Water Basis of Design
**Prepared: September 2016**

# STORYROCK Phase 1B

Prepared for:

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Prepared by:

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# 1.0 INTRODUCTION

## 1.1 Project Description

The purpose of this water report is to support the proposed StoryRock Phase 1B residential development. StoryRock Phase 1B (Phase 1B) is part of the StoryRock Master Planned Community (formerly named Cavalliere Ranch), a development consisting of 462-acres of single family residential construction. A Conceptual Water Master Plan was approved October 2014 with the project Zoning Case (13-ZN-2014) and amended October 2016.

StoryRock Phase 1B is a proposed 83-acre single family residential subdivision consisting of 96 single family residential units. Phase 1B is zoned for R1-18, R1-35, and R1-43 development.

## 1.2 Project Location

StoryRock is located within Section 12 of Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is bound to the north by the Happy Valley Road Alignment and to the west by 128$^{th}$ Street. The Pinnacle Peak Road Alignment borders the site to the south. The McDowell Sonoran Preserve borders the site to the east and portions of the site to the north and south. Phase 1B is located in the northern half of the site, south of Phase 1A and bisected by Ranch Gate Road. See **Figure 1: Vicinity Map.**

## 1.3 Scope of Water Plan

The Conceptual Master Water Plan for StoryRock established water distribution design parameters, criteria and a general plan for water distribution. The report presented a conceptual layout of transmission and distribution mains. It also established pressure zones and pressure reducing valve (PRV) locations. Water demands have been calculated based on proposed zoning and a preliminary development layout.

This report presents the basis of design criteria that will be used for the engineering design of the proposed Phase 1B development. Furthermore, this report will establish the water system demands and the proposed water system infrastructure required to serve the development. Finally, the report will show the development of Phase 1B is in conformance with the approved master plan.

All design criteria that is presented in this report will conform to the City of Scottsdale Design Standards & Polices Manual (DS&PM).

**Figure 1: Vicinity Map**

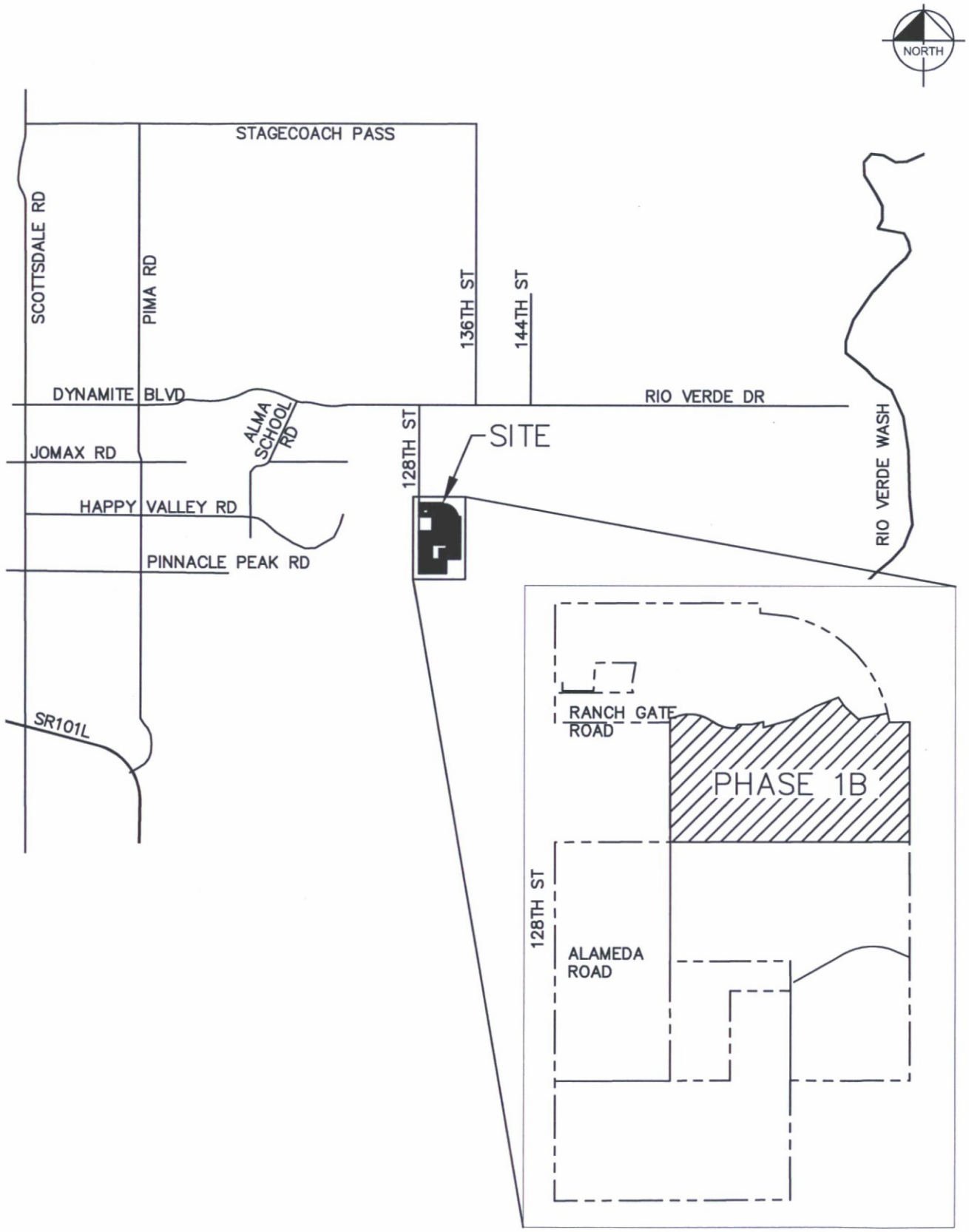


FIGURE 1
VICINITY MAP
STORYROCK

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K:\EAV_Civil\191988002 - Storyrock\Reports\Phase 1B\Water BOD\Exhibits\Figure 1 Vicinity Map.dwg Sep 07, 2016 eric.hopkins

## 2.0 EXISTING SITE CONDITIONS AND WATER SYSTEMS

### 2.1 Site Conditions

The project is undeveloped natural desert. Based on a review of City Quarter Section maps; no city water infrastructure exists on-site. The site is characterized by many washes and rock features of varying sizes. The on-site washes vary in size and depth, but generally flow from the southwest to the northeast or east through the site. Phase 1B is bordered to the east by The McDowell Sonoran Preserve. Multiple ridgelines run though the site, in the general direction of southwest to northeast. Elevations range from approximately 2630' in the southwest to 2530' in the northeast.

### 2.2 Adjacent Water Systems

Directly to the west of the project is the development of Sereno Canyon. A majority of the project infrastructure has been constructed, though none of the lots have been developed. An existing zone 13 booster pump station (PS 145) is located at Alameda Road and the 122th Street alignment, near the west edge of Sereno Canyon. The booster pump is proposed to serve the area. PS 145 is comprised of three 500 gpm pumps and a 1,750 gpm fire flow booster pump, connected to a 12,000-gallon tank. One of the pumps is required to be kept as a redundant pump. Additionally, there is space for a 4th domestic pump.

An existing 8-inch DIP waterline is located in Ranch Gate Road west of the site. This line connects to an existing 12-inch DIP waterline at 128th Street. The line in 128th Street extends north approximately 430 feet and is stubbed to the south. There is also an existing 6-inch DIP waterline in Buckskin Trail providing service to properties along the frontage. No other waterlines are located adjacent to the project.

### 2.3 Existing Pressure Zones

Based on elevations, the existing Phase 1B site falls within two (2) City of Scottsdale pressure zones: 11 and 12. Sereno Canyon to the west primarily operates in pressure zone 13. There is an existing pressure reducing valve (PRV) on the 8-inch line in Ranch Gate east of 125th Place, which reduces the line to pressure zone 12.

