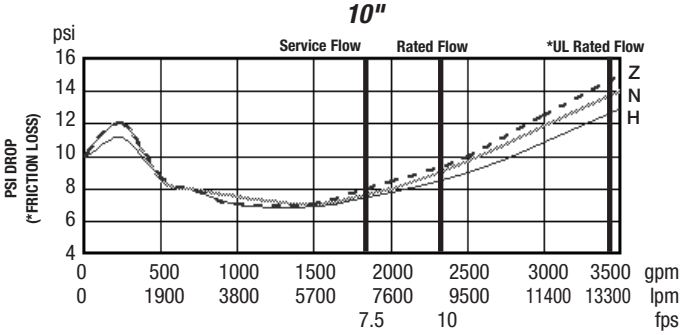
6"



8"



10"



NOTICE

Inquire with governing authorities for local installation requirements

USA: Tel: (978) 689-6066 • Fax: (978) 975-8350 • Watts.com
Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • Watts.ca
Latin America: Tel: (52) 55-4122-0138 • Watts.com

APPENDIX E

COMPUTER RUNS

PRIVATE FIRE PROTECTION SYSTEM ANALYSIS

NODE AND PIPE DIAGRAM REFERENCE:

Exhibit A at the back of this report.

CONDITIONS MODELED:

1. 2,100 gpm Fire Flow at Node 304.
2. 2,100 gpm Fire Flow at Node 104.
3. 2,100 gpm Fire Flow at Node 108.
4. 2,100 gpm Fire Flow at Node 320.

U N I T S S P E C I F I E D

FLOWRATE ..... = gallons/minute
HEAD (HGL) ..... = feet
PRESSURE ..... = psig

P I P E L I N E D A T A

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

P I P E N A M E	NODE NAMES #1	#2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.
1	0	28	25.80	12.00	120.0000	0.60
3	4	0	37.70	12.00	120.0000	0.30
5	8	4	779.80	24.00	120.0000	0.85
9	12	8	132.50	12.00	120.0000	0.73
13	16	12	181.50	12.00	120.0000	0.91
17	20	16	341.40	12.00	120.0000	0.84
21	24	20	300.50	12.00	120.0000	1.00
29	28	I-308	28.70	8.00	120.0000	1.05
31	28	100	22.30	12.00	120.0000	0.30
101	100	I-300	51.70	8.00	120.0000	1.30
103	100	104	33.10	12.00	120.0000	0.30
105	104	108	416.80	12.00	120.0000	1.32
109	108	112	465.10	12.00	120.0000	0.78
113	112	24	47.00	12.00	120.0000	1.38
115	I-332	112	67.10	8.00	120.0000	1.00
301	O-300	304	332.30	12.00	120.0000	2.08
309	O-308	312	447.70	12.00	120.0000	2.32
313	312	316	160.50	12.00	120.0000	1.16
317	320	316	38.10	12.00	120.0000	0.60
321	324	320	71.30	12.00	120.0000	1.20
325	324	328	88.50	12.00	120.0000	0.60
329	328	O-332	180.40	12.00	120.0000	2.50

P U M P/L O S S E L E M E N T D A T A

THERE IS A DEVICE AT NODE 300 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (ft)	FLOWRATE (gpm)
-27.69	0.00
-27.92	100.00
-28.15	2100.00
-34.62	2500.00

THERE IS A DEVICE AT NODE 308 ....> (ID= 1)

THERE IS A DEVICE AT NODE 332 ....> (ID= 1)

THERE IS A DEVICE AT NODE 0 DESCRIBED BY THE FOLLOWING DATA: (ID= 2)

HEAD (ft)	FLOWRATE (gpm)
151.62	0.00
129.46	1176.00
71.64	2352.00

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
4		0.00	437.00	
8		0.00	419.00	
12		0.00	408.00	
16		0.00	400.00	
20		0.00	388.00	
24		0.00	405.00	
28		0.00	430.00	
100		0.00	430.00	
104		0.00	429.00	
108		0.00	406.00	
112		0.00	405.00	
I-300	LF957	0.00	430.00	
304		2100.00	430.00	
O-308	LF957	0.00	430.00	
312		0.00	418.00	
316		0.00	418.00	
320		0.00	415.00	
324		0.00	415.00	
328		0.00	415.00	
O-332	LF957	0.00	405.00	
0		----	437.00	437.00
O-300	LF957	0.00	430.00	
I-308	LF957	0.00	430.00	
I-332	LF957	0.00	405.00	

