Drainage Reports

Abbreveated Water & Sewer Need Reports

Water Study

Wastewater Study

Stormwater Waiver Application

Accepted For:
City of Scottsdale
Water Resources Department
9379 E. San Salvador
Scottsdale, Arizona

By: REZAUR RAHMAN
Date: 09/18/2017

17-DR-2017
09/01/17

WOOD/PATEL

WATER MASTER PLAN /
BASIS OF DESIGN REPORT
FOR
DESERT MOUNTAIN PARCEL 19

July 27, 2017
WP# 164434

Accepted For:
City of Scottsdale
Water Resources Department
9379 E. San Salvador
Scottsdale, Arizona

By: REZAUR RAHMAN
Date: 09/18/2017

Prepared for:

DM 19, LLC
4222 East Camelback Road
Suite H100
Phoenix, Arizona
Phone: (602)386-1317

Submitted To:

City of Scottsdale
Water Resources Department
9388 East San Salvador Drive
Scottsdale, Arizona 85258
Phone: (480) 312-5636

Prepared By:

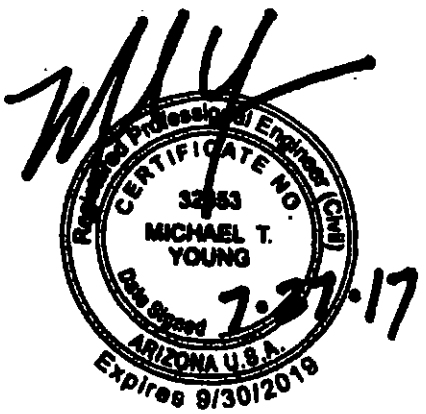
Wood, Patel & Associates, Inc.
2051 West Northern Avenue
Suite 100
Phoenix, Arizona 85021
Phone: (602) 335-8500

TABLE OF CONTENTS

TABLES

APPENDICES

EXHIBITS



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1.0 INTRODUCTION

1.1 General Background and Project Location

Desert Mountain Parcel 19 (Site) is an approximate 91-acre proposed residential/golf course development in the City of Scottsdale, located between Cave Creek Road and existing church development on the south, Pima Road on the west, and the existing fire station and booster pump site and Desert Mountain development to the east and north. Refer to Exhibit 1 – *Vicinity Map*. The property is located within Section 31, Township 6 North, Range 5 East, of the Gila and Salt River Meridian.

The Site is planned to include an 18-hole, short-game golf course, clubhouse, and residential housing. The Site lies within the City's Zone 12B Water Zone. This Water Master Plan / Basis of Design Report (Water Master Plan/BOD) utilizes a site plan prepared concurrently by Greey | Pickett, dated June 10, 2016.

This Water Master Plan/BOD Report has been prepared in accordance with Wood, Patel & Associates, Inc.'s (Wood/Patel) understanding of the City of Scottsdale's technical requirements for water distribution systems, as applicable for the Site.

1.2 Scope of Water Master Plan / Basis of Design Report

The purpose of this Water Master Plan/BOD Report is to determine water design flows, pipe sizes, and waterline locations, as required to provide water service to the proposed development. The required infrastructure identified includes water distribution system mains and connection points. A separate well purchase agreement and escrow instructions between DM19, LLC and City of Scottsdale is being prepared. Hydrology and hydraulics for the well system is not covered in this report.

1.3 Full Build-Out Condition

The design criteria utilized to determine water demands and pipe sizes for the Site are based on projected full build-out conditions. The previous zoning for the Site consisted of I-1 ESL, C-0 ESL, C-2 ESL, R1-7 ESL, and R1-35. The Site has since been rezoned to Residential R-4 and OS ESL. Additionally, it is our understanding the golf course will be irrigated by the existing Irrigation Water Distribution System (IWDS) non-potable waterlines per the latest *IWDS Pipeline Capacity Agreement for Desert Mountain Club, Inc.* by and between the City of Scottsdale and Desert Mountain Club, Inc.

2.0 DESIGN DOCUMENTATION

2.1 Design Criteria

For the purpose of this Water Master Plan/BOD Report, water demand design flows and pipe-sizing criteria utilized are based on Wood/Patel's understanding of the applicable water system design criteria listed in the *City of Scottsdale Design Standards & Policies Manual*, dated January 2010. Refer to Table 1 – *Water Distribution System Design Criteria* for detailed information regarding design criteria.

2.2 Water Demand Design Flows

Water demand design flows for Desert Mountain Parcel 19 were calculated using design criteria listed in Section 2.1 – *Design Criteria* and are summarized below. For detailed calculations, refer to Table 2 – *Offsite Water Demands - Existing Condition*, Table 3 – *Offsite Water Demands - Full Build-Out Condition*, and Table 4 – *Onsite Water Demands - Full Build-Out Condition*.

EXISTING OFFSITE WATER DEMANDS (ZONE 12)			
Type	**Average Daily Demand (gpm)**	**Maximum Daily Demand (gpm)**	**Peak Hour Demand (gpm)**
Existing Single-Family Residential	44.2	88.4	155.1
TOTAL	**44.2**	**88.4**	**155.1**

FULL BUILD-OUT OFFSITE WATER DEMANDS (ZONE 12)			
Type	**Average Daily Demand (gpm)**	**Maximum Daily Demand (gpm)**	**Peak Hour Demand (gpm)**
Single-Family Residential	76.3	152.6	267.4
Fire Station	0.5	1.0	1.8
TOTAL	**76.8**	**153.6**	**269.2**

FULL BUILD-OUT DESERT MOUNTAIN PARCEL 19 WATER DEMANDS (ZONE 12)			
Type	**Average Daily Demand (gpm)**	**Maximum Daily Demand (gpm)**	**Peak Hour Demand (gpm)**
Single-Family Residential	32.6	65.2	114.3
Clubhouse	17.4	34.8	60.9
TOTAL	**50.0**	**100.0**	**175.2**

FULL BUILD-OUT DESERT MOUNTAIN PARCEL 19 AND OFFSITE WATER DEMANDS (ZONE 12)			
Type	**Average Daily Demand (gpm)**	**Maximum Daily Demand (gpm)**	**Peak Hour Demand (gpm)**
Offsite	76.8	153.6	269.2
Desert Mountain Parcel 19	50.0	100	175.2
TOTAL	**126.8**	**253.6**	**444.4**

3.0 EXISTING CONDITIONS

3.1 Topographic Conditions

The proposed project lies in the Desert Mountain planning region of the City of Scottsdale. The Site generally slopes from east to west, at approximately 3 percent. Elevations range from 2,645 feet above mean sea level (MSL) in the east, to 2,585 feet MSL in the west. The Site is covered with typical Sonoran Desert vegetation including mesquite trees, saguaro cactus, creosote, etc. In addition, existing dirt roads to access the existing onsite wells and booster pump station are located throughout the Site.

3.2 Existing Offsite Water Storage

According to the *2015 Master Water plan Update,* water is provided to the Site by Well Site #86, which is located southeasterly of the Site. Additionally, the well site has a 0.5-million gallon (MG) storage tank. Booster Pump Station #92B conveys water from Well Site #86 and Booster Pump Station #102 to Storage Facility T-90 and Zone 12. Storage facility locations are summarized below.

- Storage Facility located at Booster Pump Station #92B, with a storage capacity of 0.5 MG.
- Storage Facility T-90 located Zone 12, with a storage capacity of 0.8 MG.

3.3 Existing Pressure Zone Sources and Hydraulic Grade Lines

The Site elevations fall within City of Scottsdale Water Pressure Zone 12B, which has ground elevations ranging from 2,570 feet to 2,700 feet. Booster Pump Station #92B, elevation equal to ~~2,645~~ 2,657 feet, supplies water to Tank 90 at an elevation of 3,116 feet. The hydraulic grade line (HGL) for pressure zones served directly by Tank 90 is approximately 3,116 feet. Since the HGL needed to serve Zone 12B is much lower than the HGL from Tank 90, several pressure reducing valves (PRVs) exist throughout Desert Mountain in order to provide pressures within the approved 50-120 psi. In order to serve Desert Mountain Parcel 19, two PRVs are necessary at each of the connection points. This is further described in Section 4.0.

3.4 Existing Offsite Water Infrastructure

Relevant existing water infrastructure adjacent to the Site includes the following:

Zone 11:

- 16-inch waterline along Cave Creek Road, from Pima Road to the existing Booster Pump Station (BPS) access road.
- 24-inch waterline along Cave Creek Road, from Pima Road to the existing BPS access road, and along the access road to the BPS.
- 12-inch waterline along the BPS access road, from Cave Creek Road to the 24-inch waterline extending to the BPS.

Zone 12 and Higher Zones:

- 8-inch waterline along Covey Trail
- 6-inch waterline along Happy Hollow Drive/Andora Hills Drive, between Bajada Drive and 93rd Street
- Two (2) 16-inch waterlines along Cave Creek Road, from Desert Mountain Parkway to the existing BPS access road. One (1) 16-inch waterline connects to a 12-inch waterline extending to a 24-inch waterline connected to the BPS. The second 16-inch waterline extends along the access road to the 24-inch waterline, which connects to the BPS.
- 12-inch waterline stub southeast of Happy Hollow Drive within Desert Mountain Phase 1 Unit 1. (Existing valve near Happy Hollow Drive exists, but unable to currently identify that waterline stub exists)

3.5 Existing Onsite Water Infrastructure

The Site currently has five (5) City of Scottsdale groundwater wells on site. Refer to Exhibit 2 – *Existing Groundwater Well Locations*. According to the *2015 Water Master Plan Update*, City of Scottsdale Well #85 is not currently in use due to high levels of arsenic. City of Scottsdale Wells 152, 153, 155, and 156 were drilled as part of the recharge and recovery project by Desert Mountain. Currently, Well #152 is a recovery-only well, with the capacity to recover approximately 700 gallons per minute (gpm).

Well #153 has a wall around the well site and installed electrical; however, this well is not operating, as it is not fully equipped. Well #155 has the capacity to recover 800 gpm and recharge 60 gpm. Well #156 has the capacity to recover 875 gpm and recharge 160 gpm.

It is Wood/Patel's understanding an existing 16-inch waterline from the BPS extends to Well Sites 155 and 156. Additionally, this 16-inch waterline connects to an existing 12-inch waterline that connects Well Sites 155 to 152. Furthermore, the existing onsite 16-inch waterline connects to the IWDS Pump Station #150 located near the southeastern corner of the Site. Additionally, seven (7) onsite vadose wells, which have the capacity to recharge approximately 500 gpm, are connected to the non-potable waterlines along the access road.

Additional waterline stubs and non-potable waterlines exist near the southeast corner of the Site, and along the access road to the well sites. As final design and construction documents are completed, an analysis will be completed to determine which waterlines can be utilized within final design. Additionally, utility location services will be utilized to accurately locate existing waterlines within the Site.

