Providence City

Water System Master Plan

Master Plan

Revision - March 2000

Knighton and Crow, P.C.

Mayors Copy.

WATER SYSTEM MASTER PLAN

for

PROVIDENCE CITY, UTAH

Prepared By:

Knighton and Crow, P.C.
95 West Golf Course Road
Logan, Utah 84321
(435)-752-8501

March 2000

Project 97-306

PRELIMINARY

CHAPTER ONE
EXECUTIVE SUMMARY

A. Introduction

Providence City is a growing community in central Cache County, Utah. The community is currently residential and, due to its close proximity, could be considered a bedroom community in Logan. Future growth is projected to be primarily residential in the west of the Old Town area and the East Bench above 5,000 feet MSL, with some commercial growth forecast in the Western Annexation Declaration Area along Highway 165. Over the past two to three years, the City has made some major improvements to its water system, including a new 1,000,000 gallon reservoir at Coombe Flats, a new well at 400 South Main, a new main along 300 East, and various distribution line upgrades through out the City. A master plan was completed by Eckhoff, Watson and Preator Engineering (EWP) in May of 1995 which maps out system improvements required by the State Drinking Water Regulations to accommodate existing and future demands. This report is an update to that Water System Master Plan and will provide the City with additional direction for making the improvements necessary to accommodate different trends seen in the City that were not expected in the original Master Plan.

B. Purpose of Study

The ongoing objectives of a municipal water system are to continually provide potable water for residential, domestic, and commercial uses, irrigation water for outdoor uses, and adequate quantities of water at sufficient pressures for fire protection. In order to meet these objectives, a water system must have the legal rights and infrastructure to provide adequate source capacity, storage capacity, and distribution capacity under existing and projected conditions. The purpose of this study has been to assist Providence City in meeting the new growth demands on its municipal water system.

C. Scope of Work

The planning effort was broke into several major tasks in order to meet the objectives outlines above.

The following tasks are addressed:

Task 1 - Calibrate the computer model to accurately model the distribution system, including the recent modifications to the distribution system.

Task 2 - Develop unit water demands for the new growth areas, with emphasis on the high density housing and commercial areas in the

north west area.

Task 3 - Study the water rights and make recommendations for additional needs.

Task 4 - Make recommendations for phased improvements.

Task 5 - Prepare cost estimates for improvements.

D. Demographics

Summary Findings

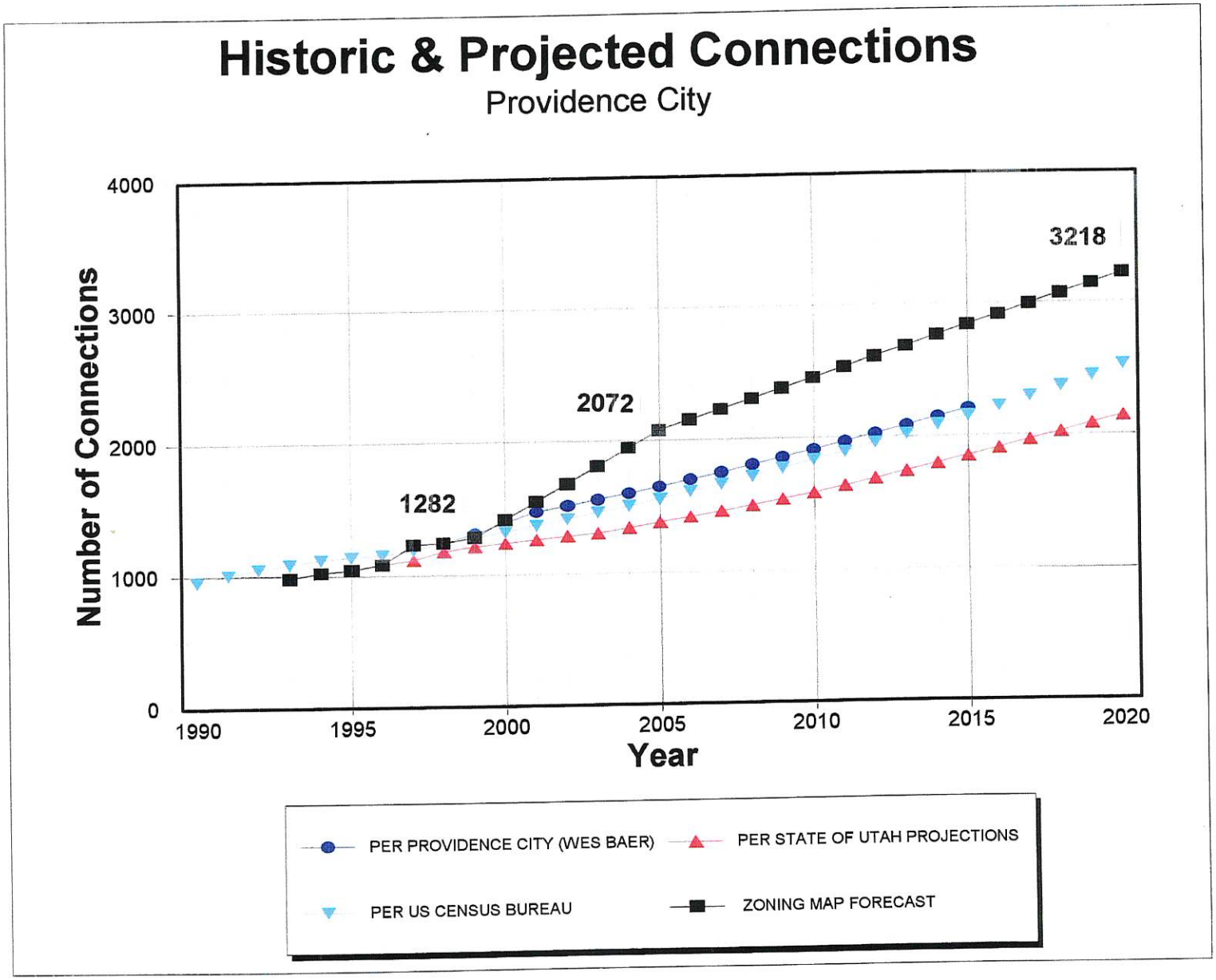
1. Projected population growth rates for Providence City to the years 2020 are shown in Figure 1-1. These population projections were based upon an assumption of ultimate buildout by the year 2040 of the land currently within the Providence City Annexation Declaration. These projections are compared to those developed by the State of Utah, Governor's Office of Planning and Budget (OPB).

