Appendix J

Fire Flow Analysis

FIRE FLOW ANALYSIS FOR THE BREEZE APARTMENTS PROJECT IN THE CITY OF OCEANSIDE

May 24, 2017

5-24-2017

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Job No. 1030-001

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May 24, 2017 1030-001

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PO Box 531
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Attention: Howard A. Jacobs, President

Subject: Fire Flow Analysis for the Breeze Apartments Project in the City of Oceanside

Introduction

This letter-report provides a fire flow analysis to the proposed Breeze Apartments project in the City of Oceanside. The project is proposed to encompass 90 multi-family dwelling units on approximately 2.6 acres located along Nevada Street south of Oceanside Boulevard. A vicinity map is provided as Figure 1.

Water Service

Water service for the Breeze Apartments project will be provided by the City of Oceanside. The project is situated in the west-central portion of the City in an area served by the 320 Pressure Zone.

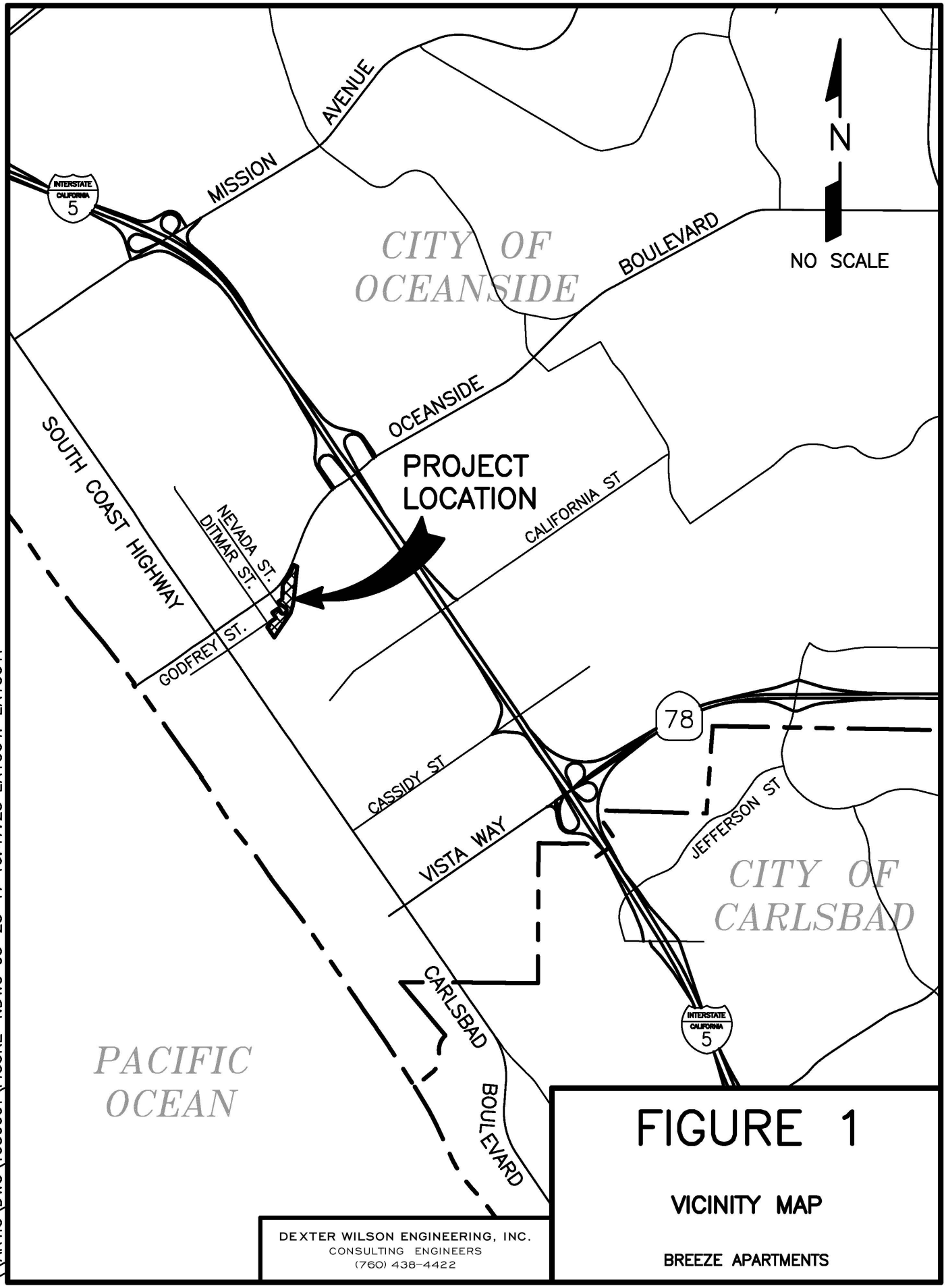

FIGURE 1

VICINITY MAP

BREEZE APARTMENTS

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The water supply to the proposed project comes from two sources. The primary source is the Fire Mountain Reservoir located on Fire Mountain Drive to the south and east of the project. This is a 3 million gallon tank providing service in the 320 Pressure Zone. The secondary source is the Wire Mountain Reservoir, which is further away to the north but includes distribution piping which serves the residential area to the north of the Breeze Apartments project.

Maximum Static Water Pressure. The maximum static water pressure available to the Breeze Apartments project will range between 112 psi at the south end of the Nevada Street cul-de-sac to 115 psi at the Godfrey/Ditmar Streets entrance to the project. These maximum static pressures are based on the maximum available hydraulic grade line in the 320 Pressure Zone of 320 feet, and elevation at the Godfrey/Ditmar Streets entrance of 54 feet and elevation in Nevada Street of 61 feet. Daily working pressures will be lower by approximately 10 to 15 psi based on 320 Pressure Zone tanks not being full, pressure losses in the public distribution piping system, and pressure losses through the water meters and backflow preventers serving the Breeze Apartments project.

Water System Design Criteria

Water system design criteria such as evaluating the capacity of transmission and distribution pipes is based on the August 2005 City of Oceanside Water, Sewer, and Reclaimed Water Design and Construction Manual (Rev. 3 December 2010) and the 2015 Water Master Plan.