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT
MAXIMUM AND MINIMUM PRESSURES = 5
MAXIMUM AND MINIMUM VELOCITIES = 5

S Y S T E M C O N F I G U R A T I O N

NUMBER OF PIPES .....(P) = 22
NUMBER OF END NODES .....(J) = 20
NUMBER OF PRIMARY LOOPS .....(L) = 2
NUMBER OF SUPPLY NODES .....(F) = 1
NUMBER OF SUPPLY ZONES .....(Z) = 1

==========

Case: 0

One Alexandria North Project
Private Fire Protection System Analysis
Fire Hydrant Flow at Node 304

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
1	0	28	1720.02	0.21	0.22	4.88	16.63	8.03
3	4	0	-379.98	0.02	0.01	1.08	0.63	0.49
5	8	4	-379.98	0.01	0.00	0.27	0.02	0.02
9	12	8	-379.98	0.06	0.01	1.08	0.59	0.49
13	16	12	-379.98	0.09	0.02	1.08	0.58	0.49
17	20	16	-379.98	0.17	0.02	1.08	0.53	0.49
21	24	20	-379.98	0.15	0.02	1.08	0.55	0.49
29	28	I-308	0.00	0.00	0.00	0.00	0.00	0.00
31	28	100	1720.02	0.18	0.11	4.88	13.00	8.03
101	100	I-300	2100.00	4.33	3.63	13.40	153.85	83.72
103	100	104	-379.98	0.02	0.01	1.08	0.65	0.49
105	104	108	-379.98	0.20	0.02	1.08	0.55	0.49
109	108	112	-379.98	0.23	0.01	1.08	0.52	0.49
113	112	24	-379.98	0.02	0.02	1.08	1.02	0.49
115	I-332	112	0.00	0.00	0.00	0.00	0.00	0.00
301	O-300	304	2100.00	3.86	1.15	5.96	15.07	11.62
309	O-308	312	0.00	0.00	0.00	0.00	0.00	0.00
313	312	316	0.00	0.00	0.00	0.00	0.00	0.00
317	320	316	0.00	0.00	0.00	0.00	0.00	0.00
321	324	320	0.00	0.00	0.00	0.00	0.00	0.00
325	324	328	0.00	0.00	0.00	0.00	0.00	0.00
329	328	O-332	0.00	0.00	0.00	0.00	0.00	0.00

P U M P/L O S S E L E M E N T R E S U L T S

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft
300	2100.00	85.11	56.95	-28.2
308	0.00	93.35	65.66	-27.7
Device "332" is closed				
332	0.00	118.55	116.65	0.0
0	2100.00	0.00	86.78	86.8

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
4		0.00	523.76	437.00	86.76	37.59
8		0.00	523.74	419.00	104.74	45.39
12		0.00	523.67	408.00	115.67	50.12
16		0.00	523.56	400.00	123.56	53.54
20		0.00	523.38	388.00	135.38	58.66
24		0.00	523.60	405.00	118.60	51.39
28		0.00	523.35	430.00	93.35	40.45
100		0.00	523.06	430.00	93.06	40.33
104		0.00	523.08	429.00	94.08	40.77
108		0.00	523.31	406.00	117.31	50.84
112		0.00	523.55	405.00	118.55	51.37
I-300	LF957	0.00	515.11	430.00	85.11	36.88
304		2100.00	481.95	430.00	51.95	22.51
O-308	LF957	0.00	495.66	430.00	65.66	28.45
312		0.00	495.66	418.00	77.66	33.65
316		0.00	495.66	418.00	77.66	33.65
320		0.00	495.66	415.00	80.66	34.95
324		0.00	495.66	415.00	80.66	34.95
328		0.00	495.66	415.00	80.66	34.95
O-332	LF957	0.00	521.65	405.00	116.65	50.55
0		----	523.78	437.00	86.78	37.61
O-300	LF957	0.00	486.95	430.00	56.95	24.68
I-308	LF957	0.00	523.35	430.00	93.35	40.45
I-332	LF957	0.00	523.55	405.00	118.55	51.37

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
20	58.66	304	22.51
16	53.54	O-300	24.68
24	51.39	O-308	28.45
112	51.37	312	33.65
I-332	51.37	316	33.65

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
101	13.40	5	0.27
301	5.96	3	1.08
1	4.88	9	1.08
31	4.88	13	1.08
17	1.08	17	1.08

