City of Prineville Water and Sewer Capacities Update

Water

Introduction

The City of Prineville water system includes a total of forty-two (42) miles of water distribution mains, ten (10) wells and five (5) storage tanks. The water system is meeting current demands, but is stressed during the summer months by heavy demands associated with irrigation. As the City of Prineville grows, the need for water system improvements will become more critical.

Wells

The City's current water supply is primarily from seven (7) "deep" wells that extract ground water from depths ranging from 239 feet to 565 feet. The seven (7) primary wells are identified as follows...

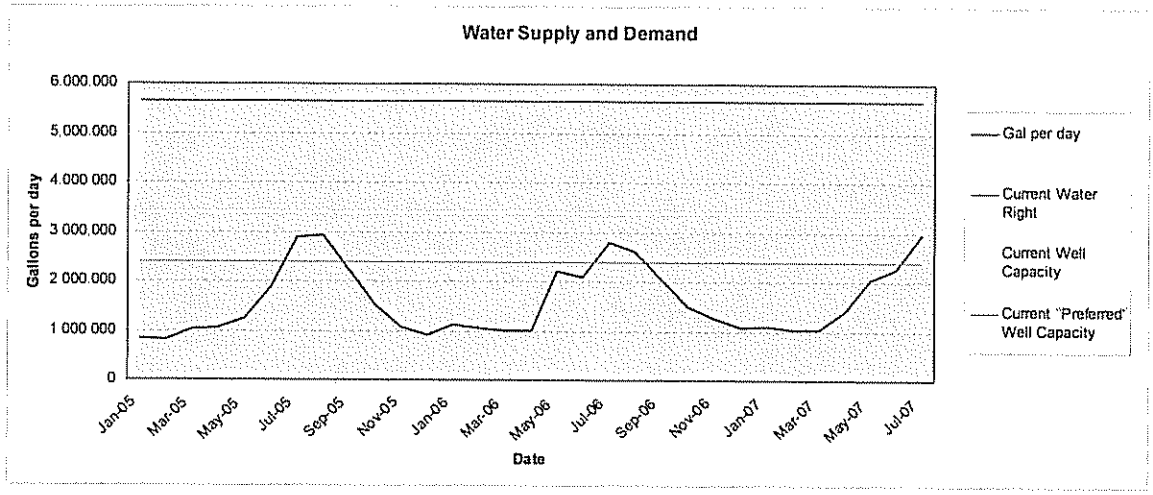
	const date	depth (ft)	permitted rate (gpm)	permitted rate (mgd)	current production rate (gpm)	current production rate (mgd)
Yancey	1947	239	359	0.52	200	0.29
S. 4th St. "deep"	1960	252	494	0.71	280	0.40
Lamonta	1957	256	494	0.71	215	0.31
Airport	1996	450	300	0.43	270	0.39
"New" Airport**	2007	565	162	0.23	750**	1.08**
Stearns*	1974	246	*	*	300	0.43
Barney	1999	250	700	1.01	400	0.58
Ochoco Heights	1943	318	539	0.78	315	0.45
S. 4th St. "shallow"	1950	41	449	0.65	130	0.19
Stadium	1987	260	425	0.61	250	0.36
Total			**3922**	**5.65**	**2360**	**3.40**

*The permitted combined output of Barney and Stearns wells is 700 gpm
**New Airport well is currently permitted at 261 acre ft/year, system is not currently online

The three (3) highlighted wells generally have a lower quality of water and are only used as needed during the summer months.

