RESOLUTION No. 484-19

A RESOLUTION TO ADOPT THE WATER SYSTEM MASTER PLAN UPDATE FOR THE CITY OF DONALD

WHEREAS, in December 1981 an "Operating and Maintenance Manual for 1981 Water System" was prepared by Boatwright Engineering Inc.; and

WHEREAS, 2005, the latest "Donald Water Master Plan" was created by HDR and adopted by the City of Donald; and

WHEREAS, at their August 11, 2015 meeting the City Council passed Ordinance No. 161-2015 an ordinance adopting the 2015 Buildable Lands Inventory, Housing Needs Assessment and the Economic Opportunities Analysis and adopted the 20-year population projected coordinated with Marion County, which revealed a deficit in residential land for the City's 20 year-land supply as required by ORS 179.296 and OAR 660-015-0000(14); and

WHEREAS, Statewide Planning Goals requires cities to plan and develop a timely, orderly and efficient arrangement of public facilities and services to new urban growth area; and

WHEREAS, in order to provide public water utility facilities and services for the projected population at their September 12, 2017 meeting the City Council approved Resolution No. 444-17 authorizing the City of Donald's grant application to Business Oregon for a Water System Master Plan in the amount of $20,000; and

WHEREAS, on March 8, 2018 the City received a grant award notification letter for project #V18008 from Business Oregon in the amount of $20,000 for a Water Master Plan; and

WHEREAS, at their June 12, 2019 meeting the City Council passed Ordinance NO. 171-2018 amending the text and map of the City of Donald Comprehensive Plan to expand the City of Donald's Urban Growth Boundary by 87.6 acres; and

WHEREAS, the Water Master Plan Update includes, among other things, background on the existing water system, water quality and service goals, a projected water system growth to serve the population to 2040, an evaluation of the existing water system, alternatives to correct system deficiencies, recommended water system improvements, water management and conservation plan, seismic risk assessment and mitigation plans, and a discussion of possible funding programs; and

WHEREAS, on July 11, 2019 the City received an acceptance letter from Oregon Health Authority that the Water System Master Plan Update was reviewed and approved by their agency; and

WHEREAS, at their July 1, 2019 Work Session the City Council heard a presentation from City Engineer Curt McLeod regarding the Water System Master Plan Update.

NOW, THEREFORE, THE CITY OF DONALD RESOLVES AS FOLLOW:

1. This Water Master Plan Update by Curran-McLeod, Inc. is hereby officially adopted and included as Exhibit A attached hereto and by this reference made a part hereof.
2. The Water Master Plan Update will serve as a guide for allocation of resources for the improvement and continued development of Donald's Water System.
3. The adoption of this Water Master Plan Update supersedes previous wastewater plans.

PASSED and ADOPTED by the City Council of the City of Donald at their regular meeting on this 13th day of August 2019 by the vote of 6 ayes and 0 nays.

DATE: August 13, 2019

Brad Oxenford, Mayor

ATTEST by City Manager this 13th day of August 2019.

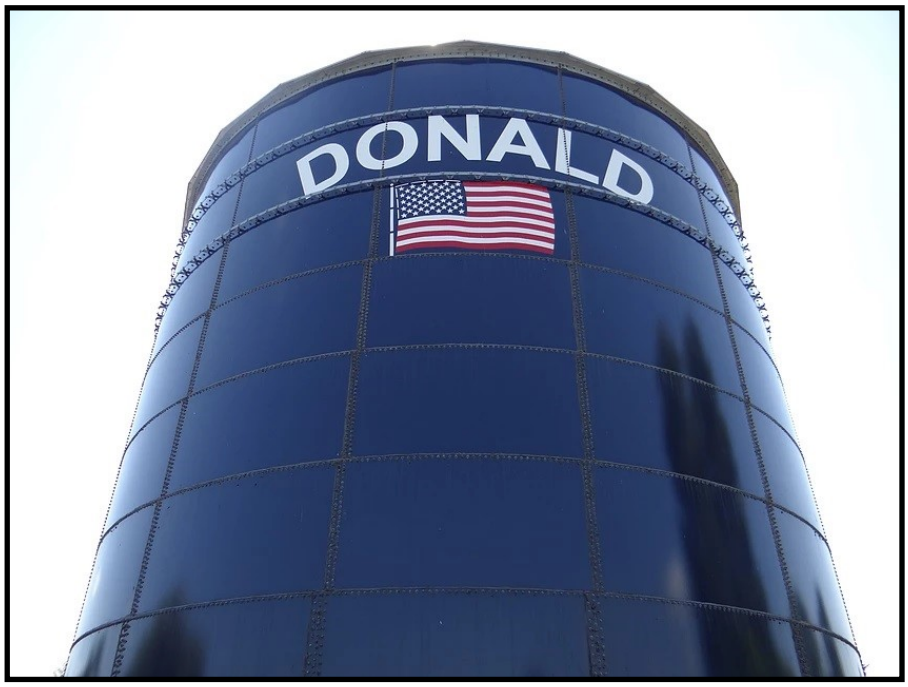
Heidi Bell, City Manager

Engineering Report

CITY OF DONALD

WATER SYSTEM MASTER PLAN UPDATE

Marion County, Oregon



This project was funded in part with a financial award from the Water Fund, funded by the Oregon State Lottery and administered by the State of Oregon, Business Development Department.

June 2019

CURRAN-McLEOD, INC., Consulting Engineers
6655 SW Hampton Street, Suite 210
Portland, OR 97223

CITY OF DONALD

WATER SYSTEM MASTER PLAN UPDATE

Marion County, Oregon

Adopted August 13, 2019
Donald Resolution 484-19

June 2019

This project was funded in part with a financial award from the Water Fund, funded by the Oregon State Lottery and administered by the State of Oregon, Business Development Department

CURRAN-MCLEOD, INC., CONSULTING ENGINEERS
Portland, Oregon 97223

PUBLIC HEALTH DIVISION
Drinking Water Services
Kate Brown, Governor

REC'D JUL 15 2019

Oregon Health Authority

800 NE Oregon Street, #640
Portland, OR 97232-2162
Phone: 971-673-0191
Fax: 971-673-0694
www.healthoregon.org/DWP

July 11, 2019

Heidi Bell, City Manager
City of Donald
PO Box 388
Donald, OR 97020

Re: **2019 Master Plan (PR#14-2019)**
City of Donald (PWS ID#00259)
Concurrence with Master Plan

Dear Heidi:

On March 6, 2019, our office received additional information to address the seismic risk assessment. This completes DWS' review, and it appears the criteria listed in Oregon Administrative Rules (OAR) 333-061-0060(5) have been met.

If you have any questions, please feel free to call me at (971) 673-0191.

Sincerely,

Carrie Gentry, PE
Regional Engineer
Drinking Water Services

cc: Curt McLeod, PE, Curran-McLeod, Inc. Consulting Engineers

ec: Greg DeBlase, Marion County Environmental Health

City of Donald
WATER SYSTEM MASTER PLAN UPDATE

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FIGURES

APPENDICES

LIST OF ACRONYMS

ADD	Average Day Demand
CCI	Construction Cost Index
CFS	Cubic Feet per Second
CMU	Concrete Masonry Unit
CY	Cubic Yard
DEQ	Dept of Environmental Quality
EDU	Equivalent Dwelling Units
ENR	Engineering News Record
EPA	Environmental Protection Agency
FY	Fiscal Year
GO	General Obligation
gpc/d	Gallons per Capita per Day
gpd	Gallons per Day
gpm	Gallons per Minute
HDPE	High Density Polyethylene
HMI	Human Machine Interface
IFA	Infrastructure Finance Authority
LAN	Local Area Network
lbs/d	Pounds per Day
LF	Lineal Foot
LS	Lump Sum
MCL	Maximum Contaminant Level
MG	Million Gallons
mg/L	Milligrams per Liter
MGD	Million Gallons per Day
mL	Milliliters
ND	None Detected
OAR	Oregon Administrative Rules
OHA	Oregon Health Authority
OHCS	Oregon Housing & Community Services
ORS	Oregon Revised Statutes
OWRD	Oregon Water Resources Department
pCi/L	picoCuries per Liter
PDD	Peak Day Demand
PLC	Programmable Logic Controller
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
RP	Repeat Sampling
RT	Routing Sampling
SCADA	Supervisory Control & Data Acquisition
SDC	System Development Charge
SDWA	Safe Drinking Water Act
SF	Square Foot
SOC	Synthetic Organic Chemicals
SY	Square Yard
TDH	Total Dynamic Head
TG	Trigger Sampling
UGB	Urban Growth Boundary
USDA	United States Department of Agriculture
WMCP	Water Management & Conservation Plan
WTP	Water Treatment Plant

City of Donald
WATER SYSTEM MASTER PLAN UPDATE
Marion County, Oregon

EXECUTIVE SUMMARY

The City of Donald commissioned CURRAN-MCLEOD, INC. to review the City's water operations and prepare a Water System Master Plan Update to the 2005 HDR Water System Master plan. The Plan provides an updated assessment of the City's well sources, treatment, storage and distribution systems. The Plan was prepared in accordance with the Oregon Health Authority Drinking Water Services, Plan Review requirements for Master Plans at existing or new public water systems.

The City has a current population of approximately 985 and 408 metered water services. The existing water system serves all of the area within the City limits and is currently near capacity. The system consists of two wells with a combined water right of 0.78 Cubic Feet Per Second (CFS) or 350 gallons per minute (gpm). However, Well No. 1 has failed and is no longer in service. Well No. 2 has a strong history of performance and the well pumping equipment has been replaced in 2018 to ensure continued performance.

The water treatment system consists of a mixing tank and three green sand pressure filters. Potassium permanganate is used to treat the water for iron, manganese and hydrogen sulfide, although none of these constituents are above the Maximum Contaminate Level prescribed by the Oregon Health Authority. Filtered water is pumped to two onsite ground level storage reservoirs. Multiple pumps and a hydro-pneumatic tank are used to maintain system pressures throughout the distribution system.

The City's water system is in compliance with all Oregon Heath Authority Water quality monitoring standards set forth in OAR 333-061-0036 for drinking water. It is anticipated that due to the quality of the groundwater source, the existing treatment process will be able to meet any new drinking water regulations for the foreseeable future.

Average water production for the past several years has been approximately 100 gallons per capita per day (gpc/d), which equates to 68 gpm or 98,500 gallons per day (gpd). Production to meet current peak day demand is 250 gpc/d, which equates to 171 gpm or 246,250 gallons per day.

Using the 2040 population projections prepared by Portland State University of 1,705, water production to meet the average day demands at the end of the planning window is expected to increase to 118 gpm, or 170,500 gpd. Production to meet peak day demands is estimated at 296 gpm, or 426,250 gpd.

In an overview, although adequate to meet current demands, the existing source, treatment and distribution pumping system capacities are inadequate to meet future demands and do not provide any degree of reliable capacity or redundancy.

Following is a summary of the capital improvements recommended to provide a reliable system to meet the projected future demands:

City of Donald
Water System Capital Improvement Plan Summary
December 2018 ENR CCI 11,185

Item	*Improvement*	*Priority*	*Estimate Cost*
A. Source Improvements			
1	Well No. 1 Cap for Future Use	1-5 years	$10,000
2	Well No. 2 Water Rights Modifications Increase Capacity to 300 gpm	1-5 years	55,000
3	Well No. 3 - Develop New Well at the WTP site, Secure water right for 300 gpm;	1-5 years	$360,000
	Total Cost of Source Improvements		**$425,000**
B. Water Treatment Plant Improvements			
1	Replace existing filter control smart relay with a Programmable logic controller	1-5 years	$25,000
2	Add two 80 gpm Green Sand Filter units and associated mechanical piping & controls	1-5 years	$180,000
3	Add secondary containment for chlorine and potassium hypochlorite feed systems. Relocate chlorine feed system	1-5 years	$10,000
4	Install necessary hardware, software, and programming for Supervisor Control and Data Acquisition (SCADA) system	1-5 years	$60,000
5	Expand the CMU building to provide office and staff facilities.	1-5 years	$150,000
	Total Cost of Treatment System Improvements		**$425,000**
C. Distribution Pumping system Improvements			
1	Three Pump, Skid-Mounted Jockey Pumping System, 833 gpm each Pump, with Variable Speed Controllers	1-5 years	$250,000
D. Emergency Power Improvements			
1	Replace existing standby power system and automatic transfer switch at WTP to support the distribution pumps and one well source	1-5 years	$90,000
		Total Cost	**$1,190,000**

Financing these improvements will require the City to approve incurring debt, and secure outside funding. Private developers may offer to work with the City to potentially utilize System Development Fee credits to fund the infrastructure improvements. If this can be negotiated, this could be a very beneficial arrangement for both parties.

Alternatively, the City should coordinate with Oregon Business Infrastructure Finance Authority (IFA) to schedule a One-Stop meeting, where multiple public funding agencies could discuss potential options for the City.

The City should begin the improvement process of all highest priority improvements to provide capacity and redundancy for the water system. The source, treatment and distribution pumping systems are all operating near capacity and without redundancy.

The total cost to implement the 1 - 5 year capital improvements is estimated at $1,190,000. With current grants funds of $75,000, the net funding needs of $1,115,000 would result in debt service of approximately $64,500 per year (plus 10% reserve if required) based on a 4% 30-year loan. This would result in a current property tax assessment of $0.70 per $1,000, or a water system rate increase of $12.71 per month. If the funding agency requires the City maintain a reserve fund, these costs would be increased by 10% for the first ten years of debt repayment.

City of Donald
WATER SYSTEM MASTER PLAN UPDATE
Marion County, Oregon

I. EXISTING WATER SYSTEM

A. Background

The City of Donald is located in Marion County, approximately 25 miles north of the City of Salem and 1 mile west of Interstate 5. The City was settled in the mid-1800s mainly by farmers and loggers. In 1908 the Oregon Electric Railway began service between Portland and Salem serving the City of Donald, which resulted in growth of the City. In 1910, the Spokane, Portland and Seattle railway purchased the system. The City is now served by the Portland & Western Railroad (PNWR). The City of Donald was incorporated in 1912.

The population of the City grew slowly from 1920 through 1980, more than doubling in size to an unofficial estimated population of 267. From 1980 to the present, growth increased more rapidly to an estimated population of 985 in 2018 according to the Portland State University Annual Population Report.

A privately-owned water system served the City until 1937, when the City purchased the well and distribution system for $750. In 1977, it was determined that the existing well was deficient by the Oregon State Board of Health and the Environmental Protection Agency. Based on the findings by the State, the City was required to correct the deficiencies. Correction of the deficiencies resulted in the development of two new wells, filtration facilities for iron and manganese, a jockey/hydro-pneumatic pumping system with an engine driven pump and auxiliary power supply, and a 200,000 gallon ground-level storage reservoir. These improvements were completed in 1981.

In 2005 a 326,000 gallon ground-level, bolted steel tank was constructed at the water treatment facility for additional storage. In 2017, a 2,500 gpm high flow pump was added to the existing pumping system, along with its own backup emergency power system, to increase fire flow capabilities. Most recently, in 2018, the 35-year-old pumping equipment for Well No. 2 was replaced.

The City has approximately 408 actively metered residential and commercial water services as of June 30, 2018. Meters are read monthly and water bills include a base charge of $42.68 per month for residential/commercial customers for the first 1,000 gallons, with a charge of $2.81 per 1,000 gallons for all additional water used. These rates are scheduled to increase by 3% per year for the next two years as per a rate study approved by Council. Afterwards, the Municipal Code sets rates to increase annually to match the cost of living index.

B. Service Area

The existing water system serves all of the area within the City limits with a single pressure zone. The ground elevation throughout the UGB varies from approximately 190 to 200 feet, with the water system hydraulic grade line at approximately 360 feet.

The study area for this Master Plan Update includes the entire Urban Growth Boundary, as shown in Figure 2.1, including the additional 87.6 acres of residential and public property annexed in 2018.

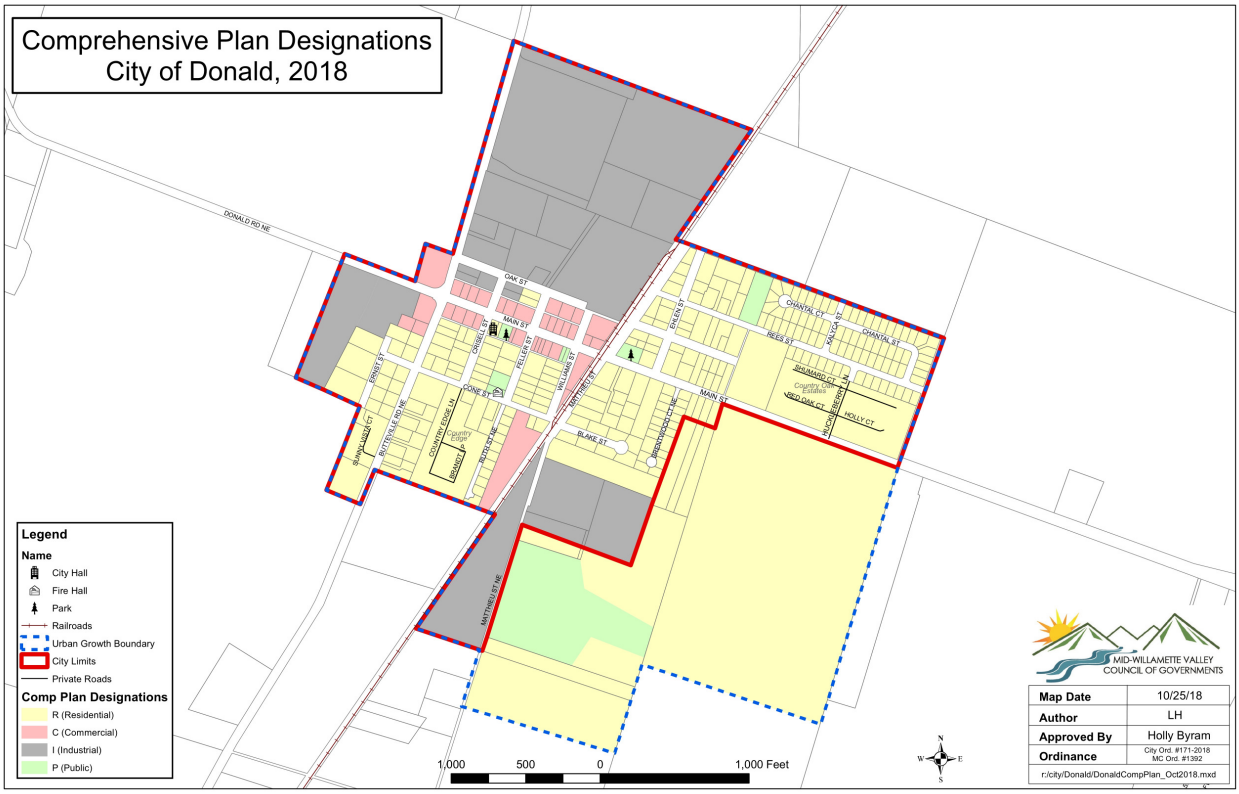

Figure 2.1 Donald Urban Growth Boundary and Land Use

C. Source of Supply

The City currently has two source wells, both located at the Water Treatment Plant site on Rees Street, NE.

Well No. 1 is located inside the Water Treatment Facility building. The well has a 12" diameter casing 210 feet deep, and is fitted with an 8" slotted PVC liner packed with sand and gravel. The well pump is designed to provide 175 gpm at a head of 175 feet and is set at approximately 175 feet below the top of the well. Static water level fluctuates from approximately 80 - 90 feet below the top of the well, and operational levels vary from 100 to 120 feet below the ground surface.

Well No. 1 has a history of sand intrusion, apparently as a result of failure of the PVC screens, to the extent that the well is no longer productive. Multiple rehabilitation efforts have been made over multiple years, but ultimately it was concluded that Well No. 1 cannot be cost effectively repaired. Well No. 1 has been out of service with zero production since 2013.

Well No. 2 is also located on the Treatment Plant property, approximately 170 feet due north of Well No. 1. Well No. 2 has a 12" casing that is 190 feet deep, and similarly fitted with a slotted PVC screen, and a 175 gpm at 175 feet TDH well pump, set at 175 feet below the top of the well. In 2018 the City replaced the pump and column piping with comparable horse power but increased capacity to 200 gpm at 200 feet TDH to ensure continued performance.

