**DEXTER WILSON ENGINEERING, INC.**

WATER • WASTEWATER • RECYCLED WATER

CONSULTING ENGINEERS

# SOUTHWEST VILLAGE SPECIFIC PLAN WATER STUDY IN THE CITY OF SAN DIEGO PTS# 614791

June 14, 2024

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

# SOUTHWEST VILLAGE
# SPECIFIC PLAN WATER STUDY
# IN THE CITY OF SAN DIEGO
# PTS# 614791

June 14, 2024


6-14-2024

**Prepared by:**

**Dexter Wilson Engineering, Inc.**
**2234 Faraday Avenue**
**Carlsbad, CA 92008**
**(760) 438-4422**

Job No. 648-031

## TABLE OF CONTENTS

## LIST OF APPENDICES

## LIST OF TABLES

**PAGE NO.**

## LIST OF FIGURES

**PAGE NO.**

## EXECUTIVE SUMMARY

This report defines the facilities needed to supply potable water to the Southwest Village development proposed by Tri Pointe Homes and other landowners within the specific plan boundary. The Southwest Village Specific Plan (Specific Plan) provides a comprehensive policy framework intended to guide future development in Southwest Village, consistent with the Otay Mesa Community Plan (OMCP) and City of Villages Strategy. The Specific Plan encompasses approximately 487 acres, will allow up to 5,130 attached and detached residences, and will facilitate creation of a new village anchored by up to 175,000 square feet of commercial and retail uses in a Mixed-Use Village Core. The Specific Plan would provide public facilities including dedication of a new elementary school, approximately 36 acres of developed parks in addition to approximately 18 acres of trails, and 185 natural open space and habitat conservation. Access to the Specific Plan area will be via two main access points, Caliente Avenue to the north and from an extension of Beyer Boulevard to the west, connecting the Specific Plan area to San Ysidro.

The purpose of this report is twofold:

1. Design Definition: Confirm the size, location, and constructability of the proposed water facilities necessary to provide service to the Southwest Village development.

2. EIR Support: Describe the water facilities in sufficient detail to support the Southwest Village Specific Plan Environmental Impact Report (EIR).

## FACILITY OVERVIEW – POTABLE WATER SYSTEM

### Water Supply Facilities

The water facilities required for service mainly consist of extending the existing City of San Diego water distribution system and appurtenant facilities. A more detailed description of existing City water facilities is included in Chapter 3 of this report. A summary map depicting these facilities is shown on Figure 3-1. Figure 3-2 depicts the backbone onsite water distribution system. The offsite water facilities improvements needed for the Southwest Village Specific Plan development are the extension of the a 16-inch water main in Caliente Avenue through the Candlelight development project which is immediately north of the Southwest Village Specific Plan as well as a new 16-inch water main in Otay Mesa Place,

Otay Mesa Road, and Beyer Boulevard from the Princess Park Pump Station into the Specific Plan area.

Based on projected demands and phasing considerations, the recommended offsite water supply facilities include:

- One 16-inch water line in Caliente Avenue extended from the existing public water system into the specific plan area.
- One 16-inch water line in Otay Mesa Place, Otay Mesa Road, and Beyer Boulevard from the Princess Park Pump Station.

Based on projected demands and phasing considerations, the recommended onsite water distribution facilities include:

- A 16-inch water line backbone loop through the build-out development site.
- Twelve-inch water line loops extended from the 16-inch backbone system.
- A 16-inch redundant water main parallel to the 16-inch backbone pipeline for early phase development only until the 16-inch loop system is completed.

## EIR DOCUMENTATION

Permitting requirements and descriptions associated with the construction of the Southwest Village Specific Plan water facilities are included in this report to support the EIR preparation efforts. Any impacts associated with the offsite improvements will be analyzed in the EIR. Construction descriptions are based on typical construction methods for the water facilities identified in this report.

# CHAPTER 1

## INTRODUCTION

The Southwest Village Specific Plan is pursuing development of 487 acres of property south of the intersection of Highway 905 and Caliente Avenue in the Otay Mesa area of the City of San Diego. The development, known as Southwest Village, will require new water service infrastructure. Dexter Wilson Engineering, Inc. is providing engineering services to assist Tri Pointe Homes with planning of the water facilities. A Location Map is shown on Figure 1-1.

## PURPOSE AND OUTLINE

This report provides preliminary planning for the Southwest Village water facilities. The purpose of the report is twofold:

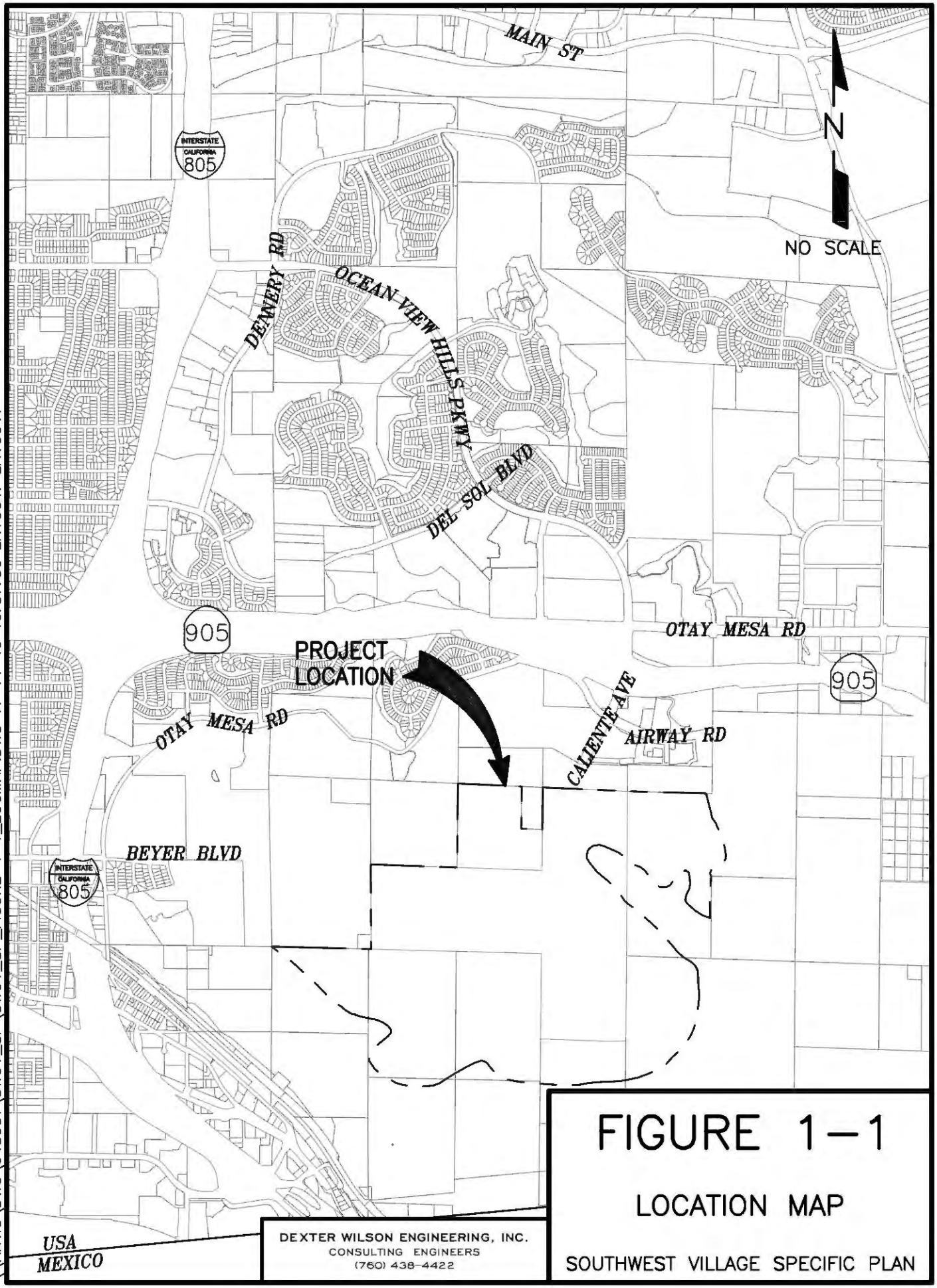
- Design Definition: Conduct sufficient research and hydraulic analysis to confirm the size, location, and constructability of the water facilities needed to provide water service to the Southwest Village Specific Plan.

- EIR Support: Describe facilities in sufficient detail to support a Specific Plan level EIR, including documentation of an alternative analysis process sufficient to comply with the California Environmental Quality Act (CEQA).

The report is organized into four chapters as follows:

- Chapter 1 – Introduction (this chapter)
- Chapter 2 – Water Demand and Design Criteria Overview
- Chapter 3 – Water Supply Facilities – Existing and Proposed
- Chapter 4 – Conclusions and Constructability

This report is an update of the previous "Southwest Village Specific Plan Water Study" dated December 16, 2022 and incorporates City comments that were previously issued. The specific City comments and responses (if any) are included in Appendix E of this report.




# FIGURE 1–1

## LOCATION MAP

SOUTHWEST VILLAGE SPECIFIC PLAN

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

## WATER SERVICE BACKGROUND

The Southwest Village Specific Plan is not within an area of the City where existing potable water service exists. Water service for the Southwest Village Specific Plan will be provided by extending the existing City of San Diego public water system into the Specific Plan area.

Previous reports and water studies have addressed this portion of the City's service area in the vicinity of the Specific Plan area. This area (South San Diego/Otay Mesa) was initially addressed from a master planning perspective in the February 1999 water study titled, "South San Diego / Otay Mesa Water Study," prepared by Dexter Wilson Engineering, Inc. In that master plan several water service alternative configurations were analyzed studied for service to the Otay Mesa area. The recommended alternative has been the basis for the water system infrastructure which has been constructed in the Otay Mesa area to the present. A further discussion of how the Southwest Village Specific Plan will fit into the water system master plan for the Otay Mesa area will be provided in Chapter 3 of this report.

Most recently this area of the City was addressed from a master planning perspective in the February 2024 water study titled, "Otay Focus Area Distribution Master Plan," prepared by Kleinfelder. In that master plan several water service recommendation and system deficiencies were discussed and analyzed for service to the Otay Mesa area. The Specific Plan will be implementing several of the recommended capital improvement projects listed in the February 2024 water study primarily pertaining to adding pump station capacity within the 680 Zone.

## PLANNED LAND USE

The Southwest Village Specific Plan land use plan proposes a variety of different housing types and uses. The plan also proposes a commercial center, parks, and a site for an elementary school. The Specific Plan's 33 Land Use Areas as outlined by the Specific Plan are summarized in Table 1-1. The buildout land use analysis map from the Specific Plan itself is attached to this report as Appendix A.

**TABLE 1-1**
**SOUTHWEST VILLAGE LAND USE SUMMARY**

| Planning Area | Specific Plan Land Use | Gross Acreage | Net Acreage | Maximum Dwelling Units[1] | Net Density[1] |
|---|---|---|---|---|---|
| 1 | Medium Density | 6.9 | 5.5 | 160 | 29.0 |
| 2 | Park | 5.0 | 4.0 | 0 | 0.0 |
| 3 | Park | 2.1 | 1.7 | 0 | 0.0 |
| 4 | Medium Density | 9.1 | 7.3 | 211 | 29.0 |
| 5 | Medium Density | 26.2 | 21.0 | 608 | 29.0 |
| 6 | Medium Density | 4.5 | 3.6 | 104 | 28.9 |
| 7 | Medium Density | 6.9 | 5.5 | 160 | 29.0 |
| 8 | Medium-High Density | 8.0 | 6.4 | 282 | 44.1 |
| 9 | Medium Density | 4.6 | 3.7 | 107 | 29.1 |
| 10 | Medium-Low Density | 12.8 | 10.2 | 225 | 22.0 |
| 11 | Medium Density | 8.2 | 6.6 | 190 | 29.0 |
| 12 | Medium-Low Density | 7.8 | 6.2 | 137 | 22.0 |
| 13 | Medium Density | 8.3 | 6.6 | 193 | 29.1 |
| 14 | Medium-Low Density | 10.3 | 8.2 | 181 | 22.0 |
| 15 | Medium-Low Density | 13.8 | 11.0 | 243 | 22.0 |
| 16 | School | 6.2 | 5.0 | 0 | 0.0 |
| 17 | Park | 10.5 | 8.4 | 0 | 0.0 |
| 18 | Medium-Low Density | 13.5 | 10.8 | 238 | 22.0 |
| 19 | Medium Density | 10.2 | 8.2 | 237 | 29.0 |
| 20 | Medium-Low Density | 7.6 | 6.1 | 134 | 22.0 |
| 21 | Medium-Low Density | 15.1 | 12.1 | 266 | 22.0 |
| 22 | Medium Density | 11.5 | 9.2 | 267 | 29.0 |
| 23 | Open Space/VPHCP | 7.8 | 6.2 | 0 | 0 |
| 24 | Residential Mixed-Use | 7.7 | 6.2 | 352 | 56.8 |
| 25 | Residential Mixed-Use | 8.0 | 6.4 | 365 | 57.0 |
| 26 | Residential Mixed-Use | 5.5 | 4.4 | 251 | 56.8 |
| 27 | Residential Mixed-Use | 4.8 | 3.8 | 219 | 57.6 |
| 28 | Open Space | 128.1 | 102.5 | 0 | 0.0 |
| 29 | Open Space/MHPA | 3.2 | 2.6 | 0 | 0.0 |
| 30 | VPHCP | 51.6 | 41.3 | 0 | 0.0 |
| 31 | VPHCP (Pump Station) | 4.6 | 3.7 | 0 | 0.0 |
| 32 | Streets | 57.0 | 45.6 | 0 | 0.0 |
| **TOTAL** | | **487.4** | **389.9** | **5,130** | **13.2** |

[1] Residential Only

## PLANNING AND ENVIRONMENTAL DOCUMENTATION

The water facilities described in this report will be evaluated in a Specific Plan EIR for the Southwest Village Specific Plan development. Any impacts associated with the offsite improvements will be analyzed in the EIR. This report serves as a technical reference for the Specific Plan EIR. The Southwest Village Specific Plan EIR will be used by the City of San Diego for its review of the Southwest Village Specific Plan.

# CHAPTER 2

## WATER DEMANDS AND DESIGN CRITERIA

This report estimates water demands directly from the planned land uses within the Southwest Village Specific Plan and employs water use factors (design criteria) specific to each land use. Land use is summarized in Table 1-1 and water use factors are described below.

### Water Use Factors

This report has assigned water use factors to each of the different land use categories based on City of San Diego Design Criteria. Specifically, the source is the City of San Diego Water Department Facility Design Guidelines Book 2.

For all land use categories, the water use factors are in gallons per day per net acre (gpd/net-ac). Non-residential land uses are based on net-acreage and each specific non-residential land use is applied a unit water demand from Book 2. The residential unit water demand is 150 gpd per person. Persons per net-acre for residential land use varies depending on residential density. Each residential area of the Specific Plan was analyzed under the maximum possible density per the land use plan in Appendix A and then a population density per "Table 2-1" in Book 2 was applied. The results are summarized in Table 2-1 on the next page.

In all cases, the water use factors represent average annual use rates; actual use will be higher in the summer months and lower in the winter months. The water use factors assigned are shown in Table 2-1 and the excerpt from Book 2 regarding the City's water use factors is included as Appendix B.

**TABLE 2-1**
**SOUTHWEST VILLAGE WATER DEMAND**

| Land Use Area | Proposed Land Use | Net Density | Net Acreage | Water Use Factor, gpd/net-ac. | Demand | | |
|---|---|---|---|---|---|---|---|
| | | | | | gpd | mgd | ac-ft/yr |
| 1 | Medium Density | 29.0 | 5.5 | 13,050 | 71,775 | 0.072 | 80 |
| 2 | Park | 0.0 | 4.0 | 4,680 | 18,720 | 0.019 | 21 |
| 3 | Park | 0.0 | 1.7 | 4,680 | 7,956 | 0.008 | 9 |
| 4 | Medium Density | 29.0 | 7.3 | 13,050 | 95,265 | 0.095 | 107 |
| 5 | Medium Density | 29.0 | 21.0 | 13,050 | 274,050 | 0.274 | 307 |
| 6 | Medium Density | 28.9 | 3.6 | 13,050 | 46,980 | 0.047 | 53 |
| 7 | Medium Density | 29.0 | 5.5 | 13,050 | 71,775 | 0.072 | 80 |
| 8 | Medium-High Density | 44.1 | 6.4 | 16,800 | 107,520 | 0.108 | 120 |
| 9 | Medium Density | 29.1 | 3.7 | 13,050 | 48,285 | 0.048 | 54 |
| 10 | Medium-Low Density | 22.0 | 10.2 | 10,110 | 103,122 | 0.103 | 116 |
| 11 | Medium Density | 29.0 | 6.6 | 13,050 | 86,130 | 0.086 | 96 |
| 12 | Medium-Low Density | 22.0 | 6.2 | 10,110 | 62,682 | 0.063 | 70 |
| 13 | Medium Density | 29.1 | 6.6 | 13,050 | 86,130 | 0.086 | 96 |
| 14 | Medium-Low Density | 22.0 | 8.2 | 10,110 | 82,902 | 0.083 | 93 |
| 15 | Medium-Low Density | 22.0 | 11.0 | 10,110 | 111,210 | 0.111 | 125 |
| 16 | School | 0.0 | 5.0 | 4,680 | 23,400 | 0.023 | 26 |
| 17 | Park | 0.0 | 8.4 | 4,680 | 39,312 | 0.039 | 44 |
| 18 | Medium-Low Density | 22.0 | 10.8 | 10,110 | 109,188 | 0.109 | 122 |
| 19 | Medium Density | 29.0 | 8.2 | 13,050 | 107,010 | 0.107 | 120 |
| 20 | Medium-Low Density | 22.0 | 6.1 | 10,110 | 61,671 | 0.062 | 69 |
| 21 | Medium-Low Density | 22.0 | 12.1 | 10,110 | 122,331 | 0.122 | 137 |
| 22 | Medium Density | 29.0 | 9.2 | 13,050 | 120,060 | 0.120 | 134 |
| 23 | Open Space/VPHCP | 0 | 6.2 | 0 | 0 | 0 | 0 |
| 24 | Residential Mixed-Use | 56.8 | 6.2 | 20,475 | 126,945 | 0.127 | 142 |
| 25 | Residential Mixed-Use | 57.0 | 6.4 | 20,475 | 131,040 | 0.131 | 147 |
| 26 | Residential Mixed-Use | 56.8 | 4.4 | 20,475 | 90,090 | 0.090 | 101 |
| 27 | Residential Mixed-Use | 57.6 | 3.8 | 20,475 | 77,805 | 0.078 | 87 |
| 28 | Open Space | 0.0 | 102.5 | 0.0 | 0 | 0 | 0 |
| 29 | Open Space/MHPA | 0.0 | 2.6 | 0.0 | 0 | 0 | 0 |
| 30 | VPHCP | 0.0 | 41.3 | 0.0 | 0 | 0 | 0 |
| 31 | VPHCP (Pump Station) | 0.0 | 3.7 | 0.0 | 0 | 0 | 0 |
| 32 | Streets | 0.0 | 45.6 | 0.0 | 0 | 0 | 0 |
| **TOTAL** | | | | | **2,283,354** | **2.283** | **2,558** |

From the City of San Diego Department Facility Design Guidelines Book 2, Figure 2-2, the maximum day demand to average annual demand ratio is approximately 1.5 based on the Coastal/Downtown peaking curve, resulting in an estimated maximum day demand in the pressure zone of 3,425,031 gpd (2,378 gpm).

From the City of San Diego Department Facility Design Guidelines Book 2, Figure 2-1, the peak hour demand to average annual demand ratio is approximately 3.4 based on the Coastal/Downtown peaking curve, resulting in an estimated peak hour demand of 4,566,708 gpd (3,171 gpm).

Appendix B of this report presents the backup data for determining these peaking factors. A summary of the remaining relevant design criteria from Book 2 is presented as Table 2-2.

**TABLE 2-2**
**CITY OF SAN DIEGO**
**WATER SYSTEM DESIGN CRITERIA**

| Criteria | Design Requirement |
|---|---|
| Single-Family Residential Fire Flow | 2,000 gpm |
| Multi-Family Residential Fire Flow | 3,000 gpm |
| Commercial Fire Flow | 4,000 gpm |
| Minimum Static Pressure | 65 psi |
| Maximum Static Pressure | 120 psi |
| Maximum Pressure Drop – Peak Hour & Max Day plus Fire | 25 psi |
| Minimum Pressure – Peak Hour | 40 psi |
| Minimum Pressure – Max Day plus Fire | 20 psi |
| Maximum Pipeline Velocity (Fire Flow) | 15 fps |
| Maximum Pipeline Velocity (Normal Operating Conditions) | 5 fps |
| Storage Requirement - Operating | 30% of Maximum Day Demand |
| Storage Requirement – Fire | Maximum Fire Flow Requirement (4,000 gpm) for 5 Hours |
| Storage Requirement – Emergency | 12 Hours of Maximum Day Demand |

## Fire Flow Requirements

Fire flow requirements are anticipated to vary by land use throughout the Southwest Village Specific Plan development. A range of 2,000 gpm (single family residential) to 4,000 gpm (commercial) for five hours will likely be the fire flow requirement. These are planning-level fire flow requirements based on the City's design criteria; these fire flow values will be used to analyzed the water distribution system needed for the Southwest Village Specific Plan and determine required pipe sizes necessary to meet City of San Diego water system design criteria.

# CHAPTER 3

## SOUTHWEST VILLAGE SPECIFIC PLAN WATER SUPPLY FACILITIES

This chapter will discuss the water system infrastructure needed to serve the Southwest Village Specific Plan. The discussions in this chapter will involve backbone water transmission piping system extensions from the existing public water system, onsite distribution system pipe sizing for ultimate build-out, and water storage necessary to comply with the City of San Diego water system design guidelines.

## EXISTING CONDITIONS – 680 PRESSURE ZONE

The Southwest Village Specific Plan will be located within and served by the City of San Diego Otay Mesa 680 Pressure Zone. The 680 Pressure Zone is a closed zone (completely pumped zone) that is currently supplied by three water booster pump stations and an emergency inter-district interconnect. The water booster pump stations include:

Otay Mesa Pump Station
Ocean View Hills Pump Station
Princess Park Pump Station

These three water booster stations take suction from the South San Diego 490 Pressure Zone transmission main piping extending from the South San Diego Reservoir west to the Interstate 805 Freeway and beyond. The hydraulic grade line (HGL) for the South San Diego 490 Pressure Zone is set by the South San Diego Reservoir.

The fourth water supply source for the Otay Mesa 680 Pressure Zone is the City of San Diego/Otay Water District emergency intertie located along Otay Mesa Road west of Brown Field. This intertie enables higher pressure Otay Water District water to augment the supply to the 680 Pressure Zone when needed.

## Water Booster Pump Stations

The Otay Mesa Pump Station is the original 680 Pressure Zone booster station situated in the northeast portion of the Otay Mesa 680 Pressure Zone. It is located on Heritage Road on the south side of the Otay River. From this booster station extends a 24-inch 680 Pressure Zone transmission main south to Otay Mesa Road, then west along Otay Mesa Road to Ocean View Hills Parkway. Note that this pump station is currently not in operation by the City due to the outdated condition and equipment relative to present City design standards and is slated to be replaced by a future City CIP.

The second 680 Pressure Zone water booster station is the Ocean View Hills Pump Station located along Ocean View Hills Parkway approximately 3,500 feet east of Interstate 805. This booster station was constructed as part of the California Terraces development project. From this booster station extends a 30-inch transmission main south to Otay Mesa Road; south of Otay Mesa Road in Caliente Avenue the 30-inch transmission main manifolds into four (4) 12-inch mains crossing Interstate 905. These four lines combine into two (2) 16-inch transmission mains which currently extend to the south terminus of Caliente Avenue.

The third 680 Pressure Zone water booster station is the Princess Park Pump Station which was constructed as part of the Remington Hills subdivision. It is located at the western end of Masterson Lane tucked between the Remington Hills subdivision and the northbound Interstate 805 off-ramp to Interstate 905. A 30-inch transmission main extends from the Princess Park Pump Station east in Masterson Lane, Carbine Way, and Hawken Drive and reduces to a 24-inch main at Old Otay Mesa Road. Note that this pump station is currently not in 680 Pressure Zone operation as well due to not being connected to the 680 Pressure Zone water system until recently.

The backbone Otay Mesa 680 Pressure Zone water facilities are shown in Figure 3-1.

## Otay Water District Emergency Interconnect

An emergency interconnect from the Otay Water District to the City of San Diego is located on Otay Mesa Road just east of the intersection with Heritage Road. This normally closed emergency interconnect with the Otay Water District has a flow delivery capacity of 5,000 gpm. A summary of the existing 680 Zone sources and their hydraulic capacities are listed in Table 3-1.

