Appendix J
Water Service Analysis

DEXTER WILSON ENGINEERING, INC.

WATER • WASTEWATER • RECYCLED WATER

CONSULTING ENGINEERS

WATER SYSTEM ANALYSIS
FOR THE
OLIVE PARK APARTMENTS PROJECT
IN THE CITY OF OCEANSIDE

August 6, 2024

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

WATER SYSTEM ANALYSIS
FOR THE
OLIVE PARK APARTMENTS PROJECT
IN THE CITY OF OCEANSIDE

August 6, 2024

8-6-2024

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Job No. 1161-001

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August 6, 2024 1161-001

Capstone Equities
5455 Wilshire Blvd., Suite #1012
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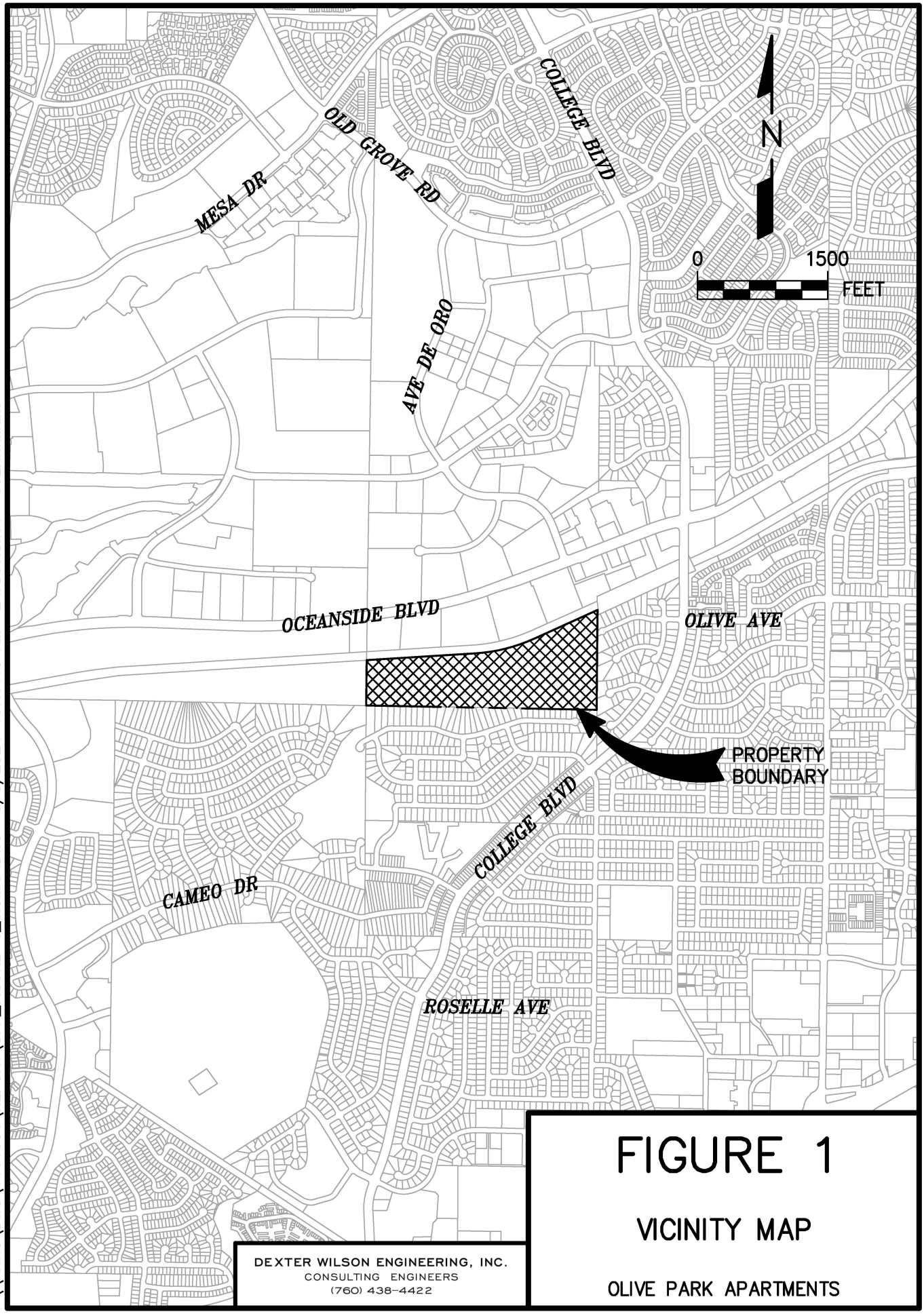
Attention: Brian Mikail, Principal

Subject: Water System Analysis for the Olive Park Apartments Project in the City of Oceanside

Introduction

This report provides a water system analysis for the Olive Park Apartments project in the City of Oceanside. The project is located west of Olive Drive and south of Oceanside Boulevard. Figure 1 provides a vicinity map of the project. A preliminary site plan is included in Appendix A.

The parcel on which the project is located encompasses approximately 43.5 acres and the existing site is presently undeveloped. The project proposes to develop 10.49 acres of the parcel with 282 multi-family units. Water service to the project will connect to the existing City of Oceanside public water mains in Olive Drive and College Boulevard.



\\ARTIC\DWG\1161001\REPORT\OPA_FIGURE-1_VICMAP.DWG 3/8/2024 10:17:48 AM LAYOUT:8x11 USER:William

FIGURE 1

VICINITY MAP

OLIVE PARK APARTMENTS

DEXTER WILSON ENGINEERING, INC.
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Purpose of Study

The purpose of this study is to analyze and determine if the existing public water system in its current size and configuration has adequate capacity for the Olive Park Apartments project. The critical demand scenario is expected to be maximum day demand plus fire flow. This report will determine the offsite (public) water system improvements needed, if any, for the proposed development of the project; this determination will be made in conformance with the City of Oceanside water system design standards.

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. Appendix B presents excerpts for design criteria used from the City's Design & Construction Manual. Based on the design manual, domestic average day water demands are determined using land use acreage and an associated water demand factor, the rates are presented in Table 1.

TABLE 1 AVERAGE DAILY WATER DEMAND FACTORS	
Land Use	**Gallons Per Day Per Acre**
Residential (1-2 DU/ac)	1,200
Residential. (2-4 DU/ac)	2,100
Residential (4-8 DU/ac)	2,400
Residential (8-12 DU/ac)	2,500
Residential (12-15 DU/ac)	2,800
Residential (15-20 DU/ac)	3,200
Residential (20-30 DU/ac)	4,100
Agricultural	1,750
Industrial	2,000
Open Space	1,300
Commercial	1,850
Institutional	1,675

The fire flow requirement for the project is expected to be at most 2,000 gpm. This value is based on 75 percent reduction of the maximum fire flow listed in the Fire Code which is 8,000 gpm. Depending on building size and type of construction, the required fire flow may be lower than 2,000 gpm. However, at this stage of the project planning, we will use a fire flow of 2,000 gpm for our analyses.

During peak hour demands, the public water system must maintain a minimum residual pressure of 35 psi. Residual pressure under maximum day demands plus fire flow must be greater than 20 psi. Pipeline velocity must not exceed 7.5 feet per second (fps) under maximum domestic demands (no fire flow). For fire flow conditions, velocities must not exceed 15 fps for less than 12-inch existing mains and 10 fps for 12-inch existing mains and greater. For new mains, velocities must not exceed 10 fps with fire flow demand flowing through one hydrant.