Both well pumps are 15 horsepower submersible design. Well logs for both Well 1 and 2 are attached in the appendix.

D. Status of Water Rights

The City applied for water rights for Wells No. 1 and No. 2 under application G9938 and received permit G-9513 with priority date of September 16, 1980. (See Appendix). The permit allows a withdrawal of up to 0.78 cfs, or 350 gpm.

An application for a partial Certificate of Beneficial Use (CBU) was submitted to Oregon Water Resources Department in 2010, and is currently being processed.

E. Water System Operations

The City of Donald owns and operates a public water system registered with the Oregon Health Authority as system number OR 41-00259. A schematic of the treatment system is shown in Figure 2.2 with the location of the facilities shown in Figure 2.3.

Source water is derived from groundwater that is pumped to the adjacent water treatment facility, where it passes through a sand separator and is then metered. The flow is conditioned with potassium permanganate to oxidize hydrogen sulfide, iron and manganese as it passes through the mixing tank and then removed through the green sand pressure filtration system. The treated water is discharged into two parallel on-site storage tanks. The treated water is not routinely chlorinated.

From the ground-level storage tanks, distribution pumps are used to pressurize a 3,500 gallon hydro-pneumatic tank, which maintains distribution system pressures between 60 and 68 psi. Two electric pumps are used to accomplish this operation.

Previously, an engine driven third pump provided an emergency backup should either of the two distribution pumps fail, or if the auxiliary engine generator fails to support the distribution pumps. With the installation of the new high flow pump in 2017, the engine driven pump is no longer in service.

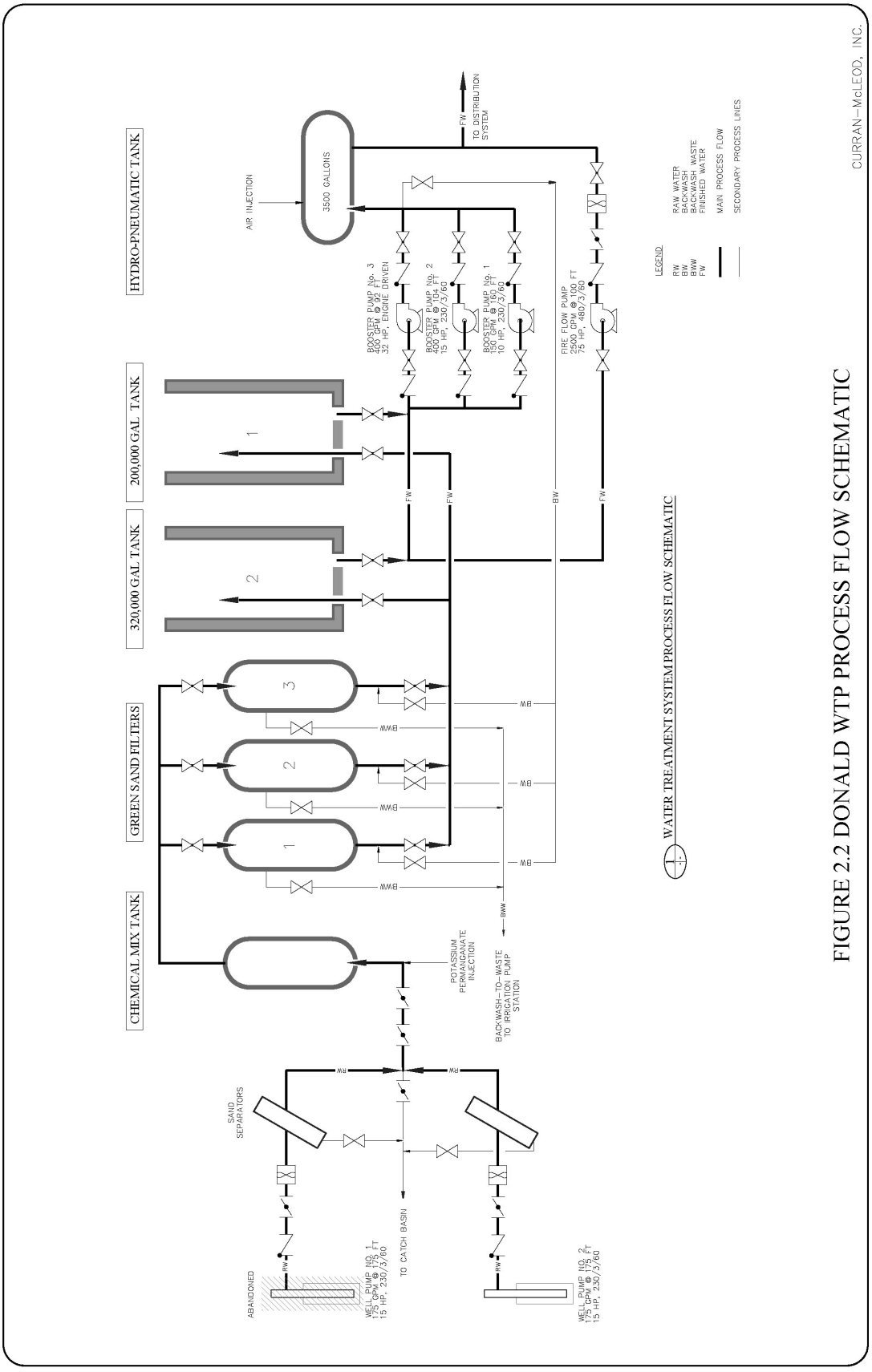

FIGURE 2.2 DONALD WTP PROCESS FLOW SCHEMATIC

CURRAN–McLEOD, INC.

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FIGURE 2.3 DONALD WTP SITE PLAN

CURRAN–McLEOD, INC.

J:\Donald\WATER SYSTEM\Water system Site Figure 2.3.dwg, 6/21/2019 9:36:03 AM, DWG To PDF.pc3

The 1981 Operation and Maintenance narrative is attached to this document in the appendix, which describes the operation of the existing system.

Subsequent to the initial water system development in 1981, a 326,000 gallon bolted steel storage reservoir was added in 2005, and more recently a new high flow pump station was added in 2017. The single, isolated high flow pump has a nominal capacity of 2,500 gpm and can draw water from the 200,000 gallon or the 326,000 gallon reservoirs.

The operation of the high flow pump is initiated by a depression in distribution system pressure if the existing booster pumps cannot maintain system pressures. A copy of the high flow pump operation is also include in the appendix, and was added as a supplement to the basic manual.

Distribution pump performance and characteristics of all pumps at the Water Treatment Plant site are summarized in the following table:

City of Donald
WTP Distribution Pump Capacity

Pump No.	*Horsepower*	*Design Head (ft)*	*Design Flow (gpm)*
1	15	104	400
2	15	104	400
3*	35	92	400
High flow pump	75	100	2,500

* Propane engine driven pump is in-place, but no longer in-service.

F. Water System Demands

Production data was provided by the City for 2014 through 2018. Based on the data provided, annual Average Day and estimated Peak Day production are shown in the following table:

City of Donald
Average Water Production History

Year	*Yearly Total (gallons)*	*Ave Day (gpd)*	*Peak Day (gpd)**	*Peak Day (gpm)**
2014	34,984,100	95,847	263,579	183
2015	35,896,000	98,345	270,449	188
2016	33,934,700	92,972	255,672	178
2017	38,596,800	105,745	290,798	202
2018	40,912,400	112,089	308,244	214
Average	36,864,800	100,999	277,748	193

*based on the 2005 Master Plan factor of 2.75 times average day demand

The 2005 Master Plan defined the Peak Day Demand based on a peak day in August 2002 of 171,800 gallons, which resulted in a peaking factor of 2.75 times. Current Peak Day Demands in mid-July of 2017 and mid-July of 2018 both had a single day of 256,000 gallons.

Based on an average day production in 2017 of 105,745 gpd, a peak day of 256,000 gallons this would indicate a peaking factor of 2.4. Based on the average day production in 2018 of 112,089 gallons, a 256,000 gallon day would indicate a peaking factor is 2.3 times average. For design, a conservative peaking factor of 2.5 will be used in this update.

The service population of the City of Donald has been relatively unchanged since 2010. The City currently has 359 residential meter connections, 35 commercial/industrial connections and 14 additional City or locked out accounts. The following table is a summary of all water system accounts as of December 2018:

City of Donald
2018 Municipal Water System Accounts

	Meter Size					*Total*
	5/8"	*3/4"*	*1"*	*1.5"*	*2"*	
Residential Accounts	319	38	2	0	0	359
Commercial/Industrial Accounts	23	2	6	4	0	35
	Total Billed Accounts					**394**
City Properties	3	3	2	0	0	8
Currently Locked-off	6	0	0	0	0	6
TOTAL CONNECTIONS	**351**	**43**	**10**	**4**	**0**	**408**

Based on the number and size of water meters, a summary of Equivalent Dwelling Units (EDU) based on the meter capacity to deliver water, is estimated in the following table:

City of Donald
2018 Connection and EDU Summary

Meter Size	*No.*	*EDU Factor*	*Total EDU*
Residential:			
5/8"	319	1	319
3/4"	38	1*	38
1"	2	1.66	3
1 1/2"	0	3.33	0
2"	0	5.33	0
Total	359	Total	360
Commercial:			
5/8"	23	1	23
3/4"	2	1*	2

1"	6	1.66	10
1 1/2"	4	3.33	13
2"	0	5.33	0
Total	35	Total	48
Public/Locked Residential:			
5/8"	9	1	9
3/4"	3	1*	3
1"	2	1.66	3
Total	14	Total	15
TOTAL EDU			423
Ave 5 year production, gallons			36,864,800
Gallons per Day per EDU			239

**5/8" and 3/4" meters are both assigned capacity factor of 1*

The following table summarizes the daily sales based on the percentages of each user category from the last fiscal year of data. The table also shows the number of Equivalent Dwelling Units as of December 2018, based on AWWA meter capacities and alternatively based on an average demand of 7,500 gallons per month, as utilized by funding agencies for comparisons:

City of Donald
2017-18 Municipal Water Sales Summary

Type of User	*No. of Users*	*2017 Annual Sales (gal)*	*Ave gpd Per Capita/Service*	*EDU[1]*	*EDU[2]*
Residential	985	22,279,000	62	360	248
Commercial	35	3,474,000	272	48	39
Public/Locked	14	462,000	90	15	5
	Total	26,215,000	Total	423	291

EDU[1] is based on water meter capacity factors shown above

EDU[2] is based on consumption of 7,500 gallons per month

In 2017-18, the system included a total of 423 Equivalent Dwelling Units with a five-year average production of 239 gallons per day per EDU. This meter capacity based EDU accounts for the commercial and industrial usage separately from residential loads. This creates some difficulty in monitoring system demands because commercial/industrial EDU and demands can vary substantially, depending upon the activity and season.

Population and water *demand* has remained relatively constant from 2010 through 2018, and the population in the City has only increased by 5 people over the past eight years. However, in 2017 and 2018 water *production* had a substantial increase.

The following table allocates all water production to population, to define the per capita production for use in projecting future needs. This per capita production factor includes the demands from commercial/industrial use, public and other use, and system losses:

City of Donald
Municipal Water Production Summary

Year	*Population*	*Annual Average (gpd)*	*Annual Average (gpd/capita)*	*Peak Day (gpd/capita)*
2014	975	95,847	98	246
2015	980	98,345	100	251
2016	985	92,972	94	236
2017	985	105,745	107	268
2018	985	112,089	114	284
	Average	100,999	103	257

A comparison of production to sales records for the same time frame provides insight into the amount of unaccounted water. The unaccounted water may be due to leakage, flushing, fire flows, backwashing at the water plant, and other uses that are not metered. The following table shows the raw water production and the metered water sales for the same time frame, with the difference being the unaccounted water, or water losses:

City of Donald
Annual Water Loss Summary

Year	*Production (gallons)*	*Sales (gallons)*	*Losses (gallons)*	*Losses (percent)*
2014	34,984,100	26,037,508	8,946,592	25.6%
2015	35,896,000	25,653,200	10,242,800	28.5%
2016	33,934,700	25,052,000	8,882,700	26.2%
2017	38,596,800	25,068,000	13,528,800	35.1%
2018	40,912,400	26,402,000	14,510,400	35.5%
Average	36,864,800	25,393,000	12,357,995	30.2%

Losses increased substantially in 2017 and 2018, to over 35%. On average, there was over 30% unaccounted water in the past five years. The City needs to continue to aggressively identify and repair any system leakage.

Interesting to note that metered backwash water more than doubled in 2017 and 2018 from the average of the previous four years. Filter backwash process water in 2017 and 2018 amounted to over three million gallons per year, which equates to approximately 9% of the losses. This

is apparently due to the process of replacing the filter media in 2017 and new operating procedures for backwashing the new media.

The City's net metered water sales records are based on three classes of water use: residential, commercial and City/Other. Sales records have been provided for the two fiscal years to determine a breakdown between each class of service connection. The actual breakdown of the last two fiscal years is shown in the following table:

City of Donald
Water Sales Allocation

Fiscal Year	*Total*	*Residential*		*Com / Ind*	*City/Other*	*%*
		Gallons	*%*	*Gallons*	*Gallons*	
2016-17	27,893,000	21,547,000	77	5,576,000	770,000	23
2017-18	26,215,000	22,279,000	85	3,474,000	462,000	15
Average	27,054,000	21,913,000	81%	4,525,000	616,000	19%

The average of the two years from the table shows approximately 81% of the water sold was for residential use, with 19% being commercial/industrial/public and other usage by the City.

For this planning effort, the water demand will be based on the existing 985 residential population with an average production of 100 gallons per capita per day (gpc/d). This incorporates the commercial/industrial demands into the per capita production, and assumes the ratio of commercial/industrial demands to residential demands will remain a relatively constant proportion with future growth.

In summary, design criteria for projecting water system demand will be based on 100 gallons per capita per day, and includes the following components:

Residential Demand per Capita	57 gpc/d
Com/Other Demand per Capita	13 gpc/d
Process / Losses per Capita	30 gpc/d
Design Ave Day Demand	**100 gpc/d**
Peak Day Demand	**250 gpc/d**

G. Operation and Maintenance Requirements

The water treatment facility is typically un-manned during the workday, but is routinely inspected by the City's two certified operators. The distribution system requires a level 1

certification based on population. The treatment facilities do not require any certification due to the raw water quality.

The Public Works Director is designated as in Direct Responsible Charge (DRC) and has Level 2 certifications for both distribution and treatment. The DRC is also registered for cross connection/backflow certification. The Donald water system operators are required by OHA to have only a level 1 certification for distribution, and no certification for treatment due to the source water quality.

Maintenance requires that potassium permanganate and sodium hypochlorite (which is only infrequently used) solutions are replenished as needed. The green sand filters are backwashed based on a time interval. Backwash water is provided from the on-site storage tanks.

Routine water quality sampling is performed monthly in accordance with the coliform site plan. Maintenance of all equipment takes place as scheduled.

The two propane-powered standby power generators, one installed in 1983 and the second in 2017, are exercised weekly to ensure their operability in the event of a power outage. 500 gallons of propane are stored at the facility and the City has an agreement to supply refueling as needed.

II. WATER QUALITY AND SERVICE GOALS

A. Existing Regulatory Requirements

The City of Donald is classified as a "Community Water System" by the Oregon Health Authority Drinking Water Services and is subject to routine monitoring under the Federal Safe Drinking Water Act (SDWA) along with its amendments as adopted by the State of Oregon. A summary of the SDWA was provided in the 2005 Water System Master Plan and can be reviewed in Section 3.11 of the Plan, beginning on Page 3-1.

B. Monitoring Requirements

OAR 333-061-0036 sets forth the monitoring schedule for compliance with the drinking water regulations. In accordance with this section:

- *Samples required by these rules must be analyzed using EPA approved methods set forth in 40 CFR 141 by a laboratory accredited according to OAR chapter 333, division 064 and the Oregon Environmental Laboratory Accreditation Program (ORELAP). The laboratory must be certified to analyze drinking water samples using the specific method for the contaminant being analyzed.*
- *All Samples must be tested by an Oregon Health Authority approved laboratory;*
- *Compliance with MCLs is to be based on each sampling point;*
- *The Authority may require additional sampling and analysis for the contaminants included in OAR 333-061-0030 when necessary to determine whether an unreasonable risk to health exists. The Authority may also require sampling and analysis for additional contaminants not included in OAR 333-061-0030 when necessary for public health protection.*

- *Water suppliers and their appointed representatives shall collect water samples from representative locations in the water system as prescribed in this rule and shall employ proper sampling procedures and techniques.*

Based on OAR 333-061-0036, the routine monitoring schedule and sampling interval for chemicals is shown in the following table taken from the Oregon Health Authority web site:

PWS #: 00259 DONALD, CITY OF Routine Sampling Schedules For Chemicals								
Facility ID	Name	Status	Test Group	Samples Required	Sampling Interval	Start	End	Notes*
DIST-A	Distribution System	A	LEAD & COPPER	10	3 Years	01/01/2002	Open	Sample Between June 1st and Sept 30th
EP-A	EP FOR WELLS #2 & #1	A	ARSENIC	1	3 Years	01/01/2002	Open	
EP-A	EP FOR WELLS #2 & #1	A	IOC	1	9 Years	01/01/2002	Open	Schedule Reflects Monitoring Reduction Granted
EP-A	EP FOR WELLS #2 & #1	A	NITRATE	1	Yearly	01/01/2002	Open	
EP-A	EP FOR WELLS #2 & #1	A	NITRITE	1	9 Years	01/01/2002	Open	Schedule Reflects Monitoring Reduction Granted
EP-A	EP FOR WELLS #2 & #1	A	RAD - GROSS ALPHA	1	9 Years	01/01/2008	Open	Schedule Reflects Monitoring Reduction Granted
EP-A	EP FOR WELLS #2 & #1	A	RAD - RADIUM 226/228	1	6 Years	01/01/2017	Open	
EP-A	EP FOR WELLS #2 & #1	A	RAD - URANIUM	1	9 Years	01/01/2014	Open	
EP-A	EP FOR WELLS #2 & #1	A	SOC	1	3 Years	01/01/2002	Open	
EP-A	EP FOR WELLS #2 & #1	A	VOLATILE ORGANICS	1	3 Years	01/01/2002	Open	

Sampling results for the last few years are summarized in the following narratives.

1. Arsenic

OAR 333-061-0036(2)(b)(A)(ii) requires water systems using groundwater sources to monitor at each point in the distribution system representative of each source after treatment or at entry points to the distribution system representative of each source after any application of treatment. Monitoring is to be conducted once every three years at each sampling point. Samples must be collected at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

Results of recent tests show the well water is well below the Primary Maximum Contaminant Levels (MCL), as shown in the following table.

Arsenic Sampling		
Sample Date	**Results (mg/L)**	**MCL (mg/L)**
Apr 07, 2017	ND	0.01
Nov 07, 2014	0.005	
Sep 04, 2014	0.005	
Aug 08, 2013	0.004	
Aug 08, 2013	0.0045	
Oct 13, 2010	0.0057	
Dec 04, 2002	0.0074	

2. Lead and Copper

Lead and Copper sampling is required within the distribution system every 3 years between June 1st and September 30th. Lead levels have been well below the 0.015 mg/L Primary MCL. Copper levels have never exceeded the 1.3 mg/L primary MCL or 1.0 mg/L Secondary MCL.

The 90th percentile summary sampling results for the last three sampling periods are shown in the following table.

Lead and Copper 90th Percentile Summary Results and Consumer Notices			
Sample Dates	**Sample Count**	**Lead (mg/L)**	**Copper (mg/L)**
Jul 18, 2018 - Jul 18, 2018	11	0.0050	0.1100
Jul 16, 2015 - Jul 16, 2015	11	0.0060	0.1870
Sep 13, 2012 - Sep 14, 2012	10	0.0028	0.1650

* Lead MCL = 0.015 mg/L, Copper MCL = 1.3 mg/L

3. Inorganic Compounds

The City of Donald is required to test for 16 inorganic chemicals listed in OAR 333-061-0030(1) and 333-061-0036(2). The City is sampling for these compounds under a reduced schedule granted by the OHA, which extends the sampling interval to once every 9 years.

