WATER BASIS OF DESIGN

Cielo Stellato

Accepted w/ Comment

City of Scottsdale
Water Resources Administration
9379 E. San Salvador
Scottsdale, AZ 85258

6.8.16

Prepared for:

Pinnacle Land Development, LLC
7440 E. Pinnacle Peak Road
Scottsdale, AZ 85255

Prepared by:

Kimley-Horn and Associates, Inc.
7740 N. 16th Street, Suite 300
Phoenix, Arizona 85020

Kimley»Horn

29101500
July 2016

3-PP-2016
07/29/16

Preliminary Water Basis of Design

CIELO STELLATO

Exp. Date 03/31/18

JULY 2016

Prepared By:

Kimley»Horn

Contents

Tables

Appendices

INTRODUCTION

INTENT

The purpose of this water report is to support the water system for the proposed Cielo Stellato residential development located at the northeast corner of Lone Mountain Parkway and Via Cortana Road in Scottsdale, Arizona. This report presents the basis of design criteria that will be used for the engineering design of the proposed development utilizing current water design standards and guidelines set forth by the City of Scottsdale, Arizona.

PROJECT DESCRIPTION

Cielo Stellato is located within Section 33 of Township 6 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is bound to the west by Lone Mountain Parkway and Via Cortana Road to the south. The site is surrounded by existing single family residential developments. See **Appendix A: Site Location Map**

Cielo Stellato is a proposed 20-acre single family residential subdivision, consisting of 14 single family residential units. The existing and proposed zoning of the project is R1-43.

DISTRIBUTION SYSTEM DESCRIPTION

EXISTING DISTRIBUTION SYSTEM

The site is surrounded by existing single family residential development. Per the City of Scottsdale Quarter Section Map 61-54 there is an existing 12-inch DIP waterline in Long Mountain Parkway directly to the west of the site. An 8-inch DIP waterline exists in Cortana Road directly to the south of the site. Additionally, there is an 8-inch waterline stub off the line in Cortana Road, located at the existing driveway.

According to Figure 6.1-3 of the City of Scottsdale Design Standards and Policies Manual (DS&PM), the site is located in Pressure Zones 13 and 14 with existing ground elevation ranging from 2830 feet in the south to 2880 feet in the north.

PROPOSED DISTRIBUTION SYSTEM

The proposed Cielo Stellato site is in pressure zones 13A and 14A. The Zone 13A water system will connect to the City of Scottsdale waterline stub in Cortana Road for the 4 southernmost lots on site. The rest of the lots will be serviced from a Zone 14A tap in the existing 12" City of Scottsdale waterline in Lone Mountain Parkway, north of PRV #314. The proposed on-site distribution system will consist of an 8" Class 350 DIP water line that will provide potable water and fire protection. Refer to **Appendix B** for the Proposed Water System Layout Exhibit.

BASIS OF DESIGN

DESIGN METHODOLOGY

The WaterCAD v8i water system modeling software distributed by Haestad Methods, Inc. was used to model the proposed water network. A fire flow test was performed to determine the residual and static pressures of the existing system. The fire flow test was performed on existing hydrants along Cortana Road to the south of the site. See **Appendix D** for complete fire flow test results.

According to Section 6-1.407 of the DSPM, distribution systems shall be designed with a minimum residual pressure of 50 psi and a maximum static pressure of 120 psi. For fire flow scenarios, a minimum design pressure of 30 psi is required.

WATER SYSTEM ANALYSIS

The proposed water distribution system for the project is modeled under 4 design scenarios. Average Day, Max Day, Peak Hour and Max Day plus Fire Flows scenarios are modeled. Average Day Demands are based on Figure 6.1-2 in the DS&PM, with peaking factors per section 6-1.404. A fire flow of 1,000 gpm per section 6-1.501 of the DS&PM was used. See **Table 1** below for a summary of water demands.

