Chapter 3 - Water Supply

General

This chapter includes a description of the City of Stanfield's current water supply system and a discussion of its capacity to meet present and future needs. The current water supply system consists of five groundwater wells. Needs and concerns associated with the water supply are discussed herein. Water rights are also described.

Present Water Supply and Controls

General

The City of Stanfield presently has five groundwater wells: the Railroad Well (Well No. 2), Well No. 3, Well No. 4, Pilot Well, and Well No. 5. The City currently obtains its municipal water supply primarily from Well No. 5 and utilizes Wells No. 3, No. 4, and the Pilot Well for supplemental and emergency backup purposes. The Railroad Well (Well No. 2) is used for irrigation only. The location of each of the City's wells is shown on Figure 1-3 in Chapter 1. Descriptions of each of the City's wells are presented herein.

City Well

The City Well was constructed as part of the original water system in 1920. The well is not in use and has been decommissioned in accordance with Oregon Administrative Rule (OAR) 690-220. The well is located adjacent to Well No. 3, which is shown on Figure 1-3.

Railroad Well (Well No. 2)

The City of Stanfield uses the Railroad Well (Well No. 2) for irrigation purposes. The Railroad Well (Well No. 2) is a 6-inch well originally constructed in the 1940s for the Union Pacific Railroad, with a depth of approximately 58 feet. The well is currently leased to the City of Stanfield for an indefinite term. Test results indicate that inorganic contaminants are below the maximum contaminant levels established by the U.S. Environmental Protection Agency (EPA), and total coliform is not present in the well water. However, due to the relatively shallow depth of the well, continued acceptable water quality cannot be ensured. Pump tests have shown the well can sustain pumping rates of approximately 100 gallons per minute (gpm). The City utilizes the well to irrigate Coe City Park, which relieves the park irrigation demand from the other municipal wells.

Well No. 3

Well No. 3 was originally constructed in 1959 to a depth of 300 feet. In 1962, the 12-inch diameter bore was deepened to 701 feet. According to the well log (UMAT 2957), the well was reconditioned in 1982, and the depth of the completed well was recorded at 776 feet. In 1992, the submersible well pump failed. After repairs, the pump failed again, and it was discovered the pump case had broken just below the top of the pump, and the pump and motor had fallen into the well. The pump and motor were not able to be retrieved, and they remain at the bottom of the well. A new Goulds 8RJLC, 8-stage turbine pump and a new 100 horsepower (Hp) submersible motor were installed in

July 1992. Well No. 3 has a crooked hole and a deep set, so the submersible pump and motor, power cable, and air line can be easily damaged. The well is unlined below approximately 124 feet and is subject to caving. If caving occurs, the pump and motor could be trapped in the hole, likely leading to abandonment of the well. Another concern for this well is lower groundwater levels it experiences during summer months. Further lowering of pumping levels may cause serious problems and increase the possibility of caving. The static water level in the well was measured in November 2014 and was 424 feet below ground surface (BGS) at that time. Well No. 3 is utilized as one of the City's backup municipal water sources.

Well No. 4

Well No. 4 was drilled in 1978 to a depth of 1,161 feet. There is a 12-inch casing from the ground surface to 156 feet and the 12-inch hole is open (unlined) from 154 to 725 feet. From 725 feet to the bottom of the well at 1,161 feet, the well is an 8-inch open hole (unlined). At the time of construction, a pump test was performed, which indicated a flow of 1,227 gpm with 185 feet of drawdown after four hours.

Well No. 4 pumps to a 625,000-gallon ground-level water storage reservoir (Reservoir No. 2) located adjacent to the well at the west end of the Stanfield Heights Subdivision in North Stanfield. Water is pumped from the reservoir via the North Stanfield booster pump station to the Stanfield Secondary School, and to the Stanfield Heights, Vantage North, and Panoramic Ridge Subdivisions. The City has installed new controls for the well pump so water can be pumped to the reservoir automatically based on the water level in the reservoir. In the past, water from the well tested positive for total coliform bacteria, which may have resulted from the well water being stagnant for too long. In addition to coliform bacteria the well has had issues with hydrogen sulfide, which has a distinct odor, but is not regulated by the EPA as a potential water system contaminant.

Since the well is uncased below 154 feet, past caving has resulted in debris blocking the hole. Possible future caving above the pump would likely render the pump irretrievable and could lead to abandonment of the well. Well No. 4 is utilized as one of the City's backup municipal water sources.