The following notes were provided by Maurice Tatlow (dated 7/6/2016):

> "*There are only (4) groundwater wells on Parcel 19. Well 156 is not located on the parcel. The recovery rates listed are approximate since the wells have never been operated for extended periods of time before they were equipped.*
>
> *There are also two (2) drain wells located on Parcel 19. They are located between vadose wells VZ-3 and VZ-4 (drain well 1) and VZ-6 and VZ-7 (Drain Well 2).* (See Exhibit 2).
>
> *City of Scottsdale Well #85 is used as a groundwater quality sampling well for the City's recharge permit.*
>
> *A separate well relocation delivery and capacity agreement will impact this property.*"

4.0 HYDRAULIC MODEL

4.1 Methodology and Existing-Condition Model Calibration

WaterCAD Version 8.0, a potable water transmission and distribution system numerical modeling program by Haestad Methods, was utilized to analyze the proposed potable water system. The Site lies within the Zone 12 pressure zone in the City of Scottsdale water system.

The water system serving Zone 12 from Tank 90 has a static HGL of approximately 3,116 feet. Several PRVs exist within Desert Mountain. The locations of these PRVs are shown schematically. The pressure at the Site is regulated by three existing upstream PRVs. The original settings for these PRVs, obtained from the City, are as follows:

- PRV #84: HGL = 2899 feet; Size = 8-inch
- PRV #166: HGL = 2864 feet; Size = 6-inch
- PRV #200: HGL = 2874 feet; Size = 6-inch

Two flow tests were conducted at the locations where the future waterlines are planned to connect to the existing system along Covey Trail and Happy Hollow Drive.

The existing-condition water model was calibrated to match the two flow tests. The calibration was completed by increasing the roughness within the existing waterlines, so that the Hazen Williams coefficient ranges from 110 to 130. Additionally, the hydraulic grade setting for PRV #84 was reduced to 2,844 feet. This resulted in the model being calibrated to within one foot of the measured hydraulic grade lines determined from the flow tests. For a summary of the calibration, refer to Appendix B – *Hydraulic Modeling Results - Existing Condition*.

Based on the elevations and revised pressure settings for each of the PRVs, PRV #200 acts as the lead and supplies most of the water throughout the system during the average and max day demands. During the peak-hour demand, PRVs #200 and #166 supply water to the system, with PRV #84 operating during fire flow demand scenarios. Refer to Exhibit 3 – *Master Water Exhibit - Full Build-Out* for waterline locations, and Appendix B for the hydraulic modeling results.

Water demands and peaking factors, described in *2010 City of Scottsdale Design Standards & Policies – Chapter 6*, were applied to the hydraulic model. Pipes were sized to accommodate modeled conditions of flow.

The following primary modeling scenarios were selected to demonstrate compliance with City of Scottsdale requirements and to analyze the proposed water system:

- Average Daily Demand
- Max Daily Demand
- Peak Hour Demand
- Maximum Daily Demand plus Fire Flow

The hydraulic model utilizes the Hazen-Williams equation to calculate the head losses throughout the system during the modeled scenarios. Fire flow demands were analyzed with an automatic sprinkler system that will be installed in the proposed Clubhouse. Refer to Table 1 – *Water Distribution System Design Criteria* for additional information regarding hydraulic modeling parameters and specific fire flow demands for specific buildings.

4.2 Piping Layout

Potable water service and fire protection will be provided through planned ductile iron pipe public waterlines. Proposed onsite waterlines will consist of a Zone 12 looped waterline connecting to the existing system at two (2) locations. The connections will be at the existing 8-inch waterline in Covey Trail, and the 12-inch waterline extending from Happy Hollow Drive. It is our understanding, if the 12-inch waterline stub off Happy Hollow Drive cannot be located by the City, then a proposed waterline to serve the Site will need to connect to BPS #92B with a series of pressure reducing valves.

All proposed on-site waterlines will be 8-inch in diameter and will be located within the proposed roadways with dead-end lines not exceeding the City of Scottsdale water standards. Water quality sampling stations will be provided for the Site per City of Scottsdale *Design Standards and Policies Manual, Section 6-1.418* and Standard Detail No. 2349.

Two 8-inch PRVs will be installed at each of the connections to reduce the pressure to acceptable levels onsite. The proposed PRVs shall be set at a HGL of 2,777 feet to maintain pressures between the City's acceptable values. Additionally, individual Pressure Regulators will be installed at all residences, as required by the City of Scottsdale on all private service lines. Refer to Exhibit 3 for waterline locations.

4.3 Hydraulic Modeling Results

The hydraulic-modeling results indicate that the onsite system is capable of delivering Average Day, Maximum Day, and Peak Hour demands with the following pressure ranges and head losses, as shown in the tables below.

Scenario	Full Build-Out Pressure (psi) Low	High
Average Day Demand	56.3	79.6
Max Day Demand	56.2	79.6
Peak Hour Demand	56.2	79.6
Extreme Node	J-DM-13	J-DM-5

Scenario	Full Build-Out Head Loss (ft/1000 ft)	Pipe
Average Day Demand	0.028	P-DM-14
Max Day Demand	0.136	P-DM-91
Peak Hour Demand	0.413	P-DM-91

Fire-flow results from the model indicate that available fire hydrant flows exceed the required fire flows at individual modeling nodes during Max Day Demand, while maintaining residual pressures greater than 30 psi throughout the Site at full build-out. Results from these scenarios indicate that minimum and maximum residual pressures and head losses meet the design criteria presented herein. Hydraulic-modeling results, calculations, and exhibits are provided in the attached appendices and exhibits.

5.0 CONCLUSIONS

This Desert Mountain Water Master Plan / Basis of Design Report, as presented, meets City of Scottsdale standards and requirements, and serves as a guide for construction documents associated with the planned potable-water distribution system. No critical issues were identified that would preclude the anticipated development as presented in this Master Plan report. The following highlights primary conclusions:

1. Desert Mountain Parcel 19 will be served by Pressure Zone 12B with one connection to the existing system at Covey Trail, and a second connection to the existing system extending from Happy Hollow Drive. In the event the waterline stub along Happy Hollow Drive cannot be located, the second water connection will be to BPS #92B.

2. The planned potable-water system is capable of being designed in accordance with the City of Scottsdale's current water-system design criteria.

3. The hydraulic modeling results presented indicate that fire flow requirements, flow velocities, head losses, and system pressures are within the allowable range of design criteria utilized for this Water Master Plan / Basis of Design Report.

4. The *Desert Mountain Parcel 19 Water Master Plan / Basis of Design* demonstrates the sufficiency of the proposed water distribution system to serve the proposed Site in accordance with City of Scottsdale Water Standards.

5. The required infrastructure identified includes water distribution system mains and connection points. A separate well purchase agreement and escrow instructions between DM19, LLC and City of Scottsdale is being prepared.

6. The proposed golf course will be supplied by a non-potable water system through separate agreements. No potable water will be used for the golf course irrigation.

7. The *Desert Mountain Parcel 19 Water Master Plan / Basis of Design* demonstrates compliance with the City of Scottsdale's *2015 Master Water plan Update.*

8. The water system will be phased. Phase I will serve the golf clubhouse. Phase 2 will extend to serve the entire development.

6.0 REFERENCES

1. *Design Standards & Policies Manual*, City of Scottsdale, January 2010.
2. *2015 Master Water Plan Update*, City of Scottsdale, March 2015.
3. *Bentley WaterCAD Version 8.0,* Bentley Systems Inc., December 2015.

TABLE 1

WATER DISTRIBUTION SYSTEM DESIGN CRITERIA

Project: Desert Mountain Parcel 19
Location: Scottsdale, AZ
References: 2010 City of Scottsdale Design Standards & Policies Manual
Project Number: 164334
Project Engineer: Mike Young, P.E.

UNIT DAILY RESIDENTIAL WATER DEMANDS

LAND USE	AVERAGE DAY WATER DEMANDS			NOTES
	Inside Use	Outside Use	Total Use	
<2 DU/AC	208.9	276.7	485.6	
2-2.9 DU/AC	193.7	276.7	470.4	
3-7.9 DU/AC	175.9	72.3	248.2	
8-11 DU/AC	155.3	72.3	227.6	
12-22 DU/AC	155.3	72.3	227.6	

UNIT DAILY NON-RESIDENTIAL WATER DEMANDS

LAND USE	AVERAGE DAY WATER DEMANDS		NOTES
	VALUE	UNITS	
Developed Open Space -Golf Course	4285	GPD/ACRE	Demand will be supplied with a separate non-potable system.
Clubhouse	125	GPD/Person	This demand was assumed to be 25% greater than the wastewater demand.
Fire Station	60	GPD/Employee	This demand was assumed to be 25% greater than the wastewater demand per Table 1- Unit Design Flows from the Arizona Administrative Code, Title 18, Chapter 9

HYDRAULIC MODELING CRITERIA

DESCRIPTION	VALUE	UNITS	NOTES
PEAKING FACTORS			
Maximum Day Demand (MDD)	2.00	x ADD	1
Peak Hour Demand (PHD)	3.50	x ADD	1
MODELED FIRE HYDRANT FLOW (MINIMUMS)			
Residential (Less than 3,600 Square Feet)	1,000	gpm	1, 2
Clubhouse	1,500	gpm	2,3
HYDRAULICS (ON SITE)			
Minimum Residual Pressure	50	psi	1
Maximum Residual Pressure	120	psi	1
Minimum Residual Pressure, Max Day Demand + Fire Flow	30	psi	1
Maximum Pipe Headloss (Distribution Lines)	10 ft/1000 ft	-	1
Maximum Pipe Headloss (Transmission Lines)	8 ft/1000 ft	-	1
Minimum Pipe Diameter (within City of Scottsdale's county service area)	8	in	1
Maximum Dead End Length (Pipes with 8 to 12 inch diameters)	1200	ft	1
Hazen-Williams C-value	110-130	-	4

Notes:

1. City of Scottsdale Design Standards and Policy Manual

2. 2015 International Fire Code, *Minimum Required Fire Flow and Flow Duration for Buildings*

3.The assumption is made that the clubhouse will have a building sprinkler system per the City of Scottsdale requirements. The sprinkler system allows the fire flow to be lowered to a minimum of 1,500 GPM per the *2010 City of Scottsdale Design Standards and Policies Manual and 2015 International Fire Code*. As final design is completed, the fire flow requirement for the Clubhouse may need to be reevaluated.

4. Proposed waterlines were modeled with a Hazen Williams C-value equal to 130. However, in order to calibrate the water model to the existing condtion flow tests, the Hazen Williams C-values for existing pipes range from 110 to 130.

TABLE 2

OFFSITE WATER DEMANDS – EXISTING CONDITION

WOOD/PATEL **TABLE 2 - OFFSITE WATER DEMANDS, EXISTING CONDITION**

Project: Desert Mountain Parcel 19
Location: Scottsdale, Arizona

Proj. Number: 164334
Proj. Engineer: Mike Young, P.E.

EXISTING LAND USE AND DWELLING UNIT BREAKDOWN

Land Use	No. of Dus	Residential Acres	Non-Residential Acres	Population Density (employees/day)		Commercial/ Retail S.F.	Unit Daily Water Demand (GPD/DU, GPD/Person)		Total Avg Day (GPD)
Existing Single Family Residential	131	290	-	-	-	-	485.6	GPD/DU	63,620
Onsite Totals									**63,620**

Notes: 1) For this report only a portion of the existing water demands north and east of Desert Mountain Parcel 19 were included. Calculated water demands from the existing subdivisions Desert Mountain Phase 1 Unit 1, Gambel Quail Preserve 2, and a portion of Desert Mountain Phase 1 Unit 4 were included within this report in order to calibrate the existing water model.