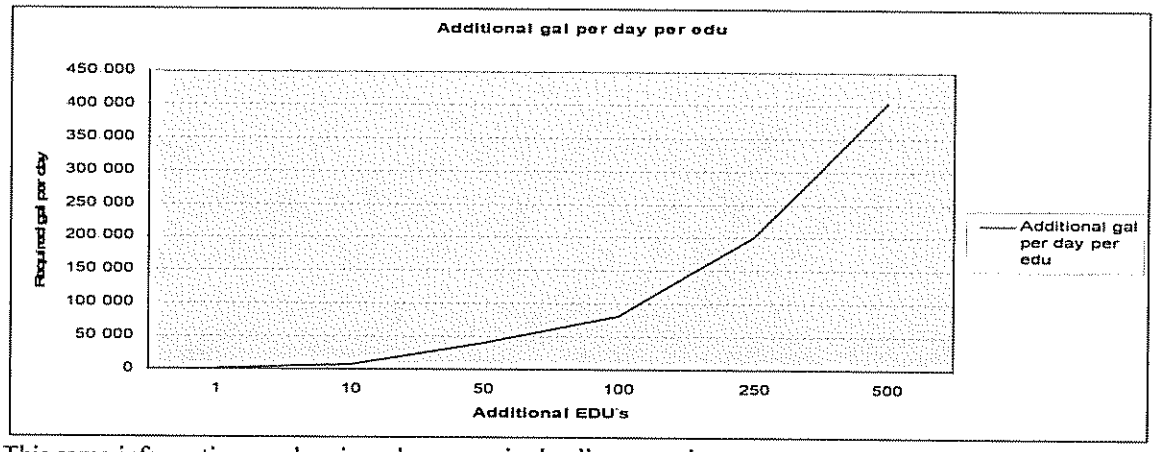
Demand

The City of Prineville operates wells both manually and automatically to meet a fluctuating water demand. The daily water production rate and daily water usage generally follow a trending pattern, peaking in July and August as shown in the following graph.

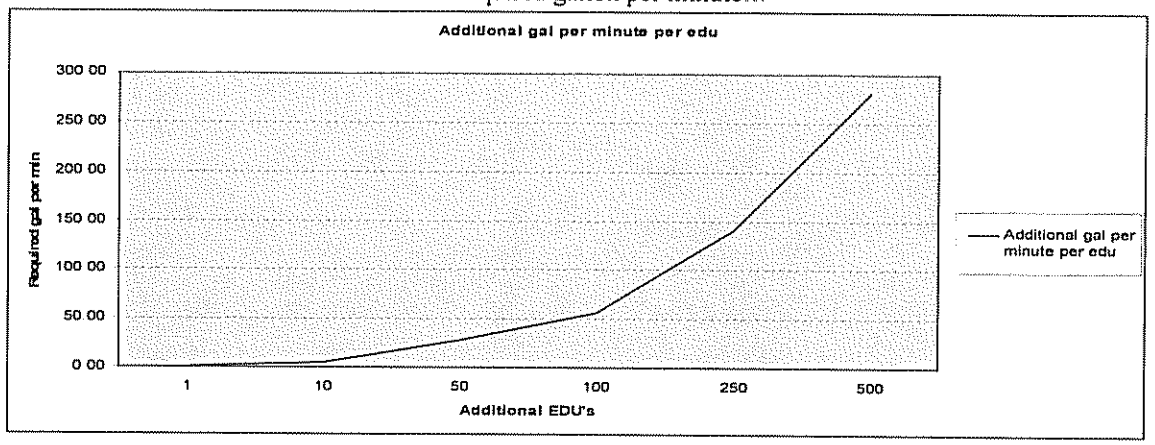


The water usage is generally low from October to April, staying fairly consistent. The high usage in summer months is a result of heavy use of water in irrigation. The maximum daily demand (MDD) to average daily demand (ADD) ratio is about 2.5. This is consistent with other cities in eastern Oregon. As the above graph shows, the water supply system is currently at approximately 98% of capacity.

Based upon the ADD of 130 gpcd (gallons per capita per day) for residential use and an average of 2.5 persons per dwelling unit, an ADD of 325 gpd per EDU (equivalent dwelling unit) and MDD of 810 gpd per EDU have been determined. Our water supply must match our MDD. Therefore, if we add 100 EDU's to the system, we need to increase our supply by 81,000 gallons per day.



This same information can be viewed as a required gallon per minute...



Water Supply Options

The City of Prineville has developed a subcommittee to review and prioritize issues related to the city water system. Attached is a short update on water right activities to date. Also attached is information pertaining to short term water supply options. It has been decided that the subcommittee will pursue new water sources with the following priorities...

1. "New" Airport Well
    a. This well has been tested at 750 gpm (1.08 mgpd).
    b. RFP for pumps will be released fall '07.
    c. Well will be online by spring '08.
    d. Existing water right will allow for heavy summer use.
2. Ochoco Point Well
    a. This site currently has water rights.
    b. It is in close proximity to our existing distribution system.
    c. It is estimated that it will produce 400 gpm (0.576 mgpd).
    d. A test well will be drilled early '08.
    e. If quality and quantity exist, permanent well is planed to be online late summer '08.
3. Matt Day Well
    a. Does not have existing water rights.
    b. Includes 2 existing wells producing 750 gpm (1.08 mgpd).
    c. Property is located 2.5 miles NW of town. Required piping would serve future industrial land.
    d. Permission to sample and test water will be sought fall '07.
    e. Water will be sampled and the quality analyzed this winter.
    f. If quality and quantity exist, permanent well would come online in approximately 2 years.
4. Airport Well #3
    a. Does not have existing water rights, but they would potentially be easier to acquire as this area is part of the Deschutes water table.
    b. It is in close proximity to our existing distribution system.
    c. It is estimate that it will produce an additional 700 gpm. Testing will be done next summer to determine how the water bearing zone reacts to extensive pumping.
5. Airport Well booster pump.
    a. By utilizing a booster pump to reduce the pressure head for the existing wells, an additional 300 gpm (0.432 mgpd) may be available.