Pilot Well

The Pilot Well is located adjacent to Interstate 84 and the Pilot Travel Center. The well was drilled in 1995 and is approximately 740 feet deep with 480 feet of 6-inch casing. The upper 18-inch diameter casing extends 15.5 feet into basalt to a total depth of 82.5 feet BGS. Water is delivered by a 15 Hp pump set at approximately 550 feet. A test during construction yielded 200 gpm at 740 feet of drawdown after one hour. The current pumping capacity of the Pilot Well is approximately 55 gpm.

The Pilot Well was originally developed by the Pilot Corporation to serve their Pilot Travel Center. The commercial development was outside the City's existing water distribution area, and extension of a new water line and booster pump station to serve the Pilot Travel Center was cost prohibitive at the time. The Pilot Corporation constructed the well as an additional point of appropriation (withdrawal) under the City of Stanfield's Well No. 4 water right permit. The well is connected to Reservoir No. 3, south of the Pilot Travel Center. The Pilot Well is not actively used by the City, but it is operable in case of an emergency.

Well No. 5

Well No. 5 was constructed in 2013 to a depth of 1,116 feet. The well has a 24-inch casing down to 89 feet, a 20-inch casing to 905 feet, and a 16-inch casing to the bottom of the well. The 16-inch casing is perforated for approximately 40 feet. There is also approximately 30 feet of 16-inch screen at the bottom of the well. After the well's construction, the static water level was measured at 430 feet BGS. A constant rate pump test completed in February 2013 showed a drawdown of 20 feet with 1,500 gpm being pumped. This resulted in a specific capacity of 75 gpm per foot of drawdown over a 24-hour period. Well No. 5 is used to fill Reservoir No. 3; both the well and the reservoir are south of the Pilot Travel Center. Since its construction, Well No. 5 has been the main source of municipal water for the City of Stanfield. A summary table of the information regarding the City's wells is provided on Table 3-1. Well logs for the wells are included in Appendix D.

TABLE 3-1
WELL INFORMATION

Well No.	OWRD Well Log No.	Depth (feet)	Static Water Level as Recorded on Well Log (feet BGS)	Hp of Pump Motor	Estimated Current Pumping Capacity (gpm)
Railroad	UMAT 54369	58	NA	5	100
3	UMAT 2957	776	424	100	550
4	UMAT 2962	1,161	290	100	450
Pilot	UMAT 50189	740	418	15	55
5	UMAT 57155	1,116	430	200	1,100

OWRD = Oregon Water Resources Department

Disinfection and Treatment

Wells No. 3, 4, 5, and the Pilot Well are treated with gas chlorination. Adding gas chlorination as water is pumped from the well creates a chlorine residual in the storage reservoirs and distribution system. Chlorine is a highly efficient disinfectant and helps reduce the risk of disease-causing pathogens such as bacteria, viruses, and protozoans from affecting water quality.

Control System Equipment and Operational Controls

The City's water system has considerable flexibility to continuously provide water to its customers. Water from Well No. 3 is pumped directly into the distribution system, while Well No. 4 is pumped to Reservoir No. 2. Reservoir No. 2 can also be filled by Reservoir No. 3 through the South Stanfield booster pump station, which is primarily fed by Well No. 5, but can also receive water from the Pilot Well.

Operation of the City's wells is controlled by the water level within the reservoirs. A level signal is sent to the Programmable Logic Controller (PLC) to begin pumping system operation. If the system does not function correctly, multiple alarms can be relayed to system operators remotely, which include, but are not limited to, booster pump station pump failure, smoke alarm in the booster pump station, well failure, gas chlorine system alarm, generator alarm, low water level in Well No. 5, and high/low reservoir water levels. In addition to the PLC control and alarm system, the City has a Supervisory Control and Data Acquisition (SCADA) system that provides full monitoring, control, and data collection.

Well Maintenance

Well Capacity

Wells require periodic maintenance to keep them functioning properly and working efficiently. Many wells lose efficiency over time. The result of lost efficiency is either decreased yield (gpm) or greater pumping drawdown, which results in higher pumping costs and production loss.

Specific capacity (production in gpm per foot of drawdown) is a measure of the well's ability to yield water. Wells can lose efficiency and capacity for a variety of reasons, including mechanical clogging, bacterial clogging, and loss of pump efficiency. Changes in a well's specific capacity over time will indicate developing well efficiency problems.

It is recommended the City perform simple specific capacity pumping tests either annually or biannually on each well. The results should be recorded and plotted on a graph over time. A specific capacity test is easily performed by pumping the well using the existing well pump and documenting the static water levels, drawdown, and the well's pumping rate. This is best done during a period when the well has been sitting idle for a few weeks. The idle time is needed to normalize the well's static water level. Noting a reduction in specific capacity will indicate problems with the well and the need to take corrective action before the problem becomes irreversible.