OLYMPIC PARKWAY
INTERSTATE CALIFORNIA 805
125
"OTAY LAKE"
OTAY 3RD PIPELINE
40"
OTAY 2ND PIPELINE
SOUTH SAN DIEGO RESERVOIR (15 MILLION GALLONS)
54"
40"
OTAY 1ST PIPELINE
MAIN ST.
48"
33"
HERITAGE RD.
42"
OTAY RIVER
33"
OCEAN VIEW HILLS PKWY.
30"
OTAY MESA PUMP STATION (TO BE REPLACED BY FUTURE CITY CIP)
OTAY VALLEY RD.
24"
SOUTH SAN DIEGO PIPELINES
SAN YSIDRO PIPELINE
OCEAN VIEW HILLS PUMP STATION
24"
42"
DEL SOL BLVD.
42"
42"
20"
HERITAGE ROAD
BROWN FIELD AIRPORT
PRINCESS PARK PUMP STATION
24"
24"
30"
OLD OTAY MESA RD.
24"
16"
16"
4 PARALLEL 12" LINES THROUGH 905
OTAY MESA RD.
SMYTHE AVE.
20"
AIRWAY ROAD
16"
16"
16"
CALIENTE AVENUE
OTAY WATER DISTRICT EMERGENCY INTERCONNECT
36"
CONNECTION POINT FOR PROJECT
905
11
AIRWAY RD.
CACTUS RD.
BRITANIA BLVD.
LA MEDIA RD.
BEYER BLVD.
INTERSTATE CALIFORNIA 5
USA
MEXICO

N

SCALE: 1" = 2500'

## LEGEND

- PROJECT BOUNDARY
- EXISTING WATER (490 ZONE)
- EXISTING WATER (680 ZONE)
- CITY OF SAN DIEGO WATER SERVICE AREA BOUNDARY

# FIGURE 3–1

## EXISTING OTAY MESA WATER FACILITIES

SOUTHWEST VILLAGE SPECIFIC PLAN

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

| TABLE 3-1<br>EXISTING 680 PRESSURE ZONE SOURCES | |
|---|---|
| **680 Zone Source** | **Hydraulic Capacity[1]** |
| Otay Mesa Pump Station | 2 Pumps at 695 gpm<br>3 Pumps at 3,080 gpm |
| Ocean View Hills Pump Station | 2 Pumps at 1,000 gpm<br>1 Pump at 3,500 gpm |
| Princess Park Pump Station | 2 Pumps at 3,100 gpm<br>1 Pump at 1,500 gpm |
| Otay Water District<br>Emergency Interconnect | 5,000 gpm |

[1] Maximum flow possible into the 680 Zone (i.e. all pumps and/or valves in service).

## SERVICE TO THE SOUTHWEST VILLAGE SPECIFIC PLAN

The Southwest Village Specific Plan proposes to extend the Otay Mesa 680 Pressure Zone backbone transmission piping from Caliente Avenue south into the development area as well as from Princess Park Pump Station. Two 16-inch transmission mains are proposed to be extended into the Southwest Village Specific Plan area. One 16-inch diameter water main will extend from Caliente Avenue.

The other 16-inch diameter water line will extend from the existing 30-inch water line at the west end of Masterson Lane near the Princess Park Pump Station. The alignment will continue from this location south on Otay Mesa Place and Otay Mesa Road and then east on existing and proposed Beyer Boulevard. This 16-inch diameter water line would be PVC and welded steel depending on static pressures along its alignment. Welded steel will be used where static pressures are greater than 150 psi.

### Existing Water Booster Stations

The water supply to the 680 Zone presently comes from solely the Ocean View Hills Pump Station. As stated previously, the Otay Mesa Pump Station is presently out of service and the Princess Park Pump Station is not yet online supplying the 680 Zone; the Princess Park Pump Station will be brought online by Southwest Village. The Southwest Village Project will provide aa condition assessment report for Princess Park Pump Station.

In addition, the Otay Water District Emergency Interconnect can provide water supply if needed on an emergency basis.

The 680 Pressure Zone itself currently has a firm pumping capacity of 5,500 gpm. This is based on having one of either the Ocean View Hills or Princess Park Pump Stations out of service completely.

## Southwest Village Specific Plan Demand

Based on the estimated water demand calculated for the Southwest Village Specific Plan development in Chapter 2, the maximum day demand is 2,378 gpm. Adding a commercial fire flow of 4,000 gpm results in a total maximum day plus fire flow water requirement of 6,378 gpm for the Southwest Village Specific Plan development. This demand is less than can be supplied by a single water booster station.

Existing water demand in the 680 Zone was provided by the City via flow meter data from January 2017 through February 2018 and is included as Appendix C in this report. The average flow rate was calculated to be 644 gpm. When added to the Southwest Village average water demand, the total average water demand amounts to 2,230 gpm and total maximum day demand increase to 3,344 gpm. A maximum day demand plus 4,000 gpm fire flow scenario for the entire 680 Pressure Zone under this existing plus Specific Plan condition would be 7,344 gpm.

Therefore, in order to meet water supply needs for the Southwest Village Specific Plan as well as the existing 680 Pressure Zone, additional pumping capacity at Ocean View Hills Pump Station will be required. It is proposed to add a 2,200 gpm pump at the existing currently unutilized pump can at Ocean View Hills Pump Station so that the station matches Princess Park Pump Station in its 680 Zone capacity (7,700 gpm each). This would result in matching redundancy and backup ability between the two stations with at least one of the two stations being available at all times.

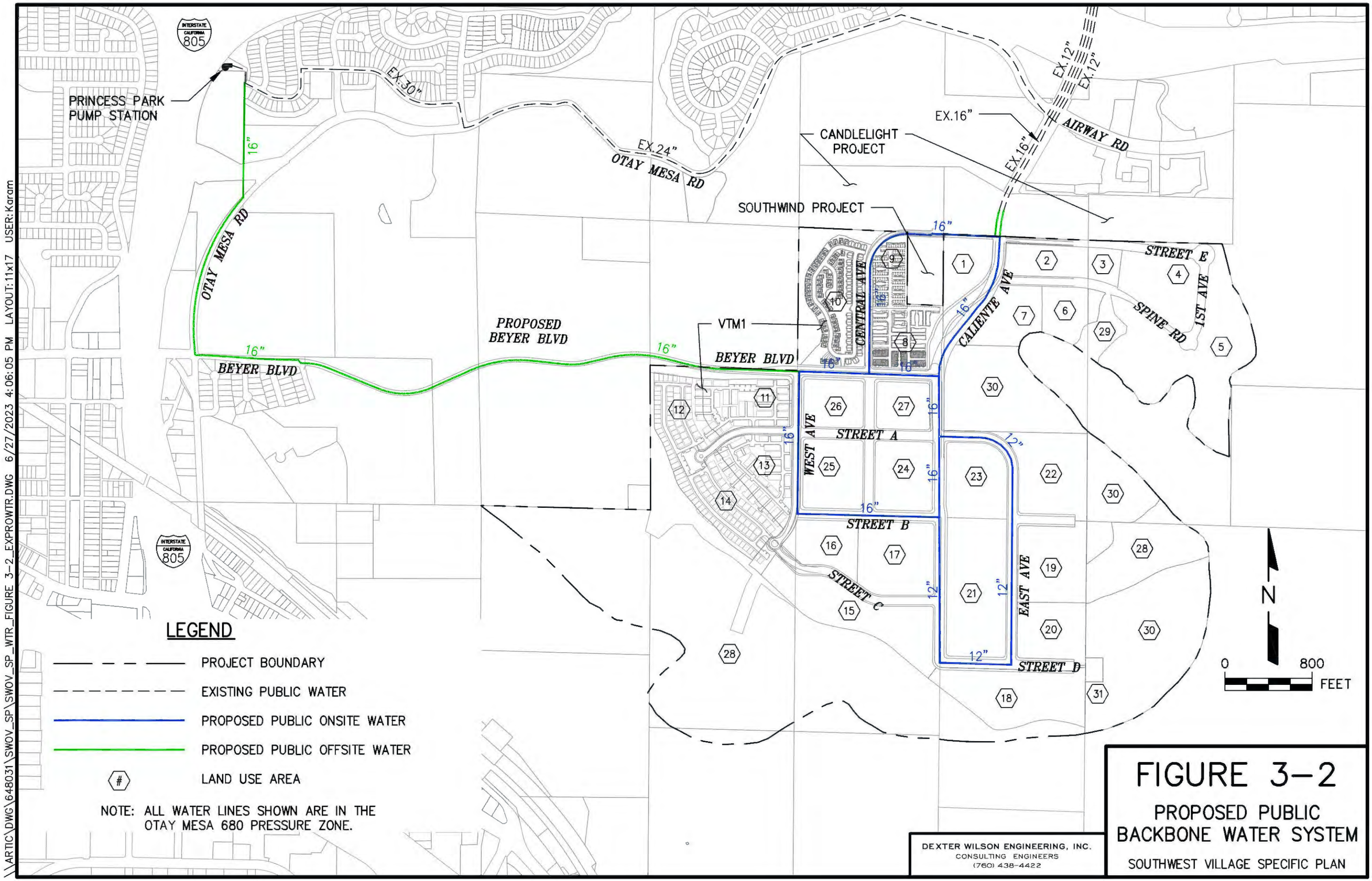
A 7,700 gpm pumping capacity is sufficient to accommodate the maximum day demand plus 4,000 gpm fire flow scenario for the entire 680 Pressure Zone under an existing plus Specific Plan condition which was previously calculated to be 7,344 gpm.

## ONSITE POTABLE WATER DISTRIBUTION

The Southwest Village Specific Plan elevations are anticipated to range from approximately 474 feet to 516 feet. With the 680 Pressure Zone providing potable water service, the maximum static pressures would range from 71 psi to 89 psi. At these static pressures it is anticipated the entire development will be able to be served by a single pressure zone (680 Zone).

The water facilities that will be extended from both offsite alignments described previously and constructed within the Southwest Village Specific Plan are expected to serve only the Southwest Village Specific Plan development. There is no future planned development in the Specific Plan vicinity that would utilize and extend the Specific Plan's onsite water distribution infrastructure other than ancillary adjacent projects which already utilize existing 680 Pressure Zone infrastructure. The land to the west, south, and east of the Southwest Village Specific Plan site is designated open space per the Otay Mesa Community Plan.

Figure 3-2 illustrates the proposed onsite water distribution system as well as extending redundant 680 Zone service and supply.




\\ARTIC\DWG\648031\SWOV_SP\SWOV_SP_WTR_FIGURE 3-2_EXPROWTR.DWG 6/27/2023 4:06:05 PM LAYOUT:11x17 USER:Karam

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

# FIGURE 3–2

## PROPOSED PUBLIC BACKBONE WATER SYSTEM

SOUTHWEST VILLAGE SPECIFIC PLAN

## Water System Computer Model

The University of Kentucky KYPIPE computer program was used to conduct a hydraulic model of the proposed 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.

The computer model for this study includes the backbone 680 Pressure Zone transmission main piping, the proposed public onsite water distribution system piping, and both redundant 16-inch diameter supply alternatives modeled independently. The water supply source nodes for the computer model are at the existing pump stations and at the emergency interconnect; these source nodes are set for a hydraulic grade line of 680 feet.

For existing land uses within the 680 Pressure Zone, water meter data from the Ocean View Hills Pump Station was obtained from the City of San Diego Public Utilities Department and utilized and incorporated into the hydraulic model as average existing water demand for the developed areas of the 680 Pressure Zone. These inputted demands account for only existing development in the 680 Zone at the time of this report. A copy of this correspondence is included in Appendix C.

The proposed public water lines within the Southwest Village Specific Plan which are incorporated into the hydraulic computer model consist of the backbone system configuration. Water distribution systems internal to individual planning areas are not built into the model at this time. As the Southwest Village Specific Plan progresses, specific water studies for individual planning areas will be completed.

## Water System Analysis and Results

Appendix D presents the computer modeling results. Exhibit A at the back of this report presents the corresponding Node and Pipe Diagram.

The planning-level commercial fire flow guideline of 4,000 gpm was modeled along the southwestern area of the Specific Plan site where the furthest reaching commercial area(s) will be constructed. The planning-level multi-family fire flow guideline of 3,000 gpm was modeled at the furthest point (southeast corner) of the Specific Plan site.

Pipe break scenarios via pump station outages were also modeled within the existing and proposed public water system. Other pipe break scenarios that were modeled include the offsite proposed 16-inch diameter water lines in Caliente Avenue or Beyer Boulevard as well as select proposed onsite 16-inch diameter water lines. These pipe break scenarios were analyzed in order to adequately assess the proposed onsite water system's capability under each alternative.

**Multi-Family Residential Fire Flow Analysis.** Under normal operating and pipe break conditions the planning-level fire flow of 3,000 gpm is being met with a minimum residual pressure of greater than 68 psi onsite, 55 psi throughout the pressure zone, and a maximum pipeline velocity of 4.5 fps.

**Commercial Fire Flow Analysis.** Under normal operating and pipe break conditions the planning-level fire flow of 4,000 gpm is being met with a minimum residual pressure of greater than 63 psi onsite, 50 psi throughout the pressure zone, and a maximum pipeline velocity of 4.0 fps.

**Emergency Interconnect.** Under all pipe break scenarios (including pump stations out of service) there is not a need for any flow support from the Emergency Interconnect. Where the Southwest Village Specific Plan is located geographically it is not anticipated that the Emergency Interconnect will be needed provided that there are two pump stations in service.

The results of the computer hydraulic analyses for the Southwest Village Specific Plan indicate that the existing and proposed water system can provide sufficient flow and pressure for the Southwest Village Specific Plan's domestic and projected fire protection service needs.

## POTABLE WATER STORAGE REQUIREMENT

Potable water storage requirements in the City of San Diego are based on three factors: Operating Storage, Fire Storage, and Emergency Storage. Table 2-2 in Chapter 2 outlines these storage requirements. The three potable water storage volumes for the Southwest Village Specific Plan are summarized in Table 3-2.

| TABLE 3-2<br>SOUTHWEST VILLAGE SPECIFIC PLAN<br>POTABLE WATER STORAGE REQUIREMENT | | |
|---|---|---|
| **Storage Type** | **Criteria** | **Required Volume** |
| Operating | 30% of Maximum Day Demand | 1.03 MG |
| Fire | Maximum Fire Flow Requirement (4,000 gpm) for 5 Hours | 1.20 MG |
| Emergency | 12 Hours of Maximum Day Demand | 1.71 MG |
| **TOTAL** | | **3.94 MG** |

The Southwest Village Specific Plan development will utilize the existing Otay Water Treatment Plant Clearwell and South San Diego Reservoir to meet the required potable water storage for the Specific Plan.

Total reservoir storage needed for the 490 and 680 Pressure Zones per the September 1999 South San Diego/Otay Mesa Water Study is 30.2 million gallons. Available storage per the 1999 report was 17.7 million gallons. Thus, the 1999 study determined a deficit of storage of 12.5 million gallons.

In May 2003, two 6.9 MG storage tanks were constructed at the Otay Water Treatment Plant for a total of 13.8 million gallons. These two clearwell storage tanks satisfied the reservoir storage volume requirement for the 490 and 680 Pressure Zones. No additional reservoir storage is needed for the 490 and 680 Pressure Zones in South San Diego.

Additionally, the February 2024 Kleinfelder Otay master plan water study states that the current South San Diego Reservoir (15 MG capacity) meets the City of San Diego's capacity requirements.

# CHAPTER 4

# CONCLUSIONS AND CONSTRUCTABILITY

All water improvements recommended in this report are feasible from a constructability outlook. The recommended water facilities can be separated into two categories in regards to constructability:

- **Onsite Water Facilities:** Construction of onsite water facilities will comprise standard construction practices for new subdivision development. Water lines 8-inch diameter through 16-inch diameter are anticipated to be constructed using PVC pipe. All proposed water lines and appurtenances onsite in public streets will follow the required City of San Diego guidelines, design criteria, and standard drawings and specifications for new construction.

- **Offsite Water Facilities:** The offsite water system improvement of extending the 16-inch diameter water line in Caliente Avenue is anticipated to involve construction at the same time as the street itself. The proposed approximate 7,900 linear foot 16-inch diameter water main in Beyer Boulevard/Otay Mesa Road is proposed to be constructed of PVC for working pressures below 150 psi and welded steel for higher working pressures. Hence, similar to the onsite water facilities, the offsite water facilities will comprise standard construction practices.

## Reimbursement Agreement for Backbone Water Facilities

To provide water service to the build-out of the Southwest Village Specific Plan project, backbone water infrastructure is needed as outlined in this water study. To accommodate build-out conditions, initial construction of any part of the Southwest Village project will entail the installation of water facilities that will be oversized in comparison to the needs of the initial development. In addition, the Southwest Village Specific Plan area encompasses several property owners. In order that the first developers to build in the Specific Plan area are not burdened with the full cost of improvements which benefit the entire Specific Plan project, those who construct any portion of the ultimate water system infrastructure will be able to enter into a reimbursement agreement administered by the City of San Diego to receive pro-rata cost shares from future builders. Figure 4-1 presents the land and property ownerships for the entire Southwest Village Specific Plan area.

LEGEND

- SOUTHWEST VILLAGE BOUNDARY
- TRI-POINTE HOMES
- OTAY MESA LLC
- HANDLER TRUST
- CITY OF SAN DIEGO
- OTHER (PRIVATE)
- EXISTING PUBLIC WATER
- PROPOSED ONSITE PUBLIC WATER
- PROPOSED OFFSITE PUBLIC WATER
- (#) LAND USE AREA

NOTE: ALL WATER LINES SHOWN ARE IN THE OTAY MESA 680 PRESSURE ZONE.

SOUTH-WIND PROJECT

BEYER BLVD

CENTRAL AVE

CALIENTE AVE

WEST AVE

EAST AVE

16" 12"

N

0 600 FEET

\\ARTIC\DWG\648031\SWOV_SP\SWOV_WTR_FIGURE-4-1_OWNERSHIP-MAP.DWG 6/27/2023 9:43:48 AM LAYOUT:11x17 USER:Karam

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

# FIGURE 4-1

## LAND/PROPERTY OWNERSHIP

SOUTHWEST VILLAGE SPECIFIC PLAN

The reimbursement agreement is awaiting legal determination from the City's Attorney's Office at the time of this report.

## Summary of Conclusions and Recommendations

The following conclusions and recommendations are summarized based on this EIR-level water study prepared for the Southwest Village Specific Plan.

1. Water service to the Southwest Village Specific Plan will be supplied by the City of San Diego from the Otay Mesa 680 Pressure Zone system.

2. Maximum static pressures within the Southwest Village Specific Plan will range between 71 psi and 89 psi.

3. A maximum day demand plus up to a 4,000 gpm fire flow scenario can be met within the Specific Plan with all residual pressures greater than 20 psi and pipeline velocities less than 15 fps under an all-pipes-open scenario as well as under a pipe break scenario.

4. Figure 3-2 presents the recommended Specific Plan buildout onsite public water system configuration and pipe sizing.

5. Offsite water distribution system improvements necessary to provide water service to the Southwest Village Specific Plan compose of extending a 16-inch water main in Caliente Avenue south into the Southwest Village Specific Plan area as well as extending an offsite 16-inch diameter water line in Beyer Boulevard/Otay Mesa to the Princess Park Pump Station.

6. Additional pumping capacity at Ocean View Hills Pump Station will be required in order to meet water supply needs for the Southwest Village Specific Plan as well as the existing 680 Pressure Zone. It is proposed to add a 2,200 gpm pump at the existing currently unutilized pump can at Ocean View Hills Pump Station so that the station matches Princess Park Pump Station in its 680 Zone capacity (7,700 gpm each). A 7,700 gpm pumping capacity is sufficient to accommodate the maximum day demand plus 4,000 gpm fire flow scenario for the entire 680 Pressure Zone under an existing plus Specific Plan condition which was calculated to be 7,344 gpm.

7. Southwest Village will perform a condition assessment report and complete upgrades for the Princess Park Pump Station prior to the completion of VTM 1 Phase 1 and the 680 Zone reaching its capacity threshold. The upgrades to the Princess Park Pump station will be determined based on the findings of the condition assessment report.

8. One vesting tentative map is under design development as the initial phase of the Southwest Village Specific Plan. Phasing beyond this vesting tentative map is unknown at this time.

9. This report presents the sizing and a general schematic layout of the proposed public water system. The water improvements design engineer should incorporate valves, fittings, and appurtenances as needed and in accordance with the City of San Diego design standards for proper installation and long-term operation of the water system.

10. Due to the elevation of the Specific Plan site, pressure regulators must be installed below an elevation of 496 feet in order to comply with the California Plumbing Code which limits pressure inside a building to a maximum of 80 psi.

11. All water improvements will be in accordance with the City of San Diego's current design standards.

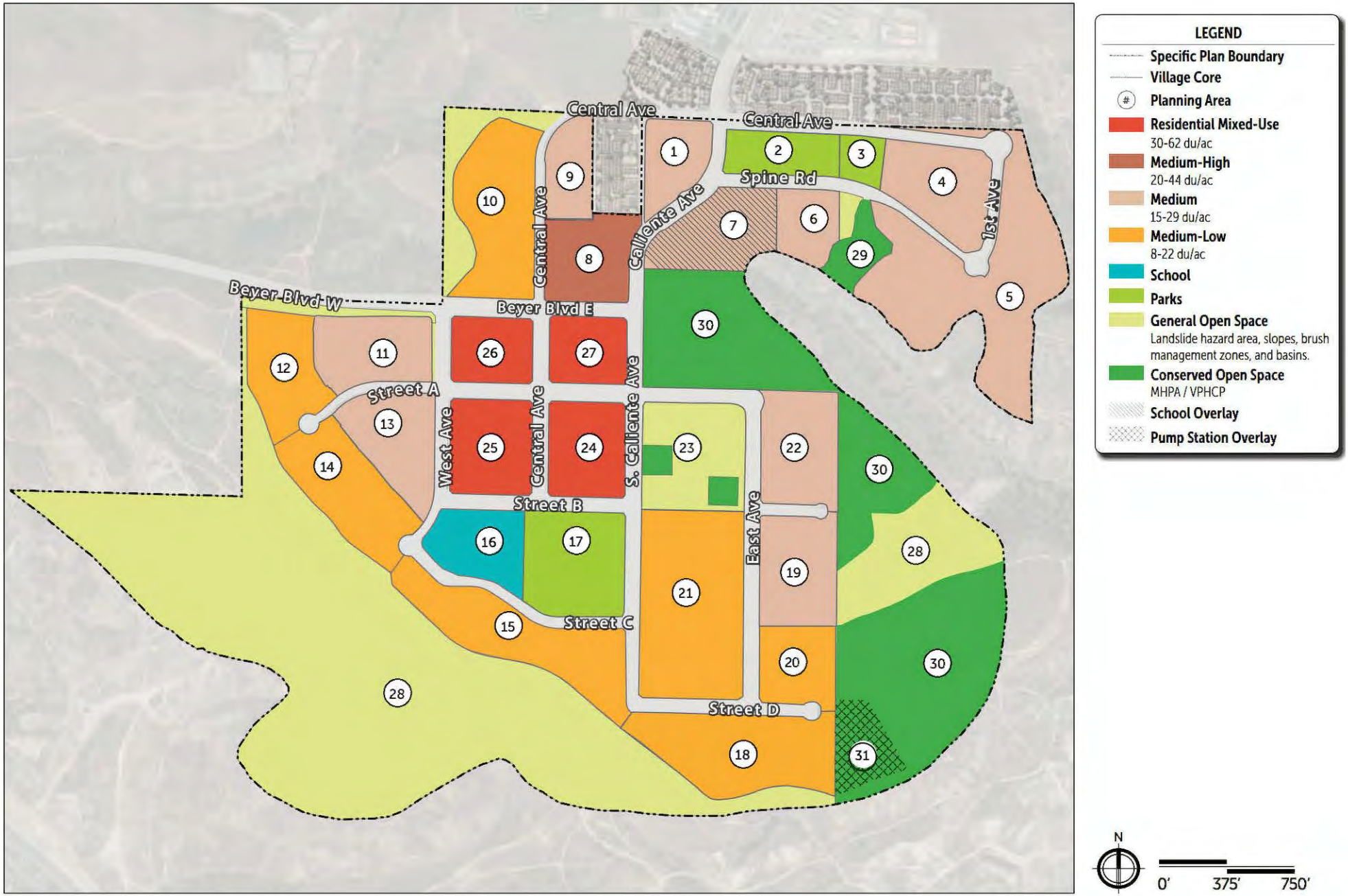
12. PVC pipe used for the public water pipelines (8-inch through 16-inch diameter piping) shall be AWWA C900 DR 18 Class 235.

13. If any water lines to be constructed by this development are metallic, a California Licensed Corrosion Engineer will be required to perform a soil corrosivity study and to design a Corrosion Control System.