Fire Flows

Fire hydrant flow requirements vary by the type of land use and are established by the local fire protection agency. Both the City's Design and Construction Manual and Master Plan identify the fire flow requirement for multi-family residential development to be 3,000 gallons per minute (gpm) at 20 psi residual for water system planning purposes.

Computer Model for System Analysis and Development

To evaluate and confirm the capacity of the existing offsite public water system, a computer model was used.

The KYPIPE computer software program developed by the University of Kentucky was used to evaluate and confirm the capacity of the existing offsite public water system to provide a 3,000 gpm fire flow to the project. The program utilizes the Hazen-Williams equation for determining head loss in pipes and a "C" value of 130 was used for all pipes per the City's Water Master Plan.

The model for this analysis includes the existing offsite piping that is adjacent to the project with some of the pertinent non-adjacent offsite piping as well. For the computer modeling of the 3,000 gpm fire flow scenario, it was estimated conservatively that a hydraulic grade line of 192 feet is available in Oceanside Boulevard just east of the interchange with Interstate 5.

The estimate of an available hydraulic grade line in Oceanside Boulevard east of Interstate 5 was made using a water level of 304 feet in the Fire Mountain Reservoir (half-full) and calculating the headloss in the existing piping from the reservoir to the fixed grade point in Oceanside Boulevard. This calculation was made estimating that all of the required fire flow (3,000 gpm) would come from the Fire Mountain Reservoir system.

Hydraulically there will be support during fire flow scenarios from the Wire Mountain system to the north of the project site. However, to be conservative in developing the calculations and hydraulic model it was assumed that all of the flow would come from the Fire Mountain Reservoir via Oceanside Boulevard.

Results of Computer Modeling for the Breeze Apartments Project

Computer modeling of the water system in the 320 Pressure Zone was performed to evaluate the service conditions and confirm the existing public water system to provide adequate fire protection service to the Breeze Apartments development.

The fire flow demand scenario that was modeled for the Breeze Apartments project was for 3,000 gpm. The 3,000 gpm was split with 1,500 gpm each at the two existing public fire hydrants adjacent to the development. One fire hydrant is at the end of the cul-de-sac in Nevada Street south of Oceanside Boulevard and the other fire hydrant is at the intersection of Godfrey Street and Ditmar Street.

