APPENDIX N

Public Water System Analysis

DEXTER WILSON ENGINEERING, INC.

WATER • WASTEWATER • RECYCLED WATER

CONSULTING ENGINEERS

WATER SYSTEM ANALYSIS
FOR THE
ALTA OCEANSIDE PROJECT
IN THE CITY OF OCEANSIDE

August 27, 2019

2234 FARADAY AVENUE • CARLSBAD, CA • (760) 438-4422

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8-27-2019

Prepared by:
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Job No. 509-108

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August 27, 2019

509-108

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9707 Waples Street
San Diego, CA 92121

Attention: Ray Martin, Vice President

Subject: Water System Analysis for the Alta Oceanside Project in the City of Oceanside

Introduction

This report provides a water system analysis for the Alta Oceanside project in the City of Oceanside. The Alta Oceanside project is located in the City of Oceanside on the southwest corner of Costa Pacifica Way and North Coast Highway, south of the San Luis Rey River. The project is proposing a mixed-use development project that includes ground-level commercial/retail space adjacent to North Coast Highway, residential apartment units with associated parking, open space, and landscaping that incorporates and retains the permanent coastal access path previously granted to the public along Costa Pacifica Way. The site is 5.31 acres near the north end of Oceanside's Downtown District.

This property is being done as a density bonus project. It is designated by the City's Redevelopment Plan for commercial and visitor-serving uses (such as hotels), but residential is allowed as part of a mixed-use project. The commercial along North Coast Highway frontage is designed to meet the commercial component for mixed-use, and the residential otherwise allowed by the zoning is a maximum of 43 dwelling units per acre (228 units). With the density bonus (allowed under both state and city regulations) the resulting density is 58.2 dwelling units per acre – with a total of 309 units. A vicinity map for the project is provided in Figure 1.

Water System Design Criteria

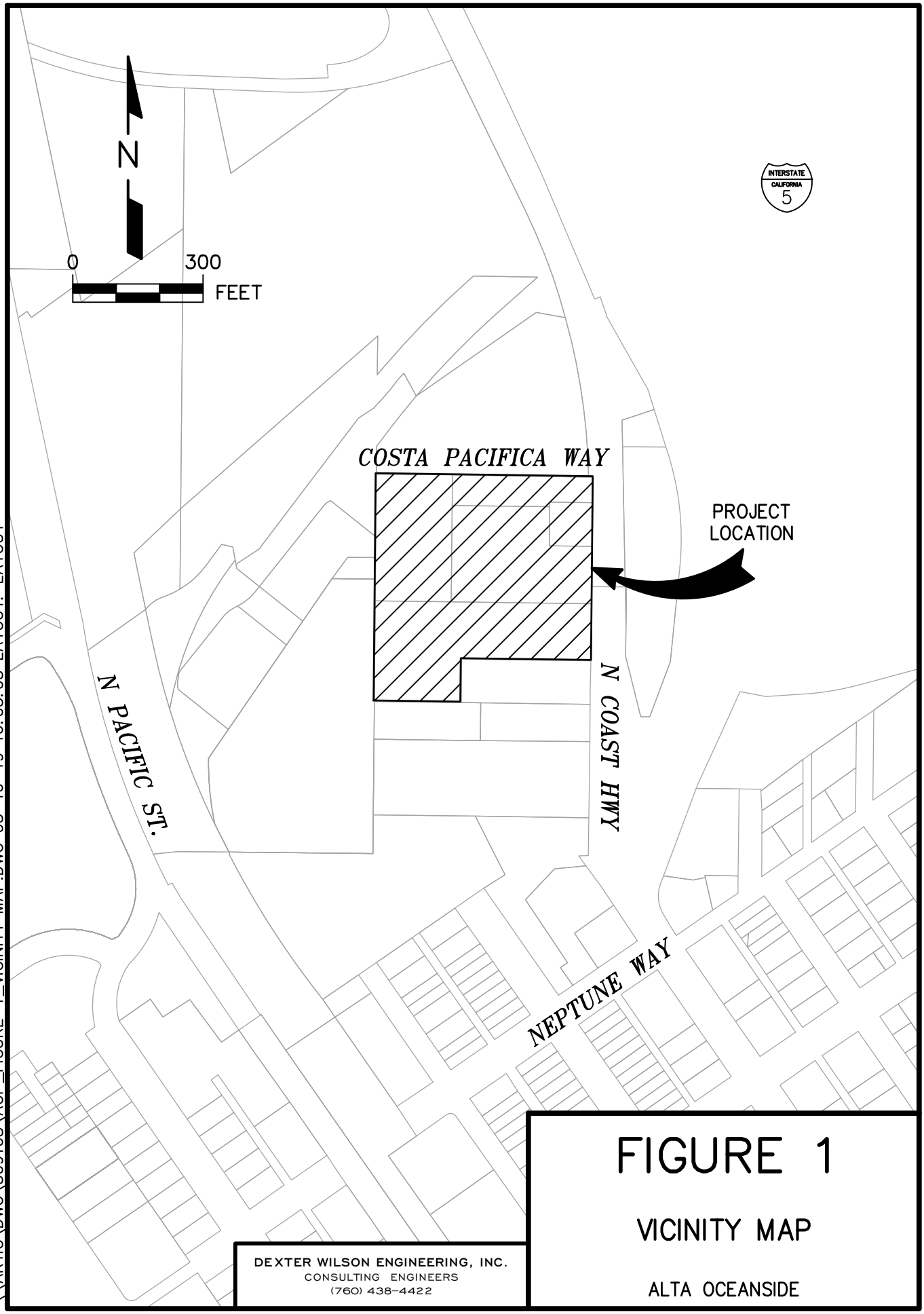
Water system design criteria are based on Section 2 of the City of Oceanside Design and Construction Manual, revised August 1, 2017.

The fire flow requirement for the project is estimated to be 3,000 gpm for multi-family residential land use. Appendix A presents the fire flow requirements excerpt from the City's Design & Construction Manual. During fire flow demands, residual pressure must be greater than 20 psi in the water system.