Table 1 Water Demands

Land Use	Dwelling units (du)	Average Daily Demand (gpd/du)	Average Daily Flow (gpd)	ADF (gpm)	Max Day Flow (gpd)	MDF (gpm)	Peak Hour Flow (gpd)	PHF (gpm)
<2 du/ac	14	485.6	6,798	4.7	13,597	9.4	23,794	16.5

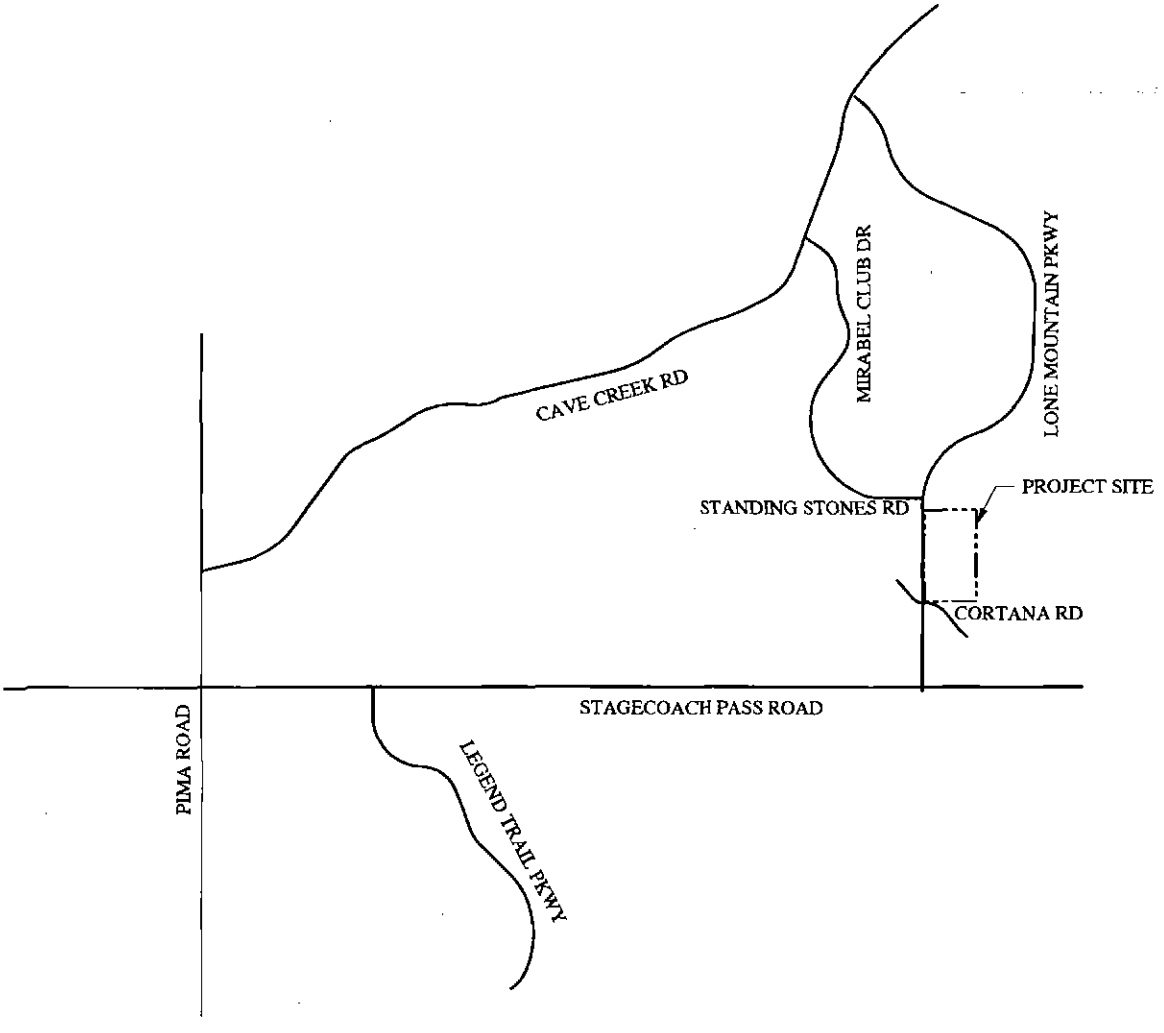
Average Day, Max Day, and Peak Hour Demands are applied at hydraulic model nodes based on number of adjacent proposed units. Fire flow demands are applied to all junctions within the project boundary.

RESULTS

Based on the fire flow tests performed and the results of the WaterCAD analysis, the proposed water system is capable of providing the required domestic flows at pressures ranging from 120 psi to 55 psi in the average day, max day, and peak hour scenarios. The fire flow pressures meet the minimum requirement of 30 psi, ranging from 50 psi to 103 psi.

Refer to **Appendix C** for the WaterCAD results.