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
0	2100.00	

NET SYSTEM INFLOW = 2100.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 2100.00

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Case: 1

One Alexandria North Project
Private Fire Protection System Analysis
Fire Hydrant Flow at Node 104

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
1	0	28	1718.73	0.21	0.22	4.88	16.60	8.02
3	4	0	-381.27	0.02	0.01	1.08	0.64	0.49
5	8	4	-381.27	0.01	0.00	0.27	0.02	0.02
9	12	8	-381.27	0.07	0.01	1.08	0.59	0.49
13	16	12	-381.27	0.09	0.02	1.08	0.58	0.49
17	20	16	-381.27	0.17	0.02	1.08	0.54	0.49
21	24	20	-381.27	0.15	0.02	1.08	0.55	0.49
29	28	I-308	0.00	0.00	0.00	0.00	0.00	0.00
31	28	100	1718.73	0.18	0.11	4.88	12.98	8.02
101	100	I-300	0.00	0.00	0.00	0.00	0.00	0.00
103	100	104	1718.73	0.27	0.11	4.88	11.36	8.02
105	104	108	-381.27	0.21	0.02	1.08	0.55	0.49
109	108	112	-381.27	0.23	0.01	1.08	0.52	0.49
113	112	24	-381.27	0.02	0.03	1.08	1.03	0.49
115	I-332	112	0.00	0.00	0.00	0.00	0.00	0.00
301	O-300	304	0.00	0.00	0.00	0.00	0.00	0.00
309	O-308	312	0.00	0.00	0.00	0.00	0.00	0.00
313	312	316	0.00	0.00	0.00	0.00	0.00	0.00
317	320	316	0.00	0.00	0.00	0.00	0.00	0.00
321	324	320	0.00	0.00	0.00	0.00	0.00	0.00
325	324	328	0.00	0.00	0.00	0.00	0.00	0.00
329	328	O-332	0.00	0.00	0.00	0.00	0.00	0.00

P U M P/L O S S E L E M E N T R E S U L T S

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft
300	0.00	93.06	65.37	-27.7
308	0.00	93.35	65.66	-27.7
Device "332" is closed				
332	0.00	118.16	90.52	0.0
0	2100.00	0.00	86.78	86.8

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
4		0.00	523.76	437.00	86.76	37.59
8		0.00	523.74	419.00	104.74	45.39
12		0.00	523.66	408.00	115.66	50.12
16		0.00	523.56	400.00	123.56	53.54
20		0.00	523.37	388.00	135.37	58.66
24		0.00	523.21	405.00	118.21	51.22
28		0.00	523.35	430.00	93.35	40.45
100		0.00	523.06	430.00	93.06	40.33
104		2100.00	522.69	429.00	93.69	40.60
108		0.00	522.92	406.00	116.92	50.66
112		0.00	523.16	405.00	118.16	51.20
I-300	LF957	0.00	523.06	430.00	93.06	40.33
304		0.00(0.00)	495.37	430.00	65.37	28.33
O-308	LF957	0.00	495.66	430.00	65.66	28.45
312		0.00	495.66	418.00	77.66	33.65
316		0.00	495.66	418.00	77.66	33.65
320		0.00	495.66	415.00	80.66	34.95
324		0.00	495.66	415.00	80.66	34.95
328		0.00	495.66	415.00	80.66	34.95
O-332	LF957	0.00	495.52	405.00	90.52	39.23
0		----	523.78	437.00	86.78	37.61
O-300	LF957	0.00	495.37	430.00	65.37	28.33
I-308	LF957	0.00	523.35	430.00	93.35	40.45
I-332	LF957	0.00	523.16	405.00	118.16	51.20

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
20	58.66	304	28.33
16	53.54	O-300	28.33
24	51.22	O-308	28.45
112	51.20	312	33.65
I-332	51.20	316	33.65

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
1	4.88	5	0.27
31	4.88	3	1.08
103	4.88	9	1.08
13	1.08	13	1.08
17	1.08	17	1.08

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
0	2100.00	

NET SYSTEM INFLOW = 2100.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 2100.00

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Case: 2

One Alexandria North Project
Private Fire Protection System Analysis
Fire Hydrant Flow at Node 108