Rehabilitation work may include a variety of approaches depending on the nature of lost efficiency. Rehabilitation work may be accomplished using mechanical cleaning or non-mechanical methods such as shocking with percussion apparatuses, chemical addition, or chlorination. In some cases, it may be necessary to use a combination of mechanical and non-mechanical methods. Generally, the longer rehabilitation work is delayed, the greater the risk that the lost capacity cannot be recovered. Tracking well production over time by performing this specific capacity test provides useful information to project forward and budget for a maintenance activity that may be required on the well. If specific capacity has not decreased but pumping rates have, this may indicate a problem with the pump rather than the well.

Static Water Level Trends

The static water level is the depth to water in a well when the well has not been pumped for a period of time. Over time, a well's static water level can be the best indicator of the status and condition of the underlying aquifer. A reduction in static water levels could indicate the aquifer is being depleted faster than it can be recharged. It is very important to observe any trends in static and pumping water levels in the City's wells. The OWRD collects water level data from Well No. 3 (UMAT 2974). This well is likely experiencing similar aquifer conditions as other wells servicing the City. Since the well has been monitored, the water level BGS has dropped from 20 feet to 321 feet. It is clear the water level is declining. Well water level data from the City's other wells should be periodically recorded, saved, and plotted to observe trends over time. OWRD well monitoring data for Well No. 3 is included in Appendix E.

Water Rights

The City of Stanfield holds four groundwater rights issued by the State of Oregon for its municipal water wells. In addition to groundwater rights, the City holds a surface water right to the Umatilla River.

- Certificate No. 33488 has an allowable instantaneous flow of 0.22 cubic feet per second (cfs) and a priority date of July 29, 1963. The point of appropriation for this right is the Railroad Well (Well No. 2).
- Certificate No. 33489 has a water right for 0.33 cfs, with a priority date of July 29, 1963. The point of appropriation for this certificate is the City Well.
- Certificate No. 37615 is permitted to withdraw 1.34 cfs and has a priority date of March 6, 1959. The original point of appropriation for this certificate is Well No. 3. Transfer No. 11601 was approved in 2013, adding Well No. 5 as an additional point of appropriation to this right, and Certificate No. 37615 was cancelled. A new certificate can be issued once a Claim of Beneficial Use (COBU) is submitted and reviewed by the OWRD. A COBU was submitted by Anderson Perry & Associates, Inc., in the winter of 2015.
- Permit No. 17091 is permitted to withdraw 2.2 cfs and has a priority date of September 22, 1977. The original point of appropriation for this water right was Well No. 4. In 1996, the Pilot Well was added as an additional point of appropriation to this right through Permit Amendment No. T-7440. In 2013, Well No. 5 was also added as an additional point of appropriation through Permit Amendment No. T-11584.
- The total combined water rights for the City's active wells (Railroad Well [Well No. 2] and Wells No. 3, 4, 5, and the Pilot Well) are 3.76 cfs, or approximately 1,690 gpm.

The City also holds a surface water right to the Umatilla River for the surface water diversion system that once supplied the City's water. This water right is for 11.58 cfs (5,200 gpm) and has a priority date of September 11, 1894. In 1996, with the assistance of the Staley Starch Company, the City submitted an application to the OWRD to transfer the Umatilla River point of diversion to a location west of the City and close to the Staley Starch Company. This transfer of diversion point was approved by the OWRD. A total of 2.01 cfs was transferred to the new point of diversion. The new point of diversion on the Umatilla River is near the point where Stage Gulch Ditch flows into the Umatilla River. Through a cooperative effort of the Staley Starch Company and the City of Stanfield, a 2.0 cfs diversion pump station was constructed at the new diversion point. The pump station was recently washed out and has not been replaced. The City uses a pump at this location to supply water to City-owned land for irrigation purposes. The City plans to continue maintaining this municipal water right to serve the City as an emergency backup water supply, to provide supplemental water when needed for bulk water sales, and in case future needs require an additional water source when groundwater sources may no longer be available. To utilize this source in the near term for domestic purposes would require a substantial investment in new surface water treatment capabilities.

The City also has two water rights associated with the wastewater treatment facility, one for storage and the other for irrigation. Copies of the City's water rights information are presented in Appendix F. A summary of the City's water rights, as well as maximum daily and monthly diversions, is included on Figure 3-1.