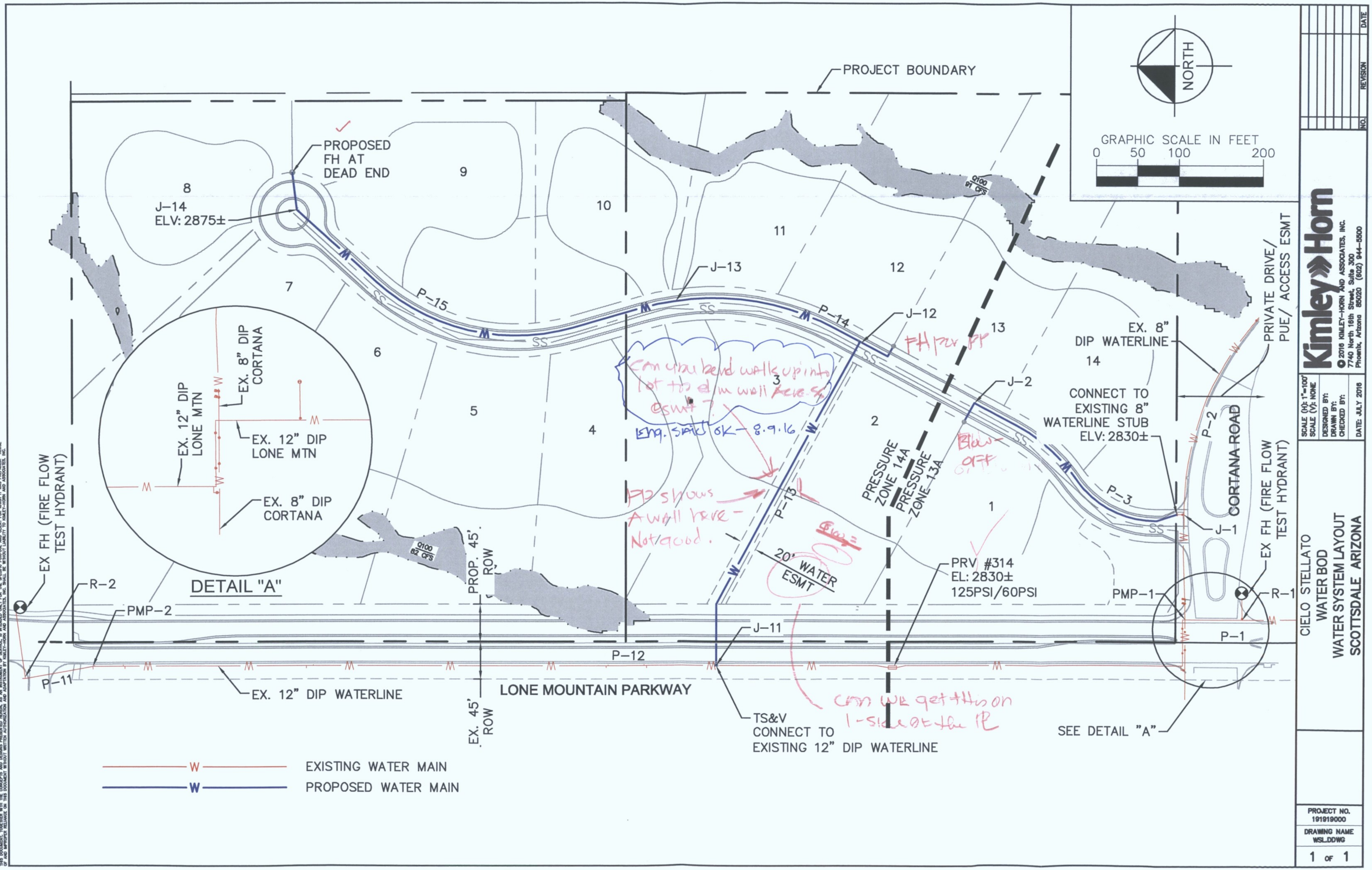
Appendix A – Site Location Map



CIELO STELLATO
VICINITY MAP
NTS

Kimley»Horn

Appendix B – Proposed Water System Layout


PROJECT BOUNDARY
NORTH
GRAPHIC SCALE IN FEET
0 50 100 200
PROPOSED FH AT DEAD END
J-14 ELV: 2875±
J-13
J-12
J-2
J-1
J-11
P-15
P-14
P-13
P-12
P-11
P-3
P-2
P-1
Q100 91 CFS
Q100 62 CFS
EX. 8" DIP WATERLINE
PRIVATE DRIVE/ PUE/ ACCESS ESMT
CONNECT TO EXISTING 8" WATERLINE STUB ELV: 2830±
CORTANA ROAD
EX FH (FIRE FLOW TEST HYDRANT)
PRESSURE ZONE 14A
PRESSURE ZONE 13A
PRV #314 EL: 2830± 125PSI/60PSI
20' WATER ESMT
PMP-1
PMP-2
R-1
R-2
PROP. 45' ROW
EX. 45' ROW
LONE MOUNTAIN PARKWAY
EX. 12" DIP WATERLINE
TS&V CONNECT TO EXISTING 12" DIP WATERLINE
SEE DETAIL "A"
DETAIL "A"
EX. 12" DIP LONE MTN
EX. 8" DIP CORTANA
EX. 12" DIP LONE MTN
EX. 8" DIP CORTANA
EXISTING WATER MAIN
PROPOSED WATER MAIN
FH per PP
Eng. said OK – 8.9.16
Can we get this on 1-side of the PL
Kimley»Horn
© 2016 KIMLEY-HORN AND ASSOCIATES, INC.
7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500
SCALE (H): 1"=100'
SCALE (V): NONE
DESIGNED BY:
DRAWN BY:
CHECKED BY:
DATE: JULY 2016
CIELO STELLATO
WATER BOD
WATER SYSTEM LAYOUT
SCOTTSDALE ARIZONA
PROJECT NO. 191919000
DRAWING NAME WSL.DDWG
1 OF 1
NO. REVISION DATE

Appendix C – WaterCAD Analysis Results

Average Day

Max Day

Peak Hour

Max Day Plus Fire Flow

FlexTable: Junction Table
Active Scenario: Average Day

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Zone
J-1	2,830.00	0	2,980.15	65.0	Zone 13
J-2	2,855.00	1	2,980.15	54.1	Zone 13
J-11	2,845.00	0	3,122.20	119.9	Zone 14
J-12	2,855.00	1	3,122.20	115.6	Zone 14