Storage

Five (5) covered water storage reservoirs are in place throughout the City with a total storage capacity of 3.5 million gallons as shown below...

1. The Ochoco Hts. #1tank is located near the Pioneer Memorial Hospital. It is an aboveground welded tank 50 ft high constructed in 1955 with a capacity of 0.5 million gallons (mg).
2. The Ochoco Hts. #2 tank is located next to Ochoco Hts. #1. It is an aboveground welded tank 50 ft high constructed in 1964 with a capacity of 0.5 mg.
3. The Barnes Butte tank is located near the State Forestry office. It is an aboveground welded tank 40 ft high constructed in 1978 with a capacity of 0.5 mg.
4. The Airport tank is located west of the city airport. It is and aboveground bolted steel tank 24 ft high constructed in 1996 with a capacity of 1.0 mg
5. The American Pine Tank is located south of Peters Road on Woodgrain Millwork's property. It is an aboveground welded tank 33 ft high with a capacity of 1.0 mg.

The total required storage volume is the sum of...

1. Equalization storage, which is the volume of water required to meet peak hour demand in excess of maximum day demand.
2. Reserve storage sufficient to supply the system's needs during disruption of supply capabilities.
3. Fire storage equal to the volume of water needed to meet a fire flow of given flow rate and duration in the reservoir service area.

The required storage volume for the City of Prineville should be calculated based on the following...

Storage Volume = MDD + ADD + Equalization Storage + Fire

This basically means that the City of Prineville should have two (2) times the MDD in storage. Currently, with a MDD of 3.0 mgd, the City should have 6.0 mg of storage. The City currently has 3.5 mg of storage. Therefore, the City currently requires an additional 2.5 mg of storage. The capacity of the wells above and beyond the MDD would lower the required storage amount, as storage recovery happens quickly. Essentially, some of the water is stored in the aquifer.

Water Distribution

The City of Prineville water distribution network is made up of a combination of asbestos-cement, cast/ductile iron, galvanized steel, wrapped steel, wood-stave pipe, and PVC pipelines ranging from 1" to 18" in diameter. The pipeline system totals about 42 miles. More than half of the total pipeline footage is made up of 6" and 8" pipes. About 11% of the pipe footage is made up of pipes 4" and smaller. Water mains 4" and smaller are too small and unable to carry high fire flows (1,000 gpm to 4,000 gpm or more). These smaller pipes need to be replace with mains 8" or larger to improve conveyance of fire flows without tremendous loss of pressure. The City of Prineville has already adopted the 8" size as the minimum distribution pipe. For commercial and especially industrial development, a minimum size of 12" has been established. It has also been recommended that all of the wood-stave, wrapped steel and galvanized steel pipes should be replaced.