TABLE 3

OFFSITE WATER DEMANDS –
FULL BUILD-OUT CONDITION

WOOD/PATEL **TABLE 3 - OFFSITE WATER DEMANDS, FULL BUILD-OUT CONDITION**

Project: Desert Mountain Parcel 19
Location: Scottsdale, Arizona

Proj. Number: 164334
Proj. Engineer: Mike Young, P.E.

PRELIMINARY LAND USE AND DWELLING UNIT BREAKDOWN

Land Use	No. of Dus	Residential Acres	Non-Residential Acres	Population Density (Employees/day)		Commercial/ Retail S.F.	Unit Daily Water Demand (GPD/DU, GPD/Person)		Total Avg Day (GPD)
Single Family Residential	227	290	-	-	-	-	485.6	GPD/DU	110,240
Existing Fire Station	-	-	1	12	Employees	7,000	60.0	GPD/Person	720
Onsite Totals									**110,960**

Notes: 1) For this report only a portion of the water demands north and east of Desert Mountain Parcel 19 were included. Calculated water demands for the full buildout of the following subdivisions were included: Desert Mountain Phase 1 Unit 1, Gambel Quail Preserve 2, and a portion of Desert Mountain Phase 1 Unit 4.

WOOD/PATEL TABLE 6- WATER DEMAND DESIGN FLOWS BY JUNCTION NODE, FULL BUILD-OUT CONDITION

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: Desert Mountain Parcel 19
Location: Scottsdale, AZ
References: 2010 City of Scottsdale Design Standards & Policies Manual

Project Number: 164434
Project Engineer: Mike Young, P.E.

Desert Mountain

HYDRAULIC MODEL NODE	Water Demand Type	Zone	Units	Unit Flow (GPD/Unit)	ADD (GPD)	ADD (GPM)	MDD (GPM)	PHD (GPM)	Fire Flow (GPM)	Note
Zone 12 (Offsite Water Demands)										
J-2EX	Residential	Zone - 12	16	485.6	7770	5.4	10.8	16.9	1,000	
J-3EX	Residential	Zone - 12	8	485.6	3885	2.7	5.4	9.5	1,000	
J-4EX	Residential	Zone - 12	30	485.6	14,568	10.1	20.2	35.4	1,000	
J-5EX	Residential	Zone - 12	11	485.6	5,342	3.7	7.4	13.0	1,000	
J-6EX	Residential	Zone - 12	12	485.6	5,827	4.0	8.0	14.0	1,000	
J-7EX	Residential	Zone - 12	36	485.6	17,482	12.1	24.2	42.4	1,000	
J-9EX	Residential	Zone - 12	55	485.6	26,708	18.5	37.0	64.8	1,000	1
J-12EX	Residential	Zone - 12	12	485.6	5,827	4.0	8.0	14.0	1,000	
J-14EX	Residential	Zone - 13	8	485.6	2,914	2.0	4.0	7.0	1,000	
J-15EX	Residential	Zone - 12	19	485.6	9,226	6.4	12.8	22.4	1,000	
J-16EX	Residential	Zone - 12	5	485.6	2,428	1.7	3.4	6.0	1,000	
J-17EX	Residential	Zone - 12	3	485.6	1,457	1.0	2.0	3.5	1,000	
J-19EX	Residential	Zone - 12	14	485.6	6,798	4.7	9.4	16.5	1,000	
J-DM-13	Existing Fire Station	Zone - 12	-	-	720	0.5	1.0	1.8	1,500	
Zone 12 Offsite Water Demand Totals			227		110,952	76.8	153.6	269.2		
Zone 12 (Onsite Water Demands)										
J-DM-1	Residential	Zone - 12	13	248.2	3,227	2.2	4.4	7.7	1,000	
J-DM-2	Residential	Zone - 12	14	248.2	3,475	2.4	4.8	8.4	1,000	
J-DM-3	Residential	Zone - 12	15	248.2	3,723	2.6	5.2	9.1	1,000	
J-DM-4	Residential	Zone - 12	19	248.2	4,716	3.3	6.6	11.6	1,000	
J-DM-5	Residential	Zone - 12	20	248.2	4,964	3.4	6.8	11.9	1,000	
J-DM-6	Residential	Zone - 12	25	248.2	6,205	4.3	8.6	15.1	1,000	
J-DM-7	Residential	Zone - 12	16	248.2	3,971	2.8	5.6	9.8	1,000	
J-DM-8	Residential	Zone - 12	20	248.2	4,964	3.4	6.8	11.9	1,000	
J-DM-9	Residential	Zone - 12	20	248.2	4,964	3.4	6.8	11.9	1,000	
J-DM-10	Residential	Zone - 12	17	248.2	4,219	2.9	5.8	10.2	1,000	
J-DM-11	Residential	Zone - 12	11	248.2	2,730	1.9	3.8	6.7	1,000	
J-DM-12	Clubhouse	Zone - 12	-	-	25,000	17.4	34.8	60.9	1,500	
Zone 12 Onsite Water Demand Totals			190		72,160	50.0	100.0	175.2		
Zone 12 Offsite and Onsite Totals					183,112	126.8	253.6	444.4		

NOTES:

1) The number of dwelling units assumes that the subdivisions Desert Mountain Phase 1 Unit 1, Gambel Quail Preserve 2, and a portion of Desert Mountain Phase 1 Unit 4 are at full build-out.

TABLE 7

EXISTING WATER SYSTEM PRESSURES
(8949 E. COVEY TRAIL)

WOOD/PATEL **TABLE 7 - EXISTING WATER SYSTEM PRESSURES (8949 E Covey Trail)**

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: Desert Mountain Parcel 19 **Proj. Number:** 164334

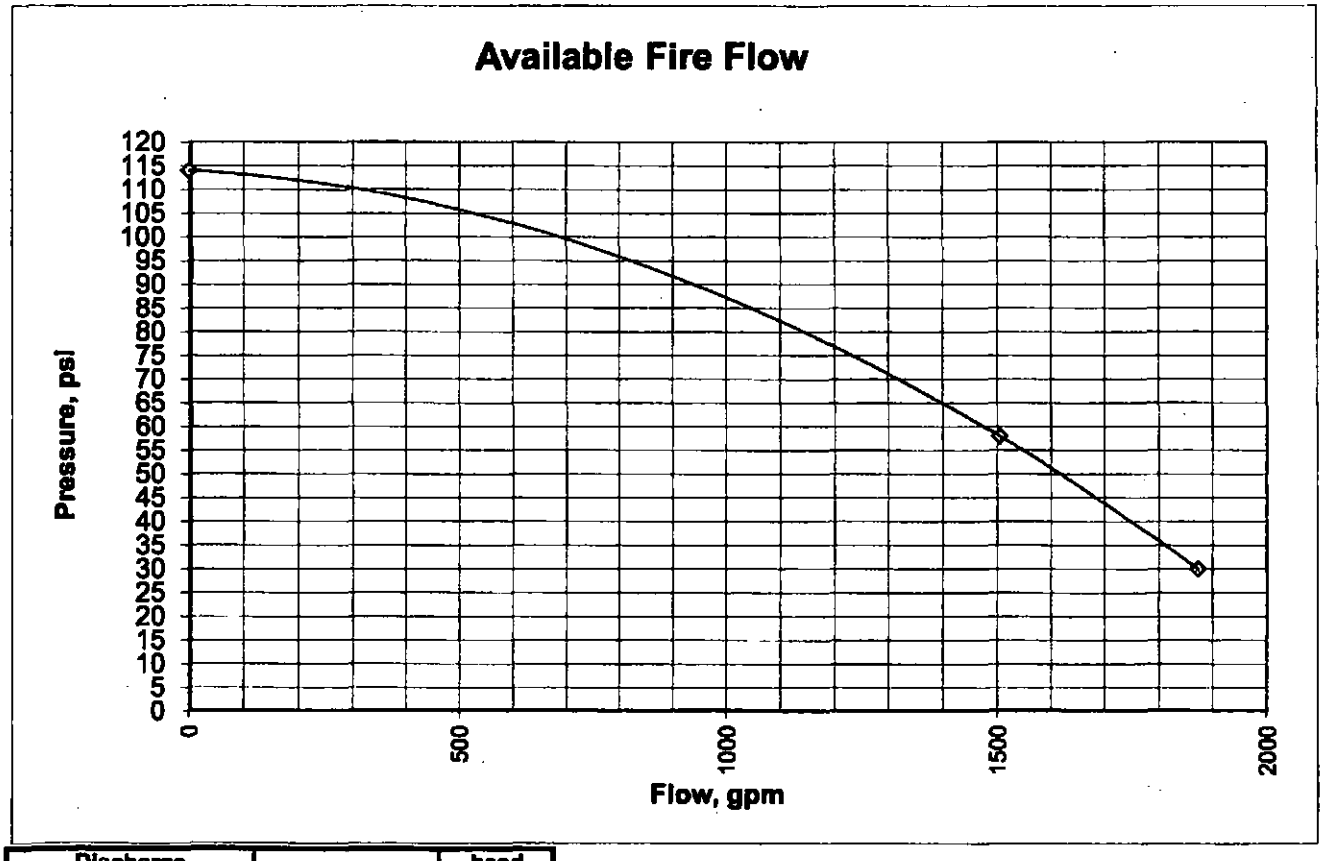
Location: 8949 East Covey Trail **Proj. Engineer:** Mike Young, P.E.

Date: May 22, 2017

Pressure Zone: Zone 12

Residual Hydrant		**Flow Hydrant**	
Static Pressure (psi)	114.0		
Residual Pressure (psi)	58.0	Flow (gpm)	1504
Calculated Flow at 30 psi	**1872 gpm**	**Calculated Flow at**	30

Sketch of Flow and Residual Hydrant:



Discharge (gpm)	psi	head (ft)
0	114	263.2
1504	58	133.9
1872	30	69.3

TABLE 8

EXISTING WATER SYSTEM PRESSURES
(9199 E. HAPPY HOLLOW DRIVE)

WOOD/PATEL **TABLE 8 - EXISTING WATER SYSTEM PRESSURES (9199 E Happy Hollow Drive)**

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: Desert Mountain Parcel 19 **Proj. Number:** 164434