# APPENDIX A

# BUILDOUT LAND USE FROM SPECIFIC PLAN

Figure 2.2 — Southwest Village Land Use Plan



## Table 2.1 — Development Summary

| PA # | Land Use | Density[1] | Overlay | Acres | Max DUs | Commercial |
|---|---|---|---|---|---|---|
| 1 | Medium | 15-29 du/ac | - | 6.9 | 160 | - |
| 2 | Park | - | - | 5.0 | - | - |
| 3 | Park | - | - | 2.1 | - | - |
| 4 | Medium | 15-29 du/ac | - | 9.1 | 211 | - |
| 5 | Medium | 15-29 du/ac | - | 26.2 | 608 | - |
| 6 | Medium | 15-29 du/ac | School Overlay | 4.5 | 104 | - |
| 7 | Medium | 15-29 du/ac | - | 6.9 | 160 | - |
| 8 | Medium-High | 20-44 du/ac | - | 8.0 | 282 | Allowed |
| 9 | Medium | 15-29 du/ac | - | 4.6 | 107 | - |
| 10 | Medium-Low | 8-22 du/ac | - | 12.8 | 225 | - |
| 11 | Medium | 15-29 du/ac | - | 8.2 | 190 | - |
| 12 | Medium-Low | 8-22 du/ac | - | 7.8 | 137 | - |
| 13 | Medium | 15-29 du/ac | - | 8.3 | 193 | - |
| 14 | Medium-Low | 8-22 du/ac | - | 10.3 | 181 | - |
| 15 | Medium-Low | 8-22 du/ac | - | 13.8 | 243 | - |
| 16 | School | - | - | 6.2 | - | - |
| 16 | Medium (PA 16 Contingency) | 15-29 du/ac | - | 6.2 | 136[2] | - |
| 17 | Park | - | - | 10.5 | - | - |
| 18 | Medium-Low | 8-22 du/ac | - | 13.5 | 238 | - |
| 19 | Medium | 15-29 du/ac | - | 10.2 | 237 | - |
| 20 | Medium-Low | 8-22 du/ac | - | 7.6 | 134 | - |
| 21 | Medium-Low | 8-22 du/ac | - | 15.1 | 266 | - |
| 22 | Medium | 15-29 du/ac | - | 11.5 | 267 | - |
| 23 | Open Space / VPHCP | - | - | 7.8 | - | - |
| 24 | Residential Mixed-Use | 30-62 du/ac | - | 7.7 | 352 | Allowed |
| 25 | Residential Mixed-Use | 30-62 du/ac | - | 8.0 | 365 | Allowed |

| PA # | Land Use | Density[1] | Overlay | Acres | Max DUs | Commercial |
|---|---|---|---|---|---|---|
| 26 | Residential Mixed-Use | 30-62 du/ac | - | 5.5 | 251 | Allowed |
| 27 | Residential Mixed-Use | 30-62 du/ac | - | 4.8 | 219 | Allowed |
| 28 | Open Space | - | - | 128.1 | - | - |
| 29 | Open Space / MHPA | - | - | 3.2 | - | - |
| 30 | VPHCP | - | - | 51.6 | - | - |
| 31 | VPHCP | - | Pump Station Overlay | 4.6 | - | - |
| | Streets | - | - | 57.0 | - | - |
| | | **Total** | | **487.4[3]** | **5,130** | **175,000** |

1. Density ranges were developed using the Planning Area's net acreage divided by the assumed dwelling unit count.
2. In the unlikely event a school is no longer needed on Planning Area 16, the site will default to Medium Density Residential use. Although the contingency for Planning Area 16 would result in approximately 136 additional dwelling units, the maximum dwelling unit cap of 5,130 units would still apply. It is assumed that each planning area will not construct the maximum number of dwelling units allowed due to site constraints, development priorities, design characteristics, and market conditions at the time a particular planning area is brought forward for development.
3. The total developable acreage is subject to slight changes due to project design refinements, however the maximum development capacity will not change.

## 2.3 — AFFORDABLE HOUSING

All implementing development applications must meet the requirements of the Land Development Code, which requires affordable units or in-lieu fees for residential development projects (Chapter 14, Article 2, and Division 13: Inclusionary Affordable Housing Regulations). In addition, an implementing development application may also be eligible for the City of San Diego's Affordable Housing, In-Fill Projects, and Sustainable Buildings Development Regulations, as defined in Chapter 14, Article 3, Division 9, if one of the criterion for eligibility is met. The required affordable units will be provided onsite.

# APPENDIX B

## CITY OF SAN DIEGO
## DESIGN GUIDELINES AND STANDARDS
## AND PEAKING FACTOR TABLES

Chapter 2

# WATER DEMANDS AND SERVICE CRITERIA

## 2.1 General

This chapter outlines planning procedures to estimate water demands and fire flows. Water system service requirements are also defined in terms of water pressure and reservoir storage.

## 2.2 Service Area

The DESIGN CONSULTANT defines the project's service area and identifies the pressure zones in which it is located. The Senior Civil Engineer in charge of either Water Planning or new development approves the service area boundaries.

## 2.3 Land Use and Residential Population

The DESIGN CONSULTANT develops present and future land use maps for the service area to define the following land use categories: residential (by zone in accordance with **Table 2-1**), central business district, commercial and institutional, parks, hospitals, hotels, industrial, office, and schools.

The DESIGN CONSULTANT estimates the residential population in the service area based on present and future allowable land use. Unless more accurate population density estimates are available, the residential population in the service area is estimated based on the figures presented in **Table 2-1**.

**Table 2-1**
**Residential Population Density**

| Zone | Dwelling Unit Density (dwelling unit/ net acre) | Unit Density (persons/ dwelling unit) | Population Density (persons/ net acre) |
|---|---|---|---|
| AR-1-1 | 0.1 | 3.5 | 0.4 |
| AR-1-1 | 0.2 | 3.5 | 0.7 |
| AR-1-2 | 1 | 3.5 | 3.5 |
| RS-1-1/RS-1-8 | 1 | 3.5 | 3.5 |
| RS-1-2/RS-1-9 | 2 | 3.5 | 7.0 |
| RS-1-4/RS-1-11 | 4 | 3.5 | 14 |

| Zone | Dwelling Unit Density (dwelling unit/ net acre) | Unit Density (persons/ dwelling unit) | Population Density (persons/ net acre) |
|---|---|---|---|
| RS-1-7/RS-1-14 | 9 | 3.5 | 32 |
| RM-1-1 | 14 | 3.2 | 45 |
| RM-2-5 | 29 | 3.0 | 87 |
| RM-3-7 | 43 | 2.6 | 112 |
| RM-3-9 | 73 | 2.2 | 161 |
| RM-4-10 | 109 | 1.8 | 196 |
| RM-4-11 | 218 | 1.5 | 327 |

Dwelling unit density in **Table 2-1** is based on net area. The net area is measured in acres, and is 80% of the gross area for each residential zone.

## 2.4 Average Annual Water Demands

For most projects, average annual water demands are determined based on the unit water demand criteria presented in **Table 2-2**.

**Table 2-2**
**Unit Water Demands**

| Land Use Category | Unit Water Demand |
|---|---|
| Residential | 150 gallons/person-day |
| Central Business District | 6000 gallons/net acre-day |
| Commercial and Institutional | 5000 gallons/net acre-day |
| Fully Landscaped Park | 4000 gallons/net acre-day |
| Hospitals | 22500 gallons/net acre-day |
| Hotels | 6555 gallons/net acre-day |
| Industrial | 6250 gallons/net acre-day |
| Office | 5730 gallons/net acre-day |
| Schools | 4680 gallons/net acre-day |

Average annual water demands are calculated as the sum of: (1) the residential water demand, and (2) other water demands for each land use category as follows:

Residential Water Demand (gallons/day) = Residential Population x 150 gallons/person-day

Other Water Demand (gallons/day) = Land Use Area by Category (net acres) x Unit Water Demand for Each Land Use Category (gallons/net acre-day)

Average Annual Water Demand (gallons/day) = Residential Water Demand + Other Water Demands

On some projects, particularly large residential developments, using the unit water demands in **Table 2-2** may generate unrealistically high estimates of water requirements. For these large projects, the DESIGN CONSULTANT or developer may request that the Senior Civil Engineer consider an alternative approach, making use of the City's water demand distribution data developed for macroscale planning purposes. Similarly, the Senior Civil Engineer may also consider alternative unit water demand estimates for specific land use types where such estimates are based on detailed demand evaluations. Recent projects of similar size, nearby location and similar character may be used for comparative demand analysis.

## 2.5 Peak Water Demands

Unless the project involves a large development that calls for an alternative approach, peak hour and maximum day water demands are estimated using the peaking factors presented in **Figures 2-1 and 2-2**. Peaking day factors correspond to the zones identified in the Public Utilities Department Water System HGL Zones.

Peak water demands are estimated as follows:

Peak Hour Demand = Average Annual Water Demand * Peak Day Factor * 1.5

Maximum Day Demand = Average Annual Water Demand * Peak Day Factor

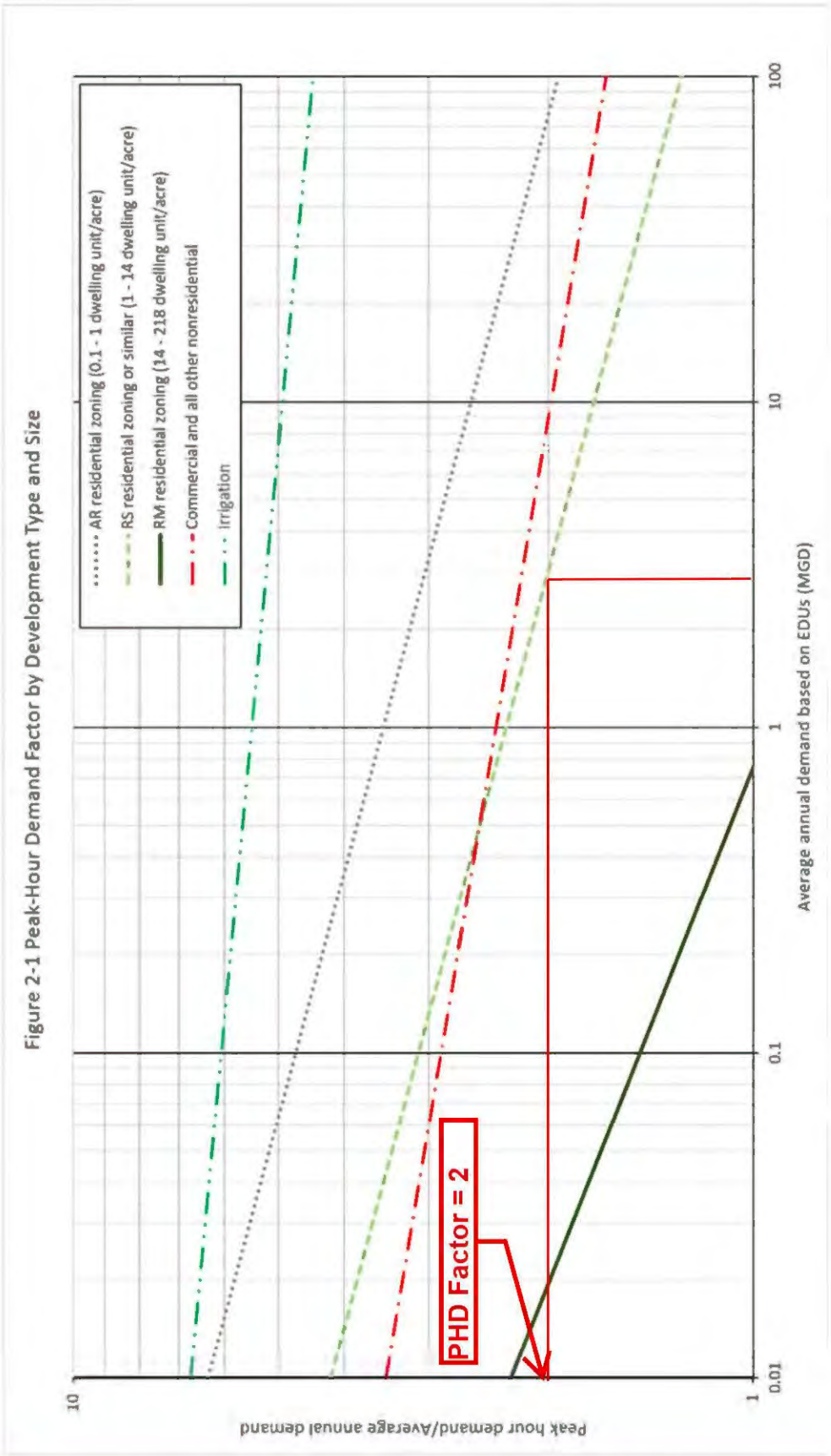



Figure 2-1 Peak-Hour Demand Factor by Development Type and Size

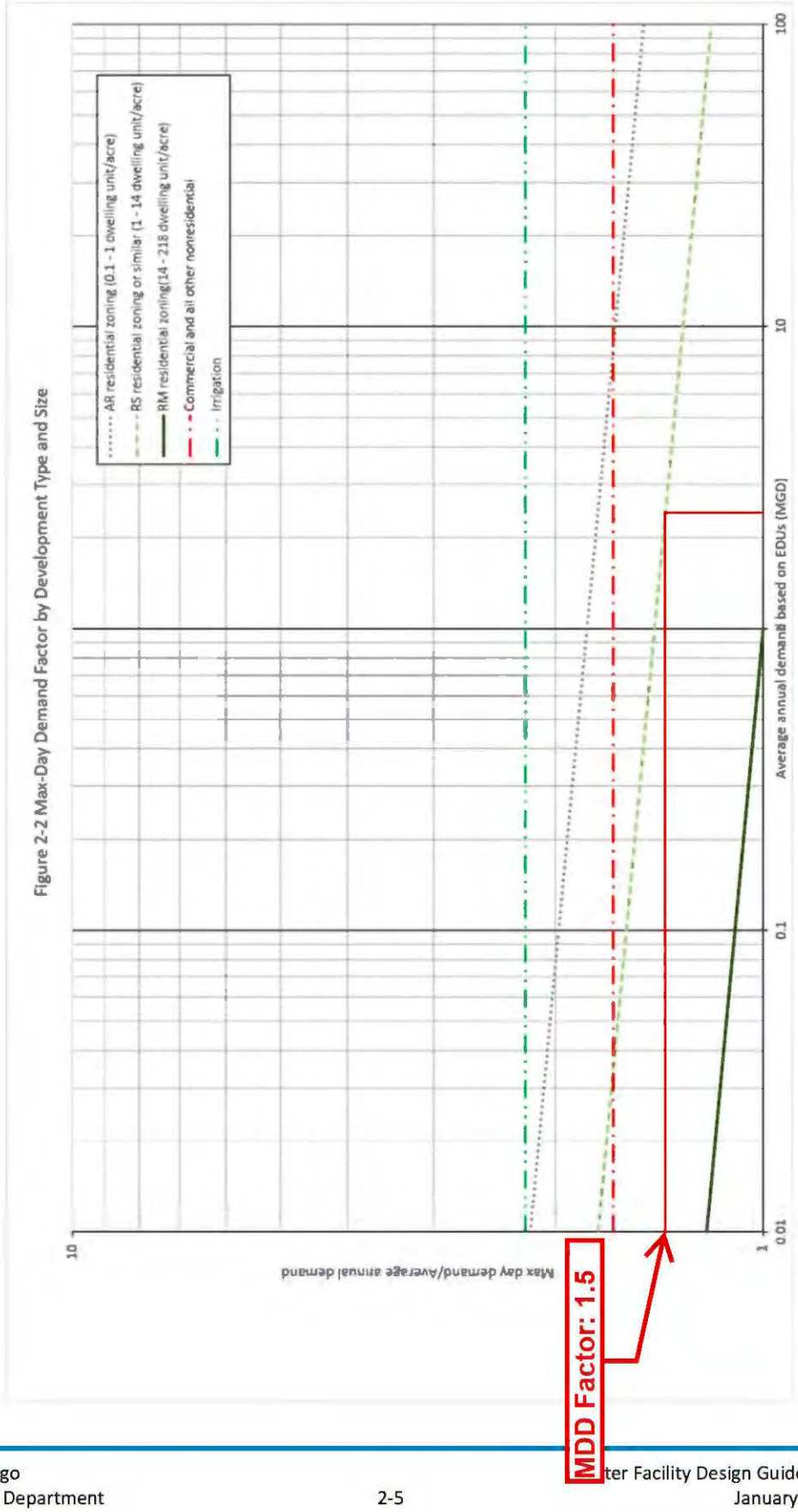



Figure 2-2 Max-Day Demand Factor by Development Type and Size

## 2.6 Fire Demands

The DESIGN CONSULTANT shall use the minimum required fire demands for design shown in **Table 2-3**. The fire flow duration for planning purposes is at least five hours. Note that the values in **Table 2-3** are the minimum design criteria for public infrastructure. Privately owned facilities shall follow the guidelines described in Appendix B of the California Fire Code (CFC).

**Table 2-3**
**Fire Demands for Design Purposes**

| Development Type | Fire Demand (gpm) |
|---|---|
| Single family residential up to Fourplexes | 1,500 |
| Condominiums and apartments | 3,000 |
| Commercial | 4,000 |
| Industrial | 6,000 |

Should application of the CFC Appendix B result in figures lower than those shown in **Table 2-3**, the firm or Civil Engineer, in consultation with the fire department, CIP City Project Manager may approve the CFC figures on a case-by-case basis following submittal of supporting calculations. In no case shall the approved fire flow rate and flow duration be less than the flow rate and duration values required by Appendix B of the CFC based on the anticipated or proposed type of building construction and total building floor area.

The required fire demand must be supplied from public and private on-site fire hydrants located as required by CFC Appendix C.

## 2.7 Pressure Criteria

### 2.7.1 Design Pressures

Water systems must be designed to provide the minimum residual pressures under:

- Maximum day demands plus fire demand conditions, or
- Peak hour demand conditions.

In analyzing the supply to a pressure zone, the minimum hydraulic grade line elevation available from the water source is used, a level that typically occurs during dry weather conditions. A water supply source is defined as a treatment plant clearwell, flow control facility, pump station, pressure regulating station or reservoir. Supply sources occur at discrete points in a system of

water mains and control both flow and pressure at the supply point. Water mains are not supply sources but rather conveyance facilities. The maximum static pressure in gravity systems is determined from reservoir overflow elevations and/or the discharge control setting on pressure reducing valves, whichever is greater. The maximum static pressure in pumped systems is determined from reservoir overflow elevations or pump shutoff levels, whichever is greater. There are two important pressure criteria used in water system design: Domestic Pressure and Fire Pressure. For systems supplying only domestic demand, only the Domestic Pressure criteria will apply. Similarly, for systems providing only fire demand, only the Fire Pressure criteria will apply. Systems supplying both types of demand, both criteria will apply and must be independently checked.

### 2.7.2 Domestic Pressure Criteria

The domestic pressure criteria for water system design are shown in **Figure 2-3**. Every water main in each pressure zone must be capable of supplying a minimum static pressure of 65 psi. Domestic pressures must fall no more than 25 psi below the static pressure, and residual water main pressure must be at least 40 psi. Domestic pressures are determined in the distribution system pipelines, excluding losses through service connections and building plumbing, and are measured relative to adjacent building pad elevations.

When analyzing a system with one source of supply out of service, domestic pressures may fall more than 25 psi below static pressure, but the domestic pressure shall not fall below 40 psi.

### 2.7.3 Pressure Requirements During Fires

For the simulation of fire conditions, a minimum operating pressure of 20 psi is required at the fire hydrant locations.. The residual pressure is determined given the fire demand among one or more hydrants and with the simultaneous water consumption occurring at the maximum day demand. The hydrants considered in this simulation must be sufficiently near to the fire location to be classified as "available" to that location as defined by the California Fire Code.

For water systems with available storage, the residual pressures in the distribution system during a fire are maintained given the following conditions:

- The water level in the storage facility at the time of the fire is at or near the minimum operating level
- The prescribed fire duration set by the California Fire Code, occurring under maximum day conditions.

## 2.8 System Reliability

Water systems must be designed to meet the operating pressure criteria with one critical source

out of service. Water mains must be designed so that no more than one, average-sized city block (approximately 30 homes) is out of service at any time, and no more than two fire hydrants (excluding fire services) are on a dead end or are out of service at any time. These provisions do not apply under earthquake conditions.

Water mains serving more than two hydrants or more than 30 homes must be looped, fed from two sources, or provided with a reservoir of sufficient capacity to supply the emergency needs (contingency and fire storage) as described below in **subsection 2.9**.

All water mains relied upon for looping and source redundancy shall be in separate streets. Dual mains in the same street or alignment require the DESIGN ENGINEER to prepare a request for deviation using the format of ATTACHMENT 1, which is included as a part of this document. Where dual mains are relied upon for looping or source redundancy, the mains shall be spaced at least 10 feet apart from outer edge to outer edge.

For City CIP work in already-built-out areas, where looping of mains or connection to two sources of supply is not feasible, water mains may be constructed require the DESIGN ENGINEER to prepare a request for deviation using the format of ATTACHMENT 1, which is included as a part of this document. Additional design considerations shall be made to minimize the chance of pipe breakage, such as use of a higher class of pipe.

## 2.9 Storage Criteria for Water Systems

There are three basic types of water storage in the City's system: regulating reservoirs, forebays and clearwells. Regulating reservoirs balance supply and demand for a pressure zone and/or service area. Pressure zones are normally designated by the overflow elevation of the regulating reservoirs. Forebays are used to balance supply and pumping demand to provide a stable suction head for a booster pump station. Typically, a clearwell is a regulating reservoir to store filtered water in a water treatment plant. The shape and material of the storage vessel (elevated tank, standpipe, circular, rectangular or trapezoidal ground level steel, prestressed or reinforced concrete reservoirs) is generally determined by the amount of water storage required, topography of the available site and the economy of construction. All water storage systems shall be designed individually based on the City approved water planning study and may only be modified if proper justification is provided from the DESIGN CONSULTANT. During the planning process, Public Utilities evaluates storage reservoirs individually based upon the intended purpose and design of the reservoir including factors of water system configuration, storage location and connectivity, water system hydraulics, pumping or gravity hydraulics, internal reservoir mixing, external storage turnover, reservoir structural design, physical condition for existing reservoirs, and numerous other factors. These factors include evaluations for the emergency storage sub-components and the operational sub-components of the reservoir. Energy management is an important consideration in planning and hydraulic modeling of water pump stations, pressure regulating stations and storage facilities. Planning and pre-design of water storage reservoirs requires case-by-case evaluation by Public Utilities engineering staff based upon the aforementioned variety of factors that are unique to each facility. Storage systems classified as a combination of regulating reservoirs, forebays and clearwells require special design by the DESIGN CONSULTANT.

**Definitions**

- Ultimate Maximum Day Demand or Maximum Day Demand (UMDD) is the forecasted maximum day demand (ultimate average day demand multiplied by a peaking factor) for a projected future planning date. This date is selected during the planning phase of the project. The Maximum Day Demand Flow Rate is the uniform flow rate delivering water in a 24-hour period to meet Maximum Day Demand.
- Peak Hour Demand is the forecasted UMDD multiplied by a peaking factor for determining the projected highest hourly consumption during one year.
- Service area includes all pressure zones supplied by a water facility including:
  a) Zone(s) served directly without the need for pumping or pressure reduction,
  b) Pumped zone(s) supplied through pumping station(s), and
  c) Pressure reduced zone(s) downstream of a pressure reducing station(s).
- WTP – Water Treatment Plant

## 2.9.1 Regulating Reservoirs

The required storage volume within a pressure zone or service area is calculated using the following equation:

Storage Capacity ≥ Operating Storage + MAX [Emergency Storage or Fire Storage]

### 2.9.1.1 Operating Storage

1. **Definition.** Operating storage is defined as the volume of storage necessary to allow a reservoir's sources of supply to operate at a uniform rate throughout the day while meeting variable water demand. In some cases, operating storage is used to permit the reduction or stopping of supply during peak hour water demand conditions or stopping of pumping operations during hours of peak energy demand. See **Figure 2-4**.

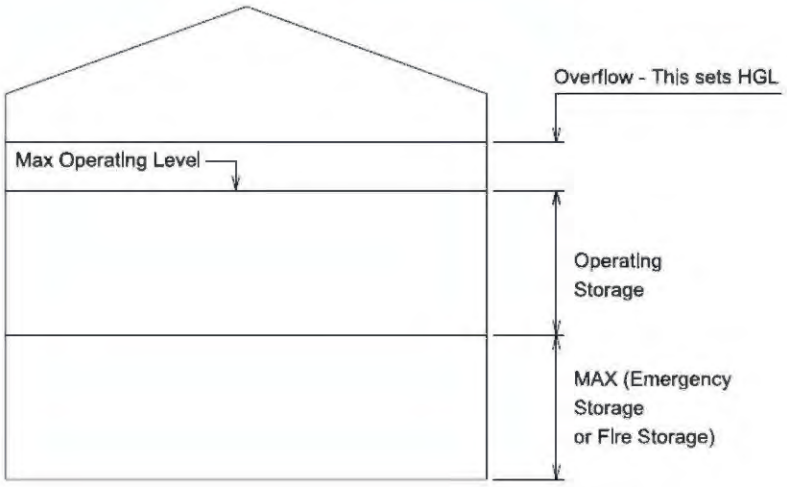



**Figure 2-4 Storage Capacity for Regulating Reservoirs**

Operating storage may also be defined as the amount of storage necessary to supply Peak Hour Demand with a water supply having a uniform Maximum Day Demand Flow Rate. Operating storage must fluctuate daily in all water storage facilities, like standpipes and elevated tanks supplied by pumps and in ground level reservoirs supplied by gravity pipelines.