### 2.4 Phasing and Existing StoryRock Development

As discussed within the approved master plan, the development of StoryRock is divided into three (3) major phases. Phase 1 is intended to be the first phase of development and is further divided into three (3) sub-phases: 1A, 1B and 1C. All major phases require off-site infrastructure installment in 128th Street. Furthermore, all Phase 1 sub-phases require off-site infrastructure installment in Ranch Gate Road. Due to its proximity to the existing infrastructure at the intersection of 128th Street and Ranch Gate Road, Phase 1A has the highest feasibility of initial development. It is possible, however, that Phase 1B or 1C will be constructed prior to Phase 1A. As such, all phases of development will be required to construct the necessary infrastructure to

serve their development, including on-site and off-site waterlines and PRVs. At this time all phases of the project are concurrently proceeding through preliminary plat applications. If other phases move ahead to final engineering and construction prior to this phase, portions of the off-site system may be already designed or constructed and would no longer be developed with this phase. Payback or other agreements may be in place to reimburse the cost of construction for shared off-site infrastructure.

## 3.0 *Proposed Water System*

### 3.1 General Discussion

Per the approved master plan, the water system for StoryRock consists of an extension of the 12-inch transmission main within 128th Street and 8-inch distribution lines internal to the development. PRV's divide the project into pressure zones 12 and 13. Waterline looping is provided for redundancy and water quality. The proposed StoryRock system connects to the zone 13 water system in Sereno Canyon along the Alameda alignment west of 128th Street, and to the zone 12 system at the intersection of Ranch Gate Road and 128th Street.

### 3.2 Phase 1B Proposed Distribution System

The Phase 1B proposed on-site distribution system will consist of an 8" Class 350 DIP water line that will provide potable water and fire protection. Phase 1B will operate entirely in pressure zone 12.

The off-site waterlines needed to serve Phase 1B includes an 8-inch line within Ranch Gate Road, an extension of the 12-inch line within 128th Street from Ranch Gate Road to Alameda Road and the 12-inch connection line to Sereno Canyon. Additionally, a PRV along 128th Street is required to serve the development.

At full buildout of the StoryRock development, waterline looping is provided through the multiple phases to ensure redundancy and cycling of water for water quality. A connection to the Phase 1A distribution system is required to loop the Phase 1B distribution system. In the event Phase 1B is developed prior to Phase 1A, an off-site waterline will need to be constructed along the proposed Phase 1A alignment. The off-site waterline will provide the second connection point to the 12-inch line in 128th Street, approximately 730 feet north of Ranch Gate Road. In addition to providing redundancy, the two connections prevent long dead-end lines. All proposed dead-end distribution lines are less than 1,200 feet, satisfying the requirements of the DS&PM.

See **Figure 2: Water System Layout** for waterline and PRV locations.

# 4.0 METHODOLOGY AND CALCULATIONS

## 4.1 General Discussion

The proposed water distribution system for Phase 1B has been designed to provide the calculated domestic and fire flow demands for the project, while maintaining required operating pressures. The design criterion conforms to the approved Conceptual Water Master Plan and is based on requirements described within the City of Scottsdale Design Standards and Policies Manual (DS&PM).

## 4.2 Water Demands, Fire Flows, Pressures

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 Flow. 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 Error! Not a valid bookmark self-reference. below for a summary of water demands. 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.

**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 | 96 | 485.6 | 46,618 | 32 | 93,235 | 65 | 163,162 | 113 |

## 4.3 Hydraulic Model

The WaterCAD v8i water system modeling software distributed by Haestad Methods, Inc. was used to model the proposed water network. The model is calibrated with provided existing system information and tested fire flow conditions. A fire flow test was performed to determine the residual and static pressure of the existing system. The test was performed along Ranch Gate Road near 125th Place. The static hydrant is located to the west of the existing PRV in pressure zone 13. Based on the fire flow test a pump curve is generated. Within the model a pump connected to a reservoir is attached to the model at the static hydrant.

Pump information was also provided for the existing Sereno Canyon booster pump station. This allows a schematic representation of the pump station to be included within the model, including the reservoir tank and the 4 existing pumps.

Refer to **Appendix A** for fire flow test results and the PS-145 pump curves.

Four scenarios are analyzed within the hydraulic models: Average Day Demands, Max Day Demands, Peak Hour Demands, and Max Day plus Fire Flow Demands. Demands are applied at each on-site junction based on the number of adjacent proposed units.

The approved master plan details further analysis of the pump station and build-out scenarios for StoryRock and the surrounding area. For this analysis, only the reservoir and pump correlating to the fire flow test were activated, leaving the booster station inactive.

The waterline loop through Phase 1A is not included in the hydraulic model. This allows the modelling results to prove the system can provide required flows and pressures without the waterline loop. This allows more flexibility in how the waterline looping is provided at final design.

## 4.5 Results

Based on the results of the hydraulic modeling, the proposed water distribution system can provide the required domestic and fire flow water demands to the project while maintaining required operating pressures. The 8-inch distribution system with a 12-inch line located in 128$^{th}$ street provides adequate flow for both domestic and fire flow scenarios. The proposed pressure zone maintains system pressure on-site in an adequate range of 50-120 psi. Booster station PS 145 does not need to be active for Phase 1B to satisfy domestic or fire flow water demands as a standalone development.

See **Appendix B** for complete results of the hydraulic models.

## *Appendix A* – Fire Flow Test Results and PS-145 Pump Curves

ALLIANCE FIRE PROTECTION CO.
FIRE SPRINKLERS

# 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
Senora Canyon
Ranch Gate & 125 Place
Scottsdale Arizona

Date: 03/28/14
Time: 9:00 AM
Report #
Tech: R.Pfeiff

Static Hydrant: 150 Yards west of 125th Pl. on North side of Ranch Gate
Elevation: 2690
Dist. Between Hydrants: 300 Yards
Diameter of Main: 8"

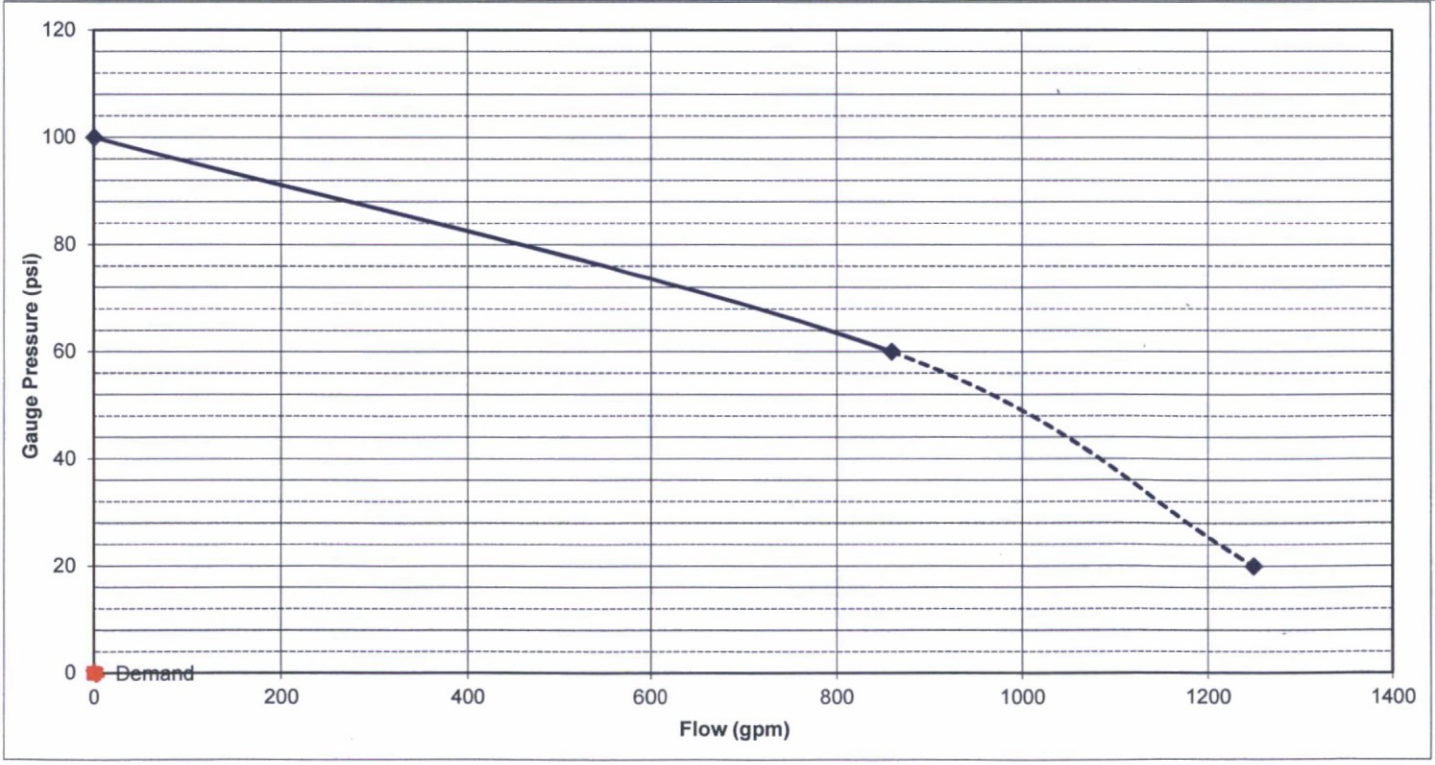
| | | | | |
|---|---|---|---|---|
| Static Pressure: | A | 100.0 | B | |
| Residual Pressure: | A | 60.0 | B | |