J-13	2,860.00	1	3,122.20	113.4	Zone 14
J-14	2,875.00	1	3,122.20	107.0	Zone 14

FlexTable: Pump Table
Active Scenario: Average Day

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
72	PMP-1	2,830.00	Fire Flow Test 1	On	2,830.00	2,980.15	1	150.15
85	PMP-2	2,860.00	Fire Flow Test 2	On	2,860.00	3,122.20	3	262.20

FlexTable: Reservoir Table
Active Scenario: Average Day

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
71	R-1	2,830.00	Zone 13	1	2,830.00
84	R-2	2,860.00	Zone 14	3	2,860.00

FlexTable: Junction Table
Active Scenario: Max Day

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Zone
J-1	2,830.00	0	2,980.15	65.0	Zone 13
J-2	2,855.00	3	2,980.15	54.1	Zone 13
J-11	2,845.00	0	3,122.20	119.9	Zone 14
J-12	2,855.00	2	3,122.20	115.6	Zone 14
J-13	2,860.00	2	3,122.20	113.4	Zone 14
J-14	2,875.00	3	3,122.20	107.0	Zone 14

FlexTable: Pipe Table
Active Scenario: Max Day

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1	33	R-1	PMP-1	48.0	130.0	3	0.00	0.000	0.00
P-2	92	PMP-1	J-1	48.0	130.0	3	0.00	0.000	0.00
P-3	408	J-1	J-2	8.0	130.0	3	0.02	0.000	0.00
P-11	12	R-2	PMP-2	48.0	130.0	7	0.00	0.000	0.00
P-12	884	PMP-2	J-11	12.0	130.0	7	0.02	0.000	0.00
P-13	431	J-11	J-12	8.0	130.0	7	0.04	0.000	0.00
P-14	251	J-12	J-13	8.0	130.0	5	0.03	0.000	0.00
P-15	508	J-13	J-14	8.0	130.0	3	0.02	0.000	0.00

FlexTable: Junction Table
Active Scenario: Peak Hour

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Zone
J-1	2,830.00	0	2,980.15	65.0	Zone 13
J-2	2,855.00	5	2,980.15	54.1	Zone 13
J-11	2,845.00	0	3,122.20	119.9	Zone 14
J-12	2,855.00	4	3,122.19	115.6	Zone 14
J-13	2,860.00	4	3,122.19	113.4	Zone 14
J-14	2,875.00	5	3,122.19	106.9	Zone 14