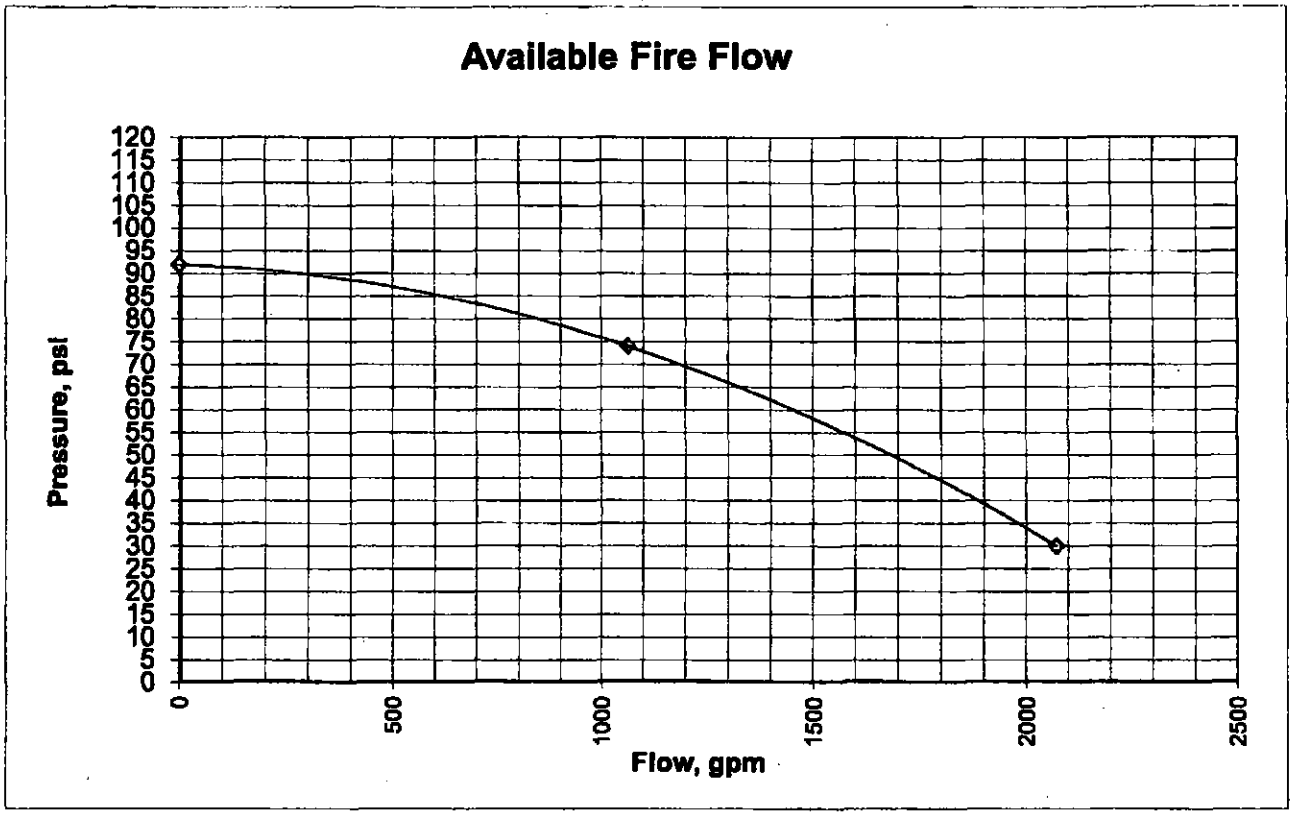
Location: 9199 East Happy Hollow Drive **Proj. Engineer:** Mike Young, P.E.

Date: June 9, 2016

Pressure Zone: Zone 12

Residual Hydrant		**Flow Hydrant**	
Static Pressure (psi)	92.0		
Residual Pressure (psi)	74.0	Flow (gpm)	1062
Calculated Flow at 30 psi	**2071 gpm**	**Calculated Flow at**	30

Sketch of Flow and Residual Hydrant:



Discharge (gpm)	Pressure (psi)	head (ft)
0	92	212.4
1062	74	170.9
2071	30	69.3

APPENDIX A

HYDRANT FLOW TEST RESULTS

Arizona Flow Testing LLC

HYDRANT FLOW TEST REPORT

Project Name:	Desert Mountain
Project Address:	North Cave Creek Road, Scottsdale, Arizona, 85251
Arizona Flow Testing Project No.:	17108
Client Project No.:	164434
Flow Test Permit No.:	C53117
Date and time flow test conducted:	May 22, 2017 at 8:00 AM
Data is current and reliable until:	November 22, 2017
Conducted by:	Floyd Vaughan – Arizona Flow Testing, LLC (480-250-8154)
Witnessed by:	Jimmy Demarbiex –City of Scottsdale-Inspector (602-541-0586)

Raw Test Data

Static Pressure: **114.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **58.0 PSI**
(Measured in pounds per square inch)

Pitot Pressure: **16.0 PSI**
(Measured in pounds per square inch)

Diffuser Orifice Diameter: 4 Inch
(Measured in inches)

Coefficient of Diffuser: "Big Boy Hose Monster"

Flowing GPM: **1,504 GPM**
(Measured in gallons per minute)

GPM @ 20 PSI: **1,989 GPM**

Data with 42 PSI Safety Factor

Static Pressure: **72.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **16.0 PSI**
(Measured in pounds per square inch)

Scottsdale requires a maximum Static Pressure of 72 PSI for AFES Design.

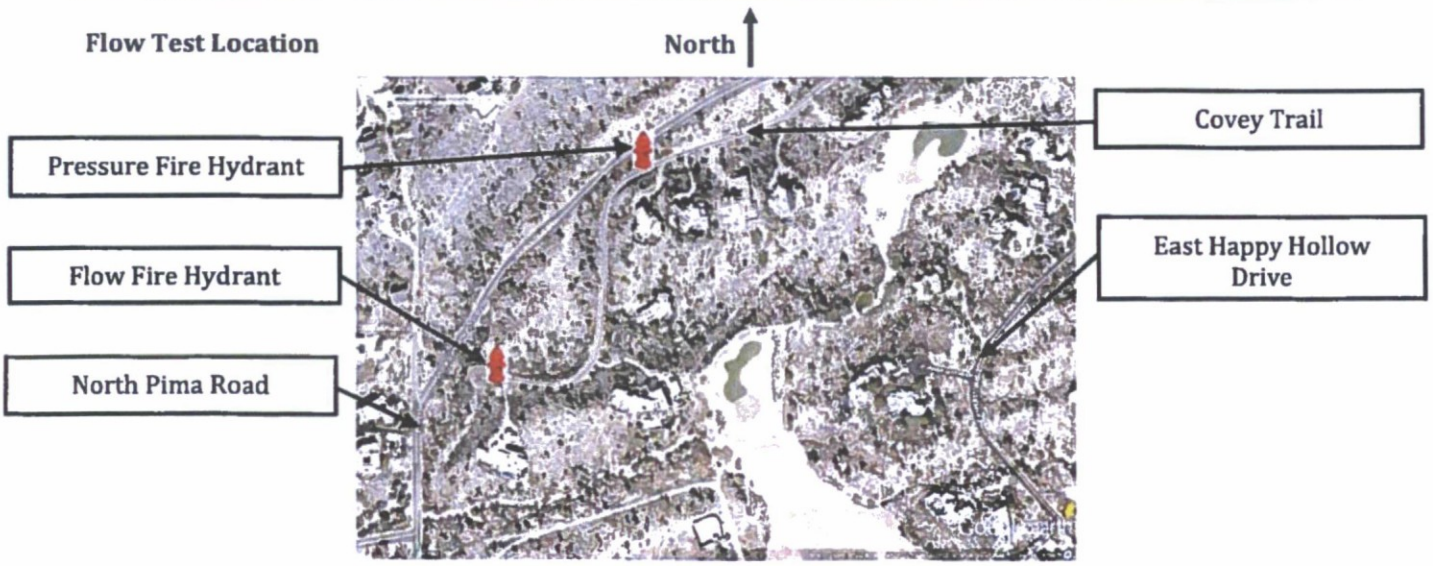
Distance between hydrants: Approx. 1,100 Feet

Main size: 8 Inch

Flowing GPM: **1,504 GPM**

GPM @ 20 PSI: **1,445 GPM**

Flow Test Location



Arizona Flow Testing LLC

HYDRANT FLOW TEST REPORT 2

Project Name:	Desert Mountain
Project Address:	North Cave Creek Road, Scottsdale, Arizona, 85251
Arizona Flow Testing Project No.:	16083
Client Project No.:	164434
Flow Test Permit No.:	C50737
Date and time flow test conducted:	June 9, 2016 at 9:00 AM
Data is current and reliable until:	December 9, 2016
Conducted by:	Floyd Vaughan – Arizona Flow Testing, LLC (480-250-8154)
Witnessed by:	Jimmy Demarbiex –City of Scottsdale-Inspector (602-541-0586)

Raw Test Data

Static Pressure: **92.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **74.0 PSI**
(Measured in pounds per square inch)

Pitot Pressure: **40.0 PSI**
(Measured in pounds per square inch)

Diffuser Orifice Diameter: One (2½ inch)
(Measured in inches)

Coefficient of Diffuser: .9

Flowing GPM: **1,062 GPM**
(Measured in gallons per minute)

GPM @ 20 PSI: **2,244 GPM**

Data with 20 PSI Safety Factor

Static Pressure: **72.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **54.0 PSI**
(Measured in pounds per square inch)

Scottsdale requires a maximum Static Pressure of 72 PSI for AFES Design.

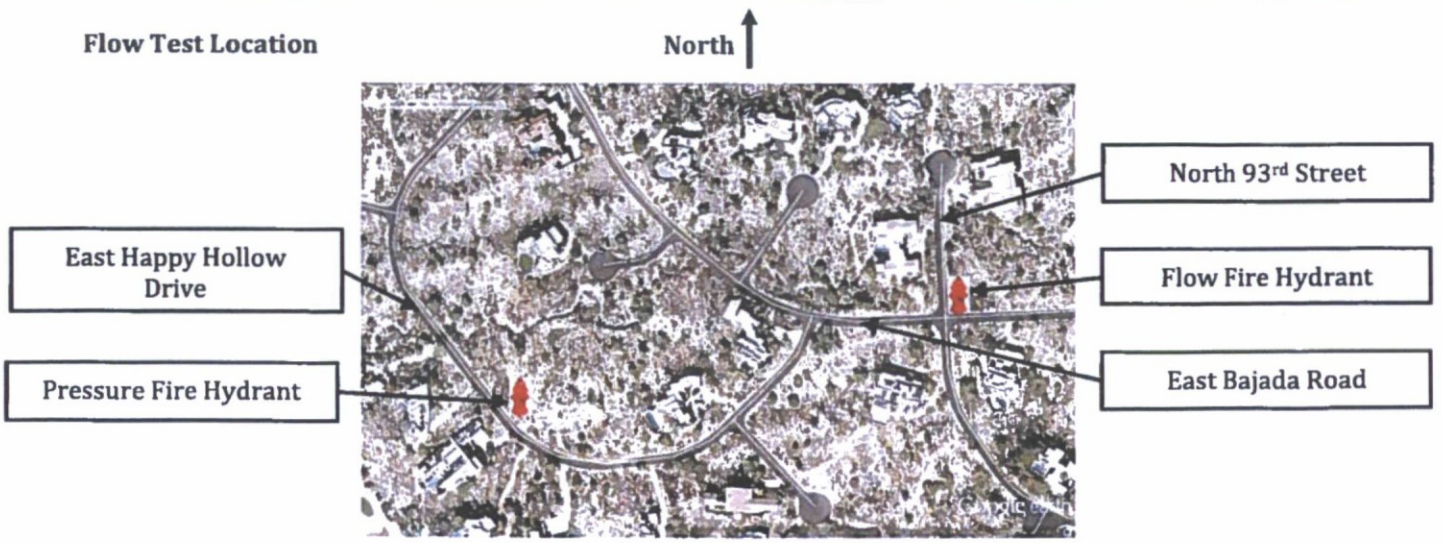
Distance between hydrants: Approx. 1,200 Feet

Main size: 8 Inch

Flowing GPM: **1,062 GPM**

GPM @ 20 PSI: **1,883 GPM**

Flow Test Location



APPENDIX B

HYDRAULIC MODELING RESULTS – EXISTING CONDITION

FlexTable: Reservoir Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Average Day Demand (Existing Condition)

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Tank 90	3,116	44.2	3,116

FlexTable: Junction Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Average Day Demand (Existing Condition)

→ HGL Based on PRV #200 Settings.