In order to optimize the use of transmission facilities and to improve water pressure during peak water demand conditions, pump or gravity inflow must be controlled to achieve top operating levels 2 hours before peak hour demand.

2. **Calculation Procedure.** Operating storage is calculated as 30 % of the ultimate maximum day demand in the service area (one or more pressure zones). The source(s) of supply must

provide for maximum day demand.

To allow the reduction or stopping of supply during peak hour water demand conditions or stopping of pumping operations during hours of peak power demand, additional operating storage volume is required. Assuming that the amount of operating storage was already determined to balance a uniform daily supply with continuously variable demand, the additional operating storage for reducing or stopping of supply due to peak hour water demand or peak power demand management equals the rate of supply reduction times the duration of supply reduction.

If more than one reservoir is planned for the service area, operational storage can be divided between reservoirs, but only when water system modeling shows that minimum pressure requirements are met during peak hour demand.

For existing and substantially developed service areas, the amount of operational storage may be determined by flow measurement. This flow measurement, based on supply and demand curves, must be adjusted for future growth and reasonably anticipated climatic extremes.

The amount of operating storage may be reduced by water supply capacity available in excess of maximum day demand flow rate.

3. **Example.** Assume the expected ultimate maximum day demand in a pressure zone is 6,000 gal/min, then the required operating storage is:

   Operating storage = ((6,000 gal/min x 1440)/1,000,000) x 0.3 = 2.6 mg

   Continuing with the example above, let us assume now that the pumps are shut off for two hours for peak power demand management, the supply is thus reduced by 6,000 gal/min for 5 hours. The additional operating storage required is then:

   Power management storage = ((6,000 gal/min x 60) x 5)/1,000,000 = 1.8 mg
   Use 1.8 mg for power management storage.

   Total operating storage: 2.6 mg + 1.8 mg = 4.4 mg

#### 2.9.1.2 Fire Storage

1. **Definition.** Fire storage is the minimum amount of water required to be stored for firefighting purposes. Minimum fire flow flows and their duration are established by the City Fire Marshall based on *California Fire Code* requirements.

2. **Calculation Procedure.** Fire storage is calculated by multiplying the maximum fire demand expected in the service area by its duration, as stated in Section 2.6. If more than one tank is

planned for a service area, fire storage can be divided between tanks, but only when water system modeling shows that minimum fire flow and pressure requirements are met.

The amount of fire storage may be reduced by water supply capacity available in excess of maximum day demand flow rate with operating storage, or in excess of peak demand flow rate without operating storage.

3. **Example.** Continuing with the example above, let us assume now that the pressure zone is classified as commercial with minimum fire flow of 4,000 gal/min for 5 hours. (For service areas with UMDD of 100 MGD and more, consider that 2 fires are burning concurrently.) The minimum fire storage is:

   Fire storage = ((4,000 gal/min x 60) x 5)/1,000,000 = 1.20 mg

#### 2.9.1.3 Emergency Storage

1. **Definition.** Emergency storage is the amount of water that needs to be stored to satisfy demand when any single component of the system (power, pump, supply pipe, etc.) is out of service.

2. **Calculation Procedure.** Maximum emergency storage is calculated as 12 hours times the ultimate maximum day demand, in gallons per minute. If anticipated total service outage exceeds 12 hours, then a cost/benefit analysis is required to determine the most cost effective solution to meet reliability and water quality objectives.

   The amount of emergency storage may be reduced by water supply capacity available after a single system component is out of service, or by the reduced time it takes to return to full service based on reasonable estimate of time for restoration of system capacity, as determined by Water Operations Division.

   If more than one reservoir is planned, emergency storage can be divided between the reservoirs, but only when water system modeling shows that minimum flow and pressure requirements are met during peak hour and fire demand conditions.

3. **Example.** The minimum amount of emergency storage based on the examples above is:

   Emergency storage = ((6,000 gal/min x 60) x 12)/1,000,000 = 4.4 mg

   If, for instance, there are two pump stations with a 3,000 gal/min capacity each supplying the same pressure zone and one pump station is out of service, the emergency storage is reduced to:

   ((3,000 x60) x 12)/1,000,000 = 2.2 mg

#### 2.9.1.4 Total Storage

For the examples listed above, the total storage would be the sum of operating, fire and emergency storages, or 3.4 + MAX [1.2 or 4.4] = 7.8 **million gallons**.

**Note:** Water storage volume located in pumped zones of a service area may not be used to reduce the calculated "Total Storage" for the gravity fed portions of a service area.

### 2.9.2 Forebays

Forebays are usually small tanks located on the suction side of a booster pump station. They balance available supply with pumping demand and provide a stable suction head to the pump station. If a pump station is adjacent to a regulating reservoir, the reservoir also acts as a forebay. Due to the nature of its function, forebays have only one element – operating storage.

The required volume can be calculated as shown in **section 2.9.1.1.2** above.

### 2.9.3 Clearwells

Typically, a clearwell is a regulating reservoir to store filtered water from a water treatment plant. The required storage volume is calculated using the following equation:

$$\text{Storage Capacity} \geq \text{Operating Storage} + \text{Emergency Storage}$$

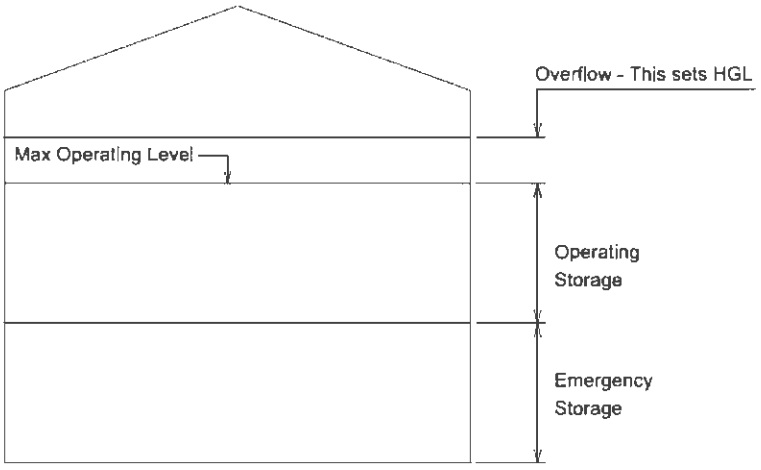
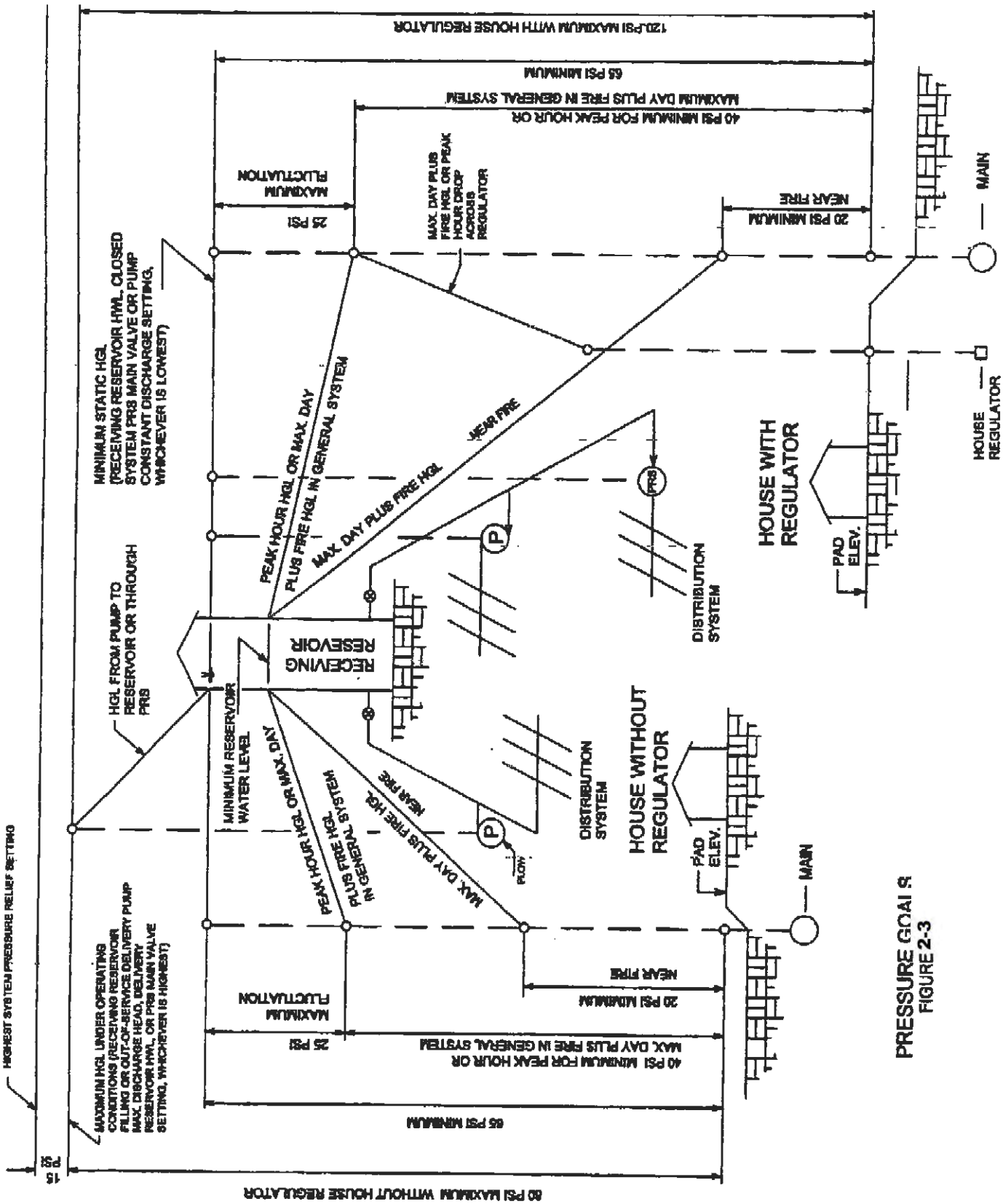
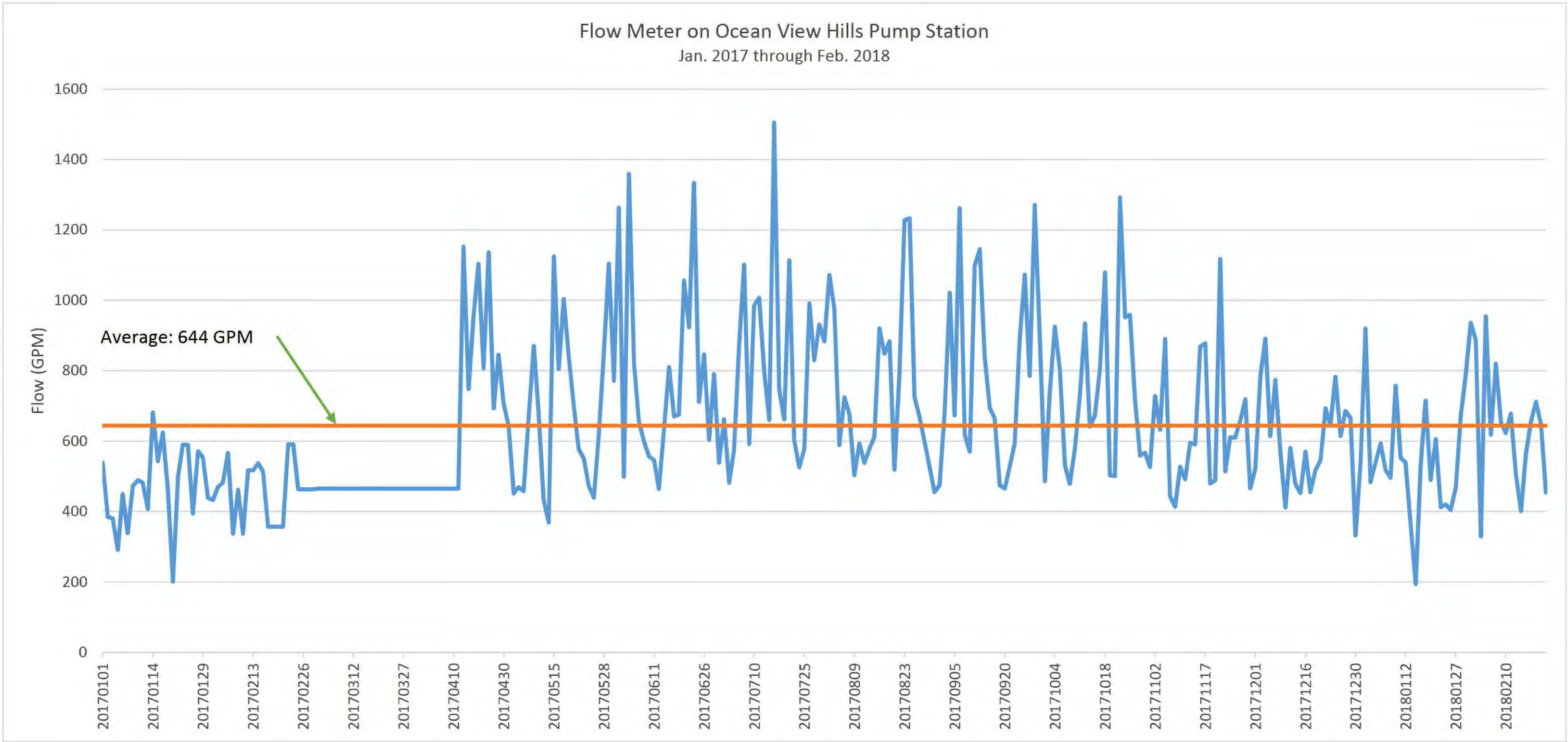



**Figure 2-5 Storage Capacity for Clearwells**


HIGHEST SYSTEM PRESSURE RELIEF SETTING
15 PSI
MAXIMUM HGL UNDER OPERATING CONDITIONS (RECEIVING RESERVOIR FILLING OR OUT-OF-SERVICE DELIVERY PUMP MAX. DISCHARGE HEAD, DELIVERY RESERVOIR HWL, OR PRS MAIN VALVE SETTING, WHICHEVER IS HIGHEST)
80 PSI MAXIMUM WITHOUT HOUSE REGULATOR
120 PSI MAXIMUM WITH HOUSE REGULATOR
65 PSI MINIMUM
40 PSI MINIMUM FOR PEAK HOUR OR MAX. DAY PLUS FIRE IN GENERAL SYSTEM
25 PSI MAXIMUM FLUCTUATION
20 PSI MINIMUM NEAR FIRE
MINIMUM STATIC HGL (RECEIVING RESERVOIR HWL, CLOSED SYSTEM PRS MAIN VALVE OR PUMP CONSTANT DISCHARGE SETTING, WHICHEVER IS LOWEST)
MAX. DAY PLUS FIRE HGL OR PEAK HOUR DROP ACROSS REGULATOR
PEAK HOUR HGL OR MAX. DAY PLUS FIRE HGL IN GENERAL SYSTEM
MAX. DAY PLUS FIRE HGL
NEAR FIRE
HGL FROM PUMP TO RESERVOIR OR THROUGH PRS
RECEIVING RESERVOIR
MINIMUM RESERVOIR WATER LEVEL
PRS
P
DISTRIBUTION SYSTEM
HOUSE WITH REGULATOR
HOUSE WITHOUT REGULATOR
PAD ELEV.
MAIN
HOUSE REGULATOR
FLOW
PRESSURE GOALS
FIGURE 2-3

# APPENDIX C

## OCEAN VIEW HILLS PUMP STATION
## FLOW DATA CORRESPONDENCE


Flow Meter on Ocean View Hills Pump Station
Jan. 2017 through Feb. 2018
Flow (GPM)
Average: 644 GPM
1600
1400
1200
1000
800
600
400
200
0
20170101
20170114
20170129
20170213
20170226
20170312
20170327
20170410
20170430
20170515
20170528
20170611
20170626
20170710
20170725
20170809
20170823
20170905
20170920
20171004
20171018
20171102
20171117
20171201
20171216
20171230
20180112
20180127
20180210

## APPENDIX D

## COMPUTER MODELING OUTPUT

The following conditions were modeled under ultimate buildout of Southwest Village (Reference Exhibit A for Corresponding Node and Pipe Diagram):

0. Average Day Demand.

1. Peak Hour Demand.

2. Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42.

3. Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42. 24-inch Otay Mesa Road Closed.

4. Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42. Source Only from Princess Park Pump Station.

5. Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48.

6. Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48. 24-inch Otay Mesa Road Closed.

7. Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48. Source Only from Princess Park Pump Station.

8. Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42. Pipes 67 Closed.

9. Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42. Pipes 69 Closed.

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: All Pipes Open - Average Day Demand**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi | Delta P from Static |
|---|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 218.65 | 0.15 |
| J-4 | 521 | 680 | 68.89 | 68.86 | 0.03 |
| J-5 | 490 | 680 | 82.32 | 81.82 | 0.50 |
| J-8 | 534 | 680 | 63.26 | 63.11 | 0.15 |
| J-10 | 517 | 680 | 70.62 | 70.46 | 0.16 |
| J-12 | 516 | 680 | 71.06 | 70.9 | 0.16 |
| J-16 | 333 | 680 | 150.35 | 150.19 | 0.16 |
| J-20 | 322 | 680 | 155.11 | 155.1 | 0.01 |
| J-22 | 466 | 680 | 92.72 | 92.63 | 0.09 |
| J-24 | 550 | 680 | 56.33 | 56.13 | 0.20 |
| J-28 | 497 | 680 | 79.29 | 78.82 | 0.47 |
| J-29 | 491 | 680 | 81.89 | 81.4 | 0.49 |
| J-32 | 516 | 680 | 71.06 | 70.71 | 0.35 |
| J-36 | 485 | 680 | 84.49 | 83.99 | 0.50 |
| J-40 | 485 | 680 | 84.49 | 83.99 | 0.50 |
| J-41 | 489 | 680 | 82.76 | 82.23 | 0.53 |
| J-42 | 496 | 680 | 79.72 | 79.18 | 0.54 |
| J-44 | 475 | 680 | 88.82 | 88.28 | 0.54 |
| J-48 | 485 | 680 | 84.49 | 83.93 | 0.56 |
| J-52 | 498 | 680 | 78.86 | 78.32 | 0.54 |
| J-202 | 275 | 680 | 175.48 | 175.49 | -0.01 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: All Pipes Open - Peak Hour Demand**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi | Delta P from Static |
|---|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 218.21 | 0.59 |
| J-4 | 521 | 680 | 68.89 | 68.77 | 0.12 |
| J-5 | 490 | 680 | 82.32 | 80.64 | 1.68 |
| J-8 | 534 | 680 | 63.26 | 62.72 | 0.54 |
| J-10 | 517 | 680 | 70.62 | 70.06 | 0.56 |
| J-12 | 516 | 680 | 71.06 | 70.48 | 0.58 |
| J-16 | 333 | 680 | 150.35 | 149.77 | 0.58 |
| J-20 | 322 | 680 | 155.11 | 155.01 | 0.10 |
| J-22 | 466 | 680 | 92.72 | 92.37 | 0.35 |
| J-24 | 550 | 680 | 56.33 | 55.64 | 0.69 |
| J-28 | 497 | 680 | 79.29 | 77.71 | 1.58 |
| J-29 | 491 | 680 | 81.89 | 80.23 | 1.66 |
| J-32 | 516 | 680 | 71.06 | 69.86 | 1.20 |
| J-36 | 485 | 680 | 84.49 | 82.81 | 1.68 |
| J-40 | 485 | 680 | 84.49 | 82.81 | 1.68 |
| J-41 | 489 | 680 | 82.76 | 80.99 | 1.77 |
| J-42 | 496 | 680 | 79.72 | 77.92 | 1.80 |
| J-44 | 475 | 680 | 88.82 | 87.02 | 1.80 |
| J-48 | 485 | 680 | 84.49 | 82.62 | 1.87 |
| J-52 | 498 | 680 | 78.86 | 77.09 | 1.77 |
| J-202 | 275 | 680 | 175.48 | 175.48 | 0.00 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: All Pipes Open - Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi | Delta P from Static |
|---|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 216.53 | 2.27 |
| J-4 | 521 | 680 | 68.89 | 68.61 | 0.28 |
| J-5 | 490 | 680 | 82.32 | 76.04 | 6.28 |
| J-8 | 534 | 680 | 63.26 | 62 | 1.26 |
| J-10 | 517 | 680 | 70.62 | 69.35 | 1.27 |
| J-12 | 516 | 680 | 71.06 | 69.78 | 1.28 |
| J-16 | 333 | 680 | 150.35 | 149.08 | 1.27 |
| J-20 | 322 | 680 | 155.11 | 154.84 | 0.27 |
| J-22 | 466 | 680 | 92.72 | 91.82 | 0.90 |
| J-24 | 550 | 680 | 56.33 | 54.48 | 1.85 |
| J-28 | 497 | 680 | 79.29 | 74.15 | 5.14 |
| J-29 | 491 | 680 | 81.89 | 76.26 | 5.63 |
| J-32 | 516 | 680 | 71.06 | 67.36 | 3.70 |
| J-36 | 485 | 680 | 84.49 | 78.48 | 6.01 |
| J-40 | 485 | 680 | 84.49 | 78.48 | 6.01 |
| J-41 | 489 | 680 | 82.76 | 75.43 | 7.33 |
| J-42 | 496 | 680 | 79.72 | 71.07 | 8.65 |
| J-44 | 475 | 680 | 88.82 | 81.33 | 7.49 |
| J-48 | 485 | 680 | 84.49 | 77.09 | 7.40 |
| J-52 | 498 | 680 | 78.86 | 72.01 | 6.85 |
| J-202 | 275 | 680 | 175.48 | 175.43 | 0.05 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**24 Inch Otay Mesa Road Closed**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi |
|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 215.45 |
| J-4 | 521 | 680 | 68.89 | 68.07 |
| J-5 | 490 | 680 | 82.32 | 72.96 |
| J-8 | 534 | 680 | 63.26 | 59.55 |
| J-10 | 517 | 680 | 70.62 | 66.89 |
| J-12 | 516 | 680 | 71.06 | 67.32 |
| J-16 | 333 | 680 | 150.35 | 146.62 |
| J-20 | 322 | 680 | 155.11 | 155.11 |
| J-22 | 466 | 680 | 92.72 | 86.92 |
| J-24 | 550 | 680 | 56.33 | 50.53 |
| J-28 | 497 | 680 | 79.29 | 70.74 |
| J-29 | 491 | 680 | 81.89 | 72.93 |
| J-32 | 516 | 680 | 71.06 | 63.71 |
| J-36 | 485 | 680 | 84.49 | 75.24 |
| J-40 | 485 | 680 | 84.49 | 75.24 |
| J-41 | 489 | 680 | 82.76 | 72.31 |
| J-42 | 496 | 680 | 79.72 | 67.91 |
| J-44 | 475 | 680 | 88.82 | 78.13 |
| J-48 | 485 | 680 | 84.49 | 73.88 |
| J-52 | 498 | 680 | 78.86 | 68.79 |
| J-202 | 275 | 680 | 175.48 | 175.48 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**e Only from Princess Park Pump Station**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi |
|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 215.29 |
| J-4 | 521 | 680 | 68.89 | 68.9 |
| J-5 | 490 | 680 | 82.32 | 72.75 |
| J-8 | 534 | 680 | 63.26 | 57.21 |
| J-10 | 517 | 680 | 70.62 | 64.56 |
| J-12 | 516 | 680 | 71.06 | 64.99 |
| J-16 | 333 | 680 | 150.35 | 144.28 |
| J-20 | 322 | 680 | 155.11 | 154.26 |
| J-22 | 466 | 680 | 92.72 | 89.87 |
| J-24 | 550 | 680 | 56.33 | 50.31 |
| J-28 | 497 | 680 | 79.29 | 70.53 |
| J-29 | 491 | 680 | 81.89 | 72.73 |
| J-32 | 516 | 680 | 71.06 | 63.5 |
| J-36 | 485 | 680 | 84.49 | 75.03 |
| J-40 | 485 | 680 | 84.49 | 75.03 |
| J-41 | 489 | 680 | 82.76 | 72.11 |
| J-42 | 496 | 680 | 79.72 | 67.71 |
| J-44 | 475 | 680 | 88.82 | 77.92 |
| J-48 | 485 | 680 | 84.49 | 73.68 |
| J-52 | 498 | 680 | 78.86 | 68.59 |
| J-202 | 275 | 680 | 175.48 | 175.34 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: All Pipes Open - Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi | Delta P from Static |
|---|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 217.23 | 1.57 |
| J-4 | 521 | 680 | 68.89 | 68.68 | 0.21 |
| J-5 | 490 | 680 | 82.32 | 77.96 | 4.36 |
| J-8 | 534 | 680 | 63.26 | 62.3 | 0.96 |
| J-10 | 517 | 680 | 70.62 | 69.65 | 0.97 |
| J-12 | 516 | 680 | 71.06 | 70.07 | 0.99 |
| J-16 | 333 | 680 | 150.35 | 149.37 | 0.98 |
| J-20 | 322 | 680 | 155.11 | 154.91 | 0.20 |
| J-22 | 466 | 680 | 92.72 | 92.04 | 0.68 |
| J-24 | 550 | 680 | 56.33 | 54.94 | 1.39 |
| J-28 | 497 | 680 | 79.29 | 75.52 | 3.77 |
| J-29 | 491 | 680 | 81.89 | 77.78 | 4.11 |
| J-32 | 516 | 680 | 71.06 | 68.33 | 2.73 |
| J-36 | 485 | 680 | 84.49 | 80.13 | 4.36 |
| J-40 | 485 | 680 | 84.49 | 80.14 | 4.35 |
| J-41 | 489 | 680 | 82.76 | 78.04 | 4.72 |
| J-42 | 496 | 680 | 79.72 | 74.63 | 5.09 |
| J-44 | 475 | 680 | 88.82 | 83.38 | 5.44 |
| J-48 | 485 | 680 | 84.49 | 73.14 | 11.35 |
| J-52 | 498 | 680 | 78.86 | 73.59 | 5.27 |
| J-202 | 275 | 680 | 175.48 | 175.45 | 0.03 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48**
**24 Inch Otay Mesa Road Closed**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi |
|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 216.4 |
| J-4 | 521 | 680 | 68.89 | 68.27 |
| J-5 | 490 | 680 | 82.32 | 75.58 |
| J-8 | 534 | 680 | 63.26 | 60.45 |
| J-10 | 517 | 680 | 70.62 | 67.8 |
| J-12 | 516 | 680 | 71.06 | 68.22 |
| J-16 | 333 | 680 | 150.35 | 147.52 |
| J-20 | 322 | 680 | 155.11 | 155.12 |
| J-22 | 466 | 680 | 92.72 | 88.39 |
| J-24 | 550 | 680 | 56.33 | 51.99 |
| J-28 | 497 | 680 | 79.29 | 72.99 |
| J-29 | 491 | 680 | 81.89 | 75.32 |
| J-32 | 516 | 680 | 71.06 | 65.61 |
| J-36 | 485 | 680 | 84.49 | 77.72 |
| J-40 | 485 | 680 | 84.49 | 77.74 |
| J-41 | 489 | 680 | 82.76 | 75.66 |
| J-42 | 496 | 680 | 79.72 | 72.24 |
| J-44 | 475 | 680 | 88.82 | 80.99 |
| J-48 | 485 | 680 | 84.49 | 70.74 |
| J-52 | 498 | 680 | 78.86 | 71.19 |
| J-202 | 275 | 680 | 175.48 | 175.49 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48**
**e Only from Princess Park Pump Station**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi |
|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 216.27 |
| J-4 | 521 | 680 | 68.89 | 68.9 |
| J-5 | 490 | 680 | 82.32 | 75.4 |
| J-8 | 534 | 680 | 63.26 | 58.7 |
| J-10 | 517 | 680 | 70.62 | 66.05 |
| J-12 | 516 | 680 | 71.06 | 66.48 |
| J-16 | 333 | 680 | 150.35 | 145.77 |
| J-20 | 322 | 680 | 155.11 | 154.47 |
| J-22 | 466 | 680 | 92.72 | 90.57 |
| J-24 | 550 | 680 | 56.33 | 51.8 |
| J-28 | 497 | 680 | 79.29 | 72.81 |
| J-29 | 491 | 680 | 81.89 | 75.14 |
| J-32 | 516 | 680 | 71.06 | 65.43 |
| J-36 | 485 | 680 | 84.49 | 77.55 |
| J-40 | 485 | 680 | 84.49 | 77.56 |
| J-41 | 489 | 680 | 82.76 | 75.49 |
| J-42 | 496 | 680 | 79.72 | 72.07 |
| J-44 | 475 | 680 | 88.82 | 80.81 |
| J-48 | 485 | 680 | 84.49 | 70.57 |
| J-52 | 498 | 680 | 78.86 | 71.02 |
| J-202 | 275 | 680 | 175.48 | 175.38 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**Pipe 67 Closed**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi |
|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 216.71 |
| J-4 | 521 | 680 | 68.89 | 68.6 |
| J-5 | 490 | 680 | 82.32 | 76.52 |
| J-8 | 534 | 680 | 63.26 | 61.97 |
| J-10 | 517 | 680 | 70.62 | 69.32 |
| J-12 | 516 | 680 | 71.06 | 69.75 |
| J-16 | 333 | 680 | 150.35 | 149.05 |
| J-20 | 322 | 680 | 155.11 | 154.83 |
| J-22 | 466 | 680 | 92.72 | 91.8 |
| J-24 | 550 | 680 | 56.33 | 54.44 |
| J-28 | 497 | 680 | 79.29 | 74.04 |
| J-29 | 491 | 680 | 81.89 | 76.13 |
| J-32 | 516 | 680 | 71.06 | 67.26 |
| J-36 | 485 | 680 | 84.49 | 78.27 |
| J-40 | 485 | 680 | 84.49 | 78.35 |
| J-41 | 489 | 680 | 82.76 | 76.94 |
| J-42 | 496 | 680 | 79.72 | 62.8 |
| J-44 | 475 | 680 | 88.82 | 77.22 |
| J-48 | 485 | 680 | 84.49 | 73.6 |
| J-52 | 498 | 680 | 78.86 | 69.75 |
| J-202 | 275 | 680 | 175.48 | 175.44 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**Pipe 69 Closed**