The modeled residual pressures are above 20 psi residual. Residual pressures are 40 psi at the Nevada Street fire hydrant and 36 psi at the Godfrey/Ditmar fire hydrant. Appendix A presents the computer model printout results and Exhibit A included in the back of this report presents the computer modeling Node and Pipe Diagram.

Conclusions and Recommendations

The following conclusions and recommendations are summarized based on the fire flow analysis prepared for the Breeze Apartments development project.

1. The Breeze Apartments project will be served by the City of Oceanside Fire Mountain 320 Pressure Zone.

2. No offsite water improvements are necessary to provide fire protection service to the Breeze Apartments project.

3. The fire flow available to the project site meets the City of Oceanside Design Guideline and Master Plan fire flow requirement of 3,000 gpm for multi-family residential land use.

4. Appendix A presents the computer model printout results and Exhibit A included in the back of this report presents the computer modeling Node and Pipe Diagram.

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 fire flow analysis for the Breeze Apartments project.

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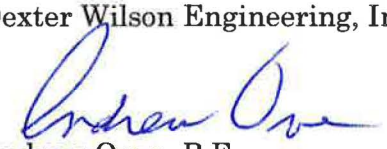

Andrew Oven, P.E.

AO:SH

Attachments

APPENDIX A

COMPUTER MODEL RESULTS
EXISTING SYSTEM

Modeling Scenarios:

1. Maximum Static Pressures

2. 3,000 gpm Fire Flow split between Nodes 16 and 20

FLOWRATE IS EXPRESSED IN GPM AND PRESSURE IN PSIG

A SUMMARY OF THE ORIGINAL DATA FOLLOWS

PIPE NO.	NODE NOS.		LENGTH (FEET)	DIAMETER (INCHES)	ROUGHNESS	MINOR LOSS K	FIXED GRADE
1	0	4	1300.0	14.0	130.0	.00	320.00
THERE IS A CHECK VALVE IN LINE NUMBER 1							
9	4	8	1500.0	14.0	130.0	.00	
13	8	12	330.0	8.0	130.0	.00	
17	8	16	290.0	8.0	130.0	.00	
21	12	20	380.0	8.0	130.0	.00	

JUNCTION NUMBER	DEMAND	ELEVATION	CONNECTING PIPES
4	.00	16.00	1 9
8	.00	70.00	9 13 17
12	.00	66.00	13 21
16	.00	61.00	17
20	.00	54.00	21

OUTPUT SELECTION: ALL RESULTS ARE OUTPUT EACH PERIOD

THIS SYSTEM HAS 5 PIPES WITH 5 JUNCTIONS , 0 LOOPS AND 1 FGNS

Breeze Apartments in the City of Oceanside 1030001A
Static Pressures

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	4	.00	.00	.00	.00	.00	.00
9	4	8	.00	.00	.00	.00	.00	.00
13	8	12	.00	.00	.00	.00	.00	.00
17	8	16	.00	.00	.00	.00	.00	.00
21	12	20	.00	.00	.00	.00	.00	.00

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
4	.00	320.00	16.00	131.73
8	.00	320.00	70.00	108.33
12	.00	320.00	66.00	110.07
16	.00	320.00	61.00	112.23
20	.00	320.00	54.00	115.27

THE NET SYSTEM DEMAND = .00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = .00
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
16	1500.00
20	1500.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 192.0

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

Breeze Apartments
3000 gpm Fire Flow Scenario split between Nodes 16 and 20

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	4	3000.00	11.90	.00	.00	6.25	9.16
9	4	8	3000.00	13.73	.00	.00	6.25	9.16
13	8	12	1500.00	12.77	.00	.00	9.57	38.71
17	8	16	1500.00	11.23	.00	.00	9.57	38.71
21	12	20	1500.00	14.71	.00	.00	9.57	38.71

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
4	.00	180.10	16.00	71.11
8	.00	166.36	70.00	41.76
12	.00	153.59	66.00	37.95
16	1500.00	155.14	61.00	40.79
20	1500.00	138.88	54.00	36.78