Sewer

Collection System

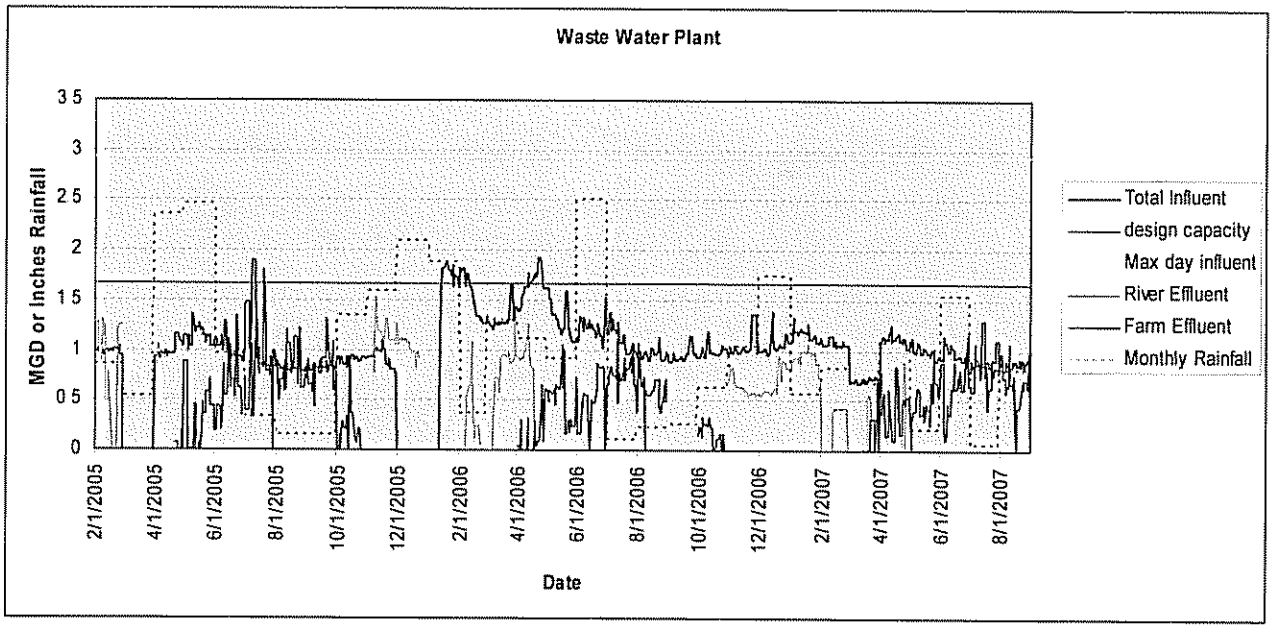
The City of Prineville sewage collection system includes both gravity sewers and pumped force-mains with a total of approximately 40 miles of pipelines ranging in size from 3" to 36" in diameter. There are five (5) sewer pump stations located in the collection system. The collection system is currently providing adequate capacity in the City, but there are some bottlenecks in the system and extensions and upgrades are needed to support projected growth.

Wastewater Treatment Plant

The City wastewater treatment plant consists of two (2) partially aerated facultative lagoon systems capable of treating 1.67 mgd of wastewater producing Oregon DEQ Class 1A/11 effluent. This is suitable for controlled irrigation reuse on City owned pasture land during the summer months and limited discharge into the Crooked River during the winter months. These systems currently serve 3,552 connections.

Influent

A graph of the influent treated at the wastewater treatment plant for the last 2.5 years can be viewed below...



It is interesting to note the decrease in influent during the sampled time period as EDU's connected to the sewer system increased by approximately 12% during the last 2.5 years. The decrease in influent can be attributed to the reduction of Infiltration and Inflow (I&I) by the Public Works Department. During the summer of 2006 the Public Works Department invested $96,000.00 re-grouting and sealing areas of the sewer collection system that were prone to I&I. It appears as if this reduction in I&I has lowered the influent at the wastewater plant by approximately 300,000 gallons per day. This reduction in I&I is very important as related to future plant expansion.

For projecting the timing of future wastewater plant expansions an Average Daily Flow (ADD) has been determined to be 140 gallons per day per person. With an average of 2.5 persons per dwelling unit, an ADD of 350 gpd per EDU can be calculated. If we divide the added capacity related to I&I work (300,000 gallons) by 350 gpd per EDU, we find that the $96,000.00 spent will allow us to add roughly 850 EDU's to our wastewater treatment system. It appears as if the wastewater treatment plant is currently treating 0.95 mgd of influent on average.

Effluent

Winter time discharge of effluent to the Crooked River is currently allowed when river flows are greater than 15 cfs. Currently this discharge averages about 1 mgd during the months allowed. It is likely that this form of disposal will decrease as DEQ becomes more restrictive. The remaining effluent is stored in two (2) lagoons for summer irrigation on the City owned golf course and on City owned pasture land. The winter discharge to the Crooked River and summer irrigation reuse on the golf course and pasture land is adequate for about 1.60 mgd of the 1.67 mgd design flow, but cannot accommodate future growth.

Additional Capacity

The combined design capacity of the two (2) systems is 1.67 mgd. The average inflow is 0.95 mgd, leaving an available capacity of approximately 0.72 mgd. As discussed previously, 350 gpd per EDU will be used for projecting future wastewater plant expansions. Taking the available capacity of 0.72 mgd at the treatment plant and dividing it by 350 gpd per EDU, it appears as if the sewer treatment plant has the capacity for an additional 2,050 EDU's. Note that the collection system is currently experiencing some bottlenecks that will need to be addressed with expansion.