| Node No. | Node El. Ft. | HGL Zone Ft. (Static)* | Static P psi | Model Run P, psi |
|---|---|---|---|---|
| J-1 | 175 | 680 | 218.80 | 216.18 |
| J-4 | 521 | 680 | 68.89 | 68.62 |
| J-5 | 490 | 680 | 82.32 | 75.07 |
| J-8 | 534 | 680 | 63.26 | 62.06 |
| J-10 | 517 | 680 | 70.62 | 69.41 |
| J-12 | 516 | 680 | 71.06 | 69.84 |
| J-16 | 333 | 680 | 150.35 | 149.13 |
| J-20 | 322 | 680 | 155.11 | 154.85 |
| J-22 | 466 | 680 | 92.72 | 91.86 |
| J-24 | 550 | 680 | 56.33 | 54.57 |
| J-28 | 497 | 680 | 79.29 | 74.41 |
| J-29 | 491 | 680 | 81.89 | 76.54 |
| J-32 | 516 | 680 | 71.06 | 67.56 |
| J-36 | 485 | 680 | 84.49 | 78.83 |
| J-40 | 485 | 680 | 84.49 | 78.79 |
| J-41 | 489 | 680 | 82.76 | 72.66 |
| J-42 | 496 | 680 | 79.72 | 65.74 |
| J-44 | 475 | 680 | 88.82 | 83.07 |
| J-48 | 485 | 680 | 84.49 | 78.71 |
| J-52 | 498 | 680 | 78.86 | 73.13 |
| J-202 | 275 | 680 | 175.48 | 175.43 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: All Pipes Open - Average Day Demand**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 937.72 | 0.43 |
| P-2 | 16 | 426.18 | 0.68 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 426.18 | 0.68 |
| P-6 | 16 | 327.52 | 0.52 |
| P-7 | 30 | 867.1 | 0.39 |
| P-8 | 12 | -69.61 | 0.2 |
| P-11 | 24 | 857.22 | 0.61 |
| P-15 | 24 | 241.5 | 0.17 |
| P-19 | 24 | -123.85 | 0.09 |
| P-23 | 16 | 37.15 | 0.06 |
| P-27 | 24 | -80.5 | 0.06 |
| P-31 | 12 | 133.8 | 0.38 |
| P-35 | 12 | 133.8 | 0.38 |
| P-39 | 12 | 133.8 | 0.38 |
| P-43 | 12 | 133.8 | 0.38 |
| P-47 | 24 | 706.1 | 0.5 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 580.41 | 0.93 |
| P-55 | 16 | 580.41 | 0.93 |
| P-62 | 16 | 312.42 | 0.5 |
| P-63 | 16 | 456.62 | 0.73 |
| P-65 | 16 | 45.54 | 0.07 |
| P-66 | 16 | 168.22 | 0.27 |
| P-67 | 16 | 183.32 | 0.29 |
| P-69 | 16 | 39.12 | 0.06 |
| P-75 | 12 | 74.59 | 0.21 |
| P-79 | 16 | -174.69 | 0.28 |
| P-81 | 16 | -396.28 | 0.63 |
| P-85 | 24 | -21.52 | 0.02 |
| P-89 | 16 | 562 | 0.9 |
| P-101 | 24 | 786.6 | 0.56 |
| P-201 | 30 | 1293.28 | 0.59 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: All Pipes Open - Peak Hour Demand**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 1820.67 | 0.83 |
| P-2 | 16 | 813.8 | 1.3 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 813.8 | 1.3 |
| P-6 | 16 | 616.6 | 0.98 |
| P-7 | 30 | 1680.53 | 0.76 |
| P-8 | 12 | -136.23 | 0.39 |
| P-11 | 24 | 1659.67 | 1.18 |
| P-15 | 24 | 483 | 0.34 |
| P-19 | 24 | -247.7 | 0.18 |
| P-23 | 16 | 74.3 | 0.12 |
| P-27 | 24 | -161 | 0.11 |
| P-31 | 12 | 253.92 | 0.72 |
| P-35 | 12 | 253.92 | 0.72 |
| P-39 | 12 | 253.92 | 0.72 |
| P-43 | 12 | 253.92 | 0.72 |
| P-47 | 24 | 1358.53 | 0.96 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 1106.6 | 1.77 |
| P-55 | 16 | 1106.6 | 1.77 |
| P-62 | 16 | 580.38 | 0.93 |
| P-63 | 16 | 868.78 | 1.39 |
| P-65 | 16 | 91.19 | 0.15 |
| P-66 | 16 | 291.98 | 0.47 |
| P-67 | 16 | 328.2 | 0.52 |
| P-69 | 16 | 39.8 | 0.06 |
| P-75 | 12 | 152.17 | 0.43 |
| P-79 | 16 | -384.83 | 0.61 |
| P-81 | 16 | -684 | 1.09 |
| P-85 | 24 | -87.62 | 0.06 |
| P-89 | 16 | 1060.02 | 1.69 |
| P-101 | 24 | 1519.53 | 1.08 |
| P-201 | 30 | 2494.33 | 1.13 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: All Pipes Open - Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 2760.02 | 1.25 |
| P-2 | 16 | 1654.59 | 2.64 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 1654.59 | 2.64 |
| P-6 | 16 | 2459.12 | 3.92 |
| P-7 | 30 | 2642.09 | 1.2 |
| P-8 | 12 | 170.79 | 0.48 |
| P-11 | 24 | 2639.27 | 1.87 |
| P-15 | 24 | 362.25 | 0.26 |
| P-19 | 24 | -185.77 | 0.13 |
| P-23 | 16 | 55.73 | 0.09 |
| P-27 | 24 | -120.75 | 0.09 |
| P-31 | 12 | 539.07 | 1.53 |
| P-35 | 12 | 539.07 | 1.53 |
| P-39 | 12 | 539.07 | 1.53 |
| P-43 | 12 | 539.07 | 1.53 |
| P-47 | 24 | 2400.59 | 1.7 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 2218.05 | 3.54 |
| P-55 | 16 | 2218.05 | 3.54 |
| P-62 | 16 | 1552.68 | 2.48 |
| P-63 | 16 | 1768.98 | 2.82 |
| P-65 | 16 | 1020.83 | 1.63 |
| P-66 | 16 | 1336.38 | 2.13 |
| P-67 | 16 | 2242.82 | 3.58 |
| P-69 | 16 | -1757.18 | 2.8 |
| P-75 | 12 | 387.09 | 1.1 |
| P-79 | 16 | -1802.69 | 2.88 |
| P-81 | 16 | -2336.78 | 3.73 |
| P-85 | 24 | 99.24 | 0.07 |
| P-89 | 16 | 2453.83 | 3.92 |
| P-101 | 24 | 2521.34 | 1.79 |
| P-201 | 30 | 4296.68 | 1.95 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**24 Inch Otay Mesa Road Closed**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 4873.44 | 2.21 |
| P-2 | 16 | 2062.51 | 3.29 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 2062.51 | 3.29 |
| P-6 | 16 | 2494.63 | 3.98 |
| P-7 | 30 | 120.75 | 0.05 |
| P-8 | 12 | 165.32 | 0.47 |
| P-11 | 24 | 4752.69 | 3.37 |
| P-15 | 24 | 362.25 | 0.26 |
| P-19 | 24 | -185.77 | 0.13 |
| P-23 | 16 | 55.73 | 0.09 |
| P-27 | 24 | -120.75 | 0.09 |
| P-31 | 12 | 1067.42 | 3.03 |
| P-35 | 12 | 1067.42 | 3.03 |
| P-39 | 12 | 1067.42 | 3.03 |
| P-43 | 12 | 1067.42 | 3.03 |
| P-47 | 24 | -120.75 | 0.09 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 2014.1 | 3.21 |
| P-55 | 16 | 2014.1 | 3.21 |
| P-62 | 16 | 1389.1 | 2.22 |
| P-63 | 16 | 1605.4 | 2.56 |
| P-65 | 16 | 648.42 | 1.03 |
| P-66 | 16 | 1172.8 | 1.87 |
| P-67 | 16 | 2278.33 | 3.64 |
| P-69 | 16 | -1721.67 | 2.75 |
| P-75 | 12 | 381.62 | 1.08 |
| P-79 | 16 | -1772.65 | 2.83 |
| P-81 | 16 | -2301.27 | 3.67 |
| P-85 | 24 | 308.08 | 0.22 |
| P-89 | 16 | 2209.49 | 3.53 |
| P-101 | 24 | | |
| P-201 | 30 | 2183.26 | 0.99 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**Source Only from Princess Park Pump Station**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 120.75 | 0.05 |
| P-2 | 16 | 2069.7 | 3.3 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 2069.7 | 3.3 |
| P-6 | 16 | 2495.15 | 3.98 |
| P-7 | 30 | 4866.25 | 2.21 |
| P-8 | 12 | 165.24 | 0.47 |
| P-11 | 24 | | |
| P-15 | 24 | 362.25 | 0.26 |
| P-19 | 24 | -185.77 | 0.13 |
| P-23 | 16 | 55.73 | 0.09 |
| P-27 | 24 | -120.75 | 0.09 |
| P-31 | 12 | -120.75 | 0.34 |
| P-35 | 12 | -120.75 | 0.34 |
| P-39 | 12 | -120.75 | 0.34 |
| P-43 | 12 | -120.75 | 0.34 |
| P-47 | 24 | 4624.75 | 3.28 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 2010.5 | 3.21 |
| P-55 | 16 | 2010.5 | 3.21 |
| P-62 | 16 | 1386.21 | 2.21 |
| P-63 | 16 | 1602.51 | 2.56 |
| P-65 | 16 | 641.75 | 1.02 |
| P-66 | 16 | 1169.91 | 1.87 |
| P-67 | 16 | 2278.85 | 3.64 |
| P-69 | 16 | -1721.15 | 2.75 |
| P-75 | 12 | 381.54 | 1.08 |
| P-79 | 16 | -1772.21 | 2.83 |
| P-81 | 16 | -2300.75 | 3.67 |
| P-85 | 24 | 311.86 | 0.22 |
| P-89 | 16 | 2205.19 | 3.52 |
| P-101 | 24 | 4745.5 | 3.37 |
| P-201 | 30 | 6935.95 | 3.15 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: All Pipes Open - Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 2406.1 | 1.09 |
| P-2 | 16 | 1360.22 | 2.17 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 1360.22 | 2.17 |
| P-6 | 16 | 1352.88 | 2.16 |
| P-7 | 30 | 2290.38 | 1.04 |
| P-8 | 12 | -1596.49 | 4.53 |
| P-11 | 24 | 2285.35 | 1.62 |
| P-15 | 24 | 362.25 | 0.26 |
| P-19 | 24 | -185.77 | 0.13 |
| P-23 | 16 | 55.73 | 0.09 |
| P-27 | 24 | -120.75 | 0.09 |
| P-31 | 12 | 450.59 | 1.28 |
| P-35 | 12 | 450.59 | 1.28 |
| P-39 | 12 | 450.59 | 1.28 |
| P-43 | 12 | 450.59 | 1.28 |
| P-47 | 24 | 2048.88 | 1.45 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 1865.24 | 2.98 |
| P-55 | 16 | 1865.24 | 2.98 |
| P-62 | 16 | 1268.47 | 2.02 |
| P-63 | 16 | 1484.77 | 2.37 |
| P-65 | 16 | 208.95 | 0.33 |
| P-66 | 16 | 1052.17 | 1.68 |
| P-67 | 16 | 1136.58 | 1.81 |
| P-69 | 16 | 920.28 | 1.47 |
| P-75 | 12 | 1403.51 | 3.98 |
| P-79 | 16 | -892.51 | 1.42 |
| P-81 | 16 | -2443.02 | 3.9 |
| P-85 | 24 | 626.92 | 0.44 |
| P-89 | 16 | 2032.41 | 3.24 |
| P-101 | 24 | 2169.63 | 1.54 |
| P-201 | 30 | 3650.6 | 1.66 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48**
**24 Inch Otay Mesa Road Closed**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 4208.14 | 1.91 |
| P-2 | 16 | 1727.81 | 2.76 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 1727.81 | 2.76 |
| P-6 | 16 | 1362.35 | 2.17 |
| P-7 | 30 | 120.75 | 0.05 |
| P-8 | 12 | -1596.71 | 4.53 |
| P-11 | 24 | 4087.39 | 2.9 |
| P-15 | 24 | 362.25 | 0.26 |
| P-19 | 24 | -185.77 | 0.13 |
| P-23 | 16 | 55.73 | 0.09 |
| P-27 | 24 | -120.75 | 0.09 |
| P-31 | 12 | 901.1 | 2.56 |
| P-35 | 12 | 901.1 | 2.56 |
| P-39 | 12 | 901.1 | 2.56 |
| P-43 | 12 | 901.1 | 2.56 |
| P-47 | 24 | -120.75 | 0.09 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 1681.45 | 2.68 |
| P-55 | 16 | 1681.45 | 2.68 |
| P-62 | 16 | 1119.47 | 1.79 |
| P-63 | 16 | 1335.77 | 2.13 |
| P-65 | 16 | -149.16 | 0.24 |
| P-66 | 16 | 903.17 | 1.44 |
| P-67 | 16 | 1146.05 | 1.83 |
| P-69 | 16 | 929.75 | 1.48 |
| P-75 | 12 | 1403.29 | 3.98 |
| P-79 | 16 | -883.27 | 1.41 |
| P-81 | 16 | -2433.55 | 3.88 |
| P-85 | 24 | 836.03 | 0.59 |
| P-89 | 16 | 1813.82 | 2.89 |
| P-101 | 24 | | |
| P-201 | 30 | 1848.56 | 0.84 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48**
**Source Only from Princess Park Pump Station**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 120.75 | 0.05 |
| P-2 | 16 | 1737.32 | 2.77 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 1737.32 | 2.77 |
| P-6 | 16 | 1362.71 | 2.17 |
| P-7 | 30 | 4198.63 | 1.91 |
| P-8 | 12 | -1596.72 | 4.53 |
| P-11 | 24 | | |
| P-15 | 24 | 362.25 | 0.26 |
| P-19 | 24 | -185.77 | 0.13 |
| P-23 | 16 | 55.73 | 0.09 |
| P-27 | 24 | -120.75 | 0.09 |
| P-31 | 12 | -120.75 | 0.34 |
| P-35 | 12 | -120.75 | 0.34 |
| P-39 | 12 | -120.75 | 0.34 |
| P-43 | 12 | -120.75 | 0.34 |
| P-47 | 24 | 3957.13 | 2.81 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 1676.69 | 2.68 |
| P-55 | 16 | 1676.69 | 2.68 |
| P-62 | 16 | 1115.61 | 1.78 |
| P-63 | 16 | 1331.91 | 2.13 |
| P-65 | 16 | -158.31 | 0.25 |
| P-66 | 16 | 899.31 | 1.43 |
| P-67 | 16 | 1146.41 | 1.83 |
| P-69 | 16 | 930.11 | 1.48 |
| P-75 | 12 | 1403.28 | 3.98 |
| P-79 | 16 | -882.91 | 1.41 |
| P-81 | 16 | -2433.19 | 3.88 |
| P-85 | 24 | 841.31 | 0.6 |
| P-89 | 16 | 1808.17 | 2.89 |
| P-101 | 24 | 4077.88 | 2.89 |
| P-201 | 30 | 5935.95 | 2.69 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**Pipe 67 Closed**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 2793.82 | 1.27 |
| P-2 | 16 | 1585.17 | 2.53 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 1585.17 | 2.53 |
| P-6 | 16 | 216.3 | 0.35 |
| P-7 | 30 | 2677.71 | 1.22 |
| P-8 | 12 | 507.06 | 1.44 |
| P-11 | 24 | 2673.07 | 1.9 |
| P-15 | 24 | 362.25 | 0.26 |
| P-19 | 24 | -185.77 | 0.13 |
| P-23 | 16 | 55.73 | 0.09 |
| P-27 | 24 | -120.75 | 0.09 |
| P-31 | 12 | 547.52 | 1.55 |
| P-35 | 12 | 547.52 | 1.55 |
| P-39 | 12 | 547.52 | 1.55 |
| P-43 | 12 | 547.52 | 1.55 |
| P-47 | 24 | 2436.21 | 1.73 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 2252.76 | 3.59 |
| P-55 | 16 | 2252.76 | 3.59 |
| P-62 | 16 | 1562.35 | 2.49 |
| P-63 | 16 | 1778.65 | 2.84 |
| P-65 | 16 | -1152.57 | 1.84 |
| P-66 | 16 | 1346.05 | 2.15 |
| P-67 | 16 | | |
| P-69 | 16 | -4000 | 6.38 |
| P-75 | 12 | 723.36 | 2.05 |
| P-79 | 16 | -3709.24 | 5.92 |
| P-81 | 16 | -4579.6 | 7.31 |
| P-85 | 24 | 2282.32 | 1.62 |
| P-89 | 16 | 2513.58 | 4.01 |
| P-101 | 24 | 2556.96 | 1.81 |
| P-201 | 30 | 4262.88 | 1.93 |