The City is not monitoring for asbestos and received a waiver for sampling since it is not vulnerable to either asbestos contamination in its wells or due to corrosion of asbestos-cement pipe.

The most recent sampling for inorganic compounds was completed in 2014 and 2015 and is shown in the following table.

Inorganic Compounds			
Contaminant	**Sample Date**	**Results (mg/L)**	**MCL (mg/L)**
Antimony	Nov 07, 2014	ND	0.006
Arsenic		0.005	0.01
Barium		0.012	2
Beryllium		ND	0.004
Cadmium		ND	0.005
Chromium		ND	0.1
Cyanide		ND	.02
Fluoride		0.27	4
Mercury		ND	0.002
Nickel		ND	0.1
Nitrate		0.07	10
Nitrate-Nitrite	Mar 09, 2015	0.05	10
	Nov 07, 2014	0.14	
Nitrite	Mar 09, 2015	0.0042	1

	Nov 07, 2014	0.07	
Selenium	Nov 07, 2014	ND	0.05
Sodium		9.6	NA
Thallium, Total		ND	0.002

* ND = None Detected NA=Not Applicable, no MCL

4. Nitrate

All community and Non-Transient Non-Community (NTNC) water systems using groundwater sources must monitor nitrate annually according to OAR 333-061-0036(2)(c)(B) at each point in the distribution system representative of each source after treatment or at entry points to the distribution system after any application of treatment.

Quarterly monitoring for at least one year is required following any one sample in which the concentration of nitrate is 50 percent of the MCL or greater. Monitoring may return to once annually after four consecutive quarterly samples are found to be reliably and consistently below the MCL.

Nitrate levels have always been well below the MCL. The following table shows the most recent sampling results.

Nitrate		
Sample Date	Results (mg/L)	MCL (mg/L)
Jul 18, 2018	0.01	10
Apr 07, 2017	0.07	
May 19, 2016	0.05	
Mar 09, 2015	0.05	
Nov 07, 2014	0.07	
Nov 07, 2014	0.07	
Sep 04, 2014	0.03	
Sep 04, 2014	0.05	

5. Nitrite

Initially the City of Donald was required to collect one sample for nitrite at each point in the distribution system representative of each source after treatment or at entry points to the distribution system after application of treatment. The monitoring interval has been reduced to a 9-years compliance cycle under a waiver granted by the OHA from the monitoring frequency specified in paragraph OAR 333-061-00030 (2)(d)(B).

The City has continued to monitor for Nitrate more frequently than required as reflected in the following table.

Nitrite		
Sample Date	Results (mg/L)	MCL (mg/L)
Mar 09, 2015	0.0042	1
Nov 07, 2014	0.07	
Nov 07, 2014	0.07	

6. Radionuclides

Radionuclides include: Gross alpha particle activity, Radium 226, Radium 228, and Uranium required initial monitoring. Community water systems without acceptable historical data, as defined below, must conduct initial monitoring to determine compliance with OAR 333-061-0030(5).

Gross Alpha Particle activity and Uranium are sampled on a 9-year cycle whereas Combined Radium-226 and Radium-228 is sampled on a 6-year cycle. The sample results and corresponding MCLs are shown in the following table.

Radionuclides			
Contaminant	Sample Date	Results	MCL
Gross Alpha	Nov 09, 2010	ND	15 pCi/L
	Nov 19, 2003	ND	
Combined Radium-226 and Radium-228	Nov 09, 2010	0.9 pCi/L	5 pCi/L
	Nov 19, 2003	ND	
Uranium	Nov 05, 2014	ND	30 µg/L
	Nov 09, 2010	ND	
	Nov 19, 2003	1.1E-5 µg/L	
Beta/Photon emitters	Nov 19, 2003	ND (1)	4 mrem/yr

(1) ND was indicated in the single sampling data on the OHA website, but there was not a sample date or ID.

7. Synthetic Organic Chemicals (SOC)

In accordance with OAR 333-061-0030(3)(a), the City must monitor the following regulated SOCs. The samples are collected at the entry point to the distribution system after application of treatment. Samples are taken at 3-year intervals.

The following table shows the most recent sample results taken on April 7, 2017, and the MCL for each contaminant:

Synthetic Organic Chemicals		
Contaminant	**Results (mg/L)**	**MCL (mg/L)**
Alachlor	ND (1)	0.002
Atrazine	ND	0.003
Benzo(a) pyrene	ND	0.0002
Carbofuran	ND	0.04
Chlordane	ND	0.002
Dalapon	ND	0.2
Di(2-ethylhexyl) adipate	ND	0.4
Di(2-ethylhexyl) phthalate	ND	0.006
Dibromochloropropane (DBCP)	ND	0.0002
Dinoseb	ND	0.007
Dioxin(2,3,7,8-TCDD)	ND (1)	0.00000003
Diquat	ND	0.02
Endothall	ND	0.1
Endrin	ND	0.002
Ethylene Dibromide (EDB)	ND	0.00005
Glyphosate	ND	0.7
Heptachlor	ND	0.0004
Heptachlor Epoxide	ND	0.0002
Hexachlorobenzene	ND	0.001
Hexachlorocyclopentadiene	ND	0.05
Lindane(BHC-g)	ND	0.0002
Methoxychlor	ND	0.04
Oxamyl(Vydate)	ND	0.2
Picloram	ND	0.5
Polychlorinated Biphenyls (PCBs) (as Decachlorobiphenyl)	ND	0.0005
Pentachlorophenol	ND	0.001
Simazine	ND	0.004
Toxaphene	ND	0.003
2,4-D	ND	0.07
2,4,5-TP (Silvex)	ND	0.05

(1) Noted as "ND" in online records, but no sample date or ID was listed.

8. Volatile Organic Chemicals

OAR 333-061-0036(3)(b)(A)(ii) required initial sampling for Volatile Organic Chemicals at sampling points served by groundwater sources, were to be collected at every entry point to the distribution system after treatment. Samples are to be collected annually for three consecutive years at the sampling point during each compliance period at the same sampling point representative of each source or treatment plant.

Since the initial analyses did not detect any contaminants listed in OAR 333-061-0030 (3)(a), sampling was reduced to one sample every three years. The most recent sampling

occurred on April 7, 2017. The results are listed in the following table along with the MCL for each contaminate.

Volatile Organic Chemicals		
Contaminant	**Results (mg/L)**	**MCL (mg/L)**
Benzene	ND	0.005
Carbon tetrachloride	ND	0.005
cis-1,2-Dichloroethylene	ND	0.07
Dichloromethane	ND	0.005
Ethylbenzene	ND	0.7
Monochlorobenzene	ND	0.1
o-Dichlorobenzene	ND	0.6
p-Dichlorobenzene	ND	0.075
Styrene	ND	0.1
Tetrachloroethylene(PCE)	ND	0.005
Toluene	ND	1
trans-1,2-Dichloroethylene	ND	0.1
Trichloroethylene (TCE)	ND	0.005
Vinyl chloride	ND	0.002
Xylenes(total)	ND	10
1,1-Dichloroethylene	ND	0.007
1,1,1-Trichloroethane	ND	0.2
1,1,2-Trichloroethane	ND	0.005
1,2-Dichloroethane	ND	0.005
1,2-Dichloropropane	ND	0.005
1,2,4-Trichlorobenzene	ND	0.07

9. Total Coliform

In addition to chemical sampling, sampling for Total Coliform is also required and is conducted monthly. The recent sampling results are shown in the following table.

Total Coliform Sampling			
Sample Date	**Sample Type**	**Results**	**Sample Site**
Dec 05, 2018	TG	Absent	Rees ST Well #2
Dec 05, 2018	RP	Absent	Main ST Site 1C
Dec 05, 2018	RP	Absent	Cone ST Site 1B
Dec 05, 2018	RP	Absent	Repeat Site 1A
Dec 03, 2018	RT	Positive	Outside Faucet
Sep 06, 2018	TG	Absent	Well #2
Sep 06, 2018	RP	Absent	10750 Main St.
Sep 06, 2018	RP	Absent	10729 Cone St.
Sep 06, 2018	RP	Absent	10710 Main St.
Sep 04, 2018	RT	Positive	Outside Faucet
Aug 06, 2018	RT	Absent	10983 Rees St.
Jul 09, 2018	RT	Absent	10861 Main St.
Jun 04, 2018	RT	Absent	10710 Main St.

May 01, 2018	RT	Absent	10983 Rees St.
Apr 03, 2018	RT	Absent	10861 Main St.
Mar 06, 2018	RT	Absent	10710 Main St.
Feb 06, 2018	RT	Absent	10983 Rees St
Jan 02, 2018	RT	Absent	10861 Main St.
Dec 04, 2017	RT	Absent	10710 Main S.
Nov 01, 2017	RT	Absent	10983 Rees St.
Oct 04, 2017	RT	Absent	10861 Main St.
Sep 06, 2017	RT	Absent	10710 Main St.

RT = Routine Sampling, RP = Repeat Sampling, TG = Triggered Sampling

Routine sampling results for Total Coliform showed a positive result at an outside faucet on September 6, and December 3, 2018. The positive results required additional re-sampling which was conducted at three additional locations as well as re-sampling of Well #2. No subsequent Total Coliform contamination was detected during the re-sampling.

10. Secondary Contaminants

Secondary contaminants are not prohibited, but rather provide a standard for aesthetic reasons. Secondary contaminants are listed in OAR 333-061-0030(6) including an action level as opposed to a Maximum Contaminant Level.

The most recent test results taken from Well No. 2 at the source, are shown in the following table:

Secondary Contaminants			
Contaminant	**Sample date**	**Results**	**Action Level**
Color	(1)	ND	15 color units
Corrosivity	(1)	ND	Non-corrosive
Foaming agents	(1)	ND	0.5 mg/L
pH	Nov 07, 1989	7.4	6.5-8.5
Hardness (as CaCO3)	Dec 14, 1983	176	250 mg/L
Odor	(1)	ND	3 threshold odor number
Total dissolved solids(TDS)	Dec 15, 1989	186	500
Aluminum	(1)	ND	0.05-0.2 mg/L
Chloride	Dec 14, 1983	7.9	250
Copper	Dec 14, 1983	ND	1.3 mg/L
Fluoride	Nov 07, 2014	0.27	2.0 mg/L
Iron	Dec 14, 1983	0.08	0.3 mg/L
Manganese	Dec 14, 1983	0.022	0.05 mg/L
Silver	Nov 10, 1992	ND	0.1 mg/L
Sulfate	Dec 09, 1999	2.3	250
Zinc	Dec 14, 1983	ND	5

(1) OHA online data for the City of Donald did not identify the sampling site or the sample date for these parameters.

The water from Well No. 2 has not exceeded the action level for any of the Secondary Contaminants.

C. Future Regulatory Requirements

1. Contaminant Candidate List (CCL 5)

EPA is developing a fifth Contaminant Candidate List (CCL 5). The list is for contaminants that are currently not subject to any proposed or promulgated national primary drinking water regulations, but are known or anticipated to occur in public water systems. Contaminants listed on the CCL may require future regulation under the Safe Drinking Water Act (SDWA).

On October 4, 2018, EPA requested nominations of chemicals, microbes, or other materials for consideration on the CCL5. The deadline for nominations was December 4, 2018. It is not known at this time how or if the new CCL5 list will impact the City's monitoring and treatment requirements, but it is unlikely any test results would exceed any regulated limits based on the previous tested water quality.

2. Lead and Copper Rule (LCR) Revisions

In December of 2015, EPA received recommendations from the National Drinking Water Advisory Council (NDWAC) and others regarding steps to strengthen the LCR. Among the recommendations being considered that may affect the treatment process are:

- Optimizing corrosion control through the treatment process,
- Clarifying and strengthening the sampling requirements,
- Increasing the availability of lead and copper sampling and testing results to the public and others.

Final rules have not been promulgated at this time. However, there is a good likelihood that increased or modified sampling and monitoring for lead and copper contamination will be required.

D. Non Regulatory Water Quality Needs

At this time there are no other non-regulatory water quality needs within the community; although a common complaint is of the smell or odor of sulfur. Water quality as provided by the City meets OHA requirements meeting the needs of all end users. This may change if higher quality water is needed by a future commercial or industrial user. However, the burden of any additional treatment to a higher level of quality will most likely be provided by the specific industrial or commercial end user.

E. Flow and Pressure Requirements

Water distribution system pressures are maintained by jockey pumps, including the two electric distribution pumps and a hydro-pneumatic tank located at the Water Treatment Plant. In addition to the distribution pumps at the Water Treatment Plant, a stand-alone 2,500 gpm high flow pump with auxiliary power supply was installed in 2017, north of the treatment building to meet all required fire flows. The automated controls will energize this pump system anytime the system pressure drops below 57 psi.

OAR 333-061 requires a minimum pressure of 20 psi be maintained within the distribution system at all times. System pressures are maintained between 60 and 68 psi.

A fire flow of 1,000 gpm for a minimum of 2 hours duration is required for residential areas. Minimum fire flow requirement for commercial buildings is 1,500 gpm for 2 hours. Although not required, the Donald Industrial Park elected to construct distribution system improvements to provide fire flow of 2,500 gpm, which is required to have a 2-hour duration. The distribution system can easily provide this flow, however, the City's storage system cannot support the higher volume of storage required, and the pumps have limited redundancy.

III. PROJECTED WATER SYSTEM GROWTH

A. Population

The population history and projections were provided by the Portland State University, College of Urban & Public Affairs, Population Research Center. The following table lists the historical population through 2018, and the PSU projections through the planning window of 2040:

City of Donald
Population Projections

Year	*Population*
1980	267
1990	316
2000	612
2010	980
2011	980
2012	980
2013	980
2014	975
2015	980
2016	985
2017	985
2018	985
2020	*1,011*
2025	*1,172*
2030	*1,355*
2035	*1,555*
2040	*1,705*

There has been essentially no growth since 2010 due to limited availability of land. In 2018, the City expanded the Urban Growth Boundary which will permit new housing development to satisfy the pent-up demand.

B. Projected Water Demands

For future projections, the water system production requirements will be on a per capita basis, based on Average Day Demands of 100 gpd/capita. This includes an estimate of commercial, City and other demands. Peak Day Demand will be based on 2.5 times the average day demand.

The following table estimates water production requirements relative to the service population:

City of Donald
Water System Demand Projections

Year	*Population*	*Ave Day Demand (gpd)*	*Ave Day Demand (gpm)*	*Peak Day Demand* (gpd)*	*Peak Day Demand (gpm)*
2018	985	98,500	68	246,250	171
2020	1,011	101,100	70	252,750	176
2025	1,172	117,200	81	293,000	203
2030	1,355	135,500	94	338,750	235
2035	1,555	155,500	108	388,750	270
2040	1,705	170,500	118	426,250	296

** Based on a peaking factor of 2.5 time average daily demand*

C. Future Storage Requirements

The water storage volume is required to meet one peak day demand plus fire flow demands. Per the International Fire Code, fire flow requirements for one and two family residences, less than 3,600 SF and separated by a minimum of 10 feet, is a minimum of 1,000 gpm.

Commercial/industrial buildings require a minimum fire flow of 1,500 gpm, and can be much higher depending on the building size and design. All fire flows 2,500 gpm or less are required for a duration of 2 hours.

The Donald Industrial Park developers elected to provide a fire flow of 2,500 gpm to provide flexibility for potential future development. The current concrete tilt up building does not require 2,500 gpm. The water treatment plant pumping equipment can provide 2,500 gpm, but does not have adequate storage or equipment redundancy to provide a reliable 2,500 gpm.

The following table summarizes the required storage capacity based on peak day and fire flow demands.

City of Donald
Projected Water Storage Requirements

Year	*Population*	*Peak Day Demand (gallons)*	*Peak Day w/ 1,000 gpm Fire Flow (gallons)*	*Peak Day w/ 1,500 gpm Fire Flow (gallons)*	*Peak Day w/ 2,500 gpm Fire Flow (gallons)*
2018	985	246,250	366,250	426,250	546,250
2020	1,011	252,750	372,750	432,750	552,750
2025	1,172	293,000	413,000	473,000	593,000
2030	1,355	338,750	458,750	518,750	638,750
2035	1,555	388,750	508,750	568,750	688,750
2040	1,705	426,250	546,250	606,250	726,250

Required storage can be reduced by reliable source and treatment capacity, which is defined as the capacity of the system with the single largest component out of service. If redundancy is available in both the source and treatment systems, the reliable capacity can be considered equivalent to stored water. Currently, with only a single source, the City has no reliable capacity,

Future reliable source and treatment will be able to provide 300 gallons per minute, or 432,000 gallons per day. As a result, when the reliable capacity is in-place, storage requirements can be reduced by 432,000 gallons.

D. Future Distribution System Pump Requirements

The distribution pumps need to be able to reliably supply the largest demands. Based on factors provided in the *Community Water System Source Book by Joseph Ameen*, peak instantaneous demands for a community of 1,705 population would require an estimated 950 gpm. Peak instantaneous demands plus 1,500 gpm fire flow would then require a reliable capacity of 2,450 gpm.

The distribution pumping system should be sized to reliably satisfy demands up to a maximum of 2,500 gpm.

IV. EVALUATION OF EXISTING WATER SYSTEM

A. Water Source

The water system was designed with two source wells, Well No. 1 and Well No. 2. The water rights for the wells allow the City to withdraw 0.78 cfs (350 gpm) from the source.

Well No. 1 is no longer in use due to a failure of the well screens and sand intrusion. Efforts to rehabilitate and reconstruct the well in 1997 were unsuccessful and the well remains out of service. This well was re-evaluated in 2018 with the same result that rehabilitation was not viable.

Well No. 1 and Sand Separator in WTP

Well No. 2 on the WTP Site

Well No. 2 is currently the only water source for the City. This well had experienced reduced output and the City was required to impose a water restriction from August through October of 2018. Subsequently, the pump and column pipe were replaced and the design capacity restored.

With the new pumping equipment and column pipe recently installed, this well has a capacity to provide approximately 200 gallons per minute, or 290,000 gallons per day. This is adequate to support a population of 1,160, or approximately 62 new homes, although without any redundancy.

Groundwater rights are combined in Permit Number G-9938, which permits withdrawal of up to 350 gpm from Well No. 1 and Well No. 2 combined. Individually, the water rights permit is limited to 175 gpm for each well. The total water rights are adequate to support growth through the planning window, although they will need to be modified to increase a single well output to meet the projected demand.

B. Water Treatment Facilities

1. Water Filtration System

The existing water treatment facility was constructed in 1981 and consists of a pressurized mixing tank and three green sand pressure filters. Well water is pumped through the mixing tank and filters, and discharges into the two reservoirs. Potassium permanganate is injected prior to the mixing tank to precondition the water for the oxidation of hydrogen sulfide, manganese and iron.

Although nearly 37 years old, the mixing tank and filter units appear to be in very good condition externally. The filter media was replaced in 2017 by Cascade Waterworks and the interior of the tanks were inspected at that time. Cascade Waterworks has indicated the

piping and interior surfaces of each of the pressure filters are also in very good condition. The new media should perform well through the entire planning window.

Filtration System

The new media installed in 2017 was Greensand Plus provided by the Inversand Company. This media is improved over the previous manganese greensand. This media is capable of hydraulic loading rates from 2 to 12 gpm per sf, limited only by headloss. Typical hydraulic design of rapid sand filters is 5 gpm per sf, which is very conservative for the Greensand Plus.

At the design 5 gpm per square foot of sand media, the existing treatment system has a capacity of 80 gpm per each of the three filter units, for a total of 240 gpm, or 345,000 gpd less backwash. This total capacity is adequate to meet the peak day demands for a population of 1,380, or the equivalent of 490 EDU.

Reliable capacity can be increased by increasing the filter loading rates to 7.5 gpm per sf on the filter media if one unit is out of service. This will result in higher head losses potentially mandating resetting the pressure switch that initiates a backwash, but will provide adequate treatment until the unit can be returned to service.

