CITY COUNCIL **Agenda**

520 E. Cascade Avenue - PO Box 39 - Sisters, Or 97759 | ph.: (541) 549-6022 | www.ci.sisters.or.us

Wednesday, June 14, 2023

This City Council meeting is accessible to the public either in person in the Council Chambers at 520 E. Cascade Avenue, Sisters, OR 97759 or via Zoom at the link below:

https://us02web.zoom.us/j/89868035443?pwd=VlZkNnpMK2pOL1pPME1HNE1xMWxiZz09
Meeting ID: 898 6803 5443 Passcode: 328756

5:30 PM WORKSHOP

1. Code Enforcement Update
2. Review Draft Private Property Tree Removal Code
3. Other Business

6:30 PM CITY COUNCIL REGULAR MEETING

1. **CALL TO ORDER/PLEDGE OF ALLEGIANCE**

2. **ROLL CALL**

3. **APPROVAL OF AGENDA**

4. **VISITOR COMMUNICATION**

5. **CONSENT AGENDA**
   A. Minutes
      1. May 24, 2023 – Regular Meeting
      2. May 24, 2023 – Workshop

   B. Approve Resolution No. 2023-04: A RESOLUTION EXTENDING THE CITY OF SISTERS WORKERS COMPENSATION COVERAGE TO VOLUNTEERS OF THE CITY OF SISTERS.

   C. Approve Resolution No. 2023-05: A RESOLUTION DECLARING THE MUNICIPAL SERVICES PROVIDED BY THE CITY OF SISTERS.

   D. Approve Resolution No. 2023-06**:** A RESOLUTION AMENDING THE PAY PLAN CLASSIFICATION FOR THE CITY OF SISTERS.

   E. OLCC Liquor License Application Approval
      1. Spoons of Sisters, LLC – Limited on Premises

This agenda is also available via the Internet at **www.ci.sisters.or.us**

6. **COUNCIL BUSINESS**
   A. **Second Reading of Ordinance 529:** AN ORDINANCE OF CITY OF SISTERS ESTABLISHING CAMPING REGULATIONS AND A CAMPING REMOVAL POLICY.

   B. **Public Hearing and Consideration of Ordinance 530:** AN ORDINANCE ADOPTING AMENDMENTS TO THE SISTERS WATER MASTER PLAN TO ALIGN CAPITAL FACILITIES PLANNING WITH THE CURRENT POPULATION FORECAST.

   C. **Public Hearing and Consideration of Ordinance 531:** AN ORDINANCE ADOPTING AMENDMENTS TO THE SISTERS WASTEWATER FACILITIES PLAN TO ALIGN CAPITAL FACILITIES PLANNING WITH THE CURRENT POPULATION FORECAST.

   D. **Public Hearing and Consideration of Resolution No. 2023-07** A RESOLUTION DECLARING THE CITY'S ELECTION TO RECEIVE STATE REVENUES.

   E. **Public Hearing and Consideration of Resolution No. 2023-08**: A RESOLUTION ADOPTING THE FISCAL YEAR 2023/24 BUDGET, APPROPRIATING FUNDS, APPROVING A TAX LEVY AND DIRECTING STAFF TO FILE THE BUDGET WITH THE COUNTY CLERK**.**

   F. **Discussion and Consideration of Resolution 2023-09:** A RESOLUTION OF CITY OF SISTERS ACCEPTING COMMUNITY WILDFIRE RISK REDUCTION PROGRAM GRANT FUNDS; AUTHORIZING EXECUTION OF GRANT AGREEMENT**.**

7. **OTHER BUSINESS**
   A. Staff Comments

8. **MAYOR/COUNCILOR BUSINESS**

9. **ADJOURN**

Pursuant to ORS 192.640, this agenda includes a list of the principal subjects anticipated to be considered at the above-referenced meeting; however, the agenda does not limit the ability of the Council to consider or discuss additional subjects. This meeting is subject to cancellation without notice.

This meeting is open to the public, and interested citizens are invited to attend. This is an open meeting under Oregon Revised Statutes, not a community forum; audience participation is at the discretion of the Council. The meeting may be recorded. The meeting location is accessible to persons with disabilities. A request for an interpreter for the hearing impaired or for other accommodations for persons with disabilities should be made to the City Recorder at least forty-eighty (48) hours in advance of the meeting.

Executive Sessions are not open to the public; however, members of the press are invited to attend.

CITY COUNCIL

Agenda Item Summary

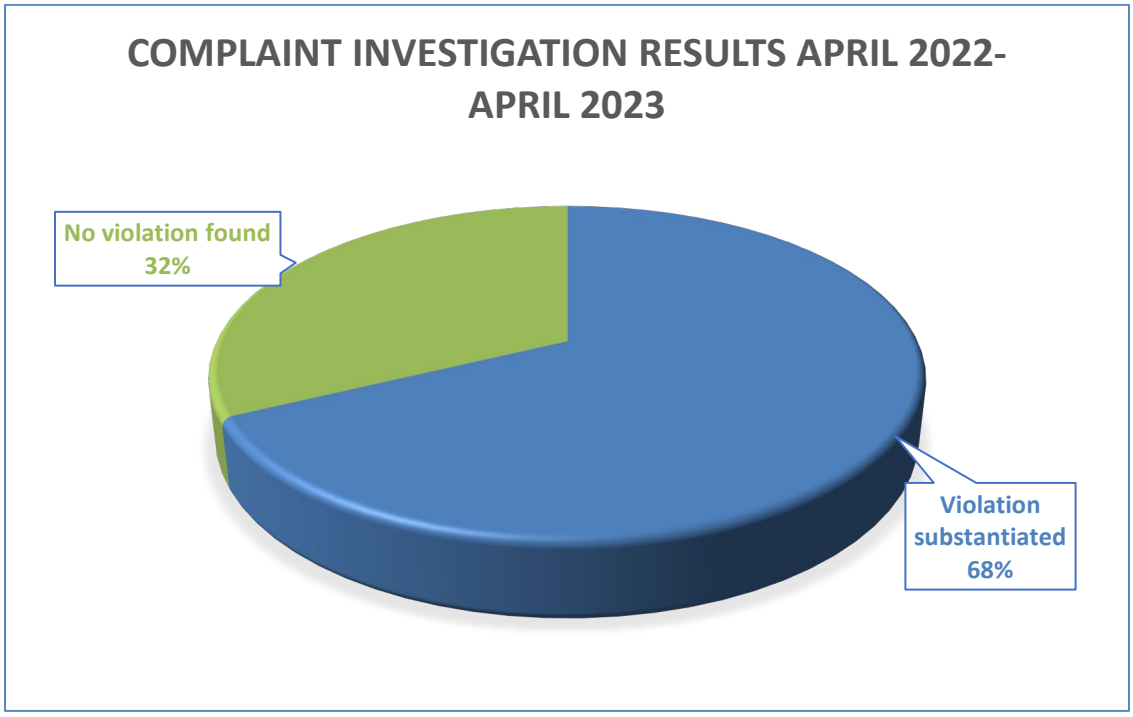
Meeting Date: June 14, 2023
Type: Workshop
Subject: Code Compliance overview and discussion

Staff: J. Smith
Dept: CDD

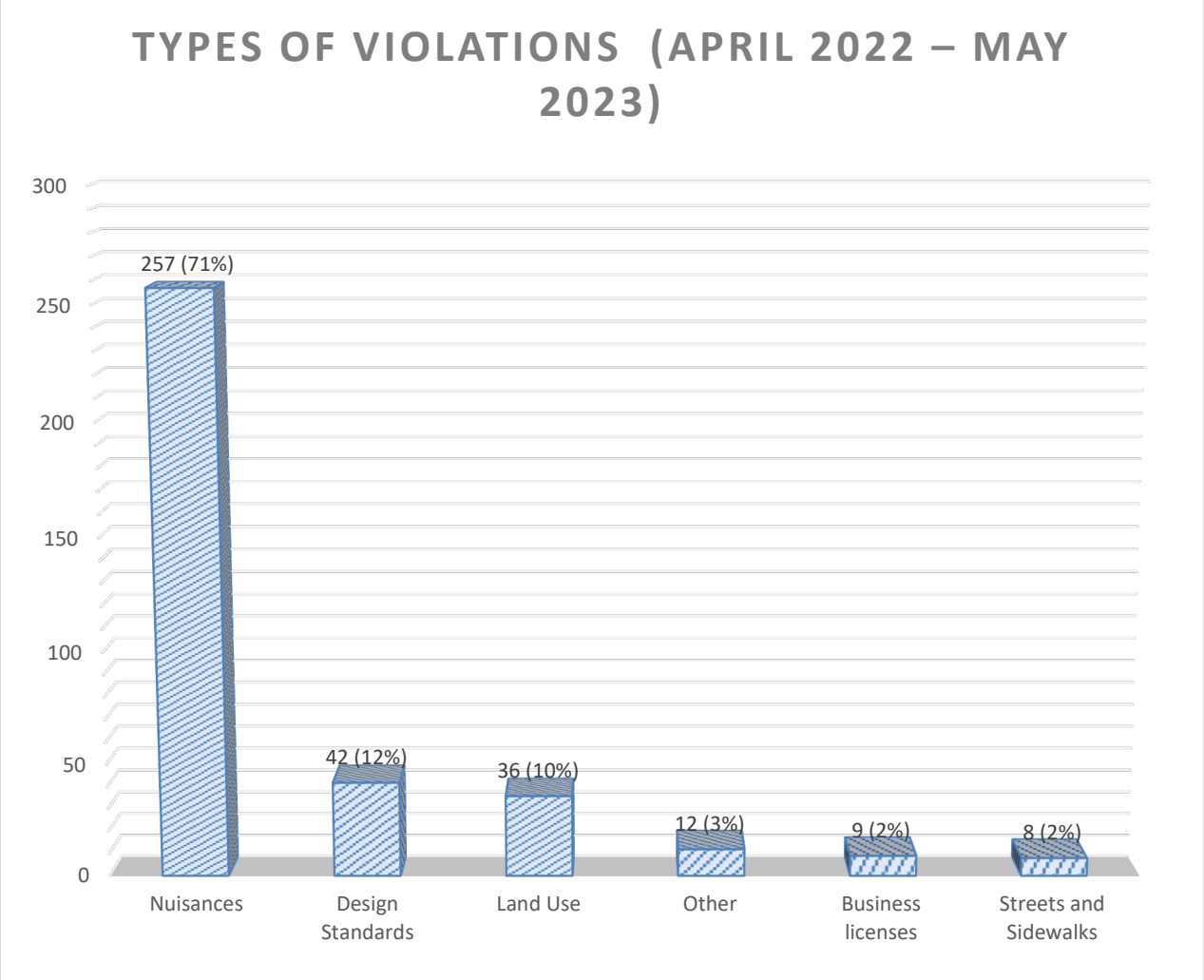
Action Requested: Feedback on the Sisters Code Compliance Program

Summary Points:

The city's Code Compliance program is committed to mitigating fire risks associated with vegetation by proactively seeking out code violations and addressing citizen complaints. Additionally, the program encourages citizens to report any concerns or observations they may have regarding fire safety, hazardous conditions, and other code violations. Every complaint is treated seriously, thoroughly investigated, and appropriate action is taken. Through a combination of proactive efforts and citizen engagement, the code compliance program strives to create a safer and more resilient city.



Code Compliance has been implemented in the City of Sisters for approximately 14 months. The following is an overview of the Code Compliance program starting with the types of code violation by category:



Note: A total of 364 violations in this timeframe

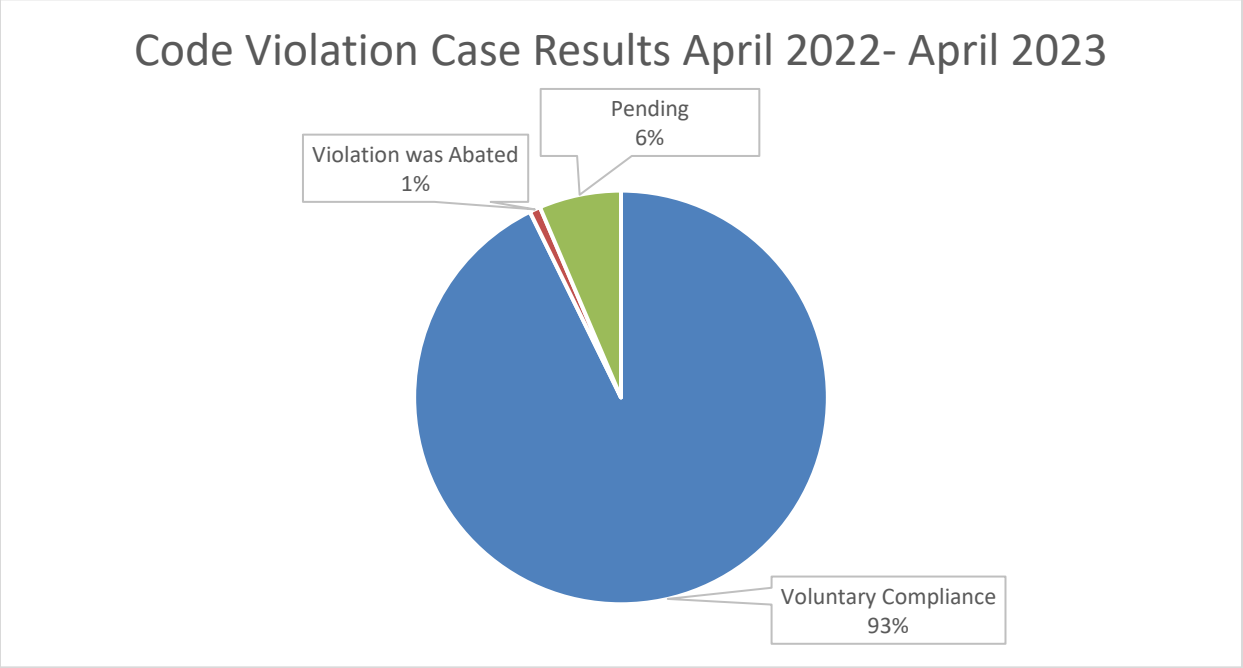
The type of violation is characterized closely with the Sister Municipal Code chapters. Their description is as shown below:

Types of violations	**Examples**
Nuisances	Overgrown vegetation, accumulation of debris, trees hanging too low over streets and sidewalks, junked vehicles, hazardous trees, abandoned motor vehicles on private property.
Design standards	Permanent, temporary, and A-frame signs, fencing, existing trees on lots being developed.
Land use	Zoning, clear vision, dark skies.
Other	Parking (when it's not clear if the vehicle is on private or public property), animal complaints (feeding deer), unknown violations, building code violations that could be other issues.
Streets and Sidewalks	Right of way permits and use.
Business licenses	Business, short-term rental, transient merchants, and social gaming licenses.

Sisters' Code Compliance works closely with Deschutes County Sheriff's Office to ensure that all complaints or issues are investigated by the correct agency. They are responsible for the following code violations:

Types of violations	**Examples**
Parking	Public no parking zones, incorrect directional parking, handicap parking, and many other parking violations.
Animal Nuisances	Animals at large.
Noise complaints	Any unreasonably loud, raucous, and or repetitive noise (*Code Compliance will investigate noise associated with a zoning use).
City parks	Building of fires, littering, horse riding, motorcycle operation, fireworks etc.
Abandoned vehicles	Wrecked or junked vehicles parked on public right of way for longer than seven days.

The main goal of Code Compliance is to have citizens voluntarily correct their violations without the use of any enforcement mechanism. In order to achieve this, code compliance utilizes a process where numerous notices are sent to the property owner or persons responsible for the violation. This results in most violations being corrected without the need for prolonged enforcement action. When these steps fail, measures are taken to encourage the responsible party to correct the issue. The Code Enforcement Officer has achieved a 93% voluntary compliance in 93% of the violations (with 6% still pending) – see chart below.



During the first year of the Code Compliance program, there have been multiple code changes spearheaded by the Code Enforcement Officer to improving the function, effectiveness, and scale of the program. They are:

1. Administrative infractions: Allows for administrative infraction to be issued from start to finish with all oversite by the City. Prior to this change, citations would be processed through the Justice Court. An administrative infraction code allows the City more opportunities to be involved with obtaining voluntary compliance and leveraging citations as a tool.

2. Amended City Code to allocate responsibility of accumulation of debris, overgrown vegetation, and noxious weed nuisances in the right of way to the adjacent property owners.
3. Currently, we are exploring and developing a code amendment to regulate significant trees on private property by addressing them specifically in the Municipal Code. The code language aims to both protect these trees, but also allow for their removal in very specific circumstances, such as when they are diseased or dead.

CITY COUNCIL

Agenda Item Summary

Meeting Date: June 14, 2023 **Staff:** J. Smith
Type: Workshop **Dept:** CDD
Subject: Proposed Municipal Code Amendment regulating private tree removal

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Action Requested: Discussion of proposed amendments to the Sisters Municipal Code related to the removal of trees located on private property.

Summary Points: The proposed amendments to City Code will establish criteria for removal of significant trees on private property. Significant trees have a trunk diameter of eight inches or greater as measured 4.5 feet above the ground. Currently, private tree removal is regulated through the Development Code (SMC 3.2.500); however, the more appropriate location for this is the Municipal Code. Consequently, the proposed code amendment would specifically address tree removals not associated with a development, clarify the removal process, and allow the removal of trees for a variety of hazards or lot improvements.

1. Existing code language: Protects and regulates significant tree removal specifically during development but does not adequately address private property that is not associated with a development.
    a. Current ordinance includes language to retain significant trees whenever practical during development. The proposed code amendment will not change or modify SMC 3.2.500.
    b. Potentially there could be interpretation issues regarding sites that have been developed in the past and current tree removal since SMC 3.2.500 is specific to site development.

2. Proposed code amendment: Sets forth regulations on the removal of significant trees on private property.
    a. The proposed code amendment would require property owners to obtain a permit for the removal of significant trees on private property.
    b. A certified arborist would be required to make a justification for the tree's removal, potential alternatives to removal, and proposal for replacement trees.
    c. This code change specifically addresses private tree removal without a significant change in past practice.

Financial Impact:
The cost of processing the tree permit would be offset by a permit fee.

Attachments: Draft Code Amendments

Title 9
Public Peace, Morals and Welfare

Chapter 9.30

TREE REMOVAL

Sections:

9.30.010 Definitions. For purposes of this Chapter 9.30, the following terms are defined as follows:

City Forester. The person designated by City Council to advise the City on trees and other urban forestry matters or such person's designee. The City Forester may be a City employee, contractor, or volunteer. For the purposes of this code, the terms "City Forester" and "City Arborist" shall be interchangeable.

Improvements. Any man-made physical addition to a property affecting the value or use of that property.

Person. Means any natural person, business entity, organization, trust, or other entity.

Remove. A tree is removed if it is cut down, ripped out, topped, or is otherwise killed by girdling, excessive pruning, poisoning, or other action resulting in the death of the tree.

Significant Tree. A tree with a trunk diameter of eight (8) inches or greater as measured 4.5 feet above the ground (DBH).

9.30.020 Tree Removal Permit

A. **Permit Required.** No person may remove a significant tree on private property within the City limits without a tree removal permit issued by the City in accordance with the provisions in this section.

B. **Exemptions.** The following actions do not require a tree removal permit:

1. Trees removed from publicly owned or managed property. This exemption includes, without limitation, removal of trees within easements benefitting a public entity, public utility easements, public leases, and public right-of-way. Removal of trees on public property is subject to SMC 4.05.040.

2. Tree removal required as prescribed in SMC 8.20 Urban/Rural Interface.

3. Trees removed in accordance with a land use permit or building permit approval.

4. Trees that present an immediate threat to the safety and welfare of persons and property provided advance notice of the proposed removal is provided to the City to the greatest extent practical under the circumstances. Notice after the fact must be provided if advance notice is not practical.

C. **Submittal Requirements.** An applicant for a tree removal permit must complete the application form prescribed by the City, pay the fee for the tree removal permit established by City Council, and submit the following information:

1. **Map of the property containing the following:**
   a) Location of proposed significant tree(s) to be removed;
   b) Existing and proposed structures that may impact the tree(s)

2. **Tree Report prepared by Certified Arborist.** Must be dated no later than one calendar year preceding the date of tree removal permit application and include the following information:

   a) Justification for removing the tree.
   b) Alternatives to removal considered.
   c) Proposal for replacement trees or justification for not replacing the tree.
   d) Name, contact information, and signature of arborist preparing report.

D. **Approval Criteria.** The City may authorize a tree removal permit for any one or more of the following reasons:

1. The tree is diseased and may result in the spread of disease to other trees.
2. The structural integrity of the tree is compromised by disease or injury.
3. The tree, including without limitation its root system, otherwise presents a hazard to life, property, utilities, streets, or other improvements.
4. The removal of the tree is necessary to construct improvements on the site.

E. **Reference.** The city may refer a tree removal permit request to the City forester for comments or additional information.

F. **Expiration.** A tree removal permit is valid for six months from the date of issuance.

9.30.030 Violation – Penalty.

A. **Responsible Party.** Any person or entity, regardless of ownership or lawful right of possession of any property, may be subject to penalty if their action or failure to act causes a violation of this Chapter 9.30. However, the owner and any other person in possession of the property at the time of the violation shall be presumed to be the party responsible for a violation occurring on such property. This presumption of responsibility may be overcome by a preponderance of the evidence showing (i) that the violation was committed by some person other than the owner, possessor, and/or their respective agents, managers, employees, family members, invitees, or contractors and (ii) that the owner and/or possessor was not able to control or prevent the violation. If more than one person is responsible, such persons shall be jointly and severally liable for the violation.

B. Each violation of this Chapter 9.30 including, without limitation, each significant tree removed without a tree removal permit, is a separate offence. Each offense is punishable by a fine of no less than $200, but not to exceed $1,000.

C. Nothing herein shall preclude City from pursuing any remedy available at law or equity including, without limitation, seeking an injunction to any violation or threatened violation of this Section 9.30.

REGULAR MEETING MINUTES
SISTERS CITY COUNCIL
520 E. CASCADE AVENUE
May 24, 2023

MEMBERS PRESENT		STAFF PRESENT:	
Michael Preedin	Mayor	Joe O'Neill	Interim City Manager
Andrea Blum	Council President	Paul Bertagna	PW Director
Jennifer Letz	Councilor	Scott Woodford	CDD Director
Gary Ross	Councilor	Kerry Prosser	City Recorder
Susan Cobb	Councilor	Jeremy Green	City Attorney

1. CALL TO ORDER/PLEDGE OF ALLEGIANCE

The meeting was called to order by Mayor Preedin at 6:46 pm.

2. ROLL CALL

A roll call was taken, and a quorum was established.

3. APPROVAL OF AGENDA

Council President Blum made a motion to approve the agenda. Councilor Letz seconded the motion. Preedin, Blum, Letz, Ross, and Cobb voted aye; the motion carried 5 -0.

4. VISITOR COMMUNICATION

Documents submitted for visitor communication could be found on the City Website. Mayor Preedin read a statement regarding ex-parte communication.

- Cathy Russell of Sisters submitted a letter for the record and spoke about traffic concerns.
- Michael, no address given, spoke about misfits and other topics.

5. CONSENT AGENDA

A. Minutes
   1. April 26, 2023 – Workshop
   2. May 10, 2023 – Regular Meeting
   3. May 10, 2023 - Workshop

Councilor Ross made a motion to approve the Consent Agenda. Councilor Cobb seconded the motion. Preedin, Blum, Letz, Ross, and Cobb voted aye; the motion carried 5 -0.

6. COUNCIL BUSINESS

A. **Public Hearing and Consideration of Ordinance 529 -** AN ORDINANCE OF CITY OF SISTERS ESTABLISHING CAMPING REGULATIONS AND A CAMPING REMOVAL POLICY.

Mayor Preedin opened a public hearing on Ordinance 529 and asked for the staff report.

Attorney Green reviewed minor updates made to the Ordinance.

Mayor Preedin asked for public comment; there was none. He closed the public hearing.

Councilor Cobb expressed concerns regarding Ordinance 529. She said the Ordinance appeared to be conflicting in nature, as it combined aspects of a camping ordinance with punitive measures while also aiming to ensure humane treatment for the removal of homeless individuals on camping sites on public property. She understood the Ordinance was intended to create guardrails but thought it failed to promote humane treatment or acknowledge the social complexities associated with homelessness.

Councilor Cobb also raised concerns regarding the difficulties faced by homeless individuals who worked and the impracticality of expecting them to dismantle their camping setup daily. She also expressed unease about removing personal belongings without sufficient notice and the arbitrary decision-making process regarding which items were considered valuable or useful. Finally, Councilor Cobb pointed out that the Policy Evaluation, outlined in Section 5.7, was not a workable policy as it involved contacting local agencies and outreach workers only after the removal had taken place.

Mayor Preedin disagreed with Councilor Cobb's statements. Similar to how we did not arrest every speeding driver, the Mayor believed that we would not automatically arrest individuals who might be pushing the boundaries of the camping ordinance. Mayor Preedin said our community was thoughtful, and those responsible for enforcing the Ordinance would approach it thoughtfully. It was a shame that we had to pass this Ordinance, but it was necessary. Mayor Preedin believed the Ordinance successfully combined two related issues without singling out people experiencing homelessness or individuals at events. The aim was to address camping as a whole in a cohesive manner. Mayor Preedin acknowledged that this Ordinance was not flawless, but thought it was well-constructed and did not propose any modifications.

Council President Blum said implementing the Ordinance was not a choice but a requirement imposed by the state. She noted local partners and advocacy groups for the houseless population in the community had the opportunity to review the Ordinance and provide input; she valued their expertise and highlighted the absence of dissenting voices among these groups. Council President Blum was in support of moving forward with the Ordinance.

Councilor Ross acknowledged the validity of objections raised by Councilor Cobb but expressed that those concerns should have been addressed earlier with legal counsel and others. Councilor Ross said the Ordinance had been reviewed and vetted by organizations working with the homeless population and had expected more opposition tonight but noted the absence of public comment. The Ordinance provided a means to address issues that might arise, particularly if they become frequent occurrences and it aligned with the

intent of the relevant statute. Councilor Ross pointed out the lack of centralized resources for the houseless in Sisters prevented the implementation of extensive support programs. He expressed the need to trust neighboring communities and local agencies that assist the houseless population to fulfill their roles effectively. Councilor Ross opposed changing the Ordinance and was ready to approve it in its current form.

Councilor Letz acknowledged the social nature of the homelessness issue and the importance of ensuring stable housing for individuals. However, there was also a need to protect the community's citizens, visitors, and property owners and to maintain their safety and investments. They had to take into account the well-being of all community members. Councilor Letz noted that Sisters was located close to federal lands where camping was legally permitted, providing some opportunities for individuals in distress to find shelter nearby.

Councilor Letz was confident in the thorough vetting of the Ordinance by legal counsel and community members with specialized knowledge in this area. She was willing to address any concerns or pain points raised by the community, law enforcement, or social workers and to revisit and make changes if necessary. Councilor Letz acknowledged that although it might require effort, the ability to adapt and modify policies was an inherent part of governance.

Mayor Preedin agreed we were not chiseling this Ordinance in granite. We could revisit it if needed.

Councilor Cobb said her comments were a follow-up to her initial questions sent to the City. She had also done some research and had communicated with some of the houseless people.

Mayor Preedin noted that despite having a homeless person involved in visitor communication tonight, they did not raise any concerns regarding the Ordinance. The Mayor acknowledged that each Councilor was free to vote according to their judgment. However, if the vote were not unanimous, the matter would be carried over to the next meeting.

Council President Blum made a motion to read Ordinance 529 by title. Councilor Ross seconded the motion. Preedin, Blum, Letz, Ross, and Cobb voted aye; the motion carried 5-0.

Director O'Neill read Ordinance 529 by title.

Council President Blum made a motion to adopt and approve Ordinance 529. Councilor Ross

seconded the motion. A roll call vote was taken; Preedin, Blum, Letz, and Ross voted aye; Cobb voted nay; the motion failed 4-1.

A second reading of Ordinance 529 would occur at the next City Council meeting Wednesday, June 14, 2023, at 6:30 pm.

B. **Discussion and Consideration of a Motion** to Approve a Grant Application with the Oregon Department of Transportation Carbon Reduction Program for approximately $220,000 with a 10.27% Match Requirement for the Design and Construction of EV Charging Ports at the East Portal.

Public Works Coordinator Dumanch thanked Council President Blum for highlighting this funding opportunity related to EV infrastructure. This grant was a chance to secure funding for the first phase of the East Portal project, as Highway 20 was designated as an alternative fuels corridor. The Oregon Department of Transportation (ODOT) was particularly interested in supporting projects that enhanced EV infrastructure in close proximity to the highway. With a match requirement of 10.27%, the funding opportunity presented an affordable option to finance EV infrastructure within the City. He anticipated grant announcements in the fall of 2023, with awards in the spring of 2024. Staff was seeking approval from the Council to apply for the grant.