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

Flowing Hydrant: 150 Yards east of 125th Pl. on North side of Ranch Gate
Elevation: 2677
Type of Supply: CITY MAIN

| Hydrant: | A | A | B | B |
|---|---|---|---|---|
| Outlet Diameter: | 4.0 | | | |
| Pitot Reading: | 4.0 | | | |
| Coeff: | 0.90 | | | |
| Discharge GPM: | 859 | 0 | 0 | 0 |

| Flow A | | | | Flow B | | | |
|---|---|---|---|---|---|---|---|
| Static pressure of | 100 | psi @ | 0 gpm | Static pressure of | 0 | psi @ | 0 gpm |
| Residual pressure of | 60 | psi @ | 859 gpm | Residual pressure of | 0 | psi @ | 0 gpm |
| Available flow @ | 20 | psi @ | 1249 gpm | Available flow @ | 20 | psi @ | gpm |




**Comments:** Elevations are approximate

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

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

## FIRE HYDRANT FLOW TEST

Name: Kimley-Horn
Senora Canyon
Alameda & 124th Street
Scottsdale Arizona

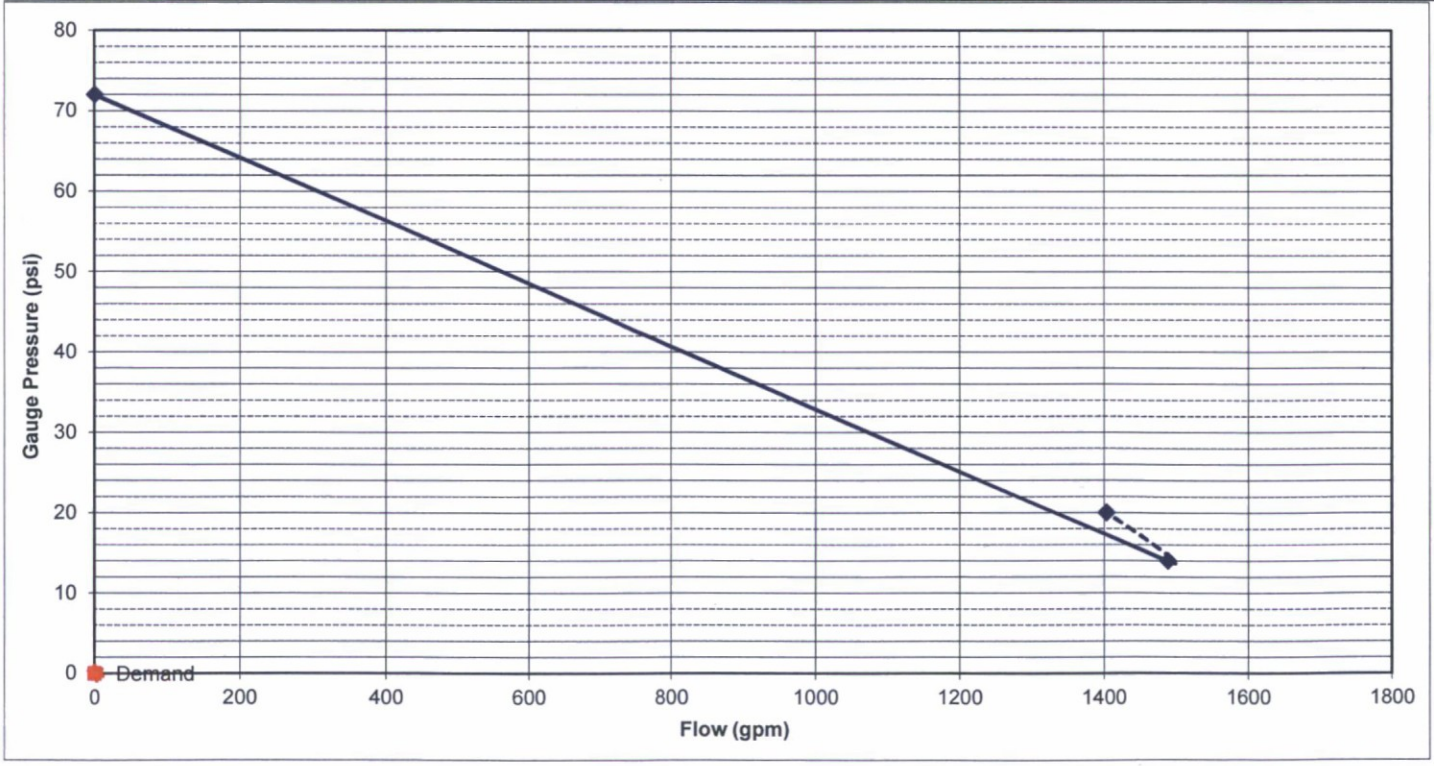
Date: 03/28/14
Time: 9:00 AM
Report #
Tech: R.Pfeiff

Static Hydrant: NWC Alameda & 124th St.
Elevation: 2766
Dist. Between Hydrants: 500 yards
Diameter of Main: 8"
Static Pressure: A 72.0 B
Residual Pressure: A 14.0 B
Pump Present: NO
Tank Present: NO
Req. GPM: Req. PSI:

Flowing Hydrant: NWC 121st St & Alameda
Elevation: 2712
Type of Supply: CITY MAIN

| Hydrant: | A | A | B | B |
|---|---|---|---|---|
| Outlet Diameter: | 4.0 | | | |
| Pitot Reading: | 12.0 | | | |
| Coeff: | 0.90 | | | |
| Discharge GPM: | 1488 | 0 | 0 | 0 |

| Flow A | | | | Flow B | | | |
|---|---|---|---|---|---|---|---|
| Static pressure of | 72 | psi @ | 0 gpm | Static pressure of | 0 | psi @ | 0 gpm |
| Residual pressure of | 14 | psi @ | 1488 gpm | Residual pressure of | 0 | psi @ | 0 gpm |
| Available flow @ | 20 | psi @ | 1403 gpm | Available flow @ | 20 | psi @ | gpm |