Existing Water System

Water Service for the Olive Park Apartments project will be provided by the City of Oceanside. The project is situated in the eastern portion of the City in an area served by the Guajome 511 Pressure Zone. The nearest existing 511 Pressure Zone public water line in the vicinity of the project is the 8-inch water line in Olive Drive. Figure 2 shows the existing water facilities in the vicinity of the Olive Park Apartments project. Exhibit A at the back of this report shows a greater extent of the 511 Pressure Zone.

The water supply to this area comes from two reservoirs, a pressure reducing valve (PRV), and two flow control facilities in the Guajome 511 Pressure Zone. The two reservoirs are the 5 million gallon Guajome 1 Reservoir and the 5 million gallon Guajome 2 Reservoir. These reservoirs provide gravity service to the Guajome 511 Pressure Zone and are located in the Peacock Hills area.

From these two tanks there are two main transmission mains extending south and west. One is an 18-inch water main in Peacock Boulevard which connects to a 12-inch line in Oceanside Boulevard. The other is a 27-inch transmission main in Old Grove Road and Avenida Del Oro which also connects to the 12-inch main in Oceanside Boulevard. These systems can be seen in Exhibit A.

LEGEND:

PROPERTY BOUNDARY

EXISTING 511 ZONE PUBLIC WATER LINE

PROPOSED 511 ZONE PUBLIC WATER LINE

EXISTING PUBLIC FIRE HYDRANT

PROPOSED PUBLIC FIRE HYDRANT

OCEANSIDE BLVD

EMERGENCY VEHICLE ACCESS RD

ESPERANZA WAY

OLIVE DR

COLLEGE BLVD

JOANN DR

PROPERTY BOUNDARY

PROJECT IMPACT LIMITS

N

0 250 FEET

FIGURE 2

EXISTING AND PROPOSED WATER FACILITIES

OLIVE PARK APARTMENTS

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

Water Service Overview

Water service to the project will be from the City of Oceanside Guajome 511 Pressure Zone**.** Finish surface elevations for the Olive Park Apartments project range from 252 feet to 264 feet. This results in a maximum static water pressure range of 107 psi to 112 psi within the project boundary.

When static pressures exceed 80 psi, the California Plumbing Code requires pressure regulating valves at each building supply. All building supplies within the Olive Park Apartments project are anticipated to have individual pressure regulating valves.

There will be two connection points to the Guajome 511 Pressure Zone: one connection will be made to the existing 8-inch public water main in Olive Drive, and a second connection will be made to the existing 10-inch in College Boulevard via a proposed Emergency Vehicle Access (EVA) Road. The connections will tie into an onsite water line loop that goes around the proposed buildings. This onsite water loop is proposed to be a public main to serve the onsite public fire hydrants. As well, fire sprinkler services and domestic services will be connected to this proposed onsite public water main. The public water main will loop around the entire site and connect to the existing 8-inch water main in Olive Drive and the existing 10-inch in College Boulevard.

Figure 2 shows the proposed public water loop around the proposed project site and the connections to the existing water system. An easement will be provided for the public water main loop which will be located within the private drive aisle surrounding the two proposed buildings. An easement will also be provided for the public water main in the EVA Road connecting to the existing 10-inch water main in College Boulevard.

Potable Water Demands

Based on the water use factors presented in the City's Design and Construction Manual and the proposed development plan for the Olive Park Apartments project, the estimated water demand for the project is calculated using the proposed number of dwelling units and the area of the development.

Since the proposed project is only developing a portion of the parcel, the 10.9 acres impacted by the project will be used to determine the dwelling unit density. The 282 multi-family dwelling units on 10.49 acres has a dwelling unit density of 26.9 dwelling units/acre. Per the City's Design and Construction Manual, the dwelling unit density corresponds to a water demand factor of 4,100 gpd/acre for the proposed project.

Multiplying 10.49 acres by 4,100 gpd/acre the average water demand is 43,009 gpd (30 gpm) for the proposed project.

The maximum day demands are 2 times the average and peak hour demands are 3 times the average according to the City's Design and Construction Manual. This results in an estimated maximum day demand of 86,018 gpd (60 gpm) and peak hour demand of 129,027 gpd (90 gpm).

Water System Computer Model

The University of Kentucky KYPIPE computer program was used to conduct a hydraulic model of the existing water system within the study area. This computer program utilizes the Hazen-Williams equation for determining headloss in pipes; the Hazen-Williams "C" value used for all pipes 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.

Water System Computer Model Available Pressure. As mentioned earlier in this report, the primary source of water in the vicinity of the Olive Park Apartments project is the City of Oceanside's Guajome 511 Pressure Zone and its two reservoirs. According to the City's Water Master Plan and atlas maps the 511-foot hydraulic grade line is the high water line of the reservoirs. To be conservative in calculating residual pressures, a hydraulic grade line of 496 feet was used for the reservoirs for computer modeling in this report. A 496-foot HGL simulates the reservoirs being half full. Exhibit A shows the two reservoirs denoted as "A" and "B."

Results of Computer Modeling for Olive Park Apartments

Computer modeling of the existing water system in the Guajome 511 Pressure Zone was performed to evaluate the ability of the existing water system to provide adequate domestic and fire protection service to the Olive Park Apartments development. Four modeling scenarios were run: average day demand, peak hour demand, and two maximum day demand plus 2,000 gpm fire flow. Appendix C presents the computer model printout results and Exhibit A at the back of this report shows the Node and Pipe Diagram.

Under average day demand and peak hour demand, the residual pressures within the Olive Park Apartments site are around 100 psi. For the two maximum day demand plus 2,000 gpm fire flow, the total fire flow was modeled at one fire hydrant location. Minimum residual pressure is greater than 70 psi at each of the two fire hydrants modeled. This residual pressure suggests that fire flows greater than 2,000 gpm can be supplied by the water system at 20 psi residual.

The proposed public water lines are proposed to be 8-inch connected to the existing 8-inch water main in Olive Drive, and 10-inch diameter in the EVA Road connecting to the existing 10-inch water main in College Boulevard. The looped public water line around the buildings is adequately sized at 8-inch diameter.

Domestic and Fire Sprinkler Services

It is anticipated that each of the two apartment buildings will have a domestic service and a fire sprinkler service. These services will be connected to the proposed 8-inch public water line looped around the project site.

The sizing of the domestic services will be done later in the design phase when architectural plans are prepared so that an accurate water fixture count can be made. The fire sprinkler system designer will be responsible for sizing the fire sprinkler lateral.

Conclusions and Recommendations

The following conclusions and recommendations are summarized based on the water system analysis prepared for the Olive Park Apartments development project.

1. Water service to the project will be provided by the City of Oceanside Guajome 511 Pressure Zone public water system.

2. Finish grade elevations within the project range from approximately 252 to 264 feet resulting in a range of maximum static water pressures of 107 to 112 psi. When static pressures exceed 80 psi, individual pressure regulators need to be installed to comply with the California Plumbing Code.

3. Public water system improvements included constructing a proposed 8-inch public water main extension connected to the existing 8-inch public water main in Olive Drive, constructing a proposed 10-inch public water main in the EVA Road connected to the existing 10-inch public water main in College Boulevard, and constructing an 8-inch loop main around the proposed buildings within the site.

4. The minimum fire flow available to the project site meets the expected 2022 California Fire Code fire flow requirement of 2,000 gpm. Based on the hydraulic analyses performed, fire hydrant flow greater than 2,000 gpm can be supplied to the project.

5. Domestic water services will be determined once architectural plans are prepared and water fixture unit counts are available.