Existing Water System

Water Service for the Alta Oceanside project will be provided by the City of Oceanside. The project is situated in the western portion of the City in an area served by the Talone 320 Pressure Zone. The nearest existing 320 Pressure Zone public water lines in the vicinity of the project are a 12-inch water line in North Coast Highway and an 8-inch water line in Costa Pacifica Way.

The water supply to this area comes mainly from three reservoirs and several pressure reducing valves (PRV) in the Talone 320 Pressure Zone. The three reservoirs are the 5 million gallon Wire Mountain Reservoir, the 3 million gallon Fire Mountain Reservoir, and the 3 million gallon John Paul Steiger Reservoir. These reservoirs provide gravity service to the Talone 320 Pressure Zone.



\\ARTIC\DWG\509108\AOP_FIGURE-1_VICINITY MAP.DWG 05-16-19 16:05:05 LAYOUT: LAYOUT

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

FIGURE 1

VICINITY MAP

ALTA OCEANSIDE

Water Service Overview

Water service to the project will be from the City of Oceanside Talone 320 Pressure Zone. Ground Floor elevations for the Alta Oceanside project range between 59 feet and 61 feet. This results in a maximum static water pressure range of 112 psi to 113 psi within the project boundary.

Building height will be approximately 65 feet. Maximum static pressure at the top floor of the building will be approximately 84 psi.

When static pressures exceed 80 psi, the California Plumbing Code requires pressure regulating valves at each building supply. All building supplies within the Alta Oceanside project will be required to have individual pressure regulating valves.

The private onsite fire protection system loop for the Alta Oceanside project will make two connections to the existing public water system. One connection will be made to the existing 12-inch public water main in North Coast Highway and a second connection will be made to the existing 8-inch public water main in Costa Pacifica Way. Each connection will include a double check detector backflow assembly.

A fire sprinkler lateral will be connected to the 8-inch public water line in Costa Pacifica Way at the north end of the building and will supply the building fire sprinkler system. This fire service lateral shall be sized by the fire sprinkler system designer and is outside the scope of work for this report.

Available Hydraulic Grade Line

The available hydraulic grade line (HGL) in the vicinity of the Alta Oceanside project was estimated based on a Hydrant Flow Test Detail Report provided by the City of Oceanside. The Hydrant Flow Test Detail Report identifies a flow and pressure at an existing fire hydrant fronting the project on the east side of North Coast Highway. Appendix B includes a copy of the Hydrant Flow Test Detail Report for reference.

Also included in Appendix B is a calculation spreadsheet used to estimate the available hydraulic grade line (HGL) at the test hydrant under various flow rates. This spreadsheet is used to obtain the available hydraulic grade line in the existing water system under a fire flow of 3,000 gpm. From the calculation spreadsheet in Appendix B, the available hydraulic grade line at 3,000 gpm is 170.6 feet.

The hydraulic grade line of 170.6 feet was used to back-calculate the available hydraulic grade line at the existing fire hydrant just south of the project on the west side of North Coast Highway based on the assumption that the majority of the fire flow is being supplied from the south via the 12-inch water line in North Coast Highway. This calculation resulted in an available hydraulic grade line of 180 feet at 3,000 gpm. The fire hydrant just south of the project on the west side of North Coast Highway was used as the source node ("0" Node) for the modeling presented in subsequent sections of this report. This was done to make the modeling presented in this report more straightforward.

Water System Analysis

The Alta Oceanside project proposes to construct four fire hydrants: two private fire hydrants onsite and two public fire hydrants offsite. The two private fire hydrants within the project will be connected to a private onsite looped fire protection water system. The proposed public fire hydrants will be connected to the existing public water system. Figure 2 shows the locations of all four proposed fire hydrants.

One of the proposed public fire hydrants will connect to the existing 12-inch public water main in North Coast Highway near the northeast corner of the project. The second proposed public fire hydrant will connect to the existing 8-inch public water main in Costa Pacifica Way in the north-central portion of the project.

In order to analyze the water system, a computer model was generated. Fire flow scenarios were modeled which provided data upon which the recommended pipe sizing for the private onsite looped fire protection system is based. The recommended private onsite looped fire protection system sizing and configuration is presented on Figure 2.

N

0 100 FEET

COSTA PACIFICA WAY

EX.8"

EX.8"

EX.8"

EX.12"

EX.12"

EX.12"

EX.12"

8"

8" DCDA BACKFLOW

8"

8"

8"

8" DCDA BACKFLOW

N COAST HWY

INTERSTATE CALIFORNIA 5

LEGEND

- PROJECT BOUNDARY
- EXISTING PUBLIC WATER
- PROPOSED PRIVATE FIRE PROTECTION SYSTEM
- PROPOSED PUBLIC WATER
- PROPOSED BACKFLOW PREVENTER
- EXISTING FIRE HYDRANT
- PROPOSED FIRE HYDRANT

FIGURE 2

PROPOSED FIRE PROTECTION SYSTEM

ALTA OCEANSIDE

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

Water System Computer Model. Analysis using the KYPIPE computer software program developed by the University of Kentucky determined residual pressures throughout the water 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. The pressure loss through the double check detector backflow assemblies was incorporated into the computer model. Appendix C presents a candidate double check detector backflow assembly. The manufacturer's literature includes charts which show pressure loss through the backflow preventer as a function of flow. These charts were used to incorporate the pressure losses reflected in the computer modeling.

Results of Computer Modeling for the Alta Oceanside Project

Appendix D presents the computer modeling results for the water system analysis. Exhibit A at the back of this report presents the corresponding Node and Pipe Diagram for the computer model. The 3,000 gpm fire flow requirement was modeled at two adjacent fire hydrant locations with a flow of 1,500 gpm at each hydrant.

Three hydraulic model runs were analyzed for the 3,000 gpm fire flow requirement. The first run analyzes the proposed private fire hydrants onsite (Computer Model Nodes 204 and 208 in the south driveway of the project). The second run analyzes two public fire hydrants (Computer Model Nodes 12 and 20 along North Coast Highway). The third run also analyzes two public fire hydrants (Computer Model Nodes 20 and 28 at the northeast and north-central points of the building). The public fire hydrants at Computer Model Nodes 20 and 28 will be constructed as part of the Alta Oceanside project.