Councilor Letz asked if the City was still interested in putting in or helping to facilitate other charging stations within the downtown core, closer to businesses. Coordinator Jackson was not aware of any other locations. He said this location was chosen based on what ODOT was looking for in project size; they wanted a project in the $300,000- $500,000 range.

Councilor Cobb said the amount collected from the gas tax would begin to decrease, which meant the amount coming from it to the City would decrease. She asked if ODOT had any plans for the charging stations to have some kind of means of either taxing or getting revenue from people who used them. Coordinator Jackson replied he did not know.

Mayor Preedin had met with the Director of ODOT, and he said road use taxes might be coming because their operational costs of road maintenance were going to exceed the money coming in starting in 2025-26.

Council President Blum made a motion to approve a grant application with the Oregon Department of Transportation Carbon Reduction Program for approximately $220,000 with a 10.27% Match Requirement for the Design and Construction of EV Charging Ports at the East Portal. Councilor Cobb seconded the motion. Preedin, Blum, Letz, Ross, and Cobb voted aye; the motion carried 5 -0.

7. OTHER BUSINESS

A. Staff Comments

Public Works-Director Bertagna

- Director Bertagna thanked Coordinator Dumanch for his work on the Environmental Sustainability Plan.
- The fuels reduction project off of Edgington Road was complete.

Finance - Director O'Neill

- The audit Request for Proposals were due this week.
- Staff had calculated commercial sewer equivalent dwelling units, which were up 34 over last year.

Community Development- Director Woodford

- The Sustainable City Year Program celebration would be held on Thursday, June 1st.
- Planning Commission would hold a workshop on June 1st to review the details of the proposal for the Space Age gas station.

City Manager's Office - Recorder Prosser

- Staff was working on updating franchise agreements with Light Speed Network and TDS Broadband Services.
- The Community Grant application process would open on July 1st.

8. MAYOR/COUNCILOR BUSINESS

Councilor Cobb attended the League of Women Voters convention, and one of the speakers reviewed that over the past ten years or so, the tax kicker in Oregon was receiving upwards of 20 million a year in interest. It was now earning 20 million a month, which was why the kicker was so large this year. The speaker said the State planned to adjust the interest assessment to ensure the kicker would be smaller in future years.

Councilor Ross said the presentation on the Water and Wastewater Master Plans was clear, concise, and understandable.

Councilor Letz attended two C4C events in the past week. The first was an emergency preparedness event; a panelist from the local insurance industry provided insights on the challenges in that field, such as difficulties in obtaining coverage and the potential for the insurance industry to play a more active role in fire prevention. Another speaker shared their experiences with the evacuation process during the 2020 fires and the importance of having a trustworthy entity in the community capable of receiving and distributing funds during emergencies; having such a group in place would be a valuable aspect of emergency preparedness. The second was a meeting focused on parks and trails. Councilor Letz also attended the Economic Development for Central Oregon luncheon last week.

Council President Blum noted the Executive Director for the Coordinated Houseless Response Organization (CHRO) had resigned; the Board would meet next week to discuss the future of the organization. She reviewed that 19 proposals from Central Oregon were submitted for review for the approximately 14 million in funding from the Governors Emergency Order on Homelessness; seven applications met the criteria and were progressing. Sisters Cold Weather Shelters' proposal was still being considered, but they needed to submit additional information.

Mayor Preedin would speak at the Veteran's Memorial Day Event next week.

Mayor Preedin mentioned that over the past couple of years of being Mayor, he had observed an increase in the time load, especially this spring, and he apologized for not being as available as usual. Being a mayor required touching all the bases, meeting everyone, and acting as the cheerleader. It was a demanding role, and being an effective mayor required dedication. He said Sisters had been punching above our weight, and maintaining that momentum was important.

9. **ADJOURN:** 8:01 pm.

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Kerry Prosser, City Recorder Michael Preedin, Mayor

WORKSHOP MEETING MINUTES
SISTERS CITY COUNCIL
520 E. CASCADE AVENUE
MAY 24, 2023

MEMBERS PRESENT:		**STAFF PRESENT:**	
Michael Preedin	Mayor	Joe O'Neill	Interim City Manager
Andrea Blum	Council President	Paul Bertagna	PW Director
Jennifer Letz	Councilor	Scott Woodford	CDD Director
Gary Ross	Councilor	Kerry Prosser	City Recorder
Susan Cobb	Councilor	Chad Davis	LT. DCSO

GUESTS:

Jon Stark	CEO Economic Development for Central Oregon (EDCO)
Eric Strobel	Sisters Area Director, EDCO
Treyton Moore	Project Engineer, Anderson Perry & Associates
Bryce Wininger	Staff Engineer, Anderson Perry & Associates

Mayor Preedin called the workshop to order at 5:30 pm.

1. Deschutes County Sheriff's Office Update

- Deputy Hudson attended a three-day advanced interviewing class hosted by the Bend Police Department.
- Deputies were preparing for summer events and looking at Rodeo and Quilt Show staffing.

2. Economic Development for Central Oregon (EDCO) Presentation

Area Director Strobel reviewed the work accomplished in Sisters over the past year. He highlighted efforts in community engagement and networking, He held business roundtable events which had fostered peer-to-peer networking and collaboration among local companies. One positive outcome of the roundtables included establishing a vanpool with commute options. There were also discussions on the impact of Sisters High School internships, and Director Woodford gave a presentation on the Housing Plan.

Area Director Strobel discussed various projects under the categories of "Move," "Start," and "Grow" and provided examples of how he had assisted businesses. He had also been developing local connections, including involvement in committees and participation in meetings with the community development department. He discussed the possibility of starting an industry trade group to provide information, education, and grant opportunities to businesses. In terms of table setting for the future, Area Director Strobel highlighted the need to build an Advisory Board and develop a strategic plan. In addition, they would like to establish a local membership drive to generate funding for the program.

Jon Stark, Chief Executive Officer, provided an update on the EDCO team, highlighted their expertise in events, marketing, and databases, and outlined their support for Area Director Strobel's economic development efforts. In addition, he reviewed the organization's

simplified strategic plan focused on business development, workforce development, and organizational stability. The presentation also covered various programs and events, including the internship program, Youth Career Connect program, and events like Pub Talks and the Bend Venture conference.

Mr. Stark presented a funding request to the City, which included increased labor and material costs due to inflation and adjustments for Area Director Strobel's transition from part-time to full-time work. Mr. Stark highlighted the organization's efforts to pay competitive wages and the value of having a full-time economic development resource in the community.

Council President Blum asked if there was a pipeline of trained workers that would help fill the hiring gap that businesses were currently experiencing. Mr. Stark replied that modest growth was expected, which might create an increase in workforce availability in the community. He said existing training programs and the reputation of Central Oregon as a trainable and hardworking workforce were seen as positive factors. The pressure on the workforce was expected to ease, and efforts were being made to improve companies' recruitment and hiring processes. While these changes were not immediate, they were viewed as incremental steps toward a better situation in the future.

Councilor Cobb asked what the current situation regarding available space for childcare was in Sisters. Area Director Strobel replied the main issue was that space for childcare had many State requirements that a light industrial area and most commercial locations could not fulfill.

Councilor Ross asked why Sisters was not part of the internship program. Mr. Stark said the program was funded by the school districts that participated in it and currently the Sisters district was not funding it. The program typically required at least half a position or more to operate effectively. We were open to reviving the program if there was sufficient desire, willingness, and demand from the community.

Councilor Letz praised Area Director Strobel's work; he understood the Sisters community, and his impact was visible. She said it was important for EDCO to continue supporting him as he addressed various multifaceted issues, including childcare and housing. The lack of available childcare options had affected the workforce, and addressing this issue was a significant opportunity. Councilor Letz thought the investment in EDCO and addressing these critical issues was money well spent.

Mayor Preedin highlighted the importance of discussing a three-year contract instead of short-term increments. He believed that maintaining momentum became challenging with yearly discussions, and he felt we now had a clearer understanding of how things would

work and the associated costs. He would like to establish a long-term plan to allow everyone to focus on economic development rather than contract negotiations.

Councilor Ross acknowledged the focus on the traded sector in economic development but noted that Sisters, as a community, differed from Redmond and Bend in terms of its businesses and their robustness. He thought local businesses had the potential to thrive with the assistance and support of Area Director Strobel. Councilor Ross believed economic development should encompass more than just the traded sector and emphasized the importance of a strong and diverse business community in Sisters. He would like to see provisions in the contract that addressed these broader aspects of economic development, such as community well-being, employability, and affordable workforce housing.

Mr. Stark acknowledged that in smaller communities like Sisters, the number of companies in the traded sector was smaller compared to larger cities, and he believed that collaboration and support among community members was essential for success.

Staff would incorporate the suggestions discussed and finalize the EDCO agreement for the Council's approval.

3. Water and Wastewater Master Plan Update

Director Bertagna introduced Bryce Wininger and Treyton Moore of Anderson Perry & Associates, the lead engineers on the Water and Wastewater Master Plans.

Water Master Plan Presentation

Mr. Wininger discussed the ongoing development of the Water and Wastewater Master Plans In collaboration with other engineers at Anderson Perry & Associates. These plans evaluated the condition, performance, and capacity of the existing water and sewer infrastructure in Sisters over a 20-year planning period. They assessed potential water demands and sewer flows based on population growth and determined necessary improvements. The primary outcome of these plans was to create a capital improvement plan with project timeframes and cost estimates for budgeting.

Mr. Wininger highlighted the key components of the water system, including supply and treatment, water storage, and distribution. He emphasized the need for clean drinking water, adequate capacity, and maintaining pressure and fire flow throughout the City. He also mentioned the importance of addressing aging infrastructure and the potential need for additional water storage and transmission lines to accommodate future growth.

Councilor Letz asked if the water line under Whychus Creek needed to be replaced and how heavy of a lift that project was. Mr. Wininger replied that the project's overall impact was not considered severe.

Council President Blum said the Public Works Advisory Board was impressed with the quality and thoroughness of the work done on these Plans. The Board understood the importance of having a clear vision and understanding the available avenues for financing. The Master Plans provided a foundation for future planning and the community's needs based on the analysis provided by experts. Council President Blum was happy with the progress and noted it was an essential responsibility of the Council to address the community's future requirements.

Wastewater Master Plan Presentation

Mr. Moore said they conducted a system-wide analysis of the wastewater system from a capacity standpoint and condition assessment, including the collection system, pump stations, wastewater treatment facility, and disposal system. The existing facilities, such as sewer pipes and lift stations, were evaluated for capacity and condition. The wastewater treatment plant was examined in terms of its unit processes and disposal capacity based on findings from the Lazy Z Master Plan. Mr. Moore proposed various improvements, including refurbishing the Rope Street lift station, adding a new lift station for the west side of town, converting individual sewer pumps to a gravity system, replacing aerators, and improving various treatment plant components. He had broken down the proposed Lazy Z improvements into two phases, one in the short term within the next five years to help get a jump on addressing capacity and then some slated for later as the City continued to grow.

Councilor Letz asked if the wastewater would be gravity fed or pumped to the Lazy Z. Director Bertagna replied it would be pumped to the site.

Councilor Ross asked if the storage lagoons would be able to handle the expected growth in population. Mr. Moore replied they had prepared water balance analyses to aid in determining the appropriate measures for managing water resources. Although some extra storage would be necessary, this requirement could be accommodated by utilizing existing ponds. The preliminary proposal for additional storage capacity was centered around the larger pond in the South. Additionally, they envisioned a smaller interconnected system of ponds and streams, which would primarily serve purposes such as evaporation control and enhancing aesthetic appeal.

Councilor Cobb asked how many miles of paths would be at the Lazy Z, and Mr. Moore replied the plans were currently at a high level, but there would be roughly 2-3 miles of trails.

Director Bertagna explained the next step for these two Master Plans would be brought back to Council as ordinances for consideration of approval.

4. **Other Business**-None

The meeting adjourned at 6:41 pm.

_____ _____

Kerry Prosser, City Recorder Michael Preedin, Mayor

RESOLUTION NO. 2023-04

A RESOLUTION EXTENDING THE CITY OF SISTERS' WORKERS' COMPENSATION COVERAGE TO VOLUNTEERS OF THE CITY OF SISTERS

WHEREAS, the City of Sisters elects the following:

Pursuant to ORS 656.031, workers' compensation coverage will be provided to the classes of volunteers listed in this resolution, noted on CIS payroll schedule, and verified at audit:

1. Volunteer boards, commissions, and councils for the performance of administrative duties.

   An aggregate assumed annual wage of $2,500 will be used per each volunteer board, commission, or council for the performance of administrative duties. The covered bodies are (list each body):

   a. City Council
   b. Planning Commission
   c. Budget Committee
   d. Parks Advisory Board
   e. Urban Forestry Board
   f. Public Works Advisory Board

2. Other Volunteers

   Volunteer exposures not addressed here will have workers' compensation coverage if, prior to the onset of the work provided that the City of Sisters:

   a. Provides at least two weeks' advance written notice to CIS underwriting requesting the coverage
   b. CIS approves the coverage and date of coverage
   c. CIS provides written confirmation of coverage

The City of Sisters agrees to maintain verifiable rosters for all volunteers including volunteer name, date of service, and hours of service and make them available at the time of a claim or audit to verify coverage.

NOW, THEREFORE, BE IT RESOLVED by the City of Sisters to provide workers' compensation coverage as indicated above.

Adopted by the City of Sisters and Sisters City Council this 14th day of June 2023.

_____
Michael Preedin, Mayor

Attest:

_____
Kerry Prosser, City Recorder

RESOLUTION NO. 2023-05

A RESOLUTION DECLARING THE MUNICIPAL SERVICES PROVIDED BY THE CITY OF SISTERS

WHEREAS, ORS 221.760 provides as follows:

Section 1. The officer responsible for disbursing funds to cities under ORS 323.455, 366.785 to 366.820 and 471.805 shall, in the case of a city located within a county having more than 100,000 inhabitants according to the most recent federal decennial census, disburse such funds only if the city provides four or more of the following service:

(1) Police protection
(2) Fire protection
(3) Street construction, maintenance and lighting
(4) Sanitary sewer
(5) Storm sewers
(6) Planning, zoning and subdivision control
(7) One or more utility services; and

WHEREAS, city officials recognize the desirability of assisting the state officer responsible for determining the eligibility of cities to receive such funds in accordance with ORS 221.760, now therefore,

BE IT RESOLVED, that the City of Sisters hereby certifies that it provides the following four or more municipal services enumerated in Section 1, ORS 221.760

_X__ Police protection
____ Fire protection
_X__ Street construction, maintenance and lighting
_X__ Sanitary sewer
_X__ Storm sewers
_X__ Planning, zoning and subdivision control
_X__ One or more utility services

Adopted by the City Council and signed by the Mayor this 14th day of June 2023.

_____
Michael Preedin, Mayor

ATTEST:

_____
Kerry Prosser, City Recorder

RESOLUTION NO. 2023-06

A RESOLUTION AMENDING THE PAY PLAN CLASSIFICATION FOR THE CITY OF SISTERS

WHEREAS, the City of Sisters elects the following:

SECTION ONE: All conflicting policies and resolutions are hereby repealed.

SECTION TWO: The following schedule sets forth the increment Pay Plan steps for classified positions of the City of Sisters employees.

		Steps														
	Grade	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PUBLIC WORKS DIRECTOR	33	48.01	49.35	50.74	52.16	53.63	55.14	56.70	58.30	59.96	61.66	63.42	65.23	67.56	69.96	72.43
ASSISTANT CITY MANAGER	30	41.16	42.30	43.47	44.68	45.93	47.21	48.53	49.89	51.30	52.73	54.22	55.75	57.80	59.90	62.07
COMMUNITY DEV DIRECTOR	30	41.16	42.30	43.47	44.68	45.93	47.21	48.53	49.89	51.30	52.73	54.22	55.75	57.80	59.90	62.07
FINANCE DIRECTOR	30	41.16	42.30	43.47	44.68	45.93	47.21	48.53	49.89	51.30	52.73	54.22	55.75	57.80	59.90	62.07
PRINCIPAL PLANNER	28	38.42	39.48	40.56	41.69	42.84	44.04	45.26	46.51	47.82	49.16	50.53	51.95	53.88	55.87	57.91
PROJECT COORINATOR	26	34.10	35.03	35.98	36.96	37.98	39.02	40.09	41.20	42.34	43.51	44.73	45.97	47.72	49.52	51.38
ACCOUNTING ANALYST	25	34.10	35.03	35.98	36.96	37.98	39.02	40.09	41.20	42.34	43.51	44.73	45.97	47.72	49.52	51.38
ASSOCIATE PLANNER	23	28.99	29.77	30.56	31.38	32.23	33.09	33.99	34.91	35.87	36.85	37.86	38.90	40.44	42.02	43.65
PUBLIC WORKS DIVISION LEAD	23	28.99	29.77	30.56	31.38	32.23	33.09	33.99	34.91	35.87	36.85	37.86	38.90	40.44	42.02	43.65
CITY HALL ADMINISTRATIVE LEAD	22	28.99	29.77	30.56	31.38	32.23	33.09	33.99	34.91	35.87	36.85	37.86	38.90	40.44	42.02	43.65
PLANNING TECH II	21	26.45	27.15	27.86	28.61	29.37	30.16	30.96	31.80	32.66	33.53	34.44	35.39	36.83	38.30	39.82
MAINTENANCE LEAD	20	25.42	26.09	26.77	27.48	28.20	28.95	29.73	30.52	31.34	32.18	33.05	33.95	35.34	36.77	38.25
DEPUTY CLERK	20	25.42	26.09	26.77	27.48	28.20	28.95	29.73	30.52	31.34	32.18	33.05	33.95	35.34	36.77	38.25
UT TECH II	20	25.42	26.09	26.77	27.48	28.20	28.95	29.73	30.52	31.34	32.18	33.05	33.95	35.34	36.77	38.25
CODE COMPLIANCE OFFICER	20	25.42	26.09	26.77	27.48	28.20	28.95	29.73	30.52	31.34	32.18	33.05	33.95	35.34	36.77	38.25
UT TECH I	17	22.67	23.24	23.85	24.47	25.10	25.76	26.44	27.13	27.85	28.60	29.35	30.13	31.41	32.72	34.07
UT ASSISTANT	12	18.94	19.42	19.90	20.41	20.92	21.45	22.01	22.57	23.15	23.74	24.36	25.00	26.12	27.28	28.47

SECTION THREE: This schedule will be effective as of pay period ending June 26, 2023.

ADOPTED by the City Council of Sisters and APPROVED by the Mayor this 14th day of June 2023.

_____
Michael Preedin, Mayor

Attest:

_____
Kerry Prosser, City Recorder

OLCC Application Checklist

520 E. Cascade Avenue | PO Box 39 - Sisters, Or 97759 | ph. (541) 549-6022 | www.ci.sisters.or.us

New or Change of Ownership

Applicant Spoons of Sisters, LLC

	Date	Initial
• Reviewed by Community Development Department	6/01	ES
• Reviewed for Current Business License	5/31	KP
• Sent to Sheriff for Background Check	5/30	KP
• Returned from Sheriff	5/31	KP
• Scheduled to City Council Meeting	6/14	KP
• Fee paid, Application Returned		

- ✓ The City has up to 45 days to grant or deny the application.
- ✓ The application will not be scheduled for a City Council meeting until it has been returned from the Deschutes County Sheriff.
- ✓ City Council Meetings are held on the 2nd and 4th Wednesdays of every month.
- ✓ All new or change of ownership applicant will be charged a $25 fee.

LIQUOR LICENSE APPLICATION

Check the appropriate license request option:

☑ New Outlet | ☐ Change of Ownership | ☐ Greater Privilege | ☐ Lesser Privilege | ☐ Additional Privilege

Select the license type you are applying for.

More information about all license types is available online.

Full On-Premises

- ☐ Commercial
- ☐ Caterer
- ☐ Public Passenger Carrier
- ☐ Other Public Location
- ☐ For Profit Private Club
- ☐ Nonprofit Private Club

Winery

- ☐ Primary location
- Additional locations: ☐ 2nd ☐ 3rd ☐ 4th ☐ 5th

Brewery

- ☐ Primary location
- Additional locations: ☐ 2nd ☐ 3rd

Brewery-Public House

- ☐ Primary location
- Additional locations: ☐ 2nd ☐ 3rd

Grower Sales Privilege

- ☐ Primary location
- Additional locations: ☐ 2nd ☐ 3rd

Distillery

- ☐ Primary location

Additional tasting locations: ☐ 2nd ☐ 3rd ☐ 4th ☐ 5th ☐ 6th

☑ **Limited On-Premises**

☐ **Off Premises**

☐ **Warehouse**

☐ **Wholesale Malt Beverage and Wine**

INTERNAL USE ONLY

Local Governing Body: After providing your recommendation, return this application to the applicant.

LOCAL GOVERNING BODY USE ONLY

City/County name:

Date application received:

Optional: Date Stamp

CITY OF SISTERS

MAY 30 2023

RECEIVED

☐ Recommend this license be granted

☐ Recommend this license be denied

Printed Name _____ Date _____

5/30/23 - Acknowledged: Lt. Chad Davis, Deschutes County S.O. Charlie Davis

LIQUOR LICENSE APPLICATION

APPLICANT INFORMATION

Identify the applicants applying for the license. This is the entity (example: corporation or LLC) or individual(s) applying for the license. Please add an additional page if more space is needed.

Name of entity or individual applicant #1:	Name of entity or individual applicant #2:
Spoons of Sisters, LLC	
Name of entity or individual applicant #3:	**Name of entity or individual applicant #4:**

BUSINESS INFORMATION

Trade Name of the Business (name customers will see):
Spoons

Premises street address (The physical location of the business and where the liquor license will be posted):
473 E Hood Ave

City:	Zip Code:	County:
Sisters	97759	Deschutes

Business phone number:	Business email:
541-719-0572	doug@spoonsinsisters.com

Business mailing address (where we will send any items by mail as described in OAR 845-004-0065[1].):
PO Box 428

City:	State:	Zip Code:
Sisters	OR	97759

Does the business address currently have an OLCC liquor license? ☐ Yes ☒ No	Does the business address currently have an OLCC marijuana license? ☐ Yes ☒ No

AUTHORIZED REPRESENTATIVE

AUTHORIZED REPRESENTATIVE – A liquor applicant or licensee may give a representative authorization to make changes to the license or application on behalf of the licensee or to receive information about a license or application.

I give permission for the below named representative to:

☑ Make changes regarding this license/application on my behalf.

☑ Receive information about the status of this application, including information about pending compliance action or communications between OLCC and the licensee/applicant.

Representative Name:
Douglas Stevens

Phone number:	Email:
541-788-3221	doug@spoonsinsisters.com

Mailing address:
PO Box 428

City:	State:	Zip Code:
Sisters	OR	97759

Please note: liquor license applications are public records.

LIQUOR LICENSE APPLICATION

APPLICATION CONTACT INFORMATON – Provide the point of contact for this application. If this individual is not an applicant or licensee, the Authorized Representative section must be filled in and the appropriate permission(s) must be selected.

Application Contact Name: Douglas Stevens	
Phone number: 541-788-3221	Email: doug@spoonsinsisters.com

TERMS

- "Real property" means the real estate (land) and generally whatever is erected or affixed to the land (for example, the building) at the business address.
- "Common area" is a privately owned area where two or more parties (property tenants) have permission to use the area in common. Examples include the walking areas between stores at a shopping center, lobbies, hallways, patios, parking lots, etc. An area's designation as a "common area" is typically identified in the lease or rental agreement.

ATTESTATION – OWNERSHIP AND CONTROL OF THE BUSINESS AND PREMISES

- Each applicant listed in the "Application Information" section of this form has read and understands OAR 845-005-0311 and attests that:

1. At least one applicant listed in the "Application Information" section of this form has the legal right to occupy and control the real property proposed to be licensed as shown by a property deed, lease, rental agreement, or similar document.

2. No person not listed as an applicant in the "Application Information" section of this form has an ownership interest in the business proposed to be licensed, unless the person qualifies to have that ownership interest waived under OAR 845-005-0311.

3. The licensed premises at the premises street address proposed to be licensed either:
   a. Does not include any common areas; or
   b. Does include one or more common areas; however, only the applicant(s) have the exclusive right to engage in alcohol sales and service in the area to be included as part of the licensed premises.
      - In this circumstance, the applicant(s) acknowledges responsibility for ensuring compliance with liquor laws within and in the immediate vicinity of the licensed premises, including in portions of the premises that are situated in "common areas" and that this requirement applies at all times, even when the business is closed.

4. The licensed premises at the premises street address either:
   a. Has no area on property controlled by a public entity (like a city, county, or state); or
   b. Has one or more areas on property controlled by a public entity (like a city, county, or state) and the public entity has given at least one of the applicant(s) permission to exercise the privileges of the license in the area.

LIQUOR LICENSE APPLICATION

- Each applicant listed in the "Application Information" section of this form has read and understands OAR 845-006-0362 and attests that:

1. Upon licensure, each licensee is responsible for the conduct of others on the licensed premises, including in outdoor areas.
2. The licensed premises will be controlled to promote public safety and prevent problems and violations, with particular emphasis on preventing minors from obtaining or consuming alcoholic beverages, preventing over-service of alcoholic beverages, preventing open containers of alcoholic beverages from leaving the licensed premises unless allowed by OLCC rules, and preventing noisy, disorderly, and unlawful activity on the licensed premises.

I attest that all answers on all forms and documents, and all information provided to the OLCC as a part of this application, are true and complete.

Print name	Signature	Date	Atty. Bar Info (if applicable)
Douglas Stevens		05/18/2023	
Print name	Signature	Date	Atty. Bar Info (if applicable)
Print name	Signature	Date	Atty. Bar Info (if applicable)
Print name	Signature	Date	Atty. Bar Info (if applicable)

PRINT FORM

RESET FORM

OREGON LIQUOR & CANNABIS COMMISSION

INDIVIDUAL HISTORY FORM

1. Name (Print):	Stevens (Last)	Douglas (First)	M (Middle)

2. Other names used (maiden, other):

3. Do you have a Social Security Number (SSN) issued by the United States Social Security Administration? Yes ☒ No ☐
If yes, you must list your SSN: [redacted]

SOCIAL SECURITY NUMBER DISCLOSURE: As part of your application for an initial or renewal license, Federal and State laws require you to provide your Social Security Number (SSN) to the Oregon Liquor Control Commission (OLCC) for child support enforcement purposes (42 USC § 666(a)(13) & ORS 25.785). If you are an applicant or licensee and fail to provide your SSN, the OLCC may refuse to process your application. Your SSN will be used only for child support enforcement purposes unless you indicate below.

Based on our authority under ORS 471.311 and OAR 845-005-0312(6), we are requesting your voluntary consent to use your SSN for the following administrative purposes only: to match your license application to your Alcohol Server Education records (where applicable), and to ensure your identity for criminal records checks. OLCC will not deny you any rights, benefits or privileges otherwise provided by law if you do not consent to use of your SSN for these administrative purposes (5 USC§ 552(a).

4. Do you consent to the OLCC's use of my SSN as described above? Check this box: ☑

5. Date of Birth (DOB):	[redacted] (mm)	[redacted] (dd)	[redacted] (yyyy)

6. Driver License or State ID #: [redacted] 7. State OR

8. Contact Phone: 541-788-3221

9. E-mail Address: doug@spoonsinsisters.com

10. Mailing Address:	PO Box 428 (Number and Street)	Sisters (City)	OR (State)	97759 (Zip Code)

11. In the past 10 years, have you been convicted of a felony or a misdemeanor in a U.S. state outside of Oregon?

No ☒ Yes ☐ (If yes, explain in the space provided, below) Unsure ☐ Choose this option and provide an explanation if, for example: you were arrested or went to court, but are unsure of whether there was a conviction; you paid a fine or served probation or parole, but are unsure of whether there was a conviction; or if you know you had a conviction, but you are unsure of whether the conviction has been removed from your record, etc.

OREGON LIQUOR & CANNABIS COMMISSION

INDIVIDUAL HISTORY FORM

12. Do you, or any entity that you are a part of, **currently hold** or **have you previously held** a recreational marijuana license in Oregon? (Note: marijuana worker permits are not marijuana licenses.)

No ☒ Yes ☐ Please list licenses (and year(s) licensed) below Unsure ☐ Please include an explanation:

13. Do you, or any entity that you are a part of, hold an alcohol license in a U.S. state outside of Oregon?

No ☒ Yes ☐ Please list licenses (and year(s) licensed) below Unsure ☐ Please include an explanation:

14. Do you or any entity that you are a part of, have any other liquor license applications pending with the OLCC?

No ☒ Yes ☐ Please list applications below Unsure ☐ Please include an explanation:

You must sign your own form (electronic signature acceptable). Another individual, such as your attorney or an individual with power of attorney, ***may not*** sign your form.