**Project: Southwest Village Specific Plan Project**
**Date: 3/9/2022**
**Job Number: 648-031**

**Scenario: Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**Pipe 69 Closed**

| Pipe No. | Pipe Size (inches) | Model Run Flow (gpm) | Model Run Velocity (fps) |
|---|---|---|---|
| P-1 | 30 | 2694.02 | 1.22 |
| P-2 | 16 | 1790.22 | 2.86 |
| P-3 | 24 | 0 | 0 |
| P-4 | 16 | 1790.22 | 2.86 |
| P-6 | 16 | 4216.3 | 6.73 |
| P-7 | 30 | 2572.45 | 1.17 |
| P-8 | 12 | -99.67 | 0.28 |
| P-11 | 24 | 2573.27 | 1.82 |
| P-15 | 24 | 362.25 | 0.26 |
| P-19 | 24 | -185.77 | 0.13 |
| P-23 | 16 | 55.73 | 0.09 |
| P-27 | 24 | -120.75 | 0.09 |
| P-31 | 12 | 522.57 | 1.48 |
| P-35 | 12 | 522.57 | 1.48 |
| P-39 | 12 | 522.57 | 1.48 |
| P-43 | 12 | 522.57 | 1.48 |
| P-47 | 24 | 2330.95 | 1.65 |
| P-50 | 24 | 0 | 0 |
| P-51 | 16 | 2150.24 | 3.43 |
| P-55 | 16 | 2150.24 | 3.43 |
| P-62 | 16 | 1507.92 | 2.41 |
| P-63 | 16 | 1724.22 | 2.75 |
| P-65 | 16 | 2642.38 | 4.22 |
| P-66 | 16 | 1291.62 | 2.06 |
| P-67 | 16 | 4000 | 6.38 |
| P-69 | 16 | | |
| P-75 | 12 | 116.63 | 0.33 |
| P-79 | 16 | -315.97 | 0.5 |
| P-81 | 16 | -579.6 | 0.92 |
| P-85 | 24 | -1567.06 | 1.11 |
| P-89 | 16 | 2362.96 | 3.77 |
| P-101 | 24 | 2451.7 | 1.74 |
| P-201 | 30 | 4362.68 | 1.98 |

```
* * * * * * * * * * * * K Y P I P E * * * * * * * * * * * *
*                                                           *
*  Pipe Network Modeling Software                           *
*                                                           *
*  CopyRighted by KYPIPE LLC (www.kypipe.com)               *
*  Version: 10.009  10/01/2019                              *
*  Company:  Dexter        Serial #:  592169                *
*  Interface:  Classic                                      *
*  Licensed for Pipe2018                                    *
*                                                           *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

Date & Time: Tue Mar 08 19:42:23 2022

Master File : \\artic\eng\648031\mar 2022 sw village specific plan 680 zone.KYP\mar 2022 sw village specific plan 680 zone.P2K

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

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

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

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

**STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE**

| P I P E N A M E | NODE NAMES #1 | #2 | LENGTH (ft) | DIAMETER (in) | ROUGHNESS COEFF. | MINOR LOSS COEFF. |
|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 3000.00 | 30.00 | 120.0000 | 0.00 |
| P-2 | J-202 | J-1 | 2800.00 | 16.00 | 120.0000 | 0.00 |
| P-3 | O-Pump-Ota | J-16 | 2200.00 | 24.00 | 120.0000 | 0.00 |
| P-4 | J-1 | J-5 | 5000.00 | 16.00 | 120.0000 | 0.00 |
| P-6 | J-5 | J-41 | 630.00 | 16.00 | 120.0000 | 0.00 |
| P-7 | J-202 | J-20 | 2600.00 | 30.00 | 120.0000 | 0.00 |
| P-8 | J-48 | J-44 | 1950.00 | 12.00 | 120.0000 | 0.00 |
| P-11 | J-4 | J-8 | 3700.00 | 24.00 | 120.0000 | 0.00 |
| P-15 | J-8 | J-10 | 2700.00 | 24.00 | 120.0000 | 0.00 |
| P-19 | J-12 | J-10 | 2750.00 | 24.00 | 120.0000 | 0.00 |
| P-23 | J-10 | J-12 | 3550.00 | 16.00 | 120.0000 | 0.00 |
| P-27 | J-16 | J-12 | 4900.00 | 24.00 | 120.0000 | 0.00 |
| P-31 | J-8 | J-24 | 1450.00 | 12.00 | 120.0000 | 0.00 |
| P-35 | J-8 | J-24 | 1450.00 | 12.00 | 120.0000 | 0.00 |
| P-39 | J-8 | J-24 | 1450.00 | 12.00 | 120.0000 | 0.00 |
| P-43 | J-8 | J-24 | 1450.00 | 12.00 | 120.0000 | 0.00 |
| P-47 | J-22 | J-24 | 4250.00 | 24.00 | 120.0000 | 0.00 |
| P-50 | OWD Interc | J-12 | 33.00 | 24.00 | 120.0000 | 0.00 |
| P-51 | J-24 | J-32 | 1350.00 | 16.00 | 120.0000 | 0.00 |
| P-55 | J-24 | J-32 | 1350.00 | 16.00 | 120.0000 | 0.00 |
| P-62 | J-28 | J-29 | 700.00 | 16.00 | 120.0000 | 0.00 |
| P-63 | J-32 | J-28 | 1600.00 | 16.00 | 120.0000 | 0.00 |
| P-65 | J-40 | J-5 | 820.00 | 16.00 | 120.0000 | 0.00 |
| P-66 | J-29 | J-40 | 700.00 | 16.00 | 120.0000 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| P-67 | J-41 | J-42 | 950.00 | 16.00 | 120.0000 | 0.00 |
| P-69 | J-42 | J-44 | 1300.00 | 16.00 | 120.0000 | 0.00 |
| P-75 | J-52 | J-48 | 2550.00 | 12.00 | 120.0000 | 0.00 |
| P-79 | J-44 | J-52 | 700.00 | 16.00 | 120.0000 | 0.00 |
| P-81 | J-52 | J-36 | 550.00 | 16.00 | 120.0000 | 0.00 |
| P-85 | J-40 | J-36 | 400.00 | 24.00 | 120.0000 | 0.00 |
| P-89 | J-32 | J-36 | 1400.00 | 16.00 | 120.0000 | 0.00 |
| P-101 | J-20 | J-22 | 2550.00 | 24.00 | 120.0000 | 0.00 |
| P-201 | Princess P | J-202 | 300.00 | 30.00 | 120.0000 | 0.00 |

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 OWD Interc DESCRIBED BY THE FOLLOWING DATA: (ID= 3)

| HEAD (ft) | FLOWRATE (gpm) | EFFICIENCY (%) |
|---|---|---|
| 600.00 | 1.00 | 75.00 (Default) |
| 590.00 | 2.00 | 75.00 (Default) |
| 550.00 | 3100.00 | 75.00 (Default) |

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

| HEAD (ft) | FLOWRATE (gpm) | EFFICIENCY (%) |
|---|---|---|
| 3.00 | 0.00 | 75.00 (Default) |
| 2.00 | 7700.00 | 75.00 (Default) |
| 1.00 | 7800.00 | 75.00 (Default) |

**N O D E  D A T A**

| NODE NAME | NODE TITLE | EXTERNAL DEMAND (gpm) | JUNCTION ELEVATION (ft) | EXTERNAL GRADE (ft) |
|---|---|---|---|---|
| Ocean View | | ---- | 0.00 | 680.00 |
| OWD Interc | | 0.00 | 0.00 | |
| Princess P | | ---- | 0.00 | 680.00 |
| J-1 | | 0.00 | 175.00 | |
| J-4 | | 80.50 | 521.00 | |
| J-5 | | 144.20 | 490.00 | |
| J-8 | | 80.50 | 534.00 | |
| J-10 | | 80.50 | 517.00 | |
| J-12 | | 80.50 | 516.00 | |
| J-16 | | 80.50 | 333.00 | |
| J-20 | | 80.50 | 322.00 | |
| J-22 | | 80.50 | 466.00 | |
| J-24 | | 80.50 | 550.00 | |
| J-28 | | 144.20 | 497.00 | |
| J-29 | | 144.20 | 491.00 | |
| J-32 | | 142.20 | 516.00 | |
| J-36 | | 144.20 | 485.00 | |
| J-40 | | 144.20 | 485.00 | |
| J-41 | | 144.20 | 489.00 | |
| J-42 | | 144.20 | 496.00 | |
| J-44 | | 144.20 | 475.00 | |
| J-48 | | 144.20 | 485.00 | |
| J-52 | | 147.00 | 498.00 | |
| J-202 | | 0.00 | 275.00 | |

O-Pump-Ota 0.00 0.00

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) = 33
NUMBER OF END NODES .....(J) = 21
NUMBER OF PRIMARY LOOPS .....(L) = 9
NUMBER OF SUPPLY NODES .....(F) = 4
NUMBER OF SUPPLY ZONES .....(Z) = 1

==========

**Case: 0**

RESULTS OBTAINED AFTER 22 TRIALS: ACCURACY = 0.32018E-04

S I M U L A T I O N D E S C R I P T I O N (L A B E L)

**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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 937.72 | 0.09 | 0.00 | 0.43 | 0.03 | 0.03 |
| P-2 | J-202 | J-1 | 426.18 | 0.42 | 0.00 | 0.68 | 0.15 | 0.15 |
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 426.18 | 0.75 | 0.00 | 0.68 | 0.15 | 0.15 |
| P-6 | J-5 | J-41 | 327.52 | 0.06 | 0.00 | 0.52 | 0.09 | 0.09 |
| P-7 | J-202 | J-20 | 867.10 | 0.07 | 0.00 | 0.39 | 0.03 | 0.03 |
| P-8 | J-48 | J-44 | -69.61 | 0.04 | 0.00 | 0.20 | 0.02 | 0.02 |
| P-11 | J-4 | J-8 | 857.22 | 0.28 | 0.00 | 0.61 | 0.08 | 0.08 |
| P-15 | J-8 | J-10 | 241.50 | 0.02 | 0.00 | 0.17 | 0.01 | 0.01 |
| P-19 | J-12 | J-10 | -123.85 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-23 | J-10 | J-12 | 37.15 | 0.01 | 0.00 | 0.06 | 0.00 | 0.00 |
| P-27 | J-16 | J-12 | -80.50 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | 133.80 | 0.10 | 0.00 | 0.38 | 0.07 | 0.07 |
| P-35 | J-8 | J-24 | 133.80 | 0.10 | 0.00 | 0.38 | 0.07 | 0.07 |
| P-39 | J-8 | J-24 | 133.80 | 0.10 | 0.00 | 0.38 | 0.07 | 0.07 |
| P-43 | J-8 | J-24 | 133.80 | 0.10 | 0.00 | 0.38 | 0.07 | 0.07 |
| P-47 | J-22 | J-24 | 706.10 | 0.22 | 0.00 | 0.50 | 0.05 | 0.05 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 580.41 | 0.36 | 0.00 | 0.93 | 0.26 | 0.26 |
| P-55 | J-24 | J-32 | 580.41 | 0.36 | 0.00 | 0.93 | 0.26 | 0.26 |
| P-62 | J-28 | J-29 | 312.42 | 0.06 | 0.00 | 0.50 | 0.08 | 0.08 |
| P-63 | J-32 | J-28 | 456.62 | 0.27 | 0.00 | 0.73 | 0.17 | 0.17 |
| P-65 | J-40 | J-5 | 45.54 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P-66 | J-29 | J-40 | 168.22 | 0.02 | 0.00 | 0.27 | 0.03 | 0.03 |
| P-67 | J-41 | J-42 | 183.32 | 0.03 | 0.00 | 0.29 | 0.03 | 0.03 |
| P-69 | J-42 | J-44 | 39.12 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 |
| P-75 | J-52 | J-48 | 74.59 | 0.06 | 0.00 | 0.21 | 0.02 | 0.02 |
| P-79 | J-44 | J-52 | -174.69 | 0.02 | 0.00 | 0.28 | 0.03 | 0.03 |
| P-81 | J-52 | J-36 | -396.28 | 0.07 | 0.00 | 0.63 | 0.13 | 0.13 |
| P-85 | J-40 | J-36 | -21.52 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 |
| P-89 | J-32 | J-36 | 562.00 | 0.35 | 0.00 | 0.90 | 0.25 | 0.25 |
| P-101 | J-20 | J-22 | 786.60 | 0.16 | 0.00 | 0.56 | 0.06 | 0.06 |
| P-201 | Princess P | J-202 | 1293.28 | 0.02 | 0.00 | 0.59 | 0.05 | 0.05 |

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 | EFFIC-ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 679.60 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 0.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 679.60 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 0.0000 |

**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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 679.60 | | | |
| Princess P | | ---- | 680.00 | | | |
| J-1 | | 0.00 | 679.57 | 175.00 | 504.57 | 218.65 |
| J-4 | | 80.50 | 679.91 | 521.00 | 158.91 | 68.86 |
| J-5 | | 144.20 | 678.82 | 490.00 | 188.82 | 81.82 |
| J-8 | | 80.50 | 679.63 | 534.00 | 145.63 | 63.11 |
| J-10 | | 80.50 | 679.61 | 517.00 | 162.61 | 70.46 |
| J-12 | | 80.50 | 679.60 | 516.00 | 163.60 | 70.90 |
| J-16 | | 80.50 | 679.60 | 333.00 | 346.60 | 150.19 |
| J-20 | | 80.50 | 679.92 | 322.00 | 357.92 | 155.10 |
| J-22 | | 80.50 | 679.75 | 466.00 | 213.75 | 92.63 |
| J-24 | | 80.50 | 679.53 | 550.00 | 129.53 | 56.13 |
| J-28 | | 144.20 | 678.90 | 497.00 | 181.90 | 78.82 |
| J-29 | | 144.20 | 678.84 | 491.00 | 187.84 | 81.40 |
| J-32 | | 142.20 | 679.17 | 516.00 | 163.17 | 70.71 |
| J-36 | | 144.20 | 678.82 | 485.00 | 193.82 | 83.99 |
| J-40 | | 144.20 | 678.82 | 485.00 | 193.82 | 83.99 |
| J-41 | | 144.20 | 678.76 | 489.00 | 189.76 | 82.23 |
| J-42 | | 144.20 | 678.73 | 496.00 | 182.73 | 79.18 |
| J-44 | | 144.20 | 678.73 | 475.00 | 203.73 | 88.28 |
| J-48 | | 144.20 | 678.69 | 485.00 | 193.69 | 83.93 |
| J-52 | | 147.00 | 678.75 | 498.00 | 180.75 | 78.32 |
| J-202 | | 0.00 | 679.98 | 275.00 | 404.98 | 175.49 |
| O-Pump-Ota | | 0.00 | 679.60 | | | |

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 |
|---|---|---|---|
| J-1 | 218.65 | J-24 | 56.13 |
| J-202 | 175.49 | J-8 | 63.11 |
| J-20 | 155.10 | J-4 | 68.86 |

V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-51 | 0.93 | P-85 | 0.02 |
| P-55 | 0.93 | P-27 | 0.06 |
| P-89 | 0.90 | P-23 | 0.06 |

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 |
|---|---|---|
| Ocean View | 937.72 | |
| Princess Pa | 1293.28 | |

NET SYSTEM INFLOW = 2231.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 2231.00

==========

**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 )

**Peak Hour Demand**

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

RESULTS OBTAINED AFTER 3 TRIALS: ACCURACY = 0.11464E-06

**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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 1820.67 | 0.31 | 0.00 | 0.83 | 0.10 | 0.10 |
| P-2 | J-202 | J-1 | 813.80 | 1.39 | 0.00 | 1.30 | 0.49 | 0.49 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 813.80 | 2.47 | 0.00 | 1.30 | 0.49 | 0.49 |
| P-6 | J-5 | J-41 | 616.60 | 0.19 | 0.00 | 0.98 | 0.30 | 0.30 |
| P-7 | J-202 | J-20 | 1680.53 | 0.23 | 0.00 | 0.76 | 0.09 | 0.09 |
| P-8 | J-48 | J-44 | -136.23 | 0.14 | 0.00 | 0.39 | 0.07 | 0.07 |
| P-11 | J-4 | J-8 | 1659.67 | 0.95 | 0.00 | 1.18 | 0.26 | 0.26 |
| P-15 | J-8 | J-10 | 483.00 | 0.07 | 0.00 | 0.34 | 0.03 | 0.03 |
| P-19 | J-12 | J-10 | -247.70 | 0.02 | 0.00 | 0.18 | 0.01 | 0.01 |
| P-23 | J-10 | J-12 | 74.30 | 0.02 | 0.00 | 0.12 | 0.01 | 0.01 |
| P-27 | J-16 | J-12 | -161.00 | 0.02 | 0.00 | 0.11 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | 253.92 | 0.34 | 0.00 | 0.72 | 0.23 | 0.23 |
| P-35 | J-8 | J-24 | 253.92 | 0.34 | 0.00 | 0.72 | 0.23 | 0.23 |
| P-39 | J-8 | J-24 | 253.92 | 0.34 | 0.00 | 0.72 | 0.23 | 0.23 |
| P-43 | J-8 | J-24 | 253.92 | 0.34 | 0.00 | 0.72 | 0.23 | 0.23 |
| P-47 | J-22 | J-24 | 1358.53 | 0.75 | 0.00 | 0.96 | 0.18 | 0.18 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 1106.60 | 1.18 | 0.00 | 1.77 | 0.87 | 0.87 |
| P-55 | J-24 | J-32 | 1106.60 | 1.18 | 0.00 | 1.77 | 0.87 | 0.87 |
| P-62 | J-28 | J-29 | 580.38 | 0.19 | 0.00 | 0.93 | 0.26 | 0.26 |
| P-63 | J-32 | J-28 | 868.78 | 0.89 | 0.00 | 1.39 | 0.56 | 0.56 |
| P-65 | J-40 | J-5 | 91.19 | 0.01 | 0.00 | 0.15 | 0.01 | 0.01 |
| P-66 | J-29 | J-40 | 291.98 | 0.05 | 0.00 | 0.47 | 0.07 | 0.07 |
| P-67 | J-41 | J-42 | 328.20 | 0.09 | 0.00 | 0.52 | 0.09 | 0.09 |
| P-69 | J-42 | J-44 | 39.80 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 |
| P-75 | J-52 | J-48 | 152.17 | 0.23 | 0.00 | 0.43 | 0.09 | 0.09 |
| P-79 | J-44 | J-52 | -384.83 | 0.09 | 0.00 | 0.61 | 0.12 | 0.12 |
| P-81 | J-52 | J-36 | -684.00 | 0.20 | 0.00 | 1.09 | 0.36 | 0.36 |
| P-85 | J-40 | J-36 | -87.62 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 |
| P-89 | J-32 | J-36 | 1060.02 | 1.13 | 0.00 | 1.69 | 0.81 | 0.81 |
| P-101 | J-20 | J-22 | 1519.53 | 0.56 | 0.00 | 1.08 | 0.22 | 0.22 |
| P-201 | Princess P | J-202 | 2494.33 | 0.06 | 0.00 | 1.13 | 0.18 | 0.18 |

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 | EFFIC-ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 678.65 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 1.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 678.63 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 1.0000 |

**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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 678.65 | | | |
| Princess P | | ---- | 680.00 | | | |
| J-1 | | 0.00 | 678.56 | 175.00 | 503.56 | 218.21 |
| J-4 | | 161.00(2.00) | 679.69 | 521.00 | 158.69 | 68.77 |
| J-5 | | 288.40(2.00) | 676.09 | 490.00 | 186.09 | 80.64 |
| J-8 | | 161.00(2.00) | 678.74 | 534.00 | 144.74 | 62.72 |
| J-10 | | 161.00(2.00) | 678.67 | 517.00 | 161.67 | 70.06 |
| J-12 | | 161.00(2.00) | 678.65 | 516.00 | 162.65 | 70.48 |
| J-16 | | 161.00(2.00) | 678.63 | 333.00 | 345.63 | 149.77 |
| J-20 | | 161.00(2.00) | 679.71 | 322.00 | 357.71 | 155.01 |
| J-22 | | 161.00(2.00) | 679.16 | 466.00 | 213.16 | 92.37 |

| | | | | | |
|---|---|---|---|---|---|
| J-24 | 161.00 | (2.00) | 678.40 | 550.00 | 128.40 | 55.64 |
| J-28 | 288.40 | (2.00) | 676.33 | 497.00 | 179.33 | 77.71 |
| J-29 | 288.40 | (2.00) | 676.15 | 491.00 | 185.15 | 80.23 |
| J-32 | 284.40 | (2.00) | 677.22 | 516.00 | 161.22 | 69.86 |
| J-36 | 288.40 | (2.00) | 676.09 | 485.00 | 191.09 | 82.81 |
| J-40 | 288.40 | (2.00) | 676.09 | 485.00 | 191.09 | 82.81 |
| J-41 | 288.40 | (2.00) | 675.90 | 489.00 | 186.90 | 80.99 |
| J-42 | 288.40 | (2.00) | 675.81 | 496.00 | 179.81 | 77.92 |
| J-44 | 288.40 | (2.00) | 675.81 | 475.00 | 200.81 | 87.02 |
| J-48 | 288.40 | (2.00) | 675.67 | 485.00 | 190.67 | 82.62 |
| J-52 | 147.00 | | 675.90 | 498.00 | 177.90 | 77.09 |
| J-202 | 0.00 | | 679.94 | 275.00 | 404.94 | 175.48 |
| O-Pump-Ota | 0.00 | | 678.63 | | | |

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 |
|---|---|---|---|
| J-1 | 218.21 | J-24 | 55.64 |
| J-202 | 175.48 | J-8 | 62.72 |
| J-20 | 155.01 | J-4 | 68.77 |

V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-51 | 1.77 | P-85 | 0.06 |
| P-55 | 1.77 | P-69 | 0.06 |
| P-89 | 1.69 | P-27 | 0.11 |

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 |
|---|---|---|
| Ocean View | 1820.67 | |
| Princess Pa | 2494.33 | |

NET SYSTEM INFLOW = 4315.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 4315.00

==========

**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 )

**Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.39305E-04

**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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 2760.02 | 0.67 | 0.00 | 1.25 | 0.22 | 0.22 |
| P-2 | J-202 | J-1 | 1654.59 | 5.16 | 0.00 | 2.64 | 1.84 | 1.84 |
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 1654.59 | 9.21 | 0.00 | 2.64 | 1.84 | 1.84 |
| P-6 | J-5 | J-41 | 2459.12 | 2.42 | 0.00 | 3.92 | 3.84 | 3.84 |
| P-7 | J-202 | J-20 | 2642.09 | 0.53 | 0.00 | 1.20 | 0.21 | 0.21 |
| P-8 | J-48 | J-44 | 170.79 | 0.22 | 0.00 | 0.48 | 0.11 | 0.11 |
| P-11 | J-4 | J-8 | 2639.27 | 2.25 | 0.00 | 1.87 | 0.61 | 0.61 |
| P-15 | J-8 | J-10 | 362.25 | 0.04 | 0.00 | 0.26 | 0.02 | 0.02 |
| P-19 | J-12 | J-10 | -185.77 | 0.01 | 0.00 | 0.13 | 0.00 | 0.00 |
| P-23 | J-10 | J-12 | 55.73 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-27 | J-16 | J-12 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | 539.07 | 1.36 | 0.00 | 1.53 | 0.94 | 0.94 |
| P-35 | J-8 | J-24 | 539.07 | 1.36 | 0.00 | 1.53 | 0.94 | 0.94 |
| P-39 | J-8 | J-24 | 539.07 | 1.36 | 0.00 | 1.53 | 0.94 | 0.94 |
| P-43 | J-8 | J-24 | 539.07 | 1.36 | 0.00 | 1.53 | 0.94 | 0.94 |
| P-47 | J-22 | J-24 | 2400.59 | 2.16 | 0.00 | 1.70 | 0.51 | 0.51 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 2218.05 | 4.28 | 0.00 | 3.54 | 3.17 | 3.17 |
| P-55 | J-24 | J-32 | 2218.05 | 4.28 | 0.00 | 3.54 | 3.17 | 3.17 |
| P-62 | J-28 | J-29 | 1552.68 | 1.15 | 0.00 | 2.48 | 1.64 | 1.64 |
| P-63 | J-32 | J-28 | 1768.98 | 3.33 | 0.00 | 2.82 | 2.08 | 2.08 |
| P-65 | J-40 | J-5 | 1020.83 | 0.62 | 0.00 | 1.63 | 0.75 | 0.75 |
| P-66 | J-29 | J-40 | 1336.38 | 0.87 | 0.00 | 2.13 | 1.24 | 1.24 |
| P-67 | J-41 | J-42 | 2242.82 | 3.07 | 0.00 | 3.58 | 3.23 | 3.23 |
| P-69 | J-42 | J-44 | -1757.18 | 2.68 | 0.00 | 2.80 | 2.06 | 2.06 |
| P-75 | J-52 | J-48 | 387.09 | 1.29 | 0.00 | 1.10 | 0.51 | 0.51 |
| P-79 | J-44 | J-52 | -1802.69 | 1.51 | 0.00 | 2.88 | 2.16 | 2.16 |
| P-81 | J-52 | J-36 | -2336.78 | 1.92 | 0.00 | 3.73 | 3.49 | 3.49 |
| P-85 | J-40 | J-36 | 99.24 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 |
| P-89 | J-32 | J-36 | 2453.83 | 5.35 | 0.00 | 3.92 | 3.82 | 3.82 |
| P-101 | J-20 | J-22 | 2521.34 | 1.42 | 0.00 | 1.79 | 0.56 | 0.56 |
| P-201 | Princess P | J-202 | 4296.68 | 0.15 | 0.00 | 1.95 | 0.50 | 0.50 |

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 | EFFIC- ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 677.03 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 2.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 677.02 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 2.0000 |

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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 677.03 | | | |
| Princess P | | ---- | 680.00 | | | |
| J-1 | | 0.00 | 674.69 | 175.00 | 499.69 | 216.53 |
| J-4 | | 120.75(1.50) | 679.33 | 521.00 | 158.33 | 68.61 |
| J-5 | | 216.30(1.50) | 665.49 | 490.00 | 175.49 | 76.04 |