6. The fire sprinkler laterals will be sized by the fire sprinkler designer.

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

8. PVC pipe to be used for water lines for the project is recommended to be in accordance with the piping specification in AWWA C900: DR18 Class 235.

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 Olive Park Apartments project.

Dexter Wilson Engineering, Inc.

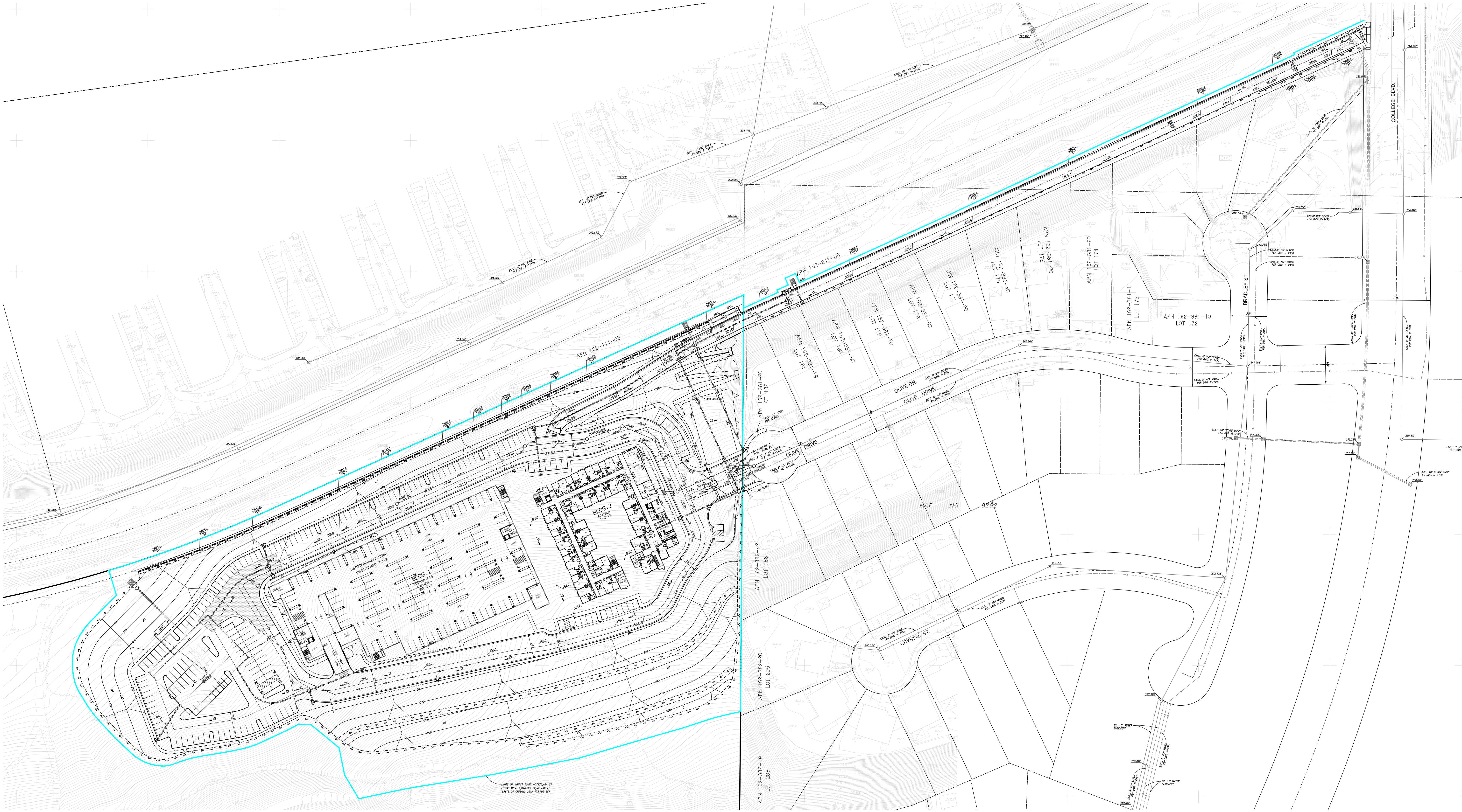
Andrew Oven, P.E.

WT:AO:ah

Attachments

APPENDIX A

PRELIMINARY SITE PLAN



APN 162-111-03
APN 162-241-05
COLLEGE BLVD.
BRADLEY ST.
APN 162-381-10
LOT 172
APN 162-381-11
LOT 173
APN 162-381-20
LOT 174
APN 162-381-30
LOT 175
APN 162-381-40
LOT 176
APN 162-381-50
LOT 177
APN 162-381-60
LOT 178
APN 162-381-70
LOT 179
APN 162-381-90
LOT 180
APN 162-381-19
LOT 181
APN 162-381-20
LOT 182
OLIVE DR.
OLIVE DRIVE
OLIVE DRIVE
MAP NO. 8292
APN 162-382-42
LOT 183
CRYSTAL ST.
APN 162-382-20
LOT 205
APN 162-382-19
LOT 206
BLDG. 1
BLDG. 2

Olive Park Apartments

Capstone Equities, LLC

PHASE 1 + PHASE 2 UNIT MIX

PHASE 1	Unit Type	Count	Mix/Unit Type	Mix %	Unit Type %
A1	1x1	56	78	32.6%	45.3%
A2	1x1	11		6.4%	
A3	1x1	11		6.4%	
B1	2x1	51	51	29.7%	29.7%
C1	3x2	43	43	25.0%	25.0%
TOTAL		**172**	**172**	**100.0%**	**100.0%**

PHASE 2	Unit Type	Count	Mix/Unit Type	Mix %	Unit Type %
A1	1x1	58	86	52.7%	78.2%
A2	1x1	16		14.5%	
A3	1x1	12		10.9%	
B1	2x1	24	24	21.8%	21.8%
C1	3x2	0	0	0.0%	0.0%
TOTAL		**110**	**110**	**100.0%**	**100.0%**

PHASES 1 + 2	Unit Type	Count	Mix/Unit Type	Mix %	Unit Type %
A1	1x1	114	164	40.4%	58.2%
A2	1x1	27		9.6%	
A3	1x1	23		8.2%	
B1	2x1	75	75	26.6%	26.6%
C1	3x2	43	43	15.2%	15.2%
TOTAL		**282**	**282**	**100%**	**100%**

APPENDIX B

EXCERPTS FROM
SECTION 2 OF THE CITY OF OCEANSIDE
DESIGN AND CONSTRUCTION MANUAL
REVISED AUGUST 1, 2017

2. Pressure Regulating Stations
3. Pressure Relief Stations
4. Reservoirs
5. Wells

H. Demands:

1. Average daily water demands shall be:

LAND USE CATEGORY	GALLONS PER DAY/PER ACRE
Single Family Res. (1-2 DU/ac)	1,200
Single Family Res. (2-4 DU/ac)	2,100
Single Family Res. (4-8 DU/ac)	2,400
Single Family Res. (8-12 DU/ac)	2,500
Single Family Res. (12-15 DU/ac)	2,800
Single Family Res. (15-20 DU/ac)	3,200
Single Family Res. (20-30 DU/ac)	4,100
Agricultural Acres	1,750
Industrial Acres	2,000
Open Space Acres	1,300
Commercial Acres	1,850
Institutional Acres	1,675

DU – Dwelling Unit

2. Peak Factors:

a. Average Daily Demand ADD = 1.00
b. Maximum Daily Demand MDD = 2.0*ADD
c. Peak Hourly Demand PHD = 3.0*ADD

2.2 FIRE FLOWS

The City of Oceanside currently utilizes the latest edition California Fire Code (CFC) requirements for determining fire flow requirements for buildings. The latest edition CFC incorporates many factors in determining fire flows, such as building construction type, building square footage, and fire protection systems. Several factors are combined to determine the minimum required fire flow requirements.