Affirmation

Even if I receive assistance in completing this form, I affirm by my signature below, that my answers on this form are true and complete. I understand the OLCC will use the above information to check my records, including but not limited to my criminal history. I understand that if my answers are not true and complete, the OLCC may deny my license application.

Name (Print):	Stevens (Last)	Douglas (First)	M (Middle)

Signature: Douglas M Stevens **Date:** 05/24/2023

This box for OLCC use ONLY

_____ Does the individual currently hold, or has the individual previously held, an OLCC- issued liquor license?

OREGON LIQUOR & CANNABIS COMMISSION

BUSINESS INFORMATION

Please Print or Type

Applicant Name: Spoons of Sisters, LLC Phone: 541-719-0572

Trade Name (dba): Spoons

Business Location Address: 473 E Hood Ave

City: Sisters ZIP Code: 97759

DAYS AND HOURS OF OPERATION

Business Hours:

Sunday	8:00	to	4:00
Monday	8:00	to	4:00
Tuesday	8:00	to	4:00
Wednesday	8:00	to	4:00
Thursday	8:00	to	4:00
Friday	8:00	to	4:00
Saturday	8:00	to	4:00

Outdoor Area Hours:

Sunday	8:00	to	4:00
Monday	8:00	to	4:00
Tuesday	8:00	to	4:00
Wednesday	8:00	to	4:00
Thursday	8:00	to	4:00
Friday	8:00	to	4:00
Saturday	8:00	to	4:00

The outdoor area is used for:

☐ Food service Hours: 8:00 to 4:00

☐ Alcohol service Hours: 8:00 to 4:00

☐ Enclosed, how Fence

The exterior area is adequately viewed and/or supervised by Service Permittees.

_____ (Investigator's Initials)

Seasonal Variations: ■ Yes ☐ No If yes, explain: Outdoor Area is closed from October thru April

ENTERTAINMENT

Check **ALL** that apply:

- ☑ Live Music
- ☐ Recorded Music
- ☐ DJ Music
- ☐ Dancing ☐ Nude Dancing
- ☐ Live Entertainment
- ☐ Minor Entertainers
- ☐ Karaoke
- ☐ Coin-operated Games
- ☐ Video Lottery Machines
- ☐ Social Gaming
- ☐ Pool Tables
- ☐ Other: _____

***Minor Entertainers in an area prohibited to minors need prior approval from the OLCC**

DAYS & HOURS OF LIVE OR DJ MUSIC

Sunday	8:00	to	6:00
Monday	8:00	to	6:00
Tuesday	8:00	to	6:00
Wednesday	8:00	to	6:00
Thursday	8:00	to	6:00
Friday	8:00	to	6:00
Saturday	8:00	to	6:00

SEATING COUNT

Restaurant: 40 Outdoor: 40 Lounge: 0

Banquet: 0 Other (explain): _____ Total Seating: 50

OLCC USE ONLY

Investigator Verified Seating: ____(Y) ____(N)

Investigator Initials: _____

Date: _____

I understand if my answers are not true and complete, the OLCC may deny my license application.

Applicant Signature: _____ **Date:** 5/26/2023

www.oregon.gov/olcc

Rev: 2.1.23

OREGON LIQUOR & CANNABIS COMMISSION

FLOOR PLAN FORM

Your floor plan must be submitted on this form

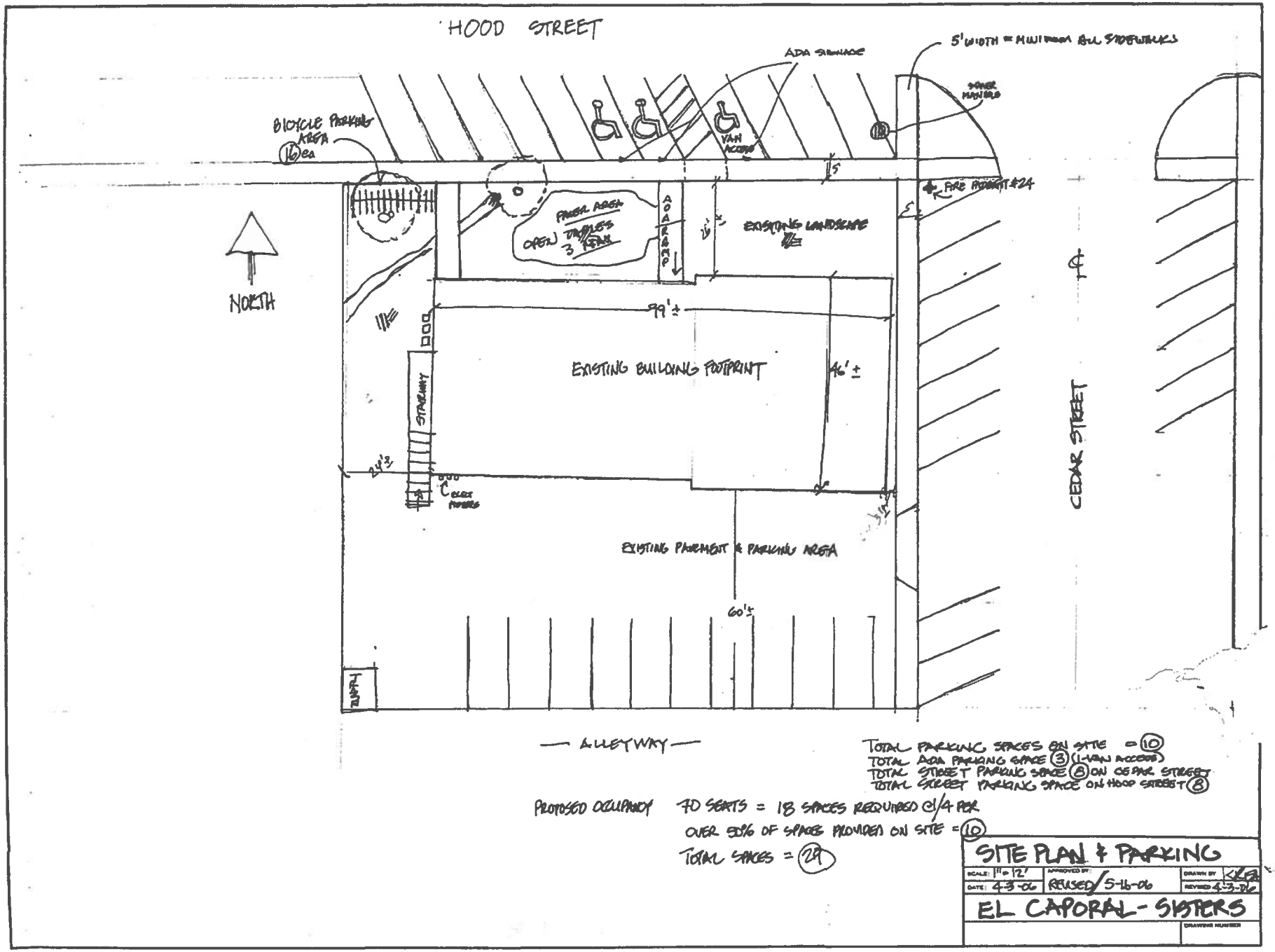
SPOONS of Sisters, LLC
Applicant Name

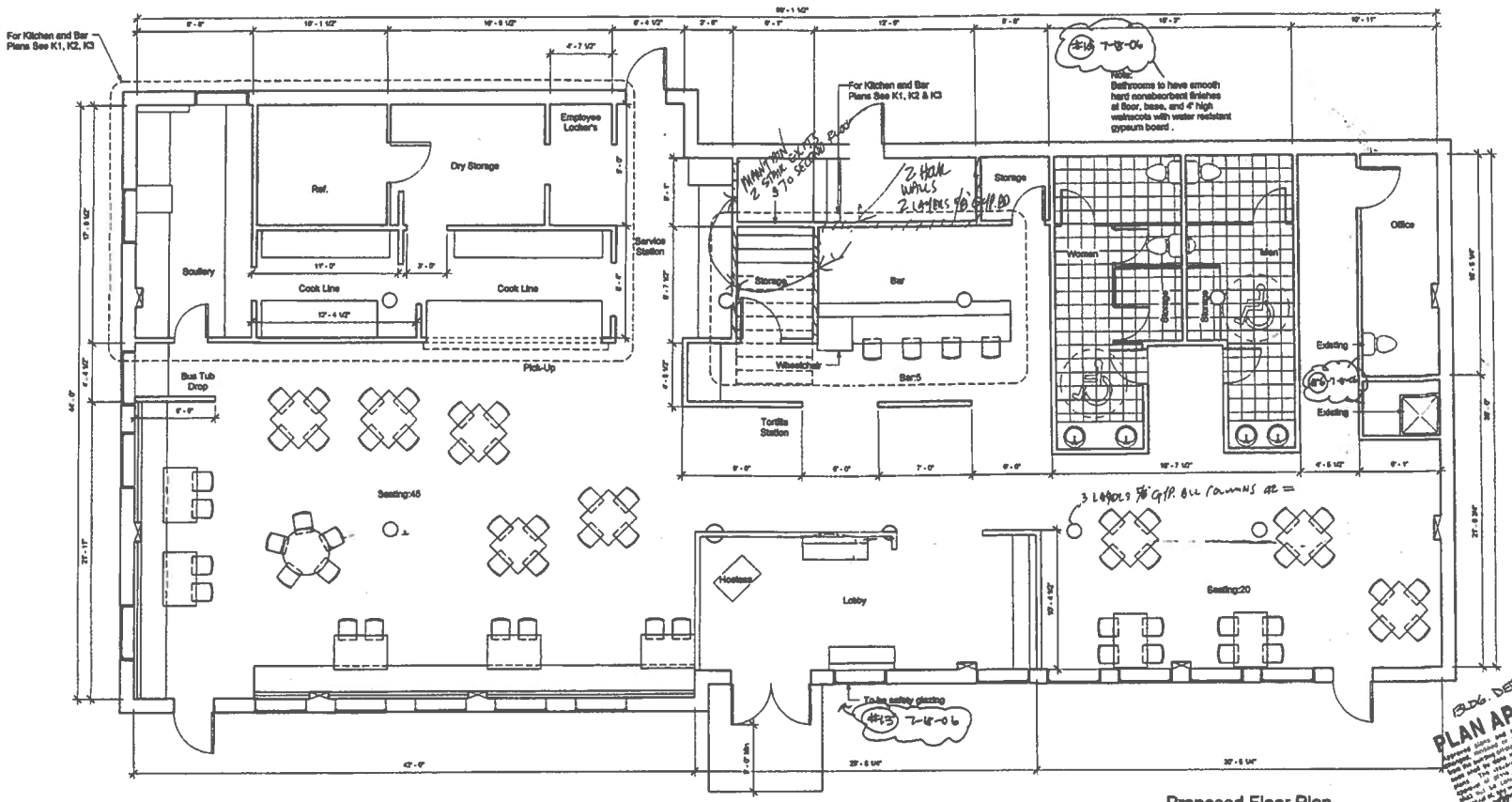
SPOONS
Trade Name (dba)

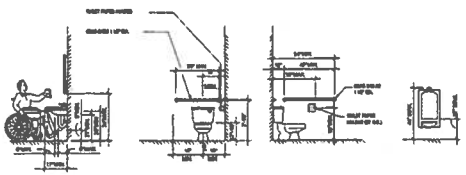
.....*OLCC USE ONLY*.....
MINOR POSTING ASSIGNMENT(S)

Date:_____ **Initials:**_____

(rev. 03/22)


HOOD STREET
ADA SIGNAGE
5' WIDTH = MINIMUM ALL SIDEWALKS
SEWER MANHOLE
BICYCLE PARKING AREA (2) ea
VAN ACCESS
FIRE HYDRANT #24
PAVER AREA
OPEN TABLES 3 FIXED
ADA RAMP
EXISTING LANDSCAPE
NORTH
99'±
EXISTING BUILDING FOOTPRINT
46'±
STAIRWAY
ELEC. PANELS
EXISTING PAVEMENT & PARKING AREA
60'±
CEDAR STREET
ALLEYWAY
TOTAL PARKING SPACES ON SITE = (10)
TOTAL ADA PARKING SPACE (3) (1-VAN ACCESS)
TOTAL STREET PARKING SPACE (8) ON CEDAR STREET
TOTAL STREET PARKING SPACE ON HOOD STREET (8)
PROPOSED OCCUPANCY 70 SEATS = 18 SPACES REQUIRED @ 1/4 PER
OVER 50% OF SPACES PROVIDED ON SITE = (10)
TOTAL SPACES = (29)
SITE PLAN & PARKING
SCALE: 1" = 12'
DATE: 4-3-06
APPROVED BY: REVISED 5-16-06
DRAWN BY: KLB
REVISED 4-3-06
EL CAPORAL - SISTERS
DRAWING NUMBER



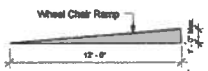


TYPICAL HANDICAPPADA CRITERIA
TOILET ROOM ELEVATIONS

#18 7-18-06

2 ADA Lavatory Elevations
1/4" = 1'-0"

#3 7-18-06



3 ADA Ramp w/ GRAB BARS & 12" EXTENSION
1/4" = 1'-0"

1 Proposed Floor Plan
1/4" = 1'-0"

#2 7-18-06

#11 7-18-06 - Fire sprinkler not required

#7 7-18-06

Note:
All landings at exterior doors are existing and comply with IBC 1008.1.4

Note:
Provide 2 hour separation (double 5/8" gypsum board type X) between first and second floor including supporting elements.

Each dining room exterior exit door to be provided with panic hardware and illuminated exit signs. IBC 1008.1.9 and 1011

Provide emergency exit illumination IBC 1008

Provide 1/2" maximum threshold entry at exterior doors IBC 1109.9.5

Provide 5' Minimum landings at entries.

#4 7-18-06
#2 7-18-06
#5 7-18-06

3635 sq. ft. Floor Area

Revised 8-8-06

BUILDING DEPT
PLAN APPROVED
As Noted
8/9/06

DATCO DESIGN
21046 DEHMER DR. BEND, OR. 97702
PHONE: (541) 388-1437 FAX (541) 388-3283

ALL BID

Drawn By: ENRIQUE RIQUELME

For: El Caporal Restaurant
473 Hood Street Suite A
Salem, Oregon

Drawn By: BD
Date: August 8, 2006
Sheet Title: Floor Plan

Scale: 1/4" = 1'-0"
Sheet Number: a1

ORDINANCE NO. 529

AN ORDINANCE OF CITY OF SISTERS ESTABLISHING CAMPING REGULATIONS AND A CAMPING REMOVAL POLICY.

WHEREAS, the City Council (the "Council") of City of Sisters ("City") recognizes the competing concerns surrounding homeless individuals camping on public property within City's incorporated limits and desires to implement regulations to address these concerns; and

WHEREAS, ORS 195.530 requires that any city law that regulates the acts of sitting, lying, sleeping, and/or keeping warm and dry outdoors on public property that is open to the public must be objectively reasonable as to time, place, and manner; and

WHEREAS, the Council and City staff solicited input concerning City camping regulations from members of the community, including interested stakeholders and organizations that assist low-income and/or homeless members of the community; and

WHEREAS, the Council has received valuable input from the community concerning the proposed camping regulations, including input from City's Public Works Advisory Board and Parks Advisory Board; and

WHEREAS, the Council held a work session concerning the proposed camping regulations on April 12, 2023, and May 10, 2023. A public hearing was held during the Council meeting on May 24, 2023, at the City Hall at 520 E Cascade, Sisters, Oregon at 6:30 p.m., at which time and place all persons had an opportunity to appear and comment on the camping regulations and camping removal policy; and

WHEREAS, the Council finds that the camping regulations and camping removal policy contained in the attached Exhibit A and its addition to Sisters Municipal Code ("SMC") Section 4.10 are in the public interest.

are in the public interest.

NOW, THEREFORE, THE CITY OF SISTERS ORDAINS AS FOLLOWS:

1. Findings. The above-stated findings are hereby adopted.

2. Purpose. The purpose of this Ordinance No.529 (this "Ordinance") is to minimize any adverse public safety and health impacts of camping on City property while providing some areas of City property, in the absence of alternative forms of shelter, where homeless persons may rest and/or sleep.

3. Adoption of Camping Regulations. The Council hereby adopts the camping regulations and camping removal policy contained in the attached Exhibit A.

4. Interpretation; Severability; Errors. All pronouns contained in this Ordinance and any variations thereof will be deemed to refer to the masculine, feminine, or neutral, singular or plural, as the identity of the parties may require. The singular includes the plural and the plural includes the singular. The word "or" is not exclusive. The words "include," "includes," and "including" are not limiting. The provisions of this Ordinance are hereby declared severable. If any section, subsection, sentence, clause, and/or portion of this Ordinance is for any reason held invalid, unenforceable, and/or unconstitutional, such invalid, unenforceable, and/or unconstitutional section, subsection, sentence, clause, and/or portion will (a) yield to a construction permitting enforcement to the maximum extent permitted by applicable law, and (b) not affect the validity, enforceability, and/or constitutionality of the remaining portion of this Ordinance. This Ordinance may be corrected by order of the Council to cure editorial and/or clerical errors.

APPROVED AND ADOPTED by the City Council of the City of Sisters and signed by the mayor this 14th day of June 2023.

_____
By: Michael Preedin, Mayor

ATTEST:

_____
By: Kerry Prosser, City Recorder

Exhibit A
Camping Regulations and Camping Removal Policy

1. Purpose. The purpose of this Ordinance is to (a) maintain streets, parks, and other public areas within City in a clean, sanitary, and accessible condition, and (b) adequately protect the health, safety, and public welfare of the community by imposing time, place, and manner regulations that identify when, where, and how camping on City property is allowed.

2. Definitions. For purposes of this Ordinance, the following terms and phrases have the meanings assigned to them below:

"Alley" means a narrow way providing a means of public or private access to the back or side of a property which is not intended for general traffic circulation.

"Camp" or "camping" means to pitch, erect, create, use, and/or occupy camp facilities for the purpose of habitation, as evidenced by use of camp paraphernalia.

"Camp facility(ies)" include, without limitation, tents, huts, temporary shelters, lean-tos, shacks, and/or any other structures (or parts thereof).

"Camp paraphernalia" includes, without limitation, tarpaulins, cots, beds, sleeping bags, blankets, mattresses, hammocks, outdoor cooking devices, and/or similar equipment.

"Campsite" means any place where one or more persons have established living accommodations by use of camp facilities and/or camp paraphernalia.

"Established campsite" means a campsite in place for more than 24 hours.

"City manager" means City's then-appointed city manager and his or her designee.

"City property" means all real property, land, and public facilities owned, leased (either to City or by City), controlled, and/or managed by City.

"Fire District" means the Sisters-Camp Sherman Rural Fire Protection District.

"Personal property" means any item that can reasonably be identified as belonging to an individual and that has apparent value or utility.

"Public park" means all property owned or controlled by City which is operated for public use for recreational and/or open space purposes.

"Recreational fire" means a fire for the cooking of food, warmth, fellowship, and/or ceremonial purposes.

"Right-of-way" means streets, public utility easements, and/or other public rights-of-way.

"School" means public or private preschool, elementary school, middle school, high school, and/or other school attended primarily by children under 18 years of age.

"Street" means any highway, lane, road, street, right-of-way, alley, and every way or place in City that is publicly owned or maintained for vehicular travel (whether improved or unimproved).

"Sidewalk" means the portion of the street between the curbline and adjacent property line intended for use of pedestrians and includes multi-use pathways (i.e., pathways for bicycles and pedestrians).

3. Time, Place and Manner Regulations. Camping is permitted on City property subject to the time, place, and manner regulations contained in this Ordinance.

3.1 Time Regulations. Except as expressly authorized by City's municipal code, camping is prohibited on any City property between the hours of 7:00 am to 8:30 pm.

3.2 Place Regulations. Unless otherwise specifically authorized by City's municipal code or by declaration of the mayor and/or city manager in emergency circumstances, camping is prohibited on City property (a) not open to the public, (b) within or upon any alley, right-of-way, parking lot/space, public park, and/or school property, (c) within 100 feet of any street in which it is lawful for vehicular travel to exceed 25 miles per hour, (d) within 25 feet of the public entrance to a business, (e) within 10 feet of a public or private driveway, (f) within 100 feet of City property located within the following zones: (i) R Residential District; (ii) MFR Multi-Family Residential; (iii) SRR Sun Ranch Residential District; and (iv) DC Downtown Commercial, (g) all City property located at the following addresses: (i) 308 East Sun Ranch Drive, Sisters, Oregon 97759; (ii) 460 West Highway 20, Sisters, Oregon 97759 (Tax Lot 151005d000400); and (iii) Tax Lot 151005DA02100; (h) within 500 feet of any permitted shelter use authorized by City, and/or (i) any other City property designated by the city manager from time to time.

3.3 Manner Regulations. At times and locations where camping is permitted under this Ordinance, the following regulations apply: (a) camping in a manner that reduces the clear, continuous sidewalk width to less than four feet is prohibited; (b) at no time may camp facilities, whether constructed with plywood, wood materials, pallets, and/or other materials, be built or placed on City property by anyone other than, or as authorized by, the public entity that owns or controls the City property in question (tents and similar items used for shelter that are readily portable are not prohibited by this subsection); (c) individuals engaged in camping are allowed to use a sleeping bag, bedroll, and/or other material used for bedding purposes (e.g., materials used to keep warm and dry while sleeping are permitted provided any tent or tarpaulin used to keep warm and dry may not exceed 50 square feet in surface area); (d) a camp or camping must be limited within a spatial footprint of 150 square feet in surface area (the intent of this subsection is to permit a person to sleep and maintain the essentials for living, while still maintaining the ability of everyone to use public spaces as designed and intended); (e) individuals may not accumulate, discard, and/or leave behind garbage, debris, unsanitary or hazardous materials, and/or other items of no apparent utility in a right-of-way, on City property, and/or on any adjacent public or private property; (f) open flames, recreational fires, burning of garbage, bonfires, and/or other fires, flames, and/or heating deemed unsafe by Fire District are prohibited (some cooking stoves and other means of keeping warm may be allowed if permitted by Fire District); (g) dumping of gray water (i.e., wastewater from baths, sinks, and the like) or black water (i.e., sewage) into any facilities or places not intended for gray water or black water disposal is prohibited (this includes, without limitation, storm drains which are not intended for disposal of gray water or black water); (h) unauthorized connections or taps to electrical or other utilities, or violations of building,

fire, and/or other relevant codes or standards, are prohibited; (i) obstruction or attachment of camp materials or personal property to fire hydrants, utility poles, and/or other utility or public infrastructure, fences, trees, vegetation, vehicles, and/or buildings is prohibited; (j) storage of personal property, including, without limitation, vehicle tires, bicycles, and/or associated components (except as needed for an individual's personal use), gasoline, generators, lumber, household furniture, extra propane tanks, combustible material, or other items or materials, is prohibited (other than what is related to camping, sleeping, or keeping warm and dry); (k) digging, excavation, terracing of soil, alteration of property or infrastructure, and/or damage to vegetation or trees is prohibited; and (l) except as expressly authorized by City's municipal code, all persons are prohibited from leaving personal property, including, without limitation, camp facilities and camp paraphernalia, unattended on any City property for more than 24 hours. Notwithstanding anything contained in this Ordinance to the contrary, the city manager may temporarily authorize storage of personal property on City property by written order that specifies the period of time and location for the storage under the following circumstances: (x) emergency circumstances; (y) in conjunction with a special event permit; and/or (z) upon finding it to be in the public interest and consistent with the Council's goals and policies.

4. Health and Safety Fee; Fines.

4.1 Health and Safety Fee. Any person who violates Section 3 of this Ordinance will first be subject to a health and safety fee in an amount not to exceed $35.00. The purpose of the health and safety fee is to reimburse City for the expense of maintaining a healthy, safe, and organized community for the public.

4.2 Fines. A willful violation of Section 3 of this Ordinance is a Class B violation under City's municipal code. A Class B violation carries a penalty of no more than $250.00; the actual fine imposed will be determined at the discretion of the city manager, hearings officer, or municipal court judge. A violation is "willful" if the prohibited act or omission under Section 3 of this Ordinance occurs or continues after issuance of the health and safety fee. Each violation will constitute a separate offense. Continuing violations of the same offense will not constitute a separate offense for each day the violation occurs.

5. Campsite Removal – ORS 195.500-195.505.

5.1 Campsite Removal Policy. City recognizes the social nature of the problem of homeless individuals camping on City property. In accordance with ORS 195.500 – ORS 195.505, City has developed the campsite removal policy contained in this Section 5 to ensure the most humane treatment for the removal of homeless individuals from campsites on City property. Any City law and/or policy that offers greater protections to homeless individuals subject to removal from an established campsite supersedes contrary provisions of this Section 5.

5.2 Campsite Removal. Upon determination by enforcement personnel that a camp or camping in violation of this Ordinance has become an established campsite, or enforcement personnel determine a campsite otherwise in compliance with this Ordinance endangers the public health and safety, the campsite may be removed consistent with this Section 5. Upon a determination by enforcement personnel that a camp or camping in violation of this Ordinance is not an established campsite, the campsite may be removed without complying with the notice requirements under Section 5.3.

5.3 Notice Required. The following notice requirements apply to the removal and clearing of campsites: (a) notice is not required prior to removal and clearance of a campsite that is not an established

campsite; and (b) at least 72 hours before removing individuals and personal property from an established campsite, law enforcement officials must post written notice, in English and Spanish, at all entrances to the campsite to the extent that the entrances can reasonably be identified. The written notice required under Section 5.3(b) must state or contain, at a minimum, the following: (x) where unclaimed personal property will be stored; (y) the telephone number that individual(s) may call to find out where personal property will be stored; or (z) if a permanent storage location has not yet been determined, the address and telephone number of an agency that will have the information when available. If a funeral service is scheduled with less than 72-hours' notice at a cemetery at which there is a campsite, or a campsite is established at a cemetery less than 72 hours before the scheduled service, the written notice required under Section 5.3(b) may be posted at least 24 hours before removing homeless individuals from the campsite.

5.4 Exceptions to Notice Requirements. Notwithstanding anything contained in this Ordinance to the contrary, the 72-hour notice required under Section 5.3(b) will not be applicable (i.e., will not be required) under the following circumstances: (a) when there are grounds for law enforcement officials to reasonably believe that illegal activities other than camping are occurring at an established campsite; and/or (b) an exceptional emergency at an established campsite, including, without limitation, possible site contamination by hazardous materials, a public health emergency, and/or other immediate danger to human life or safety.

5.5 Local Agencies. When a 72-hour notice is posted under Section 5.3(b), law enforcement officials must inform the local agency that delivers social services to homeless individuals as to where the notice has been posted. The local agency may arrange for outreach workers to visit the campsite that is subject to the notice to assess the need for social service assistance in arranging shelter and other assistance.

5.6 Personal Property.

5.6.1 All personal property at a campsite that remains unclaimed after removal/clearing, whether notice is required under this policy or not, must be given to (a) law enforcement official, (b) local agency that delivers social services to homeless individuals, (c) outreach worker, (d) local agency official, or (e) person authorized to issue a citation for unlawful camping under state law, administrative rule, or city or county ordinance.

5.6.2 Unclaimed personal property must be stored in a facility located in the same community as the campsite from which it was removed. Items that have no apparent value or utility or are in an unsanitary condition may be immediately discarded upon removal of the homeless individuals from the campsite. Weapons, controlled substances other than prescription medication, and items that appear to be either stolen or evidence of a crime must be given to or retained by law enforcement officials.

5.6.3 Unclaimed personal property removed from a campsite must be stored in an orderly fashion, keeping items that belong to an individual together to the extent that ownership can reasonably be determined. Unclaimed personal property will be stored in a manner in which it is possible to identify the date the property was removed and location where the property was removed. Unclaimed personal property will be stored for a minimum of 30 days during which it must be reasonably available to any individual claiming ownership. Any personal property that remains unclaimed after 30 days may be disposed of or donated to a corporation described in section 501(c)(3) of the Internal Revenue Code as amended and in effect on December 31, 2020.

5.7 Policy Evaluation. Following the removal of homeless individuals from a campsite on City property, law enforcement officials, local agency officials, and outreach workers may meet to assess the notice and removal policy, to discuss whether the removals are occurring in a humane and just manner, and to determine if any changes to this policy are needed.

5.8 Prohibition on Citations in Limited Circumstances. A person authorized to issue a citation for unlawful camping under state law, administrative rule, and/or city or county ordinance may not issue the citation if the citation would be issued within 200 feet of a notice required under Section 5.3(b) and within two hours before or after the notice was posted.

6. City Manager Authority. The city manager may adopt administrative rules to implement any of the provisions of this Ordinance.

7. Preemption. If and to the extent any provisions of City's municipal code conflict with any provisions of this Ordinance, the provisions of this Ordinance will control and supersede the conflicting provisions contained in City's municipal code.