The results of the computer modeling analyses are summarized in Table 1.

TABLE 1
ALTA OCEANSIDE PROJECT
WATER SYSTEM ANALYSIS RESULTS

Fire Flow Scenario	Hydrant Type	Minimum Residual Pressure, psi	At Node	Node Elevation, ft
3,000 gpm Fire Flow split between Nodes 204 and 208	Private, Onsite	35	208	59
3,000 gpm Fire Flow split between Nodes 12 and 20	Public, N.C. Hwy	46	20	62
3,000 gpm Fire Flow split between Nodes 20 and 28	Public, N. C. Hwy & Costa Pacifica Way	41	28	55

As shown in Table 1, under each fire flow scenario, the fire flow requirement is met with a residual pressure greater than 35 psi, well above the minimum requirement of 20 psi residual.

The results of the water system analysis indicate that the existing water distribution system is capable of supplying a 3,000 gpm fire flow to the Alta Oceanside project based on the water system presented in Figure 2.

As shown on Figure 2, the private onsite looped fire protection system will make two connections to the existing public water system. One connection will be made to the existing 12-inch public water main in North Coast Highway. A second connection will be made to the existing 8-inch public water main in Costa Pacifica Way. Each connection will include an 8-inch fire service lateral and an 8-inch double check detector backflow assembly in accordance with City of Oceanside standards.

Conclusions and Recommendations

The following conclusions and recommendations are summarized based on the water system analysis prepared for the Alta Oceanside development project.

1. Water service to the project will be provided by the City of Oceanside Talone 320 Pressure Zone public water system.

2. Ground floor elevations within the project range from approximately 59 to 61 feet resulting in a range of maximum static water pressures of 112 to 113 psi.

3. Static pressure at the top floor of the proposed project building will be approximately 84 psi based on an approximate building height of 65 feet and no pressure regulation at the building supply.

4. The fire flow available to the project site meets the 3,000 gpm fire flow requirement at a minimum of 20 psi residual pressure when connected to the existing public water system adjacent to the project.

5. The existing public water system provides the necessary flow and pressure for the proposed private onsite looped fire protection system. No offsite water system improvements are needed to provide service to the project except for two public fire hydrants and the necessary water service laterals.

6. Private fire protection service for the Alta Oceanside project will be supplied by two 8-inch lateral connections to the public system. Internal to the project, the private fire protection system will consist of an 8-inch loop between the connections.

7. Each private fire protection system connection to a public main shall include an 8-inch double check detector backflow assembly in accordance with City of Oceanside standards.

8. Figure 2 provides a layout of the Alta Oceanside project showing the recommended private onsite looped fire protection system pipeline sizes and configuration.

9. The fire sprinkler lateral which will supply the fire sprinkler system for the building shall be sized by the fire sprinkler designer and is not included in the scope of this report.

10. The public water system improvements shall be designed and constructed in accordance with the guidelines, standards, and approved materials of the City of Oceanside.

11. This report presents the sizing and a general schematic layout of the proposed private onsite looped fire protection water system. The design engineer for this system should incorporate valves, fittings, and appurtenances as needed for proper installation and long-term operation of the system.

12. Water piping used for the private onsite looped water lines within the project, is recommended to be AWWA C900, DR 18 (Class 235) for private fire protection system piping.

Thank you for the opportunity to provide water system planning services for this project. Please feel free to contact us to further discuss any aspect of the information presented in this water service analysis for the Alta Oceanside project.

Dexter Wilson Engineering, Inc.

Andrew Oven, P.E.

AO:FF:sc

Attachments

APPENDIX A

FIRE FLOW REQUIREMENT EXCERPT
FROM
SECTION 2 OF THE CITY OF OCEANSIDE DESIGN AND CONSTRUCTION MANUAL REVISED AUGUST 1, 2017

TABLE 2.1: General Fire Flow Guidelines

Land Use Classifications	Design Fire Flow (GPM)	Duration (HOURS)	Residual Pressure (PSI)
Residential - Single Family	1500	2	20
Residential - Multi-Family	3000	2	20
Commercial	4000	4	20
Industrial	4000	4	20
Governmental - Institutional	4000	4	20

All new developments that are required to have a fire suppression system shall have the system approved by the Fire Marshall. Sprinkler calculations shall be provided to the Fire Department for review and to verify the fire service connection and backflow assembly is properly sized.

2.3 PRESSURES

A. Minimum residual pressure shall be 20 PSI at design fire flow plus maximum day domestic demand.

B. Minimum residual pressure shall be 35 PSI at peak hour domestic demand.

C. Minimum residual pressure shall be 45 PSI at peak day.

D. When static pressures exceed 80 PSI at property line, pressure-reducing valves will be required at the building. The pressure regulator shall be Class 150 or greater.

E. All new single-family residential water service in each pressure zone shall be provided with a minimum static pressure of 50 PSI at the water meter.

2.4 MAINS

A. Minimum diameter shall be 8 inches.

B. All mains not meeting the minimum main diameter and material requirements shall be replaced to meet current design standards. This is applicable for all new commercial, industrial, institutional, and residential developments of four (4) units or more. Where the full replacement length along the frontage property is deemed in excess of the overall project cost, the developer may pay an in-lieu fee upon the approval of the Water Utilities Director.

C. All lines are to be looped.

D. Minimum depth of cover required:

1. 36 inches for 12-inch mains and smaller.

2. Mains over 12 inches require special design.

E. Design shall be based on maximum day requirements plus fire flow. Maximum velocity shall be 7.5 FPS not including fire flow.