Although General Guidelines contained in Table 2.1 represent typical fire flows for various land use categories, minimum fire flow calculations are governed by the latest edition CFC, Section 507, for each specific building type and construction.

The typical fire flow for the different land use categories are shown in the following Table. All fire flows are measured with a 20-PSI Residual Pressure.

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.

F. For fire flow conditions, velocities shall not exceed 15 FPS for less than 12-inch existing mains, and velocities shall not exceed 10 FPS for 12-inch existing mains and above. For new mains, velocities shall not exceed 10 FPS with the fire flow demand flowing through one hydrant.

G. Thrust blocks shall be installed in accordance with Standard Drawing W-27. When water pressures exceed 200 PSI and/or soil-bearing pressures are less than 2000 PSF a special design shall be required by a Registered Civil/Structural Engineer.

H. All mains shall be shown in profile on the improvement plans.

I. All water mains not located within the Public right-of-way shall be provided with a minimum 20-foot wide water easement. In some cases, a wider easement may be required, as determined by the Water Utilities Director.

J. Where water and sewer mains are located within the same easement, the minimum easement size shall be 30 feet wide.

K. Easements shall be easily accessible to City maintenance equipment. Access shall be unobstructed with all-weather driveways and capable of withstanding a 40 ton load.

L. No trees, plantings, fences, structures, or building overhang shall be located within City easements.

M. Homeowners who purchase property containing a City easement will be responsible for the maintenance of that easement property.

N. No building foundations will be allowed within 10 feet of the outside edge of a City easement.

O. The shortest pipe length shall be no less than 6 linear feet.

2.5 VALVES

A. Maximum valve spacing:

1. 500 feet in residential areas and high-point areas.

2. 1,000 feet on arteries and secondary feeders, supply lines and combination arteries and supply lines.

B. Valve locations: as required by the Water Utilities Director.

C. Butterfly Valves shall conform to the “Standard for Rubber Seated Butterfly Valves”, per AWWA C-504, as last revised and shall be tested and certified with the valve actuator installed on the valve.

D. Gate Valves sizes 3 inches through 12 inches shall conform to the “Standard for Resilient Wedge Gate Valves for Water and Sewerage Systems”, per AWWA C-509, and C-550 for Interior Epoxy coating, and C-110 for Ductile Iron 250 PSI, latest revision. Gate valves shall be as described in Section 2.12.

APPENDIX C

COMPUTER RUNS

PUBLIC WATER SYSTEM ANALYSIS

NODE AND PIPE DIAGRAM REFERENCE:

Exhibit A

CONDITIONS MODELED:

1. Average Day Demand.

2. Peak Hour Demand.

3. Maximum Day Demand plus Fire Flow of 2,000 gpm at Node 316.

4. Maximum Day Demand plus Fire Flow of 2,000 gpm at Node 324.

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	B	3287.20	18.00	120.0000	1.74
5	8	4	357.70	18.00	120.0000	0.75
9	12	8	195.90	18.00	120.0000	0.80
13	16	12	794.70	12.00	120.0000	1.05
17	4	20	477.20	8.00	120.0000	1.59
21	20	24	945.00	8.00	120.0000	0.60
23	20	32	668.80	8.00	120.0000	2.07
25	24	28	547.90	8.00	120.0000	1.71
29	28	32	866.60	8.00	120.0000	1.41
33	32	36	277.90	8.00	120.0000	0.80
37	36	8	799.80	8.00	120.0000	1.05
39	36	16	192.30	8.00	120.0000	0.80
41	44	16	1274.20	12.00	120.0000	0.60
45	48	44	1165.40	12.00	120.0000	0.96
49	48	52	224.40	8.00	120.0000	1.05
51	76	48	1204.70	12.00	120.0000	1.16
53	52	56	874.30	8.00	120.0000	0.00
57	56	60	584.60	8.00	120.0000	1.03
61	52	60	1153.30	8.00	120.0000	1.00
63	60	64	325.40	8.00	120.0000	0.78
65	64	68	1111.70	8.00	120.0000	1.21
69	68	52	1947.70	8.00	120.0000	1.48
71	68	72	1040.90	10.00	120.0000	0.96
73	72	76	2260.30	10.00	120.0000	1.16
77	80	76	97.40	12.00	120.0000	0.80
81	82	80	565.70	10.00	120.0000	1.59
83	84	82	374.30	10.00	120.0000	0.60
85	84	88	444.40	8.00	120.0000	1.41
87	84	100	159.80	10.00	120.0000	0.96
89	88	92	164.80	8.00	120.0000	1.41
93	96	92	277.90	10.00	120.0000	0.60
97	100	96	156.50	10.00	120.0000	0.65
101	100	104	257.90	10.00	120.0000	0.96
105	104	108	202.90	6.00	120.0000	0.75
109	104	112	353.20	8.00	120.0000	1.10
113	104	116	789.10	8.00	120.0000	1.33
201	A	204	2506.80	42.00	120.0000	1.44
205	204	208	5954.50	27.00	120.0000	1.98
209	208	212	2947.50	30.00	120.0000	1.77
213	212	216	2001.30	27.00	120.0000	1.80
217	216	220	2031.30	12.00	120.0000	1.20
219	212	220	2018.10	10.00	120.0000	1.26
221	220	80	1409.10	12.00	120.0000	0.78
301	116	304	121.10	8.00	120.0000	0.00

305	304	308	58.90	8.00	120.0000	1.05
309	308	310	196.50	8.00	120.0000	0.54
311	310	312	97.40	8.00	120.0000	0.70
313	312	316	298.00	8.00	120.0000	0.00
317	316	320	263.90	8.00	120.0000	0.25
321	320	324	270.50	8.00	120.0000	0.36
325	324	328	299.30	8.00	120.0000	0.36
329	328	304	253.20	8.00	120.0000	0.72
333	310	82	1484.70	10.00	120.0000	1.30

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
4		0.00	352.00	
8		20.00	348.00	
12		0.00	340.00	
16		0.00	310.00	
20		0.00	356.00	
24		20.00	380.00	
28		0.00	346.00	
32		20.00	323.00	
36		20.00	315.00	
44		0.00	272.00	
48		10.00	278.00	
52		0.00	286.00	
56		20.00	318.00	
60		0.00	331.00	
64		25.00	340.00	
68		20.00	275.00	
72		25.00	330.00	
76		0.00	233.00	
80		0.00	233.00	
82		0.00	240.00	
84		0.00	245.00	
88		25.00	275.00	
92		60.00	270.00	
96		25.00	260.00	
100		0.00	255.00	
104		0.00	260.00	
108		5.00	255.00	
112		5.00	282.00	
116		15.00	255.00	
204		0.00	435.00	
208		50.00	395.00	
212		60.00	362.00	
216		50.00	230.00	
220		50.00	240.00	
304		31.00	255.00	
308		0.00	262.00	
310		0.00	262.00	
312		0.00	263.00	
316		0.00	258.00	
320		0.00	258.00	

324	0.00	260.00	
328	0.00	265.00	
A	----	481.00	496.00
B	----	481.00	496.00

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) = 53
NUMBER OF END NODES .....(J) = 42
NUMBER OF PRIMARY LOOPS .....(L) = 10
NUMBER OF SUPPLY NODES .....(F) = 2
NUMBER OF SUPPLY ZONES .....(Z) = 1