CITY COUNCIL

Agenda Item Summary

Meeting Date: June 14, 2023 **Staff:** Woodford

Type: Ordinance **Dept:** CDD

Subject: Public Hearing for City File No. CP 22-01, Comprehensive Plan Amendment to adopt the updated Water Master Plan.

Action Requested: Approval of Ordinance 530 for a Comprehensive Plan Amendment to adopt the updated Water Master Plan (Planning File #CP 22-01) and replace and supersede the prior Water Master Plan.

Background: On May 18, 2023, the Planning Commission approved a Comprehensive Plan Amendment request to update the Water Master Plan during a public hearing.

All communities in Oregon are required to have a Comprehensive Plan that addresses the Statewide Planning Goals. Goal 11 relates to Public Facilities and Services and Oregon Administrative Rules (OAR) 660-011 implement the Goal, which requires that a city develop and adopt a public facility plan for areas within an urban growth boundary containing a population greater than 2,500 persons. The purpose of the plan is to help assure that urban development in such urban growth boundaries is guided and supported by types and levels of urban facilities and services appropriate for the needs and requirements of the urban areas to be serviced, and that those facilities and services are provided in a timely, orderly and efficient manner.

The City of Sisters last adopted a Water Master Plan in 2017, which examined water needs to serve the population of Sisters into 2037. That Plan recommended that a population forecast update be prepared at a minimum of every 5 years, and, if necessary, corresponding revisions be made to the capital facilities plan. Regular population forecast updates ensure that the capital facilities plan would remain closely aligned with current population and current demand on City infrastructure.

According to OAR 660-011-0045 (Adoption and Amendment Procedures for Public Facility Plans), the governing body of the city responsible for development of the public facility plan shall adopt the plan as a supporting document to the jurisdiction's Comprehensive Plan. The proposed updated Water Master Plan (WMP) will be a component of the Sisters Comprehensive Plan by reference and thus an Amendment to the Comprehensive Plan is required to approve the updated Plan. Planning Commission recommendation and City Council approval are required.

This WMP Update focuses on the City's water system components, including the water supply, treatment, storage, and distribution systems. This WMP Update includes an analysis of the existing systems and their performance, an evaluation of system needs and

improvement alternatives, and a summary of the City's current water improvements financial status and potential funding opportunities for improvements.

Recommendation: Staff and Planning Commission recommend that City Council review and formally adopt Ordinance No. 530.

Attachments:

- Attachment A – Ordinance No. 530
  - Exhibit A – Staff Findings
  - Exhibit B – Adoption Draft for the Updated Water Master Plan
    The draft plan can be found at the link above.

ORDINANCE NO. 530

AN ORDINANCE ADOPTING AMENDMENTS TO THE SISTERS WATER MASTER PLAN TO ALIGN CAPITAL FACILITIES PLANNING WITH THE CURRENT POPULATION FORECAST.

WHEREAS, the City of Sisters ("City"), in accordance with Statewide Land Use Goal 11 and its implementing regulations, adopted the Sisters Water System Master Plan ("Master Plan") to plan for the water needs of the community;

WHEREAS, the Master Plan is a component of the City's Comprehensive Plan;

WHEREAS, the Master Plan was last updated in 2017;

WHEREAS, the Master Plan recommends that a population forecast update be prepared at a minimum of every 5 years to ensure that capital facility plans remain closely aligned with current population projections;

WHEREAS, analysis revealed current and future system deficiencies in City's water system based on the current population forecast;

WHEREAS, the City, as the applicant for file number CP-22-01, proposed legislative amendments to the Master Plan to identify solutions to such current and future system deficiencies (collectively, the "Amendments");

WHEREAS, in accordance with Sisters Development Code Chapter 4.1, legislative amendments to the Comprehensive Plan are processed as a Type IV application;

WHEREAS, the Department of Land Conservation and Development received notice of the proposed Amendments at least 35 days prior to the first evidentiary hearing;

WHEREAS, after due notice, a public hearing on the Amendments was held before the Sisters Planning Commission ("Planning Commission") on May 18, 2023;

WHEREAS, the Sisters Planning Commission, after receiving public testimony and other evidence and fully deliberating the matter, recommended that the Sisters City Council ("City Council") adopt the proposed Amendments;

WHEREAS, after due notice, a public hearing was scheduled before the City Council on June 14, 2023; and

WHEREAS, after reviewing the staff report and the Planning Commission's recommendation, receiving public testimony and other evidence, and deliberating the matter fully, the City Council voted to adopt the Amendments.

NOW, THEREFORE, THE CITY OF SISTERS ORDAINS AS FOLLOWS:

1. Findings. The findings contained in the recitals and those found in the staff report delivered at the June 14, 2023, public hearing before City Council, and attached hereto as Exhibit A, are hereby adopted.

2. Amendments. The Amendments, which are incorporated into the updated Master Plan attached hereto as Exhibit B, are hereby adopted as City's public facility plan for water and made part of City's Comprehensive Plan.

3. Authorization. The city manager, or designee, is authorized to execute any documents and to take such actions as are necessary to further the purposes and objectives of this Ordinance.

4. Severability; Corrections. If any section, subsection, sentence, clause, and/or portion of this Ordinance 530 (this "Ordinance") is for any reason held invalid, unenforceable, and/or unconstitutional, such invalid, unenforceable, and/or unconstitutional section, subsection, sentence, clause, and/or portion will (a) yield to a construction permitting enforcement to the maximum extent permitted by applicable law, and (b) not affect the validity, enforceability, and/or constitutionality of the remaining portion of this Ordinance. This Ordinance may be corrected by order of the City Council to cure editorial and/or clerical errors.

This Ordinance was PASSED by the City Council by a vote of ___ for and ___ against and APPROVED by the mayor on this 14th day of June 2023.

_____
Michael Preedin, Mayor

ATTEST:

_____
Kerry Prosser, City Recorder

Exhibit A

STAFF REPORT

[attached]

STAFF REPORT
Community Development Department

FILE NUMBERS: Sisters Water Master Plan Update / City File #: CP 22-01

APPLICANT: City of Sisters

REQUEST: Comprehensive Plan Amendment to update the Sisters Water Master Plan

APPLICABLE CRITERIA: City of Sisters Development Code (SDC):
Chapter 4.1 – Types of Applications and Review Procedures
Oregon Revised Statutes
Oregon Administrative Rules

HEARING DATE: May 18, 2023 at 5:30 pm

CITY STAFF: Scott Woodford, Community Development Director

I. BACKGROUND:

All communities in Oregon are required to have a Comprehensive Plan that addresses the Statewide Planning Goals. One of the goals is Goal 11: Public Facilities and Services. Associated with Goal 11 are Administrative Rules that implement it: OAR 660-011 – Public Facilities Planning. These rules require that a city or county develop and adopt a public facility plan for areas within an urban growth boundary containing a population greater than 2,500 persons. The purpose of the plan is to help assure that urban development in such urban growth boundaries is guided and supported by types and levels of urban facilities and services appropriate for the needs and requirements of the urban areas to be serviced, and that those facilities and services are provided in a timely, orderly and efficient arrangement.

The City of Sisters last adopted a Water Master Plan in 2017 and examined water needs to serve the population of Sisters into 2037. That Plan recommended that a population forecast update be prepared at a minimum of every 5 years, and, if necessary, corresponding revisions be made to the capital facilities plan. Regular population forecast updates ensure that the capital facilities plan would remain closely aligned with current population and current demand on City infrastructure.

According to OAR 660-011-0045 (Adoption and Amendment Procedures for Public Facility Plans), the governing body of the city or county responsible for development of the public facility plan shall adopt the plan as a supporting document to the jurisdiction's comprehensive plan. The proposed updated Wastewater Facilities Plan (WMP) is a component of the Sisters Comprehensive Plan by reference and thus an Amendment to the Comprehensive Plan is required to approve the updated Plan, thus the purpose of the Planning Commission and City Council review.

This WMP Update focuses on the City's water system components, including the water supply, treatment, storage, and distribution systems. This WMP Update includes an analysis of the existing systems and their performance, an evaluation of system needs and improvement alternatives, and a

summary of the City's current Water Department financial status and potential funding opportunities for improvements.

II. EXHIBITS: The Exhibit that make up the record in this matter is the Draft Water Master Plan (**Note:** Exhibits are available for review on the City of Sisters website at the following link: https://www.ci.sisters.or.us/sites/default/files/fileattachments/city_council/page/22850/wtrsysmstplnupd_sisters_446-08_draft_050223_-_reduced.pdf

III. CONCLUSIONARY FINDINGS: The following findings relate to compliance with applicable criteria to this land use application:

City of Sisters Development Code (SDC):
Chapter 4.1 – Types of Applications and Review Procedures

- City of Sisters Comprehensive Plan
- Statewide Planning Goals

SISTERS DEVELOPMENT CODE

CHAPTER 4.1 – TYPES OF APPLICATIONS AND REVIEW PROCEDURES

4.1.100 Purpose
The purpose of this chapter is to establish standard decision-making procedures that will enable the City, the applicant, and the public to reasonably review applications and participate in the local decision-making process in a timely and effective way.

Staff Finding: Staff finds that this provision is advisory.

4.1.200 Description of Permit/Decision-Making Procedures
All land use and development permit applications, except building permits, shall be decided by using the procedures contained in this Chapter. General provisions for all permits are contained in Section 4.1.700. Specific procedures for certain types of permits are contained in Section 4.1.200 through 4.1.600. The procedure "type" assigned to each permit governs the decision-making process for that permit. There are four types of permit/decision-making procedures: Type I, II, III, and IV. These procedures are described in subsections A-D below. In addition, Table 4.1.200 lists all of the City's land use and development applications and their required permit procedure(s).

…

D. Type IV Procedure (Legislative). Type IV procedures apply to legislative matters. Legislative matters involve the creation, revision, or large-scale implementation of public policy (e.g., adoption of land use regulations, zone changes, and comprehensive plan amendments which apply to entire districts). Type IV matters are considered initially by the Planning Commission with final decisions made by the City Council and appeals possible to the Oregon Land Use Board of Appeals.

Table 4.1.200
Summary of Development Decisions/Permit by Type of Decision-making Procedure

Action	Decision Type	Applicable Regulations
Comprehensive Plan Amendment	Type IV	Comprehensive Plan

Staff Finding: The City is proposing an amendment to its Water Master Plan, which will "involve the creation, revision, or large-scale implementation of public policy (e.g., adoption of land use regulations, zone changes, and comprehensive plan amendments which apply to entire districts)," thus compliance with a Type IV procedure is required.

E. Notice of all Type III and IV hearings will be sent to public agencies and local jurisdictions (including those providing transportation facilities and services) that may be affected by the proposed action. Affected jurisdictions could include ODOT, the Department of Environmental Quality, the Oregon Department of Aviation, and neighboring jurisdictions.

***Staff Findings*:** The procedures outlined in the sections above were followed in the review of this application.

4.1.600 Type IV Procedure (Legislative)

A. Application requirements. See 4.1.700.

B. Notice of Hearing.

1. Required hearings. A minimum of two hearings, one before the Planning Commission and one before the City Council, are required for all Type IV applications, except annexations where only a hearing by the City Council is required.

Staff Finding: A minimum of two hearings will be provided – at least one before the Planning Commission and at least one before the City Council.

2. Notification requirements. Notice of public hearings for the request shall be given by the Community Development Director or designee in the following manner:

a. At least 20 days, but not more than 40 days, before the date of the first hearing on an ordinance that proposes to amend the comprehensive plan or any element thereof, or to adopt an ordinance that proposes to rezone property, a notice shall be prepared in conformance with ORS 227.175 and mailed to:

1. Each owner whose property would be rezoned in order to implement the ordinance (i.e., owners of property subject to a comprehensive plan amendment shall be notified if a zone change would be required to implement the proposed comprehensive plan amendment);
2. Any affected governmental agency.
3. Recognized neighborhood groups or associations affected by the ordinance;
4. Any person who requests notice in writing;
5. For a zone change affecting a manufactured home or mobile home park, all mailing addresses within the park, in accordance with ORS 227.175.
6. Owners of airports shall be notified of a proposed zone change in accordance with ORS 227.175.

Staff Finding: Staff reviewed the requirements in Section 4.1.600 (B)(2)(a) and did not provide any notice, as staff found that the criteria for notice was not met in this case.

b. At least 14 calendar days before the scheduled Planning Commission public hearing date, and 14 calendar days before the City Council hearing date, notice shall be published in a newspaper of general circulation in the City.
c. The Community Development Director or designee shall:
    1. For each mailing of notice, file an affidavit of mailing in the record as provided by Subsection a; and
    2. For each published notice, file in the record the affidavit of publication in a newspaper that is required in subsection b.

d. The Department of Land Conservation and Development (DLCD) shall be notified in writing of proposed comprehensive plan and development code amendments at least 35 days before the first public hearing at which public testimony or new evidence will be received.
e. Notifications for annexation shall follow the provisions of this Chapter and ORS 199.

Staff Finding: Staff provided notice in accordance with 4.1.600 (B)(2)(b). The notice was published in the Nugget newspaper on April 5, 2023, at least 14 days prior to the initial April 20, 2023 public hearing (where it was continued to the May 18, 2023 public hearing). A second hearing is required and will be held by City Council, at which time notice will again be posted in compliance with this section.

……..

E. <u>Decision-Making Considerations</u>. The recommendation by the Planning Commission and the decision by the City Council shall be based on consideration of the following factors:

1. Approval of the request is consistent with the Statewide Planning Goals;

Staff Finding: Staff has reviewed the request for a Comprehensive Plan Amendment with the Statewide Planning Goals and finds the Amendment to be consistent with all of the applicable goals. See more detail below.

Goal 1 Citizen Involvement: To develop a citizen involvement program that insures the opportunity for citizens to be involved in all phases of the planning process.

Staff Finding: The Water Master Plan is a guiding document for water facilities for the next twenty years. Typically, there is not a significant amount of public outreach during the formation of the Plan, but there have been at least two work sessions – one with the Planning Commission and one with the City Council where the draft plan was presented. These were public meetings.t

The process for approval of the Water Master Plan is detailed in 4.1.600. The adoption process requires public hearings and notifications as outlined in 4.1.600.B. 4.1.600.B.1 states that two hearings are required, one Planning Commission hearing and one City Council hearing, for application approval. The Planning Commission public hearing date is set for May 18, 2023. The City Council date is pending. The City provided noticing in accordance with 4.1.600.B.2. Type IV Procedure (Legislative) Notice of Hearing, which details the required public hearing notification process. In compliance with 4.1.600.B.2.a, the City met the required notice timelines to the parties affected. In compliance with 4.1.600.B.2.b, the city also published notice in the local newspaper. Additionally, the Department of Land Conservation and Development was notified in writing by the city as required in 4.1.600.B.2.d. The City filed the required affidavits per

4.1.600.B.2.c.. The amendment does not include any annexations, therefore 4.1.600.B.2.e is not applicable.

The City included the required content as specified in 4.1.600.C. Based on the preceding findings, the process for adoption of the amendment complies with Goal 1 and meets the requirements of the State's citizen involvement provisions.

Goal 2 Land Use Planning: To establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions.

Staff Finding: The Sisters 2040 Comprehensive Plan is the planning and policy framework tool for decisions and actions related to use of land in the Sisters Urban Area. The plan was adopted September 22, 2021, with an effective date of October 22, 2021. The Water Master Plan complies with and is consistent with the goals and policies set in the Comprehensive Plan.

Sisters' established planning and policy framework, including but not limited to the Comprehensive Plan and Development Code, has been acknowledged to be consistent with state law and provide adequate factual basis for decisions and actions. As adopted as a contextual document to this framework, the amendment is consistent with Statewide Planning Goal 2.

Goal 3 - Agricultural Land: To preserve and maintain agricultural lands.

Staff Finding: Goal 3 is not applicable as the Water Master Plan does not affect any agricultural plan designations or uses.

Goal 4 - Forest Land: To conserve forest lands.

Staff Finding: Recommendations and development projects in the Water Master Plan primarily address properties withing the Urban Growth Boundary (UGB) and do not occur on land designated as Forest Land; however, some improvements including the city's water storage reservoir, exist on forest lands, off Edgington Road in Deschutes County south of town. The City's water storage system consists of one 1.6 million gallon (MG) enclosed concrete tank storage reservoir is located on land owned by the federal government managed by the U.S. Forest Service (USFS). The location of a new reservoir will be adjacent to the existing reservoir for ease of connection to the existing system and per a pre-arranged agreement with the U.S. Forest Service for the proposed land use. Impact to forest lands should be minimal as it will occupy an area that has already been cleared of trees in the past. Upgrade of distribution lines from the storage to town are also proposed, but they will utilize existing corridors. Therefore, the proposed amendment is consistent with Statewide Planning Goal 4.

Goal 5 - Open Spaces, Scenic and Historic Areas, and Natural Resources: To conserve open space and protect natural and scenic resources.

Staff Finding: OAR 660-015-0000(5) requires local governments to protect significant riparian corridors, upland wildlife habitat, and wetlands to conserve these resources and the biological systems they contain and support. The City of Sisters details protection and conservation efforts in the Comprehensive Plan. The projects contemplated in the Water Master Plan aim to

conserve open space and protect natural and scenic resources by planning for the efficient use of our natural resources and to emphasize water conservation.

According to the Plan, water conservation can create water savings and reduction in water demand that can eliminate or delay the need for developing new water sources or treatment plants. The City has implemented a number of conservation measures, as outlined in the City's 2017 WMCP prepared by GSI Water Solutions, Inc. Water conservation can be achieved by educating the public on irrigation best practices, restricting irrigation to specific hours or days, and implementing a leak detection program. Leaks can contribute to non-revenue water, which are quantities of water either lost between the points of source and delivery or unmetered and unpaid for water used.

The cumulative effect of the planned projects in the Water Master Plan projects will protect and conserve existing natural resources. Therefore, the amendment is consistent with Statewide Planning Goal 5.

Goal 6 - Air, Water and Land Resources Quality: To maintain and improve the quality of the air, water, and land resources of the state.

Staff Finding: Ensuring water quality for public consumption is a major component of the Water Master Plan. State and Federal rules and regulations govern water quality and construction standards for water systems and the city must comply with all applicable laws. To maintain quality in the future, additional facilities and upsizing of transmission lines will be needed to accommodate such growth. The WMP outlines the specific projects needed, their cost, and how to pay for those improvements (through System Development Charges).

Also important is being good stewards of our water resources to ensure they are available into the future and that includes conserving the water we have. The WMP has a section on water conservation and the city already has a Water Management and Conservation Plan put together in 2017.

The Water Master Plan recommendations thoroughly promote the improvement of air, water and land resource quality and therefore the amendment is in compliance with Statewide Planning Goal 6.

Goal 7 - Areas Subject to Natural Disasters and Hazards: To protect life and property from natural disasters and hazards.

Staff Finding: This amendment does not directly address potential natural disasters and hazards. These hazards are addressed in other planning processes. Therefore, this amendment is consistent with Statewide Planning Goal 7.

Goal 8 - Recreational Needs: To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts.

Staff Finding: This amendment does not directly address potential recreational needs, which are addressed in other planning processes such as the Parks Master Plan. Therefore, this amendment is consistent with Statewide Planning Goal 8.

Goal 9 - Economic Development: To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon 's citizens.

Staff Finding: The updated WMP outlines a plan for the community to adequately support its housing needs that are based on the predicted population growth for Sisters for the next twenty years, via an adequate water system. To accommodate those housing needs, the Plan recommends improvements to the existing water supply, storage and distribution systems over time. Providing adequate basic infrastructure, such as water supply, will help ensure a healthy and viable community, which will aid in the continued economic development and economic health of the community. Therefore, this amendment is consistent with Statewide Planning Goal 9.

Goal 10 - Housing: To provide for the housing needs of the citizens of the state.

Staff Finding: The provisions of this amendment do not specifically address the planning or development of housing, although one purpose of the Plan update is to ensure that as the community grows, adequate water infrastructure are also developed commensurately. Therefore, this amendment is consistent with Statewide Planning Goal 11.

Goal 11 - Public Facilities and Services: To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.

Staff Finding: The proposed WMP update contemplate the provision and expansion of water facilities to keep pace with new growth, so as to meet our housing, employment and recreational needs into the future. Therefore, this amendment is consistent with Statewide Planning Goal 11.

Goal 12- Transportation: To provide and encourage a safe, convenient and economic transportation system.

Staff Finding: This amendment does not directly address potential transportation needs, which are addressed in other planning processes, namely the Transportation System Plan. Therefore, this amendment is consistent with Statewide Planning Goal 12.

Goal 13 - Energy Conservation: To conserve energy.

Staff Finding: The amendment does not specifically concern energy conservation, but energy conservation is a priority with the city and any opportunity to utilize energy efficient equipment will be pursued. Therefore, the proposed amendment is consistent with Statewide Planning Goal 13.

Goal 14 - Urbanization: To provide for an orderly and efficient transition from rural to urban land use.

Staff Finding: The primary purpose of a Water Master Plan is to ensure that the city maintains adequate water supply, storage and distribution as the city urbanizes into the future. Consequently, the Plan highlights the necessary improvements, the cost to provide them and

the implementation timeframe necessary to keep pace with the anticipated growth. Doing so will "provide for an orderly and efficient transition from rural to urban land use" as the Urban Growth Boundary expands in the future. Therefore, the proposed amendment is consistent with Statewide Planning Goal 14.

> ***Goal 15 - Willamette River Greenway: To protect, conserve, enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the Willamette River Greenway.***

Staff Finding: Goal 15 is not applicable to the Sisters UGB and the amendment does not interfere with compliance with Statewide Planning Goal 15.

> ***Goal 16 through 19 (Estuarine Resources, Coastal Shorelands, Beaches and Dunes. and Ocean Resources):***

Staff Finding: There are no coastal, ocean, estuarine, or beach and dune resources within the Sisters UGB. Therefore, these goals are not relevant, and the amendment will not affect compliance with Statewide Planning Goals 16 through 19.

1. ***Approval of the request is consistent with the Comprehensive Plan; and***

Staff Finding: The 2040 Sisters Comprehensive Plan (adopted September 22, 2021) includes Public Facilities goals outlined in section 9. The following goals and policies are applicable to the proposed amendment:

- Goal 9: Plan and develop a timely, orderly, and efficient arrangement of water, wastewater, stormwater, transportation, and other public facilities to support the City's continued operation and future development.

  Policy 9.1 The City shall be proactive in planning, financing, managing, and obtaining lands, facilities, equipment, and other system elements to ensure the safe and efficient operation of the public facilities and services for which it is primarily responsible, including water, wastewater, stormwater, and transportation facilities and services.

  Policy 9.2 The City shall continue to update its water and wastewater supply system to meet current and new State and Federal health requirements, and domestic and emergency needs.

  Policy 9.3 The City shall continue to assess System Development Charges to finance the impacts of growth on public facilities in an equitable and efficient manner.

  Policy 9.4 The City of Sisters Public Works Standards shall be periodically updated and improved for specificity, accuracy, and consistency with County, State and Federal requirements, and should incorporate innovative strategies and initiatives based on cost-effective and scientifically-proven principles.

  Policy 9.5 The City shall continue to promote water management and conservation strategies to reduce impacts on the City's water supply system. Strategies could include reduced use of irrigation; tiered billing system tied to water use; incentives or requirements

for use of water-efficient fixtures; use of drought-tolerant plants; or other similar strategies or incentives.

Policy 9.6 The City shall pursue additional water rights as needed to ensure adequate capacity to meet water demands identified in the City's Water System Plan.

Policy 9.7 The City shall continue to explore strategies for wastewater reuse and use of biosolids as a means of helping to meet future effluent disposal demands.

Policy 9.8 The City shall plan for all properties within the city limits to be able to be provided with water, sewer and transportation facilities; will support the provision of electrical, internet and phone utilities; and will plan for adequate public facilities to be provided to properties in the urban growth boundary.

Policy 9.9 Public facilities and all utilities (phone, cable, internet, and power), where feasible shall be located underground and required "to and through" when a property is developed or redeveloped, in order to ensure that neighboring properties can be served in the future.

Policy 9.10 The City shall support and coordinate with agencies and interest groups including the Sisters School District, County, Central Oregon Community College, Deschutes County Libraries, and the Sisters Parks and Recreation District to meet the educational and recreational needs for the community.

Policy 9.11 The City shall implement opportunities for on-site infiltration, detention, and treatment of stormwater through implementation of the Central Oregon Stormwater Manual (2007) and the City's Public Works Standards in the development process and in construction of City stormwater management facilities.

Policy 9.12 The City shall ensure that street lighting in Sisters is consistent with the City's Western Design Theme, the dark skies ordinance, and other development code provisions, except where it is inconsistent with established or adopted safety-related requirements or standards.

Policy 9.13 The City shall coordinate with Sisters Ranger District on planning on Forest Service property within and adjacent to the city limits.

Policy 9.14 Support the work of partnering agencies and businesses in promoting and improving access to and the quality of community health services and outcomes.

Policy 9.15 The City shall consider potential impacts from natural hazards, such as wildfire, when locating its Public Works facilities and equipment.

The proposed WMP complies with and implements the goal and applicable policies of the Comprehensive Plan, specifically the Public Facilities section. It specifically complies with the overarching goal language to "plan and develop a timely, orderly, and efficient arrangement of water, wastewater, stormwater, transportation, and other public facilities to support the City's continued operation and future development." Therefore, this criterion is satisfied.

2. The property and affected area is presently provided with adequate public facilities,

services and transportation networks to support the use, or such facilities, services and transportation networks are planned to be provided concurrently with the development of the property. The applicant must demonstrate that the property and affected area shall be served with adequate public facilities, services and transportation networks to support maximum anticipated levels and densities of use allowed by the District without adversely impacting current levels of service provided to existing users; or applicant's proposal to provide concurrently with the development of the property such facilities, services and transportation networks needed to support maximum anticipated level and density of use allowed by the District without adversely impacting current levels of service provided to existing users.

Staff Finding: The affected area of the WMP is the entire Sisters Urban Growth Boundary, both in its existing boundaries and any future areas of expansion. These areas are either presently provided with adequate public facilities or future improvements and expansions that are noted in the WWFP will be implemented along with or, in advance of future growth, to ensure that adequate public facilities are available concurrently with development.

The WWFP utilizes the latest population projections prepared by the Population Research Center at Portland State University, dated June 30, 202, through the planning year of 2042, resulting in a population within city limits of 6,917 by 2042. These numbers are used to demonstrate that the affected area will be served with adequate public facilities and services to support the maximum anticipated levels of demand without adversely affecting existing users. Therefore, this criterion is satisfied.

3. Compliance with 4.7.600, Transportation Planning Rule (TPR) Compliance

Staff Finding: 4.7.600 Transportation Planning Rule Compliance states:

A. When a development application includes a proposed comprehensive plan amendment or land use district change, the proposal shall be reviewed by the City to determine whether it significantly affects a transportation facility, in accordance with Oregon Administrative Rule (OAR) 660-012-0060. Significant means the proposal would:

1. Change the functional classification of an existing or planned transportation facility. This would occur, for example, when a proposal is projected to cause future traffic to exceed the capacity of "collector" street classification, requiring a change in the classification to an "arterial" street, as identified by the Transportation System Plan; or

2. Change the standards implementing a functional classification system; or

3. Allow types or levels of land use that would result in levels of travel or access what are inconsistent with the functional classification of a transportation facility; or

4. The effect of the proposal would reduce the performance standards of a public utility or facility below the minimum acceptable level identified in the Transportation System Plan.

Adoption of the amendment will not change the functional classification of an existing or planned transportation facility. Nor will it change standards implementing a functional classification system. Further, it will not allow types or levels of land uses which would result in levels of travel or access which are inconsistent with the functional classification of a transportation facility or reduce the performance standards of any facility. Therefore, Statewide Planning Goal 12 is not implicated by this amendment.

B. Amendments to the Comprehensive Plan and land use standards which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan. This shall be accomplished by one of the following:

1. Limiting allowed land uses to be consistent with the planned function of the transportation facility;

Or

2. Amending the Transportation System Plan to ensure that existing, improved, or new transportation facilities are adequate to support the proposed land uses consistent with the requirement of the Transportation Planning Rule; or,

3. Altering land use designations, densities, or design requirements to reduce demand for automobile travel and meet travel needs through other modes of transportation.

Staff Finding: The amendment does not significantly affect a transportation facility and therefore do not interfere with compliance of 4.7.600B. This criterion is satisfied.