The addition of permanganate prior to the green sand filters has proven to be effective in the oxidation of hydrogen sulfide, manganese and iron. It is anticipated this treatment will continue to be effective for the foreseeable future, with comparable future source waters.

The existing treatment system has been able to comply with all drinking water quality requirements, including those that have been enacted since the treatment facility was placed into service in 1981. It is difficult to predict what future regulation may be enacted over the 20-year planning period, but it is anticipated that the treatment process will continue to meet future regulatory requirements due to the quality of the ground water.

2. Chemical Feed Systems

a. Potassium Permanganate

The existing LMI Milton Roy potassium permanganate diaphragm feed pump has an 8 gallon per hour capacity. The feed rate is set at approximately 40% of full speed and 35% of stroke length. The pump sits atop a 150 gallon chemical drum that is equipped with a mechanical mixer that is used to prepare a 0.4% solution of permanganate. The permanganate solution is fed into the raw water ahead of the filtration system mix tank.

The existing permanganate feed system with the current settings feeds approximately 1.1 gallons per hour of permanganate into the system. Increasing peak day flows to 300 gpm will require an increased feed rate, however, the feed pump and chemical tank are adequately sized to meet future needs.

b. Sodium Hypochlorite

A Stenner sodium hypochlorite peristaltic feed pump is maintained at the plant for service during any contamination event. The pump is wall mounted above a 50-gallon polyethylene drum and feeds a 12.5% sodium hypochlorite solution into finished water as it leaves the building. The City keeps a second drum of sodium hypochlorite on hand next to the chemical feed tank.

The chlorine feed pump is only infrequently used and is usually set at 50%-60% depending on the time of the year, and then only if there was a positive total coliform sample. The City has experienced two total coliform positive results in 2018 and is currently changing its policy on taking samples in an enclosed area.

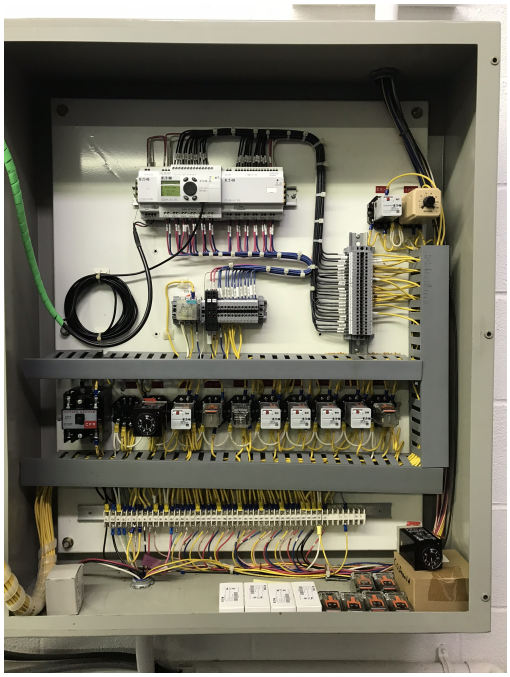
The hypochlorite feed system appears to be in good condition. The pump is adequately sized for future demands. At the year 2040 design flow, the feed pump would typically be operated at 15 to 20% to provide a chlorine residual of 2 parts per million if the City elected to disinfect the treated water. Currently the City does not routinely inject chlorine into the system.

3. Filter Control System

The control system for the water filtration plant originally had a drum or cam timer to sequence the filter operations. The drum/cam timer was replaced with a smart relay and master timer to make changes to the filter operation easier, quicker and more reliable. Overall the control system enclosure and components appear to have been well maintained.

The control system has very limited ability to communicate system status and malfunctions to City staff except through local alarms. In addition, the Eaton Smart Relay which replaced the cam/drum timer has no ability to communicate directly via any communication protocol with any supervisor control and data acquisition (SCADA) software.

Water Filtration System Control Panel



Water Filtration System Panel Interior

C. Water Storage

Following treatment through the mixing tank and pressure filters, water is discharged into two ground storage tanks: a 32'-8" diameter by 32' tall, 200,000 gallon welded steel tank constructed in 1981, and a 39'-2" by 35'-8" tall, 326,000 gallon bolted steel tank constructed in 2005. Both tanks appear to be in very good condition.

326,000 Gallon Reservoir (2005)

200,000 Gallon Reservoir (1983)

In 2013 divers cleaned and inspected the 200,000 gallon Storage Tank. The inspection revealed that the interior coating had failed. In 2014, the tank interior and exterior were recoated at a cost of $120,000 The tank was cleaned and inspected again in November of 2018, no deficiencies were noted, and the interior coating was in good condition.

D. Distribution System Pumps

The distribution jockey pumping system consists of three constant-speed pumps and one variable-speed pump as shown in the following table. Pump control and system pressures are provided by a 3,500 gallon hydro-pneumatic tank.

City of Donald
WTP Distribution Pump Capacity

Pump No.	*Horsepower*	*Design Head (ft)*	*Design Flow (gpm)*
1	15	104	400
2	15	104	400
3*	35	92	400
4 High flow	75	100	2,500

** Propane engine driven pump is in-place, but no longer in-service.*

Pumps No. 1 and No. 2 in conjunction with the hydro-pneumatic tank are used to maintain distribution system pressure, based on pressure and level switch settings on the hydro-pneumatic tank.

Distribution Pumps No. 1 and No. 2

Engine Driven Distribution Pump No. 3

Pump No. 4 is a high flow pump that was installed in 2017 and is located in a separate building on the Water Treatment Plant site. The pump is controlled independently and is not integrated into the WTP pump controls, but will also maintain system pressures if pumps 1 and/or 2 are unable to maintain adequate system pressures.

High Flow Pump No. 4 Building and Standby Generator

Existing distribution pumps Nos. 1 - 3 are at the end of their design life having been in service more than 35 years. In addition, system pressure and peak day flows can only be maintained by utilizing multiple pumps, without sufficient redundancy. The high flow pump is fully capable of service through the planning window, although currently without redundancy.

Sizing of the hydro-pneumatic tank and compressed air system is adequate to support future demands and the tank is in good condition. The tank is not absolutely necessary as the system expands, but it simplifies the control systems and can provide more consistent distribution system pressures.

E. Standby Power System

The existing standby power system at the water treatment facility cannot provide standby power to the entire facility. The generator is sufficient to support distribution pumps 1 and 2 as well as the building electrical systems, but cannot concurrently support continued operation of the source well.

Water Treatment Facility Standby Generator

However, if needed, the propane powered pump could be called on to provide additional water to the distribution system. This could permit operation of Well No. 2 on the auxiliary power system during a power outage. Maintaining system pressures would be difficult under this scenario, and the system would have limited ability to respond to moderate flow demands.

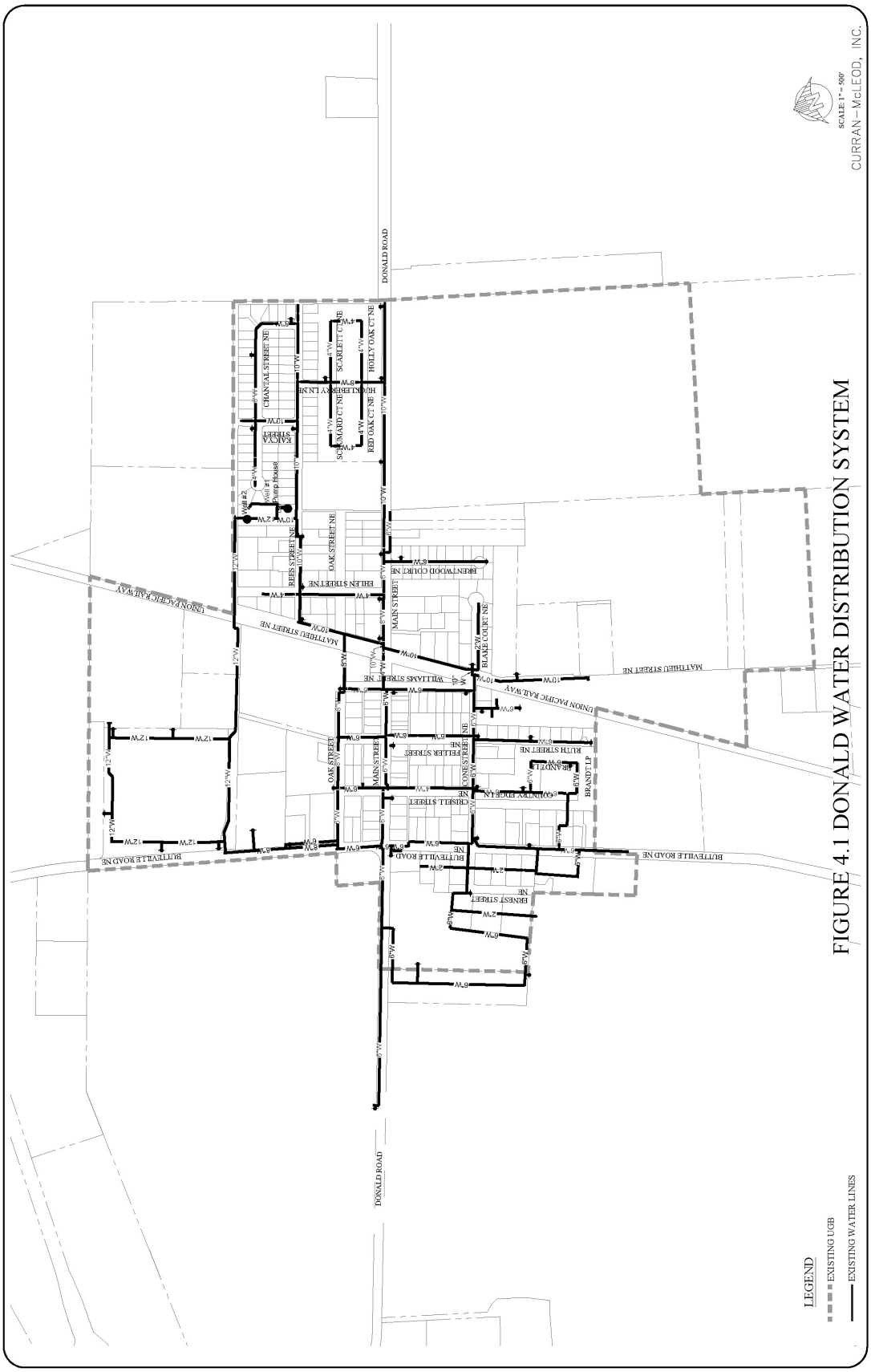
The fire flow pump installed in 2017 has a new engine generator that would permit this high capacity pump to respond to system demands if the system pressures warranted. This system would not be impacted by the control systems at the Water Treatment Plant.

F. Distribution System

The distribution system for the City of Donald, as shown on the following Figure 4.1, is well developed to support peak day and fire flow demands. Public Works Standards for the distribution system require the use of PVC pipe with ductile iron fittings for 4-inch through 12-inch water lines.

The water distribution system was modeled using EPANET2 to analyze the distribution system for fire flows superimposed on a peak day event. The model results indicate that there are no current deficiencies within the distribution system to be able to supply fire flows, with the exception of Blake Court. The depth of this cul-de-sac being greater than 150 feet and the existing 2" water supply line makes this area out of compliance with fire protection guidelines. This line is scheduled for replacement in 2020.

A copy of the EPANET2 model mapping and summary of line sizes is show in the appendix.



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G. Operation and Maintenance Requirements

The City of Donald maintains operating manuals for each component of the system. All of the City's facilities are well maintained and serviced as scheduled to ensure performance when needed.

V. ALTERNATIVES TO CORRECT SYSTEM DEFICIENCIES

Master planning efforts for the City of Donald take into consideration various alternatives for correcting existing deficiencies and meeting future needs of the City. The following narrative examines various alternatives for each element of the existing water system.

A. Source Alternatives

Reliable source capacity needs to be a minimum of 300 gpm to support growth through the planning window. Reliable source is the capacity with the single largest system component out of service. Four alternatives were evaluated:

1. Surface Water

The Willamette River is used by other communities as a source of drinking water. The City of Donald is located approximately 2 1/2 miles south of the Willamette River. A water intake, pump station and raw water transmission line could be constructed to utilize the Willamette River as a new water source.

This alternative would be prohibitively difficult due to regulatory challenges: Acquisition of a new water right on the Willamette, construction of a raw water intake, pumping structure and treatment facility, selection of a pipe line route with easements for the pipe line and construction of over two miles of pipeline.

This alternative would be the most expensive option to develop new source, estimated at $2.0 to 2.5 million, and would require securing water rights on the Willamette River, which is a multi-year endeavor, if even possible. This option is not a viable alternative.

2. Wholesale Water Purchase

Several communities in the Portland metropolitan area have entered into contracts with larger providers for the wholesale purchase of water. This requires the construction of long distance water transmission lines and a contractual agreement with the provider.

In the case of the City of Donald there are several communities that could be considered to jointly develop source capacity. Nearby municipalities and distance from Donald include:

Aurora	4.0 miles
Barlow	5.8 miles
Canby	7.5 miles
Dundee	9.0 miles
Gervais	8.3 miles
Hubbard	3.0 miles
Newberg	7.6 miles
St. Paul	6.6 miles
Wilsonville	6.5 miles
Woodburn	5.3 miles

The capacities of each of these communities were not defined, nor their willingness to supply water to the City. But, in either case, interconnection would require the construction of a booster pump station and water transmission line that, by comparison to other source option costs, eliminates the feasibility of all potential regional connections.

The cost of transmission pipelines, including easements and permits, is estimated at approximately $600,000 to $700,000 per mile for a 10" transmission line. Additionally, the water would need to be purchased at a wholesale cost dictated by the regional provider. This makes connection to the nearest potential regional system approximately two million dollars in capital costs and ongoing commodity costs. This is not a viable option.

3. Well Development

Substantial information is available on the groundwater resources in the Willamette River Basin. A 2005 groundwater hydrology study completed by the USGS with assistance from the Oregon Water Resources Department titled *Ground-Water Hydrology of the Willamette Basin*, indicated that approximately 300,000 acre-feet of groundwater was withdrawn from the Willamette Basin during the two year study period. Of that, 48% was extracted from the Central Willamette Basin, which includes the City of Donald. The total withdrawals from the basin amounted to approximately 10% of the amount of the annual recharge entering the groundwater from precipitation.

The USGS report indicates precipitation substantially recharges the Donald area of the Central Willamette Basin annually. Seasonal variations in the water level appear to be as high as 50 feet in this basin, but are recovered annually, dependent upon precipitation.

Groundwater resources in the lowlands of the central Willamette Valley basin appear to be plentiful and unrestricted by OWRD.

Well No. 1 has been abandoned by the City due to the well construction details. The City is currently dependent on Well No. 2 as its sole source of supply. Well No. 2 has been performing well for nearly 40 years.

Development of additional groundwater capacity will be required to provide a reliable source to meet demands through the planning window. Peak day demand at the end of the 20-year planning window is 300 gpm. The future source capacity should ideally include one 300 gpm well, with a second redundant 300 gpm well.

An estimate of cost for a single new 300 gpm Well No. 3, approximately 200 feet deep, located near the Water Treatment Plant is $360,000. A stand alone well with well house and an estimated 500 feet of 6" transmission line is estimated to cost $500,000.

Any new well will need to meet Oregon Water Resources Department and Oregon Health Authority setbacks from potential sources of contamination, such as septic tanks and sewer lines. The area within 100 feet of a municipal well should be owned by the City, be public right-of-way, or a perpetual restrictive easement would need to be obtained from the land owners to restrict potential contaminants as listed in OAR 333-061-050.

Per OAR 333-061-050 *The following sanitary hazards are not allowed within 100 feet of a well which serves a public water system unless waived by the Authority: any existing or proposed pit privy, subsurface sewage disposal drain field; cesspool; solid waste disposal site; pressure sewer line; buried fuel storage tank; animal yard, feedlot or animal waste storage; untreated storm water or gray water disposal; chemical (including solvents, pesticides and fertilizers) storage, usage or application; fuel transfer or storage; mineral resource extraction, vehicle or machinery maintenance or long term storage; junk/auto/scrap yard; cemetery; unapproved well; well that has not been properly abandoned or of unknown or suspect construction; source of pathogenic organisms or any other similar public health hazards. No gravity sewer line or septic tank shall be permitted within 50 feet of a well which serves a public water system.*

The Water Treatment Plant site is less than 130 feet wide, which is not wide enough to provide the required protective radius on the City site. The adjoining properties each have their sanitary sewer services on the opposite yards from the treatment plant site, so restrictive easements would have minimal impact on any on the adjoining properties, or a waiver may be a potential, acknowledging that the impacted area would only extend approximately 35 feet beyond each property lines and can be positioned to avoid any sanitary sewer piping.

A potential option to meet the projected demands is to increase the capacity of the existing well. The long term demands for the City require a reliable 300 gpm source. If the capacity of Well No. 2 can be increased to 300 gpm, only one additional well would be required to provide redundancy. This would reduce the 20-year capital improvement costs by approximately $500,000 by postponing the need for Well Number 4.

4. Repurposing Existing Wells

Acquisition or shared use of existing wells may be a viable alternative. Any well converted to municipal use would require revised water rights and would need to comply with the OHA and OWRD construction standards, and the restrictions listed in OAR 333-061-050.

There is an existing agricultural well located immediately south of the intersection of the private road Huckleberry Lane, NE, and Main Street/Donald Road, with a capacity reported at over 800 gpm. This well is owned by GGP, LLC. (GK Machines, Inc.), and has been tentatively offered to share with the City as a new municipal water source. The well log is included in the appendices.

The well is currently obligated to provide irrigation water to the adjoining farm land for nearly the next decade. Use of this well as a municipal supply would require continuing to support the farm use which may require scheduled capacity limitations. This source could be developed by incorporating a flow controlled side stream that permitted the City to utilize a portion of the source, while maintaining the primary irrigation function.

The well does not meet requirements of OHA with respect to the required 100 foot setback from any pressure sewer lines or property ownership. The well is within approximately 80 feet of a pressure sewer main and it is not located on City property. Ownership of the well site, or a restrictive easement would need to be negotiated with the property owners.

A waiver from OHA for setback requirements would be needed to use the well as a municipal water supply. This waiver request has been submitted for approval. With OHA approval, the City could work with the well owner to develop a mutually beneficial arrangement to utilize the well.

The cost to generate an agreement with the owner, securing municipal water rights, constructing a new well building that would be complementary to the adjacent development, and construction of the required support components is estimated at $430,000. The estimate anticipates reusing the existing well pump and column piping, and installing 1,500 feet of pipe to the Water Treatment Plant site. OWRD approval of a changed use to include municipal water supply would be required.

B. Water Treatment Plant Improvements

The source water is relatively high quality groundwater and is treated primarily for aesthetic purposes to reduce odors, manganese and iron levels. The source water does not exceed the Action Levels or Maximum Contaminant Levels for any constituent listed in the drinking water regulations. The existing treatment process efficiently meets the City's needs, so there was no consideration to modify the treatment process.

The process will need additional capacity to meet the future projected demands and maintain the desired treatment.

1. Pressure Filter Improvements

Each existing filter is 54" diameter with a surface area of approximately 16 square feet. At the design loading rate of 5 gpm per square foot, each of the three filters is capable of treating 80 gallons per minute. The 20-year growth projections for the City will require a peak day treatment capacity of approximately 300 gpm. This will require four production filters plus one redundant filter.

The existing filters should be retrofitted with new controls and automation to provide a new 20-year service life. The filter media was replaced in 2017 with a more efficient media type that can replace the use of potassium permanganate in favor of sodium hypochlorite. This would simplify the operations and be very compatible with potentially adopting a policy of continuous chlorination for treatment and to maintain a distribution system residual.

Additional pressure filters need to be added in parallel to the existing filters so that the total of all filters can provide the future peak day production of 300 gpm. Each filter would typically be identical to the existing units with a capacity of 80 gpm each. Two new units in addition to the three existing units could provide a reliable capacity of 320 gpm, with one spare unit for redundancy. With all five filters operational, the peak loading rate would be 60 gpm per filter at the end of the planning window.