FlexTable: Pipe Table
Active Scenario: Peak Hour

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1	33	R-1	PMP-1	48.0	130.0	5	0.00	0.000	0.00
P-2	92	PMP-1	J-1	48.0	130.0	5	0.00	0.000	0.00
P-3	408	J-1	J-2	8.0	130.0	5	0.03	0.000	0.00
P-11	12	R-2	PMP-2	48.0	130.0	12	0.00	0.000	0.00
P-12	884	PMP-2	J-11	12.0	130.0	12	0.03	0.000	0.00
P-13	431	J-11	J-12	8.0	130.0	12	0.07	0.000	0.00
P-14	251	J-12	J-13	8.0	130.0	8	0.05	0.000	0.00
P-15	508	J-13	J-14	8.0	130.0	5	0.03	0.000	0.00

FlexTable: Pump Table
Active Scenario: Peak Hour

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
72	PMP-1	2,830.00	Fire Flow Test 1	On	2,830.00	2,980.15	5	150.15
85	PMP-2	2,860.00	Fire Flow Test 2	On	2,860.00	3,122.20	12	262.20

FlexTable: Reservoir Table
Active Scenario: Peak Hour

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
71	R-1	2,830.00	Zone 13	5	2,830.00
84	R-2	2,860.00	Zone 14	12	2,860.00

Fire Flow Node FlexTable: Fire Flow Report
Active Scenario: Max Day + FF

Label	Elevation (ft)	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Calculated Zone Lower Limit @ Total Flow Needed) (psi)	Satisfies Fire Flow Constraints?
J-1	2,830.00	1,000	2,354	49.2	True
J-2	2,855.00	1,000	1,793	60.0	True
J-11	2,845.00	1,000	4,454	102.1	True
J-12	2,855.00	1,000	3,335	98.6	True
J-13	2,860.00	1,000	2,968	96.6	True
J-14	2,875.00	1,000	2,482	103.1	True

Appendix D – Fire Flow Test Results

ALLIANCE FIRE PROTECTION CO.

Phone: (480) 966-9178 Fax: (480) 967-9191
2114 East Cedar Street • Tempe, Arizona 85281
E-mail Address: afpc@afpc.com

AZ Lic. C-16 58130
AZ Lic. L-16 74007
NV Lic. C-41a 30135

FIRE HYDRANT FLOW TEST

Name: Kimley-Horn

Date: 05/17/16
Time: 8:00 AM
Report #
Tech: R.Pfeiff

Lone Mountain & Cortana
Scottsdale Arizona

Static Hydrant: SEC Lone Mountain & Cortana
Flowing Hydrant: SEC Cortana & Porta Nuova