**Comments:** Elevations are approximate

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

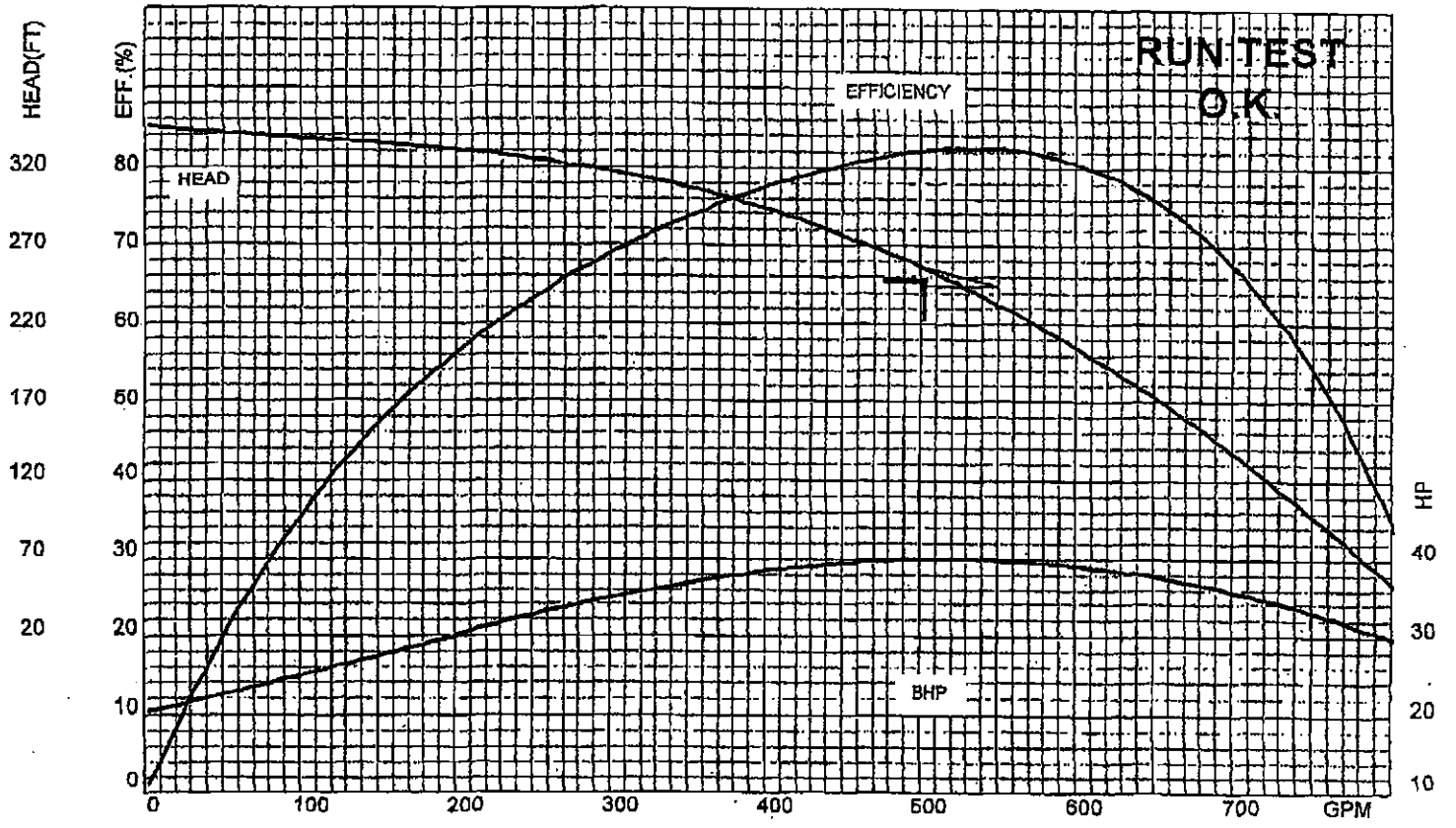
S-145 P 1-3

HYDRAULIC PERFORMANCE WARRANTY
GUARANTEED AT DESIGNED POINT ONLY AND IS CONTINGENT ON:
1.PROPER NPSH OR SUBMERGENCE AVAILABLE.
2.PROPER AND ADEQUATE FLOW TO PUMP SUCTION.
3.FLUID FREE OF GAS, AIR, AND ABRASIVE MATTER.
4.IMPELLER WITH PROPER LATERAL ADJUSTMENT (VERTICAL PUMP ONLY).

PEERLESS PUMPS

TEST SITE: Lubbock TX
BY: TH
DATE: 9/15/2008
CUSTOMER: P.E.C. PUMP

| | | | |
|---|---|---|---|
| PUMP: | 10MA | Rated GPM: | 500.00 |
| IMP. NO.: | T84383 | Rated Hd(ft): | 246.00 |
| SHOP ORDER: | 747272B-2 | Rated RPM: | 1762 |
| STAGES: | 8 | Rated HP | 36.97 |
| IMP. DIA1: | 1 @ 6.75 X 6.75 | Rated Eff % | 81.40 |
| IMP. DIA2: | 2-8 @ 6.88 X 6.88 | Spec. Gravity: | 1.000 |
| IMP. DIA3: | 0 | | |




CERTIFIED BOWL PERFORMANCE TEST CURVE

S-145 P-5

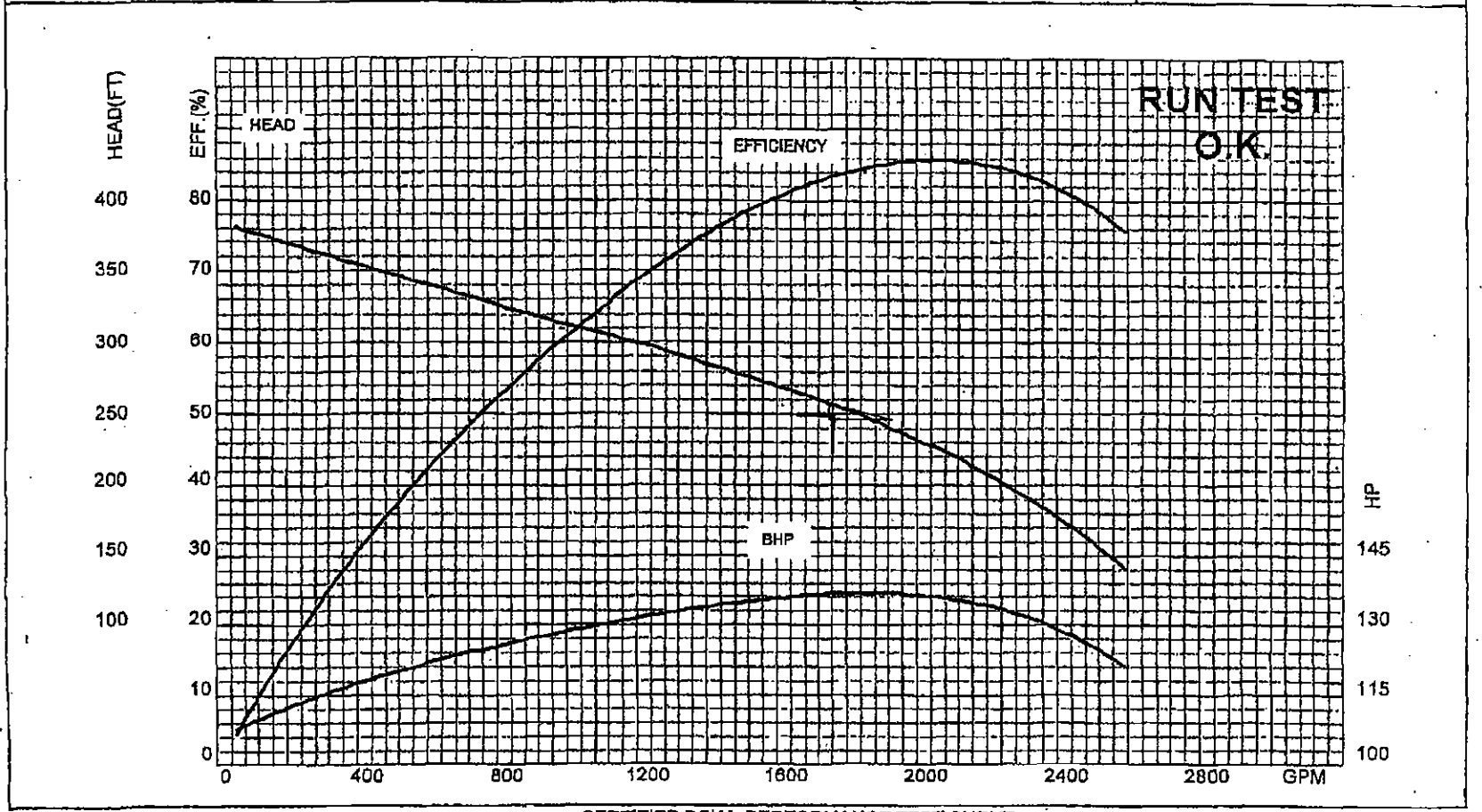
HYDRAULIC PERFORMANCE WARRANTY
GUARANTEED AT DESIGNED POINT ONLY AND IS CONTINGENT ON:
1.PROPER NPSH OR SUBMERGENCE AVAILABLE.
2.PROPER AND ADEQUATE FLOW TO PUMP SUCTION.
3.FLUID FREE OF GAS, AIR, AND ABRASIVE MATTER.
4.IMPELLER WITH PROPER LATERAL ADJUSTMENT (VERTICAL PUMP ONLY).