Label	Elevation (ft)	Zone	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-2EX	2,697	Zone 12	3.4	76.2	2,873
J-3EX	2,713	Zone 12	1.7	69.3	2,873
J-4EX	2,662	Zone 12	5.1	91.3	2,873
J-5EX	2,682	Zone 12	2.7	82.7	2,873
J-6EX	2,720	Zone 12	1.0	66.3	2,873
J-7EX	2,746	Zone 12	7.4	55.0	2,873
J-9EX	2,705	Zone 12	10.1	72.8	2,873
J-12BEX	2,668	Zone 12	0.0	88.8	2,873
J-12EX	2,667	Zone 12	2.7	89.2	2,873
J-14EX	2,696	Zone 12	2.0	76.7	2,873
J-15EX	2,695	Zone 12	2.4	77.2	2,873
J-16EX	2,625	Zone 12	1.7	107.5	2,874
J-17EX	2,604	Zone 12	1.0	116.6	2,874
J-19EX	2,701	Zone 12	3.0	74.3	2,873
J-44EX	2,651	Zone 12	0.0	96.5	2,874
J-52EX	2,651	Zone 12	0.0	96.1	2,873

FlexTable: Pipe Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Average Day Demand (Existing Condition)

Label	Diameter (in)	Length (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1EX	6.0	1,156	110.0	-0.5	0.01	0.000
P-3EX	6.0	944	110.0	-2.4	0.03	0.002
P-5EX	12.0	317	110.0	0.8	0.00	0.000
P-6EX	6.0	611	110.0	1.2	0.01	0.000
P-8EX	12.0	1,062	110.0	4.7	0.01	0.000
P-13EX	6.0	1,219	110.0	-15.4	0.17	0.044
P-17AEX	6.0	109	110.0	-0.5	0.01	0.000
P-17BEX	6.0	812	110.0	0.5	0.01	0.000
P-18EX	6.0	1,195	110.0	2.2	0.02	0.001
P-21EX	6.0	685	110.0	-37.1	0.42	0.227
P-24EX	8.0	1,155	110.0	1.0	0.01	0.000
P-27EX	6.0	776	110.0	1.1	0.01	0.000
P-28EX	6.0	1,474	110.0	-1.9	0.02	0.001
P-63EX	8.0	827	110.0	-39.1	0.25	0.061
P-73EX	8.0	2,139	110.0	-41.5	0.26	0.069
P-74EX	8.0	1,303	110.0	2.7	0.02	0.000
P-81EX	6.0	2,034	110.0	-11.6	0.13	0.026
P-83EX	12.0	1,244	110.0	8.0	0.02	0.000
P-87	8.0	896	130.0	0.0	0.00	0.000
P-88EX	12.0	639	110.0	0.0	0.00	0.000
P-89	12.0	379	110.0	0.0	0.00	0.000
P-90EX	8.0	6,156	130.0	0.0	0.00	0.000
P-101EX	8.0	7,590	130.0	44.2	0.28	0.057
P-102EX	8.0	2,974	120.0	44.2	0.28	0.066
P-103EX	12.0	5,208	130.0	0.0	0.00	0.000

FlexTable: PRV Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Average Day Demand (Existing Condition)

Label	Elevation (ft)	Diameter (Valve) (in)	Minor Loss Coefficient (Local)	Hydraulic Grade Setting (Initial) (ft)	Flow (gpm)	Hydraulic Grade (From) (ft)	Hydraulic Grade (To) (ft)	Headloss (ft)
PRV-84	2,760	8.0	0.000	2,844	0.0	3,116	2,873	0.00
PRV-166	2,714	6.0	0.000	2,864	0.0	3,116	2,873	0.00
PRV-200	2,712	6.0	0.000	2,874	44.2	3,116	2,874	241.83

FlexTable: Reservoir Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Existing FT #1 Residual Conditions

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Tank 90	3,116	1,548.2	3,116

FlexTable: Junction Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Existing FT #1 Residual Conditions

Label	Elevation (ft)	Zone	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-2EX	2,697	Zone 12	3.4	68.4	2,855
J-3EX	2,713	Zone 12	1.7	61.5	2,855
J-4EX	2,662	Zone 12	5.1	83.5	2,855
J-5EX	2,682	Zone 12	2.7	74.9	2,855
J-6EX	2,720	Zone 12	1.0	58.4	2,855
J-7EX	2,746	Zone 12	7.4	47.2	2,855
J-9EX	2,705	Zone 12	10.1	64.9	2,855
J-128EX	2,668	Zone 12	0.0	80.9	2,855
J-12EX	2,667	Zone 12	2.7	81.4	2,855
J-14EX	2,696	Zone 12	2.0	68.9	2,855
J-15EX	2,695	Zone 12	2.4	69.4	2,855
J-16EX	2,625	Zone 12	1.7	58.4	2,760
J-17EX	2,604	Zone 12	1,505.0	41.0	2,699
J-19EX	2,701	Zone 12	3.0	66.5	2,855
J-44EX	2,651	Zone 12	0.0	77.4	2,829
J-52EX	2,651	Zone 12	0.0	88.3	2,855

FlexTable: Pipe Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Existing FT #1 Residual Conditions

Label	Diameter (in)	Length (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1EX	6.0	1,156	110.0	-0.5	0.01	0.000
P-3EX	6.0	944	110.0	-2.4	0.03	0.001
P-5EX	12.0	317	110.0	0.8	0.00	0.000
P-6EX	6.0	611	110.0	1.2	0.01	0.000
P-8EX	12.0	1,062	110.0	4.7	0.01	0.000
P-13EX	6.0	1,219	110.0	-15.4	0.17	0.044
P-17AEX	6.0	109	110.0	-0.5	0.01	0.000
P-17BEX	6.0	812	110.0	0.5	0.01	0.000
P-18EX	6.0	1,195	110.0	2.2	0.02	0.001
P-21EX	6.0	685	110.0	-37.1	0.42	0.227
P-24EX	8.0	1,155	110.0	1,505.0	9.61	53.065
P-27EX	6.0	776	110.0	1.1	0.01	0.000
P-28EX	6.0	1,474	110.0	-1.9	0.02	0.001
P-63EX	8.0	827	110.0	-39.1	0.25	0.061
P-73EX	8.0	2,139	110.0	678.9	4.33	12.149
P-74EX	8.0	1,303	110.0	1,506.7	9.62	53.176
P-81EX	6.0	2,034	110.0	-11.6	0.13	0.026
P-83EX	12.0	1,244	110.0	8.0	0.02	0.000
P-87	8.0	896	130.0	-720.4	4.60	9.951
P-88EX	12.0	639	110.0	0.0	0.00	0.000
P-89	12.0	379	110.0	0.0	0.00	0.000
P-90EX	8.0	6,156	130.0	720.4	4.60	9.952
P-101EX	8.0	7,590	130.0	827.8	5.28	12.871
P-102EX	8.0	2,974	120.0	827.8	5.28	14.928
P-103EX	12.0	5,208	130.0	0.0	0.00	0.000

Covey Trail

FlexTable: PRV Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Existing FT #1 Residual Conditions

Label	Elevation (ft)	Diameter (Valve) (in)	Minor Loss Coefficient (Local)	Hydraulic Grade Setting (Initial) (ft)	Flow (gpm)	Hydraulic Grade (From) (ft)	Hydraulic Grade (To) (ft)	Headloss (ft)
PRV-84	2,760	8.0	0.000	2,844	0.0	3,116	2,855	0.00
PRV-166	2,714	6.0	0.000	2,864	720.4	3,055	2,864	190.50
PRV-200	2,712	6.0	0.000	2,874	827.8	3,018	2,874	144.57

FlexTable: Reservoir Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Existing FT #2 Residual Conditions

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Tank 90	3,116	1,106.2	3,116

FlexTable: Junction Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Existing FT #2 Residual Conditions

Label	Elevation (ft)	Zone	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-2EX	2,697	Zone 12	1,065.4	60.6	2,837
J-3EX	2,713	Zone 12	1.7	54.3	2,839
J-4EX	2,662	Zone 12	5.1	76.6	2,839
J-5EX	2,682	Zone 12	2.7	67.1	2,837
J-6EX	2,720	Zone 12	1.0	51.6	2,839
J-7EX	2,746	Zone 12	7.4	41.9	2,843
J-9EX	2,705	Zone 12	10.1	62.1	2,848
J-12BEX	2,668	Zone 12	0.0	73.5	2,838
J-12EX	2,667	Zone 12	2.7	74.0	2,838
J-14EX	2,696	Zone 12	2.0	71.1	2,860
J-15EX	2,695	Zone 12	2.4	73.1	2,864
J-16EX	2,625	Zone 12	1.7	105.3	2,868
J-17EX	2,604	Zone 12	1.0	114.4	2,868
J-19EX	2,701	Zone 12	3.0	59.7	2,839
J-44EX	2,651	Zone 12	0.0	94.2	2,868
J-52EX	2,651	Zone 12	0.0	80.9	2,838

FlexTable: Pipe Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Existing FT #2 Residual Conditions

Label	Diameter (in)	Length (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1EX	6.0	1,156	110.0	94.1	1.07	1.269
P-3EX	6.0	944	110.0	-123.9	1.41	2.114
P-5EX	12.0	317	110.0	-199.8	0.57	0.175
P-6EX	6.0	611	110.0	95.8	1.09	1.312
P-8EX	12.0	1,062	110.0	771.6	2.19	2.136
P-13EX	6.0	1,219	110.0	-188.1	2.13	4.578
P-17AEX	6.0	109	110.0	78.6	0.89	0.909
P-17BEX	6.0	812	110.0	-78.6	0.89	0.909
P-18EX	6.0	1,195	110.0	81.3	0.92	0.968
P-21EX	6.0	685	110.0	-386.0	4.38	17.333
P-24EX	8.0	1,155	110.0	1.0	0.01	0.000
P-27EX	6.0	776	110.0	25.5	0.29	0.113
P-28EX	6.0	1,474	110.0	22.5	0.26	0.090
P-63EX	8.0	827	110.0	-388.0	2.48	4.310
P-73EX	8.0	2,139	110.0	-262.5	1.68	2.091
P-74EX	8.0	1,303	110.0	2.7	0.02	0.000
P-81EX	6.0	2,034	110.0	-187.8	2.13	4.565
P-83EX	12.0	1,244	110.0	893.8	2.54	2.805
P-87	8.0	896	130.0	-127.8	0.82	0.404
P-88EX	12.0	639	110.0	713.1	2.02	1.846
P-89	12.0	379	110.0	0.0	0.00	0.000
P-90EX	8.0	6,156	130.0	127.8	0.82	0.405
P-101EX	8.0	7,590	130.0	265.2	1.69	1.564
P-102EX	8.0	2,974	120.0	265.2	1.69	1.814
P-103EX	12.0	5,208	130.0	713.1	2.02	1.355

FlexTable: PRV Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Existing FT #2 Residual Conditions

Label	Elevation (ft)	Diameter (Valve) (in)	Minor Loss Coefficient (Local)	Hydraulic Grade Setting (Initial) (ft)	Flow (gpm)	Hydraulic Grade (From) (ft)	Hydraulic Grade (To) (ft)	Headloss (ft)
PRV-84	2,760	8.0	0.000	2,844	713.1	3,109	2,844	264.91
PRV-166	2,714	6.0	0.000	2,864	127.8	3,114	2,864	249.27
PRV-200	2,712	6.0	0.000	2,874	265.2	3,104	2,874	230.39

ject: Desert Mountain Parcel 19 164434

ation: Scottsdale, AZ Ryan Hall, E.I.T.