Elevation: 2836
Elevation: 2851

Dist. Between Hydrants: 200 Yards
Type of Supply: CITY MAIN

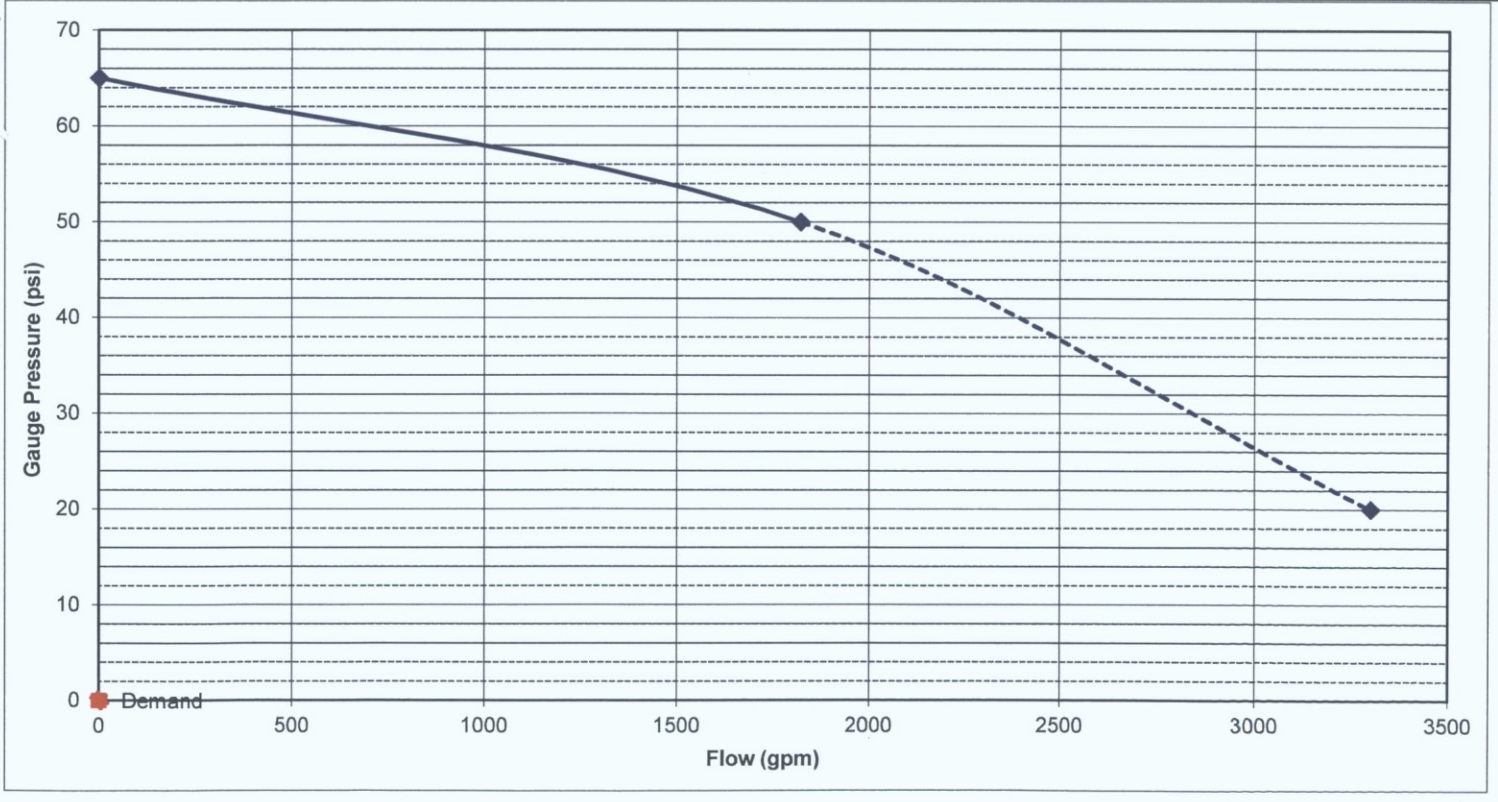
Diameter of Main: Unknown

Static Pressure:	A	65.0	B	
Residual Pressure:	A	50.0	B	

Pump Present: NO
Tank Present: NO
Req. GPM: Req. PSI:

Hydrant:	A	A	B	B
Outlet Diameter:	4.0			
Pitot Reading:	18.0			
Coeff:	0.90			
Discharge GPM:	1822	0	0	0

Flow A				Flow B			
Static pressure of	65	psi @	0 gpm	Static pressure of	0	psi @	0 gpm
Residual pressure of	50	psi @	1822 gpm	Residual pressure of	0	psi @	0 gpm
Available flow @	20	psi @	3298 gpm	Available flow @	20	psi @	gpm



Comments:

NOTES:

1. Flowing hydrant is assumed to be on a circulating main or downstream of the pressure test hydrant on a dead-end system.
2. Flow analysis assumes a gravity flow system with no distribution pumps and having no demand, other than the test
3. The distance between hydrants, elevations & main diameters are for information only.

ALLIANCE FIRE PROTECTION CO.

Phone: (480) 966-9178 Fax: (480) 967-9191
2114 East Cedar Street • Tempe, Arizona 85281
E-mail Address: afpc@afpc.com

AZ Lic. C-16 58130
AZ Lic. L-16 74007
NV Lic. C-41a 30135

FIRE HYDRANT FLOW TEST

Name: Kimley-Horn
29101500
Lone Mountain Parkway & Standing Stones Road
Scottsdale Arizona

Date: 06/30/16
Time: 7:30 AM
Report #
Tech: R.Pfeiff

Static Hydrant: SEC Lone Mountain & Standing Stones Road
Elevation:
Dist. Between Hydrants: 75 Yards
Diameter of Main: Unknown