APPENDIX B

FIRE HYDRANT FLOW TEST
AND
CALCULATION SPREADSHEET

Hydrant Flow Test (Distribution) Detail Report

4/23/2019
12:10 PM

Hydrant Number: **800421030** **Test Date:** **7/12/2018** **Test Number:** **1**

Test Type:	Dual Hydrant	**Test Static (psi):**	96.00
Tested By:	J. Barry	**Residual (psi):**	85.00
		Discharge (gpm):	1351.40
Start Time:	8:08 AM	**Flow at 20 psi:**	3837.70
End Time:	8:09:00AM	**Volume (gal):**	1351.40
Test Time:	1.00	**Half Static Press:**	
		Flow at Half:	

Turn Off Volume Calc: ☐

Flow Results:

Flow Hydrant:	Pitot Pressure:	Discharge or Q:
800421024	65.00	1,351.40

Major Service Meter Flows:

Acct Number:	Flw Rt (gpm):

Pump Flows at Time of Test:

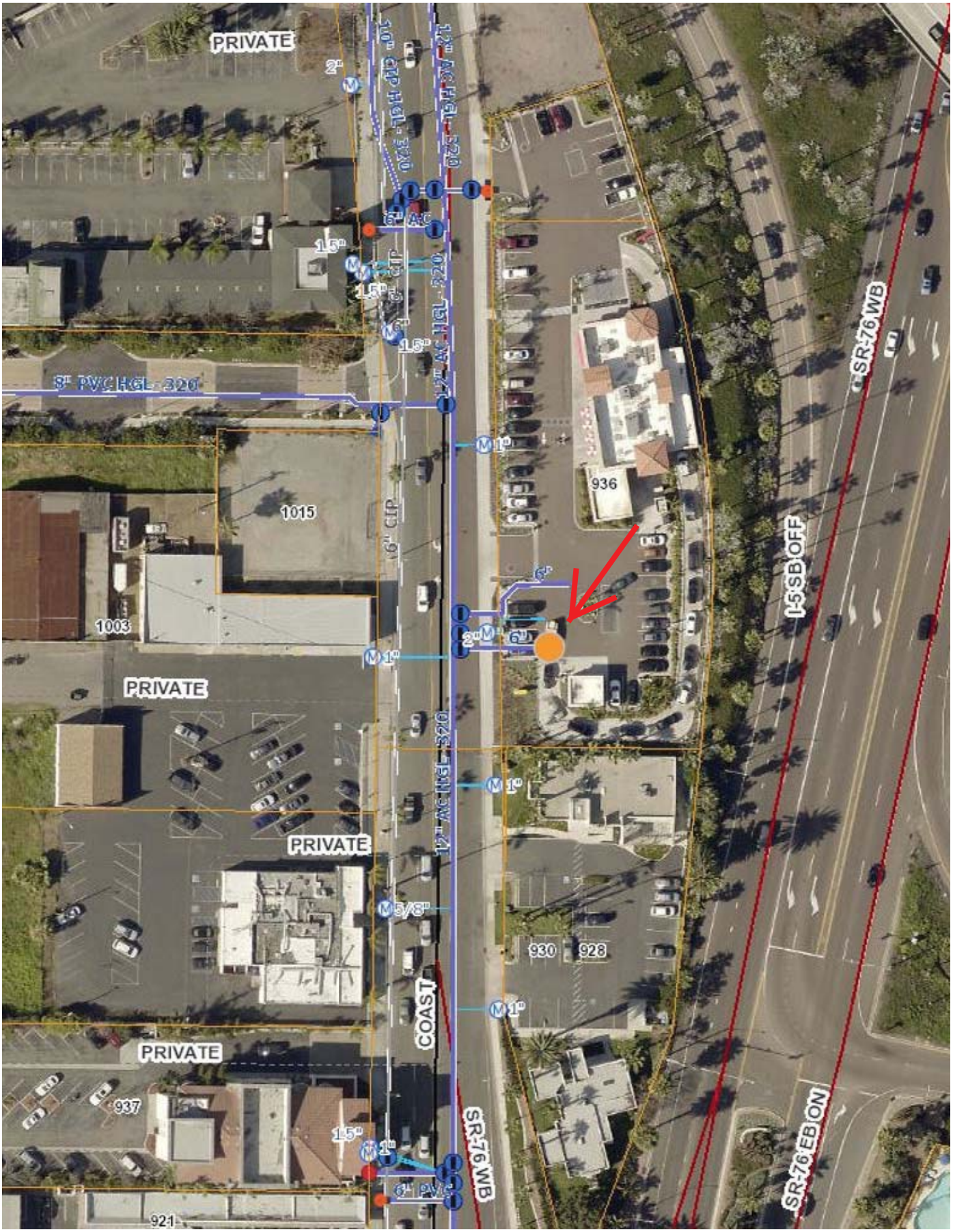
Station No:	Pump No:	Discharge (gpm):

Tank Levels at Time of Test:

Facility Name:	Facility No:	Wt Elev:	Status:

Outlet Size:	2.5 in	**User 7:**	
User 2:		**User 8:**	
User 3:		**User 9:**	
Test Location ::	1103 N. Coast Hwy.	**User 10:**	
Project ::		**User 11:**	
User 6:		**User 12:**	

User 13: ☐ **User 14:** ☐ **User 15:** ☐


PRIVATE
10" CIP HGL 320
12" AC HGL 320
8" PVC HGL 320
1015
1003
936
6" CIP
PRIVATE
PRIVATE
PRIVATE
930
928
937
921
COAST
SR-76 WB
I-5 SB OFF
SR-76 WB
SR-76 EB ON

Fire Hydrant Flow Test Date July 12, 2018

Input Flow Test Results

Static Pressure	96 PSI			
Residual Pressure	85 PSI			
Hydrant Flow	1351.4 GPM			
Actual Hydrant Elevation	60 Feet	HGL	281.6 Feet	
Estimated Hydrant Elevation	60 Feet	HGL	281.6 Feet	

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

k = 4.099E-05

Extrapolated Calculations

Q, gpm	Residual Pressure	Available HGL
500	94.3 psi	277.5 ft
700	92.7 psi	274.0 ft
900	90.8 psi	269.6 ft
1100	88.5 psi	264.2 ft
1300	85.8 psi	257.9 ft
1500	82.7 psi	250.8 ft
1700	79.2 psi	242.8 ft
1900	75.3 psi	233.9 ft
2000	73.3 psi	229.1 ft
2100	71.1 psi	224.2 ft
2300	66.6 psi	213.7 ft
2500	61.7 psi	202.3 ft
2700	56.4 psi	190.2 ft
2900	50.8 psi	177.3 ft
3000	47.9 psi	170.6 ft
3300	38.6 psi	149.2 ft
3500	32.0 psi	133.9 ft
3700	25.1 psi	117.9 ft
3900	17.9 psi	101.2 ft
4000	14.1 psi	92.6 ft
4100	10.3 psi	83.7 ft
4300	2.4 psi	65.5 ft
4500	-5.8 psi	46.5 ft