==========

Case: 1

Olive Park Apartments Project
Proposed Public Water System
Average Day Demand

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	B	-205.15	0.07	0.00	0.26	0.02	0.02
5	8	4	-163.44	0.01	0.00	0.21	0.02	0.01
9	12	8	-106.98	0.00	0.00	0.13	0.01	0.01
13	16	12	-106.98	0.04	0.00	0.30	0.05	0.05
17	4	20	41.71	0.03	0.00	0.27	0.06	0.06
21	20	24	19.17	0.01	0.00	0.12	0.01	0.01
23	20	32	22.54	0.01	0.00	0.14	0.02	0.02
25	24	28	-0.83	0.00	0.00	0.01	0.00	0.00
29	28	32	-0.83	0.00	0.00	0.01	0.00	0.00
33	32	36	1.71	0.00	0.00	0.01	0.00	0.00
37	36	8	-36.45	0.04	0.00	0.23	0.05	0.05
39	36	16	18.16	0.00	0.00	0.12	0.01	0.01
41	44	16	-125.15	0.08	0.00	0.35	0.06	0.06
45	48	44	-125.15	0.07	0.00	0.35	0.06	0.06
49	48	52	57.73	0.02	0.00	0.37	0.12	0.11
51	76	48	-57.41	0.02	0.00	0.16	0.02	0.01
53	52	56	22.15	0.02	0.00	0.14	0.02	0.02
57	56	60	2.15	0.00	0.00	0.01	0.00	0.00
61	52	60	19.02	0.02	0.00	0.12	0.01	0.01
63	60	64	21.18	0.01	0.00	0.14	0.02	0.02
65	64	68	-3.82	0.00	0.00	0.02	0.00	0.00
69	68	52	-16.56	0.02	0.00	0.11	0.01	0.01
71	68	72	-7.27	0.00	0.00	0.03	0.00	0.00
73	72	76	-32.27	0.03	0.00	0.13	0.01	0.01
77	80	76	-25.15	0.00	0.00	0.07	0.00	0.00
81	82	80	-166.00	0.15	0.01	0.68	0.28	0.26
83	84	82	-114.37	0.05	0.00	0.47	0.13	0.13
85	84	88	39.51	0.02	0.00	0.25	0.06	0.05
87	84	100	74.86	0.01	0.00	0.31	0.07	0.06
89	88	92	14.51	0.00	0.00	0.09	0.01	0.01
93	96	92	45.49	0.01	0.00	0.19	0.02	0.02
97	100	96	70.49	0.01	0.00	0.29	0.06	0.05
101	100	104	4.37	0.00	0.00	0.02	0.00	0.00
105	104	108	5.00	0.00	0.00	0.06	0.00	0.00
109	104	112	5.00	0.00	0.00	0.03	0.00	0.00
113	104	116	-5.63	0.00	0.00	0.04	0.00	0.00
201	A	204	350.85	0.00	0.00	0.08	0.00	0.00
205	204	208	350.85	0.05	0.00	0.20	0.01	0.01
209	208	212	300.85	0.01	0.00	0.14	0.00	0.00
213	212	216	166.73	0.00	0.00	0.09	0.00	0.00
217	216	220	116.73	0.11	0.00	0.33	0.06	0.06
219	212	220	74.12	0.12	0.00	0.30	0.06	0.06

221	220	80	140.85	0.11	0.00	0.40	0.08	0.08
301	116	304	-20.63	0.00	0.00	0.13	0.02	0.02
305	304	308	-36.76	0.00	0.00	0.23	0.06	0.05
309	308	310	-36.76	0.01	0.00	0.23	0.05	0.05
311	310	312	14.87	0.00	0.00	0.09	0.01	0.01
313	312	316	14.87	0.00	0.00	0.09	0.01	0.01
317	316	320	14.87	0.00	0.00	0.09	0.01	0.01
321	320	324	14.87	0.00	0.00	0.09	0.01	0.01
325	324	328	14.87	0.00	0.00	0.09	0.01	0.01
329	328	304	14.87	0.00	0.00	0.09	0.01	0.01
333	310	82	-51.63	0.04	0.00	0.21	0.03	0.03

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	495.93	352.00	143.93	62.37
8		20.00	495.92	348.00	147.92	64.10
12		0.00	495.92	340.00	155.92	67.57
16		0.00	495.88	310.00	185.88	80.55
20		0.00	495.90	356.00	139.90	60.62
24		20.00	495.88	380.00	115.88	50.22
28		0.00	495.88	346.00	149.88	64.95
32		20.00	495.88	323.00	172.88	74.92
36		20.00	495.88	315.00	180.88	78.38
44		0.00	495.80	272.00	223.80	96.98
48		10.00	495.73	278.00	217.73	94.35
52		0.00	495.70	286.00	209.70	90.87
56		20.00	495.68	318.00	177.68	77.00
60		0.00	495.68	331.00	164.68	71.36
64		25.00	495.68	340.00	155.68	67.46
68		20.00	495.68	275.00	220.68	95.63
72		25.00	495.68	330.00	165.68	71.79
76		0.00	495.71	233.00	262.71	113.84
80		0.00	495.71	233.00	262.71	113.84
82		0.00	495.55	240.00	255.55	110.74
84		0.00	495.50	245.00	250.50	108.55
88		25.00	495.47	275.00	220.47	95.54
92		60.00	495.47	270.00	225.47	97.70
96		25.00	495.48	260.00	235.48	102.04
100		0.00	495.49	255.00	240.49	104.21
104		0.00	495.49	260.00	235.49	102.05
108		5.00	495.49	255.00	240.49	104.21
112		5.00	495.49	282.00	213.49	92.51
116		15.00	495.49	255.00	240.49	104.21
204		0.00	496.00	435.00	61.00	26.43
208		50.00	495.95	395.00	100.95	43.74
212		60.00	495.94	362.00	133.94	58.04
216		50.00	495.93	230.00	265.93	115.24
220		50.00	495.82	240.00	255.82	110.85
304		31.00	495.49	255.00	240.49	104.21
308		0.00	495.50	262.00	233.50	101.18
310		0.00	495.50	262.00	233.50	101.19
312		0.00	495.50	263.00	232.50	100.75
316		0.00	495.50	258.00	237.50	102.92

320	0.00	495.50	258.00	237.50	102.92
324	0.00	495.50	260.00	235.50	102.05
328	0.00	495.49	265.00	230.49	99.88
A	----	496.00	481.00	15.00	6.50
B	----	496.00	481.00	15.00	6.50

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
216	115.24	A	6.50
76	113.84	B	6.50
80	113.84	204	26.43
220	110.85	208	43.74
82	110.74	24	50.22

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
81	0.68	25	0.01
83	0.47	29	0.01
221	0.40	33	0.01
49	0.37	57	0.01
41	0.35	101	0.02

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
A	350.85	
B	205.15	

NET SYSTEM INFLOW = 556.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 556.00