DEL CALIBRATION TO EXISTING CONDITIONS

	Static Pressure Comparison (PSI)			Residual Pressure Comparison			Model Nodes	Flow
Flow Test #	Static Pressure (Field)	Static Pressure (Model)	PSI Difference (Model-Field)	Residual Pressure (Field)	Residual Pressure (Model)	PSI Difference (Model-Field)	Pressure Node	(GPM)
I (Covey Tr)	114	107.5	-6.5	58	58.4	0.4	J-16EX	1,504
Happy Hollow)	92	89.2	-2.8	74	74	0.0	J-12EX	1,062

	Static HGL Comparison (FT)			Residual HGL Comparison			Model Nodes		Flow
Flow Test #	HGL (Field)	HGL (Model)	HGL Difference (Model-Field)	HGL (Field)	HGL (Model)	HGL Difference (Model-Field)	Elevation Node (ft)	Pressure Node	(GPM)
I (Covey Tr)	2888.3	2874.0	-14.3	2759.0	2760.0	1.0	2625	J-16EX	1,504
Happy Hollow)	2879.5	2873.0	-6.5	2837.9	2838.0	0.1	2667	J-12EX	1,062

APPENDIX C

HYDRAULIC MODELING RESULTS – FULL BUILD-OUT

FlexTable: Reservoir Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Average Day Demand (Existing + Proposed)

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Tank 90	3,116	126.8	3,116

FlexTable: Junction Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Average Day Demand (Existing + Proposed)

Label	Elevation (ft)	Zone	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-2EX	2,697	Zone 12	5.4	75.0	2,870
J-3EX	2,713	Zone 12	2.7	68.0	2,870
J-4EX	2,662	Zone 12	10.1	90.1	2,870
J-5EX	2,682	Zone 12	3.7	81.4	2,870
J-6EX	2,720	Zone 12	4.0	65.0	2,870
J-7EX	2,746	Zone 12	12.1	53.8	2,870
J-9EX	2,705	Zone 12	18.5	71.6	2,871
J-12BEX	2,668	Zone 12	0.0	87.5	2,870
J-12EX	2,667	Zone 12	4.0	87.9	2,870
J-14EX	2,696	Zone 12	2.0	75.9	2,871
J-15EX	2,695	Zone 12	6.4	76.4	2,872
J-16EX	2,625	Zone 12	1.7	107.0	2,872
J-17EX	2,604	Zone 12	1.0	116.1	2,872
J-19EX	2,701	Zone 12	4.7	73.1	2,870
J-44EX	2,651	Zone 12	0.0	96.0	2,872
J-52EX	2,651	Zone 12	0.0	94.8	2,870
J-DM-1	2,640	Zone 12	2.2	59.3	2,777
J-DM-2	2,636	Zone 12	2.4	61.0	2,777
J-DM-3	2,628	Zone 12	2.6	64.4	2,777
J-DM-4	2,600	Zone 12	3.3	76.6	2,777
J-DM-5	2,593	Zone 12	3.4	79.6	2,777
J-DM-6	2,617	Zone 12	4.3	69.2	2,777
J-DM-7	2,621	Zone 12	2.8	67.5	2,777
J-DM-8	2,611	Zone 12	3.4	71.8	2,777
J-DM-9	2,600	Zone 12	3.4	76.6	2,777
J-DM-10	2,622	Zone 12	2.9	67.2	2,777
J-DM-11	2,630	Zone 12	1.9	63.6	2,777
J-DM-12	2,635	Zone 12	17.4	61.5	2,777
J-DM-13	2,647	Zone 12	0.5	56.3	2,777

FlexTable: Pipe Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Average Day Demand (Existing + Proposed)

Label	Diameter (in)	Length (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1EX	6.0	1,156	110.0	1.1	0.01	0.000
P-3EX	6.0	944	110.0	-4.8	0.05	0.005
P-5EX	12.0	317	110.0	14.7	0.04	0.002
P-6EX	6.0	611	110.0	3.8	0.04	0.004
P-8EX	12.0	1,062	110.0	19.0	0.05	0.002
P-13EX	6.0	1,219	110.0	-40.8	0.46	0.270
P-17AEX	6.0	109	110.0	9.4	0.11	0.018
P-17BEX	6.0	812	110.0	15.8	0.18	0.047
P-18EX	6.0	1,195	110.0	13.4	0.15	0.034
P-21EX	6.0	685	110.0	-90.4	1.03	1.179
P-24EX	8.0	1,155	110.0	26.3	0.17	0.030
P-27EX	6.0	776	110.0	1.9	0.02	0.001
P-28EX	6.0	1,474	110.0	-2.8	0.03	0.002
P-63EX	8.0	827	110.0	-92.4	0.59	0.302
P-73EX	8.0	2,139	110.0	-98.8	0.63	0.342
P-74EX	8.0	1,303	110.0	28.0	0.18	0.033
P-81EX	6.0	2,034	110.0	-31.1	0.35	0.163
P-83EX	12.0	1,244	110.0	28.7	0.08	0.005
P-87	8.0	896	130.0	0.0	0.00	0.000
P-88EX	12.0	639	110.0	0.0	0.00	0.000
P-89	12.0	379	110.0	25.2	0.07	0.004
P-90EX	8.0	6,156	130.0	0.0	0.00	0.000
P-101EX	8.0	7,590	130.0	126.8	0.81	0.399
P-102EX	8.0	2,974	120.0	126.8	0.81	0.462
P-103EX	12.0	5,208	130.0	0.0	0.00	0.000
P-DM-14	8.0	151	110.0	25.3	0.16	0.028
P-DM-15	8.0	143	110.0	25.2	0.16	0.027
P-DM-30	8.0	510	110.0	2.5	0.02	0.000
P-DM-35	8.0	587	110.0	0.1	0.00	0.000
P-DM-40	8.0	965	110.0	18.6	0.12	0.015
P-DM-45	8.0	687	110.0	25.3	0.16	0.027
P-DM-50	8.0	567	110.0	3.4	0.02	0.000
P-DM-51	8.0	436	110.0	16.1	0.10	0.012
P-DM-55	8.0	574	110.0	11.8	0.08	0.006
P-DM-60	8.0	553	110.0	9.0	0.06	0.004
P-DM-65	8.0	651	110.0	3.4	0.02	0.000
P-DM-70	8.0	434	110.0	-2.2	0.01	0.000
P-DM-75	8.0	180	110.0	1.9	0.01	0.000
P-DM-80	8.0	400	110.0	2.6	0.02	0.001
P-DM-85	8.0	272	110.0	20.0	0.13	0.017
P-DM-90	8.0	357	110.0	20.5	0.13	0.018
P-DM-91	8.0	533	110.0	25.2	0.16	0.027

FlexTable: PRV Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Average Day Demand (Existing + Proposed)

Label	Elevation (ft)	Diameter (Valve) (in)	Minor Loss Coefficient (Local)	Hydraulic Grade Setting (Initial) (ft)	Flow (gpm)	Hydraulic Grade (From) (ft)	Hydraulic Grade (To) (ft)	Headloss (ft)
PRV-1	2,600	8.0	0.000	2,777	25.3	2,872	2,777	95.21
PRV-2	2,642	8.0	0.000	2,777	25.2	2,870	2,777	93.14
PRV-84	2,760	8.0	0.000	2,844	0.0	3,116	2,870	0.00
PRV-166	2,714	6.0	0.000	2,864	0.0	3,116	2,872	0.00
PRV-200	2,712	6.0	0.000	2,874	126.8	3,113	2,874	239.23

FlexTable: Reservoir Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Max Day Demand (Existing + Proposed)

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Tank 90	3,116	253.6	3,116

FlexTable: Junction Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Max Day Demand (Existing + Proposed)

Label	Elevation (ft)	Zone	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-2EX	2,697	Zone 12	10.8	70.7	2,860
J-3EX	2,713	Zone 12	5.4	63.7	2,860
J-4EX	2,662	Zone 12	20.2	85.8	2,860
J-5EX	2,682	Zone 12	7.4	77.1	2,860
J-6EX	2,720	Zone 12	8.0	60.7	2,860
J-7EX	2,746	Zone 12	24.2	49.5	2,860
J-9EX	2,705	Zone 12	37.0	67.8	2,862
J-12BEX	2,668	Zone 12	0.0	83.1	2,860
J-12EX	2,667	Zone 12	8.0	83.6	2,860
J-14EX	2,696	Zone 12	4.0	73.1	2,865
J-15EX	2,695	Zone 12	12.8	73.9	2,866
J-16EX	2,625	Zone 12	3.4	105.4	2,869
J-17EX	2,604	Zone 12	2.0	114.5	2,869
J-19EX	2,701	Zone 12	9.4	68.8	2,860
J-44EX	2,651	Zone 12	0.0	94.4	2,869
J-52EX	2,651	Zone 12	0.0	90.5	2,860
J-DM-1	2,640	Zone 12	4.4	59.3	2,777
J-DM-2	2,636	Zone 12	4.8	61.0	2,777
J-DM-3	2,628	Zone 12	5.2	64.3	2,777
J-DM-4	2,600	Zone 12	6.6	76.6	2,777
J-DM-5	2,593	Zone 12	6.8	79.6	2,777
J-DM-6	2,617	Zone 12	8.6	69.2	2,777
J-DM-7	2,621	Zone 12	5.6	67.5	2,777
J-DM-8	2,611	Zone 12	6.8	71.8	2,777
J-DM-9	2,600	Zone 12	6.8	76.6	2,777
J-DM-10	2,622	Zone 12	5.8	67.2	2,777
J-DM-11	2,630	Zone 12	3.8	63.6	2,777
J-DM-12	2,635	Zone 12	34.8	61.4	2,777
J-DM-13	2,647	Zone 12	1.0	56.2	2,777

FlexTable: Pipe Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Max Day Demand (Existing + Proposed)