Residual Pressure, psi	Available Flow, gpm
0 psi	4,359
10 psi	4,107
20 psi	3,842
30 psi	3,560
40 psi	3,257
50 psi	2,929
60 psi	2,565
70 psi	2,151
80 psi	1,655
90 psi	974
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 C

MANUFACTURER'S LITERATURE FOR A DOUBLE CHECK DETECTOR BACKFLOW ASSEMBLY

For Fire Protection Applications

Job Name _____ Contractor _____

Job Location _____ Approval _____

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

Approval _____ Representative _____

Series 3000SS

Double Check Detector Assemblies

Sizes: 2½" – 12" (65 – 300mm)

Features

- Cam-Check Assembly valve provides low head loss
- Short lay length is ideally suited for retrofit installations
- Stainless Steel body is half the weight of competitive designs reducing installation and shipping cost
- Stainless steel construction provides long term corrosion protection and maximum strength
- Single top access cover with two-bolt grooved style coupling for ease of maintenance
- No special tools required for servicing
- Compact construction allows for smaller vaults and enclosures
- Furnished with ⅝" x ¾" bronze meter (gpm or cfm)
- Detects underground leaks and unauthorized water use
- Maybe installed horizontal or vertical "flow up" position (ASSE Only)

Available Models

Suffix:

LG	– less shutoff valves
OSY	– UL/FM outside stem and yoke resilient seated gate valves
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
CFM	– cubic feet per minute
GPM	– gallons per minute meter

Post indicator plate and operating nut available – consult factory

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

Series 3000SS Double Check Detector Assemblies are designed for use in accordance with water utility non-health hazard containment requirements. It is mandatory to prevent the reverse flow of fire protection system substances, i.e., glycerin wetting agents, stagnant water and water of non-potable quality from being pumped or siphoned into the potable water supply.

Specifications

A Double Check Detector Assembly shall be installed on fire protection systems when connected to a drinking water supply. Degree of hazard present is determined by the local authority having jurisdiction. The main valve body shall be manufactured from 300 Series stainless steel to provide corrosion resistance, 100% lead free* through the waterway. The double check detector assembly consists of two independently operating, spring loaded check valves, two UL, FM, OSY resilient seated gate valves, and bypass assembly. The bypass assembly consists of a meter (cubic ft. or gallons), a double check including shutoff valves and required test cocks. Each cam-check shall be internally loaded and provide a positive drip tight closure against reverse flow. Cam-check includes a stainless steel cam arm and spring, rubber faced disc and a replaceable seat. There shall be no brass or bronze parts used within the cam-check valve assembly. The check valve seats shall be of molded thermoplastic construction. The use of seat screws as a retention method is prohibited. All internal parts shall be accessible through a single cover on the valve assembly. The valve cover shall be held in place through the use of a single grooved style two-bolt coupling. The bypass line shall be hydraulically sized to accurately measure low flow. The bypass line shall consist of a meter, a small diameter double check assembly with test cocks and isolation valves. The bypass line double check valve shall have two independently operating modular poppet check valves, and top mounted test cocks. The assembly shall be an Ames 3000SS.

Materials

All internal metal parts: 300 Series stainless steel, Main valve body: 300 Series stainless steel, Check assembly: Noryl® Flange dimension in accordance with AWWA Class D. Noryl® is a registered trademark of General Electric Company.

⚠ WARNING

It is illegal to use this product in any plumbing system providing water for human consumption, such as drinking or dishwashing, in the United States. Before installing standard material product, consult your local water authority, building and plumbing codes.

AMES FIRE & WATERWORKS

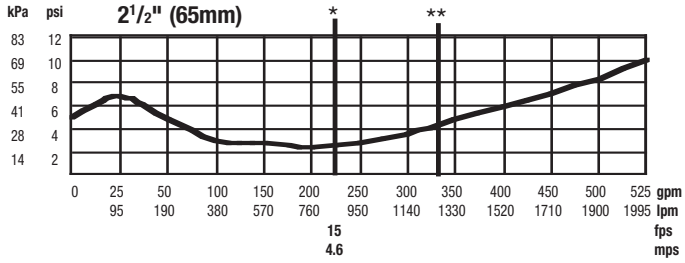
A **WATTS** *Brand*

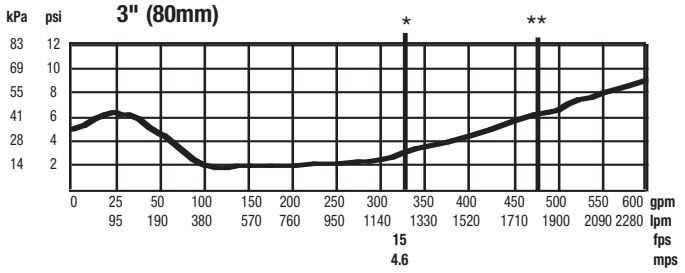
Pressure — Temperature

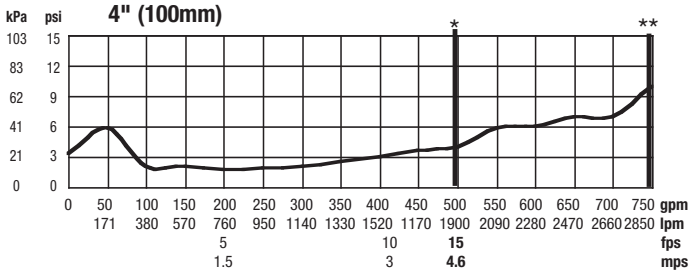
Temperature Range: 33°F – 110°F (0.5°C – 43°C)
Maximum Working Pressure: 175psi (12 bar)