PEERLESS PUMPS

TEST SITE: Lubbock TX
BY: TH
DATE: 9/18/2008
CUSTOMER: P.E.C. PUMP

| | |
|---|---|
| PUMP: | M14HXB |
| IMP. NO.: | V4399 |
| SHOP ORDER: | 747310A-1 |
| STAGES: | 4 |
| IMP. DIA1: | 1-3 @ 9.16 X 10.44 |
| IMP. DIA2: | 4 @8.86 X 9.94 |
| IMP. DIA3: | 0 |

| | |
|---|---|
| Rated GPM: | 1750.00 |
| Rated Hd(ft): | 245.00 |
| Rated RPM: | 1782 |
| Rated HP | 134.90 |
| Rated Eff % | 82.30 |
| Spec. Gravity: | 1.000 |




CERTIFIED BOWL PERFORMANCE TEST CURVE

## *Appendix B– WaterCAD Model Results*

# FlexTable: Junction Table
## Storyrock Phase 1B.wtg
## Active Scenario: Average Day

| Label | Elevation (ft) | Demand (gpm) | Hydraulic Grade (ft) | Pressure (psi) | Zone |
|---|---|---|---|---|---|
| J-1 | 2,640.00 | 0 | 2,810.04 | 73.6 | Zone 12 |
| J-2 | 2,695.00 | 0 | 2,920.75 | 97.7 | Zone 13 |
| J-3 | 2,604.00 | 0 | 2,810.00 | 89.1 | Zone 11 |
| J-4 | 2,588.00 | 0 | 2,809.99 | 96.0 | Zone 11 |
| J-5 | 2,584.00 | 4 | 2,809.99 | 97.8 | Zone 11 |
| J-6 | 2,578.00 | 2 | 2,809.99 | 100.4 | Zone 11 |
| J-7 | 2,552.00 | 10 | 2,809.98 | 111.6 | Zone 11 |
| J-8 | 2,542.00 | 2 | 2,809.99 | 115.9 | Zone 11 |
| J-9 | 2,608.00 | 5 | 2,809.99 | 87.4 | Zone 11 |
| J-10 | 2,614.00 | 3 | 2,809.99 | 84.8 | Zone 11 |
| J-11 | 2,591.00 | 2 | 2,809.99 | 94.7 | Zone 11 |
| J-12 | 2,605.00 | 3 | 2,810.00 | 88.7 | Zone 11 |
| SC-1 | 2,735.00 | 0 | 2,920.76 | 80.4 | Zone 13 |
| SC-2 | 2,755.00 | 0 | 2,920.77 | 71.7 | Zone 13 |
| SC-3 | 2,767.00 | 0 | 2,920.76 | 66.5 | Zone 13 |
| SC-4 | 2,780.00 | 0 | 2,920.76 | 60.9 | Zone 13 |
| SC-5 | 2,762.00 | 0 | 2,920.76 | 68.7 | Zone 13 |
| SC-6 | 2,725.00 | 0 | 2,920.76 | 84.7 | Zone 13 |
| SC-7 | 2,600.00 | 0 | 2,726.00 | 54.5 | Zone 13 |
| SC-8 | 2,693.50 | 0 | 2,920.78 | 98.3 | Zone 13 |
| SC-9 | 2,744.68 | 0 | 2,920.76 | 76.2 | Zone 13 |

# FlexTable: Pipe Table
## Storyrock Phase 1B.wtg
## Active Scenario: Average Day

| Label | Length (Scaled) (ft) | Start Node | Stop Node | Diameter (in) | Hazen-Williams C | Flow (gpm) | Velocity (ft/s) | Headloss Gradient (ft/1000ft) |
|---|---|---|---|---|---|---|---|---|
| FH-1 | 260 | R-FH | FF TEST 1 | 48.0 | 130.0 | 33 | 0.01 | 0.000 |
| FH-2 | 345 | FF TEST 1 | SC-8 | 36.0 | 130.0 | 33 | 0.01 | 0.000 |
| P-1 | 301 | T-1 | SC-7 | 24.0 | 130.0 | 0 | 0.00 | 0.000 |
| P-1 | 272 | SC-7 | PUMP 1 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-2 | 257 | SC-7 | PUMP 2 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-3 | 267 | SC-7 | PUMP 3 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-4 | 292 | SC-7 | PUMP 5 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-5 | 263 | PUMP 1 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-6 | 273 | PUMP 2 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-7 | 280 | PUMP 3 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-8 | 304 | PUMP 5 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-9 | 1,049 | SC-6 | SC-3 | 12.0 | 130.0 | 0 | 0.00 | 0.000 |
| P-10 | 725 | SC-3 | SC-4 | 12.0 | 130.0 | 9 | 0.03 | 0.001 |
| P-11 | 985 | SC-4 | SC-5 | 12.0 | 130.0 | 9 | 0.03 | 0.000 |
| P-12 | 2,393 | SC-1 | SC-3 | 8.0 | 130.0 | 9 | 0.06 | 0.003 |
| P-13 | 1,027 | SC-1 | SC-2 | 8.0 | 130.0 | -9 | 0.06 | 0.003 |
| P-14 | 782 | SC-2 | SC-8 | 8.0 | 130.0 | -21 | 0.13 | 0.014 |
| P-15 | 227 | SC-8 | PRV-1 | 8.0 | 130.0 | 12 | 0.08 | 0.005 |
| P-16 | 1,460 | PRV-1 | J-1 | 8.0 | 130.0 | 12 | 0.08 | 0.005 |
| P-17 | 2,375 | J-1 | PRV-2 | 12.0 | 130.0 | -21 | 0.06 | 0.002 |
| P-18 | 2,399 | SC-2 | SC-5 | 8.0 | 130.0 | 11 | 0.07 | 0.005 |
| P-19 | 446 | SC-5 | SC-9 | 12.0 | 130.0 | 21 | 0.06 | 0.002 |
| P-20 | 1,343 | SC-9 | J-2 | 12.0 | 130.0 | 21 | 0.06 | 0.002 |
| P-21 | 286 | J-2 | PRV-2 | 12.0 | 130.0 | 21 | 0.06 | 0.003 |
| P-22 | 1,317 | J-1 | J-3 | 8.0 | 130.0 | 33 | 0.21 | 0.032 |
| P-23 | 730 | J-3 | J-4 | 8.0 | 130.0 | 15 | 0.10 | 0.008 |
| P-24 | 433 | J-4 | J-5 | 8.0 | 130.0 | 15 | 0.10 | 0.008 |
| P-25 | 315 | J-5 | J-6 | 8.0 | 130.0 | 9 | 0.06 | 0.003 |
| P-26 | 1,188 | J-6 | J-7 | 8.0 | 130.0 | 10 | 0.06 | 0.004 |
| P-27 | 1,154 | J-5 | J-8 | 8.0 | 130.0 | 2 | 0.01 | 0.000 |
| P-28 | 887 | J-9 | J-6 | 8.0 | 130.0 | 3 | 0.02 | 0.001 |
| P-29 | 478 | J-9 | J-10 | 8.0 | 130.0 | 3 | 0.02 | 0.001 |
| P-30 | 697 | J-9 | J-11 | 8.0 | 130.0 | -12 | 0.08 | 0.005 |
| P-31 | 507 | J-11 | J-12 | 8.0 | 130.0 | -14 | 0.09 | 0.007 |
| P-32 | 246 | J-12 | J-3 | 8.0 | 130.0 | -18 | 0.11 | 0.010 |