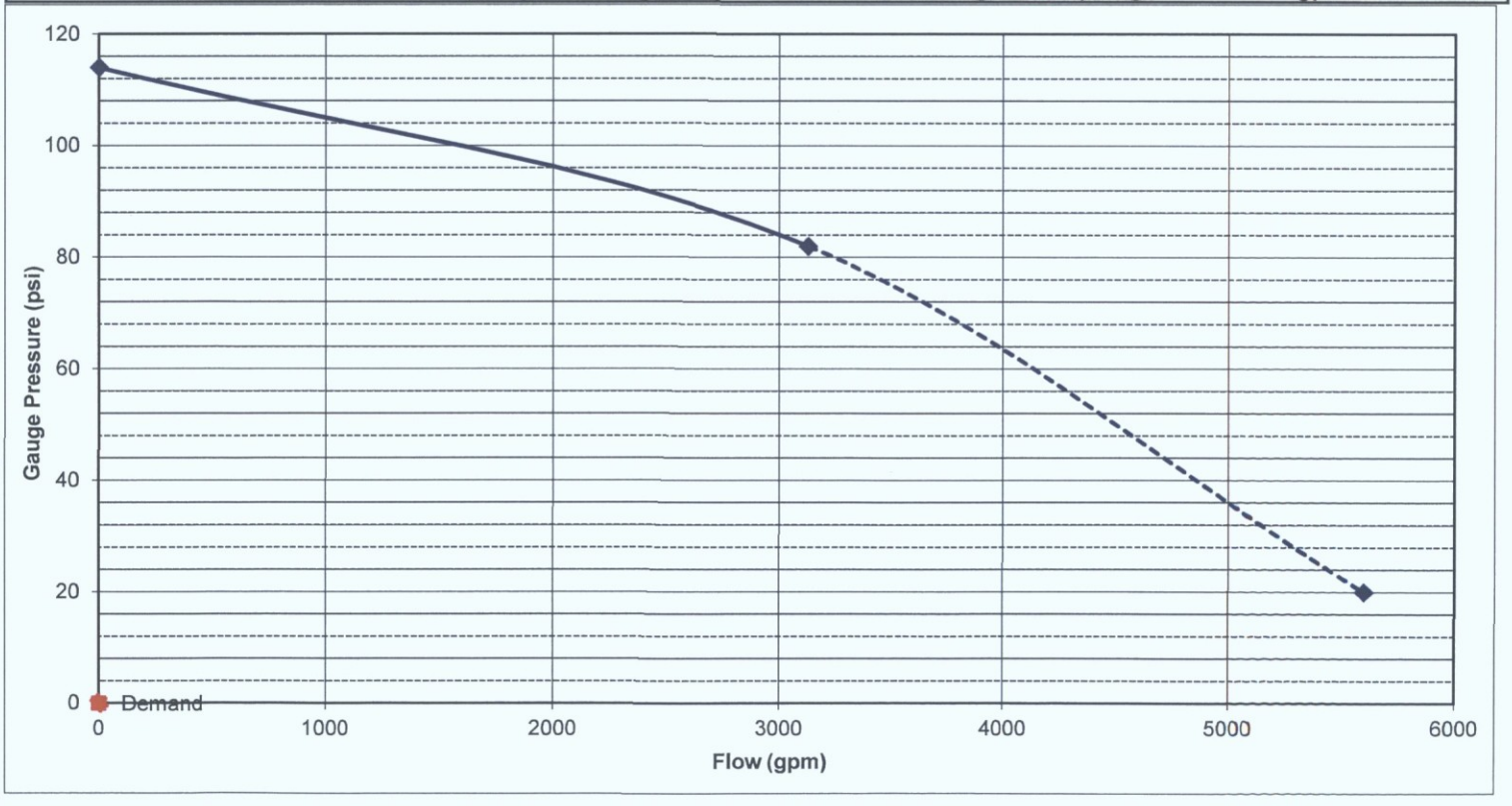
Static Pressure:	A	114.0	B	
Residual Pressure:	A	82.0	B	

Pump Present: NO
Tank Present: NO
Req. GPM: Req. PSI:

Flowing Hydrant: NEC Standing Stones & Lone Mountain Pkwy
Elevation:
Type of Supply: CITY MAIN

Hydrant:	A	A	B	B
Outlet Diameter:	4.0			
Pitot Reading:	53.0			
Coeff:	0.90			
Discharge GPM:	3127	0	0	0

Flow A				Flow B			
Static pressure of	114	psi @	0 gpm	Static pressure of	0	psi @	0 gpm
Residual pressure of	82	psi @	3127 gpm	Residual pressure of	0	psi @	0 gpm
Available flow @	20	psi @	5596 gpm	Available flow @	20	psi @	gpm



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