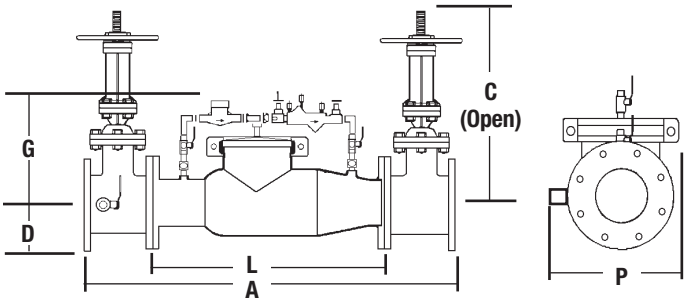
Capacity

Flow curves as tested by Underwriters Laboratory per UL 1469, 1996. * Rated flow **UL Tested







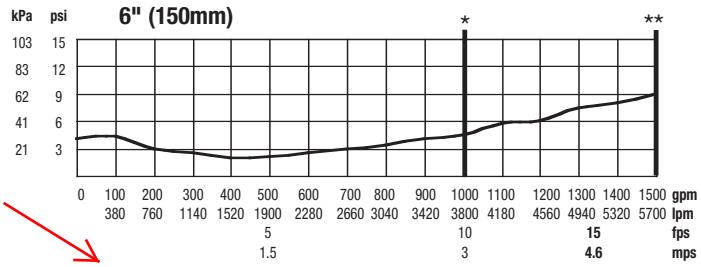


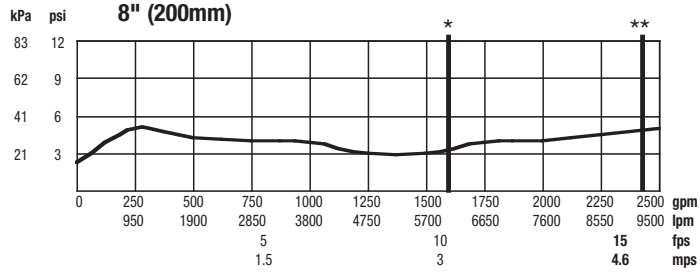
Standards

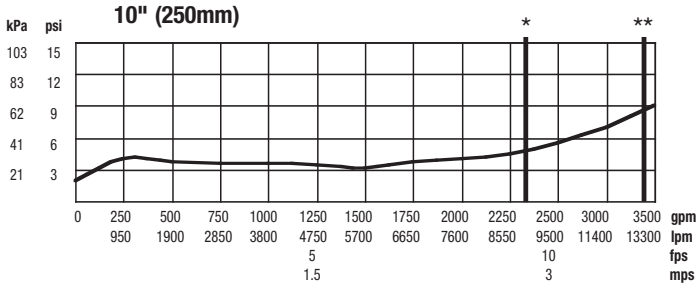
ASSE 1048, AWWA C510-92, CSA B64.5, UL 1469

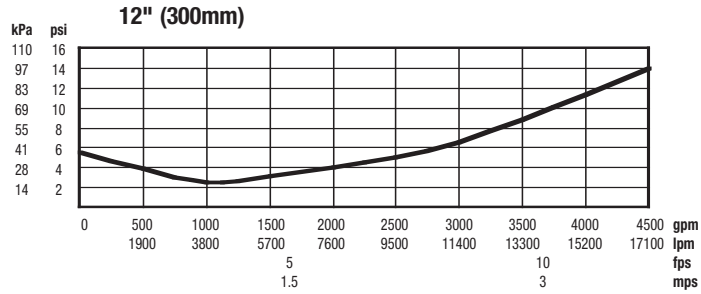
Approvals

UL Classified (OSY only), FM (sizes 2½" – 10", OSY only)









SIZE (DN)		DIMENSIONS												NET WEIGHT		NET WEIGHT	
		A		C (OSY)		D		G		L		P		w/Gates		w/o Gates	
in.	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lb.*	*kg.*	*lb.*	*kg.*
2½	65	37	965	16⅜	416	3½	89	10	250	22	559	12½	318	155	70	68	31
3	80	38	965	18⅞	479	3¾	95	10	250	22	559	13	330	230	104	70	32
4	100	40	1016	22¾	578	4½	114	10	250	22	559	14½	368	240	109	73	33
6	150	48½	1232	30⅛	765	5½	140	15	381	27½	699	15½	394	390	177	120	54
8	200	52½	1334	37¾	959	6¾	171	15	381	29½	749	18½	464	572	259	180	82
10	250	55½	1410	45¾	1162	8	200	15	381	29½	749	19½	495	774	351	190	86
12	300	57½	1461	53⅛	1349	9½	241	15	381	29½	749	21	533	1044	474	220	100

AMES
FIRE & WATERWORKS

A **WATTS** *Brand*

USA: Backflow Tel: (978) 689-6066 • Fax: (978) 975-8350 • AmesFireWater.com
USA: Control Valves Tel: (713) 943-0688 • Fax: (713) 944-9445 • AmesFireWater.com
Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • AmesFireWater.ca
Latin America: Tel: (52) 81-1001-8600 • AmesFireWater.com

APPENDIX D

COMPUTER RUNS

WATER SYSTEM ANALYSIS
FOR
FIRE HYDRANT FLOW

NODE AND PIPE DIAGRAM REFERENCE:

Exhibit A

CONDITIONS MODELED:

1. Fire flow of 3,000 gpm split between Nodes 204 and 208.

2. Fire flow of 3,000 gpm split between Nodes 12 and 20.

3. Fire flow of 3,000 gpm split between Nodes 20 and 28.

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

PIPE NAME	NODE NAMES #1	#2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.
1	4	0	107.80	12.00	120.0000	0.00
3	8	4	44.70	12.00	120.0000	0.60
5	12	8	184.60	12.00	120.0000	1.05
9	4	I-200	60.50	8.00	120.0000	1.55
21	12	20	120.60	12.00	120.0000	1.05
25	20	24	29.30	12.00	120.0000	0.60
29	24	26	58.90	8.00	120.0000	1.35
33	I-212	26	25.00	8.00	120.0000	1.55
37	26	28	223.90	8.00	120.0000	1.26
201	O-200	204	308.10	8.00	120.0000	1.71
205	204	208	307.40	8.00	120.0000	1.76
209	208	O-212	314.00	8.00	120.0000	1.46