2. Because of a change in the zoning master plan to allow multi family and high density housing, a larger than normal growth rate is anticipated for the next five years.

3. Existing (1999), 20-year and 40-year projection connections are shown by zone area as follows:

	Existing (1999)	20 Year (2020)	40 Year (2040)
Zone 1 (Lower Old Town)	723	1730	2524
Zone 2 (Upper Bench Area)	527	1112	1573
Zone 3 (Above 5,000 feet)	32	376	648
TOTALS :	1282	3218	4745

4. A planning horizon of approximately 20 years - 2000 to the year 2020 - was chosen. It was projected that ultimate buildout would occur in 2040.



F:\drafting\cj\97-306\growth.wb3

Figure 1-1

E. Water Sources

Summary Findings

Providence City currently has four existing water sources: Broad Hollow Spring, 1st East Well (Dale's Well), Alder Well and the new well at 400 South Main (400 South Well). Broad Hollow Spring is Providence City's primary water source, as it is a gravity flow source requiring only chlorination. Each of the water sources have the capacity of supplying more water than the City has the right to use.

CURRENT AVERAGE AVAILABLE PEAK JULY DAY SUPPLY

	Water Right (gpm)	Source Capacity (gpm)
1.) Broad Hollow Spring	1024	2300
2.) 1st East Well	2002	2200
3.) Alder Well	550	750
3.) 400 South Well	1423	2200
TOTAL SUPPLY:	4999	7450

will file for these rights

As can be seen from the supply/demand forecast in Figure 3-1, the current water supply with the new 400 South well is sufficient for the existing peak day demand through 2008. However, if the Spring had to be taken out of service due to a turbidity event caused by high flows or an earthquake, the existing three wells would not be sufficient with existing water rights. Therefore, we believe that it should be a high priority to have additional water rights appropriated to the 1st East Well and the 4th South Well and a pumping station at the new well on-line this year. The existing supply sources have additional unused capacity, as shown above, and is adequate to supply the City thru the year 2020.

Figure 3-1 also shows that Providence uses much more water than the state average. These additional uses are explained by excessive unmetered uses, leaking lines and unmonitored overflowing.

Recommendations

It is recommended that a pump house be installed at the new well with a new transmission line up to the Eck Tank location. This will require that an enlarged storage facility be provided at the Eck Tank location. A booster pump at Eck Tank and new transmission line to the Red's Tank will also be needed soon to provide a second source for Zone 2. Some of the unmetered uses should be replaced by secondary water and an effort should be made to identify and replace leaking lines.