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
1	0	28	1344.96	0.13	0.14	3.82	10.35	5.09
3	4	0	-755.04	0.07	0.02	2.14	2.31	1.75
5	8	4	-755.04	0.05	0.00	0.54	0.06	0.06
9	12	8	-755.04	0.23	0.05	2.14	2.14	1.75
13	16	12	-755.04	0.32	0.06	2.14	2.10	1.75
17	20	16	-755.04	0.60	0.06	2.14	1.92	1.75
21	24	20	-755.04	0.53	0.07	2.14	1.98	1.75
29	28	I-308	0.00	0.00	0.00	0.00	0.00	0.00
31	28	100	1344.96	0.11	0.07	3.82	8.13	5.09
101	100	I-300	0.00	0.00	0.00	0.00	0.00	0.00
103	100	104	1344.96	0.17	0.07	3.82	7.14	5.09
105	104	108	1344.96	2.12	0.30	3.82	5.81	5.09
109	108	112	-755.04	0.81	0.06	2.14	1.87	1.75
113	112	24	-755.04	0.08	0.10	2.14	3.84	1.75
115	I-332	112	0.00	0.00	0.00	0.00	0.00	0.00
301	O-300	304	0.00	0.00	0.00	0.00	0.00	0.00
309	O-308	312	0.00	0.00	0.00	0.00	0.00	0.00
313	312	316	0.00	0.00	0.00	0.00	0.00	0.00
317	320	316	0.00	0.00	0.00	0.00	0.00	0.00
321	324	320	0.00	0.00	0.00	0.00	0.00	0.00
325	324	328	0.00	0.00	0.00	0.00	0.00	0.00
329	328	O-332	0.00	0.00	0.00	0.00	0.00	0.00

P U M P/L O S S E L E M E N T R E S U L T S

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft
300	0.00	93.33	65.64	-27.7
308	0.00	93.51	65.82	-27.7
Device "332" is closed				
332	0.00	116.54	90.69	0.0
0	2100.00	0.00	86.78	86.8

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
4		0.00	523.69	437.00	86.69	37.57
8		0.00	523.64	419.00	104.64	45.35
12		0.00	523.36	408.00	115.36	49.99
16		0.00	522.98	400.00	122.98	53.29
20		0.00	522.32	388.00	134.32	58.21
24		0.00	521.72	405.00	116.72	50.58
28		0.00	523.51	430.00	93.51	40.52
100		0.00	523.33	430.00	93.33	40.44
104		0.00	523.10	429.00	94.10	40.78
108		2100.00	520.68	406.00	114.68	49.69
112		0.00	521.54	405.00	116.54	50.50
I-300	LF957	0.00	523.33	430.00	93.33	40.44
304		0.00(0.00)	495.64	430.00	65.64	28.44
O-308	LF957	0.00	495.82	430.00	65.82	28.52
312		0.00	495.82	418.00	77.82	33.72
316		0.00	495.82	418.00	77.82	33.72
320		0.00	495.82	415.00	80.82	35.02
324		0.00	495.82	415.00	80.82	35.02
328		0.00	495.82	415.00	80.82	35.02
O-332	LF957	0.00	495.69	405.00	90.69	39.30
0		----	523.78	437.00	86.78	37.61
O-300	LF957	0.00	495.64	430.00	65.64	28.44
I-308	LF957	0.00	523.51	430.00	93.51	40.52
I-332	LF957	0.00	521.54	405.00	116.54	50.50

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
20	58.21	304	28.44
16	53.29	O-300	28.44
24	50.58	O-308	28.52
112	50.50	312	33.72
I-332	50.50	316	33.72

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
1	3.82	5	0.54
31	3.82	3	2.14
103	3.82	9	2.14
105	3.82	13	2.14
17	2.14	17	2.14

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
0	2100.00	

NET SYSTEM INFLOW = 2100.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 2100.00

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Case: 3

One Alexandria North Project
Private Fire Protection System Analysis
Fire Hydrant Flow at Node 320