Label	Diameter (in)	Length (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1EX	6.0	1,156	110.0	2.8	0.03	0.002
P-3EX	6.0	944	110.0	-10.0	0.11	0.020
P-5EX	12.0	317	110.0	34.5	0.10	0.007
P-6EX	6.0	611	110.0	8.2	0.09	0.014
P-8EX	12.0	1,062	110.0	42.5	0.12	0.010
P-13EX	6.0	1,219	110.0	-87.0	0.99	1.097
P-17AEX	6.0	109	110.0	22.9	0.26	0.092
P-17BEX	6.0	812	110.0	37.1	0.42	0.227
P-18EX	6.0	1,195	110.0	30.9	0.35	0.162
P-21EX	6.0	685	110.0	-190.4	2.16	4.684
P-24EX	8.0	1,155	110.0	43.0	0.27	0.073
P-27EX	6.0	776	110.0	4.1	0.05	0.004
P-28EX	6.0	1,474	110.0	-5.3	0.06	0.006
P-63EX	8.0	827	110.0	-194.4	1.24	1.199
P-73EX	8.0	2,139	110.0	-207.2	1.32	1.349
P-74EX	8.0	1,303	110.0	46.4	0.30	0.084
P-81EX	6.0	2,034	110.0	-66.5	0.75	0.667
P-83EX	12.0	1,244	110.0	62.8	0.18	0.021
P-87	8.0	896	130.0	0.0	0.00	0.000
P-88EX	12.0	639	110.0	0.0	0.00	0.000
P-89	12.0	379	110.0	60.0	0.17	0.019
P-90EX	8.0	6,156	130.0	0.0	0.00	0.000
P-101EX	8.0	7,590	130.0	253.6	1.62	1.439
P-102EX	8.0	2,974	120.0	253.6	1.62	1.669
P-103EX	12.0	5,208	130.0	0.0	0.00	0.000
P-DM-14	8.0	151	110.0	41.0	0.26	0.066
P-DM-15	8.0	143	110.0	60.0	0.38	0.135
P-DM-30	8.0	510	110.0	13.5	0.09	0.009
P-DM-35	8.0	587	110.0	8.7	0.06	0.004
P-DM-40	8.0	965	110.0	27.6	0.18	0.032
P-DM-45	8.0	687	110.0	41.0	0.26	0.067
P-DM-50	8.0	567	110.0	6.8	0.04	0.003
P-DM-51	8.0	436	110.0	31.1	0.20	0.040
P-DM-55	8.0	574	110.0	22.5	0.14	0.022
P-DM-60	8.0	553	110.0	16.9	0.11	0.013
P-DM-65	8.0	651	110.0	6.8	0.04	0.002
P-DM-70	8.0	434	110.0	-3.3	0.02	0.001
P-DM-75	8.0	180	110.0	3.8	0.02	0.001
P-DM-80	8.0	400	110.0	6.3	0.04	0.002
P-DM-85	8.0	272	110.0	41.1	0.26	0.068
P-DM-90	8.0	357	110.0	42.1	0.27	0.070
P-DM-91	8.0	533	110.0	60.0	0.38	0.136

FlexTable: PRV Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Max Day Demand (Existing + Proposed)

Label	Elevation (ft)	Diameter (Valve) (in)	Minor Loss Coefficient (Local)	Hydraulic Grade Setting (Initial) (ft)	Flow (gpm)	Hydraulic Grade (From) (ft)	Hydraulic Grade (To) (ft)	Headloss (ft)
PRV-1	2,600	8.0	0.000	2,777	41.0	2,869	2,777	91.47
PRV-2	2,642	8.0	0.000	2,777	60.0	2,860	2,777	83.00
PRV-84	2,760	8.0	0.000	2,844	0.0	3,116	2,860	0.00
PRV-166	2,714	6.0	0.000	2,864	0.0	3,116	2,866	0.00
PRV-200	2,712	6.0	0.000	2,874	253.6	3,105	2,874	231.34

Fire Flow Node FlexTable: Fire Flow Report

DESERT MOUNTAIN PARCEL 19

Active Scenario: Max Day Demand + FF (Existing + Proposed)

Label	Elevation (ft)	Satisfies Fire Flow Constraints?	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Press. (Calc Rsdl) (psi)	Press (Calc Zn Lwr Limit) (psi)	Junction w/ Min Press (Zone)
J-2EX	2,697	True	1,010.8	3,010.8	38.5	35.9	J-6EX
J-3EX	2,713	True	1,005.4	1,516.3	30.0	40.9	J-7EX
J-4EX	2,662	True	1,020.2	2,713.0	30.0	36.9	J-19EX
J-5EX	2,682	True	1,007.4	3,007.4	42.8	36.0	J-6EX
J-6EX	2,720	True	1,008.0	3,008.0	35.5	36.6	J-7EX
J-7EX	2,746	True	1,024.2	3,024.2	36.4	47.6	J-6EX
J-9EX	2,705	True	1,037.0	2,164.9	30.0	40.7	J-7EX
J-12BEX	2,668	True	1,000.0	1,779.8	30.0	33.3	J-12EX
J-12EX	2,667	True	1,008.0	1,768.7	30.0	34.1	J-12BEX
J-14EX	2,696	True	1,004.0	2,701.1	30.0	41.5	J-7EX
J-15EX	2,695	True	1,012.8	3,012.8	42.1	41.8	J-7EX
J-16EX	2,625	True	1,003.4	1,933.3	30.0	39.1	J-17EX
J-17EX	2,604	True	1,002.0	1,611.1	30.0	42.4	J-7EX
J-19EX	2,701	True	1,009.4	1,475.4	30.0	41.0	J-7EX
J-44EX	2,651	True	1,000.0	2,957.2	30.0	41.1	J-16EX
J-52EX	2,651	True	1,000.0	1,780.3	35.7	30.0	J-12BEX
J-DM-1	2,640	True	1,004.4	2,540.6	32.6	30.0	J-DM-13
J-DM-2	2,636	True	1,004.8	2,476.1	30.0	34.2	J-DM-13
J-DM-3	2,628	True	1,005.2	2,612.4	30.0	31.0	J-DM-13
J-DM-4	2,600	True	1,006.6	2,786.4	30.0	33.1	J-DM-5
J-DM-5	2,593	True	1,006.8	2,268.7	30.0	41.5	J-7EX
J-DM-6	2,617	True	1,008.6	2,499.1	30.0	32.1	J-DM-7
J-DM-7	2,621	True	1,005.6	2,335.8	30.0	36.2	J-DM-13
J-DM-8	2,611	True	1,006.8	2,355.7	31.7	30.0	J-DM-11
J-DM-9	2,600	True	1,006.8	1,931.8	30.0	41.4	J-7EX
J-DM-10	2,622	True	1,005.8	2,263.8	33.7	30.0	J-DM-11
J-DM-11	2,630	True	1,003.8	2,080.6	30.0	41.0	J-DM-13
J-DM-12	2,635	True	1,534.8	2,332.0	30.0	31.6	J-DM-13
J-DM-13	2,647	True	1,501.0	2,290.5	30.0	36.2	J-DM-12

FlexTable: Reservoir Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Peak Hour Demand (Existing + Proposed)

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Tank 90	3,116	443.8	3,116

444.4 Per Section 2.2 of this Report.

FlexTable: Junction Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Peak Hour Demand (Existing + Proposed)

Label	Elevation (ft)	Zone	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-2EX	2,697	Zone 12	18.9	65.2	2,848
J-3EX	2,713	Zone 12	9.4	58.3	2,848
J-4EX	2,662	Zone 12	35.4	80.3	2,848
J-5EX	2,682	Zone 12	12.9	71.7	2,848
J-6EX	2,720	Zone 12	14.0	55.2	2,848
J-7EX	2,746	Zone 12	42.3	44.0	2,848
J-9EX	2,705	Zone 12	64.8	63.4	2,852
J-128EX	2,668	Zone 12	0.0	77.5	2,847
J-12EX	2,667	Zone 12	14.0	77.9	2,847
J-14EX	2,696	Zone 12	7.0	71.4	2,861
J-15EX	2,695	Zone 12	22.4	73.0	2,864
J-16EX	2,625	Zone 12	5.9	104.6	2,867
J-17EX	2,604	Zone 12	3.5	113.6	2,867
J-19EX	2,701	Zone 12	16.5	63.3	2,848
J-44EX	2,651	Zone 12	0.0	93.7	2,867
J-52EX	2,651	Zone 12	0.0	84.8	2,847
J-DM-1	2,640	Zone 12	7.7	59.3	2,777
J-DM-2	2,636	Zone 12	8.4	61.0	2,777
J-DM-3	2,628	Zone 12	9.1	64.3	2,777
J-DM-4	2,600	Zone 12	11.6	76.6	2,777
J-DM-5	2,593	Zone 12	11.9	79.6	2,777
J-DM-6	2,617	Zone 12	15.0	69.2	2,777
J-DM-7	2,621	Zone 12	9.8	67.4	2,777
J-DM-8	2,611	Zone 12	11.9	71.8	2,777
J-DM-9	2,600	Zone 12	11.9	76.5	2,777
J-DM-10	2,622	Zone 12	10.2	67.2	2,777
J-DM-11	2,630	Zone 12	6.7	63.5	2,777
J-DM-12	2,635	Zone 12	60.9	61.4	2,777
J-DM-13	2,647	Zone 12	1.8	56.2	2,777

FlexTable: Pipe Table

DESERT MOUNTAIN PARCEL 19

Active Scenario: Peak Hour Demand (Existing + Proposed)

Label	Diameter (in)	Length (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1EX	6.0	1,156	110.0	5.1	0.06	0.006
P-3EX	6.0	944	110.0	-17.7	0.20	0.057
P-5EX	12.0	317	110.0	62.6	0.18	0.020
P-6EX	6.0	611	110.0	14.6	0.17	0.040
P-8EX	12.0	1,062	110.0	76.4	0.22	0.030
P-13EX	6.0	1,219	110.0	-154.6	1.75	3.184
P-17AEX	6.0	109	110.0	41.9	0.48	0.283
P-17BEX	6.0	812	110.0	67.4	0.76	0.684
P-18EX	6.0	1,195	110.0	55.9	0.63	0.484
P-21EX	6.0	685	110.0	-337.5	3.83	13.518
P-24EX	8.0	1,155	110.0	71.0	0.45	0.185
P-27EX	6.0	776	110.0	7.3	0.08	0.011
P-28EX	6.0	1,474	110.0	-9.2	0.10	0.017
P-63EX	8.0	827	110.0	-344.5	2.20	3.459
P-73EX	8.0	2,139	110.0	-221.4	1.41	1.525
P-74EX	8.0	1,303	110.0	76.9	0.49	0.215
P-81EX	6.0	2,034	110.0	-118.2	1.34	1.936
P-83EX	12.0	1,244	110.0	112.2	0.32	0.060
P-87	8.0	896	130.0	-145.5	0.93	0.514
P-88EX	12.0	639	110.0	0.0	0.00	0.000
P-89	12.0	379	110.0	109.3	0.31	0.057
P-90EX	8.0	6,156	130.0	145.5	0.93	0.514
P-101EX	8.0	7,590	130.0	298.3	1.90	1.944
P-102EX	8.0	2,974	120.0	298.3	1.90	2.254
P-103EX	12.0	5,208	130.0	0.0	0.00	0.000
P-DM-14	8.0	151	110.0	67.5	0.43	0.168
P-DM-15	8.0	143	110.0	109.3	0.70	0.411
P-DM-30	8.0	510	110.0	27.2	0.17	0.032
P-DM-35	8.0	587	110.0	18.8	0.12	0.016
P-DM-40	8.0	965	110.0	44.0	0.28	0.077
P-DM-45	8.0	687	110.0	67.5	0.43	0.169
P-DM-50	8.0	567	110.0	11.9	0.08	0.007
P-DM-51	8.0	436	110.0	53.7	0.34	0.110
P-DM-55	8.0	574	110.0	38.6	0.25	0.060
P-DM-60	8.0	553	110.0	28.8	0.18	0.035
P-DM-65	8.0	651	110.0	11.9	0.08	0.007
P-DM-70	8.0	434	110.0	-5.0	0.03	0.002
P-DM-75	8.0	180	110.0	6.7	0.04	0.003
P-DM-80	8.0	400	110.0	11.8	0.08	0.007
P-DM-85	8.0	272	110.0	72.7	0.46	0.194
P-DM-90	8.0	357	110.0	74.4	0.48	0.203
P-DM-91	8.0	533	110.0	109.3	0.70	0.413