Critical Groundwater Areas

The City of Stanfield is located within the boundaries of the Stage Gulch Critical Groundwater Area (CGWA). Under OAR 690, Division 507, the "Umatilla Basin Program," each subarea within the CGWA is allowed a "sustainable annual yield." This is the estimated amount of water that may be withdrawn from the basalt aquifer without causing aquifer levels to decline. For each subarea, the sustainable

annual yield is allocated in the order of priority date. However, municipalities have the first rights to the allocation, making them the most "senior" users in the CGWA.

A municipality's allocation is determined by taking the average of the prior three years of water use. This allocation is simply an estimate of the amount of water the municipality will withdraw in that water year. This allocation is used to aid in the "accounting" of available water for the more junior users in the CGWA. There is no penalty if a municipality withdraws more than their given allocation. Due to the way in which the OARs are written, municipalities have the most reliable and guaranteed rights in the CGWA. For reference, the City of Stanfield's annual allocations are listed on Table 3-2, below.

TABLE 3-2
CGWA ANNUAL ALLOCATIONS

Year	Allocation (AF)
2010	405
2011	441
2012	557
2013	621
2014	580
2015	580
2016	518

AF = acre-feet

As a municipality within the CGWA, the allocation of groundwater provided by the OWRD is not anticipated to impair the City of Stanfield's ability to meet current and future demands. However, these allocations should continue to be monitored and any proposed measures to reduce allocations in the basin should be analyzed.

Water Supply Analytical Testing

General Supply Well Testing Data

Summaries of analytical data related to the City's water quality testing were obtained from the Oregon Health Authority - Drinking Water Services' (DWS) website. The City's wells have been sampled for the constituents required by the DWS, including total and fecal coliforms, volatile organic compounds, synthetic organic compounds, inorganic compounds, radiological agents, pesticides, fluoride, nitrates, nitrites, arsenic, and several metals.

In the past five years, the City of Stanfield has not experienced any violations for exceeding the limits of any of the constituents listed above. However, Well No. 5 had alert levels for sodium in 2013, and both Well No. 5 and the Pilot Well had alert levels of sodium in 2016. As previously discussed, sodium can cause water to taste salty; therefore, the EPA has established a secondary maximum contaminant level for sodium.

Distribution System Water Quality Testing

Although the distribution system is discussed in greater detail in Chapter 5, a brief discussion of distribution system sample analytical testing is presented herein for completeness. The City

routinely obtains samples from the distribution system for analysis of total coliforms and *E. coli*. In general, coliforms are not present in routine distribution system samples.

The City also obtains samples from the distribution system for chemical analysis of asbestos, lead, copper, and disinfection byproducts (DBP). From 1993 through 2013, all detected concentrations of asbestos, lead, copper, and DBP were less than their corresponding EPA action levels. Results from the City's coliform, lead, copper, and DBP tests are summarized in the DWS' water quality testing summaries in Appendix G.

Source Water Assessment Report

The 1996 amendments to the Safe Drinking Water Act require states provide the information needed by public water systems to develop drinking water protection plans if they chose to do so. The information provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the Drinking Water Protection Area (DWPA), an inventory of potential sources of contamination within the DWPA, and an assessment of the relative threat these potential sources pose to the water system. In Oregon, the principal agency involved with the source water assessments is the DWS. The DWS completed a *Source Water Assessment Report* for the City of Stanfield's water supply wells in December 2003. A copy of the *Source Water Assessment Report* is included in Appendix H.

The *Source Water Assessment Report* includes information related to the City's water sources, including delineation of the source water protection area, a sensitivity analysis, an inventory of potential contamination sources, the susceptibility of the drinking water sources to contamination, and recommended uses of the *Source Water Assessment Report*. The DWPA delineation is intended to identify the area that supplies the system's drinking water. The DWPA is designated for projected 1-, 2-, and 5-year time of travel periods for water from the aquifer to enter Stanfield's water supply sources. Figures showing the DWPA, the times of travel for groundwater to the wells, and potential contamination sources are included in the *Source Water Assessment Report*.

The *Source Water Assessment Report* does not include information regarding the Pilot Well and Well No. 5. However, the primary intent of the report is to identify and locate significant potential sources of contaminants of concern with in the City of Stanfield's drinking water protection area. The report describes the aquifer supplying the drinking water for the City of Stanfield as consisting of layered Columbia River basalt with water bearing zones between 290 and 1,161 feet BGS. The aquifer is considered to be a confined volcanic basalt flow aquifer with a confining layer thickness of 245 feet at minimum. Historically high concentrations of nitrate in Well No. 3 imply that the aquifer is highly sensitive to potential contaminant sources at the surface or shallow surface.