Exhibit B

AMENDED SISTERS WATER SYSTEM MASTER PLAN

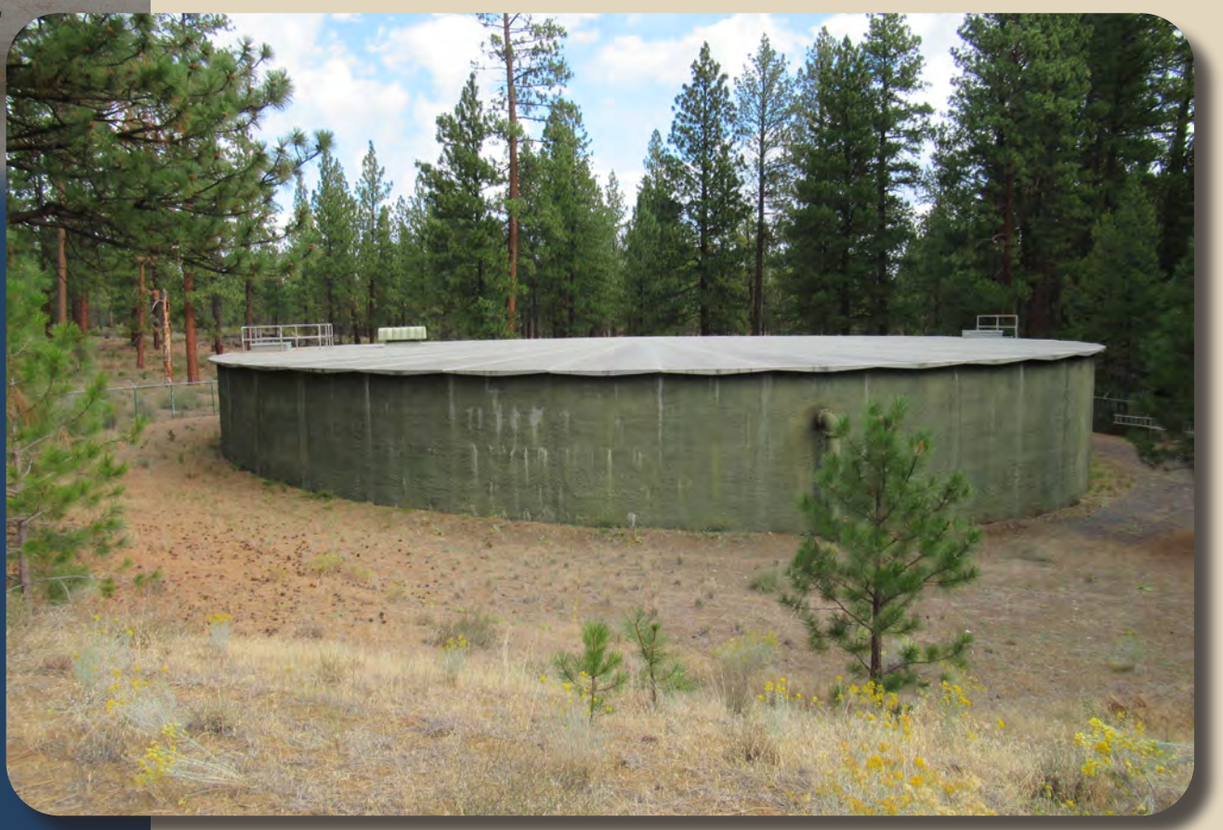
[attached]

Draft

City of Sisters, Oregon

Water System Master Plan Update

2023



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WATER SYSTEM MASTER PLAN UPDATE

FOR

CITY OF SISTERS, OREGON

MAY 2023

05/02/2023 2:58 PM

ANDERSON PERRY & ASSOCIATES, INC.

La Grande, Redmond, Hermiston, and Enterprise Oregon
Walla Walla, Washington

 Job No. 446-08

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Acknowledgments

Anderson Perry & Associates, Inc., thanks the City of Sisters for the opportunity to provide this Water System Master Plan (WSMP) Update and especially wishes to thank City staff, City engineers, and the Public Works Advisory Committee who provided key information and guidance in the preparation of this WSMP Update.

Executive Summary

Introduction

This Executive Summary briefly summarizes the Water System Master Plan (WSMP) Update prepared by Anderson Perry & Associates, Inc., for the City of Sisters, Oregon. The recommendations outlined hereafter have been developed in cooperation with the City of Sisters' Public Works Department and direction from the Public Works Advisory Committee. This WSMP Update focuses on the City's water system components, including the water supply, treatment, storage, and distribution systems. This WSMP Update includes an analysis of the existing systems and their performance, an evaluation of system needs and improvement alternatives, and a summary of the City's current Water Department financial status and potential funding opportunities for improvements. Included in this Executive Summary is a brief discussion of the population, design criteria, evaluation and needs of water system components, categories of improvements and summary of costs, and potential action items related to this WSMP Update. For more detailed discussions of the information presented in this Executive Summary, refer to the individual chapters of this WSMP Update.

Objectives of this Water System Master Plan Update

The primary objectives of this WSMP Update are to accomplish the following:

1. Establish planning criteria.

2. Analyze the individual components of the existing water supply system considering capacity, compliance with current water quality standards, water rights, condition of components, operational dependability, and cost of operation. Potential water supply system improvements to meet the planning criteria are identified.

3. Analyze the existing water storage facilities considering capacity, condition of reservoirs, and distribution system pressures. Potential reservoir improvements to meet the planning criteria are identified.

4. Update the existing water model, identify distribution system deficiencies and alternatives for meeting current and future water system needs. Provide an updated map of the City's existing distribution system based on the updated water model.

6. Prepare a summary of current and future water system needs, as well as recommended improvements with associated estimated costs and layout schematics. Estimated costs are presented with a prioritized Capital Improvements Plan (CIP).

Population

To estimate future water system demands, historical water use as a function of the population is determined, then projected into the future based on forecasted populations. The City of Sisters' 2020 Census population of 3,220 was used as the base year population for which per capita water use demands were developed for this WSMP Update.

Population projections for this WSMP Update are based on the proposed population forecasts prepared by the Population Research Center at Portland State University, dated June 30, 2022, through the planning year 2042, resulting in a population within the city limits of 6,917 by 2042. Chapter 2 of this WSMP Update presents more information on historic and projected populations for the City of Sisters.

Design Criteria

When establishing design standards for a water system, primary consideration must be given to state and federal rules and regulations governing water quality and construction standards for water systems. These regulations are set by both the U.S. Environmental Protection Agency (EPA) and Oregon Health Authority - Drinking Water Services (DWS). In addition to these public health and safety requirements, many other factors control the design parameters for municipal water systems, as discussed in Chapter 2.

Chapter 2 summarizes the water system design criteria for evaluating the existing water system and developing improvements to satisfy present and future needs for each. Application of these criteria is discussed further in the specific chapters that address the water supply, treatment, storage, and distribution system facilities.

Existing Water System

The City of Sisters utilizes water drawn from four volcanic and sedimentary rock aquifer supply wells to supply the City with water. The wells are referred to as Wells No. 1, 2, 3, and 4 and were built in 1975, 1991, 2007, and 2021, respectively. The need for Well No. 4 was identified in the City's 2017 Water Capital Facilities Plan to accommodate continuing growth. Existing source capacities are adequate to supply projected water demands through most of the planning period.

The City currently holds groundwater rights allowing up to 9.27 cubic feet per second (cfs) (4,161 gallons per minute [gpm]) to be withdrawn from City wells. The City currently holds surface water rights allowing up to 5.65 cfs (2,536 gpm) to be withdrawn from Pole Creek and Whychus Creek. However, due to the high cost of water treatment requirements and low summer streamflow in Whychus Creek, the City is unlikely to use surface water for future municipal use. The City's existing water rights are adequate to supply projected water demands through the planning period.

Well water is disinfected with chlorine at each source. Well No. 1 is disinfected with chlorine gas; all other wells are disinfected with sodium hypochlorite produced with on-site generation systems.

Currently, the City has one operating water storage reservoir, built in 1995, with a total available storage volume of 1.6 million gallons (MG). The existing reservoir is located approximately 1.8 miles outside of city limits at an elevation sufficient to provide adequate water delivery pressures without booster pump stations. The reservoir is adequately sized to provide the City's existing operational, equalization, and fire demand design storage volumes with additional reserve volume. To accommodate the City's projected growth, it is recommended additional storage be constructed within the planning period.

The City's distribution system consists of a piping network that provides water and system pressure to the City's users. The City has more than 200,000 feet of piping in its distribution system. The distribution system piping consists of asbestos cement (AC), polyvinyl chloride (PVC), high density polyethylene, cast iron, ductile iron (DI), galvanized steel, and carbon steel piping. Much of the original steel and AC distribution piping has been replaced over time. As of November 2022, approximately 90 percent of the

existing system consists of C900 PVC pipe. Piping within the distribution system generally ranges from 4- to 16-inch diameter, with the majority being 4-, 6-, 8-, 10-, and 12-inch diameter.

Water Quality Requirements

The City of Sisters' water system comes under the jurisdiction of the DWS. The DWS assumed primacy (responsibility) from the EPA in February 1986 for enforcement of the federal Safe Drinking Water Act. Therefore, the City works primarily with the DWS as the regulating agency with regard to their water system. The City has not received any regulatory violations from the DWS in the last five years.

The Deschutes County Environmental Health Division conducts water system sanitary surveys of communities on behalf of the DWS to assist with identifying potential contamination sources that may impact water quality. These surveys are generally scheduled to occur every three to five years.

The City of Sisters' latest sanitary survey was conducted on July 26, 2022. The only noted deficiency was a gap between the steel plate and the concrete pedestal on Well No. 1. The City has corrected this deficiency and reported the correction to the Deschutes County environmental specialist.

In summary, many regulations affect operation of the City of Sisters' water system. The City of Sisters has good water quality with an efficient well-maintained water system meeting federal and state water quality criteria.

Deficiencies

The City's water supply, treatment, storage, and distribution systems are generally in good condition, are operated efficiently, and have adequate capacity to meet current water demands and supply the City with good quality drinking water. Most existing deficiencies are due to aging infrastructure and do not pose critical risks. Certain systems will become deficient in capacity as demand increases with growth. Additional facilities and upsizing of transmission lines will be needed to accommodate such growth. Existing and future water system deficiencies are outlined hereafter.

Supply and Treatment

- Current water source capacity will not meet projected future demands under well operational design conditions developed during the preparation of this WSMP Update. Through discussions with City staff, the well operational design conditions assume the largest producing source is offline (maintenance, contamination, etc.) and the remaining sources are limited to a maximum operating time of 21 hours per day. Under these conditions, it is estimated that the City's maximum daily demand (MDD) will exceed the available supply capacity when the population reaches approximately 4,500 (near year 2028) and the existing source capacity would be approximately 2.1 million gallons per day below the system's MDD in year 2042. The need for additional source capacity is dependent on the storage reservoir's ability to make up the difference between the MDD and the available source capacity.
- The Well No. 1 mechanical building is approaching its useful service life. The building is also undersized to accommodate the on-site chlorination system, electrical equipment, and controls.

Storage

- Through discussions with the City, it was decided that storage facilities should be capable of providing all necessary operational needs and have a remaining emergency reserve storage of at least one day's storage of average daily demand (ADD). Under these parameters, the year 2022 storage is deficient by approximately 40,000 gallons, and this shortage would be exacerbated with continuing growth throughout the planning period.

Distribution

- A single 12-inch AC transmission line conveys water to and from the reservoir to a location referred to as Whychus Creek junction. The AC transmission line was constructed in the 1960s and is reaching the end of its service life. Since construction, nearby trees have grown to an extent that could potentially cause damage to the line should they fall. No redundancy in the transmission lines exists to maintain reservoir operation if this section of line is damaged or removed from service for another reason.
- The existing distribution system cannot adequately provide the planning year's projected peak hourly flow or recommended fire flow while maintaining a minimum residual system pressure of 20 pounds per square inch at all points of delivery.

Summary of Existing Water Supply and Treatment, Storage, and Distribution System Recommended Improvements

Supply and Treatment

To address potential water supply capacity deficiencies expected to arise toward the end of the planning period, it is recommended that the City develop a new source, increase the capacity of either Well No. 1 or 2, or do both. Assuming the City constructs additional storage (discussed further below and in Chapter 4) and assuming the largest producing source was offline, the City would need to construct and bring online a new source or increase the capacity of an existing source by year 2035. To exercise the City's full permitted withdrawal rate by either developing a new source or increasing the capacity of the existing sources, either a permanent water rights transfer or permit amendment from the Oregon Water Resources Department would be needed. A new permit to use groundwater could also be applied for to increase the total permitted groundwater withdrawal rate.

To add redundancy and operational flexibility to the system, it is recommended that the City install a variable frequency drive (VFD) and standby power to Well No. 3. This will reduce the chance of the City relying on only three of four sources during utility interruptions and will add the ability to run Well No. 3 based on a distribution set point pressure.

To maintain Well No. 1 in good working order and convert from gas chlorination to on-site generation of sodium hypochlorite, it is recommended the City construct a new Well No. 1 mechanical building. This will provide adequate space to install new electrical, instrumentation, and controls; install a new on-site sodium hypochlorite generator system; resolve aging infrastructure deficiencies; and reduce operation and maintenance costs and safety concerns associated with the existing chlorine gas disinfection system.

Storage

Based on findings of this WSMP Update and discussions with City staff, constructing an additional 2.2 MG of storage is recommended. This volume was determined based on design criteria for the planning year 2042. Based on lifecycle costs and resilience to seismic activity, the preferred type of reservoir is a prestressed concrete tank. The location of the new reservoir will be adjacent to the existing reservoir for ease of connection to the existing system and pre-arranged agreement with the U.S. Forest Service for the proposed land use. The reservoir should be constructed at the same elevation as the existing tank to allow a hydraulic connection without additional control mechanisms. The City currently has an emergency reserve capacity of 1,034,500 gallons, which is less than the current year's ADD. Based on current population forecasts and assuming no additional storage is constructed, the City's entire volume of storage will be utilized in approximately year 2035 with no remaining emergency reserve available at that time. To maintain the recommended emergency reserve, the new reservoir should be constructed as soon as reasonably possible.

Distribution

High Priority Improvements

1. Install a new 16-inch PVC transmission line from the existing reservoir to the city limits near the middle and high schools on Edgington Road.

2. Install a new 16-inch DI transmission line from the existing reservoir to the Whychus Creek junction.

Medium Priority Improvements

1. Replace existing AC distribution mains in the Edge O The Pines subdivision.

2. Install a new 12-inch PVC water main on Camp Polk Road Extension from East Barclay Drive to Sun Ranch Drive.

3. Install a new 12-inch DI transmission line from the Whychus Creek junction to the city limits and replace the existing 12-inch AC water main from East Tyee Drive to East Hood Avenue with new 12-inch PVC pipe.

4. Install a new 12-inch PVC distribution main along the city limits from East Desperado Trail to Creekside Drive.

5. Reconnect existing Hood Avenue South Alley water services with new taps, lines, meter assemblies, and valve boxes from either West Hood Avenue or West Washington Avenue.

Long-Term/Future Development Improvements

No other long-term development improvements are needed. An ongoing meter replacement program to replace aging service meters should be implemented on an annual basis.

To meet the objectives of this WSMP Update, address identified deficiencies, and support growth and development in the City, recommended water system improvements have been identified and are summarized on Table ES-1.

TABLE ES-1
RECOMMENDED WATER SYSTEM IMPROVEMENTS PROJECTS, IMPLEMENTATION TIME FRAME, AND TOTAL ESTIMATED PROJECT COST[1]

Implementation Priority	Chapter	Improvement Type	Recommended Improvement	Total Estimated Project Cost and Implementation Time Frame (2023 Dollars)		
				2023 to 2027	2027 to 2032	2032 to 2042
1	3	Supply	Install VFD and backup power at Well No. 3.	$372,000		
2	3	Supply, Treatment	Rebuild the Well No. 1 pump station building and install a new on-site generation system.	$808,000		
3	4	Storage	Construct new 2.2 MG water storage tank and rehabilitate the existing 1.6 MG water storage tank.	$6,283,000		
4	5	Distribution	Install a new 16-inch PVC transmission line on Edgington Road from the existing reservoir to city limits near the middle and high schools.	$3,635,000		
5	5	Distribution	Install a new 16-inch DI transmission line from the existing reservoir to Whychus Creek junction.	$1,466,000		
6	5	Distribution	Replace existing AC distribution mains in the Edge O The Pines subdivision.		$1,567,000	
7	5	Distribution	Install new 12-inch PVC water main on Camp Polk Road Extension from East Barclay Drive to East Sun Ranch Drive.		$319,000	
8	5	Distribution	Install a new 12-inch DI transmission line from the Whychus Creek junction to East Tyee Drive and replace the existing 12-inch AC water main from East Tyee Drive to East Hood Avenue with new 12-inch PVC pipe.		$2,504,000	
9	5	Distribution	Install new 12-inch PVC main from East Desperado Trail to Creekside Drive.		$654,000	

Implementation Priority	Chapter	Improvement Type	Recommended Improvement	Total Estimated Project Cost and Implementation Time Frame (2023 Dollars)		
				2023 to 2027	2027 to 2032	2032 to 2042
10	5	Distribution	Reconnect existing Hood Avenue South Alley water services with new taps, lines, meter assemblies, and meter boxes from either West Hood Avenue or West Washington Avenue.		$103,000	
11	3	Supply	Construct new Well No. 5 and transmission line.			$2,102,000
Annually	5	Distribution	Ongoing water service meter replacement.	50 per year at $400 each = $20,000 per year	50 per year at $400 each = $20,000 per year	50 per year at $400 each = $20,000 per year
			TOTALS	**$12.6 M**	**$5.2 M**	**$2.1 M**
				TOTAL RECOMMENDED IMPROVEMENTS COST (2023 Dollars) YEARS 2023 THROUGH 2042		**$19.9 M**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

M = million

Action Items and Implementation Schedule

To move forward with completing the water system improvements summarized in this WSMP Update, the following action items are recommended.

Action Item

The City will need to:

- Submit and obtain approval of this WSMP Update from the DWS.
- Finalize and adopt this WSMP Update and the recommended improvements once agencies review and approve the draft WSMP Update.
- Review and update its comprehensive plan to incorporate the findings of this WSMP Update.
- Inform the Public Works Advisory Board of the need for and scope of the improvements projects, to answer questions, and to explain the need for potential increases in user fees.
- Develop a funding plan for the desired improvements during the time frames indicated in the CIP (see Chapter 7).
- Develop the required permitting (e.g., boring under highways, river crossings, etc.)

- Prepare funding applications, as applicable, for the associated water system improvements projects and submit them to the appropriate funding agencies.

Recommended Improvements Summary Implementation Plan

To implement the recommended improvements, the City will need to secure monies to fund these improvements, while working closely with its citizens to inform them of the water system needs and the necessity for increased water user rates.

Water system improvements as outlined in this WSMP Update are intended to provide the City with a reliable, quality water system that will meet the needs of the City for the 20-year planning period and beyond. As development occurs, water system improvements will help the City meet these needs. With the CIP approach, projects will be implemented in a manner that distributes the use of funds throughout the 20-year period and prioritizes projects necessary to maintain adequate supply, treatment, storage, and distribution as the population grows.

Chapter 1 - Introduction

Purpose of Plan

This Water System Master Plan (WSMP) Update presents the results of a water system planning effort intended to provide information from which continued and future operation and future improvements to the City of Sisters' municipal water system can be based. This WSMP Update is intended to satisfy the criteria of the Oregon Health Authority - Drinking Water Services (DWS) and Oregon Administrative Rules 333-061-0060 and provide the City with a projected plan to meet water system needs for the next 20 years. The purpose of this WSMP Update is to develop water system design criteria for a 20-year planning period; evaluate the adequacy of the existing water supply, storage, and distribution systems; identify any deficiencies or operational issues in the existing water system; evaluate alternatives for improving the City's water system; and provide a summary of the current Water Department financial status and potential funding programs for improvement implementation.

Organization of this Water System Master Plan Update

This WSMP Update is divided into seven main chapters and an Executive Summary. Specifically, the WSMP Update includes:

A. An Executive Summary of the overall WSMP Update that describes water quality and service goals (design criteria), present and future water system deficiencies, the Engineer's recommended alternatives for achieving the goals and correcting the deficiencies, and the recommended implementation plan for funding, designing, and constructing improvements.

B. Chapter 1, "Introduction," discusses the objectives of the WSMP Update, describes the community and environment, and provides an overview of the City's existing water system.

C. Chapter 2, "Water System Requirements," presents the data upon which recommended improvements to the water system are based. Data relating to current and 20-year elements such as service area, population, land use, water use, fire flows, state and federal regulations, and the design criteria developed for this WSMP Update are presented. Included in this section are additional design criteria associated with providing service to future commercial/industrial customers with higher than typical water demands. A description of the water quality and level of service goals (design criteria) for the water system considering existing and anticipated future regulatory requirements, non-regulatory water quality needs of water users, flow and pressure requirements, capacity needs related to water use, and fire flow needs are also provided.

D. Chapter 3, "Water Supply and Treatment," discusses the operation and capacity of the existing water supply and treatment systems with respect to existing and future system demands and regulations. Information concerning water rights and permits for the appropriation of water from various sources is presented. Potential alternatives to further develop the City's water supply system are also presented.

E. Chapter 4, "Water Storage," discusses the existing storage reservoir, presents the four primary components of water storage relative to the City's design criteria, discusses alternative types of storage facilities, and provides recommendations for storage improvements.

F. Chapter 5, "Distribution System," presents information related to the existing distribution system facilities, water quality test results, and fire flow information. Results from computer modeling of the water system are presented. Existing deficiencies and deficiencies likely to develop during the planning period are identified. Improvements are presented to address both existing and future anticipated limitations of the distribution system.

G. Chapter 6, "Recommended System Improvements and Improvements Prioritization," presents information related to water supply, storage, and distribution system improvements developed through analysis of the system. Recommended improvements are prioritized for inclusion in a Capital Improvements Plan with identified time frames for implementation. Cost estimates are presented for the high priority water system improvements.

H. Chapter 7, "Current Financial Status and Project Financing," provides a summary of the Water Department financial status and a description of alternatives to finance water system improvements, including local financing such as user rates and financing assistance programs.

I. The "Appendices" contain key materials referenced in this WSMP Update, which are provided for reference by City staff. This information includes water rights information and other applicable water system information.

Sources of Information

The conclusions and recommendations outlined in this WSMP Update are based on data, information, and records provided by the City's Public Works Department and City Engineer. This information includes, in part, past flow records (supply and usage), descriptions of system operation, condition of system components and identification of problem areas, water quality data, and system layout and sizing. The recommendations and conclusions are, therefore, dependent in part on the completeness and accuracy of the information provided.

Previous plans, studies, databases, and standards for the City's water system have been referenced with the development of this WSMP Update. These items include:

- 2017 Water Capital Facilities Plan Update (Becon Civil Engineering and Land Surveying)
- 2017 Water Management and Conservation Plan (GSI Water Solutions, Inc.)
- 2017 Public Protection Classification Summary Report (Insurance Services Office, Inc.)
- 2021 City of Sisters' Water System GIS Database

Review and Updating of Water System Master Plan

This WSMP Update should be periodically reviewed and updated to stay current with population growth, water system demands, and changing state and federal regulations. The DWS requires WSMPs be updated every 20 years. However, due to the City's projected growth over the next five to ten years, it is recommended this WSMP Update be reviewed at five-year intervals and be updated at ten-year intervals, or as growth dictates.

Objectives of this Water System Master Plan Update

The primary objectives of this WSMP Update are to accomplish the following:

1. Establish planning criteria including service area boundaries; population growth projections; past, present, and future water usage patterns; fire flow requirements; federal and state standards; system pressures; and service goals.

2. Analyze the individual components of the existing water supply and treatment systems considering capacity, compliance with current water quality standards, water rights, condition of components, operational dependability, and cost of operation. Develop the water supply needs for the planning period and identify alternatives for meeting long-term water supply needs including alternatives for correcting existing system deficiencies. Evaluate the historic performance of the City's wells and the City's ability to maintain capacity and develop additional capacity. Evaluate water supply development/improvement options and associated capital and operation and maintenance costs.

3. Analyze the existing water storage facilities considering capacity, condition of the reservoir, and distribution system pressures. Assess the City's storage capacity considering operational storage, equalization storage, fire reserve storage, and emergency storage. Identify the storage requirements of the water system for the planning period. Evaluate water storage development/improvement options and associated costs.

4. Utilizing existing distribution system maps, GIS mapping, and City records, update the existing water model to depict current conditions and present future improvement options. Identify distribution system deficiencies and alternatives for meeting current and future system needs. Provide estimated costs for implementing recommended high priority improvements. Prepare proposed water distribution improvement figures or maps.

5. Prepare a summary of current and future water system needs as well as develop a Capital Improvements Plan with recommended improvements with associated estimated costs and layout schematics. Recommendations will be made for meeting the water system needs for the planning period, and an implementation schedule will be developed to outline a phased, prioritized plan to address any recommended system improvements to be implemented over the next ten years.

6. Provide a summary of the existing Water Department financial condition noted in previous studies completed for the City. Information is also provided about potential state and federal grant and loan programs that may be available to assist the City in implementing any identified water system improvements.

Regional Setting

The City of Sisters lies in the northwestern portion of Deschutes County, Oregon, east of the Cascade Range. Whychus Creek runs through the southeast corner of the City, flowing from southwest to northeast.

Topography

The County generally slopes northeast, with major drainages flowing east and northeast. Whychus Creek, which runs through the southeastern section of the City, flows northeast to the confluence with the Deschutes River. Elevations rise heading west toward the Cascade Range. The elevation of the City of Sisters ranges from approximately 3,150 to 3,225 feet above mean sea level.

Weather Conditions

In the Sisters' area, summers are typically dry with clear days. Winters bring rain, snow, and frozen soils. Temperatures vary from an average high temperature in summer of 84.3° Fahrenheit (F) to an average low temperature in winter of 21.1°F. According to data compiled by the Western Regional Climate Center, the annual average precipitation is approximately 13.62 inches per year. Santiam Pass, located approximately 17 miles northwest of the City in the Cascade Range, receives an average of approximately 85 inches of precipitation per year. The variation in precipitation from the Cascade Range to the City is due to a rain shadow effect.

Transportation

U.S. Route 20 and Oregon Route 126 merge in Sisters to form Cascade Avenue, the main thoroughfare through the city center. The two highways split east of Sisters, with Oregon Route 126 heading to Redmond and U.S. Route 20 heading to Bend. West of Sisters, Oregon Route 242 splits off the combined Oregon Route 126 and U.S. Route 20.

Location and Study Area

The City of Sisters is situated at the convergence of U.S. Route 20 and Oregon Route 126 and bordered on the west by the lower eastern slopes of the Cascade Range. Surrounding communities to the east include Bend and Redmond, Oregon. The location of the community and layout of the City relative to surrounding physical features are shown on Figure 1-1.

The study area for this WSMP Update encompasses the entire area within the Sisters' city limits. The city limits and UGB are also shown on Figure 1-1.

Soils

The City's soils are generally composed of a sandy loam. Based on a Natural Resources Conservation Service soil survey, most of the soils in and around the City fall into three categories: 85A-Lundgren sandy loam, 47A-Ermabell loamy fine sand, and 157C-Wanoga-Fremkle-Rock outcrop complex. These soils slowly convey runoff and have a slight risk of erosion. All three soil types are well drained and are not prone to flooding following precipitation.

Waterways and Wetlands

Whychus Creek is the largest perennial stream in the surrounding area, flowing from southwest to northeast through the southeast region of Sisters. Most of the developed areas of the City lie outside the Whychus Creek 100-year floodplain, with only a few structures located near the floodplain. Well No. 1 is located outside the 100-year floodplain as shown on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map panel, but the ground surface elevations at the well are very near 100-year flood levels reported by FEMA.

Irrigation pipes, canals, and ditches in the Sisters area route surface water to surrounding agricultural fields. These irrigation conveyance systems are primarily served by Whychus Creek, although many are currently not used, as many surface water rights in the region have been transferred to in-stream leases.

Multiple wetlands exist in and around the City, primarily within the riparian zone of Whychus Creek. A few other wetlands are mapped on Deschutes County's National, Local, and State Wetland Inventory mapper, including multiple intermittent streams and manmade ponds. These appear to have very little or no flow for most of the year.

Existing Water System

Overview

The City of Sisters' water system generally serves the area within its city limits. The City also provides water to a Sisters-Camp Sherman Fire District training facility. Existing water facilities include four volcanic and sedimentary rock aquifer supply wells and associated pump stations, one water storage reservoir, and water distribution piping. The water storage reservoir is located outside city limits at a higher elevation. Three of the wells are within city limits, and one is located approximately 500 feet south of city limits adjacent to Whychus Creek. All of the wells are connected directly to the distribution system. The water storage reservoir is both filled and drained through a transmission line network. No water treatment is currently required; however, the City uses chlorine disinfection at each supply well to maintain a residual in the system. A surface water diversion from Pole Creek was used historically and remains in place but is no longer used. The Pole Creek diversion system is composed of an embankment dam and sand filter. Piping from the sand filter to the existing transmission line has been disconnected. The City has no booster pump stations. The distribution system pressure is maintained by the water storage reservoir level and is affected by pipe friction losses in the reservoir transmission line. During high demands when no supply wells are running, distribution system pressure falls due to friction losses in the reservoir transmission line. When system pressure drops below supply well set points, the wells turn on, adding supplemental water to the system and assisting in maintaining system pressure. The locations of the main water system components are shown on Figure 1-1. Figure 1-2 presents a water system schematic diagram depicting the existing water system components and process flows. The City's water system components are discussed briefly hereafter. Each system component is discussed in greater detail in subsequent chapters of this WSMP Update.