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Case: 2

Olive Park Apartments Project
Proposed Public Water System
Peak Hour Demand

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	B	-615.30	0.55	0.02	0.78	0.17	0.17
5	8	4	-490.26	0.04	0.00	0.62	0.12	0.11
9	12	8	-320.78	0.01	0.00	0.40	0.06	0.05
13	16	12	-320.78	0.28	0.01	0.91	0.38	0.36
17	4	20	125.04	0.22	0.02	0.80	0.48	0.45
21	20	24	57.58	0.10	0.00	0.37	0.11	0.11
23	20	32	67.47	0.10	0.01	0.43	0.15	0.14
25	24	28	-2.42	0.00	0.00	0.02	0.00	0.00
29	28	32	-2.42	0.00	0.00	0.02	0.00	0.00
33	32	36	5.04	0.00	0.00	0.03	0.00	0.00
37	36	8	-109.48	0.28	0.01	0.70	0.36	0.35
39	36	16	54.52	0.02	0.00	0.35	0.10	0.10
41	44	16	-375.30	0.61	0.01	1.06	0.49	0.48
45	48	44	-375.30	0.56	0.02	1.06	0.49	0.48
49	48	52	172.97	0.18	0.02	1.10	0.91	0.82
51	76	48	-172.33	0.14	0.00	0.49	0.12	0.11
53	52	56	66.42	0.12	0.00	0.42	0.14	0.14
57	56	60	6.42	0.00	0.00	0.04	0.00	0.00
61	52	60	56.96	0.12	0.00	0.36	0.11	0.11
63	60	64	63.38	0.04	0.00	0.40	0.13	0.13
65	64	68	-11.62	0.01	0.00	0.07	0.01	0.01
69	68	52	-49.59	0.16	0.00	0.32	0.08	0.08
71	68	72	-22.03	0.01	0.00	0.09	0.01	0.01
73	72	76	-97.03	0.21	0.00	0.40	0.10	0.10
77	80	76	-75.30	0.00	0.00	0.21	0.03	0.02
81	82	80	-498.00	1.11	0.10	2.03	2.15	1.97
83	84	82	-342.93	0.37	0.02	1.40	1.03	0.98
85	84	88	118.74	0.18	0.01	0.76	0.44	0.41
87	84	100	224.19	0.07	0.01	0.92	0.53	0.45
89	88	92	43.74	0.01	0.00	0.28	0.07	0.06
93	96	92	136.26	0.05	0.00	0.56	0.19	0.18
97	100	96	211.26	0.06	0.01	0.86	0.45	0.40
101	100	104	12.93	0.00	0.00	0.05	0.00	0.00
105	104	108	15.00	0.01	0.00	0.17	0.04	0.04
109	104	112	15.00	0.00	0.00	0.10	0.01	0.01
113	104	116	-17.07	0.01	0.00	0.11	0.01	0.01
201	A	204	1052.70	0.02	0.00	0.24	0.01	0.01
205	204	208	1052.70	0.37	0.01	0.59	0.06	0.06
209	208	212	902.70	0.08	0.00	0.41	0.03	0.03
213	212	216	500.22	0.03	0.00	0.28	0.02	0.02
217	216	220	350.22	0.86	0.02	0.99	0.43	0.42
219	212	220	222.48	0.89	0.02	0.91	0.45	0.44

221	220	80	422.70	0.84	0.02	1.20	0.61	0.60
301	116	304	-62.07	0.01	0.00	0.40	0.12	0.12
305	304	308	-110.18	0.02	0.01	0.70	0.49	0.36
309	308	310	-110.18	0.07	0.00	0.70	0.38	0.36
311	310	312	44.89	0.01	0.00	0.29	0.08	0.07
313	312	316	44.89	0.02	0.00	0.29	0.07	0.07
317	316	320	44.89	0.02	0.00	0.29	0.07	0.07
321	320	324	44.89	0.02	0.00	0.29	0.07	0.07
325	324	328	44.89	0.02	0.00	0.29	0.07	0.07
329	328	304	44.89	0.02	0.00	0.29	0.07	0.07
333	310	82	-155.07	0.34	0.01	0.63	0.23	0.23

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	495.44	352.00	143.44	62.16
8		60.00(3.00)	495.39	348.00	147.39	63.87
12		0.00	495.38	340.00	155.38	67.33
16		0.00	495.08	310.00	185.08	80.20
20		0.00	495.21	356.00	139.21	60.32
24		60.00(3.00)	495.10	380.00	115.10	49.88
28		0.00	495.10	346.00	149.10	64.61
32		60.00(3.00)	495.10	323.00	172.10	74.58
36		60.00(3.00)	495.10	315.00	180.10	78.05
44		0.00	494.46	272.00	222.46	96.40
48		30.00(3.00)	493.89	278.00	215.89	93.55
52		0.00	493.68	286.00	207.68	90.00
56		60.00(3.00)	493.56	318.00	175.56	76.08
60		0.00	493.56	331.00	162.56	70.44
64		75.00(3.00)	493.52	340.00	153.52	66.52
68		60.00(3.00)	493.52	275.00	218.52	94.69
72		75.00(3.00)	493.53	330.00	163.53	70.86
76		0.00	493.75	233.00	260.75	112.99
80		0.00	493.74	233.00	260.74	112.99
82		0.00	492.53	240.00	252.53	109.43
84		0.00	492.14	245.00	247.14	107.10
88		75.00(3.00)	491.95	275.00	216.95	94.01
92		180.00(3.00)	491.94	270.00	221.94	96.17
96		75.00(3.00)	491.99	260.00	231.99	100.53
100		0.00	492.06	255.00	237.06	102.73
104		0.00	492.06	260.00	232.06	100.56
108		15.00(3.00)	492.05	255.00	237.05	102.72
112		15.00(3.00)	492.06	282.00	210.06	91.02
116		45.00(3.00)	492.07	255.00	237.07	102.73
204		0.00	495.98	435.00	60.98	26.42
208		150.00(3.00)	495.60	395.00	100.60	43.59
212		180.00(3.00)	495.51	362.00	133.51	57.85
216		150.00(3.00)	495.48	230.00	265.48	115.04
220		150.00(3.00)	494.60	240.00	254.60	110.33
304		93.00(3.00)	492.08	255.00	237.08	102.74
308		0.00	492.11	262.00	230.11	99.72
310		0.00	492.19	262.00	230.19	99.75
312		0.00	492.18	263.00	229.18	99.31
316		0.00	492.16	258.00	234.16	101.47

320	0.00	492.14	258.00	234.14	101.46
324	0.00	492.12	260.00	232.12	100.59
328	0.00	492.10	265.00	227.10	98.41
A	----	496.00	481.00	15.00	6.50
B	----	496.00	481.00	15.00	6.50

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
216	115.04	A	6.50
76	112.99	B	6.50
80	112.99	204	26.42
220	110.33	208	43.59
82	109.43	24	49.88

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
81	2.03	25	0.02
83	1.40	29	0.02
221	1.20	33	0.03
49	1.10	57	0.04
41	1.06	101	0.05

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
A	1052.70	
B	615.30	

NET SYSTEM INFLOW = 1668.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 1668.00

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Case: 3

Olive Park Apartments Project
Proposed Public Water System
Maximum Day Demand Plus 2,000 gpm Fire Flow at Node 316