| J-8 | | 120.75(1.50) | 677.09 | 534.00 | 143.09 | 62.00 |
| J-10 | | 120.75(1.50) | 677.05 | 517.00 | 160.05 | 69.35 |
| J-12 | | 120.75(1.50) | 677.03 | 516.00 | 161.03 | 69.78 |
| J-16 | | 120.75(1.50) | 677.02 | 333.00 | 344.02 | 149.08 |
| J-20 | | 120.75(1.50) | 679.32 | 322.00 | 357.32 | 154.84 |
| J-22 | | 120.75(1.50) | 677.89 | 466.00 | 211.89 | 91.82 |
| J-24 | | 120.75(1.50) | 675.73 | 550.00 | 125.73 | 54.48 |
| J-28 | | 216.30(1.50) | 668.12 | 497.00 | 171.12 | 74.15 |
| J-29 | | 216.30(1.50) | 666.97 | 491.00 | 175.97 | 76.26 |
| J-32 | | 213.30(1.50) | 671.45 | 516.00 | 155.45 | 67.36 |
| J-36 | | 216.30(1.50) | 666.10 | 485.00 | 181.10 | 78.48 |
| J-40 | | 216.30(1.50) | 666.11 | 485.00 | 181.11 | 78.48 |
| J-41 | | 216.30(1.50) | 663.07 | 489.00 | 174.07 | 75.43 |
| J-42 | | 4000.00( ** ) | 660.00 | 496.00 | 164.00 | 71.07 |
| J-44 | | 216.30(1.50) | 662.68 | 475.00 | 187.68 | 81.33 |
| J-48 | | 216.30(1.50) | 662.89 | 485.00 | 177.89 | 77.09 |
| J-52 | | 147.00 | 664.19 | 498.00 | 166.19 | 72.01 |
| J-202 | | 0.00 | 679.85 | 275.00 | 404.85 | 175.43 |
| O-Pump-Ota | | 0.00 | 677.02 | | | |

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 |
|---|---|---|---|
| J-1 | 216.53 | J-24 | 54.48 |
| J-202 | 175.43 | J-8 | 62.00 |
| J-20 | 154.84 | J-32 | 67.36 |

V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-6 | 3.92 | P-85 | 0.07 |
| P-89 | 3.92 | P-27 | 0.09 |
| P-81 | 3.73 | P-23 | 0.09 |

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 |
|---|---|---|
| Ocean View | 2760.02 | |
| Princess Pa | 4296.68 | |

NET SYSTEM INFLOW = 7056.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 7056.70

==========

**Case: 3**

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 = 3 )

**Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**Source Only from Ocean View Hills Pump Station**

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

Pipe P-101 is CLOSED

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.79148E-07

**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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 4873.44 | 1.91 | 0.00 | 2.21 | 0.64 | 0.64 |
| P-2 | J-202 | J-1 | 2062.51 | 7.75 | 0.00 | 3.29 | 2.77 | 2.77 |
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 2062.51 | 13.84 | 0.00 | 3.29 | 2.77 | 2.77 |
| P-6 | J-5 | J-41 | 2494.63 | 2.48 | 0.00 | 3.98 | 3.94 | 3.94 |
| P-7 | J-202 | J-20 | 120.75 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 |
| P-8 | J-48 | J-44 | 165.32 | 0.20 | 0.00 | 0.47 | 0.10 | 0.10 |
| P-11 | J-4 | J-8 | 4752.69 | 6.67 | 0.00 | 3.37 | 1.80 | 1.80 |
| P-15 | J-8 | J-10 | 362.25 | 0.04 | 0.00 | 0.26 | 0.02 | 0.02 |
| P-19 | J-12 | J-10 | -185.77 | 0.01 | 0.00 | 0.13 | 0.00 | 0.00 |
| P-23 | J-10 | J-12 | 55.73 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-27 | J-16 | J-12 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | 1067.42 | 4.81 | 0.00 | 3.03 | 3.32 | 3.32 |
| P-35 | J-8 | J-24 | 1067.42 | 4.81 | 0.00 | 3.03 | 3.32 | 3.32 |
| P-39 | J-8 | J-24 | 1067.42 | 4.81 | 0.00 | 3.03 | 3.32 | 3.32 |
| P-43 | J-8 | J-24 | 1067.42 | 4.81 | 0.00 | 3.03 | 3.32 | 3.32 |
| P-47 | J-22 | J-24 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 2014.10 | 3.58 | 0.00 | 3.21 | 2.65 | 2.65 |
| P-55 | J-24 | J-32 | 2014.10 | 3.58 | 0.00 | 3.21 | 2.65 | 2.65 |
| P-62 | J-28 | J-29 | 1389.10 | 0.93 | 0.00 | 2.22 | 1.33 | 1.33 |
| P-63 | J-32 | J-28 | 1605.40 | 2.79 | 0.00 | 2.56 | 1.74 | 1.74 |
| P-65 | J-40 | J-5 | 648.42 | 0.27 | 0.00 | 1.03 | 0.32 | 0.32 |
| P-66 | J-29 | J-40 | 1172.80 | 0.68 | 0.00 | 1.87 | 0.97 | 0.97 |
| P-67 | J-41 | J-42 | 2278.33 | 3.16 | 0.00 | 3.64 | 3.33 | 3.33 |
| P-69 | J-42 | J-44 | -1721.67 | 2.58 | 0.00 | 2.75 | 1.98 | 1.98 |
| P-75 | J-52 | J-48 | 381.62 | 1.26 | 0.00 | 1.08 | 0.49 | 0.49 |
| P-79 | J-44 | J-52 | -1772.65 | 1.46 | 0.00 | 2.83 | 2.09 | 2.09 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P-81 | J-52 | J-36 | -2301.27 | 1.87 | 0.00 | 3.67 | 3.39 | 3.39 |
| P-85 | J-40 | J-36 | 308.08 | 0.00 | 0.00 | 0.22 | 0.01 | 0.01 |
| P-89 | J-32 | J-36 | 2209.49 | 4.40 | 0.00 | 3.53 | 3.15 | 3.15 |
| P-101-XX | J-20 | J-22 | | | | | | |
| P-201 | Princess P | J-202 | 2183.26 | 0.04 | 0.00 | 0.99 | 0.14 | 0.14 |

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 | EFFIC-ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 671.36 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 3.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 671.35 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 3.0000 |

**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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 671.36 | | | |
| Princess P | | ---- | 680.00 | | | |
| J-1 | | 0.00 | 672.20 | 175.00 | 497.20 | 215.45 |
| J-4 | | 120.75(1.50) | 678.09 | 521.00 | 157.09 | 68.07 |
| J-5 | | 216.30(1.50) | 658.36 | 490.00 | 168.36 | 72.96 |
| J-8 | | 120.75(1.50) | 671.41 | 534.00 | 137.41 | 59.55 |
| J-10 | | 120.75(1.50) | 671.37 | 517.00 | 154.37 | 66.89 |
| J-12 | | 120.75(1.50) | 671.36 | 516.00 | 155.36 | 67.32 |
| J-16 | | 120.75(1.50) | 671.35 | 333.00 | 338.35 | 146.62 |
| J-20 | | 120.75(1.50) | 679.96 | 322.00 | 357.96 | 155.11 |
| J-22 | | 120.75(1.50) | 666.59 | 466.00 | 200.59 | 86.92 |
| J-24 | | 120.75(1.50) | 666.60 | 550.00 | 116.60 | 50.53 |
| J-28 | | 216.30(1.50) | 660.24 | 497.00 | 163.24 | 70.74 |
| J-29 | | 216.30(1.50) | 659.31 | 491.00 | 168.31 | 72.93 |
| J-32 | | 213.30(1.50) | 663.02 | 516.00 | 147.02 | 63.71 |
| J-36 | | 216.30(1.50) | 658.62 | 485.00 | 173.62 | 75.24 |
| J-40 | | 216.30(1.50) | 658.63 | 485.00 | 173.63 | 75.24 |
| J-41 | | 216.30(1.50) | 655.88 | 489.00 | 166.88 | 72.31 |
| J-42 | | 4000.00( ** ) | 652.71 | 496.00 | 156.71 | 67.91 |
| J-44 | | 216.30(1.50) | 655.29 | 475.00 | 180.29 | 78.13 |
| J-48 | | 216.30(1.50) | 655.50 | 485.00 | 170.50 | 73.88 |
| J-52 | | 147.00 | 656.76 | 498.00 | 158.76 | 68.79 |
| J-202 | | 0.00 | 679.96 | 275.00 | 404.96 | 175.48 |
| O-Pump-Ota | | 0.00 | 671.35 | | | |

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 |
|---|---|---|---|
| J-1 | 215.45 | J-24 | 50.53 |
| J-202 | 175.48 | J-8 | 59.55 |
| J-20 | 155.11 | J-32 | 63.71 |

V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-6 | 3.98 | P-7 | 0.05 |
| P-81 | 3.67 | P-27 | 0.09 |
| P-67 | 3.64 | P-47 | 0.09 |

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 |
|---|---|---|
| Ocean View | 4873.44 | |
| Princess Pa | 2183.26 | |

NET SYSTEM INFLOW = 7056.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 7056.70

==========

**Case: 4**

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 = 4 )

**Maximum Day Demand plus 4,000 gpm Commercial Fire Flow at Node 42**
**Source Only from Princess Park Pump Station**

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

Pipe P-101 is OPENED
Pipe P-11 is CLOSED

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.18354E-05

**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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 120.75 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 |
| P-2 | J-202 | J-1 | 2069.70 | 7.80 | 0.00 | 3.30 | 2.79 | 2.79 |
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 2069.70 | 13.93 | 0.00 | 3.30 | 2.79 | 2.79 |
| P-6 | J-5 | J-41 | 2495.15 | 2.48 | 0.00 | 3.98 | 3.94 | 3.94 |
| P-7 | J-202 | J-20 | 4866.25 | 1.65 | 0.00 | 2.21 | 0.64 | 0.64 |
| P-8 | J-48 | J-44 | 165.24 | 0.20 | 0.00 | 0.47 | 0.10 | 0.10 |
| P-11-XX | J-4 | J-8 | | | | | | |
| P-15 | J-8 | J-10 | 362.25 | 0.04 | 0.00 | 0.26 | 0.02 | 0.02 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P-19 | J-12 | J-10 | -185.77 | 0.01 | 0.00 | 0.13 | 0.00 | 0.00 |
| P-23 | J-10 | J-12 | 55.73 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-27 | J-16 | J-12 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | -120.75 | 0.09 | 0.00 | 0.34 | 0.06 | 0.06 |
| P-35 | J-8 | J-24 | -120.75 | 0.09 | 0.00 | 0.34 | 0.06 | 0.06 |
| P-39 | J-8 | J-24 | -120.75 | 0.09 | 0.00 | 0.34 | 0.06 | 0.06 |
| P-43 | J-8 | J-24 | -120.75 | 0.09 | 0.00 | 0.34 | 0.06 | 0.06 |
| P-47 | J-22 | J-24 | 4624.75 | 7.29 | 0.00 | 3.28 | 1.71 | 1.71 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 2010.50 | 3.57 | 0.00 | 3.21 | 2.64 | 2.64 |
| P-55 | J-24 | J-32 | 2010.50 | 3.57 | 0.00 | 3.21 | 2.64 | 2.64 |
| P-62 | J-28 | J-29 | 1386.21 | 0.93 | 0.00 | 2.21 | 1.33 | 1.33 |
| P-63 | J-32 | J-28 | 1602.51 | 2.78 | 0.00 | 2.56 | 1.74 | 1.74 |
| P-65 | J-40 | J-5 | 641.75 | 0.26 | 0.00 | 1.02 | 0.32 | 0.32 |
| P-66 | J-29 | J-40 | 1169.91 | 0.68 | 0.00 | 1.87 | 0.97 | 0.97 |
| P-67 | J-41 | J-42 | 2278.85 | 3.16 | 0.00 | 3.64 | 3.33 | 3.33 |
| P-69 | J-42 | J-44 | -1721.15 | 2.57 | 0.00 | 2.75 | 1.98 | 1.98 |
| P-75 | J-52 | J-48 | 381.54 | 1.26 | 0.00 | 1.08 | 0.49 | 0.49 |
| P-79 | J-44 | J-52 | -1772.21 | 1.46 | 0.00 | 2.83 | 2.09 | 2.09 |
| P-81 | J-52 | J-36 | -2300.75 | 1.86 | 0.00 | 3.67 | 3.39 | 3.39 |
| P-85 | J-40 | J-36 | 311.86 | 0.00 | 0.00 | 0.22 | 0.01 | 0.01 |
| P-89 | J-32 | J-36 | 2205.19 | 4.39 | 0.00 | 3.52 | 3.13 | 3.13 |
| P-101 | J-20 | J-22 | 4745.50 | 4.59 | 0.00 | 3.37 | 1.80 | 1.80 |
| P-201 | Princess P | J-202 | 6935.95 | 0.37 | 0.00 | 3.15 | 1.23 | 1.23 |

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 | EFFIC-ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 665.97 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 4.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 665.96 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 4.0000 |

**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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 665.97 | | | |
| Princess P | | ---- | 680.00 | | | |
| J-1 | | 0.00 | 671.83 | 175.00 | 496.83 | 215.29 |
| J-4 | | 120.75(1.50) | 680.00 | 521.00 | 159.00 | 68.90 |
| J-5 | | 216.30(1.50) | 657.89 | 490.00 | 167.89 | 72.75 |
| J-8 | | 120.75(1.50) | 666.02 | 534.00 | 132.02 | 57.21 |
| J-10 | | 120.75(1.50) | 665.98 | 517.00 | 148.98 | 64.56 |
| J-12 | | 120.75(1.50) | 665.97 | 516.00 | 149.97 | 64.99 |
| J-16 | | 120.75(1.50) | 665.96 | 333.00 | 332.96 | 144.28 |
| J-20 | | 120.75(1.50) | 677.98 | 322.00 | 355.98 | 154.26 |
| J-22 | | 120.75(1.50) | 673.39 | 466.00 | 207.39 | 89.87 |
| J-24 | | 120.75(1.50) | 666.10 | 550.00 | 116.10 | 50.31 |
| J-28 | | 216.30(1.50) | 659.76 | 497.00 | 162.76 | 70.53 |
| J-29 | | 216.30(1.50) | 658.83 | 491.00 | 167.83 | 72.73 |
| J-32 | | 213.30(1.50) | 662.54 | 516.00 | 146.54 | 63.50 |
| J-36 | | 216.30(1.50) | 658.15 | 485.00 | 173.15 | 75.03 |
| J-40 | | 216.30(1.50) | 658.16 | 485.00 | 173.16 | 75.03 |
| J-41 | | 216.30(1.50) | 655.41 | 489.00 | 166.41 | 72.11 |

| | | | | | |
|---|---|---|---|---|---|
| J-42 | 4000.00( ** ) | 652.25 | 496.00 | 156.25 | 67.71 |
| J-44 | 216.30(1.50) | 654.82 | 475.00 | 179.82 | 77.92 |
| J-48 | 216.30(1.50) | 655.03 | 485.00 | 170.03 | 73.68 |
| J-52 | 147.00 | 656.29 | 498.00 | 158.29 | 68.59 |
| J-202 | 0.00 | 679.63 | 275.00 | 404.63 | 175.34 |
| O-Pump-Ota | 0.00 | 665.96 | | | |

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 |
|---|---|---|---|
| J-1 | 215.29 | J-24 | 50.31 |
| J-202 | 175.34 | J-8 | 57.21 |
| J-20 | 154.26 | J-32 | 63.50 |

V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-6 | 3.98 | P-1 | 0.05 |
| P-81 | 3.67 | P-27 | 0.09 |
| P-67 | 3.64 | P-23 | 0.09 |

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 |
|---|---|---|
| Ocean View | 120.75 | |
| Princess Pa | 6935.95 | |

NET SYSTEM INFLOW = 7056.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 7056.70

==========

**Case: 5**

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 = 5 )

**Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48**

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

Pipe P-11 is OPENED

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.50997E-06

## 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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 2406.10 | 0.52 | 0.00 | 1.09 | 0.17 | 0.17 |
| P-2 | J-202 | J-1 | 1360.22 | 3.59 | 0.00 | 2.17 | 1.28 | 1.28 |
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 1360.22 | 6.40 | 0.00 | 2.17 | 1.28 | 1.28 |
| P-6 | J-5 | J-41 | 1352.88 | 0.80 | 0.00 | 2.16 | 1.27 | 1.27 |
| P-7 | J-202 | J-20 | 2290.38 | 0.41 | 0.00 | 1.04 | 0.16 | 0.16 |
| P-8 | J-48 | J-44 | -1596.49 | 13.64 | 0.00 | 4.53 | 6.99 | 6.99 |
| P-11 | J-4 | J-8 | 2285.35 | 1.72 | 0.00 | 1.62 | 0.46 | 0.46 |
| P-15 | J-8 | J-10 | 362.25 | 0.04 | 0.00 | 0.26 | 0.02 | 0.02 |
| P-19 | J-12 | J-10 | -185.77 | 0.01 | 0.00 | 0.13 | 0.00 | 0.00 |
| P-23 | J-10 | J-12 | 55.73 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-27 | J-16 | J-12 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | 450.59 | 0.97 | 0.00 | 1.28 | 0.67 | 0.67 |
| P-35 | J-8 | J-24 | 450.59 | 0.97 | 0.00 | 1.28 | 0.67 | 0.67 |
| P-39 | J-8 | J-24 | 450.59 | 0.97 | 0.00 | 1.28 | 0.67 | 0.67 |
| P-43 | J-8 | J-24 | 450.59 | 0.97 | 0.00 | 1.28 | 0.67 | 0.67 |
| P-47 | J-22 | J-24 | 2048.88 | 1.61 | 0.00 | 1.45 | 0.38 | 0.38 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 1865.24 | 3.10 | 0.00 | 2.98 | 2.30 | 2.30 |
| P-55 | J-24 | J-32 | 1865.24 | 3.10 | 0.00 | 2.98 | 2.30 | 2.30 |
| P-62 | J-28 | J-29 | 1268.47 | 0.79 | 0.00 | 2.02 | 1.13 | 1.13 |
| P-63 | J-32 | J-28 | 1484.77 | 2.41 | 0.00 | 2.37 | 1.51 | 1.51 |
| P-65 | J-40 | J-5 | 208.95 | 0.03 | 0.00 | 0.33 | 0.04 | 0.04 |
| P-66 | J-29 | J-40 | 1052.17 | 0.56 | 0.00 | 1.68 | 0.80 | 0.80 |
| P-67 | J-41 | J-42 | 1136.58 | 0.87 | 0.00 | 1.81 | 0.92 | 0.92 |
| P-69 | J-42 | J-44 | 920.28 | 0.81 | 0.00 | 1.47 | 0.62 | 0.62 |
| P-75 | J-52 | J-48 | 1403.51 | 14.05 | 0.00 | 3.98 | 5.51 | 5.51 |
| P-79 | J-44 | J-52 | -892.51 | 0.41 | 0.00 | 1.42 | 0.59 | 0.59 |
| P-81 | J-52 | J-36 | -2443.02 | 2.08 | 0.00 | 3.90 | 3.79 | 3.79 |
| P-85 | J-40 | J-36 | 626.92 | 0.02 | 0.00 | 0.44 | 0.04 | 0.04 |
| P-89 | J-32 | J-36 | 2032.41 | 3.77 | 0.00 | 3.24 | 2.69 | 2.69 |
| P-101 | J-20 | J-22 | 2169.63 | 1.08 | 0.00 | 1.54 | 0.42 | 0.42 |
| P-201 | Princess P | J-202 | 3650.60 | 0.11 | 0.00 | 1.66 | 0.37 | 0.37 |

## 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 | EFFIC- ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 677.71 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 5.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 677.70 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 5.0000 |

## 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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 677.71 | | | |

| | | | | | |
|---|---|---|---|---|---|
| Princess P | ---- | 680.00 | | | |
| J-1 | 0.00 | 676.30 | 175.00 | 501.30 | 217.23 |
| J-4 | 120.75(1.50) | 679.48 | 521.00 | 158.48 | 68.68 |
| J-5 | 216.30(1.50) | 669.90 | 490.00 | 179.90 | 77.96 |
| J-8 | 120.75(1.50) | 677.76 | 534.00 | 143.76 | 62.30 |
| J-10 | 120.75(1.50) | 677.72 | 517.00 | 160.72 | 69.65 |
| J-12 | 120.75(1.50) | 677.71 | 516.00 | 161.71 | 70.07 |
| J-16 | 120.75(1.50) | 677.70 | 333.00 | 344.70 | 149.37 |
| J-20 | 120.75(1.50) | 679.48 | 322.00 | 357.48 | 154.91 |
| J-22 | 120.75(1.50) | 678.40 | 466.00 | 212.40 | 92.04 |
| J-24 | 120.75(1.50) | 676.79 | 550.00 | 126.79 | 54.94 |
| J-28 | 216.30(1.50) | 671.28 | 497.00 | 174.28 | 75.52 |
| J-29 | 216.30(1.50) | 670.49 | 491.00 | 179.49 | 77.78 |
| J-32 | 213.30(1.50) | 673.69 | 516.00 | 157.69 | 68.33 |
| J-36 | 216.30(1.50) | 669.91 | 485.00 | 184.91 | 80.13 |
| J-40 | 216.30(1.50) | 669.93 | 485.00 | 184.93 | 80.14 |
| J-41 | 216.30(1.50) | 669.10 | 489.00 | 180.10 | 78.04 |
| J-42 | 216.30(1.50) | 668.23 | 496.00 | 172.23 | 74.63 |
| J-44 | 216.30(1.50) | 667.42 | 475.00 | 192.42 | 83.38 |
| J-48 | 3000.00( ** ) | 653.78 | 485.00 | 168.78 | 73.14 |
| J-52 | 147.00 | 667.83 | 498.00 | 169.83 | 73.59 |
| J-202 | 0.00 | 679.89 | 275.00 | 404.89 | 175.45 |
| O-Pump-Ota | 0.00 | 677.70 | | | |

## 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 |
|---|---|---|---|
| J-1 | 217.23 | J-24 | 54.94 |
| J-202 | 175.45 | J-8 | 62.30 |
| J-20 | 154.91 | J-32 | 68.33 |

### V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-8 | 4.53 | P-27 | 0.09 |
| P-75 | 3.98 | P-23 | 0.09 |
| P-81 | 3.90 | P-19 | 0.13 |

## 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 |
|---|---|---|
| Ocean View | 2406.10 | |
| Princess Pa | 3650.60 | |

NET SYSTEM INFLOW = 6056.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 6056.70

==========

**Case: 6**

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 = 6 )

**Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48**
**Source Only from Ocean View Hills Pump Station**

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

Pipe P-101 is CLOSED

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.68881E-07

**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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 4208.14 | 1.46 | 0.00 | 1.91 | 0.49 | 0.49 |
| P-2 | J-202 | J-1 | 1727.81 | 5.59 | 0.00 | 2.76 | 1.99 | 1.99 |
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 1727.81 | 9.97 | 0.00 | 2.76 | 1.99 | 1.99 |
| P-6 | J-5 | J-41 | 1362.35 | 0.81 | 0.00 | 2.17 | 1.28 | 1.28 |
| P-7 | J-202 | J-20 | 120.75 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 |
| P-8 | J-48 | J-44 | -1596.71 | 13.64 | 0.00 | 4.53 | 7.00 | 7.00 |
| P-11 | J-4 | J-8 | 4087.39 | 5.05 | 0.00 | 2.90 | 1.36 | 1.36 |
| P-15 | J-8 | J-10 | 362.25 | 0.04 | 0.00 | 0.26 | 0.02 | 0.02 |
| P-19 | J-12 | J-10 | -185.77 | 0.01 | 0.00 | 0.13 | 0.00 | 0.00 |
| P-23 | J-10 | J-12 | 55.73 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-27 | J-16 | J-12 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | 901.10 | 3.52 | 0.00 | 2.56 | 2.43 | 2.43 |
| P-35 | J-8 | J-24 | 901.10 | 3.52 | 0.00 | 2.56 | 2.43 | 2.43 |
| P-39 | J-8 | J-24 | 901.10 | 3.52 | 0.00 | 2.56 | 2.43 | 2.43 |
| P-43 | J-8 | J-24 | 901.10 | 3.52 | 0.00 | 2.56 | 2.43 | 2.43 |
| P-47 | J-22 | J-24 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 1681.45 | 2.56 | 0.00 | 2.68 | 1.90 | 1.90 |
| P-55 | J-24 | J-32 | 1681.45 | 2.56 | 0.00 | 2.68 | 1.90 | 1.90 |
| P-62 | J-28 | J-29 | 1119.47 | 0.63 | 0.00 | 1.79 | 0.89 | 0.89 |
| P-63 | J-32 | J-28 | 1335.77 | 1.98 | 0.00 | 2.13 | 1.24 | 1.24 |
| P-65 | J-40 | J-5 | -149.16 | 0.02 | 0.00 | 0.24 | 0.02 | 0.02 |
| P-66 | J-29 | J-40 | 903.17 | 0.42 | 0.00 | 1.44 | 0.60 | 0.60 |
| P-67 | J-41 | J-42 | 1146.05 | 0.89 | 0.00 | 1.83 | 0.93 | 0.93 |
| P-69 | J-42 | J-44 | 929.75 | 0.82 | 0.00 | 1.48 | 0.63 | 0.63 |
| P-75 | J-52 | J-48 | 1403.29 | 14.05 | 0.00 | 3.98 | 5.51 | 5.51 |
| P-79 | J-44 | J-52 | -883.27 | 0.40 | 0.00 | 1.41 | 0.58 | 0.58 |