Water Supply

The City obtains all of their municipal water supply from four wells constructed in a volcanic and sedimentary rock aquifer. The combined water rights for potable water from these sources allow more than 4.7 million gallons per day (3,300 gallons per minute) of water to be provided to the City. Additional surface water rights from Pole Creek and Whychus Creek allow 5.65 cubic feet per second; however, these rights are no longer exercised due to costly practices associated with treating surface water. Groundwater is treated at each source with either chlorine gas or sodium hypochlorite prior to distribution throughout the system. A summary of the City's water supply wells is shown on Table 1-1.

TABLE 1-1
SUMMARY OF WATER SUPPLY SOURCES

Well Number	General Location/Land Ownership
Well No. 1	On Three Creeks Road south of East Tyee Drive outside city limits. The well is in an existing easement.
Well No. 2	On West McKinney Butte Road, on the northeast corner of the middle school's ballfield.
Well No. 3	On South Sun Ranch Drive in the Grand Peaks at Sisters subdivision. Well No. 3 is on City-owned land.
Well No. 4	At 504 South Locust Street in Sisters Creekside Campground on City-owned land.

Water Storage

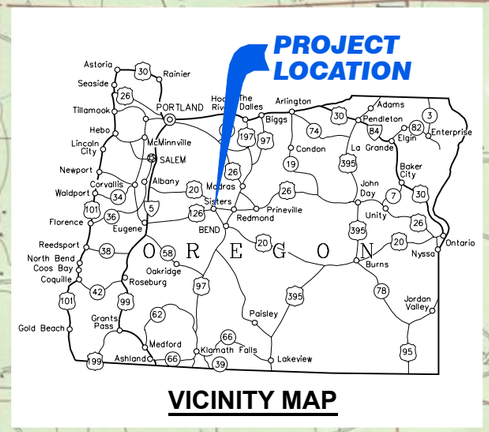
The storage facilities within the City's water system include a totally enclosed 1.6 million gallon (MG) partially buried concrete reservoir and an embankment dam open air reservoir. Only the enclosed concrete reservoir remains in service. The reservoirs are adjacent to each other and located approximately 1.8 miles south of the city limits. Table 1-2 provides general location information.

TABLE 1-2
SUMMARY OF WATER STORAGE FACILITIES

Reservoir Description	General Location/Land Ownership
1.6 MG Concrete Tank	Approximately 1.8 miles south of Sisters.
Abandoned embankment dam open air reservoir	Adjacent to the 1.6 MG concrete tank.

Distribution System

The City has approximately 190,000 linear feet (LF) of 6-inch diameter or larger piping in its distribution system, with an additional 9,000 LF of 4-inch diameter and smaller pipe. The distribution system piping consists of asbestos cement, polyvinyl chloride, high density polyethylene, cast iron, ductile iron, galvanized steel, and carbon steel piping. Piping within the distribution system generally ranges from 4- to 16-inch diameter, with the majority being 6-, 8-, 10-, and 12-inch diameter.



VICINITY MAP

LEGEND

- (R) RESERVOIR
- (W) WELL
- WATER MAINS
- CITY LIMITS

To Sweet Home

To Redmond

To Bend

WELL NO. 3

SISTERS

WELL NO. 2

WELL NO. 4

DISTRIBUTION SYSTEM

WELL NO. 1

RESERVOIR TRANSMISSION LINES

1.6 MG RESERVOIR NO. 1

T. 15 S., R. 10 E., W.M.

2,000 0 2,000

SCALE IN FEET

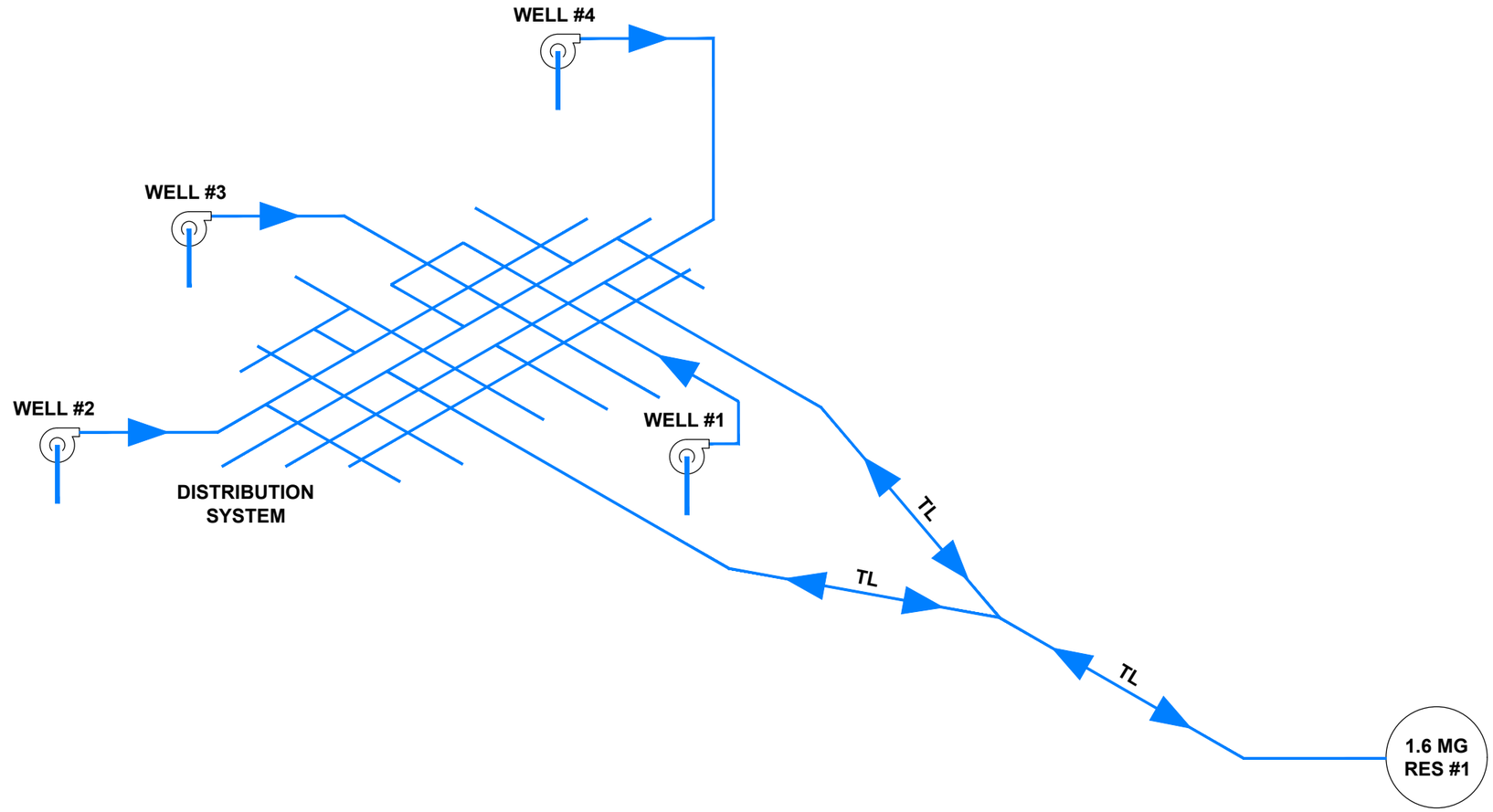
anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

EXISTING WATER SYSTEM LOCATION AND VICINITY MAPS

FIGURE 1-1

X:\Clients\Sisters OR\446-08 WSMP\GIS\446-08_WSMPaprx, WSMP-446-08-Fig1-1, 11/21/2022 11:58 AM, gsaurbier



ABBREVIATIONS

RES	RESERVOIR
TL	TRANSMISSION LINE

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OPERATIONAL OVERVIEW WATER SYSTEM

FIGURE
1-2

Chapter 2 - Water System Requirements

Introduction

This chapter of the Water System Master Plan (WSMP) Update presents basic information from which criteria have been developed for evaluating the City's water system. These criteria are used to determine the needed size or capacity of system improvements to serve the City for the 20-year planning period. Information concerning the service area, population projections, land use, water use, and state and federal requirements is presented.

Service Area

The term "service area" refers to the area being served with water from the City's water system. The present service area primarily consists of developed lands within the city limits. For the purposes of this WSMP Update, the future service area consists of the present service area and undeveloped areas within the urban growth boundary (UGB) as shown on Sisters' Planning and Zoning Map located in Appendix A. Land within the City's UGB is mostly developed with relatively small vacant lots distributed fairly evenly through the city limits.

The City is expecting residential, commercial, and industrial growth to continue, but the annexation of additional land beyond the available land within the UGB may or may not be required. In response to recent growth, the need for up to 100 acres but as little as no additional buildable land outside the City's current UGB has been identified.

Service Population and Planning Period

To estimate the demands that may be placed on a municipal water system, a determination of the population to be served must be made. Population estimates must be made with reference to time. Projections are usually made based on an annual percentage increase estimated from past growth rates, while considering future growth expectations. The addition or deletion of a major business, industry, or recreation use in the area could significantly affect the population and overall water system needs.

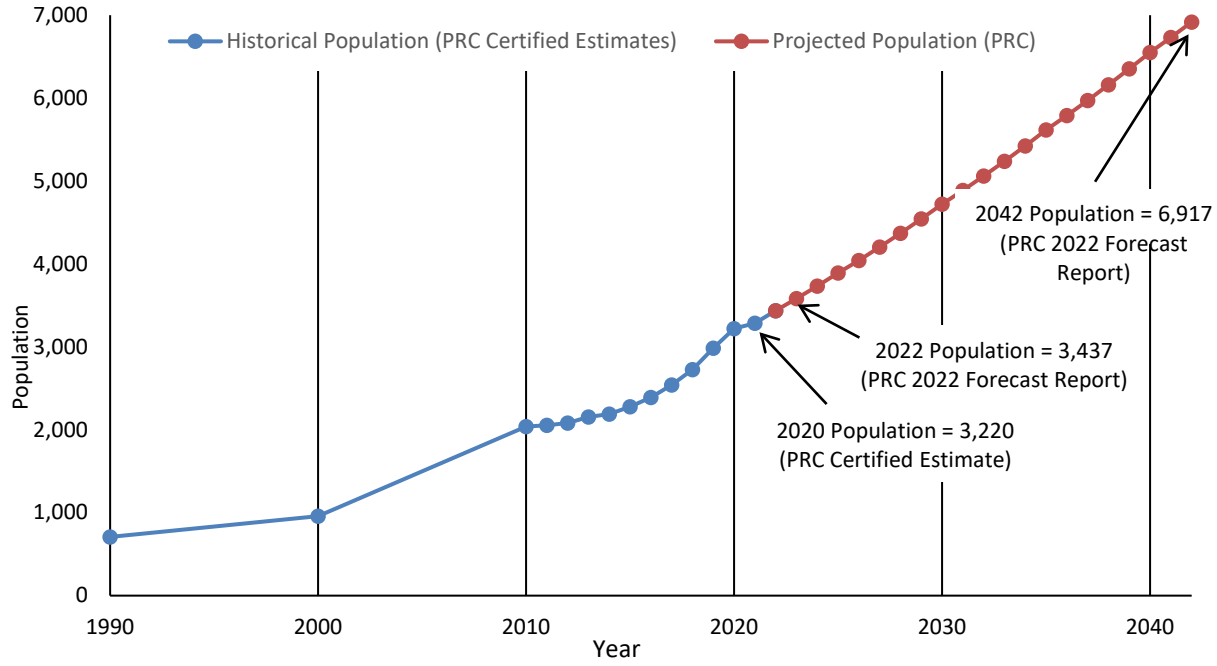
The period over which the population is to be projected usually depends on the type of improvements being considered. Improvements requiring long-term financing should be designed for no less than the term of the financing. Facilities that are readily expanded or modified normally have a ten- to 20-year design life. Facilities that are not easily modified or expanded, such as buried pipelines and storage reservoirs, may be designed for their expected life, which is usually 40 to 50 years, or more.

The historical population data for the City of Sisters, shown on Chart 2-1, were provided by the Population Research Center (PRC) located at Portland State University (PSU). This agency is the recognized primary source of population data available in Oregon between the official Census data generated at the beginning of each decade. Past population figures from the PRC and the Census show the City's population has increased steadily from 708 in 1990, to 959 in 2000, and 3,220 in 2020, respectively. This represents a historical growth rate between 1990 and 2000 of approximately 3.1 percent per year, and between 2000 and 2020 of approximately 6.2 percent per year. The City has experienced average annual growth rates of 6 to 10 percent between 2016 and 2020, which is a significantly higher rate than projected by the PRC. The PRC's population estimate for 2020 of 3,220 was

used as the base population to determine water system demands on a per capita basis in the development of this WSMP Update.

The PRC forecasts that the City of Sisters' population will increase to 6,551 and 7,505 in year 2040 and 2045, respectively. This equates to an annual rate of 2.75 percent between 2040 and 2045. Applying these growth rates to the design year results in a projected population of 6,917 in year 2042.

CHART 2-1
HISTORICAL AND PROJECTED POPULATION



In 2013, the Oregon Legislature passed House Bill (HB) 2253, which was signed by the governor. HB 2253 removed the responsibility for developing population projections from counties and assigned coordinated population forecasting to the PRC for cities and counties in Oregon outside the Portland metro boundary. HB 2253 was codified under Oregon Revised Statutes Chapter 195 and is further implemented under Oregon Administrative Rules (OAR) Chapter 660, Division 032. OAR 660-032-0020(1) requires local governments to use the most recent final population forecast when changing a comprehensive plan when the change is based on a population forecast. The PRC completed population projections for Deschutes County and all cities within the County, including the City of Sisters, in 2022.

Land Use

This WSMP Update has been prepared to consider water use requirements within the Sisters city limits and UGB. The City has established zoning within the city limits and within areas adjacent to the city limits in the UGB. The City's UGB currently has only a single plot of City-owned land, which is zoned as Public Facility (PF).

Within the city limits and UGB, the City has developed the zoning designations noted on Table 2-1.

TABLE 2-1
LAND USE DISTRICTS
WITHIN THE CITY LIMITS AND URBAN GROWTH BOUNDARY

City Zone	UGB Outside of City Limits
Airport (A)	UAR10
Downtown Commercial (DC)	
Highway Commercial (HC)	
Tourist Commercial (TC)	
Open Space (OS)	
Public Facility (PF)	
Light Industrial (I1)	
North Sisters Business Park (NSBP)	
Multi-Family Residential (MFR)	
Residential (R)	
Sun Ranch Residential (SRR)	
Pine Meadow Village Residential (R-PMV)	
Urban Area Reserve (UAR)	
Urban Area Reserve 10 Acre Min. (UAR10)	

The zoning classifications in the city limits and the UGB are shown on the City's Planning and Zoning Map located in Appendix A.

Regulatory Requirements

The City of Sisters' water system comes under the jurisdiction of the Oregon Health Authority - Drinking Water Services (DWS). The DWS assumed primacy (responsibility) from the U.S. Environmental Protection Agency (EPA) in February 1986 for enforcement of the federal Safe Drinking Water Act (SDWA). Therefore, the City is currently, and will principally be, working with the DWS as the regulating agency with regard to their water system.

Regulatory Background

The SDWA was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The law was amended in 1986 and 1996 and requires many actions to protect drinking water and its sources: rivers, lakes, reservoirs, springs, and groundwater wells. The primary regulations associated with the SDWA address requirements concerning trace minerals, compounds, and microorganisms that may affect the health of water consumers. The SDWA provides for monitoring, testing requirements, reporting, record keeping, and public notification procedures in the event of non-compliance.

The 1986 amendments to the SDWA included provisions for wellhead protection, new monitoring for certain substances, filtration for certain surface water systems, disinfection for certain groundwater systems, and restrictions on lead content in pipe solder and plumbing.

The 1996 amendments to the SDWA included provisions for consumer confidence reporting, stronger protection for microbial contaminants and disinfection byproducts, operator certification, lowering maximum contaminant levels (MCLs), and source water assessments.

Enacted in 1981, the Oregon Drinking Water Quality Act established periodically amended statutes and subsequent administrative rules to enforce, at a minimum, the federal SDWA requirements. The DWS administers and enforces drinking water quality standards for public water systems in the state of Oregon. The agency focuses resources in the areas of highest public health benefit and promotes voluntary compliance with state and federal drinking water standards. The DWS also emphasizes prevention of contamination through source water protection, provides technical assistance to water system owners, and provides water system operator training. They also work closely with public water systems to make sure public notification is made in accordance with regulatory guidelines when required. If the City is unaware of their compliance status or in need of regulatory guidance, it is recommended that the regional DWS office be contacted.

Recent Regulatory History (Past 15 Years)

Following is a list of regulations that have been enacted in the past 15 years:

1. **Reduction of Lead in Drinking Water Act.** This requires any new installation or purchase of materials used in potable locations to be "lead-free." Lead-free has been redefined as "(A) not containing more than 0.2 percent lead when used with respect to solder and flux; and (B) not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures." This law was enacted on January 4, 2014. Oregon requires drinking water components to be National Sanitation Foundation/American National Standards Institute Standard 61 compliant to meet the intent of this law.

2. **Stage 2 Disinfectants and Disinfection Byproduct Rule (D/DBPR).** This rule focuses on public health protection by limiting exposure to disinfection byproducts. The D/DBPR specifically targets total trihalomethanes and five haloacetic acids, which can form in water through disinfectants used to control microbial pathogens. This rule applies to all community water systems (CWSs) and non-transient non-community (NTNC) water systems that add a primary or residual disinfectant other than ultraviolet light. Stage 2 of the D/DBPR was enacted in 2012 for large CWSs and NTNCs and in October 2013 for all CWSs and NTNC water systems.

3. **Unregulated Contaminant Monitoring Rule (UCMR) 3**. The EPA uses the UCMR program to collect data for contaminants suspected to be present in drinking water but that do not have health-based standards set under the SDWA. Every five years, the EPA develops a new list of UCMR contaminants, largely based on the Contaminant Candidate List. OAR 333-061-0043 requires CWSs to report detection of unregulated contaminants in their annual Consumer Confidence Report.

4. **Revised Coliform Monitoring Requirements**. This rule requires that total coliform samples be collected by public water systems at sites representative of water quality throughout the distribution system according to a written sample site identification plan. Total coliform occurrence will continue to be investigated; however, it is no longer associated with an MCL. Emphasis will not be placed on the MCL for *E. coli* because it is a reliable indicator of fecal contamination. Monitoring changes were made that include reducing the number of repeat samples to collect after a routine coliform positive from four to three.

Potential Regulatory Changes

Following is a list of regulations that may be enacted in the future:

1. **Lead and Copper Rule Improvements (LCRI)**. The LCRI is a new regulation to better protect communities from exposure to lead in drinking water. The EPA intends to promulgate the LCRI prior to October 16, 2024, which will require that all lead service lines be replaced as quickly as feasible. Water systems will be required to prepare and maintain an inventory of service line materials by October 16, 2024.

2. **Radon in Drinking Water Rule**. This rule would attempt to reduce airborne and waterborne radon concentrations to limit exposure levels. This rule would apply to CWSs that use groundwater or mixed groundwater and surface water. The proposal is currently on hold, and the EPA has no timeline for publishing this rule.

3. **Fourth Contaminant Candidate List (CCL4) Regulatory Determinations**. The CCL4 is currently in draft form. The EPA has made a preliminary determination to regulate strontium, which is currently still pending. Two new nominated contaminates, manganese and nonylphenol, have been added for the final publication.

4. **Carcinogenic Volatile Organic Chemicals (cVOC) Rule**. The EPA is developing a proposed national primary drinking water regulation for a group of 16 known cancer-causing compounds, including eight currently regulated cVOCs and up to eight from the Third Contaminant Candidate List.

5. **Perchlorate Rule**. The EPA is developing a proposed national primary drinking water regulation for perchlorate. Perchlorate may cause adverse health effects. Scientific research indicates this contaminant can disrupt the thyroid's ability to produce hormones needed for normal growth and development.

6. **Hexavalent Chromium**. The EPA currently regulates hexavalent chromium as part of the total chromium drinking water standard. New information on health effects has become available since the original standard was set, and the EPA is reviewing this information to determine whether new health risks need to be addressed. The State of California has already implemented a hexavalent chromium-specific MCL.

7. **Fluoridation**. Fluoride MCLs may be lowered in the future as the health impacts of fluoride are fully realized. The current MCL of 4 parts per million could be reduced to 1 or less. This lower MCL could require systems with naturally occurring fluoride above the MCL to treat to reduce levels.

8. **Cybersecurity**. Executive Order 13636: Improving Critical Infrastructure Cybersecurity was established in February 2013. The order calls for the development of a voluntary, risk-based cybersecurity framework. The EPA will evaluate whether any additional authority and/or regulations to address cybersecurity in the water sector are needed.

Regulatory Requirements Summary

In summary, many regulations affect the operation of the City of Sisters' water system. The City has good water quality with a well-run water system meeting federal and state water quality criteria. The City's water quality testing history is documented on the DWS's publicly available Drinking Water Data Online website. On their website, the DWS has noted that the City has not had any regulatory violations in the past five years. The City's water system information as shown on the website is included in Appendix B.

The information presented herein is intended to provide the City with a brief summary of the regulations and possible future regulations that will likely affect the operation of the City's water system. These regulations continue to expand and will require careful attention to maintain compliance. It is recommended that the City consult periodically with the DWS to ensure compliance with current regulatory requirements and to address any regulatory questions or issues.

Seismic Risk Assessment and Mitigation Plan

To reduce risk and improve recovery for the next Cascadia earthquake and tsunami, the Oregon Resilience Plan (ORP) was developed in 2013 by the Oregon Seismic Safety Policy Advisory Commission. The goals of the ORP are to address critical infrastructure needed to supply water in the event of an emergency and identify projects that need to be completed in the next 50 years to ensure water can be supplied to a community in the event of a strong earthquake. Scientists have recognized the Cascadia subduction zone as an active fault that poses a major geological hazard to Oregon. The ORP addresses vulnerabilities of pipelines, treatment plants, water storage reservoirs, supply wells, and pump stations that compose Oregon's water and wastewater systems and discusses the intervention required to increase the resilience of infrastructure in the event of a Cascadia earthquake.

To assist in the goal of preparing communities, water systems that submit a WSMP to the DWS after January 10, 2018, are required to follow seismic assessment guidelines put forth by the DWS. CWSs with more than 300 connections must conduct a Seismic Risk Assessment and Mitigation Plan if any of their existing or proposed facilities are located in areas with moderate to very heavy damage potential as determined by the Oregon Department of Geology and Mineral Industries.

According to the ORP, the City of Sisters is located in a region of light impact resulting from a simulated magnitude 9 Cascadia earthquake. Therefore, a Seismic Risk Assessment and Mitigation Plan was not conducted as part of this WSMP Update.

Water System Sanitary Survey

The Deschutes County Environmental Health Division conducts water system sanitary surveys of communities on behalf of the DWS to assist with identifying potential contamination sources that may impact water quality. These surveys are generally scheduled to occur every three to five years.

The City of Sisters' latest sanitary survey was conducted on July 26, 2022. The only noted deficiency was a gap between the steel plate and the concrete pedestal on Well No. 1. The City has corrected this deficiency and reported the correction to the Deschutes County environmental specialist. A copy of the full July 26, 2022, sanitary survey is included in Appendix C.

Water Demand

Future water demands, for the purpose of identifying needed future water system improvements, can be estimated from past water use data and population projections. Water use data are usually expressed in terms of various rates of water used for various periods of time. This allows components of the water system to be sized for the maximum demands that will be placed on them. The rates of water use that are important in evaluating a water supply system are the average daily demand (ADD), which is the total amount of water used during a one-year period divided by 365 days; the maximum daily demand (MDD), which is the maximum total amount of water used during any 24-hour period; and the peak hourly or peak instantaneous demand, which is a measure of the maximum demand for water at any given time.

Water supply facilities are normally designed to provide enough capacity to meet the MDD. As a general rule, a water supply pump would be sized to supply the needed water during the MDD without continuous 24-hour operation. For example, if the water usage during high demand summer months required a water supply pump to operate 21 hours or more per day to keep up with the MDD, the situation may warrant the addition of another water supply source to provide some backup capability to avoid over-stressing the pumping equipment. Booster pumps and distribution pipelines are generally sized to deliver peak instantaneous demands (or peak hourly demands [PHD]) because they must be capable of meeting the highest system demand. Storage reservoirs are sized to make up the difference between water supply capacity and peak water use rates, at a minimum. Additional capacity (reserve) is usually provided in water storage reservoirs for both emergencies and fire suppression, as discussed in Chapter 4.

Per Capita Water Use

To be utilized for projecting future water demands, past water use data must be converted to a per capita (per person) rate of use. This is done by dividing the average daily, peak daily, and peak instantaneous water use rates by the number of people being served by the water system. These water demand rates are expressed as gallons per capita day (gpcd). These values multiplied by a population projected for some future year can provide estimated total demand rates for that year, assuming water use characteristics do not significantly change.

Historical Average Water Use

To determine current water demands, production records for the City's water supply system were reviewed from 2015 through 2020. Production volumes for Well No. 1 were reduced by 3.6 percent to account for a meter inaccuracy that was corrected in 2022. Production volumes for Well No. 4 were not available during the study period of this WSMP Update. Charts 2-2 through 2-4 present the total monthly production for each of the City's wells. It is important to note that the volume scale depicted on the left side of the charts has been adjusted based on the volume supplied by each well.