With four filters the reliable capacity would be 240 gpm, or 345,000 gpd. This would be adequate to serve a population of 1,380 estimated for the year 2030. Filter unit number 5 could potentially be added incrementally, as demands increase in the future.

2. Chemical Feed Systems

Both chemical feed systems appear to be in good condition and adequately sized, however, there are some needed improvements. The sodium hypochlorite system needs to have a secondary containment system to contain accidental spills or spills resulting from failure of the containment crock.

Chlorine is also very corrosive and will damage equipment that is exposed to the off-gasses or spills. The sodium hypochlorite system should be moved back into the original gas chlorination system storage room to isolate it from the remaining plant equipment.

Consideration should also be given to a secondary containment system for the permanganate system, but it is less critical and poses less of a threat to personnel as long as it is separated from reducing agents. Although not flammable, it releases dangerous off-gasses in a fire, so should be kept separate from combustible materials.

The use of potassium permanganate can potentially be eliminated with the new filter media's capabilities. Consideration should be given to abandoning the use of permanganate in favor of hypochlorite.

The chemical feed equipment requirements are the same for both chemicals and could provide continuous chlorination if desired by the City. The sporadic positive tests for total coliform could potentially be eliminated if the City incorporated continuous chlorination.

3. Filter Control System

The filter control system could remain in place as it currently exists, however this will continue to limit the ability of the City staff to monitor filter plant operations. In order to integrate the water filtration system into the SCADA system, additional relays and wiring would be needed to act as slaves to transmit and receive discrete signals to and from the panel.

Salvaging the existing controls would require extensive field wiring modification, as well as additional hard wiring between the proposed SCADA network and the panel. A better solution would be to remove the existing electro-mechanical relays and install a micro PLC that could be programmed to control the filter operations and communicate to SCADA via an Ethernet system.

4. Distribution Pumping Equipment

The three existing distribution pumps in the water treatment facility need to be replaced due to their age and limited capacity to meet current peak instantaneous demands. New pumps must have a range to meet the peak instantaneous demands and fire flow, and have mechanical redundancy. The existing fire pump should be integrated into the pumping system and continue to be controlled by the water level in the hydro-pneumatic tank and system pressure.

Due to the ground level storage design, the jockey style pumping configuration must be continued, with or without the hydro-pneumatic tank, to provide adequate distribution system pressures at all times. The hydro-pneumatic tank is beneficial to stabilize the system pressures and control pump operations, and provides a momentary water supply to carry through the time between a loss of utility power and the engine generator operation.

To meet the peak instantaneous demand of 1,000 gpm, plus fire flow of 1,500 gpm, will require each of three new pumps to have a minimum capacity of 833 gpm, with variable frequency drives. All three pumps would be considered reliable capacity assuming a worst case of the existing 2,500 gpm high flow pump being out of service.

5. Supervisory Control and Data Acquisition (SCADA)

The water treatment facility operations are monitored manually by City staff. Monitoring data for monthly reporting must also be read and recorded manually on a daily basis. Local status and indication of specific alarm conditions are displayed on several different control panels at the facility but not transmitted off-site.

Notification of system failures are limited to

- Low reservoir level;
- Low distribution system pressure;
- Power failure at the WTP;

- Extended Backwash of filters;
- Fire alarm actuation;
- Open doors/windows; and
- Motion detectors

These alarms are sent as one general alarm, so the severity of the failure is unknown until the operators arrive on-site, regardless of the cause of the alarm.

The new distribution system pumps and filtration unit controls will be factory assembled on individual skids with integral controls. This could potentially be separated into two parallel control panels which could provide control redundancy. With the new control system, all existing equipment can be integrated to improve operations and communication.

With new control systems, consideration also needs to be given to networking the systems to a centralized monitoring and control system. Supervisory Control and Data Acquisition (SCADA) and Human Machine Interface (HMI) software could be used on any personal computer to view and control operations. System status, alarm conditions, data logging and operational trending can easily be provided with a SCADA system.

The SCADA system could be programmed to allow remote control and viewing of the plant operations, and to display and acknowledge any alarm conditions.

6. Office and Staff Facilities

The existing water treatment facility consists of a single large area which houses the mechanical equipment and a small separate room that originally housed the gas chlorination system. There is no office, counter space for laboratory work, or restroom/locker room at the facility. A single desk shares an area of the building with parts storage bins.

The existing CMU block building will not be able to accommodate the new distribution pump skids and filtration equipment. Expansion of the green sand filtration system will occupy much of the available space in the existing building, and require relocation of the existing distribution system pumps.

Due to the location of the building near the east property line, the 200,000 storage tank to the south, and the backwash holding tank to the north, the building can only be expanded to the west. The building expansion can provide space for needed office and laboratory operations, staff support improvements, including a bathroom and shower facility, and a materials storage/shop space. The building expansion would tentatively be of CMU construction to match the existing building architecture.

C. Standby Power System

The existing standby power system at the water treatment facility cannot provide emergency power to the entire facility. The system is able to provide lighting and miscellaneous power to the building and power to one distribution pump and one well pump. The standby power system is already inadequate to meet the need to provide sufficient power to the existing distribution pumps and the well pump if there is a prolonged power outage.

Replacing the standby power system and automatic transfer switch is required in order to provide emergency power to all the distribution pumps, and ultimately two of the three well sources if located reasonably close to the plant.

D. Storage

The existing storage tanks provide a total of 526,000 gallons of storage. With the development of additional reliable source and treatment capacity, as identified in this planning document, no additional storage facilities will be required through the planning window population of 1,705. Without development of reliable source and treatment capacity, the existing storage has adequate capacity to meet peak day plus commercial 1,500 gpm fire through a population of approximately 1,380.

E. Environmental Impact of Improvements

All improvements with the exception of the recommendation to drill a new well for future demand are being made within the existing water treatment facility site. There should be no direct environmental impact from the improvements with the exception of a higher withdrawal of ground water over time which could affect ground water resources.

F. Operation and Maintenance Costs

The City of Donald's Water Fund collects fees for the operation and maintenance of the water treatment and distribution processes. The Water Fund is an enterprise fund meaning it is self-supported through water bills. The Water Fund’s principal revenue source is the collection of the monthly water bills. The Fund is also supplemented by customer fees such as late fees, door hanging fees, and new account fees.

Previously the water rate was adjusted based on the Portland-Salem Consumer Price Index (CPI-U). However, a rate study completed in 2016 by Donovan Enterprises Incorporated indicated that a 3% increase in the water rates each year is needed to keep pace with the costs and repairs associated with providing the water service.

This increase is in lieu of the annual increase until fiscal year 2020-2021. The following table summarizes the Fund for the years 2016 through 2019 and was obtained from the City's 2018-2019 Budget:

City of Donald
Water System Budget

	Budgets			
	Actual 2016	**Actual 2017**	**Actual 2018**	**Adopted 2019**
Resources				
Beginning Fund Balance	$345,924	$392,636	$411,063	$471,090
Total Revenues	$268,412	$261,034	$275,256	$318,900
Total Resources	**$614,336**	**$653,670**	**$686,319**	**$789,990**
Requirements				
Total Personnel Services	$131,563	$139,531	$146,381	$181,985
Total Materials & Services	$75,541	$58,512	$63,275	$137,794
Total Capital Outlay	$0	$35,634	-	$10,419
Total Allocated Requirements	**$207,104**	**$233,677**	**$209,657**	**$330,189**
Requirements not Allocated				
Total Requirements not Allocated	$14,596	$8,929	$9,117	$159,500
Reserved Future Expenditures	-	-	-	$61,990
Ending Balance (prior years)	$392,636	$411,064	$467,545	-
Un-appropriated Ending Fund Balance	-	-	-	$238,311
Total Requirements	**$614,336**	**$653,670**	**$686,319**	**$789,990**

VI. RECOMMENDED WATER SYSTEM IMPROVEMENTS

A. Source Improvements

Development of additional well sources is by far the most cost effective means to increase source capacity. To reliably meet the design peak day demand, the City needs to immediately construct a second well with comparable capacity to Well No. 2. Ultimately the well capacity needs to be 300 gpm to meet the projected demands at the end of the planning window.

Well No. 2 can provide 200 gpm, which can support peak day demands until approximately the year 2025. A hydrogeologist should review the well capacity to determine if it is feasible to increase the well capacity. If Well 2 could produce 300 gpm, a second well with comparable capacity should be developed as high priority, 1 to 5 years, to provide redundancy. If each well can produce 300 gpm, Well No. 4 would not be required within the 20-year planning window.

Source development should include:

1. Cap Well No. 1

Well No. 1 should have the pumping equipment removed and be capped for potential future use. The well is not susceptible to contamination and potentially could be developed with new technology in the future. The existing well pump, column piping, sand separator and meter should be removed and a blind flange attached to the casing.

Capping this well permits a potential future use and is very cost effective as opposed to abandonment. Abandonment requires removal or encasement of the well casing in accordance with OWRD requirements. Abandonment is estimated to cost $25,000 to $30,000, whereas the cost of capping the well is incidental, estimated at $10,000.

2. Well No. 2

Well No. 2 is fully functional; however, to meet peak day demands in the 20-year planning window, the capacity should be increased to 300 gpm. If feasible to increase the capacity, it will require modifying the OWRD water right. The permit notes that the two wells can provide a total of 0.78 cfs, but is limited to 175 gpm from each well.

The City will need to coordinate with OWRD to determine the best process to increase the water rights to 300 gpm per each of two wells. The estimated cost for coordinating with OWRD for water rights is $5,000. The cost to increase the capacity of the pumping equipment is estimated at $50,000 for the electrical and mechanical changes.

3. Well No. 3

To provide system redundancy, the most cost effective and operationally efficient option is to drill a new Well No. 3 on the Water Treatment Plant site if the protective radius can be secured from the surrounding properties. This well would require modification of the existing water rights, or application of new rights. The estimated is shown below:

City of Donald
Well No. 3 Construction Cost Estimate

Item	*Quantity*	*Units*	*Unit Price*	*Total*
Mobilization, Bonding & Insurance	1	LS	$15,000	$15,000
Erosion Control, Water Management	1	LS	5,000	$5,000
Start Card Fees	1	LS	3,000	$3,000
16" Well Boring & Bentonite Seal	25	LF	400	$10,000
12" Drill, Casing & Well Screen	200	LF	500	$100,000
Well Gravel Pack	200	LF	200	$40,000
Well Development & Testing	1	LS	20,000	$20,000
Pump & Column Pipe, 200 LF	1	LS	15,000	$15,000
Mechanical Piping, Pitless Adapter	1	LS	20,000	$20,000
Controls & Instrumentation	1	LS	25,000	$25,000
WTP Building Modifications	1	LS	5,000	$5,000
Estimated Construction Cost				**$258,000**
Engineering (15%)				38,700
Contingency (25%)				63,300
Total Project Cost				**$360,000**

Well No. 3 should be constructed immediately to provide redundancy. When peak system demands exceed the current well capacity of 200 gpm or 290,000 gpd, in approximately year 2025, capacity of the existing Well No. 2 will need to be expanded to 300 gpm, or a third production well (Well No. 4) will be required.

4. Well No. 4

If the capacity of Well Number 2 cannot be increased to 300 gpm, Well No. 4 will be needed and should be located as close as possible to the Water Treatment Plant. Well No. 4 would be stand alone, as opposed to Well No. 3, so will require a well house, new electrical controls and SCADA connection. Auxiliary power is available for the wells near the Water Treatment Plant, and is not proposed for any remote wells.

At the time Well No. 4 is developed, the City will need to prepare a Water Management & Conservation Plan (WMCP), and apply for additional water rights.

An estimate of cost for Well No. 4 is shown below:

City of Donald
Well No. 4 Construction Cost Estimate

Item	*Quantity*	*Units*	*Unit Price*	*Total*
Mobilization, Bonding & Insurance	1	LS	$15,000	$15,000
Erosion Control, Water Management	1	LS	5,000	5,000
Start Card Fees	1	LS	3,000	3,000
16" Well Boring & Bentonite Seal	25	LF	400	10,000
12" Drill, Casing & Well Screen	200	LF	500	100,000
Well Gravel Pack	200	LF	200	40,000
Well Development & Testing	1	LS	20,000	20,000
Pump & Column Pipe, 200 LF	1	LS	15,000	15,000
Mechanical Piping	1	LS	15,000	15,000
Controls & Instrumentation	1	LS	30,000	30,000
Well House & Site Development	1	LS	50,000	50,000
6" Transmission Piping	500	LF	80	40,000
Estimated Construction Cost				**$343,000**
Engineering (15%)				51,450
Contingency (20%)				65,550
Site Easement, WMCP, Water Rights				40,000
Total Project Cost				**$500,000**

The City could achieve some efficiencies coordinating with GK Machine (GGP, LLC), OHA and OWRD to potentially utilize the existing well south of the intersection of Main Street and the private road, Huckleberry Lane, NE. This would require construction of a 1,500 foot transmission line back to the Treatment Plant site, a well house designed to fit into the future residential neighborhood architecture, and special valving and controls to

allow both irrigation and municipal use concurrently. To be conservative, this option is not included in the recommended Capital Improvement Plan.

The cost of utilizing the GK Machine, Inc. (GGP, LLC) well is estimated below:

City of Donald
Private Well Repurposing Cost Estimate

Item	*Quantity*	*Units*	*Unit Price*	*Total*
Mobilization, Bonding & Insurance	1	LS	$15,000	$15,000
Erosion Control, Water Management	1	LS	2,000	2,000
Mechanical Piping	1	LS	30,000	30,000
Well House & Site Development	1	LS	100,000	100,000
6" Transmission Piping	1,600	LF	80	128,000
Controls & Instrumentation	1	LS	40,000	40,000
Estimated Construction Cost				**$315,000**
Engineering (15%)				47,000
Contingency (20%)				63,000
Site Easement, Agreement, Water Rights				5,000
Total Project Cost				**$430,000**

Well No. 4 will be required when peak day demands exceed approximately 290,000 gpd, estimated by the year 2025, if the capacity of Well No. 2 cannot be increased to 300 gpm.

B. Water Treatment Plant Improvements

1. Filter Control System

The existing filter control panel is in good condition and will provide service for the foreseeable future. However, the existing control system smart relay should be replaced with a micro PLC with network communications capability to be able to be networked to the facility SCADA and HMI.

The cost of this improvement which would involve removal and replacement of the existing smart relay with a PLC, field wiring and programming is estimated at $25,000.

2. Pressure Filter Improvements

Two additional green sand filter units will require rerouting and replacement of some piping to install the new units. Common inlet piping from the wells and outlet piping to the reservoirs may also need to be increased in size to maintain reasonable headloss within the system. The new treatment units will need to be located to allow for full access to the existing units for ease of maintenance and servicing. The existing mixing tank can service all five filters.

The current filter configuration has no redundancy. A fourth unit is needed to provide a reliable capacity of 240 gpm from three operational filters, assuming the loading rates are

maintained at 5 gpm per square foot. At 240 gpm reliable capacity, the filter can support a population of approximately 1,380, estimated in the year 2030.

The addition of two new pressure filters and associated mechanical piping and controls is estimated at $180,000. If a single filter unit is added, the constructed cost is estimated at $120,000.

3. Chemical Feed Systems

The existing sodium hypochlorite and potassium permanganate chemical feed systems are adequately sized and in good condition. However, the sodium hypochlorite system needs to be relocated to the old chlorination room, and both systems need to have spill containment and an eyewash/shower near the storage area.

The cost of these improvements is estimated at $10,000.

4. Supervisor Control and Data Acquisition (SCADA)

The SCADA system would be programmable logic controller (PLC) based with a local area network (LAN) communications to a personal computer. Remote monitoring would be accomplished in real time through the use of remote monitoring software or possibly other generic software such as PC Anywhere via a portable lap top computer or at other locations where it could be viewed on a desktop PC.

The estimated cost of providing the necessary hardware, software, documentation and programming is estimated at $60,000.

5. Office and Staff Facilities

Expand the CMU building to the west approximately 24 feet to compensate for space lost in the existing building due to the proposed mechanical improvements and provide City staff with a workable environment. The additional space will provide office space and a bathroom with shower and lockers for City staff. Counter space will also be provided to allow on-site water quality testing in the future.

At $200 per square foot, the cost of these improvements is estimated at $150,000.

C. Distribution System Pumps

The distribution pumps will include three 833 gpm maximum output variable speed pumps to meet peak day and fire flow requirements. A skid mounted, pre-tested, three pump system is estimated to cost $250,000.

D. Standby Power System

A new standby generator system and automatic transfer switch with power distribution system improvement is estimated at $90,000.

E. Storage

With development of reliable source and treatment capacity, no additional storage improvements are required.

F. Distribution Piping Improvements

No distribution system improvements are warranted.

A summary of all recommended capital improvements is listed in the following table based on successfully expanding the capacity of Well No. 2 to 300 gpm:

City of Donald
Capital Improvement Plan Summary
December 2018 ENR CCI 11,185

Item	*Improvement*	*Priority*	*Estimate Cost*
A. Source Improvements			
1	Well No. 1 Cap for Future Use	1-5 years	$10,000
2	Well No. 2 Modify Water Rights, Increase Capacity to 300 GPM	1-5 years	55,000
3	Well No. 3 - Develop New Well at the WTP site, Secure water right for 300 gpm;	1-5 years	360,000
	Total Cost of Source Improvements		**$425,000**
B. Water Treatment Plant Improvements			
1	Replace existing filter control smart relay with a Programmable Logic Controller	1-5 years	$25,000
2	Add two 80 gpm Green Sand Filter units and associated mechanical piping & controls	1-5 years	180,000
3	Add secondary containment for chlorine and potassium hypochlorite feed systems. Relocate chlorine feed system	1-5 years	10,000
4	Install necessary hardware, software, and programming for Supervisor Control and Data Acquisition (SCADA) system	1-5 years	60,000
5	Expand the CMU building to provide office and staff facilities.	1-5 years	150,000
	Total Cost of Treatment Improvements		**$425,000**

C. Distribution Pumping system Improvements			
1	Three Pump, Skid-Mounted Jockey Pumping System, 833 gpm each Pump, with Variable Speed Controllers	1-5 years	$250,000
D. Emergency Power Improvements			
1	Replace existing standby power system and automatic transfer switch at WTP	1-5 years	$90,000
		Total Cost	**$1,190,000**

VII. WATER MANAGEMENT AND CONSERVATION PLAN

Under OAR 690-086-0100 (1) municipal water suppliers are encouraged to prepare Water Management and Conservation Plans (WMCP), but are not required to do so unless a plan is prescribed by a condition of a water use permit, a permit extension, or another order or rule of the Water Resources Commission.

The City of Donald does not have a Water Management and Conservation Plan. As a condition of developing new well sources, OWRD will likely require a Water Management and Conservation Plan be prepared when an application is submitted. A WMCP is estimated to cost $7,500 and should be included in the future scope of work to develop Well No. 4.

VIII. SEISMIC RISK ASSESSMENT AND MITIGATION PLANS

The City of Donald is located in the central Willamette Valley within Zone VII of the Oregon Department of Geology and Mineral Industries, Map of Earthquake and Tsunami Damage Potential for a Simulated Magnitude 9 Cascadia Earthquake, Plate 7. This indicates the City will have a "Moderate" impact from a magnitude 9 earthquake. According to the classification "Moderate" indicates it will be**:**

"Difficult to stand or walk; furniture broken; damage to poorly built masonry buildings; weak chimneys break; plaster, loose bricks, cornices, unbraced parapets and porches fall; some cracks in better masonry buildings."

More current information published by the Oregon Department of Geology and Mineral Industries indicates the City of Donald will have 'very strong' shaking during any earthquake event, but no fault lines are located near the City.

The City of Donald has several facilities that are considered essential in accordance with OAR 333-061-060(5)(j) to provide water in the event of an emergency. Essential facilities need to be able to continue to provide water for fire protection, health and emergency response, and domestic demands immediately following an emergency, or alternative supply provisions must be immediately implemented.

Critical components in the City of Donald include:

Well Number 2: This facility is currently the only water source for the City, and is located adjacent to the Water Treatment Plant control building with the controls integrated into the

plant controls. Damage to the well construction is not anticipated to be substantial in a major seismic event, however, the power supply and controls are likely to be inoperable. Failure of this facility would eliminate all water source of supply to the community.