THE NET SYSTEM DEMAND = 3000.00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	3000.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 3000.00
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

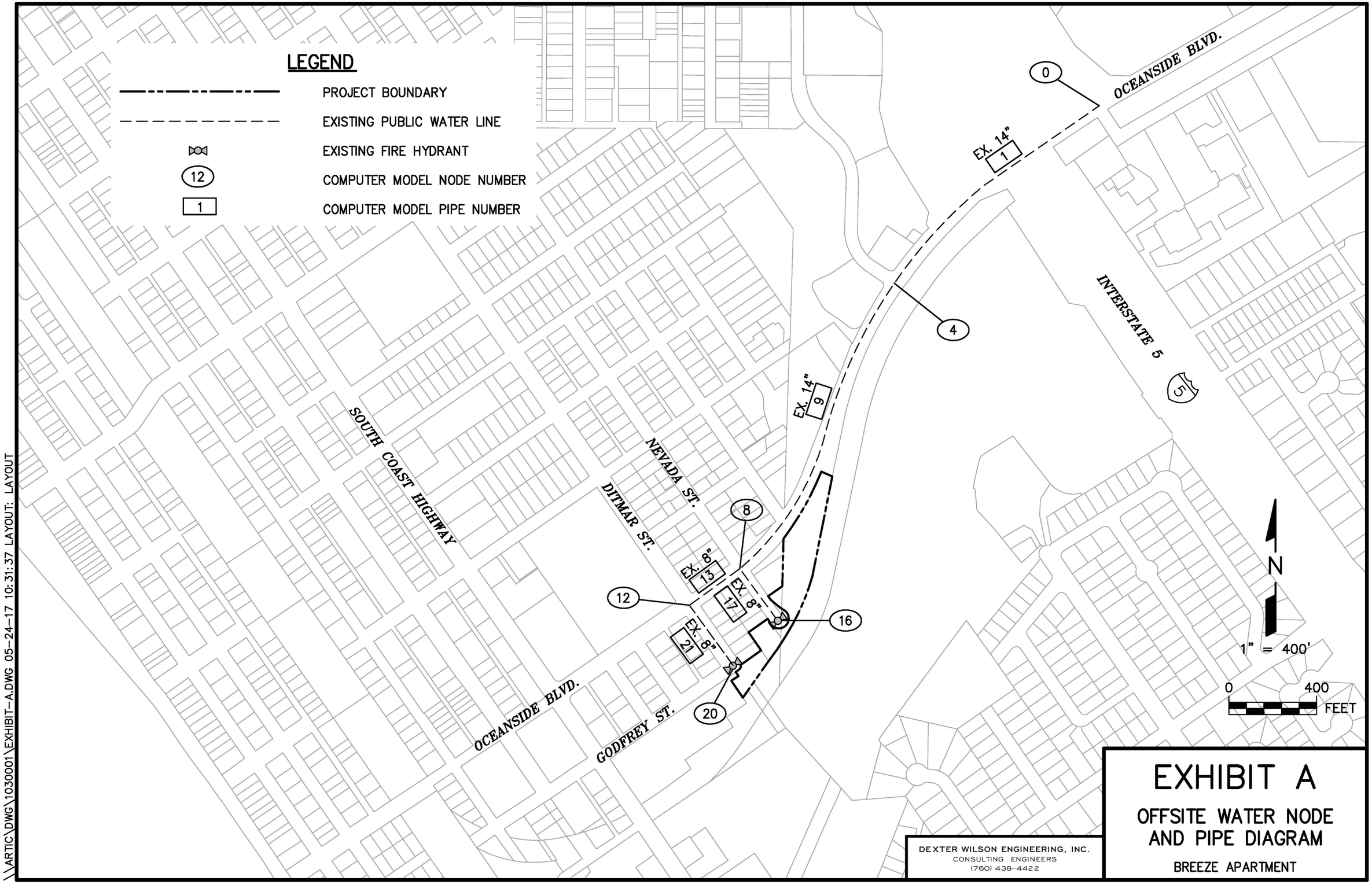

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EXHIBIT A

OFFSITE WATER NODE AND PIPE DIAGRAM

BREEZE APARTMENT

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