CHART 2-2
WELL NO. 1 MONTHLY PRODUCTION

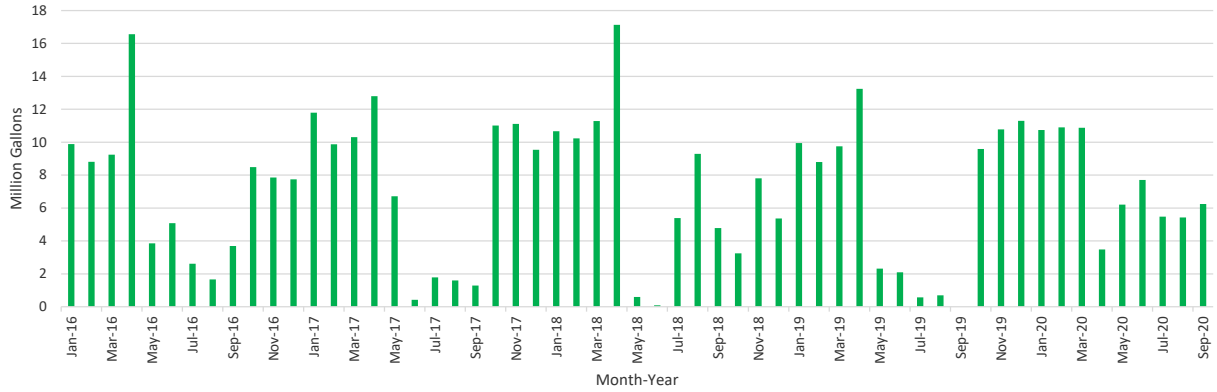


CHART 2-3
WELL NO. 2 MONTHLY PRODUCTION

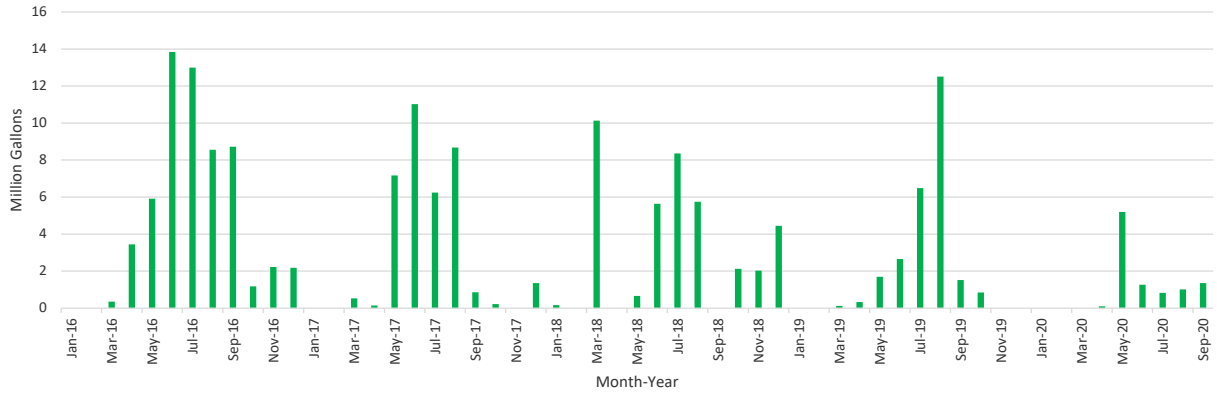
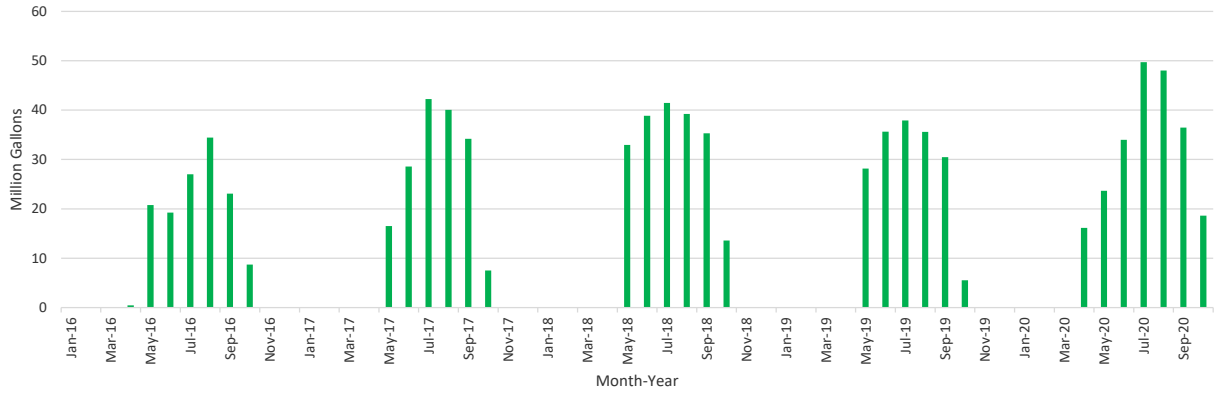


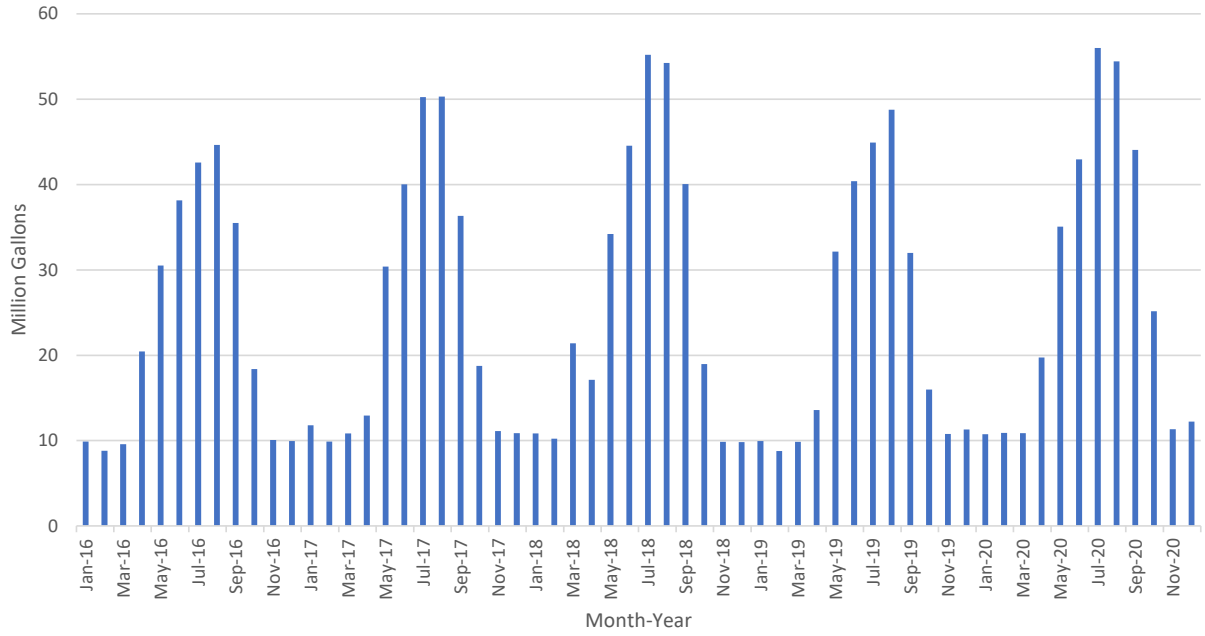
CHART 2-4
WELL NO. 3 MONTHLY PRODUCTION



As shown in the charts, the majority of the City's water supply is from Wells No. 1 and 3. Well No. 1 is primarily used for supply during winter months, while Well No. 3 is primarily used during summer months. Well No. 4, which was brought online in December 2021, is currently used for supply during periods of high demand and during transition periods in the spring and fall of each year.

The combined monthly production from the City's surface water source and wells is shown on Chart 2-5.

CHART 2-5
COMBINED WELL SOURCES MONTHLY PRODUCTION

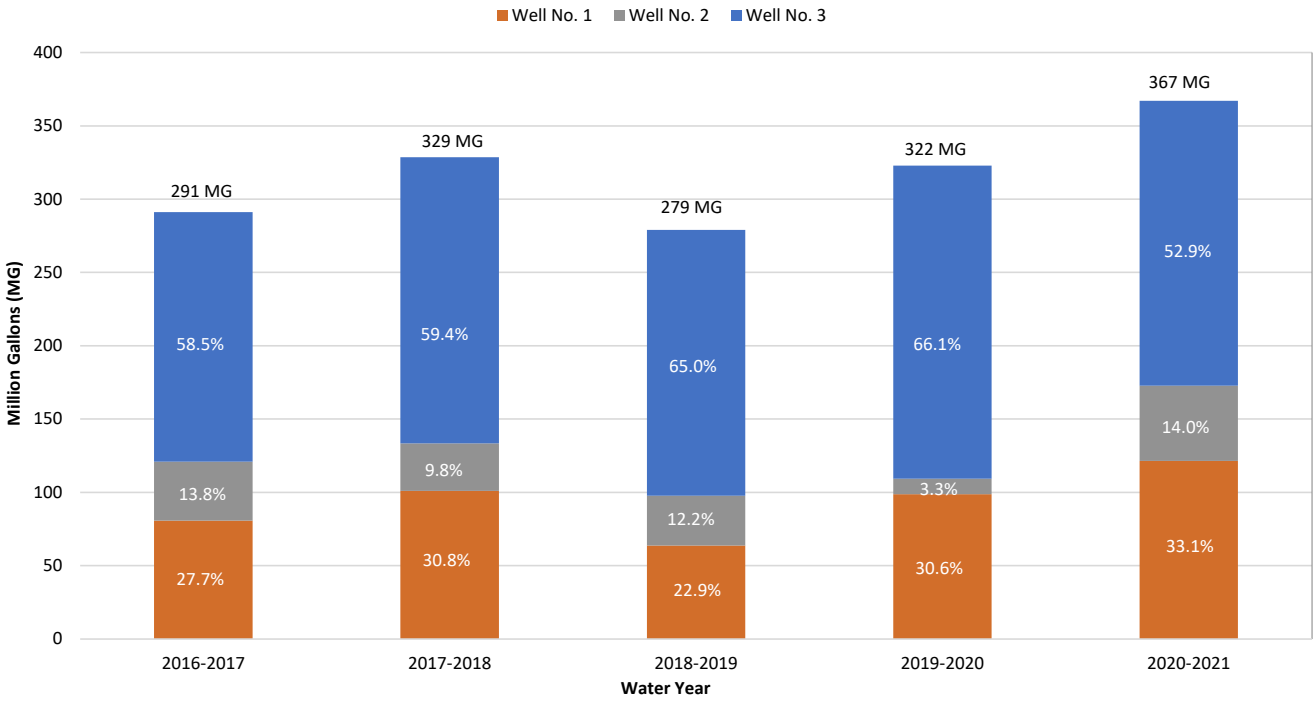


The total production records show typical patterns of high summer demand, increasing and decreasing spring and fall demand, respectively, and low winter demand. The data depicted on Chart 2-5 show that typical summer demands are generally more than 4.5 times higher at their peak than winter demand. This winter to summer variance, which is typical of many central and eastern Oregon cities, is likely due to the dry summers where City water is the only means of irrigation within city limits. The peak could also be magnified by the large influx of tourism during warm summer months.

The highest water production month between January 2016 and December 2020 occurred in July 2020 with 56.0 million gallons (MG) of water produced, or an average production rate of 1.81 million gallons per day (MGD). The lowest water production month occurred in February 2019 with 8.9 MG produced. Water production consistently falls to approximately 10.0 MG per month during winter months.

The total annual production from all City water supply sources was further broken into a percentage supplied by each source between October 2016 and September 2021, as shown on Chart 2-6. It should be noted that the volumes presented on Chart 2-6 are for the water year as reported on the Oregon Water Resources Department water use reporting website, starting October 1 and ending September 30 (example: the 2016 water years begins October 1, 2015, and ends September 30, 2016).

CHART 2-6
TOTAL ANNUAL WATER PRODUCTION



As shown on Chart 2-6, total annual production for the five years analyzed has averaged approximately 318 MG per year. The following annual production trends were noted:

- The majority of the City's water produced (approximately 60 percent) is from Well No. 3. Well No. 3 is generally not used during winter months.
- Well No. 1 produces approximately 29 percent of the City's water supply. Well No. 1 is primarily used to produce the City's winter water demand.
- The least of the City's water supply (approximately 11 percent) is from Well No. 2. Well No. 2 is more consistently used year-round apart from a few winter months when demand is at its lowest.

Average Daily Demands

The ADD is a measure of the overall annual average rate of consumption. It is derived, in general, by dividing the total water produced during the year by the estimated population for that year. The ADDs for years 2016 to 2020 are noted on Table 2-2 and stated in various units for comparison purposes.

TABLE 2-2
AVERAGE DAILY DEMAND

Year	Total Production (MG)	Population*	ADD		
			gpd	gpm	gpcd
2016	279	2,390	763,368	530	319
2017	294	2,540	804,225	558	317
2018	327	2,725	894,704	621	328
2019	278	2,985	762,985	530	256
2020	334	3,220	913,842	635	284

**Annual population data from PSU PRC.*
gpd = gallons per day
gpm = gallons per minute

The ADD for all customer water use for the years 2016 through 2020 was determined to be 301 gpcd. Of this, approximately 60 percent has been calculated to be associated with residential water use. The remaining water demand is attributed to municipal, bulk water, irrigation, commercial businesses, and industry. Applying the ADD current year (2022) and planning year (2042) populations, the ADDs for these years are 1.035 MGD and 2.082 MGD, respectively.

Maximum Daily Demands

The MDD values presented on Table 2-3 represent the one day of the year with the highest daily production. MDDs usually occur during a particular day from June through September, which is when water use is normally at its greatest due to warmer weather and irrigation needs. Peak daily flows can occur in other months but normally occur during the hottest period of the year. Records of peak daily flows and the associated total production from January 2016 through December 2020 were obtained from the City. The highest MDD from the period of January 2016 through December 2020 occurred on August 5, 2020. A MDD peaking factor is the MDD divided by the ADD for a given year. The highest MDD peaking factor from the period of January 2016 through December 2020 occurred on August 5, 2020, and was 3.00. Table 2-3 shows the peak daily use of each year from 2016 through 2020 and its associated peaking factor.

TABLE 2-3
MAXIMUM DAILY DEMAND

Year	Day of Peak Flow	Total Daily Production (MG)	Population	MDD (gpcd)	ADD (gpcd)	MDD Peaking Factor (PDD/ADD)
2016	June 30	1.987	2,390	831	319	2.60
2017	August 3	2.367	2,540	932	317	2.94
2018	July 28	2.562	2,725	940	328	2.86
2019	July 15	2.191	2,985	734	256	2.87
2020	August 5	2.740	3,220	851	284	3.00

The average MDD peaking factor for years 2016 through 2020 shown on Table 2-3 is 2.85. On a per capita basis, the MDD is 855 gpcd. Applying the average peaking factor to the ADD of the current

year (2022) and planning year (2042), the MDD for these years are 2.95 MGD and 5.93 MGD, respectively.

Generally, a water supply system, at a minimum, needs to be able to supply water to meet the system's MDD. In the City's case, where water supply is taken from several wells, it is desirable to be able to meet the MDD with the largest source offline and other sources pumping a maximum of 21 hours per day. This allows a three-hour rest period to provide the pumps adequate rest time between cycles and allows some recharge of the wells during the non-pumping period.

Comparison of Water Demands

The City's ADD of 301 gpcd is higher than most other water systems in central and eastern Oregon. However, the 855 gpcd MDD is similar to several other communities in central and eastern Oregon. The higher ADD may be attributed to the City's large commercial/industrial water users. Refer to Table 2-4 for a comparison of the City of Sisters' demands compared to other central and eastern Oregon communities. Table 2-4 is sorted by ADD in ascending order.

TABLE 2-4
COMPARATIVE WATER USAGE TYPICAL FOR
METERED WATER SYSTEMS IN CENTRAL AND EASTERN OREGON

City	ADD (gpcd)	MDD (gpcd)	Peak Factor (maximum daily)	Population[1]
Echo, Oregon	175	525	3.0	700
Prineville, Oregon	176	405	2.3	8,889
Ice Fountain Water District, Oregon	207	621	3.0	1,921
Umatilla, Oregon	210	483	2.3	4,686
Baker City, Oregon	227	834	3.7	10,035
La Grande, Oregon	230	667	2.9	13,238
Union, Oregon	230	890	3.9	2,121
Vale, Oregon	250	625	2.5	1,890
Hermiston, Oregon	250	600	2.4	17,730
John Day, Oregon	270	865	3.2	2,010
Boardman, Oregon[2]	275	960	3.5	3,445
Stanfield, Oregon	275	660	2.4	2,130
Enterprise, Oregon	284	582	2.0	1,940
Irrigon, Oregon	290	800	2.8	1,790
Ontario, Oregon[3]	296	533	1.8	11,485
Milton-Freewater, Oregon	300	750	2.5	6,550
Sisters, Oregon	**301**	**855**	**2.9**	**3,220**
Hines, Oregon	350	1,600	4.6	1,700
Ontario, Oregon[4]	515	840	1.6	11,485

[1]Population estimates reflect the time period when demands were calculated.

[2]Includes only City water use (does not include Port of Morrow).

[3]Includes all users except Heinz.

[4]Includes all users.

Description of Customers Served

The City of Sisters' water service accounts as of the end of 2020 are summarized on Table 2-5. These data were obtained from City staff and included water use data from January 2016 to September 2021.

TABLE 2-5
YEAR 2020 WATER ACCOUNT INFORMATION

Account Type[1]	2020 Number of Accounts[2]	2020 Total Annual Use (MG)	2020 Average Annual Use Per Account (gallons)	Percentage of Total Water Use
Residential Single-Family	1,445	154.3	106,785	55
Residential Multi-Family	32	14.0	437,567	5
Industrial/Commercial	231	63.0	272,547	23
City-Owned	44	9.2	208,740	3
Irrigation	45	36.6	812,867	13
Other	23	3.0	130,245	1
Total	**1,820**	**280.1**	**-**	**100**

[1] Account types were consolidated from City designations into general type.

[2] The number of accounts by account type was taken from December 2020 of the City-provided summary of Consumption by Size and Class, 2016 to 2021.

As shown on Table 2-5, residential water use accounts for approximately 60 percent of the total water use in the City, while industrial and commercial water use accounts for approximately 23 percent. Irrigation services, which account for 13 percent of the City's water use, allow some developments to manage irrigation through a larger area, opposed to individual users being responsible for their own irrigation.

For residential single-family water service accounts, which is also considered an equivalent dwelling unit (EDU), the average usage for years 2016 through 2020 is approximately 300 gallons per account per day. Using these data, the number of EDUs within the City in the current year and planning year is 3,448 and 6,940, respectively. It is noted that the total volume of water consumed is less than supplied for year 2020. The difference between supply and consumption is referred to as non-revenue or unaccounted for water. Sources of non-revenue water include, but are not limited to, leaks, pumping to waste during well pump starts, unmetered usage by fire districts and/or the City, storage tank overflows, meter inaccuracies, and unauthorized use. Non-revenue water is discussed further in Chapter 5

Peak Hourly Demand

PHD is the highest water demand of the year during any 24-hour period and does not include fire demand. As hourly consumptive use data are not available for the City, the PHD was calculated using the Washington State Department of Health - Water System Design Manual (2020), equation 3-1. Using this method, the estimated PHD for the current year and planning year are 3,428 and 6,745 gpm, respectively.

Estimated Buildable Lands Capacity

In recognizing the potential need to provide additional water service to undeveloped areas within the UGB, a comparison of a potential population increase associated with future developed land within the City's UGB was undertaken. The 2019 City of Sisters Housing Needs Analysis prepared by Johnson Economics estimated that within the UGB there were a total of 835 potentially developable residential lots. Using an average persons per household of 2.4, this equates to a growth of approximately 2,004 persons from 2019. In comparison with the population projections shown on Chart 2-1, the City could anticipate completing this full buildout within the UGB by year 2031, which is prior to the design year of 2042.

It should be recognized that over the planning period of this WSMP Update, actual growth could exceed or fall below the projections presented on Chart 2-1 and discussed herein.

Fire Demand

Fire Protection Ratings

Flow rates for fire suppression in residential, commercial, and industrial areas within developed communities are usually determined from the size, density, and occupancy of buildings, type of construction materials, and desired fire insurance rating. Incorporated cities and some rural areas are given a fire suppression rating by Insurance Services Office, Inc. (ISO). The rating is used by insurance companies to determine the cost for providing fire insurance to home and business owners. ISO's fire suppression rating schedule is used to review those features of available public fire protection that have a significant influence on minimizing damage once a fire has begun. These features include the receiving and handling of fire alarms; the fire district's manpower, equipment, and training; and the capability of the water system to provide the needed fire flows (NFF).

ISO periodically evaluates fire suppression capabilities of incorporated cities and fire departments. The numerical ratings range from Class 1 down to Class 10, with Class 1 indicating the highest fire suppression capability and Class 10 the lowest. A Class 10 rating is reserved for unprotected areas that have no fire department and no water supply system. Most protected areas outside of cities have a Class 9 rating, and cities with fire departments serving communities with populations between 10,000 and 20,000 generally have class ratings between 4 and 6. The ISO rating for Sisters, based on the 2017 evaluation, is Class 3. It is recommended the City obtain an updated ISO evaluation and report if any large water system or fire department improvements have occurred, as this could result in an improved fire suppression rating.

ISO's fire suppression rating schedule evaluates a city's fire department capabilities and the domestic water supply capacity on an approximately equal basis (50 percent and 40 percent of the rating schedule, respectively). To reduce the cost of fire insurance in a community, improvements usually must be made to the fire department, the water system, or both, depending on their present condition. It is difficult to determine possible fire insurance savings on commercial buildings because the insurance costs are determined by many other factors related to the type of occupancy and the type of building construction.

Needed Fire Flows

ISO also recommends fire flows for various conditions in both residential and commercial settings. NFF for residential areas are set forth in the 2012 ISO Fire Suppression Rating Schedule and shown on Table 2-6, below.

TABLE 2-6
INSURANCE SERVICES OFFICE, INC.,
NEEDED RESIDENTIAL FIRE FLOWS

Distance Between Buildings	Needed Fire Flows
More than 30 feet	500 gpm
21 to 30 feet	750 gpm
11 to 20 feet	1,000 gpm
10 feet or less	1,500 gpm

Needed fire flows for commercial buildings are based on many factors including building size, construction materials used, and what is housed in the building.

The Oregon Fire Code (OFC) requires a minimum flow of 1,000 gpm in residential areas and a minimum of 1,500 gpm for a minimum of two hours in all other occupancies. These requirements increase with square footage of the building and can be quite large for commercial and institutional buildings (schools). These fire flows must be maintained with a system-wide minimum of 20 pounds per square inch residual pressure. Attaining the required fire flow for commercial areas may not be realistically achievable. The OFC has an allowance for decreases in fire flow for small communities (if approved by the local fire chief), where development of full fire flow is impractical.

ISO reports typically include a Hydrant Flow Data Summary that recommends NFF protection rates for both residential and commercial districts to receive full credit ratings. ISO does not consider NFFs over 3,500 gpm in determining the public protection classification for cities. Specific properties with an NFF in excess of 3,500 gpm are evaluated separately and assigned an individual public protection classification. Based on discussions with the City Public Works Department and City engineers, the following fire flow design criterion for this WSMP Update was developed:

- Public facility zones: 2,500 gpm for two hours
- Commercial and industrial areas: 2,000 gpm for two hours
- Residential zones: 1,500 gpm for two hours

As discussed further in Chapters 4 and 5, the NFF of 2,500 gpm for two hours was used to evaluate existing and future water storage requirements, while flows ranging from 1,500 gpm to 2,500 gpm were applied within specific land use zones to evaluate the distribution system's ability to deliver such flows to those zones.

Design Criteria

In establishing design standards for a water system, primary consideration must be given to state and federal rules and regulations governing water quality and construction standards for water systems. These regulations are set by both the EPA and the DWS. In addition to public health and safety requirements, many other factors control the design parameters for municipal water systems. The City

must evaluate factors such as financial feasibility, philosophy and policies of the City Council, past system performance and service, and expectations of the water users. All these factors are important and influence the standards by which water system improvements are made.

Figure 2-1 presents a summary of the water system design criteria developed based on the population projections from the PRC and historical per capita demands through the study period. These criteria have been used to evaluate the existing water system and develop potential improvement options to satisfy present and future water system needs. Application of these criteria is discussed further in the specific chapters that address the water supply, storage, and distribution system facilities. Figure 2-1 presents design criteria based on a service population in 2022 of 3,437, and the corresponding calculated ADD, MDD, and PHD plus NFF. Design criteria are also shown for the design year 2042 with a population of 6,917. The design criteria presented on Figure 2-1 are used as base information in later chapters for evaluating existing and future system needs and capacity.

SUMMARY OF DESIGN CRITERIA

	Base Year 2020	Year 2022	Design Year 2042
Design Population[1]	3,220	3,437	6,917
Supply			
Average Daily Demand[2] (ADD) (gpcd)	301	301	301
ADD (gpd)	969,200	1,034,500	2,082,000
ADD (gpm)	670	720	1,450
Maximum Month ADD[3] (gpcd)	632	632	632
Maximum Month ADD (gpd)	2,035,400	2,172,500	4,372,200
Maximum Month ADD (gpm)	1,410	1,510	3,040
Maximum Daily Demand[4] (MDD) (gpcd)	858	858	858
MDD (gpd)	2,762,300	2,948,400	5,933,700
MDD (gpm)	1,920	2,050	4,120
EDU[5] (units)	3,447	3,448	6,940
EDU_{MDD}[6] (gpd)	801	855	855
Peak Hourly Demand[7] (gpm)	3,212	3,428	6,745
Peak Hourly Demand Factor	4.8	4.8	4.7
Fire Demand			
Residential Zones (gpm)	1,500	1,500	1,500
Commercial/Industrial Zones (gpm)	2,000	2,000	2,000
Public Facility Zones (gpm)	2,500	2,500	2,500
Duration (hour)	2	2	2
Minimum Residual Line Pressure Under Peak Demands Plus Fire Flow (psi)	20	20	20
MDD plus Fire Flow[8] (gpm)	4,420	4,550	6,620

[1]Population estimate and projections are from the Population Research Center at Portland State University.

[2]ADD calculated from historical records provided by City staff for years 2016 to 2020.

[3]Maximum month ADD peaking factor of 2.10 x ADD calculated from historical records provided by City staff from year 2018.

[4]MDD peaking factor of 2.85 x ADD calculated from historical records provided by City staff for years 2016 to 2020.

[5]EDUs calculated as ADD/average consumption per single-family residential account from 2016 to 2020 of 300 gpd per account.

[6]MDD divided by EDUs.

[7]Estimated peak hourly demand exclusive of fire flow. EDU-based peaking factor from Water System Design Manual, Washington Department of Health, 2020.

[8]Peak daily demand plus City Engineer-recommended fire flow of 2,500 gpm.

EDU = Equivalent Dwelling Unit

EDU_{MDD} = Maximum day demand per EDU

gpcd = gallons per capita per day

gpd = gallons per day

gpm = gallons per minute

psi = pounds per square inch

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

SUMMARY OF DESIGN CRITERIA

FIGURE
2-1

Chapter 3 - Water Supply and Treatment

This chapter includes a description of the City of Sisters' current water supply and treatment system and a discussion of its capacity to meet present and future needs. Alternatives for addressing deficiencies within the present system and for meeting future needs are outlined herein. Water rights, well water levels, and water supply quality are also discussed in this chapter. Cost estimates for potential viable water supply alternatives are discussed herein and summarized in Chapter 6.

Water Supply Sources and Treatment

Currently, the City of Sisters' water supply comes from one groundwater source in the Upper Deschutes Basin and is supplied by four wells. The locations of the City's production wells are shown on Figures 1-1 and 1-2 in Chapter 1. A description of each water supply source and the treatment process used for each source is discussed herein. *Ground-Water Hydrology of the Upper Deschutes Basin, Oregon,* prepared by the U.S. Department of the Interior and the U.S. Geological Survey (USGS) in 2001, was referenced for background water supply information.

Although the City also holds surface water rights for the use of water from Pole Creek and Whychus Creek, surface water is not currently used as a source for the City's municipal water supply system. The City does not have any interconnections with other municipal water supply systems.

Regional Aquifer System

The City's wells produce water from a volcanic and sedimentary rock aquifer, which is likely correlative to the Deschutes Formation. Groundwater flow direction in the region is generally to the northeast, driven by a groundwater hydraulic gradient fed by rainfall and snowmelt recharge originating in the Cascade Range from the southwest and smaller amounts locally. The aquifer's composition of volcanic rock consists primarily of Pliocene and younger basaltic rocks, as well as unconsolidated volcanic deposits including ash and cinders. The permeability of the various rock types is variable and may include interflow zones and faults in basaltic lava flows.

In 1998, USGS completed a study demonstrating that existing and new uses of groundwater in the Deschutes Basin Study Area impact the flows in the Lower Deschutes River Scenic Waterway. As a result, the Oregon Water Resources Department (OWRD) developed the Deschutes Basin Groundwater Mitigation Program in 2002, and any groundwater permits issued after 2022 have required the City to provide mitigation to offset the effects of groundwater pumping on surface water. The City holds one permit, G-16794, which requires mitigation in the Whychus Creek Zone of Impact.

Mitigation for new groundwater uses is provided by completing mitigation projects that result in water being legally protected in-stream, such as a permanent in-stream water rights transfer. To meet the mitigation obligation for a new groundwater permit, the applicant can either complete their own mitigation project or obtain mitigation credits from a mitigation bank or other credit holder that has already completed a project. Historically, the City has established mitigation credits

via in-stream transfer of its existing municipal water rights in the Pole Creek watershed and by cancellation or in-stream transfer of water rights for the Lazy Z Ranch. Generally, each acre-foot (AF) of water legally protected in-stream equals one mitigation credit.

Groundwater Supply

Currently, the City utilizes four wells for all of its production. The four City wells are constructed in unconfined volcanic and sedimentary rock aquifers. Well No. 4 was brought online in December 2021, and a reference static water surface level for Well No. 4 has not yet been established. General information for each well is summarized on Table 3-1.

TABLE 3-1
WELL INFORMATION[1]

Parameter/Well	No. 1	No. 2	No. 3	No. 4
Date Drilled	1975	1991	2007	2021
Depth, feet	211	302	293	293
Static Water Level[1], feet BGS	85	101	73	77
Pumping Water Level[1], feet BGS	90	101	79	90
Drawdown, feet	5	0.3	6	13
Reported Sustainable Withdrawal Rate[1], gpm	1,315	1,200	2,500	1,970
Specific Capacity[2], gpm/ft	260	4,000	415	150
Pump Type	LST	LST	LST	LST
Installed Hp	75	75	150	150
Pump Setting (feet BGS)	150	158	150	160
Reference Static WSL (feet BGS)	107	118	73	N/A

[1]As reported on the OWRD Well Driller Report.

[2]Capacity is a measure of the well production per foot of water drawdown in the well while pumping.

BGS = below ground surface

gpm = gallons per minute

gpm/ft = gallons per minute per foot

Hp = horsepower

LST = line shaft turbine

N/A = not available

WSL = water surface level

Data Source: OWRD Well Report Query, State of Oregon Water Supply Well Report

Each wellhead is enclosed within mechanical buildings at each site and equipped with a human machine interface, programmable logic controller, and radio telemetry units and antenna. The transmission of information between each source and the City's supervisory control and data acquisition (SCADA) master station located in the wastewater operations building allows operators to monitor and control well pump operations remotely from the master computer. Operators can use mobile devices to monitor pump operations remotely.