# FlexTable: PRV Table

## Storyrock Phase 1B.wtg

## Active Scenario: Average Day

| Label | Elevation (ft) | Flow (gpm) | Hydraulic Grade (From) (ft) | Hydraulic Grade (To) (ft) | Headloss (ft) | Zone |
|---|---|---|---|---|---|---|
| PRV-1 | 2,675.56 | 12 | 2,920.78 | 2,810.05 | 110.73 | Zone 12 |
| PRV-2 | 2,685.00 | 21 | 2,920.75 | 2,810.05 | 110.71 | Zone 12 |

# FlexTable: Pump Table
## Storyrock Phase 1B.wtg
## Active Scenario: Average Day

| Label | Elevation (ft) | Hydraulic Grade (Suction) (ft) | Hydraulic Grade (Discharge) (ft) | Flow (Total) (gpm) | Flow (Design) (gpm) | Pump Head (ft) | Head (Design) (ft) | Zone |
|---|---|---|---|---|---|---|---|---|
| FF TEST 1 | 2,690.00 | 2,690.00 | 2,920.78 | 33 | (N/A) | 230.78 | (N/A) | Zone 13 |
| PUMP 1 | 2,717.00 | (N/A) | (N/A) | (N/A) | 500 | (N/A) | 245.00 | Zone 13 |
| PUMP 2 | 2,717.00 | (N/A) | (N/A) | (N/A) | 500 | (N/A) | 245.00 | Zone 13 |
| PUMP 3 | 2,717.00 | (N/A) | (N/A) | (N/A) | 500 | (N/A) | 245.00 | Zone 13 |
| PUMP 5 | 2,717.00 | (N/A) | (N/A) | (N/A) | 1,750 | (N/A) | 245.00 | Zone 13 |



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Watertown, CT 06795 USA +1-203-755-1666

# FlexTable: Reservoir Table
## Storyrock Phase 1B.wtg
## Active Scenario: Average Day

| Label | Elevation (ft) | Flow (Out net) (gpm) | Hydraulic Grade (ft) | Zone |
|---|---|---|---|---|
| R-FH | 2,690.00 | 33 | 2,690.00 | Zone 13 |



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# FlexTable: Tank Table
# Storyrock Phase 1B.wtg
# Active Scenario: Average Day

| Label | Elevation (Base) (ft) | Elevation (Minimum) (ft) | Elevation (Initial) (ft) | Elevation (Maximum) (ft) | Diameter (ft) | Flow (Out net) (gpm) | Hydraulic Grade (ft) | Zone |
|---|---|---|---|---|---|---|---|---|
| T-1 | 2,720.00 | 2,720.00 | 2,726.00 | 2,727.00 | 20.00 | 0 | 2,726.00 | Zone 12 |

# FlexTable: Junction Table
# Storyrock Phase 1B.wtg
# Active Scenario: Max Day

| Label | Elevation (ft) | Demand (gpm) | Hydraulic Grade (ft) | Pressure (psi) | Zone |
|---|---|---|---|---|---|
| J-1 | 2,640.00 | 1 | 2,810.03 | 73.6 | Zone 12 |
| J-2 | 2,695.00 | 0 | 2,920.09 | 97.4 | Zone 13 |
| J-3 | 2,604.00 | 0 | 2,809.87 | 89.1 | Zone 11 |
| J-4 | 2,588.00 | 0 | 2,809.85 | 96.0 | Zone 11 |
| J-5 | 2,584.00 | 9 | 2,809.84 | 97.7 | Zone 11 |
| J-6 | 2,578.00 | 4 | 2,809.84 | 100.3 | Zone 11 |
| J-7 | 2,552.00 | 20 | 2,809.82 | 111.5 | Zone 11 |
| J-8 | 2,542.00 | 4 | 2,809.84 | 115.9 | Zone 11 |
| J-9 | 2,608.00 | 11 | 2,809.84 | 87.3 | Zone 11 |
| J-10 | 2,614.00 | 7 | 2,809.84 | 84.7 | Zone 11 |
| J-11 | 2,591.00 | 4 | 2,809.85 | 94.7 | Zone 11 |
| J-12 | 2,605.00 | 7 | 2,809.86 | 88.6 | Zone 11 |
| SC-1 | 2,735.00 | 0 | 2,920.14 | 80.1 | Zone 13 |
| SC-2 | 2,755.00 | 0 | 2,920.16 | 71.5 | Zone 13 |
| SC-3 | 2,767.00 | 0 | 2,920.11 | 66.2 | Zone 13 |
| SC-4 | 2,780.00 | 0 | 2,920.11 | 60.6 | Zone 13 |
| SC-5 | 2,762.00 | 0 | 2,920.11 | 68.4 | Zone 13 |
| SC-6 | 2,725.00 | 0 | 2,920.11 | 84.4 | Zone 13 |
| SC-7 | 2,600.00 | 0 | 2,726.00 | 54.5 | Zone 13 |
| SC-8 | 2,693.50 | 0 | 2,920.20 | 98.1 | Zone 13 |
| SC-9 | 2,744.68 | 0 | 2,920.11 | 75.9 | Zone 13 |

# FlexTable: Pipe Table
# Storyrock Phase 1B.wtg
# 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/1000ft) |
|---|---|---|---|---|---|---|---|---|
| FH-1 | 260 | R-FH | FF TEST 1 | 48.0 | 130.0 | 66 | 0.01 | 0.000 |
| FH-2 | 345 | FF TEST 1 | SC-8 | 36.0 | 130.0 | 66 | 0.02 | 0.000 |
| P-1 | 301 | T-1 | SC-7 | 24.0 | 130.0 | 0 | 0.00 | 0.000 |
| P-1 | 272 | SC-7 | PUMP 1 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-2 | 257 | SC-7 | PUMP 2 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-3 | 267 | SC-7 | PUMP 3 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-4 | 292 | SC-7 | PUMP 5 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-5 | 263 | PUMP 1 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-6 | 273 | PUMP 2 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-7 | 280 | PUMP 3 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-8 | 304 | PUMP 5 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-9 | 1,049 | SC-6 | SC-3 | 12.0 | 130.0 | 0 | 0.00 | 0.000 |
| P-10 | 725 | SC-3 | SC-4 | 12.0 | 130.0 | 20 | 0.06 | 0.002 |
| P-11 | 985 | SC-4 | SC-5 | 12.0 | 130.0 | 20 | 0.06 | 0.002 |
| P-12 | 2,393 | SC-1 | SC-3 | 8.0 | 130.0 | 20 | 0.13 | 0.013 |
| P-13 | 1,027 | SC-1 | SC-2 | 8.0 | 130.0 | -20 | 0.13 | 0.013 |
| P-14 | 782 | SC-2 | SC-8 | 8.0 | 130.0 | -44 | 0.28 | 0.057 |
| P-15 | 227 | SC-8 | PRV-1 | 8.0 | 130.0 | 22 | 0.14 | 0.015 |
| P-16 | 1,460 | PRV-1 | J-1 | 8.0 | 130.0 | 22 | 0.14 | 0.015 |
| P-17 | 2,375 | J-1 | PRV-2 | 12.0 | 130.0 | -44 | 0.13 | 0.008 |
| P-18 | 2,399 | SC-2 | SC-5 | 8.0 | 130.0 | 25 | 0.16 | 0.019 |
| P-19 | 446 | SC-5 | SC-9 | 12.0 | 130.0 | 44 | 0.13 | 0.008 |
| P-20 | 1,343 | SC-9 | J-2 | 12.0 | 130.0 | 44 | 0.13 | 0.008 |
| P-21 | 286 | J-2 | PRV-2 | 12.0 | 130.0 | 44 | 0.13 | 0.008 |
| P-22 | 1,317 | J-1 | J-3 | 8.0 | 130.0 | 65 | 0.42 | 0.117 |
| P-23 | 730 | J-3 | J-4 | 8.0 | 130.0 | 30 | 0.19 | 0.028 |
| P-24 | 433 | J-4 | J-5 | 8.0 | 130.0 | 30 | 0.19 | 0.028 |
| P-25 | 315 | J-5 | J-6 | 8.0 | 130.0 | 18 | 0.11 | 0.011 |
| P-26 | 1,188 | J-6 | J-7 | 8.0 | 130.0 | 20 | 0.13 | 0.013 |
| P-27 | 1,154 | J-5 | J-8 | 8.0 | 130.0 | 4 | 0.03 | 0.001 |
| P-28 | 887 | J-9 | J-6 | 8.0 | 130.0 | 7 | 0.04 | 0.002 |
| P-29 | 478 | J-9 | J-10 | 8.0 | 130.0 | 7 | 0.04 | 0.002 |
| P-30 | 697 | J-9 | J-11 | 8.0 | 130.0 | -24 | 0.15 | 0.019 |
| P-31 | 507 | J-11 | J-12 | 8.0 | 130.0 | -28 | 0.18 | 0.025 |
| P-32 | 246 | J-12 | J-3 | 8.0 | 130.0 | -35 | 0.22 | 0.037 |