Although the pumping equipment and well construction are anticipated to remain functional, a source of emergency power and controls would be required to utilize the well.

Treatment Facilities: The green sand filters and disinfection facilities are not essential to supplying water to the community during an emergency event. The source water meets all Health Authority water quality standards for a community water system and is acceptable to deliver without treatment.

The controls and instrumentation for the treatment facility are similarly non-essential; however, the controls have integrated the source well controls and distribution system pump controls, which are both essential to providing continued water supplies. In a major seismic event, it is likely the treatment plant building and control systems will sustain major damage and require substantial repairs to be functional. The CMU treatment plant building was constructed in 1981 well before the current seismic design codes were adopted.

Failure of the treatment building control equipment would immediately eliminate all water source production and distribution pumping equipment. In essence, the entire water system would immediately be out of service.

Treated Water Storage: The Donald Water System includes two ground level, steel water storage reservoirs. These reservoirs total 526,000 gallons and were constructed in 1983 and 2005, both prior to the current seismic design standards. These facilities are essential to providing fire protection to the community, and are likely to sustain substantial damage in a major seismic event.

In conjunction with anticipated distribution system piping failures, the volume of stored water is likely to be depleted in a very short time and would not be available for emergency response or to satisfy normal domestic demands.

Distribution System: The distribution system includes pumping facilities and distribution piping, both of which are essential facilities to provide emergency water. All water is pumped from the storage tanks into the distribution system to maintain system pressure.

The distribution pumps and controls are located inside the Water Treatment Plant control building and anticipated to be damaged. The pumps and mechanical piping are inadequately restrained and susceptible to substantial mechanical damage. The distribution system electrical controls are likely to also be damaged due to inadequate restraint and damage associated with the surrounding CMU building failure.

In a major seismic event, damage would be anticipated throughout the distribution system, preventing the distribution pumps from maintaining acceptable pressures.

Emergency Response Improvements:

There is very little that can be retrofitted to the source, treatment and storage systems to improve their resiliency during an emergency event. Failure of the treatment plant building and equipment, storage tanks and distribution system pumps would require emergency electrical repairs for any water to be distributed on an emergency basis.

The key to emergency response would be to ensure that a well source can be functional immediately after a seismic event, and then to be able to distribute water directly from the well to the community.

As opposed to defining mitigation plan for improvements to the existing systems, it is more efficient to incorporate seismic resiliency improvements into the listed Capital Improvement Projects:

- Well Number 3 should have provisions to function independently of the existing water treatment plant controls. The well should have access to auxiliary power and a provision to deliver water directly to the distribution system, from the well head, bypassing the treatment plant and storage system if necessary. Well number 3 is anticipated to be constructed within five years.

- Improvements to the Water Treatment Plant are also anticipated to be completed within five years. These improvements should incorporate resiliency plans to protect the new electrical controls and pumping equipment. These improvements can ensure the source and distribution pumping system remain functional immediately following a seismic event.

- Long term improvements to the water storage reservoirs should include a structural analysis to determine whether they comply, or can be modified to comply, with current seismic code requirements. The City has excess storage capacity and will soon have sufficient source capacity to function without storage on an emergency basis. The City has the option to reduce the full level on each tank to potentially comply with current seismic code requirements and better protect against failure.

A structural analysis of the storage reservoirs will be included in any future storage volume expansion, which will ultimately be required, but is well beyond the planning window for this current Master Plan Update.

IX. FUNDING PROGRAM

Implementation of the Capital Improvement Plan will require the City of Donald to secure funding from governmental or private agencies, through a grant/loan program. The debt is anticipated to ultimately be retired through System Development Charges resulting from anticipated growth. System Development Charge revenues are dependent on growth, which is not assured, so SDC revenues similarly are not assured. As a result, property taxes or user fees alone will be required to demonstrate the City's ability to support any debt.

The System Development Charge methodology was last updated in January of 2016. The value of the capital improvements recommended in this Master Plan update are comparable to the value in SDC methodology, however, the tasks are substantially modified. The SDC should be reviewed and adjusted accordingly.

If development occurs as anticipated, the SDC revenues should be adequate to retire a substantial amount of the debt for all improvements. The logistics of SDC cash flow will be problematic. SDC revenues are typically collected as building permits are issued. The infrastructure capacity needs to be in-place before permits are issued.

In 2018 the City of Donald and GK Machine, Inc. (GGP, LLC.) submitted a joint proposal for the State of Oregon Workforce Housing Initiative. As a result, the application was approved and grant funds were awarded to both the City of Donald and GK Machine, Inc. Gary Grossen Properties, (GGP, LLC.), will manage the engineering and initial infrastructure portion of the grant funds that will lead to construction of a number of workforce housing units.

The funding program provided through the Oregon Workforce Housing Initiative, included the following:

Grantee (City of Donald)	**Funds**
Pre-development engineering design costs for the water and/or wastewater treatment facility upgrades	$195,000
*COST FOR CONSTRUCTING THE WASTE WATER FACILITIES	$330,000 (BUSINESS OREGON)
Total Requested from OHCS:	**$195,000**

*A Separate Reservation Of Funding From Business Oregon Will Be Issued If Awarded.

GK Machine, Inc.	**Funds**
Offer employees a 12-month rent reduction when moving to Donald and down payment assistance to GK Machine Inc., employees when they purchase a home in Donald	$100,000 (OHCS Match)
Final engineering design costs – pre-development costs	$150,000
Total Funds Requested from OHCS:	**$250,000**
Combined Total Funds Requested for the Pilot Project:	***$775,000**

The Capital Improvement Plan includes $1,190,000 of improvements in years 1 - 5. Undertaking the current water system needs and accounting for $75,000 of the pre-

development engineering grant funds being applied to the water system, reduces the current project costs to an estimated total of $1,115,000.

The City has the option of applying up to $195,000 of grant funding to the pre-development engineering costs to reduce the debt service, although this conversely reduces the funding available for wastewater infrastructure engineering allowed in the OHCS award.

Based on a 4%, 30 year debt of $1,115,000, the annual debt service would be approximately $64,500 per year, plus a 10% reserve if required by the funding agency. Depending upon the funding source, the City should also be aware of potential bank fees and bond counsel cost.

A. General Obligation Bonds

General Obligation Bonds are the traditional means of funding capital improvements that benefit the entire community. GO bonds require a positive vote from the community, and the debt service is allocated based on property valuations, and collected with annual property tax payments. Annual debt service of $64,500 would equate to approximately $0.70 per $1,000, plus reserves, on the $92,082,013 current assessed value of the City.

The cost allocation with GO bonds impacts all residents with guarantee of the full faith and credit of the City. In that the capital improvements are primarily to benefit future users, this allocation is not the most equitable for the City.

B. Revenue Bonds

Revenue bonds require a commitment of user fees to retire debt. This revenue stream is guaranteed by the City's commitment to collect sufficient user fees to retire the debt, which again is allocated to all users as opposed to future users. With user fees the actual annual debt service payment can be made with SDC revenues if available, but the user fees insure the payment.

Based on the current approximate 423 EDU and annual debt service of $64,500, the user rates would increase by approximately $12.71 per month plus reserves, if used exclusively to cover debt service.

C. Governmental Grant/Load Programs:

Oregon Business Infrastructure Finance Authority Water Wastewater program, USDA Rural Development Water and Waste Disposal Loan and Grant Program, and the Oregon DEQ Clean Water State Revolving Fund program commonly provide funding for municipal water projects. Each program has attributes that would benefit the City of Donald. The City should qualify for grants to offset a portion of the remaining project costs.

D. System Development Charges:

System Development Charges can collect sufficient revenues to cover the total cost of the improvements, however, SDC collections are made at the time of issuing building permits as opposed to completing the capital construction. In that the capital improvements are primarily

benefitting future growth, if debt service can be paid from SDC revenues, this is the most equitable to the City residents.

SDC revenues are not assured, so cannot be used as a primary debt service source when applying for funding assistance. SDC funds can, however, be used to make the annual debt service payments for any funding agency, if SDC revenues are available. The City currently has an SDC fund balance of approximately $12,000 that can be applied to these projects.

An alternative use of SDC funds was proposed in the joint application prepared by the City of Donald and GK Machine, Inc. (GGP, LLC.) submitted to the Oregon Workforce Housing Initiative in 2018. This application anticipated the bulk of the project cost could be funded with advance payments of System Development Charge revenues.

Subsequent to the approval of the Urban Growth Boundary expansion, residential development is anticipated to increase, which at the current SDC rates could generate up to approximately $1,575,000 in revenues. These funds could potentially be given as credits if private developers would undertake construction of the public facilities. This arrangement could be very beneficial to the community, and potentially eliminate the need for any interim financing. The City should explore this opportunity before applying for any additional program funding.

E. Recommended Funding Program & Schedule

The City of Donald should work cooperatively with GGP, LLC. to determine how the improvements can be completed using SDC credits. Alternatively, it would be beneficial to secure funding from a state agency as opposed to the open market. Oregon Business Infrastructure Finance Authority can provide options for the City through the One-Stop process. This can be arranged by coordination through the IFA Regional Coordinator.

The 1 - 5 year capital improvements should be undertaken immediately to ensure the City can continue to serve the existing population as well as provide capacity for future growth.

APPENDICES

Appendix A

Well No. 1 Well Log

The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED
AUG 26 1980
WATER RESOURCES DEPT
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

MARION 562

State Well No. 4S/1W-17

State Permit No. WELL NO. 1

(1) OWNER:
Name City of Donald
Address City Hall
Donald, Oregon 97020

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
12 " Diam. from +1½ ft. to 210 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:
Perforated? ☒ Yes ☐ No.
Type of perforator used Mills Knife
Size of perforations 3/8 in. by 2½ in.
216 perforations from 175 ft. to 185 ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom?
Yield: 500 gal./min. with 84 ft. drawdown after ½ hrs.
" 300 " 61 " 23½ "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Portland Cement
Well sealed from land surface to 25 ft.
Diameter of well bore to bottom of seal 16 in.
Diameter of well bore below seal 12 in.
Number of sacks of cement used in well seal 17 sacks
How was cement grout placed? mixed and poured through tremy pipe
Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off crushed gravel placed ~~XXXX~~
Was well gravel packed? ☐ Yes ☒ No Size of gravel: 3/4 minus
Gravel placed from 207 ft. to 210 ft.

(10) LOCATION OF WELL:
County Marion Driller's well number 2314
¼ ¼ Section 17 T. 4S R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 103 ft.
Static level 75 ft. below land surface. Date 8/13/80
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing
Depth drilled 210 ft. Depth of completed well 210 207 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Topsoil	0	2	
Hard Brown Clay	2	6	
Brown Clay	6	27	
Blue Clay	27	42	
Sticky Blue Clay	42	68	
Brown Clay	68	83	
Sticky Brown Clay	83	96	
Brown Silty Clay	96	103	
Brown Sand and Gravel, clay some water	103	123	67
Brown Clay	123	128	
Silty Blue Gray Clay	128	136	
Sticky Blue Clay	136	159	
Silty Blue Clay	159	171	
Black Sandy Gravel	171	174	
Black Sand and Gravel	174	186	75
Black Sand and wood	186	206	
Blue Clay	206	210	
Black Sand	210	?	

Work started 7/28/80 19 Completed 8/13/80 19
Date well drilling machine moved off of well 8/13/80 19

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Mark D. Beers (Drilling Machine Operator) Date 8/15/80, 19
Drilling Machine Operator's License No. 811

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Willamette Drilling Co. (Person, firm or corporation) (Type or print)
Address 7365 O'Neil Rd. N.E. Salem, OR 97303
[Signed] Dallas L Reis (Water Well Contractor)
Contractor's License No. 561 Date 8/15/80, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-110

WATERLAB
2609 12th S.E.
Salem, Oregon 97302
(503) 363-0473

August 19, 1980

TEST RESULTS

TO: Boatwright Engineering
2613-12th St. SE
Salem, OR 97302

DATE COLLECTED: 8/12/80

COLLECTED BY: R. Fetrow

SOURCE: City of Donald - New well

LAB REPORT #: P2860-80

TEST PERFORMED	SUGGESTED MAXIMUM*	P2861-80
Odor, Threshhold #	#3	#2
Color, color units	15	0
Sand, mg/liter	2	0
Turbidity, Formazin units	1	0
Conductivity, microhos/cm	N.A.	300
pH, pH units	N.A.	7.610
Alkalinity, mg/liter	N.A.	95
Calcium, mg/liter	N.A.	32.8
Chloride, mg/liter	250.0	14.2
Copper, mg/liter	1.0	less than 0.01
Hardness as calcium carbonate, mg/liter	N.A.	96
Iron, total, mg/liter	0.30	0.46
Magnesium, mg/liter	N.A.	3.4
Manganese, mg/liter	0.050	0.133
Nitrite (nitrogen), mg/liter	N.A.	less than 0.1
Silica, mg/liter	N.A.	34.5
Sodium, mg/liter	N.A.	55.8
Sulfate, mg/liter	250.0	less than 0.1
Total solids, mg/liter	1000.0	188
Volatile solids, mg/liter	N.A.	47
Zinc, mg/liter	5.0	less than 0.1

*Per OAR Ch. 333 State of Oregon Health Division regulations for public drinking water.

N.A. = Not applicable

NOTE: For fluoride and nitrate determinations see EPA inorganic tests.

UMPQUA RESEARCH COMPANY

626 N.E. Division St. • P.O. Box 791 • Myrtle Creek, OR. 97457
Phone (503) 863-5201
EPA APPROVED, OREGON STATE CERTIFIED LABORATORY NO. 73

URC Sample No. 00813-5
Date Received 8-13-80
Time Received
Date Reported 8-22-80

Print or type applicable information in box below.

Sample Bottle Number ____ Time Collected 2:15 PM Date Collected 8-12-80

Mailing Address: Water Lab
Name Attn: Beth Lyda
Street 2609 - 12th St. S.E.
City Salem State OR Zip 97302

Sample Location:
Name City of Donald
Street New Well #1
City ____ State ____ Zip ____

Water Source: Spring ☐ Stream ☐ Well ☐ Chlorinated Yes ☐ No ☐ Sample Type: Routine ☐ Resample ☐ Check ☐ Sample Point ____ Collector's Name Waterlab

EPA PRIMARY DRINKING WATER STANDARDS

Inorganics

Test	Test Method[1]	Units	Limits	Test Results	Date of Analysis	Analyst
Arsenic, As	SM 404 C	MG/L	0.05	ND@0.01	8-19-80	MJS
Barium, Ba	SM 303 A	MG/L	1.	ND@0.1	8-21-80	MJS
Cadmium, Cd	SM 305 A	MG/L	0.01	ND@0.005	8-15-80	MJS
Chromium, Cr	SM 307 A	MG/L	0.05	ND@0.02	8-21-80	MJS
Fluoride, F	SM 414 A&C	MG/L	1.4 to 2.4	0.4	8-19-80	RD
Lead, Pb	SM 311 A	MG/L	0.05	ND@0.01	8-15-80	MJS
Mercury, Hg	SM 315 A	MG/L	0.002	ND@0.001	8-19-80	MJS
Nitrate, NO_3 as N	ASTM D992-71	MG/L	10.	ND@0.1	8-25-80	MJS
Selenium, Se	SM 318 C	MG/L	0.01	ND@0.002	8-19-80	MJS
Silver, Ag	SM 319 A	MG/L	0.05	ND@0.01	8-21-80	MJS
						M

Organics

Endrin	SM 509 A	MG/L	0.0002			
Lindane	SM 509 A	MG/L	0.004			
Methoxychlor	SM 509 A	MG/L	0.1			
Toxaphene	SM 509 A	MG/L	0.005			
2,4-D	SM 509 B	MG/L	0.1			
2,4,5-TP (Silvex)	SM 509 B	MG/L	0.01			
Total Trihalomethanes	EPA	MG/L	0.1			

Other

pH	SM 424	pH units		7.5	8-14-80	RD
Specific Conductance	SM 205	µMHO/CM		210	8-14-80	RD

SM = Standard Methods, 14th Ed. ND = None Detected

DOMESTIC IRRIGATION INDUSTRIAL

Willamette Drilling Company, Inc.

Well Drilling Contractors

7365 O'Neil Rd. N.E.
SALEM, OREGON 97303
Phone 393-1757

August 15, 1980

Re: Recovery Test following
pump test performed on
City of Donald Well # 1

Well pumped for 24 hours at a rate of 300 GPM at a pumping level of 136 feet

After 1 minute of shutdown ~~XX~~ of Test Pump Water Level 101 feet

After	2	minutes	W.L.	91 ft.
"	3	"	"	86 "
"	4	"	"	83 "
"	5	"	"	81 "
"	6	"	"	80½ "
"	7	"	"	80 "
"	8	"	"	80 "
"	9	"	"	80 "
"	10	"	"	79½ "
"	15	"	"	79½ "
"	20	"	"	79 "
"	25	"	"	79 "
"	30	"	"	78 3/4 "
After	1 hour		"	78 "

Static level seemed to fluctuate during drilling time and would vary several feet from day to day. However the static generally stayed between 70 and 80 feet and this could possibly explain why the water level never raised above 78 feet after 1 hour of recovery time.

Sincerely,

Mark D. Beier

WELL No. 1
45/1W-17
Record

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

RECEIVED
MAR 21 1988
WATER RESOURCES DEPT
SALEM, OREGON

MARION 555

(1) OWNER:
Name City of Donald Well Number
Address City Hall
City Donald State Ore. Zip 97020

(2) TYPE OF WORK:
☐ New Well ☐ Deepen ☑ Recondition ☐ Abandon

(3) DRILL METHOD
☐ Rotary Air ☐ Rotary Mud ☑ Cable
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other Municipal

(5) BORE HOLE CONSTRUCTION:
Special Construction approval Yes ☐ No ☑ Depth of Completed Well 188 ft.
Explosives used Yes ☐ No ☑ Type ____ Amount ____

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other
Backfill placed from ____ ft. to ____ ft. Material ____
Gravel placed from ____ ft. to ____ ft. Size of gravel ____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	8"	164'	174.5'	.250	☑	☐	☑	☐
	6"	185	188'	.250	☑	☐	☑	☐

Location of shoe(s) ____

(7) PERFORATIONS/SCREENS:
☐ Perforations Method ____
☑ Screens Type V-slot Material 304 SS

Slot From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
5'	185'	50			Tele.	☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☑ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
250	44'		1 hr. 5 hrs.

Temperature of water 54° Depth Artesian Flow Found ____
Was a water analysis done? ☐ Yes By whom ____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ____
Depth of strata: ____

(9) LOCATION OF WELL by legal description:
County Marion Latitude ____ Longitude ____
Township 45 N or S, Range 1W E or W, WM.
Section 17 ¼ ¼
Tax Lot ____ Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) 10945 Ehlen St. Donald, Ore.

(10) STATIC WATER LEVEL:
40 ft. below land surface. Date 2-3-88
Artesian pressure ____ lb. per square inch. Date ____

(11) WATER BEARING ZONES:
Depth at which water was first found ____

From	To	Estimated Flow Rate	SWL
175'	185'	250 GPM	40'

(12) WELL LOG:
Ground elevation ____

Material	From	To	SWL
- EXISTING WELL: 12" diameter - 190' depth			
- PROBLEM: Decrease in yield			
- UNUSUAL CIRCUMSTANCES: 8" P.V.C. liner with a 6" P.V.C. screen were in the well with #8 aquarium sand around the screen to block fine sand entrance. Records of placement of these materials were not made so not available. The scope of the project consisted of chemical & mechanical rehabilitation of the 12" perforated casing, no alteration expected.			
- SOLUTION: After removing all P.V.C. & execution of development process, a column of steel pipe-screen was set into 12". This column consisted of 10½'-8" x .250" pipe, 10.5' of 8" telescope size SS screen slot 50 slot, 3'-6" x .250" pipe on bottom w/a plate & bail on the bottom. Number 6 aquarium sand was put around screen for sand filtration.			