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	B	-1260.62	2.06	0.07	1.59	0.65	0.63
5	8	4	-1036.09	0.16	0.02	1.31	0.49	0.44
9	12	8	-777.09	0.05	0.01	0.98	0.32	0.26
13	16	12	-777.09	1.47	0.08	2.20	1.94	1.84
17	4	20	224.53	0.64	0.05	1.43	1.44	1.33
21	20	24	90.86	0.24	0.00	0.58	0.25	0.25
23	20	32	133.67	0.34	0.02	0.85	0.54	0.51
25	24	28	50.86	0.05	0.00	0.32	0.09	0.09
29	28	32	50.86	0.07	0.00	0.32	0.09	0.09
33	32	36	144.53	0.16	0.01	0.92	0.63	0.59
37	36	8	-219.00	1.02	0.03	1.40	1.31	1.27
39	36	16	323.53	0.50	0.05	2.06	2.90	2.62
41	44	16	-1100.62	4.48	0.09	3.12	3.58	3.51
45	48	44	-1100.62	4.09	0.15	3.12	3.64	3.51
49	48	52	315.26	0.56	0.07	2.01	2.79	2.50
51	76	48	-765.36	2.16	0.08	2.17	1.86	1.79
53	52	56	97.29	0.25	0.00	0.62	0.28	0.28
57	56	60	57.29	0.06	0.00	0.37	0.11	0.11
61	52	60	93.97	0.31	0.01	0.60	0.27	0.27
63	60	64	151.26	0.21	0.01	0.97	0.68	0.64
65	64	68	101.26	0.34	0.01	0.65	0.31	0.30
69	68	52	-123.99	0.86	0.01	0.79	0.45	0.44
71	68	72	185.26	0.33	0.01	0.76	0.32	0.31
73	72	76	135.26	0.40	0.01	0.55	0.18	0.18
77	80	76	-900.62	0.24	0.08	2.55	3.26	2.42
81	82	80	-2332.00	19.40	2.24	9.53	38.25	34.29
83	84	82	-1025.64	2.80	0.16	4.19	7.93	7.49
85	84	88	235.35	0.65	0.05	1.50	1.56	1.45
87	84	100	790.29	0.74	0.16	3.23	5.59	4.62
89	88	92	185.35	0.15	0.03	1.18	1.12	0.93
93	96	92	-65.35	0.01	0.00	0.27	0.05	0.05
97	100	96	-15.35	0.00	0.00	0.06	0.00	0.00
101	100	104	805.64	1.24	0.16	3.29	5.42	4.79
105	104	108	10.00	0.00	0.00	0.11	0.02	0.02
109	104	112	10.00	0.00	0.00	0.06	0.00	0.00
113	104	116	785.64	10.69	0.52	5.01	14.21	13.55
201	A	204	1851.38	0.05	0.00	0.43	0.02	0.02
205	204	208	1851.38	1.06	0.03	1.04	0.18	0.18
209	208	212	1751.38	0.28	0.02	0.79	0.10	0.10
213	212	216	1039.12	0.12	0.01	0.58	0.07	0.06
217	216	220	939.12	5.32	0.13	2.66	2.68	2.62
219	212	220	592.26	5.47	0.11	2.42	2.77	2.71

221	220	80	1431.38	8.05	0.20	4.06	5.86	5.71
301	116	304	755.64	1.53	0.00	4.82	12.61	12.61
305	304	308	-42.11	0.00	0.00	0.27	0.08	0.06
309	308	310	-42.11	0.01	0.00	0.27	0.06	0.06
311	310	312	1264.25	3.19	0.71	8.07	39.97	32.71
313	312	316	1264.25	9.75	0.00	8.07	32.71	32.71
317	316	320	-735.75	3.17	0.09	4.70	12.33	12.00
321	320	324	-735.75	3.25	0.12	4.70	12.46	12.00
325	324	328	-735.75	3.59	0.12	4.70	12.41	12.00
329	328	304	-735.75	3.04	0.25	4.70	12.98	12.00
333	310	82	-1306.36	17.41	0.57	5.34	12.11	11.72

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	493.87	352.00	141.87	61.48
8		40.00(2.00)	493.70	348.00	145.70	63.13
12		0.00	493.63	340.00	153.63	66.57
16		0.00	492.09	310.00	182.09	78.91
20		0.00	493.18	356.00	137.18	59.45
24		40.00(2.00)	492.95	380.00	112.95	48.94
28		0.00	492.90	346.00	146.90	63.65
32		40.00(2.00)	492.82	323.00	169.82	73.59
36		40.00(2.00)	492.65	315.00	177.65	76.98
44		0.00	487.52	272.00	215.52	93.39
48		20.00(2.00)	483.28	278.00	205.28	88.96
52		0.00	482.66	286.00	196.66	85.22
56		40.00(2.00)	482.41	318.00	164.41	71.24
60		0.00	482.35	331.00	151.35	65.58
64		50.00(2.00)	482.13	340.00	142.13	61.59
68		40.00(2.00)	481.78	275.00	206.78	89.60
72		50.00(2.00)	481.44	330.00	151.44	65.62
76		0.00	481.04	233.00	248.04	107.48
80		0.00	480.72	233.00	247.72	107.35
82		0.00	459.09	240.00	219.09	94.94
84		0.00	456.12	245.00	211.12	91.48
88		50.00(2.00)	455.42	275.00	180.42	78.18
92		120.00(2.00)	455.24	270.00	185.24	80.27
96		50.00(2.00)	455.22	260.00	195.22	84.60
100		0.00	455.22	255.00	200.22	86.76
104		0.00	453.83	260.00	193.83	83.99
108		10.00(2.00)	453.82	255.00	198.82	86.16
112		10.00(2.00)	453.83	282.00	171.83	74.46
116		30.00(2.00)	442.61	255.00	187.61	81.30
204		0.00	495.94	435.00	60.94	26.41
208		100.00(2.00)	494.86	395.00	99.86	43.27
212		120.00(2.00)	494.56	362.00	132.56	57.44
216		100.00(2.00)	494.42	230.00	264.42	114.58
220		100.00(2.00)	488.97	240.00	248.97	107.89
304		62.00(2.00)	441.09	255.00	186.09	80.64
308		0.00	441.09	262.00	179.09	77.61
310		0.00	441.10	262.00	179.10	77.61
312		0.00	437.21	263.00	174.21	75.49
316		2000.00	427.46	258.00	169.46	73.43

320	0.00	430.72	258.00	172.72	74.84
324	0.00	434.09	260.00	174.09	75.44
328	0.00	437.80	265.00	172.80	74.88
A	----	496.00	481.00	15.00	6.50
B	----	496.00	481.00	15.00	6.50

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
216	114.58	A	6.50
220	107.89	B	6.50
76	107.48	204	26.41
80	107.35	208	43.27
82	94.94	24	48.94

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
81	9.53	97	0.06
311	8.07	109	0.06
313	8.07	105	0.11
333	5.34	93	0.27
113	5.01	305	0.27

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
A	1851.38	
B	1260.62	

NET SYSTEM INFLOW = 3112.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 3112.00

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Case: 4

Olive Park Apartments Project
Proposed Public Water System
Maximum Day Demand Plus 2,000 gpm Fire Flow at Node 324