FlexTable: PRV Table

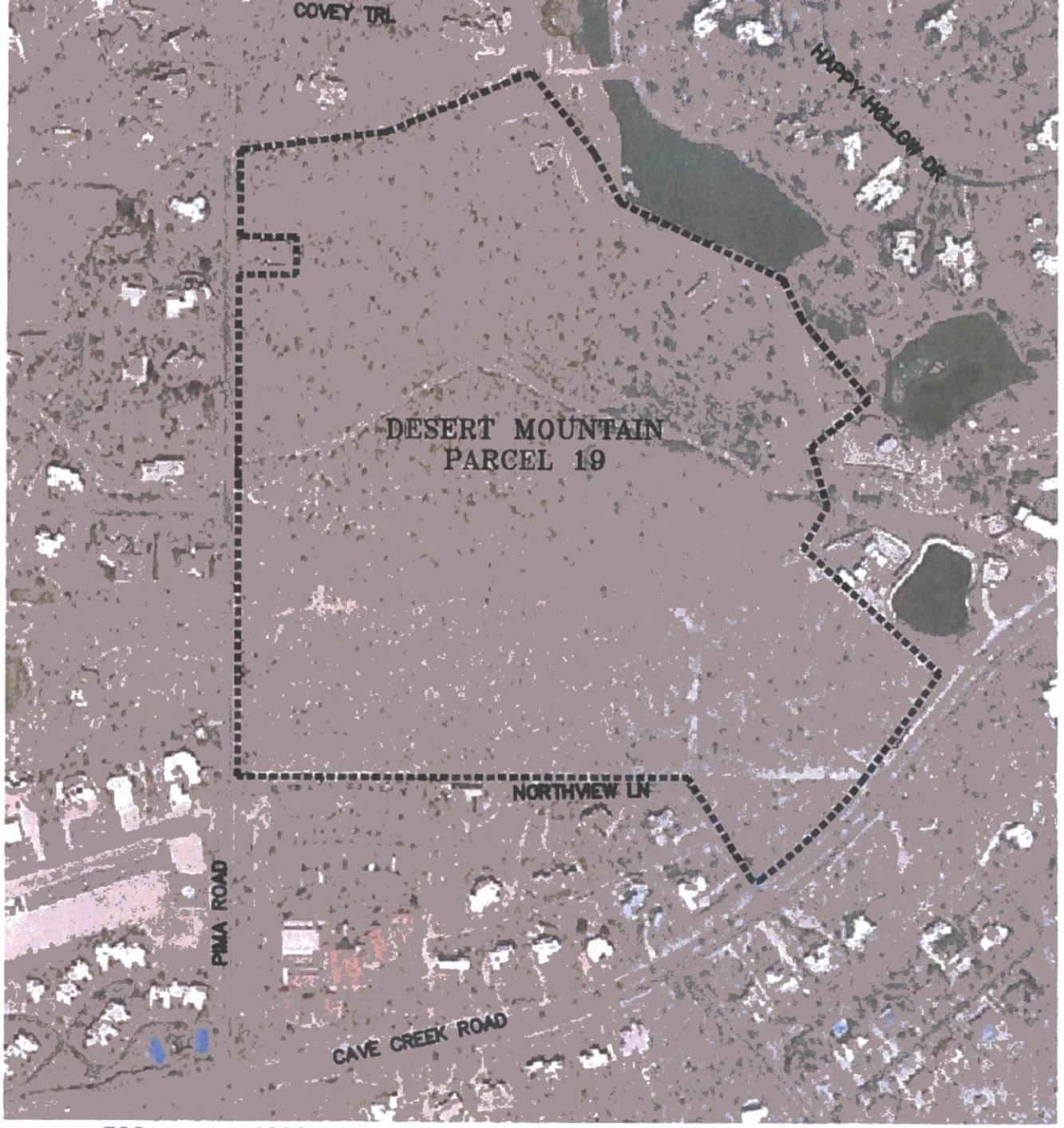
DESERT MOUNTAIN PARCEL 19

Active Scenario: Peak Hour Demand (Existing + Proposed)

Label	Elevation (ft)	Diameter (Valve) (in)	Minor Loss Coefficient (Local)	Hydraulic Grade Setting (Initial) (ft)	Flow (gpm)	Hydraulic Grade (From) (ft)	Hydraulic Grade (To) (ft)	Headloss (ft)
PRV-1	2,600	8.0	0.000	2,777	67.5	2,866	2,777	89.36
PRV-2	2,642	8.0	0.000	2,777	109.3	2,847	2,777	69.81
PRV-84	2,760	8.0	0.000	2,844	0.0	3,116	2,848	0.00
PRV-166	2,714	6.0	0.000	2,864	145.5	3,113	2,864	248.60
PRV-200	2,712	6.0	0.000	2,874	298.3	3,101	2,874	227.51

EXHIBIT 1

VICINITY MAP



0 500 1000

Horz. 1 in. = 500 ft.

X:\N-Drive\2016\16434\Project Support\Reports\Water BOD\Exhibits\4434-Exhibit 1-Vicinity Map.dwg

N

WOOD/PATEL
MISSION: CLIENT SERVICE
(602) 335-8500
WWW.WOODPATEL.COM

DESERT MOUNTAIN

EXHIBIT 1
VICINITY MAP

DATE:	SCALE:	SHEET
6-15-2016	1" = 500'	

EXHIBIT 2

EXISTING GROUNDWATER WELL LOCATIONS

N

300 600

Horz. 1 in. = 300 ft.

NOT
FOR CONSTRUCTION OR RECORDING

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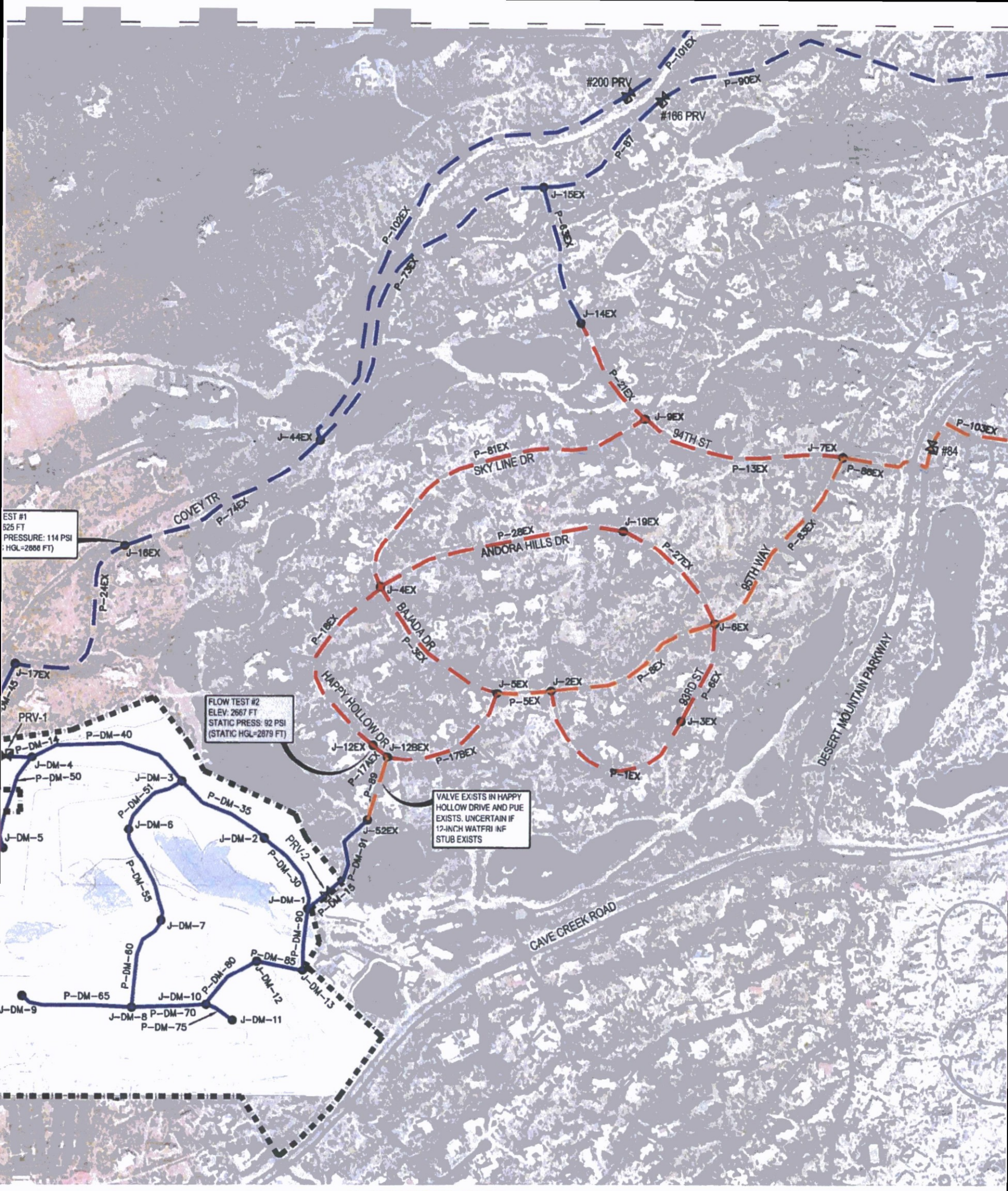
DESERT MOUNTAIN P1

EXHIBIT 2- EXISTING GROUNDWAT WELL LOCATIONS

	SCALE: 1" = 300'	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SM	
	DRAWN: SM	

EXHIBIT 3

MASTER WATER EXHIBIT – FULL BUILD-OUT



LEGEND

● J1	HYDRAULIC MODEL JUNCTION NODE
P1	HYDRAULIC MODEL PIPE
- - - - -	PROPERTY BOUNDARY

PIPE DIAMETER	EXISTING	PROPOSED
6-INCHES	- - -	———
8-INCHES	- - -	———
12-INCHES	- - -	———

NOTES:

1) WATERLINE PIPES 90EX, 101EX, AND 103EX ALL CONNECT TO TANK 90, WHICH SERVES AS A STORAGE FACILITY FOR PRESSURE ZONE 12.

N

600 1200

Horz. 1 in. = 600 ft.

NOT *FOR CONSTRUCTION OR RECORDING*

WOOD/PATEL
MISSION: CLIENT SERVICE
(602) 335-8500
WWW.WOODPATEL.COM

DESERT MOUNTAIN P1

EXHIBIT 3- MASTER WATER EXHIBIT-FULL BUILD-OUT

	SCALE: 1" = 600'	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SM	
	DRAWN: SM	