# FlexTable: PRV Table

## Storyrock Phase 1B.wtg

## Active Scenario: Max Day

| Label | Elevation (ft) | Flow (gpm) | Hydraulic Grade (From) (ft) | Hydraulic Grade (To) (ft) | Headloss (ft) | Zone |
|---|---|---|---|---|---|---|
| PRV-1 | 2,675.56 | 22 | 2,920.20 | 2,810.05 | 110.15 | Zone 12 |
| PRV-2 | 2,685.00 | 44 | 2,920.09 | 2,810.05 | 110.05 | Zone 12 |

# FlexTable: Pump Table
## Storyrock Phase 1B.wtg
## Active Scenario: Max Day

| Label | Elevation (ft) | Hydraulic Grade (Suction) (ft) | Hydraulic Grade (Discharge) (ft) | Flow (Total) (gpm) | Flow (Design) (gpm) | Pump Head (ft) | Head (Design) (ft) | Zone |
|---|---|---|---|---|---|---|---|---|
| FF TEST 1 | 2,690.00 | 2,690.00 | 2,920.20 | 66 | (N/A) | 230.20 | (N/A) | Zone 13 |
| PUMP 1 | 2,717.00 | (N/A) | (N/A) | (N/A) | 500 | (N/A) | 245.00 | Zone 13 |
| PUMP 2 | 2,717.00 | (N/A) | (N/A) | (N/A) | 500 | (N/A) | 245.00 | Zone 13 |
| PUMP 3 | 2,717.00 | (N/A) | (N/A) | (N/A) | 500 | (N/A) | 245.00 | Zone 13 |
| PUMP 5 | 2,717.00 | (N/A) | (N/A) | (N/A) | 1,750 | (N/A) | 245.00 | Zone 13 |


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# FlexTable: Reservoir Table
# Storyrock Phase 1B.wtg
# Active Scenario: Max Day

| Label | Elevation (ft) | Flow (Out net) (gpm) | Hydraulic Grade (ft) | Zone |
|---|---|---|---|---|
| R-FH | 2,690.00 | 66 | 2,690.00 | Zone 13 |



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# FlexTable: Tank Table
# Storyrock Phase 1B.wtg
# Active Scenario: Max Day

| Label | Elevation (Base) (ft) | Elevation (Minimum) (ft) | Elevation (Initial) (ft) | Elevation (Maximum) (ft) | Diameter (ft) | Flow (Out net) (gpm) | Hydraulic Grade (ft) | Zone |
|---|---|---|---|---|---|---|---|---|
| T-1 | 2,720.00 | 2,720.00 | 2,726.00 | 2,727.00 | 20.00 | 0 | 2,726.00 | Zone 12 |

# FlexTable: Junction Table
## Storyrock Phase 1B.wtg
## Active Scenario: Peak Hour

| Label | Elevation (ft) | Demand (gpm) | Hydraulic Grade (ft) | Pressure (psi) | Zone |
|---|---|---|---|---|---|
| J-1 | 2,640.00 | 1 | 2,809.99 | 73.5 | Zone 12 |
| J-2 | 2,695.00 | 0 | 2,918.44 | 96.7 | Zone 13 |
| J-3 | 2,604.00 | 0 | 2,809.56 | 88.9 | Zone 11 |
| J-4 | 2,588.00 | 0 | 2,809.50 | 95.8 | Zone 11 |
| J-5 | 2,584.00 | 15 | 2,809.46 | 97.5 | Zone 11 |
| J-6 | 2,578.00 | 7 | 2,809.45 | 100.1 | Zone 11 |
| J-7 | 2,552.00 | 35 | 2,809.41 | 111.4 | Zone 11 |
| J-8 | 2,542.00 | 7 | 2,809.46 | 115.7 | Zone 11 |
| J-9 | 2,608.00 | 19 | 2,809.46 | 87.2 | Zone 11 |
| J-10 | 2,614.00 | 12 | 2,809.46 | 84.6 | Zone 11 |
| J-11 | 2,591.00 | 7 | 2,809.49 | 94.5 | Zone 11 |
| J-12 | 2,605.00 | 12 | 2,809.53 | 88.5 | Zone 11 |
| SC-1 | 2,735.00 | 0 | 2,918.58 | 79.4 | Zone 13 |
| SC-2 | 2,755.00 | 0 | 2,918.61 | 70.8 | Zone 13 |
| SC-3 | 2,767.00 | 0 | 2,918.49 | 65.5 | Zone 13 |
| SC-4 | 2,780.00 | 0 | 2,918.48 | 59.9 | Zone 13 |
| SC-5 | 2,762.00 | 0 | 2,918.48 | 67.7 | Zone 13 |
| SC-6 | 2,725.00 | 0 | 2,918.49 | 83.7 | Zone 13 |
| SC-7 | 2,600.00 | 0 | 2,726.00 | 54.5 | Zone 13 |
| SC-8 | 2,693.50 | 0 | 2,918.74 | 97.5 | Zone 13 |
| SC-9 | 2,744.68 | 0 | 2,918.47 | 75.2 | Zone 13 |