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 200 DESCRIBED BY THE FOLLOWING DATA: (ID= 8" AMES 3000SS DCDA)

HEAD (ft)	FLOWRATE (gpm)
-5.77	0.00
-12.46	260.00
-12.92	2500.00

THERE IS A DEVICE AT NODE 212 .....> (ID= 8" AMES 3000SS DCDA)

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
4		0.00	62.00	
8		0.00	62.00	
12		0.00	60.00	
20		0.00	62.00	
24		0.00	62.00	
26		0.00	58.00	
28		0.00	55.00	
I-200		0.00	61.00	

204	1500.00	57.00	
208	1500.00	59.00	
I-212	0.00	58.00	
0	----	67.00	180.00
O-200	0.00	61.00	
O-212	0.00	58.00	

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 = 3
MAXIMUM AND MINIMUM VELOCITIES = 3

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

NUMBER OF PIPES .....(P) = 12
NUMBER OF END NODES .....(J) = 11
NUMBER OF PRIMARY LOOPS .....(L) = 1
NUMBER OF SUPPLY NODES .....(F) = 1
NUMBER OF SUPPLY ZONES .....(Z) = 1

==========

Case: 0

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.31916E-05

Alta Oceanside Project
Fire Hydrant Flow Analysis
3,000 GPM Fire Flow split between Nodes 204 and 208

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	4	0	-3000.00	2.43	0.00	8.51	22.50	22.50
3	8	4	-1400.71	0.25	0.15	3.97	8.78	5.49
5	12	8	-1400.71	1.01	0.26	3.97	6.88	5.49
9	4	I-200	1599.29	3.06	2.51	10.21	92.00	50.55
21	12	20	1400.71	0.66	0.26	3.97	7.62	5.49
25	20	24	1400.71	0.16	0.15	3.97	10.51	5.49
29	24	26	1400.71	2.33	1.68	8.94	67.99	39.55
33	I-212	26	-1400.71	0.99	1.92	8.94	116.48	39.55
37	26	28	0.00	0.00	0.00	0.00	0.00	0.00
201	O-200	204	1599.29	15.58	2.77	10.21	59.53	50.55
205	204	208	99.29	0.09	0.01	0.63	0.33	0.29
209	208	O-212	-1400.71	12.42	1.81	8.94	45.32	39.55

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
200	1599.29	111.01	98.18	-12.8
212	1400.71	109.77	96.97	-12.8

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	177.57	62.00	115.57	50.08
8		0.00	177.18	62.00	115.18	49.91
12		0.00	175.91	60.00	115.91	50.23
20		0.00	174.99	62.00	112.99	48.96
24		0.00	174.68	62.00	112.68	48.83
26		0.00	170.68	58.00	112.68	48.83
28		0.00	170.68	55.00	115.68	50.13
I-200		0.00	172.01	61.00	111.01	48.10
204		1500.00	140.84	57.00	83.84	36.33
208		1500.00	140.74	59.00	81.74	35.42
I-212		0.00	167.77	58.00	109.77	47.57
0		----	180.00	67.00	113.00	48.97
O-200		0.00	159.18	61.00	98.18	42.54
O-212		0.00	154.97	58.00	96.97	42.02

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
12	50.23	208	35.42
28	50.13	204	36.33
4	50.08	O-212	42.02

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
9	10.21	205	0.63
201	10.21	3	3.97
29	8.94	5	3.97

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	3000.00	

NET SYSTEM INFLOW = 3000.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 3000.00

==========

Case: 1

C H A N G E S F O R N E X T S I M U L A T I O N (Change Number = 1)

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

RESULTS OBTAINED AFTER 19 TRIALS: ACCURACY = 0.00000E+00

Alta Oceanside Project
Fire Hydrant Flow Analysis
3,000 GPM Fire Flow split between Nodes 12 and 20

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	4	0	-3000.00	2.43	0.00	8.51	22.50	22.50
3	8	4	-3000.00	1.01	0.67	8.51	37.59	22.50
5	12	8	-3000.00	4.15	1.18	8.51	28.89	22.50
9	4	I-200	0.00	0.00	0.00	0.00	0.00	0.00
21	12	20	1500.00	0.75	0.30	4.25	8.68	6.23
25	20	24	0.00	0.00	0.00	0.00	0.00	0.00
29	24	26	0.00	0.00	0.00	0.00	0.00	0.00
33	I-212	26	0.00	0.00	0.00	0.00	0.00	0.00
37	26	28	0.00	0.00	0.00	0.00	0.00	0.00
201	O-200	204	0.00	0.00	0.00	0.00	0.00	0.00
205	204	208	0.00	0.00	0.00	0.00	0.00	0.00
209	208	O-212	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
200	0.00	116.57	110.81	-5.8
212	0.00	111.51	113.81	0.0

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	177.57	62.00	115.57	50.08
8		0.00	175.89	62.00	113.89	49.35
12		1500.00	170.56	60.00	110.56	47.91
20		1500.00	169.51	62.00	107.51	46.59
24		0.00	169.51	62.00	107.51	46.59
26		0.00	169.51	58.00	111.51	48.32
28		0.00	169.51	55.00	114.51	49.62
I-200		0.00	177.57	61.00	116.57	50.52
204		0.00(0.00)	171.81	57.00	114.81	49.75
208		0.00(0.00)	171.81	59.00	112.81	48.88
I-212		0.00	169.51	58.00	111.51	48.32
0		----	180.00	67.00	113.00	48.97
O-200		0.00	171.81	61.00	110.81	48.02
O-212		0.00	171.81	58.00	113.81	49.32

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
I-200	50.52	20	46.59
4	50.08	24	46.59
204	49.75	12	47.91

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
1	8.51	21	4.25
3	8.51	3	8.51
5	8.51	5	8.51

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	3000.00	

NET SYSTEM INFLOW = 3000.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 3000.00

==========

Case: 2

C H A N G E S F O R N E X T S I M U L A T I O N (Change Number = 2)

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

RESULTS OBTAINED AFTER 3 TRIALS: ACCURACY = 0.00000E+00

Alta Oceanside Project
Fire Hydrant Flow Analysis
3,000 GPM Fire Flow split between Nodes 20 and 28