Water Supply Design Criteria

As presented in Chapter 2, the planning period for this Water System Master Plan extends to the year 2037. The 2017 population of Stanfield is estimated to be 2,130. This population has been assumed as the current population for planning purposes. With the assumed 0.3 percent per year population growth between 2017 and 2035 and 0.1 percent between the years of 2035 and 2037, the projected population for the year 2037 is 2,252. Based on this population data and the City's current water use characteristics, the average daily and peak daily demands (PDDs) are as shown on Table 3-3.

TABLE 3-3
PROJECTED WATER DEMANDS

Year	Population	Average Daily Flow (gpm)	Peak Daily Flow (gpm)
2017	2,130	410	980
2037	2,252	430	1,030

Water supply facilities are normally designed to meet PDDs without having to provide 24-hour service. The current total production capability of the City's water system is approximately 2,150 gpm, which exceeds the projected 20-year PDD. Future changes in the City's projected population, water use characteristics, and/or available supply could affect these assumptions. The City should periodically review this information to ensure additional water supply beyond that recommended herein is not needed sooner than anticipated to meet City demands.

Water Supply Reliability

The reliability of the water supply is one of the most important components of any water system. Because the health and safety of the community depends on a reliable water source, high priority should be given to help ensure a municipal water system always has the ability to meet the water needs of its customers. A number of factors, such as mechanical failures, water quality concerns, power outages, primary water transmission line failures, etc., can affect the reliability of a water supply. It is nearly impossible to ensure 100 percent reliability of any system. However, having proper system components can reduce the risk of a water supply failure.

The City uses groundwater wells for their water supply. In general, a groundwater well source is less susceptible to seasonal fluctuations in weather patterns, drought, or contamination than a surface water source. The City's water sources have been reliable and, due to multiple water supply sources available, the City's system has a degree of redundancy.

The City's water system is prepared to handle power outages with a standby electric generator on site at each booster pump station. The generators at the booster pump stations and standby emergency power equipment should be maintained in accordance with the manufacturers operation and maintenance manual at least monthly to ensure they remain reliable and in good operating condition.

Summary

At this time, the City has enough source capacity to meet current and future demands. As discussed earlier, it is desirable to design a system with enough source capacity to provide for PDDs without requiring the well pumps to operate for 24 hours per day. As shown on Figure 2-2 in Chapter 2, the 2037 peak daily flow requirement is estimated to be 1,030 gpm. The current capacity from the City's primary well (Well No.5), as well as the two supplemental wells (Wells No. 3 and 4), is approximately 2,150 gpm. As a result, it is not recommended the City increase its supply capacity at this time.

Application No.	Permit No.	Certificate No.	Transfer No.	Priority Date	Source	Use	Allowed Rate	Maximum Instant and Annual Quantity Diverted to Date	Authorized Completion Date	Notes
Umatilla River Decree		76874	T-7527 (Change in POD)	September 11, 1894	Umatilla River	Municipal	11.5 cfs	Instant = 1.34 cfs Annual = 122 AF (2002)	N/A	N/A
G-2673	G-2477	33489	N/A	July 29, 1963	City Well	Municipal	0.33 cfs	Instant = N/A Annual = 333 AF (1988)	N/A	Well not used during normal operation
G-2669	G-2474	33488	N/A	July 29, 1963	Railroad Well (Well No. 2)	Municipal	0.22 cfs	Instant = 0.19 cfs Annual = 67.5 AF (2014)	N/A	Well used to irrigate Coe City Park
G-1409	G-1321	37615 (Cancelled in 2013)	T-11601	March 6, 1959	Well No. 3, Well No. 5	Municipal	1.34 cfs	Instant = 1.34 cfs Annual = 453 AF (1998)	October 1, 2033	N/A
G-8459	G-17091	-	T-7440 and T-11584	September 22, 1977	Well No. 4, Well No. 5, Pilot Well	Municipal	2.2 cfs	Instant = 1.39 cfs Annual = 573 AF (2010)	October 1, 2049	N/A
R-72685	R-11700	-	N/A	September 14, 1992	WWTF	Storage Only	10.1 AF	Instant = N/A Annual = N/A	N/A	N/A
S-72686	S-52029	-	N/A	September 14, 1992	WWTF	Irrigation	107 AF	Instant = N/A Annual = 107 AF (2013)	N/A	N/A

AF = acre-feet
cfs = cubic feet per second
POD = point of diversion
WWTF = wastewater treatment facility

anderson perry & associates, inc.

CITY OF
STANFIELD, OREGON
WATER SYSTEM MASTER PLAN

WATER RIGHT INVENTORY

FIGURE

3-1