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
1	0	28	1573.36	0.18	0.19	4.46	14.00	6.81
3	4	0	-526.64	0.03	0.01	1.49	1.17	0.90
5	8	4	-526.64	0.02	0.00	0.37	0.03	0.03
9	12	8	-526.64	0.12	0.03	1.49	1.09	0.90
13	16	12	-526.64	0.16	0.03	1.49	1.07	0.90
17	20	16	-526.64	0.31	0.03	1.49	0.98	0.90
21	24	20	-526.64	0.27	0.03	1.49	1.01	0.90
29	28	I-308	1096.34	0.72	0.80	7.00	52.93	25.12
31	28	100	477.02	0.02	0.01	1.35	1.13	0.75
101	100	I-300	0.00	0.00	0.00	0.00	0.00	0.00
103	100	104	477.02	0.02	0.01	1.35	1.00	0.75
105	104	108	477.02	0.31	0.04	1.35	0.84	0.75
109	108	112	477.02	0.35	0.02	1.35	0.79	0.75
113	112	24	-526.64	0.04	0.05	1.49	1.91	0.90
115	I-332	112	-1003.66	1.43	0.64	6.41	30.83	21.33
301	O-300	304	0.00	0.00	0.00	0.00	0.00	0.00
309	O-308	312	1096.34	1.56	0.35	3.11	4.27	3.49
313	312	316	1096.34	0.56	0.17	3.11	4.57	3.49
317	320	316	-1096.34	0.13	0.09	3.11	5.85	3.49
321	324	320	1003.66	0.21	0.15	2.85	5.08	2.96
325	324	328	-1003.66	0.26	0.08	2.85	3.81	2.96
329	328	O-332	-1003.66	0.53	0.31	2.85	4.71	2.96

P U M P/L O S S E L E M E N T R E S U L T S

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft
300	0.00	93.39	65.70	-27.7
308	1096.34	91.90	63.81	-28.1
332	1003.66	115.57	87.49	-28.1
0	2100.00	0.00	86.78	86.8

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
4		0.00	523.74	437.00	86.74	37.59
8		0.00	523.71	419.00	104.71	45.37
12		0.00	523.57	408.00	115.57	50.08
16		0.00	523.37	400.00	123.37	53.46
20		0.00	523.04	388.00	135.04	58.52
24		0.00	522.73	405.00	117.73	51.02
28		0.00	523.42	430.00	93.42	40.48
100		0.00	523.39	430.00	93.39	40.47
104		0.00	523.36	429.00	94.36	40.89
108		0.00	523.01	406.00	117.01	50.71
112		0.00	522.64	405.00	117.64	50.98
I-300	LF957	0.00	523.39	430.00	93.39	40.47
304		0.00(0.00)	495.70	430.00	65.70	28.47
O-308	LF957	0.00	493.81	430.00	63.81	27.65
312		0.00	491.90	418.00	73.90	32.02
316		0.00	491.17	418.00	73.17	31.71
320		2100.00	490.94	415.00	75.94	32.91
324		0.00	491.31	415.00	76.31	33.07
328		0.00	491.64	415.00	76.64	33.21
O-332	LF957	0.00	492.49	405.00	87.49	37.91
0		----	523.78	437.00	86.78	37.61
O-300	LF957	0.00	495.70	430.00	65.70	28.47
I-308	LF957	0.00	521.90	430.00	91.90	39.82
I-332	LF957	0.00	520.57	405.00	115.57	50.08

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
20	58.52	O-308	27.65
16	53.46	304	28.47
24	51.02	O-300	28.47
112	50.98	316	31.71
108	50.71	312	32.02

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
29	7.00	5	0.37
115	6.41	31	1.35
1	4.46	103	1.35
309	3.11	105	1.35
313	3.11	109	1.35

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
0	2100.00	

NET SYSTEM INFLOW = 2100.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 2100.00

EXHIBIT A

NODE AND PIPE DIAGRAM

LEGEND

PROJECT BOUNDARY

EXISTING 610 ZONE PUBLIC WATER LINE

PROPOSED 610 ZONE PUBLIC WATER LINE

PROPOSED PRIVATE FIRE PROTECTION LINE

EXISTING PUBLIC FIRE HYDRANT

PROPOSED PUBLIC FIRE HYDRANT

PROPOSED PRIVATE FIRE HYDRANT

PROPOSED BACKFLOW PREVENTER

(2) COMPUTER MODEL NODE NUMBER

[3] COMPUTER MODEL PIPE NUMBER

N

0 150 FEET

PROPOSED 8" BACKFLOW PREVENTER

PROPOSED 8" BACKFLOW PREVENTER

FIRE SPRINKLER LATERAL, TYP.

PROPOSED 8" BACKFLOW PREVENTER

B1

B2

B3

B4

PS1

CUP

N TORREY PINES RD

EX.24"

EX.12"

EX.10"

EX.6"

NOTE:
FIRE SPRINKLER LATERALS TO BE SIZED BY FIRE SPRINKLER DESIGNER.

EXHIBIT A

NODE AND PIPE DIAGRAM

ONE ALEXANDRIA NORTH

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422