F. Water Storage

Summary Findings

Providence City currently has four reinforced concrete water storage tanks with a combined capacity or 2,630,000 gallons. The Coombe Flat tank serve pressure Zone 3 with an overflow (O.F.) elevation of 5403. The two Red's tanks serve pressure Zone 2 and are located adjacent to each other, with an overflow (O.F.) elevation of 5110. The Eck Tank serves pressure Zone 1, with an O.F. elevation of 4810.

CURRENT AVAILABLE STORAGE

Red's Tank 1 Capacity	1,000,000 gallons
Red's Tank 2 Capacity	130,000 gallons
Eck Tank Capacity	500,000 gallons
Coombe Flat Tank Capacity	1,000,000 gallons
Total Storage:	2,630,000 gallons

new 1.5 mil @ Eck location (Proposed) 4,130,000 gallons total

Our review of existing water storage requirements for Providence City indicates that the City has exceeded its existing storage capacity, as summarized below:

	Zone 1 (gallons)	Zone 2 (gallons)	Zone 3 (gallons)
Indoor Demands	307,700	215,000	12,800
Irrigation Demands	443,478	307,804	18,240
Fire Storage	300,000	300,000	300,000
Total Storage Demand:	1,051,178	822,804	331,040
Available Storage:	500,000	1,130,000	1,000,000
Available Excess from Zone 3:	0	668,960	0
EXCESS/DEFICIT:	-551,178	307,196	668,960

new 1.5 948,822

The excess/deficit amounts are visually depicted in Figures 7-1 through 7-3.

Recommendations

A. A review of Providence City's existing water storage requirements with respect to the State of Utah Public Drinking Water Rules (PDWRs) revealed that presently

the City has approximately 500,000 gallons below the required storage capacity in Zone 1. The citizens of Providence use a substantially higher amount of water than required by the state in the table above. It is recommended that Providence City begin the process of constructing a new water tank at the Eck Tank site.

G. Water Distribution System

Summary Findings

1. Generally, existing fire hydrants in Providence City are 600 to 700 feet apart. The *Uniform Fire Code* (UFC) requires that fire hydrants be no farther than 500 feet apart, or no structures more than 250 feet from a fire hydrant, for areas with fire flow requirements of 1750 gpm or less. In addition, the UFC requires that fire hydrants be no farther than 450 feet apart, and that structures be no farther than 225 feet from a fire hydrant for areas with fire flow requirements of 2500 gpm. The State of Utah also requires that hydrants be installed on water lines which are 8-inches or larger in diameter.

2. With the UFC as a guide, the water system was analyzed, using two different fire fighting flow regimes. Flow rates at particular junctions near the schools and commercial areas were analyzed, using a 2500 gpm and 1500 gpm fire flow lasting two hours. Other areas of the City were analyzed, using 2000 gpm and 1500 gpm fire flow for a two-hour duration.

3. The existing distribution system cannot meet water demands placed on it by peak day indoor and outdoor uses as required by the State PDWRs:

	Existing Connections	Existing Fire Flow and Peak Day Demand	Year 2020 Connections	Year 2020 Demand
Zone 1	723	3543 gpm	1730	4841 gpm
Zone 2	527	3226 gpm	1112	4022 gpm
Zone 3	32	2543 gpm	376	3015 gpm

The State PDWRs require that distribution systems be capable of maintaining a system pressure of 20 psi at all locations within the system while both peak day and fire flow demands are being supplied.

Computer modeling of the existing distribution system with 1500 gpm fire flow demand indicates that the pressure in distribution lines drops below 20 psi in many areas throughout the City.

Recommendations

1. General replacement of all 2-, 3-, 4-, and 5- inch lines with 6- and 8-inch lines is required throughout Old Town.

2. The Baur Avenue area needs to be upgraded.

3. Other improvements include linking the Hillsborough Subdivision to the Grandview Subdivision with an 8-inch diameter line.

4. The main line along 300 East needs to be upgraded from 200 North to the Bindrup Subdivision.

5. The new commercial area is deficient until it is properly looped.

6. It is recommended that Providence City phase in the installation of new fire hydrants as old lines are upgraded. The State of Utah criteria require that fire hydrants are to be installed on 8-inch diameter water lines or larger.

H. Water Rights

Summary Findings

Providence City has a sufficient number of sources but insufficient water rights to supply the City's current needs through the year 2020, as shown in Table 4-1. Peak day demand as shown on Figure 3-1 in the year 2020 is 4378 gpm (9.75 cfs) based upon State PDWR's minimum and 6721 gpm (14.98 cfs) based upon measured usage. As shown in Table 4-1, the allowable peak diversion rate is 4998 gpm (11.14 cfs).

Recommendations

The existing water supply sources are capable of supplying more water than is currently allocated by water rights. Providence City should make application to have additional water rights appropriated at the existing sources.