Date started October 8, 1987 Completed FEB. 6, 1988

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

WWC Number ____
Signed ____ Date ____

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 633
Signed Michael Waldroop Date Mar. 21, 1988

WHITE COPIES - WATER RESOURCES DEPARTMENT YELLOW COPY - CONSTRUCTOR PINK COPY - CUSTOMER 9809C 10/86

STATE OF OREGON

WATER WELL REPORT

(as required by ORS 537.765) per WWC Trs

RECEIVED OCT 30 1984 WATER RESOURCES DEPT. SALEM, OREGON

START CARD # 45 / 1W-17

Abandon

PLEASE TYPE or PRINT IN INK (for official use only)

(1) OWNER:

Name City of Donnald

Address

City Donnald State Or

(2) TYPE OF WORK (check):

New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☒

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary Air ☐ Driven ☐

Rotary Mud ☐ Dug ☐

Cable ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☒

Irrigation ☐ Thermal: Withdrawal ☐ Reinjection ☐

Other: Piezometric ☐ Grounding ☐ Test ☐

(5) CASING INSTALLED:

Steel Threaded ☒ Plastic ☐ Welded ☐

" Diam. from ft. to ft. Gauge

" Diam. from ft. to ft. Gauge

LINER INSTALLED:

Steel Threaded ☐ Plastic ☐ Welded ☐

" Diam. from ft. to ft. Gauge

(6) PERFORATIONS:

Perforated? ☐ Yes ☐ No

Size of perforations in. by in.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☐ No

Manufacturer's Name

Type Model No.

Diam. Slot Size Set from ft. to ft.

Diam. Slot Size Set from ft. to ft.

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

Air test gal./min. with drill stem at ft. hrs.

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m.

Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Special standards: Yes ☐ No ☐

Well seal—Material used cement grout

Well sealed from land surface to 55' ft.

Diameter of well bore to bottom of seal 7 1/2 in.

Diameter of well bore below seal in.

Amount of sealing material 25 sacks ☒ pounds ☐

How was cement grout placed? Poured

Was pump installed? Type HP Depth ft.

Was a drive shoe used? ☐ Yes ☐ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☐ No

Type of Water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☐ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL by legal description:

County Marion ¼ ¼ of Section of

Township (Township is North or South), Range (Range is East or West), WM.

Tax Lot Lot Block Subdivision

MAILING ADDRESS OF WELL (or nearest address)

(11) WATER LEVEL of COMPLETED WELL:

Depth at which water was first found ft.

Static level ft. below land surface. Date

Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing

Depth drilled ft. Depth of completed well ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Well measured to be 135' deep with a 60' SWL backfilled well with gravel to 55', pulled casing 13', than casing came easly. May have broken appox. 58' below surface, poured cement through casing than pulled casing leaving cement 2' below surface			

Date work started Sept 13 1984 completed Sept 14 84

Date well drilling machine moved off of well Sept 17 1984

(unbonded) Water Well Constructor Certification (if applicable):

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Thomas C Lee Date Sept 17, 1984

(bonded) Water Well Constructor Certification:

Bond 261716 (number) Issued by: Huggins (Surety Company Name)

On behalf of Robinson Drilling (type or print name of Water Well Constructor)

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief:

(Signed) George K Robinson (Water Well Constructor)

(Dated) 10-1-84

NOTICE TO WATER WELL CONSTRUCTOR
The original and first copy of this report are to be filed with the

WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310
within 30 days from the date of well completion.

SP*46868-690

Appendix B

Well No. 2 Well Log

The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED SEP 22 1980 WATER RESOURCES DEPT SALEM, OREGON

WATER WELL REPORT

STATE OF OREGON (Please type or print) (Do not write above this line)

MARION 563

State Well No. 4S/1W-17

State Permit No. WELL No. 2

(1) OWNER:

Name City of Donald

Address City Hall

Donald, Oregon 97020

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☐ Driven ☐

Cable ☒ Jetted ☐

Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☒

Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:

Threaded ☐ Welded ☒

12 " Diam. from +1½ ft. to 190 ft. Gage .250

" Diam. from ft. to ft. Gage

" Diam. from ft. to ft. Gage

(6) PERFORATIONS:

Perforated? ☒ Yes ☐ No.

Type of perforator used Mills Knife

Size of perforations 3/8 in. by 2½ in.

192 perforations from 175 ft. to 185 ft.

perforations from ft. to ft.

perforations from ft. to ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.

Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☒ No If yes, by whom? driller

Yield: 300 gal./min. with 42 ft. drawdown after 2 hrs.

" 450 " 52 " 1 "

" " " "

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m.

Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used Portland Cement

Well sealed from land surface to 25 ft.

Diameter of well bore to bottom of seal 16+ in.

Diameter of well bore below seal 12 in.

Number of sacks of cement used in well seal 25½ sacks

How was cement grout placed? poured thru tremy pipe

Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☒ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County Marion Driller's well number 2322

¼ ¼ Section 17 T. 4S R. 1W W.M.

Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found 96 ft.

Static level 70 ft. below land surface. Date 9/1/80

Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing

Depth drilled 190 ft. Depth of completed well 190 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Topsoil	0	2	
Hard Brown Clay	2	6	
Brown Clay	6	25	
Blue Clay	25	41	
Sticky Blue Clay	41	69	
Brown Clay	69	74	
Sticky Brown Clay	74	92	
Silty Brown Clay	92	96	
Brown Sand and Gravel, with clay and some water	96	117	
Brown Clay	117	132	
Blue Clay	132	142	
Sticky Blue Clay	142	158	
Blue XXXXX Silty Clay	158	170	
Black Sand and Gravel	170	185	
Blue Clay and Gravel	185	190	

Work started 8/15/80 19 Completed 9/2/80 19

Date well drilling machine moved off of well 9/2/80 19

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Mark O Beus (Drilling Machine Operator) Date 9/3/80, 19

Drilling Machine Operator's License No. 811

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name WILLAMETTE DRILLING CO. (Person, firm or corporation) (Type or print)

Address 7365 O'Neil Rd. N.E. Salem, Oregon 97303

[Signed] Dallas L Beus (Water Well Contractor)

Contractor's License No. 561 Date 9/3/80, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45858-110

WATERLAB

2609 12th S.E.
Salem, Oregon 97302
(503) 363-0473

September 11, 1980

TEST RESULTS

TO: Boatwright Engineering
2613-12th St. SE
Salem, OR 97302

DATE COLLECTED: 9/2/80

COLLECTED BY: R. Fetrow

SOURCE: City of Donald - Well #2

LAB REPORT #: P3034-80

TEST PERFORMED	SUGGESTED MAXIMUM*	P3034-80
Odor, Threshhold #	#3	#2
Color, color units	15	0
Sand, mg/liter	2	0
Turbidity, Formazin units	1	0
Conductivity, microhos/cm	N.A.	275
pH, pH units	N.A.	7.270
Alkalinity, mg/liter	N.A.	80
Calcium, mg/liter	N.A.	38.4
Chloride, mg/liter	250.0	21.3
Copper, mg/liter	1.0	less than 0.01
Hardness as calcium carbonate, mg/liter	N.A.	121.2
Iron, total, mg/liter	0.30	0.46
Magnesium, mg/liter	N.A.	6.1
Manganese, mg/liter	0.050	0.48
Nitrite (nitrogen), mg/liter	N.A.	less than 0.1
Silica, mg/liter	N.A.	37.5
Sodium, mg/liter	N.A.	2.62
Sulfate, mg/liter	250.0	less than 0.1
Total solids, mg/liter	1000.0	420.0
Volatile solids, mg/liter	N.A.	38.1
Zinc, mg/liter	5.0	less than 0.1

*Per OAR Ch. 333 State of Oregon Health Division regulations for public drinking water.

N.A. = Not applicable.

NOTE: For fluoride and nitrate determinations see EPA inorganic tests.

UMPQUA RESEARCH COMPANY

626 N.E. Division St. • P.O. Box 791 • Myrtle Creek, OR. 97457
Phone (503) 863-5201
EPA APPROVED, OREGON STATE CERTIFIED LABORATORY NO. 73

URC Sample No. 00904-6
Date Received 9-4-80
Time Received
Date Reported 9-17-80

Print or type applicable information in box below

Sample Bottle Number 3034 Time Collected Date Collected 9-2-80

Mailing Address: Water Lab
Name Attn: Beth Lyda
Street 2609 - 12th St. S.E.
City Salem State OR Zip 97302

Sample Location:
Name City of Donald
Street
City Donald State OR Zip 97020

Water Source: Spring ☐ Stream ☐ Well ☐ Chlorinated: Yes ☐ No ☐ Sample Type: Routine ☐ Resample ☐ Check ☐
Sample Point Well #2
Collector's Name R. Fetrow

EPA PRIMARY DRINKING WATER STANDARDS

Inorganics

Test	Test Method[1]	Units	Limits	Test Results	Date of Analysis	Analyst
Arsenic, As	SM 404 C	MG/L	0.05	0.01	9-9-80	MJS
Barium, Ba	SM 303 A	MG/L	1.	ND@0.1	9-11-80	MJS
Cadmium, Cd	SM 305 A	MG/L	0.01	ND@0.005	9-13-80	MJS
Chromium, Cr	SM 307 A	MG/L	0.05	ND@0.02	9-11-80	MJS
Fluoride, F	SM 414 A&C	MG/L	1.4 to 2.4	0.6	9-17-80	RD
Lead, Pb	SM 311 A	MG/L	0.05	ND@0.01	9-13-80	MJS
Mercury, Hg	SM 315 A	MG/L	0.002	ND@0.001	9-13-80	MJS
Nitrate, NO_3 as N	ASTM D992-71	MG/L	10.	ND@0.1	9-15-80	MJS
Selenium, Se	SM 318 C	MG/L	0.01	ND@0.002	9-9-80	MJS
Silver, Ag	SM 319 A	MG/L	0.05	ND@0.01	9-11-80	MJS

Organics

Endrin	SM 509 A	MG/L	0.0002			
Lindane	SM 509 A	MG/L	0.004			
Methoxychlor	SM 509 A	MG/L	0.1			
Toxaphene	SM 509 A	MG/L	0.005			
2,4-D	SM 509 B	MG/L	0.1			
2,4,5-TP (Silvex)	SM 509 B	MG/L	0.01			
Total Trihalomethanes	EPA	MG/L	0.1			

Other

pH	SM 424	pH units		7.8	9-8-80	RD
Specific Conductance	SM 205	µMHO/CM		220	9-8-80	RD

SM = Standard Methods, 14th Ed. ND = None Detected

DOMESTIC IRRIGATION INDUSTRIAL

Willamette Drilling Company, Inc.

Well Drilling Contractors

7365 O'Neil Rd. N.E.
SALEM, OREGON 97303
Phone 393-1757

September 2, 1980

Re; Recovery test following pump test performed on City of Donald Well # 2

Well pumped for 24 hours at a rate of 300 GPM at a pumping level of 112 feet.

After 1 minute of shutdown of pump W.L. 81 feet
After 2 min. W.L. 77 ft.
" 3 " " 75 "
" 4 " " 74 "
" 5 " " 73½ "
" 10 " " 72½ "
" 15 " " 72 "
" 20 " " 72 "
" 25 " " 71½ "
" 30 " " 71½ "
" 45 " " 71 "
" 60 " " 71 "
After 3hrs. " 70 "

Drawdown Rate of Well #1 during pumping of Well # 2

At Start 67 ft.
After 30min 69 ft.
" 1hr. 70½ "
" 1½hrs. 70½ "
" 2 3/4 72 "
" 3½ 73½ "
" 6½ 73½ "
" 10½ 74½ "
" 15½ 75 "
" 24 75

Recovery Rate of Well # 1 following pumping of Well # 2

Water level 72½ feet after 7 minutes of shutdown
" " 71 " " 19 " " "
" " 71 " " 28 " " "
" " 70 " " 75 " " "
" " 69 " " 3 hrs." " "

The pumping rate of Well # 2 seems to indicate a greater flow than # 1. This Well was briefly pumped at 450 GPM to check drawdown and to clear any sand that would appear. The pumping level at 450 GPM was 122 feet.

Sincerely,

Mark D. Beier

Mark D. Beier

Appendix C

Water Rights Permit

STATE OF OREGON

MARION COUNTY

PERMIT TO APPROPRIATE THE PUBLIC WATERS

This is to certify that I have examined Application G-9938 and do hereby grant the same SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

This permit is issued to City of Donald of PO Box 338, Donald, Oregon 97020, Phone 678-5543, for the use of the waters of two wells, being 0.39 cubic foot per second from each well, for the purpose of municipal use; that the priority of the right dates from September 16, 1980 and is limited to the amount of water which can be applied to beneficial use and shall not exceed 0.78 cubic foot per second measured at the point of diversion from the wells, or its equivalent in case of rotation with other water users.

The wells are to be located: Well 1 - is to be located south 78°45'27" east 5,192.85 feet; Well 2 - is to be located south 80°37'42" east 5,225.68 feet, both from the northwest corner of the G.A. Cone DLC 62, Well 1 - being within the NW 1/4SE 1/4; and Well 2 - being within the SW 1/4NE 1/4, both within Township 4 South, Range 1 West, WM, in the county of Marion.

A description of the place of use under the permit, and to which such right is appurtenant, is as follows:

Township 4 South	Range 1 West, WM	Section 17	SW 1/4NW 1/4	Municipal
			SE 1/4NW 1/4	
			SW 1/4NE 1/4	
			NE 1/4SE 1/4	
			NW 1/4SE 1/4	
			NE 1/4SW 1/4	
			NW 1/4SW 1/4	
			SE 1/4SW 1/4	
			SW 1/4SW 1/4	

The wells shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon.

The works constructed shall include an air line and pressure gauge or an access port for measuring line, adequate to determine water level elevation in each well at all times.

The permittee shall install and maintain a weir, meter, or other suitable measuring device, and shall keep a complete record of the amount of ground water withdrawn.

Actual construction work shall begin on or before February 8, 1983 and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 1983. Extended to October 1, 1988 Extended to October 1, 1988 10-1-98

Complete application of the water to the proposed use shall be made on or before October 1, 1984. Extended to October 1, 1988 Extended to October 1, 1988 10-1-98

WITNESS my hand this 8th day of February, 1982

Appendix D

WTP
Operation & Maintenance Manual, 1981

CITY OF DONALD

OPERATING AND MAINTENANCE

MANUAL FOR

1981 WATER SYSTEM

Prepared By

Boatwright Engineering, Inc.
2613 12th St. S.E.
Salem, Oregon

December 1981

INTRODUCTION

SCOPE

The purpose of this manual is to provide the reader with a general knowledge of the basic design concepts and features of the 1981 Donald Water System Improvements. With this information, the Submittal Data bound separately, the As Constructed drawings and the list of contacts for technical advice the City of Donald should be able to properly operate and maintain the water system.

BACKGROUND

The City of Donald in 1977 was being requested by the State Board of Health and the Environmental Protection Agency to upgrade the deficiencies in its water system. In 1978 a preliminary engineering feasibility study was prepared by Boatwright Engineering, discussing various options of source development and water system improvements. The city then secured loan and grant funds through the Farmer Home Administration to finance the water system improvements.

GENERAL DESIGN CONSIDERATION

The water system improvements required a new source of supply, storage for 2-3 days supply and fire protection capability. To meet these requirements, property was purchased, two new wells drilled, treatment equipment installed, a 200,000 gallon reservoir, treatment plant building and booster pump system constructed, and improvements made to the distribution system piping. The chemical quality of the well water required that treatment be provided. The treatment process

requires a uniform rate of flow, therefore treated water is stored (200,000 gallons) after it is produced, ready to meet nonuniform flow requirements of a distribution system. Since the terrain is generally level throughout the city limits of Donald and does not provide any high elevation for a storage reservoir to pressurize the distribution system, it is pressurized through a booster pump system and code tank located in the treatment plant building.

1981 WATER SYSTEM IMPROVEMENTS

SOURCE OF SUPPLY

The new source of supply consists of two new wells drilled on property procured by the City in the NE area of Donald. Well No. 1 is a 12" diameter cased and sealed well located in the treatment plant building. It is 210 feet deep fitted with an eight inch (8") slotted PVC liner packed with sand and gravel between the 12" casing. Well No. 2 is a 12" cased and sealed well north of Well No. 1. It is 190 feet deep fitted with a well screen. Copies of the well logs are included in the exhibit section of this manual.

Well Pumps in both wells are submersible type; Jacuzzi model S6HC-3Z with a 3450 RPM, 15 HP, 3 phase, 230 volt motor, set at 175 feet, low water cut out and restore probes are located at 170 feet and 150 feet respectively. The design

capacity of each pump is 175 gallons per minute at 170 feet of total dynamic head. The wells are also equipped with ¼" galvanized air tubes so that the water level in the well can be determined with a pressure gage and hand pump. The well pumps are controlled from the master control panel by hand, off, auto switches for each well. A selector switch is used to determine which well pump is the "first pump on" as signalled from the water level in the 200,000 gallon reservoir. The water level is displayed on the digital readout on the master panel. Set points for the high alarm, first pump on and off, second pump on and off, and low alarm, are each adjustable within the master panel with the master selector, digital read-out and locking set point dials. Typically the high water alarm should be set at 31.0 feet, the lead pump start/stop should be set at 25.5/30.5 feet, the lag pump start/stop at 20.0/30.0 feet, and the low water alarm at 15.0 feet. These set points may be changed with experience of operation to best suit the demands of the system. The discharge lines from each well meet inside the treatment plant building at a cross in the pipe fittings. Prior to this point each well is metered separately and a manual valve is installed (red) to allow discharging the water to waste in the catch basin located outside of the building. A complete chemical analysis is located in the exhibits section of this manual. The presence of hydrogen sulfide, iron and manganese requires treatment of the water to reduce the level of the

chemical presence to allowable limits. This is further discussed under the TREATMENT section of this manual.

A sand separator is installed on Well No. 1 to remove sand that is being pumped from the well. The separator creates a cyclone motion of the water causing the sand particles to be removed from the water supply. The automatic purge valve discharges the accumulation of sand to the catch basin drain outside the treatment building.

TREATMENT

Reduction of the hydrogen sulfide is accomplished with the CHLORINATOR system. This consists of piping, scales, chlorine bottles, and chlorinator, located in the chlorine room. CAUTION: CHLORINE IS A DANGEROUS GAS. Anyone without experience and knowledge of working with chlorine equipment should not handle or operate the chlorine system. A gas mask in case of emergency is located in the main part of the building near the master control panel. The chlorinator requires a supply of water from the pressurized distribution system. An electric solenoid valve wired into the wall pump circuit automatically opens when either well pump runs to allow the flow through the chlorinator equipment. Water flow through the chlorinator creates a vacuum to the regulators on the bottles. If the regulator is set to the "stand by" position the second bottle will come on automatically when the first bottle is empty. The chlorine gas enters the water flow and is piped to and

injected into the influent pipe to the chemical mixing tank. The chlorine residual can be monitered with the test kit provided. The water entering the distribution system should have a free chlorine residual of 0.5 to 0.2 ppm and should be adjusted as required based on tests taken in the system to maintain a 0.2 ppm residual throughout the distribution system. Detailed information on the chlorinator is found in separately bound submittals.

Removal of the iron and manganese is accomplished by the green sand filter system, consisting of the chemical feeder, chemical mixing tank, three filter tanks and the related piping valves and controls. The green sand filter bed is continually recharged by feeding the solution of potassium permanganate to the influent water prior to the chemical mixing tank. After mixing the water enters the green sand filter where the iron and manganese is removed, and the treated water is then stored in the 200,000 gallon reservoir. Detailed operation of the filter system is included separately in the manufacture's operational manual. As the filter bed is loaded with the chemical removal it becomesmore difficult for the water to be forced through the filter media. The backwash cleaning of the sand filter is initiated by the adjustable pressure differential switch across the filter or on a time clock basis. The backwash water flows from the distribution system code tank

and is controlled by the electrically operated valves to sequence the backwashing of the three filter tanks. The flow controller on the backwash discharge line regulates the amount of flow. The backwash water is discharged into the concrete holding tank outside of the building. The design of the holding tank and irrigation system is to hold the backwash water for two hours (controlled by time clock) then with the floating outlet drain allow the holding tank to be drained to the manhold (wet well) inside of the building. The accumulation of sludge in the bottom of the tank should be checked and cleaned out periodically as needed. The manhole is equipped with the solenoid valve to release the holding tank drain and the irrigation pump which pumps the backwash water through the sprinkler system. The irrigation pump is equipped with level switches for on/off control of the pump as the backwash water fills the manhole from the holding tank.