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	4	0	-3000.00	2.43	0.00	8.51	22.50	22.50
3	8	4	-3000.00	1.01	0.67	8.51	37.59	22.50
5	12	8	-3000.00	4.15	1.18	8.51	28.89	22.50
9	4	I-200	0.00	0.00	0.00	0.00	0.00	0.00
21	12	20	3000.00	2.71	1.18	8.51	32.29	22.50
25	20	24	1500.00	0.18	0.17	4.25	11.99	6.23
29	24	26	1500.00	2.64	1.92	9.57	77.51	44.89
33	I-212	26	0.00	0.00	0.00	0.00	0.00	0.00
37	26	28	1500.00	10.05	1.79	9.57	52.90	44.89
201	O-200	204	0.00	0.00	0.00	0.00	0.00	0.00
205	204	208	0.00	0.00	0.00	0.00	0.00	0.00
209	208	O-212	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
200	0.00	116.57	110.81	-5.8
212	0.00	103.75	113.81	0.0

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	177.57	62.00	115.57	50.08
8		0.00	175.89	62.00	113.89	49.35
12		0.00	170.56	60.00	110.56	47.91
20		1500.00	166.67	62.00	104.67	45.36
24		0.00	166.32	62.00	104.32	45.20
26		0.00	161.75	58.00	103.75	44.96
28		1500.00	149.91	55.00	94.91	41.13
I-200		0.00	177.57	61.00	116.57	50.52
204		0.00(0.00)	171.81	57.00	114.81	49.75
208		0.00(0.00)	171.81	59.00	112.81	48.88
I-212		0.00	161.75	58.00	103.75	44.96
0		----	180.00	67.00	113.00	48.97
O-200		0.00	171.81	61.00	110.81	48.02
O-212		0.00	171.81	58.00	113.81	49.32

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
I-200	50.52	28	41.13
4	50.08	26	44.96
204	49.75	I-212	44.96

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
29	9.57	25	4.25
37	9.57	1	8.51
3	8.51	3	8.51

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	3000.00	

NET SYSTEM INFLOW = 3000.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 3000.00

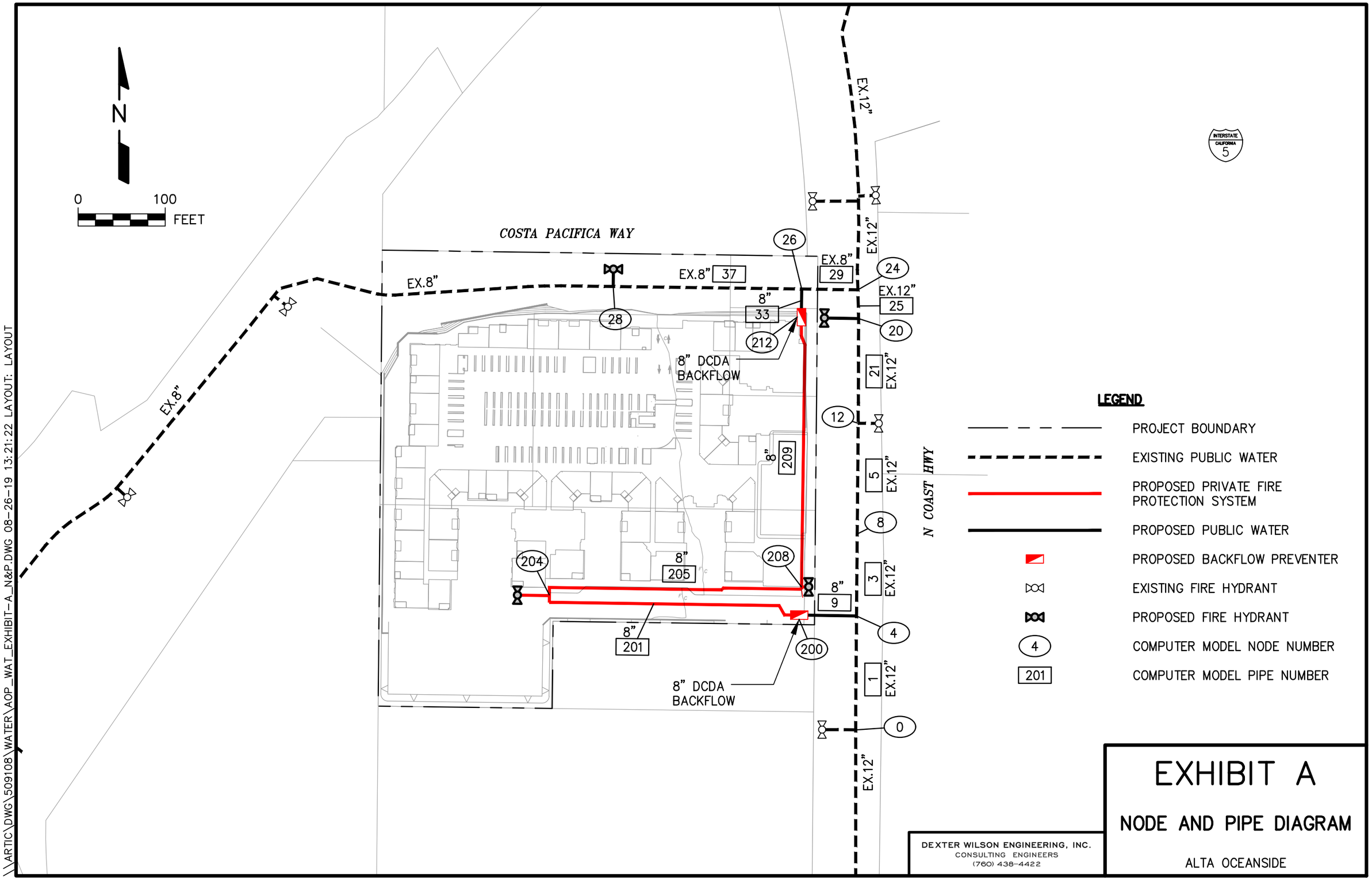


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EXHIBIT A

NODE AND PIPE DIAGRAM

ALTA OCEANSIDE

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