# FlexTable: Pipe Table
# Storyrock Phase 1B.wtg
# 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/1000ft) |
|---|---|---|---|---|---|---|---|---|
| FH-1 | 260 | R-FH | FF TEST 1 | 48.0 | 130.0 | 116 | 0.02 | 0.000 |
| FH-2 | 345 | FF TEST 1 | SC-8 | 36.0 | 130.0 | 116 | 0.04 | 0.000 |
| P-1 | 301 | T-1 | SC-7 | 24.0 | 130.0 | 0 | 0.00 | 0.000 |
| P-1 | 272 | SC-7 | PUMP 1 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-2 | 257 | SC-7 | PUMP 2 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-3 | 267 | SC-7 | PUMP 3 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-4 | 292 | SC-7 | PUMP 5 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-5 | 263 | PUMP 1 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-6 | 273 | PUMP 2 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-7 | 280 | PUMP 3 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-8 | 304 | PUMP 5 | SC-6 | 12.0 | 130.0 | (N/A) | (N/A) | (N/A) |
| P-9 | 1,049 | SC-6 | SC-3 | 12.0 | 130.0 | 0 | 0.00 | 0.000 |
| P-10 | 725 | SC-3 | SC-4 | 12.0 | 130.0 | 35 | 0.10 | 0.005 |
| P-11 | 985 | SC-4 | SC-5 | 12.0 | 130.0 | 35 | 0.10 | 0.005 |
| P-12 | 2,393 | SC-1 | SC-3 | 8.0 | 130.0 | 35 | 0.22 | 0.037 |
| P-13 | 1,027 | SC-1 | SC-2 | 8.0 | 130.0 | -35 | 0.22 | 0.037 |
| P-14 | 782 | SC-2 | SC-8 | 8.0 | 130.0 | -79 | 0.50 | 0.166 |
| P-15 | 227 | SC-8 | PRV-1 | 8.0 | 130.0 | 37 | 0.23 | 0.040 |
| P-16 | 1,460 | PRV-1 | J-1 | 8.0 | 130.0 | 37 | 0.23 | 0.040 |
| P-17 | 2,375 | J-1 | PRV-2 | 12.0 | 130.0 | -79 | 0.22 | 0.023 |
| P-18 | 2,399 | SC-2 | SC-5 | 8.0 | 130.0 | 44 | 0.28 | 0.056 |
| P-19 | 446 | SC-5 | SC-9 | 12.0 | 130.0 | 79 | 0.22 | 0.023 |
| P-20 | 1,343 | SC-9 | J-2 | 12.0 | 130.0 | 79 | 0.22 | 0.023 |
| P-21 | 286 | J-2 | PRV-2 | 12.0 | 130.0 | 79 | 0.22 | 0.023 |
| P-22 | 1,317 | J-1 | J-3 | 8.0 | 130.0 | 114 | 0.73 | 0.330 |
| P-23 | 730 | J-3 | J-4 | 8.0 | 130.0 | 53 | 0.34 | 0.080 |
| P-24 | 433 | J-4 | J-5 | 8.0 | 130.0 | 53 | 0.34 | 0.080 |
| P-25 | 315 | J-5 | J-6 | 8.0 | 130.0 | 31 | 0.20 | 0.029 |
| P-26 | 1,188 | J-6 | J-7 | 8.0 | 130.0 | 35 | 0.23 | 0.038 |
| P-27 | 1,154 | J-5 | J-8 | 8.0 | 130.0 | 7 | 0.05 | 0.002 |
| P-28 | 887 | J-9 | J-6 | 8.0 | 130.0 | 12 | 0.07 | 0.005 |
| P-29 | 478 | J-9 | J-10 | 8.0 | 130.0 | 12 | 0.08 | 0.005 |
| P-30 | 697 | J-9 | J-11 | 8.0 | 130.0 | -42 | 0.27 | 0.053 |
| P-31 | 507 | J-11 | J-12 | 8.0 | 130.0 | -50 | 0.32 | 0.070 |
| P-32 | 246 | J-12 | J-3 | 8.0 | 130.0 | -61 | 0.39 | 0.104 |

# FlexTable: PRV Table
## Storyrock Phase 1B.wtg
## Active Scenario: Peak Hour

| Label | Elevation (ft) | Flow (gpm) | Hydraulic Grade (From) (ft) | Hydraulic Grade (To) (ft) | Headloss (ft) | Zone |
|---|---|---|---|---|---|---|
| PRV-1 | 2,675.56 | 37 | 2,918.74 | 2,810.05 | 108.69 | Zone 12 |
| PRV-2 | 2,685.00 | 79 | 2,918.43 | 2,810.05 | 108.39 | Zone 12 |

# FlexTable: Pump Table
# Storyrock Phase 1B.wtg
# Active Scenario: Peak Hour

| Label | Elevation (ft) | Hydraulic Grade (Suction) (ft) | Hydraulic Grade (Discharge) (ft) | Flow (Total) (gpm) | Flow (Design) (gpm) | Pump Head (ft) | Head (Design) (ft) | Zone |
|---|---|---|---|---|---|---|---|---|
| FF TEST 1 | 2,690.00 | 2,690.00 | 2,918.74 | 116 | (N/A) | 228.74 | (N/A) | Zone 13 |
| PUMP 1 | 2,717.00 | (N/A) | (N/A) | (N/A) | 500 | (N/A) | 245.00 | Zone 13 |
| PUMP 2 | 2,717.00 | (N/A) | (N/A) | (N/A) | 500 | (N/A) | 245.00 | Zone 13 |
| PUMP 3 | 2,717.00 | (N/A) | (N/A) | (N/A) | 500 | (N/A) | 245.00 | Zone 13 |
| PUMP 5 | 2,717.00 | (N/A) | (N/A) | (N/A) | 1,750 | (N/A) | 245.00 | Zone 13 |

# FlexTable: Reservoir Table
# Storyrock Phase 1B.wtg
# Active Scenario: Peak Hour

| Label | Elevation (ft) | Flow (Out net) (gpm) | Hydraulic Grade (ft) | Zone |
|---|---|---|---|---|
| R-FH | 2,690.00 | 116 | 2,690.00 | Zone 13 |



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# FlexTable: Tank Table
# Storyrock Phase 1B.wtg
# Active Scenario: Peak Hour

| Label | Elevation (Base) (ft) | Elevation (Minimum) (ft) | Elevation (Initial) (ft) | Elevation (Maximum) (ft) | Diameter (ft) | Flow (Out net) (gpm) | Hydraulic Grade (ft) | Zone |
|---|---|---|---|---|---|---|---|---|
| T-1 | 2,720.00 | 2,720.00 | 2,726.00 | 2,727.00 | 20.00 | 0 | 2,726.00 | Zone 12 |

# Fire Flow Node FlexTable: Fire Flow Report

## Storyrock Phase 1B.wtg

## Active Scenario: Max Day + FF

| Label | Elevation (ft) | Fire Flow (Needed) (gpm) | Flow (Total Available) (gpm) | Pressure (Calculated Residual) (psi) | Zone | Satisfies Fire Flow Constraints? |
|---|---|---|---|---|---|---|
| J-1 | 2,640.00 | 1,000 | 1,224 | 30.0 | Zone 12 | True |
| J-2 | 2,695.00 | 1,000 | 607 | 65.8 | Zone 13 | False |
| J-3 | 2,604.00 | 1,000 | 1,188 | 34.4 | Zone 11 | True |
| J-4 | 2,588.00 | 1,000 | 1,174 | 39.3 | Zone 11 | True |
| J-5 | 2,584.00 | 1,000 | 1,176 | 40.8 | Zone 11 | True |
| J-6 | 2,578.00 | 1,000 | 1,167 | 43.6 | Zone 11 | True |
| J-7 | 2,552.00 | 1,000 | 1,184 | 42.0 | Zone 11 | True |
| J-8 | 2,542.00 | 1,000 | 1,172 | 46.7 | Zone 11 | True |
| J-9 | 2,608.00 | 1,000 | 1,162 | 32.6 | Zone 11 | True |
| J-10 | 2,614.00 | 1,000 | 1,127 | 30.0 | Zone 11 | True |
| J-11 | 2,591.00 | 1,000 | 1,170 | 39.2 | Zone 11 | True |
| J-12 | 2,605.00 | 1,000 | 1,185 | 33.5 | Zone 11 | True |
| SC-1 | 2,735.00 | 1,000 | 627 | 48.7 | Zone 13 | False |
| SC-2 | 2,755.00 | 1,000 | 641 | 40.8 | Zone 13 | False |
| SC-3 | 2,767.00 | 1,000 | 606 | 35.5 | Zone 13 | False |
| SC-4 | 2,780.00 | 1,000 | 605 | 30.0 | Zone 13 | False |
| SC-5 | 2,762.00 | 1,000 | 607 | 37.7 | Zone 13 | False |
| SC-6 | 2,725.00 | 1,000 | 606 | 53.3 | Zone 13 | False |
| SC-7 | 2,600.00 | 1,000 | 3,000 | 54.5 | Zone 13 | True |
| SC-8 | 2,693.50 | 1,000 | 682 | 67.5 | Zone 13 | False |
| SC-9 | 2,744.68 | 1,000 | 607 | 45.0 | Zone 13 | False |