WATER STORAGE: 200,000 GALLON RESERVOIR

After treatment the water is piped to the 200,000 gallon reservoir for storage and is pumped into the distribution system as demand dictates. The reservoir is equipped with manholes, ladder and safety cage, access hatch and vent. The half-scale gage board on the outside of the tank will give the operator a visual indication of the water level inside. The reservoir level is recorded automatically on the chart

recorder. The paper roll should be maintained and dated frequently to establish a permanent record of operation. Piping and valving at the reservoir will allow the reservoir to be isolated for cleaning and checking the interior coating. Unless otherwise needed more frequently the reservoir painting should be inspected at least once each five years.

BOOSTER PUMP SYSTEM

The distribution system is charged with water by a hydro-pnuematic pressure system using a 3500 gallon code tank and three booster pumps pressure controlled automatically to meet the water demands of the distribution system.

The booster pumps consists of various capacity and power supplies to meet the demands on the system. The first pump (#1) is a Jacuzzi series D model DM2-T with a 10 horsepower, 3 phase 220 volt 3450 rpm motor. The pump has a capacity of 150 gallons per minute at 160 feet of total dynamic head (69 psi) and 290 gallons per minute at 115 feet of total dynamic head (50 psi). The normal operating range of this pump should be set to start at 50 psi and stop at 75 psi. The second pump (#2) is a Jacuzzi Model 15 EM4-T with a 15 horsepower, 3 phase, 220 volt, 1750 rpm motor. The pump has a capacity of 400 gallons per minute at 104 feet of total dynamic head (45 psi). The normal operating range of this pump should be set to start when the system pressure reaches 45 psi for 20 seconds continuously and shut-off at 50 psi. The third pump (#3) is a Jacuzzi

Model Z1EM4-2T4D-SAE C110 with a 35 horsepower Ford 4-cylinder, propane powered engine. The pump has a capacity of 400 gallons per minute at 92 feet total dynamic head (40 psi). The normal operating range of this pump should be set to start when the system pressure reaches 40 psi for 20 seconds continuously and shut-off at 45 psi. The engine driven pump is further controlled by an electrically operated control valve in the discharge piping to allow the engine 30 seconds to warmup before the pumping load is placed on the engine. The engine is equipped with air cleaner, oil filter, fuel filter and water cooling. The levels and filters should be checked and maintained as recommended by the manufacturer. The code tank is equipped with an air volume system using an air compressor and probes to maintain a water capacity at 35% at shut-off pressure. Air lines to the control panel are connected to the adjustable pressure switches for automatic control of the booster pumps. Also on the control panel are the hand off auto switches for each booster pump. In the "auto" position each pump will then operate to meet the demands from the distribution system.

DISTRIBUTION SYSTEM

Several improvements and replacement pipelines have been installed in the distribution system as shown on the AS-CONSTRUCTED drawings. Various valves, blowoffs, fittings, and fire hydrants have also been installed. Gate valves installed provide control of the water flow during emergency conditions

such as a break or leak repair. Valves which are not normally operated on the system should periodically (at least once per year) be operated to prevent the valve from freezing or otherwise becoming inoperable. Fire hydrants and blowoffs should also be operated periodically to maintain in an operable condition and also to flush the pipelines especially the dead end lines to keep the quality of water from deteriorating from little usage.

Appendix E

High Flow Pump No. 4
Operation & Maintenance Manual, 2017

Cascade
Water Works, Inc.
13469 MORROW LANE SE CCB#157482 PH. 503-364-4888
TURNER, OR 97392 email: cascadewaterworks@hotmail.com FAX: 503-364-7444

Operational Narrative of Donald High Flow Pump Station

1. **The pump is set to run as a back-up to the City's electric pumps which generally provide 65-70 psi of pressure to the city.**
2. **Pressure transmitter at pump station monitors pressure at all times. When pressure drops below 57 psi, pump starts and tries to maintain 64 psi (which is beyond its capability). As more water is used, pressure drops and the pump speeds up until full speed.**
3. **Pump will ramp up (15 seconds ramp time) to the speed needed to maintain 64 psi. If high water volume is flowing, this will approach full speed (60 Hz).**
4. **If 64 psi cannot be maintained, pump will run at full speed until 64 psi can be maintained with the assistance of the City's electric booster pumps.**
5. **Once 64 psi can be easily maintained by other electric pumps, the pump will slow down to maintain 64 psi.**
6. **When pump has run at minimum speed (52 Hz) for 20 seconds, it will shut down. This will happen when flow has been reduced to what the other pumps can produce at 64 psi.**
7. **A low pressure switch on the inlet side of the pump will prevent the pump from running in the event of the reservoir running out of water. It is set to shut the pump off at 1.0 psi and will reset at 2.0 psi. So, if reservoir is empty pump will not run until approximately 5 feet of water is in the reservoir. This can be by-passed by**

placing the pump in manual mode and operating the speed control dial on the panel face. If running in manual mode, the pump can be ran dry and destroyed with no water flow.

8. Any time the power goes out, the auto-transfer switch will turn on the generator, the pump will start due to the loss of signal from the pressure transmitter. If pressure is being maintained by the city's other electric pumps, the pump will run for 20 seconds at minimum speed, and then shut down. This will happen each time the power is switched from utility power to generator power and vice versa.
9. Generator will exercise every Monday at 2:00 pm for 15 minutes.
10. If generator is called for due to power outage, there will be a few seconds delay to have pump running. Once generator is operating and power is restored, it will run for a minimum of 10 minutes before switching back to utility power.
11. Isolation valves are buried in the site at either end of the connection to the suction piping at the reservoir and the discharge piping to the west of the pump station.
12. Check valve in the pump station will prevent water from flowing from the system back into the reservoir.
13. Insertion flow monitor will monitor the flow from the pump. It will not record low flows (below 100 gpm). The flow monitor also totals flow which should be recorded regularly by city.

If any problem arises and cannot be quickly resolve, please call Jonathan Smith at Cascade Water Works, Inc. 503-364-4888

Appendix F

EPANET2 Water System Hydraulic Modeling

City of Donald Water System Model

Network Table - Links

Link ID	Length ft	Diameter in	Flow GPM
Pipe 1	450	12	148.10
Pipe 2	680	12	151.10
Pipe 3	650	12	145.10
Pipe 4	420	12	-323.15
Pipe 5	1450	12	477.25
Pipe 6	250	12	480.25
Pipe 7	120	10	1199.75
Pipe 8	50	10	1683.00
Pipe 9	570	10	327.78
Pipe 11	120	10	3.00
Pipe 12	250	10	53.80
Pipe 13	100	10	3.00
Pipe 14	380	4	3.00
Pipe 15	780	8	44.80
Pipe 16	240	12	270.98
Pipe 17	330	12	-38.80
Pipe 18	1000	12	306.78
Pipe 19	920	4	18.43
Pipe 20	150	8	300.78
Pipe 21	970	4	17.91
Pipe 22	190	8	267.44
Pipe 23	580	10	3.00

City of Donald Water System Model

Link ID	Length ft	Diameter in	Flow GPM
Pipe 24	1210	10	294.78
Pipe 25	275	6	3.00
Pipe 26	50	6	288.78
Pipe 27	600	6	3.00
Pipe 28	200	6	282.78
Pipe 29	500	4	67.64
Pipe 30	240	4	3.00
Pipe 31	450	10	868.97
Pipe 32	450	10	795.33
Pipe 33	240	10	682.94
Pipe 34	280	8	347.42
Pipe 35	520	10	1053.34
Pipe 36	40	2	6.00
Pipe 37	400	2	3.00
Pipe 38	40	10	1044.34
Pipe 40	420	8	465.25
Pipe 41	300	8	313.97
Pipe 42	300	6	148.28
Pipe 43	10	6	85.01
Pipe 44	250	6	230.29
Pipe 45	250	8	131.37
Pipe 46	250	8	-41.41
Pipe 47	300	8	109.39

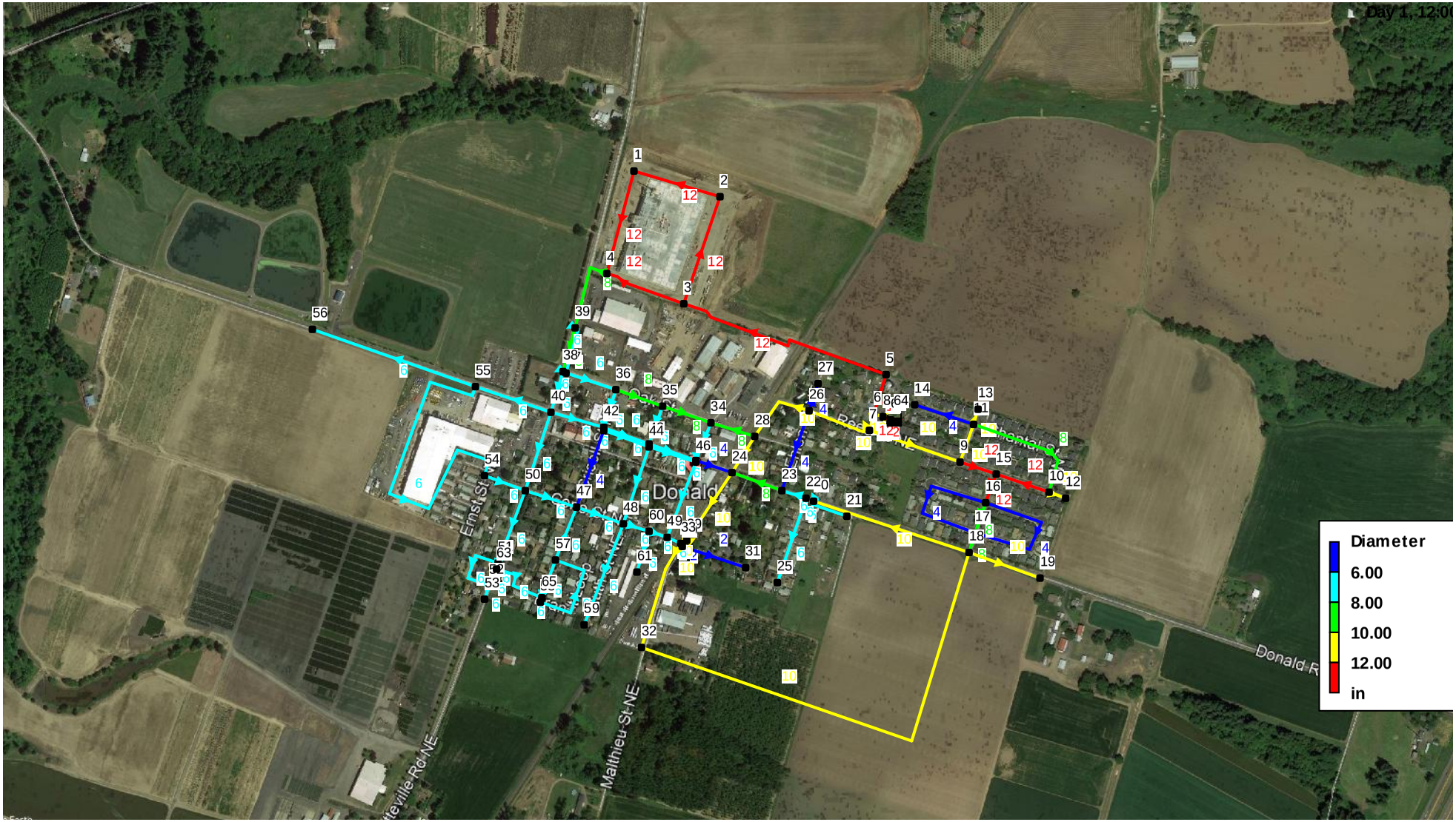
City of Donald Water System Model

Link ID	Length ft	Diameter in	Flow GPM
Pipe 48	275	6	225.96
Pipe 49	275	6	95.92
Pipe 50	275	6	86.95
Pipe 51	225	6	147.81
Pipe 52	250	4	25.98
Pipe 53	325	6	-74.71
Pipe 54	300	6	-13.80
Pipe 55	275	6	-97.76
Pipe 56	300	6	116.29
Pipe 57	275	6	-1.45
Pipe 58	20	6	167.63
Pipe 59	500	4	34.54
Pipe 60	510	6	100.65
Pipe 61	500	6	111.84
Pipe 62	30	6	216.59
Pipe 63	480	6	215.04
Pipe 64	550	6	14.12
Pipe 65	400	6	49.93
Pipe 67	100	6	3.00
Pipe 68	1760	6	41.60
Pipe 69	280	6	-38.60
Pipe 70	1050	6	3.00
Pipe 71	480	6	47.60

City of Donald Water System Model

Link ID	Length ft	Diameter in	Flow GPM
Pipe 72	650	6	-10.59
Pipe 74	325	6	-28.93
Pipe 75	700	6	3.00
Pipe 76	250	6	3.00
Pipe 77	100	6	-458.66
Pipe 78	100	6	-246.62
Pipe 79	150	6	-252.62
Pipe 80	250	6	-146.78
Pipe 81	300	6	-86.31
Pipe 83	2900	10	0.00
Pipe 82	10	12	1686.00
Pipe 84	10	12	1686.00
Pipe 10	650	10	1500.00
Pipe 39	125	6	32.81
Pipe 66	125	6	-8.12
Pipe 73	200	6	-21.35
Pipe 85	50	6	13.59
Pipe 86	350	6	-37.93

City of Donald Water System Model



EPANET 2

Appendix G

GK Machine Well Log

MARI 56719

Amended *

G.K. MACHINE WELL

MARI 56719

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

WELL I.D. # L 56631

START CARD # 101574

(1) OWNER: Well Number

Name Norman & Itha Reiling Trust

Address 10773 Feller Rd.

City Aurora. OR Hubbard State OR Zip ~~97002~~ 97032

(2) TYPE OF WORK

[X] New Well [ ] Deepening [ ] Alteration (repair/recondition) [ ] Abandonment

(3) DRILL METHOD:

[ ] Rotary Air [ ] Rotary Mud [X] Cable [ ] Auger

[ ] Other

(4) PROPOSED USE:

[ ] Domestic [ ] Community [ ] Industrial [X] Irrigation

[ ] Thermal [ ] Injection [ ] Livestock [ ] Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval [ ] Yes [X] No Depth of Completed Well 238 ft.

Explosives used [ ] Yes [X] No Type Amount

HOLE Diameter	From	To	Material	SEAL From	To	Sacks or pounds
18"	0	238	cement	0	150	174sacks cem & 5%bentonite

How was seal placed: Method [ ] A [ ] B [X] C [ ] D [ ] E

[ ] Other

Backfill placed from ft. to ft. Material

Gravel placed from 150 ft. to 238 ft. Size of gravel 5-9

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
Liner:	~~2½"~~	+8"	199 2"		~~[X]~~	[ ]	[ ]	~~[X]~~
	~~2½"~~	+19"	175 5"		~~[X]~~	[ ]	[ ]	~~[X]~~

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:

[ ] Perforations Method

[X] Screens Type Material stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
+2	178 6"			12"	pipe	[X]	[ ]
178 6"	192 10"	.075		12"	p.s.	[ ]	[ ]
192 10"	200 7"			12"	pipe	[X]	[ ]
200 7"	208	.075		12"	p.s.	[ ]	[ ]
208	210 9"			12"	pipe	[X]	[ ]
210 9"	231 1"	.075		12"	p.s.	[ ]	
231 1"	238			12"	pipe	[X]	

(8) WELL TESTS: Minimum testing time is 1 hour

[X] Pump [ ] Bailer [ ] Air [ ] Artesian [X] Flowing

Yield gal/min	Drawdown	Drill stem at	Time
825	127 3"		1 hr.
775	128 8"		5 hrs.

Temperature of water 53 Depth Artesian Flow Found

Was a water analysis done? [ ] Yes By whom

Did any strata contain water not suitable for intended use? [ ] Too little

[ ] Salty [ ] Muddy [ ] Odor [ ] Colored [ ] Other

Depth of strata:

(9) LOCATION OF WELL by legal description:

County Marion Latitude Longitude

Township 4S N or S Range 1W E or W. WM.

Section 17 NW 1/4 SE 1/4

Tax Lot 2600 Lot Block Subdivision

Street Address of Well (or nearest address) Donald Rd (east of Donald, next to city limits- Donald OR

(10) STATIC WATER LEVEL:

53 ft. below land surface. Date 6/6/02

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found 82

From	To	Estimated Flow Rate	SWL
82	109	30gpm	
179	231	775 gpm	53

(12) WELL LOG:

Ground Elevation

Material	From	To	SWL
See attached page			

RECEIVED
SEP 05 2002
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 3/1/02 Completed 7/1/02

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number 1704

Signed Date 7/26/02

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 783

Signed Date 7/10/02

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER

MARI 56719

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

Mari 56719

WELL I.D. # L 56631
START CARD # 101574

(1) OWNER: Well Number
Name Norman & Itha Reiling Trust
Address 10773 Feller Rd.
City Aurora, OR State Zip 97002

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 238 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
18"	0	238	cement	0	150	174sacks cem & 5%bentonite

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other
Backfill placed from ft. to ft. Material
Gravel placed from 150 ft. to 238 ft. Size of gravel 5-9

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	2½"	+8"	199 4"		☒	☐	☐	☒
	2½"	+19"	175 5"		☒	☐	☐	☒

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☒ Screens Type Material stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
+2	178 6"			12"	pipe	☒	☐
178 6"	192 10"	.075		12"	p.s.	☐	☐
192 10"	200 7"			12"	pipe	☒	☐
200 7"	208	.075		12"	p.s.	☐	☐
208	210 9"			12"	pipe	☒	☐
210 9"	231 1"	.075		12"	p.s.	☐	
231 1"	238			12"	pipe	☒	

(8) WELL TESTS: Minimum testing time is 1 hour
☒ Pump ☐ Bailer ☐ Air ☐ Flowing ☐ Artesian

Yield gal/min	Drawdown	Drill stem at	Time
825	127 3"		1 hr.
775	128 8"		5 hrs.

Temperature of water 53 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Marion Latitude Longitude
Township 4S N or S Range 1W E or W. WM.
Section 17 NW 1/4 SE 1/4
Tax Lot 2600 Lot Block Subdivision
Street Address of Well (or nearest address) Donald Rd (east of Donald next to city limits- Donald OR

(10) STATIC WATER LEVEL:
53 ft. below land surface. Date 6/6/02
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 82

From	To	Estimated Flow Rate	SWL
82	109	30gpm	
179	231	775 gpm	53

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
See attached page			

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JUL 31 2002
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 3/1/02 Completed 7/1/02

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1704
Signed Date 7/26/02

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 783
Signed Date 7/19/02

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER

Mari
56719

Norman & Itha Reiling Trust
10773 Feller Rd.
Aurora, OR 97002

Well I.D.# L56631

Start Card # 101574

Marion County Township: 4S Range: 1W Sec: 17 NW1/4, SE1/4

WELL LOG

Material	From	To	SWL
Topsoil	0	2	
Clay brown	2	16	
Clay gray	16	43	
Clay gray soft	43	64	
Clay gray sticky	64	72	
Clay blue	72	78	
Clay brown sandy	78	82	
Sand brown & clay	82	98	36
Sand brown & gravel	98	109	36
Clay brown sandy	109	112	
Clay gray sticky	112	115	
Clay gray	115	119	
Sand & clay gray	119	126	44
Sand & clay	126	166	44
Clay gray & blue,sandy	166	175	
Sand	175	177	
Clay gray silty	177	179	
Sand & Gravel	179	193	44
Sand fine silty &clay	193	201	
Sand fine, clay green	201	205	44
Sand black coarse	205	208	44
Clay gray & green sticky	208	210	
Sand,silt & clay green	210	212	44
Sand & clay layers green	212	222	44
Sand	222	225	44
Sand & clay layer green	225	234	44
Clay green,gray, & black	234	239	

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WATER RESOURCES DEPT.
SALEM, OREGON