| P-81 | J-52 | J-36 | -2433.55 | 2.07 | 0.00 | 3.88 | 3.76 | 3.76 |
| P-85 | J-40 | J-36 | 836.03 | 0.03 | 0.00 | 0.59 | 0.07 | 0.07 |
| P-89 | J-32 | J-36 | 1813.82 | 3.06 | 0.00 | 2.89 | 2.18 | 2.18 |
| P-101-XX | J-20 | J-22 | | | | | | |
| P-201 | Princess P | J-202 | 1848.56 | 0.03 | 0.00 | 0.84 | 0.11 | 0.11 |

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 | EFFIC-ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 673.44 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 6.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 673.43 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 6.0000 |

**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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 673.44 | | | |
| Princess P | | ---- | 680.00 | | | |
| J-1 | | 0.00 | 674.38 | 175.00 | 499.38 | 216.40 |
| J-4 | | 120.75(1.50) | 678.54 | 521.00 | 157.54 | 68.27 |
| J-5 | | 216.30(1.50) | 664.41 | 490.00 | 174.41 | 75.58 |
| J-8 | | 120.75(1.50) | 673.50 | 534.00 | 139.50 | 60.45 |
| J-10 | | 120.75(1.50) | 673.45 | 517.00 | 156.45 | 67.80 |
| J-12 | | 120.75(1.50) | 673.44 | 516.00 | 157.44 | 68.22 |
| J-16 | | 120.75(1.50) | 673.43 | 333.00 | 340.43 | 147.52 |
| J-20 | | 120.75(1.50) | 679.97 | 322.00 | 357.97 | 155.12 |
| J-22 | | 120.75(1.50) | 669.97 | 466.00 | 203.97 | 88.39 |
| J-24 | | 120.75(1.50) | 669.98 | 550.00 | 119.98 | 51.99 |
| J-28 | | 216.30(1.50) | 665.44 | 497.00 | 168.44 | 72.99 |
| J-29 | | 216.30(1.50) | 664.81 | 491.00 | 173.81 | 75.32 |
| J-32 | | 213.30(1.50) | 667.42 | 516.00 | 151.42 | 65.61 |
| J-36 | | 216.30(1.50) | 664.36 | 485.00 | 179.36 | 77.72 |
| J-40 | | 216.30(1.50) | 664.39 | 485.00 | 179.39 | 77.74 |
| J-41 | | 216.30(1.50) | 663.60 | 489.00 | 174.60 | 75.66 |
| J-42 | | 216.30(1.50) | 662.71 | 496.00 | 166.71 | 72.24 |
| J-44 | | 216.30(1.50) | 661.89 | 475.00 | 186.89 | 80.99 |
| J-48 | | 3000.00( ** ) | 648.25 | 485.00 | 163.25 | 70.74 |
| J-52 | | 147.00 | 662.29 | 498.00 | 164.29 | 71.19 |
| J-202 | | 0.00 | 679.97 | 275.00 | 404.97 | 175.49 |
| O-Pump-Ota | | 0.00 | 673.43 | | | |

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 |
|---|---|---|---|
| J-1 | 216.40 | J-24 | 51.99 |
| J-202 | 175.49 | J-8 | 60.45 |
| J-20 | 155.12 | J-32 | 65.61 |

V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-8 | 4.53 | P-7 | 0.05 |
| P-75 | 3.98 | P-27 | 0.09 |
| P-81 | 3.88 | P-47 | 0.09 |

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 |
|---|---|---|
| Ocean View | 4208.14 | |
| Princess Pa | 1848.56 | |

NET SYSTEM INFLOW = 6056.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 6056.70

==========

**Case: 7**

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 = 7 )

Maximum Day Demand plus 3,000 gpm Multi Family Fire Flow at Node 48
Source Only from Princess Park Pump Station

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

Pipe P-101 is OPENED
Pipe P-11 is CLOSED

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.38570E-05

**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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 120.75 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 |
| P-2 | J-202 | J-1 | 1737.32 | 5.64 | 0.00 | 2.77 | 2.02 | 2.02 |
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 1737.32 | 10.08 | 0.00 | 2.77 | 2.02 | 2.02 |
| P-6 | J-5 | J-41 | 1362.71 | 0.81 | 0.00 | 2.17 | 1.29 | 1.29 |
| P-7 | J-202 | J-20 | 4198.63 | 1.26 | 0.00 | 1.91 | 0.48 | 0.48 |
| P-8 | J-48 | J-44 | -1596.72 | 13.64 | 0.00 | 4.53 | 7.00 | 7.00 |
| P-11-XX | J-4 | J-8 | | | | | | |
| P-15 | J-8 | J-10 | 362.25 | 0.04 | 0.00 | 0.26 | 0.02 | 0.02 |
| P-19 | J-12 | J-10 | -185.77 | 0.01 | 0.00 | 0.13 | 0.00 | 0.00 |
| P-23 | J-10 | J-12 | 55.73 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-27 | J-16 | J-12 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | -120.75 | 0.09 | 0.00 | 0.34 | 0.06 | 0.06 |
| P-35 | J-8 | J-24 | -120.75 | 0.09 | 0.00 | 0.34 | 0.06 | 0.06 |
| P-39 | J-8 | J-24 | -120.75 | 0.09 | 0.00 | 0.34 | 0.06 | 0.06 |
| P-43 | J-8 | J-24 | -120.75 | 0.09 | 0.00 | 0.34 | 0.06 | 0.06 |
| P-47 | J-22 | J-24 | 3957.13 | 5.46 | 0.00 | 2.81 | 1.28 | 1.28 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 1676.69 | 2.55 | 0.00 | 2.68 | 1.89 | 1.89 |
| P-55 | J-24 | J-32 | 1676.69 | 2.55 | 0.00 | 2.68 | 1.89 | 1.89 |
| P-62 | J-28 | J-29 | 1115.61 | 0.62 | 0.00 | 1.78 | 0.89 | 0.89 |
| P-63 | J-32 | J-28 | 1331.91 | 1.97 | 0.00 | 2.13 | 1.23 | 1.23 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P-65 | J-40 | J-5 | -158.31 | 0.02 | 0.00 | 0.25 | 0.02 | 0.02 |
| P-66 | J-29 | J-40 | 899.31 | 0.42 | 0.00 | 1.43 | 0.60 | 0.60 |
| P-67 | J-41 | J-42 | 1146.41 | 0.89 | 0.00 | 1.83 | 0.93 | 0.93 |
| P-69 | J-42 | J-44 | 930.11 | 0.82 | 0.00 | 1.48 | 0.63 | 0.63 |
| P-75 | J-52 | J-48 | 1403.28 | 14.05 | 0.00 | 3.98 | 5.51 | 5.51 |
| P-79 | J-44 | J-52 | -882.91 | 0.40 | 0.00 | 1.41 | 0.58 | 0.58 |
| P-81 | J-52 | J-36 | -2433.19 | 2.07 | 0.00 | 3.88 | 3.76 | 3.76 |
| P-85 | J-40 | J-36 | 841.31 | 0.03 | 0.00 | 0.60 | 0.07 | 0.07 |
| P-89 | J-32 | J-36 | 1808.17 | 3.04 | 0.00 | 2.89 | 2.17 | 2.17 |
| P-101 | J-20 | J-22 | 4077.88 | 3.46 | 0.00 | 2.89 | 1.36 | 1.36 |
| P-201 | Princess P | J-202 | 5935.95 | 0.28 | 0.00 | 2.69 | 0.92 | 0.92 |

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 | EFFIC-ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 669.40 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 7.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 669.39 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 7.0000 |

**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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 669.40 | | | |
| Princess P | | ---- | 680.00 | | | |
| J-1 | | 0.00 | 674.08 | 175.00 | 499.08 | 216.27 |
| J-4 | | 120.75(1.50) | 680.00 | 521.00 | 159.00 | 68.90 |
| J-5 | | 216.30(1.50) | 664.01 | 490.00 | 174.01 | 75.40 |
| J-8 | | 120.75(1.50) | 669.46 | 534.00 | 135.46 | 58.70 |
| J-10 | | 120.75(1.50) | 669.42 | 517.00 | 152.42 | 66.05 |
| J-12 | | 120.75(1.50) | 669.40 | 516.00 | 153.40 | 66.48 |
| J-16 | | 120.75(1.50) | 669.39 | 333.00 | 336.39 | 145.77 |
| J-20 | | 120.75(1.50) | 678.47 | 322.00 | 356.47 | 154.47 |
| J-22 | | 120.75(1.50) | 675.00 | 466.00 | 209.00 | 90.57 |
| J-24 | | 120.75(1.50) | 669.54 | 550.00 | 119.54 | 51.80 |
| J-28 | | 216.30(1.50) | 665.02 | 497.00 | 168.02 | 72.81 |
| J-29 | | 216.30(1.50) | 664.40 | 491.00 | 173.40 | 75.14 |
| J-32 | | 213.30(1.50) | 667.00 | 516.00 | 151.00 | 65.43 |
| J-36 | | 216.30(1.50) | 663.96 | 485.00 | 178.96 | 77.55 |
| J-40 | | 216.30(1.50) | 663.99 | 485.00 | 178.99 | 77.56 |
| J-41 | | 216.30(1.50) | 663.20 | 489.00 | 174.20 | 75.49 |
| J-42 | | 216.30(1.50) | 662.31 | 496.00 | 166.31 | 72.07 |
| J-44 | | 216.30(1.50) | 661.49 | 475.00 | 186.49 | 80.81 |
| J-48 | | 3000.00( ** ) | 647.84 | 485.00 | 162.84 | 70.57 |
| J-52 | | 147.00 | 661.89 | 498.00 | 163.89 | 71.02 |
| J-202 | | 0.00 | 679.72 | 275.00 | 404.72 | 175.38 |
| O-Pump-Ota | | 0.00 | 669.39 | | | |

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 |
|---|---|---|---|
| J-1 | 216.27 | J-24 | 51.80 |
| J-202 | 175.38 | J-8 | 58.70 |
| J-20 | 154.47 | J-32 | 65.43 |

V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-8 | 4.53 | P-1 | 0.05 |
| P-75 | 3.98 | P-27 | 0.09 |
| P-81 | 3.88 | P-23 | 0.09 |

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 |
|---|---|---|
| Ocean View | 120.75 | |
| Princess Pa | 5935.95 | |

NET SYSTEM INFLOW = 6056.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 6056.70

==========

**Case: 8**

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 = 8 )

**Maximum Day Demand plus 4,000 gpm Commercial Fire Flow**
**Pipe 67 Closed**

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

Pipe P-11 is OPENED
Pipe P-67 is CLOSED

RESULTS OBTAINED AFTER 6 TRIALS: ACCURACY = 0.31338E-06

## 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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 2793.82 | 0.68 | 0.00 | 1.27 | 0.23 | 0.23 |
| P-2 | J-202 | J-1 | 1585.17 | 4.76 | 0.00 | 2.53 | 1.70 | 1.70 |
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 1585.17 | 8.50 | 0.00 | 2.53 | 1.70 | 1.70 |
| P-6 | J-5 | J-41 | 216.30 | 0.03 | 0.00 | 0.35 | 0.04 | 0.04 |
| P-7 | J-202 | J-20 | 2677.71 | 0.55 | 0.00 | 1.22 | 0.21 | 0.21 |
| P-8 | J-48 | J-44 | 507.06 | 1.63 | 0.00 | 1.44 | 0.84 | 0.84 |
| P-11 | J-4 | J-8 | 2673.07 | 2.30 | 0.00 | 1.90 | 0.62 | 0.62 |
| P-15 | J-8 | J-10 | 362.25 | 0.04 | 0.00 | 0.26 | 0.02 | 0.02 |
| P-19 | J-12 | J-10 | -185.77 | 0.01 | 0.00 | 0.13 | 0.00 | 0.00 |
| P-23 | J-10 | J-12 | 55.73 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-27 | J-16 | J-12 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | 547.52 | 1.40 | 0.00 | 1.55 | 0.96 | 0.96 |
| P-35 | J-8 | J-24 | 547.52 | 1.40 | 0.00 | 1.55 | 0.96 | 0.96 |
| P-39 | J-8 | J-24 | 547.52 | 1.40 | 0.00 | 1.55 | 0.96 | 0.96 |
| P-43 | J-8 | J-24 | 547.52 | 1.40 | 0.00 | 1.55 | 0.96 | 0.96 |
| P-47 | J-22 | J-24 | 2436.21 | 2.22 | 0.00 | 1.73 | 0.52 | 0.52 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 2252.76 | 4.40 | 0.00 | 3.59 | 3.26 | 3.26 |
| P-55 | J-24 | J-32 | 2252.76 | 4.40 | 0.00 | 3.59 | 3.26 | 3.26 |
| P-62 | J-28 | J-29 | 1562.35 | 1.16 | 0.00 | 2.49 | 1.66 | 1.66 |
| P-63 | J-32 | J-28 | 1778.65 | 3.37 | 0.00 | 2.84 | 2.10 | 2.10 |
| P-65 | J-40 | J-5 | -1152.57 | 0.77 | 0.00 | 1.84 | 0.94 | 0.94 |
| P-66 | J-29 | J-40 | 1346.05 | 0.88 | 0.00 | 2.15 | 1.26 | 1.26 |
| P-67-XX | J-41 | J-42 | | | | | | |
| P-69 | J-42 | J-44 | -4000.00 | 12.27 | 0.00 | 6.38 | 9.44 | 9.44 |
| P-75 | J-52 | J-48 | 723.36 | 4.12 | 0.00 | 2.05 | 1.61 | 1.61 |
| P-79 | J-44 | J-52 | -3709.24 | 5.75 | 0.00 | 5.92 | 8.21 | 8.21 |
| P-81 | J-52 | J-36 | -4579.60 | 6.67 | 0.00 | 7.31 | 12.13 | 12.13 |
| P-85 | J-40 | J-36 | 2282.32 | 0.19 | 0.00 | 1.62 | 0.46 | 0.46 |
| P-89 | J-32 | J-36 | 2513.58 | 5.59 | 0.00 | 4.01 | 3.99 | 3.99 |
| P-101 | J-20 | J-22 | 2556.96 | 1.46 | 0.00 | 1.81 | 0.57 | 0.57 |
| P-201 | Princess P | J-202 | 4262.88 | 0.15 | 0.00 | 1.93 | 0.50 | 0.50 |

## 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 | EFFIC-ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 676.97 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 8.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 676.96 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 8.0000 |

## 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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 676.97 | | | |
| Princess P | | ---- | 680.00 | | | |
| J-1 | | 0.00 | 675.09 | 175.00 | 500.09 | 216.71 |

| | | | | | |
|---|---|---|---|---|---|
| J-4 | 120.75(1.50) | 679.32 | 521.00 | 158.32 | 68.60 |
| J-5 | 216.30(1.50) | 666.59 | 490.00 | 176.59 | 76.52 |
| J-8 | 120.75(1.50) | 677.02 | 534.00 | 143.02 | 61.97 |
| J-10 | 120.75(1.50) | 676.98 | 517.00 | 159.98 | 69.32 |
| J-12 | 120.75(1.50) | 676.97 | 516.00 | 160.97 | 69.75 |
| J-16 | 120.75(1.50) | 676.96 | 333.00 | 343.96 | 149.05 |
| J-20 | 120.75(1.50) | 679.30 | 322.00 | 357.30 | 154.83 |
| J-22 | 120.75(1.50) | 677.84 | 466.00 | 211.84 | 91.80 |
| J-24 | 120.75(1.50) | 675.62 | 550.00 | 125.62 | 54.44 |
| J-28 | 216.30(1.50) | 667.85 | 497.00 | 170.85 | 74.04 |
| J-29 | 216.30(1.50) | 666.69 | 491.00 | 175.69 | 76.13 |
| J-32 | 213.30(1.50) | 671.22 | 516.00 | 155.22 | 67.26 |
| J-36 | 216.30(1.50) | 665.63 | 485.00 | 180.63 | 78.27 |
| J-40 | 216.30(1.50) | 665.81 | 485.00 | 180.81 | 78.35 |
| J-41 | 216.30(1.50) | 666.56 | 489.00 | 177.56 | 76.94 |
| J-42 | 4000.00( ** ) | 640.93 | 496.00 | 144.93 | 62.80 |
| J-44 | 216.30(1.50) | 653.21 | 475.00 | 178.21 | 77.22 |
| J-48 | 216.30(1.50) | 654.84 | 485.00 | 169.84 | 73.60 |
| J-52 | 147.00 | 658.96 | 498.00 | 160.96 | 69.75 |
| J-202 | 0.00 | 679.85 | 275.00 | 404.85 | 175.44 |
| O-Pump-Ota | 0.00 | 676.96 | | | |

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 |
|---|---|---|---|
| J-1 | 216.71 | J-24 | 54.44 |
| J-202 | 175.44 | J-8 | 61.97 |
| J-20 | 154.83 | J-42 | 62.80 |

V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-81 | 7.31 | P-27 | 0.09 |
| P-69 | 6.38 | P-23 | 0.09 |
| P-79 | 5.92 | P-19 | 0.13 |

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 |
|---|---|---|
| Ocean View | 2793.82 | |
| Princess Pa | 4262.88 | |

NET SYSTEM INFLOW = 7056.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 7056.70

==========

**Case: 9**

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 = 9 )

**Maximum Day Demand plus 4,000 gpm Commercial Fire Flow**
**Pipe 69 Closed**

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

Pipe P-67 is OPENED
Pipe P-69 is CLOSED

RESULTS OBTAINED AFTER 3 TRIALS: ACCURACY = 0.24677E-04

**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 |
|---|---|---|---|---|---|---|---|---|
| P-1 | Ocean View | J-4 | 2694.02 | 0.64 | 0.00 | 1.22 | 0.21 | 0.21 |
| P-2 | J-202 | J-1 | 1790.22 | 5.96 | 0.00 | 2.86 | 2.13 | 2.13 |
| P-3 | O-Pump-Ota | J-16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-4 | J-1 | J-5 | 1790.22 | 10.65 | 0.00 | 2.86 | 2.13 | 2.13 |
| P-6 | J-5 | J-41 | 4216.30 | 6.56 | 0.00 | 6.73 | 10.41 | 10.41 |
| P-7 | J-202 | J-20 | 2572.45 | 0.51 | 0.00 | 1.17 | 0.20 | 0.20 |
| P-8 | J-48 | J-44 | -99.67 | 0.08 | 0.00 | 0.28 | 0.04 | 0.04 |
| P-11 | J-4 | J-8 | 2573.27 | 2.14 | 0.00 | 1.82 | 0.58 | 0.58 |
| P-15 | J-8 | J-10 | 362.25 | 0.04 | 0.00 | 0.26 | 0.02 | 0.02 |
| P-19 | J-12 | J-10 | -185.77 | 0.01 | 0.00 | 0.13 | 0.00 | 0.00 |
| P-23 | J-10 | J-12 | 55.73 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-27 | J-16 | J-12 | -120.75 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 |
| P-31 | J-8 | J-24 | 522.57 | 1.28 | 0.00 | 1.48 | 0.88 | 0.88 |
| P-35 | J-8 | J-24 | 522.57 | 1.28 | 0.00 | 1.48 | 0.88 | 0.88 |
| P-39 | J-8 | J-24 | 522.57 | 1.28 | 0.00 | 1.48 | 0.88 | 0.88 |
| P-43 | J-8 | J-24 | 522.57 | 1.28 | 0.00 | 1.48 | 0.88 | 0.88 |
| P-47 | J-22 | J-24 | 2330.95 | 2.05 | 0.00 | 1.65 | 0.48 | 0.48 |
| P-50 | OWD Interc | J-12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P-51 | J-24 | J-32 | 2150.24 | 4.04 | 0.00 | 3.43 | 2.99 | 2.99 |
| P-55 | J-24 | J-32 | 2150.24 | 4.04 | 0.00 | 3.43 | 2.99 | 2.99 |
| P-62 | J-28 | J-29 | 1507.92 | 1.09 | 0.00 | 2.41 | 1.55 | 1.55 |
| P-63 | J-32 | J-28 | 1724.22 | 3.18 | 0.00 | 2.75 | 1.99 | 1.99 |
| P-65 | J-40 | J-5 | 2642.38 | 3.59 | 0.00 | 4.22 | 4.38 | 4.38 |
| P-66 | J-29 | J-40 | 1291.62 | 0.81 | 0.00 | 2.06 | 1.16 | 1.16 |
| P-67 | J-41 | J-42 | 4000.00 | 8.97 | 0.00 | 6.38 | 9.44 | 9.44 |
| P-69-XX | J-42 | J-44 | | | | | | |
| P-75 | J-52 | J-48 | 116.63 | 0.14 | 0.00 | 0.33 | 0.05 | 0.05 |
| P-79 | J-44 | J-52 | -315.97 | 0.06 | 0.00 | 0.50 | 0.09 | 0.09 |
| P-81 | J-52 | J-36 | -579.60 | 0.15 | 0.00 | 0.92 | 0.26 | 0.26 |
| P-85 | J-40 | J-36 | -1567.06 | 0.09 | 0.00 | 1.11 | 0.23 | 0.23 |
| P-89 | J-32 | J-36 | 2362.96 | 4.99 | 0.00 | 3.77 | 3.56 | 3.56 |
| P-101 | J-20 | J-22 | 2451.70 | 1.35 | 0.00 | 1.74 | 0.53 | 0.53 |
| P-201 | Princess P | J-202 | 4362.68 | 0.16 | 0.00 | 1.98 | 0.52 | 0.52 |

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 | EFFIC-ENCY % | USEFUL POWER Hp | INCREMTL COST $ | TOTAL COST $ | #PUMPS PARALLEL | #PUMPS SERIES | NPSH Avail. ft | Case |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Device "OWD Interconnec" is closed | | | | | | | | | | | | |
| OWD Interc | 0.00 | 0.00 | 677.17 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 9.0000 |
| Device "Pump-Otay M" is closed | | | | | | | | | | | | |
| Pump-Otay | 0.00 | 0.00 | 677.16 | 0.0 | 75.00 | 0. | 0.0 | 0.0 | ** | ** | 33.2 | 9.0000 |

**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 |
|---|---|---|---|---|---|---|
| Ocean View | | ---- | 680.00 | | | |
| OWD Interc | | 0.00 | 677.17 | | | |
| Princess P | | ---- | 680.00 | | | |
| J-1 | | 0.00 | 673.88 | 175.00 | 498.88 | 216.18 |
| J-4 | | 120.75(1.50) | 679.36 | 521.00 | 158.36 | 68.62 |
| J-5 | | 216.30(1.50) | 663.23 | 490.00 | 173.23 | 75.07 |
| J-8 | | 120.75(1.50) | 677.22 | 534.00 | 143.22 | 62.06 |
| J-10 | | 120.75(1.50) | 677.18 | 517.00 | 160.18 | 69.41 |
| J-12 | | 120.75(1.50) | 677.17 | 516.00 | 161.17 | 69.84 |
| J-16 | | 120.75(1.50) | 677.16 | 333.00 | 344.16 | 149.13 |
| J-20 | | 120.75(1.50) | 679.34 | 322.00 | 357.34 | 154.85 |
| J-22 | | 120.75(1.50) | 677.99 | 466.00 | 211.99 | 91.86 |
| J-24 | | 120.75(1.50) | 675.94 | 550.00 | 125.94 | 54.57 |
| J-28 | | 216.30(1.50) | 668.72 | 497.00 | 171.72 | 74.41 |
| J-29 | | 216.30(1.50) | 667.64 | 491.00 | 176.64 | 76.54 |
| J-32 | | 213.30(1.50) | 671.90 | 516.00 | 155.90 | 67.56 |
| J-36 | | 216.30(1.50) | 666.91 | 485.00 | 181.91 | 78.83 |
| J-40 | | 216.30(1.50) | 666.82 | 485.00 | 181.82 | 78.79 |
| J-41 | | 216.30(1.50) | 656.67 | 489.00 | 167.67 | 72.66 |
| J-42 | | 4000.00( ** ) | 647.70 | 496.00 | 151.70 | 65.74 |
| J-44 | | 216.30(1.50) | 666.71 | 475.00 | 191.71 | 83.07 |
| J-48 | | 216.30(1.50) | 666.63 | 485.00 | 181.63 | 78.71 |
| J-52 | | 147.00 | 666.77 | 498.00 | 168.77 | 73.13 |
| J-202 | | 0.00 | 679.84 | 275.00 | 404.84 | 175.43 |
| O-Pump-Ota | | 0.00 | 677.16 | | | |

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 |
|---|---|---|---|
| J-1 | 216.18 | J-24 | 54.57 |
| J-202 | 175.43 | J-8 | 62.06 |
| J-20 | 154.85 | J-42 | 65.74 |

V E L O C I T I E S

| PIPE NUMBER | MAXIMUM VELOCITY (ft/s) | PIPE NUMBER | MINIMUM VELOCITY (ft/s) |
|---|---|---|---|
| P-6 | 6.73 | P-27 | 0.09 |
| P-67 | 6.38 | P-23 | 0.09 |
| P-65 | 4.22 | P-19 | 0.13 |

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 |
|---|---|---|
| Ocean View | 2694.02 | |
| Princess Pa | 4362.68 | |

NET SYSTEM INFLOW = 7056.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 7056.70

==========

***** HYDRAULIC ANALYSIS COMPLETED *****

# APPENDIX E

## RESPONSES TO CITY COMMENTS

***(No outstanding comments at time of study)***

OTAY MESA
PUMP STATION
(TO BE REPLACED
BY FUTURE CITY CIP)

OCEAN VIEW HILLS PKWY

OCEAN VIEW
HILLS PUMP
STATION

PRINCESS PARK
PUMP STATION

OTAY MESA RD

BEYER BLVD

PROPOSED BEYER BLVD

CENTRAL AVE

WEST AVE

CALIENTE AVE

PROPOSED CALIENTE AVE

OTAY VALLEY RD.

HERITAGE RD.

AIRPORT RD

OTAY MESA RD.

AIRWAY RD.

CACTUS RD.

BROWN FIELD
AIRPORT

OTAY WATER DISTRICT
EMERGENCY INTERCONNECT
(NORMALLY CLOSED)

N

0 600 FEET

## LEGEND

- PROJECT BOUNDARY
- EXISTING PUBLIC WATER
- PROPOSED PUBLIC WATER
- (12) COMPUTER MODEL NODE NUMBER
- [5] COMPUTER MODEL PIPE NUMBER


DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
2234 FARADAY AVENUE
CARLSBAD, CA 92008
(760) 438-4422


# EXHIBIT A

## NODE AND PIPE DIAGRAM

SOUTHWEST VILLAGE SPECIFIC PLAN