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	B	-1260.62	2.06	0.07	1.59	0.65	0.63
5	8	4	-1036.09	0.16	0.02	1.31	0.49	0.44
9	12	8	-777.09	0.05	0.01	0.98	0.32	0.26
13	16	12	-777.09	1.47	0.08	2.20	1.94	1.84
17	4	20	224.53	0.64	0.05	1.43	1.44	1.33
21	20	24	90.86	0.24	0.00	0.58	0.25	0.25
23	20	32	133.67	0.34	0.02	0.85	0.54	0.51
25	24	28	50.86	0.05	0.00	0.32	0.09	0.09
29	28	32	50.86	0.07	0.00	0.32	0.09	0.09
33	32	36	144.53	0.16	0.01	0.92	0.63	0.59
37	36	8	-219.00	1.02	0.03	1.40	1.31	1.27
39	36	16	323.53	0.50	0.05	2.06	2.90	2.62
41	44	16	-1100.62	4.48	0.09	3.12	3.58	3.51
45	48	44	-1100.62	4.09	0.15	3.12	3.64	3.51
49	48	52	315.26	0.56	0.07	2.01	2.79	2.50
51	76	48	-765.36	2.16	0.08	2.17	1.86	1.79
53	52	56	97.29	0.25	0.00	0.62	0.28	0.28
57	56	60	57.29	0.06	0.00	0.37	0.11	0.11
61	52	60	93.97	0.31	0.01	0.60	0.27	0.27
63	60	64	151.26	0.21	0.01	0.97	0.68	0.64
65	64	68	101.26	0.34	0.01	0.65	0.31	0.30
69	68	52	-123.99	0.86	0.01	0.79	0.45	0.44
71	68	72	185.26	0.33	0.01	0.76	0.32	0.31
73	72	76	135.26	0.40	0.01	0.55	0.18	0.18
77	80	76	-900.62	0.24	0.08	2.55	3.26	2.42
81	82	80	-2332.00	19.40	2.24	9.53	38.25	34.29
83	84	82	-1043.09	2.89	0.17	4.26	8.18	7.73
85	84	88	239.07	0.67	0.05	1.53	1.61	1.50
87	84	100	804.02	0.76	0.16	3.28	5.78	4.77
89	88	92	189.07	0.16	0.03	1.21	1.16	0.97
93	96	92	-69.07	0.01	0.00	0.28	0.05	0.05
97	100	96	-19.07	0.00	0.00	0.08	0.01	0.00
101	100	104	823.09	1.29	0.17	3.36	5.64	4.98
105	104	108	10.00	0.00	0.00	0.11	0.02	0.02
109	104	112	10.00	0.00	0.00	0.06	0.00	0.00
113	104	116	803.09	11.14	0.54	5.13	14.80	14.12
201	A	204	1851.38	0.05	0.00	0.43	0.02	0.02
205	204	208	1851.38	1.06	0.03	1.04	0.18	0.18
209	208	212	1751.38	0.28	0.02	0.79	0.10	0.10
213	212	216	1039.12	0.12	0.01	0.58	0.07	0.06
217	216	220	939.12	5.32	0.13	2.66	2.68	2.62
219	212	220	592.26	5.47	0.11	2.42	2.77	2.71

221	220	80	1431.38	8.05	0.20	4.06	5.86	5.71
301	116	304	773.09	1.59	0.00	4.93	13.15	13.15
305	304	308	-404.16	0.23	0.11	2.58	5.80	3.96
309	308	310	-404.16	0.78	0.06	2.58	4.24	3.96
311	310	312	884.75	1.64	0.35	5.65	20.45	16.89
313	312	316	884.75	5.03	0.00	5.65	16.89	16.89
317	316	320	884.75	4.46	0.12	5.65	17.36	16.89
321	320	324	884.75	4.57	0.18	5.65	17.55	16.89
325	324	328	-1115.25	7.76	0.28	7.12	26.88	25.93
329	328	304	-1115.25	6.57	0.57	7.12	28.17	25.93
333	310	82	-1288.91	16.98	0.56	5.26	11.81	11.44

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	493.87	352.00	141.87	61.48
8		40.00(2.00)	493.70	348.00	145.70	63.13
12		0.00	493.63	340.00	153.63	66.57
16		0.00	492.09	310.00	182.09	78.91
20		0.00	493.18	356.00	137.18	59.45
24		40.00(2.00)	492.95	380.00	112.95	48.94
28		0.00	492.90	346.00	146.90	63.65
32		40.00(2.00)	492.82	323.00	169.82	73.59
36		40.00(2.00)	492.65	315.00	177.65	76.98
44		0.00	487.52	272.00	215.52	93.39
48		20.00(2.00)	483.28	278.00	205.28	88.96
52		0.00	482.66	286.00	196.66	85.22
56		40.00(2.00)	482.41	318.00	164.41	71.24
60		0.00	482.35	331.00	151.35	65.58
64		50.00(2.00)	482.13	340.00	142.13	61.59
68		40.00(2.00)	481.78	275.00	206.78	89.60
72		50.00(2.00)	481.44	330.00	151.44	65.62
76		0.00	481.04	233.00	248.04	107.48
80		0.00	480.72	233.00	247.72	107.35
82		0.00	459.09	240.00	219.09	94.94
84		0.00	456.02	245.00	211.02	91.44
88		50.00(2.00)	455.31	275.00	180.31	78.13
92		120.00(2.00)	455.12	270.00	185.12	80.22
96		50.00(2.00)	455.10	260.00	195.10	84.54
100		0.00	455.10	255.00	200.10	86.71
104		0.00	453.65	260.00	193.65	83.91
108		10.00(2.00)	453.64	255.00	198.64	86.08
112		10.00(2.00)	453.64	282.00	171.64	74.38
116		30.00(2.00)	441.97	255.00	186.97	81.02
204		0.00	495.94	435.00	60.94	26.41
208		100.00(2.00)	494.86	395.00	99.86	43.27
212		120.00(2.00)	494.56	362.00	132.56	57.44
216		100.00(2.00)	494.42	230.00	264.42	114.58
220		100.00(2.00)	488.97	240.00	248.97	107.89
304		62.00(2.00)	440.37	255.00	185.37	80.33
308		0.00	440.71	262.00	178.71	77.44
310		0.00	441.55	262.00	179.55	77.80
312		0.00	439.56	263.00	176.56	76.51
316		0.00	434.52	258.00	176.52	76.49

320	0.00	429.94	258.00	171.94	74.51
324	2000.00	425.20	260.00	165.20	71.59
328	0.00	433.24	265.00	168.24	72.90
A	----	496.00	481.00	15.00	6.50
B	----	496.00	481.00	15.00	6.50

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
216	114.58	A	6.50
220	107.89	B	6.50
76	107.48	204	26.41
80	107.35	208	43.27
82	94.94	24	48.94

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
81	9.53	109	0.06
325	7.12	97	0.08
329	7.12	105	0.11
311	5.65	93	0.28
313	5.65	25	0.32

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
A	1851.38	
B	1260.62	

NET SYSTEM INFLOW = 3112.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 3112.00

EXHIBIT A

NODE AND PIPE DIAGRAM

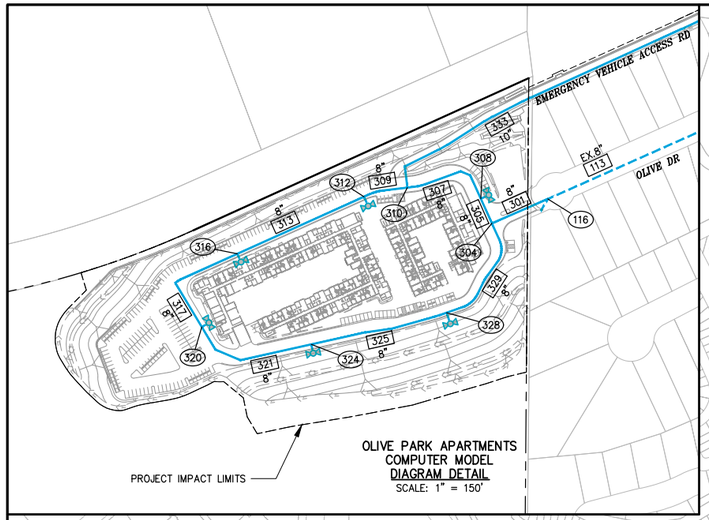

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EXHIBIT A

NODE AND PIPE DIAGRAM

OLIVE PARK APARTMENTS