A brief description of each well and installed equipment currently being used by the City to supply drinking water is presented hereafter. Well construction information was obtained from OWRD well logs. More information about each well obtained from the OWRD and City records can be found in Appendix D.

Well No. 1

Well No. 1 is located approximately 0.5 mile south of U.S. Route 20 off Three Creeks Road. The well was constructed in 1975 to a depth of 211 feet. A 14-inch casing is present from 2 feet above ground surface to 100 feet BGS, a 12-inch diameter casing is present from 25 feet BGS to 111 feet BGS, and a 10-inch casing is present from ground surface to 195.6 feet BGS. Perforations in the casing begin at 50 feet BGS and are 1/4-inch by 6-inch and 1/4-inch by 2-inch in size. The well was sealed with cement and bentonite from the ground surface to 40 feet BGS. The original well test reported a yield of 1,315 gpm and a drawdown of 5.25 feet.

Well No. 1 Equipment and Enclosure

Well No. 1 is equipped with a 75-Hp LST pump set at approximately 150 feet BGS, a propeller-type flowmeter, a pump-to-waste valve and piping arrangement, and chlorine injection line. The pump motor was rebuilt most recently in 2011, at which time the pump was also replaced. A soft starter was installed in 1995, which can be operated remotely via the SCADA system. The concrete masonry unit (CMU) wellhouse was constructed in 1976. The building needs to be rebuilt, lacks adequate space for current electrical installations, and is not adequately ventilated. The building has a separate chlorine gas room. Both rooms are spatially constrained, which hinders major maintenance activities. A Detroit Diesel 125-kilowatt (kW) diesel-fueled standby power generator set was installed circa 2005 with a subbase fuel storage of 100 gallons. The City maintains a full 700-gallon fuel trailer that can be used to refill generators in a sustained outage situation.

Well No. 2

Well No. 2 is located near Sisters Middle School at the intersection of McKinney Butte Road and North Freemont Street. The well was constructed in 1991 to a depth of 302 feet. An 18-inch diameter casing is present from 1 foot above ground surface to 39 feet BGS. Inside the 18-inch casing is a 14-inch diameter liner present from 1.5 feet above ground surface to 244 feet BGS. Within the 14-inch diameter liner is a 10-inch diameter liner present from 238 feet to 302 feet BGS. Perforations in the casing are located from 242 feet to 302 feet BGS and are 1/8-inch by 3-inch. The well casing is sealed with cement from the ground surface to 39 feet BGS. The original well was reported to have a yield of 1,200 gpm with 0.3 foot of water level drawdown.

Well No. 2 Equipment and Enclosure

Well No. 2 is equipped with a 75 Hp LST pump set at approximately 160 feet BGS, a propeller-type flowmeter, a deep well pump control valve, a pump-to-waste valve and piping arrangement, and chlorine injection line. The pump motor was rebuilt in 2011. The CMU wellhouse was constructed in 1992 with two rooms and is generally in good condition. One room houses the piping, valving, metering, and electrical controls. The other room houses an on-site sodium hypochlorite generation system. Electrical equipment includes a soft starter and radio-controlled telemetry system that allows remote operation. The electrical controls were replaced in 1995. A Detroit Diesel 125 kW diesel-fueled standby power generator set was installed circa 2005 with a subbase fuel storage of 100 gallons.

Well No. 3

Well No. 3 is located southwest of the Sisters Eagle Airport at the intersection of Sun Ranch Drive and West Heising Drive. The well was constructed in 2007 to a depth of 293 feet. A 16-inch diameter steel casing is present from 2 feet above ground surface to 195 feet BGS. A 14-inch stainless steel wire wrap screen is present from 188 feet to 268 feet BGS followed by a 14-inch diameter steel liner from 268 feet to 283 feet BGS. The well casing is sealed with cement from ground surface to 130 feet BGS, followed by bentonite chips from 130 feet to 170 feet BGS, followed by cement from 170 to 195 BGS. The original well yield is reported to be 2,500 gpm with 6 feet of water level drawdown.

Well No. 3 Equipment and Enclosure

Well No. 3 is equipped with a 150 Hp LST pump set at approximately 150 feet BGS, an electromagnetic flowmeter, a deep well pump control valve, a pump-to-waste valve and piping arrangement, a check valve, an air release valve, a sample tap, and a chlorine injection line. The CMU wellhouse was constructed in 2007 with a single room that houses the piping, valving, metering, electrical controls, and an on-site sodium hypochlorite generation system. Electrical equipment consists of a soft starter, well level monitoring system, and radio-controlled telemetry system that allows remote operation. Disinfection is provided with a 0.8 percent hypochlorite solution generated on site by an Evoqua OSEC system, injected into the discharge manifold with one of two Grundfos chemical metering pumps. Well No. 3 does not have backup power.

Well No. 4

Well No. 4 is located off Locust Street within the Sisters Creekside Campground near the east entrance. The well was constructed in 2021 to a depth of 293 feet. A 16-inch diameter steel casing was installed 4 feet above ground surface to 200 feet BGS. A 12-inch diameter continuous wire wrap stainless steel screen was installed from 190 to 290 feet BGS, followed by a 12-inch diameter steel sump from 290 to 293 feet BGS. The well casing is sealed with bentonite chips from ground surface to 115 feet BGS and cement with 5 percent bentonite chips from 115 to 137 BGS. The original well yield was reported to be 1,970 gpm with 13 feet of water level drawdown.

Well No. 4 Equipment and Enclosure

Well No. 4 is equipped with a 150-Hp LST pump set at approximately 160 feet BGS, an electromagnetic flowmeter, a deep well pump control valve, a pump-to-waste valve and piping arrangement, a check valve, an air release valve, a sample tap, and a chlorine injection line. The CMU wellhouse was constructed in 2021 with a single room that houses all components and equipment other than the generator set. Electrical equipment includes a VFD, well level monitoring system, and radio-controlled telemetry system that allows remote operation. A Kohler 250 kW diesel-fueled standby power generator set was installed in 2021 with a subbase fuel storage of 500 gallons.

Water Levels in Wells

Periodical monitoring of well water levels provides the ability to determine if any trends show decreased capability of an aquifer or a specific well to provide the desired water flow. The City measures and reports well water levels every year and has a robust water level dataset. The City has recorded water levels in the recently constructed Well No. 4, but available water level data are limited.

Groundwater recharge is primarily affected by annual precipitation in the Cascade Range to the west on the eastern slopes of the Cascade Range. Snowmelt and rain percolate down to the water table, where it then flows down the hydraulic gradient to the north and east toward the Deschutes River. Groundwater level monitoring data on four wells near the region of the City show varying levels that correlate with climate trends with an observable lag of a few years. Groundwater level data from OWRD Observation Well DESC 3016, which is located in the City, documents the typical water level fluctuations over time in the City's vicinity. The City's wells water level fluctuations all correlate with the trend recorded by Observation Well DESC 3016. Groundwater levels have been declining since approximately 2015; however, the current levels are near or above those measured in 1996. Currently, only Well No. 2 has a water level lower than that measured during the original well construction.

A summary of historic water levels and associated trends in each City well is graphically presented for Wells No. 1, 2, and 3 on Charts 3-1, 3-2, and 3-3, respectively. During the preparation of this Water System Master Plan (WSMP) Update, Well No. 4 had only two years of limited documented water level measurements, which is too short of a duration to evaluate long-term trends. The well reference elevation (Ref El.) refers to the level of which any water level decline will be compared. A static water surface level decline of 25 feet or more below the reference elevation requires action by the City, including discontinued or reduced use of the source until the water level recovers. Currently, no City wells have static water levels that are more than 25 feet below the reference levels.

CHART 3-1
WELL NO. 1 - DESC 3023 AND STATE OBSERVATION WELL WATER LEVEL HYDROGRAPH

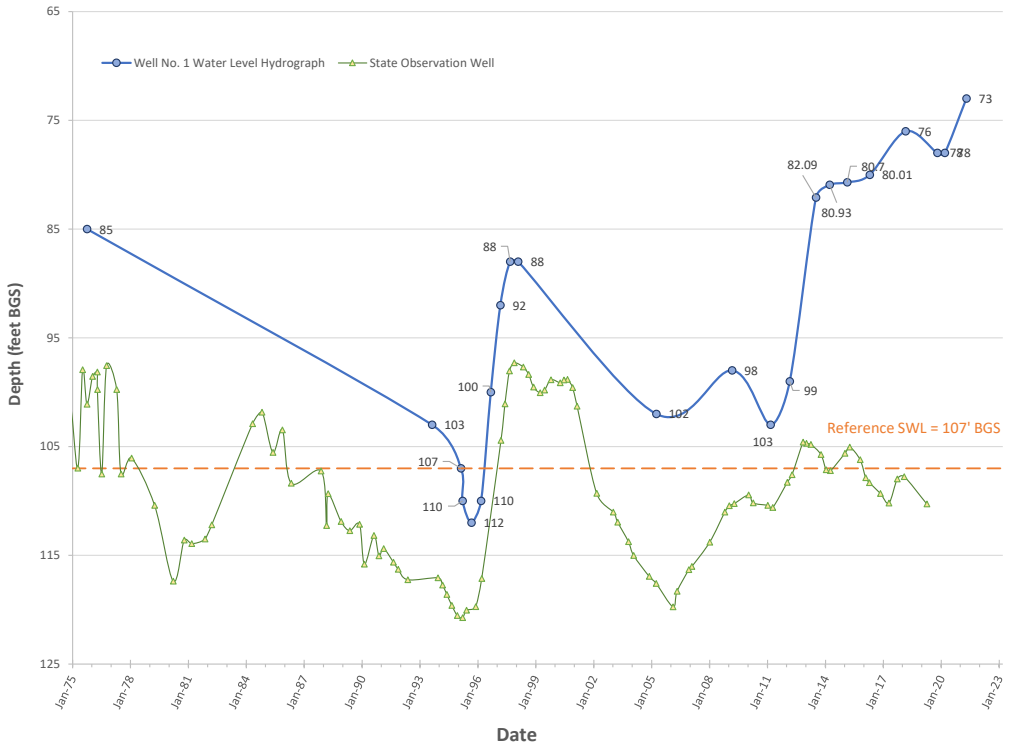


CHART 3-2
WELL NO. 2 - DESC 1034 AND STATE OBSERVATION WELL WATER LEVEL HYDROGRAPH

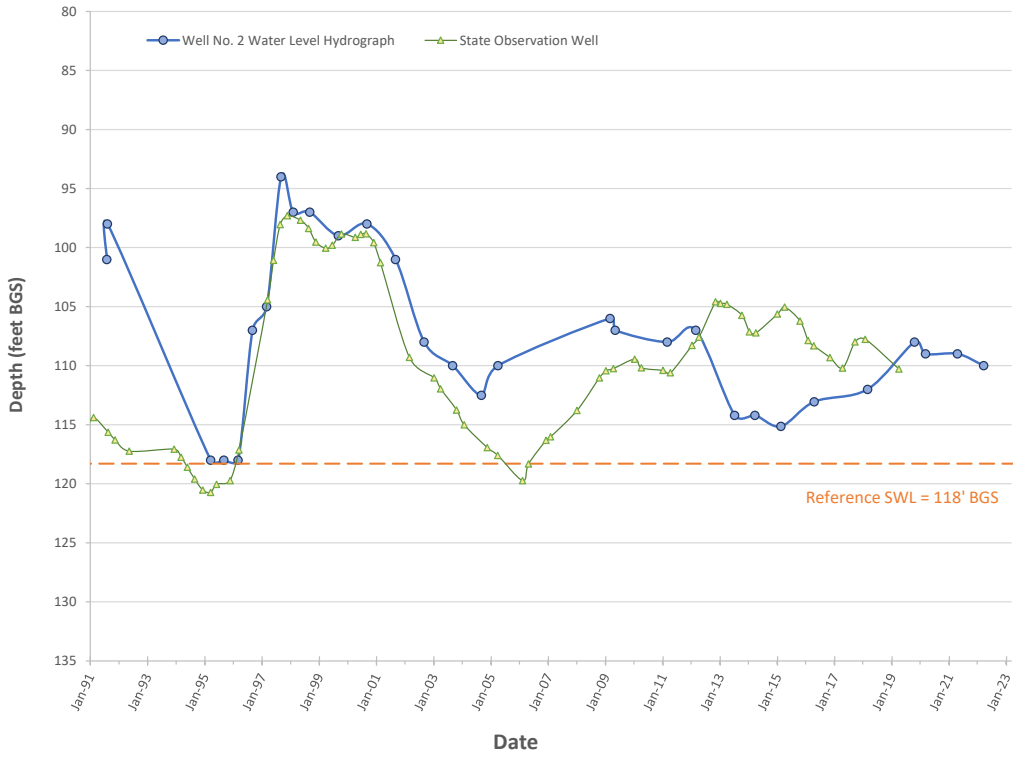
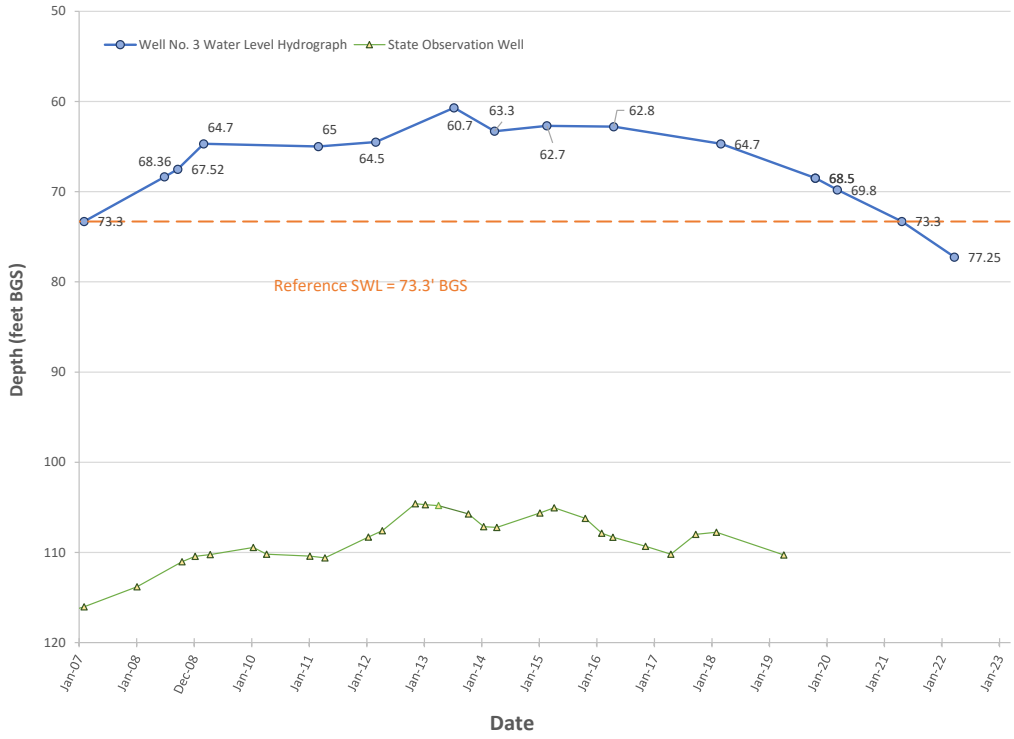


CHART 3-3
WELL NO. 3 - DESC 57902 AND STATE OBSERVATION WELL WATER LEVEL HYDROGRAPH



Well Operations and Rotation

Currently, the City rotates use of their wells throughout the year to alleviate pressure on any single well. Well No. 1 is typically used year-round, with higher use during winter months and lower use during summer months. From 2015 to 2020, Well No. 1 supplied approximately 30 percent of the total water used. Well No. 2 is typically used most of the year with the exception of the coldest winter months. The highest demand on Well No. 2 is typically during mid-summer. From 2015 to 2020, Well No. 2 supplied approximately 12 percent of the total water used. Well No. 3 is primarily used from May to October of each year and supplies the majority of the water used during these months. From November to April of each year, Well No. 3 is generally not used. From 2015 to 2020, Well No. 3 supplied approximately 58 percent of the total water used.

All City wells currently in operation have experienced some level of operational changes from 2015 to 2020. The static WSL of Well No. 1 has remained relatively constant since 2012 and is currently higher than the static WSL measured during construction. The static WSL of Well No. 2 has experienced a minor increase since 2012 and is currently slightly lower than the static WSL measured during construction. Well No. 3 experienced an increase in static WSL after construction from 2007 to 2013. Since 2013, the static WSL of Well No. 3 has been gradually decreasing. The City is planning to use Well No. 4 primarily during periods of high demand and for supplemental water during the spring and fall.

Water Rights

The City of Sisters holds several municipal and irrigation water rights issued by the State of Oregon for its groundwater sources and surface water sources. The City's existing municipal and irrigation water rights certificates and permits are summarized on Table 3-2. Copies of the City's water rights permits, certificates, and transfers are presented in Appendix E.

TABLE 3-2
WATER RIGHTS INFORMATION

Point of Appropriation/ Diversion	Application/ Permit No.	Certificate No.	Priority Date	Transfers	Maximum Authorized Rate	
					Flow (cfs)	Flow (gpm)
Municipal Groundwater Rights						
Well No. 1 Well No. 3	G-10545/G-9979	88184	2/24/1983	T-11284 (complete)	1.78	799
Well No. 3	G-12591/ G-11418	87247	6/25/1991	T-10766 (complete)	1.78	799
Well No. 2 (Adding Well No. 3 under review) (Adding Well No. 4 under review)	G-12591/ G-11418	93889	6/25/1991	T-13840[1] (under review)	1.56	700
Well No. 1 Well No. 2 Well No. 3 Well No. 4	G-17058/ G-16794	-	5/27/2008 (Completion Date: 9/9/30)	-	2.00[2]	898[2]
Well No. 4	G-14486/ G-18270	COBU Submitted May 2022	3/27/1997	T-12767 (approved)	2.15	965
Total Municipal Groundwater Allocation					**9.27**	**4,161**
Municipal Surface Water Rights						
Whychus Creek	S-5551/S-3384	3227	5/18/1917	IL-1243	1.5	673
Whychus Creek	S-12560/S-8906	10028	2/11/1929	IL-1243	0.2	90
Whychus Creek	S-16404/S-12597	13501	4/7/1937	IL-1243	1.25	561
Whychus Creek	S-17149/S-12869	13509	11/1/1937	IL-1243	1.25	561
Pole Creek	S-44263/S-32854	65091	11/17/1967	IL-1243	1.45	651
Total Municipal Surface Water Allocation					**5.65**	**2,536**
Primary Irrigation Water Rights						
Whychus Creek	-	93680	1880	T-11318 (complete)	2.028	910
Whychus Creek	-	93681	12/31/1881	T-11318 (complete)	0.554	249
Whychus Creek	-	93683	1886	T-11318 (complete)	0.109	49
Total Primary Irrigation Water Allocation					**2.691**	**1,208**

Point of Appropriation/ Diversion	Application/ Permit No.	Certificate No.	Priority Date	Transfers	Maximum Authorized Rate	
					Flow (cfs)	Flow (gpm)
Supplemental Irrigation Water Rights						
A Well	G-8548/G-8148	82875	11/25/1977	T-8902 (remaining)	0.110	49
Three Wells	G-3489/G-3095	87347	5/13/1966	T-11201 (remaining)	0.157[3]	70[3]
A Well	G-3489/G-3095	85254	5/13/1966	T-8900 (remaining)	0.246[3]	110[3]
Four Wells	G-5295/G-4841	91703	8/25/1970	T-12188 (remaining)	0.108[3]	48[3]
Total Supplemental Irrigation Water Allocation					**0.621**	**277**
Surface Water Storage Rights						
Point of Diversion	**Application/ Permit No.**	**Certificate No.**	**Priority Date**	**Transfers**	Allocation	
					AF	MG
Pole Creek	R-43919/R-5054	65090	8/10/1967	IL-1243	6.3	2.05
Total Municipal Surface Water Storage					**6.3**	**2.05**

[1] Transfer application T-13840 was submitted October 6, 2021, requesting to add Wells No. 3 and 4 as authorized points of appropriation to Certificate No. 93889. The transfer application is under review.

[2] Appropriation of water for Permit G-16794 is further limited to no more than 604.6 AF per year.

[3] One-eightieths of one cfs, or its equivalent for each acre irrigated, and shall be further limited to a diversion of not to exceed 3.0 AF for each acre irrigated during the irrigation season of each year.

cfs = cubic feet per second

COBU = Claim of Beneficial Use

MG = million gallons

The existing water rights authorize the City to instantaneously withdraw a total of 9.27 cfs, or approximately 4,161 gpm, for municipal use. The City also holds surface water rights authorizing the use of up to 5.65 cfs (2,536 gpm) from the Pole Creek and Whychus Creek watersheds for municipal use. The City's surface water rights are not currently in use and are currently leased in-stream.

The City also holds surface water irrigation rights for Whychus Creek, for which water is delivered via the Three Sisters Irrigation District. A portion of the rights is leased in-stream while a portion is used for irrigation on the City's Lazy Z Ranch property. Groundwater rights authorizing the use of water for supplemental irrigation on the Lazy Z Ranch property are not currently in use.

Municipal Groundwater Water Rights

The City's groundwater rights authorize the City to withdraw a total of 9.27 cfs or approximately 4,161 gpm. Permit G-16794, which authorizes the use of up to 2.0 cfs, is further limited to 604.6 AF per year. Additionally, the permit requires a total of 241.8 mitigation credits to fully exercise the annual withdrawal rate. To date, 88.4 mitigation credits have been provided, authorizing the use of up to 221 AF of water per year under Permit G-16794.

Municipal Surface Water Rights

The City has multiple municipal surface water rights. The allocations associated with the City's surface rights provide the City with the ability to withdraw a total of 5.65 cfs from various surface water sources in the Pole Creek and Whychus Creek watersheds. Due to the high cost of water treatment requirements and low summer streamflow in Whychus Creek, the City is unlikely to use surface water for future municipal use. These surface water rights are currently leased in-stream.

Summary of Water Rights Transfers

Several water rights transfers have occurred over the years, changing the point of appropriation, place of use, or character of use authorized under an existing water right. The City's only transfer under review is a transfer application to change the points of appropriation under Certificate 93889.

Greenlight Water

The OWRD has developed the Municipal Water Management and Conservation Planning program, which provides a process for municipal water suppliers to develop plans to meet future water needs. To obtain long-term permit extensions, the City of Sisters is required to prepare plans that demonstrate the community's need for increased diversions of water under the permits as their demands grow. Restricting diversion rates until the City can prove their need for additional water is known as "greenlight water." This program affects Permit G-16794, which allocates 2.0 cfs of instantaneous withdrawal, further limited to 604.6 AF per year. Permit G-16794 requires a total of 241.8 AF of mitigation water within the Whychus Creek Zone of Impact be provided to exercise the maximum permitted annual withdrawal rate. The maximum instantaneous withdrawal rate of 2.0 cfs is permitted regardless of the amount of mitigation provided. The total volume withdrawn each year is limited by the amount of mitigation provided. The City must submit an annual Incremental Development Plan to the OWRD as required by the permit's conditions. The permit requires the permittee submit a Water Management and Conservation Plan (WMCP) within five years of permit issuance; the WMCP was submitted February 1, 2011. This was followed by a WMCP progress report. Permit G-16794 also requires that the permittee provide mitigation prior to each stage of development under the permit in accordance with an Incremental Development Plan. The City submitted a WMCP Update in April 2017. A progress report was due no later than April 27, 2022. An updated WMCP is due no later than October 30, 2026. To date, the City has provided 88.4 mitigation credits for Permit G-16794, allowing a maximum withdrawal rate of 221 AF per year.

Source Capacity Assessment

For the purposes of this WSMP Update, the ability of the City's existing sources, in their current configuration, to meet current and projected peak daily flows with existing capacity and water rights was evaluated. Demands in this section are based on historical water usage and projected future water demand as presented in Chapter 2.

The pumping capacities shown on Table 3-3 were provided by the City and are used to assess current source production from the City's supply sources. The pumping capacities shown are less than the sustainable well withdraw rates determined during initial well yield tests following construction of each well, as shown on Table 3-1. Pumping capacity could be increased in the future with the installation of larger capacity pumps, but careful attention to production volumes would need to be provided to

ensure the City does not exceed the maximum permissible flow rates allowed by their water rights permits and certificates. Currently, the maximum combined operational pumping capacity of the City's existing wells is greater than the maximum municipal groundwater allocation of 4,161 gpm.

TABLE 3-3
CURRENT WATER SUPPLY OPERATIONAL CAPACITY

Water Supply Source	Installed Pump (Hp)	Pumping Capacity (gpm)
Well No. 1	75	800
Well No. 2	75	750
Well No. 3	150	1,550
Well No. 4	150	1,500
	Total	**4,600**

The hours of operation for each supply source currently used in the system may vary, but it is recommended that sources do not operate for more than 21 hours per day. The source production values for the wells listed above are considered to be the City's current sustainable well production flows.

Source capacity with respect to water rights was assessed with only certificated and permitted water rights. Evaluations of the City's source capacity and water rights compared to the current and projected water demand are shown on Table 3-4.

TABLE 3-4
SOURCE CAPACITY EVALUATION

Parameter/Year	2022	2042
Water Demand		
Average Daily Demand (ADD), million gallons per day (MGD)	1.0	2.1
Maximum Daily Demand (MDD), MGD	2.8	5.9
Source Capacity - All Wells Online		
All Current Well Production Sources, gpm	4,600	4,600
Well Production Capacity[1], MGD	5.8	5.8
Sustainable Total Supply Capacity Compared to MDD[1], MGD	***2.9***	***-0.1***
Source Capacity - Wells No. 1, 2, and 4[2]		
Groundwater Source Production, gpm	3,050	3,050
Current Surface Water Capacity[1,2], MGD	3.8	3.8
Sustainable Total Supply Capacity Compared to MDD[1,2], MGD	***1.0***	***-2.1***
Groundwater Water Rights		
Groundwater Right Allocation[3], gpm	4,161	4,161
Groundwater Right Allocation[3], MGD	6.0	6.0
Total Supply Water Right Permit Capacity Compared to MDD, MGD	***3.2***	***0.1***

[1]Twenty-one hours per day supply source operation.

[2]Excludes Well No. 3 for evaluation of source capacity with the largest source offline.

[3]Maximum permissible combination of water right withdrawal rates.

The City entirely relies on groundwater supply to meet customer demands. No surface water rights are currently, or planned to be, utilized by the City for municipal water supply and, therefore, are negated

from this analysis. Well No. 3 is the City's largest producing source in addition to being the only well that is not equipped with emergency backup power. The City's design source capacity should assume either utility power is down or the largest producing source is offline, and the remaining sources are allowed to operate for only a maximum of 21 hours per day. Both scenarios should consider Well No. 3 to be offline.

Assuming all sources are online and each well pump is allowed to operate for no more than 21 hours per day, the source capacity is adequate to supply the City's current demand and deficient by approximately 0.1 MGD to supply the City's projected MDD through the planning year 2042. Assuming Well No. 3 is offline and each well pump is allowed to operate for no more than 21 hours per day, the remaining source capacity is deficient by approximately 2.1 MGD to supply the City's projected MDD through the planning year 2042.

The City's existing allocated groundwater right withdrawal rates are adequate to supply the projected MDD through the planning year 2042. However, the City's total source capacity with all wells running at full speed is greater than the combined permissible groundwater withdrawal rate of 4,161 gpm. Assuming the VFD motor control was utilized on Well No. 4 to reduce the pumping rate to 1,061 gpm, the City could exercise the total combined groundwater withdrawal rate of 4,161 gpm. Ideally, the City would be able to exercise the full water right allocation with the largest producing source offline and rotation of the remaining wells such that no well was required to operate for more than 21 hours per day.

To supply the MDD through the planning year with the adopted design source capacity, either a new source will need to be added to the system, or the capacities of Wells No. 1 and/or 2 would need to be increased. The additional source will need to add a yield of approximately 1,670 gpm (2.1 MG per 21 hours) for the City to exercise the full water right allocation with the largest source offline and 21 hours of operation per day. No new water rights will be needed for the additional source, but the new sources will need to be added to the existing certificates and permit as an additional point of appropriation. Assuming the City's growth rate coincides with the Population Research Center-published values and no other changes to average consumption are made, the City's MDD is anticipated to exceed the design source supply in year 2028. When peak demands exceed available source supply, the difference must be supplied by water storage facilities. Under these circumstances, the ability of storage to accommodate peak demand periods above the available source supply must be carefully evaluated. Refer to Chapter 4 for a discussion on proposed storage and resulting dates for necessary improvements.

Water Conservation

Although it does not impact system capacity, water conservation can create water savings and reduction in water demand that can eliminate or delay the need for developing new water sources or treatment plants. The City has implemented a number of conservation measures, as outlined in the City's 2017 WMCP prepared by GSI Water Solutions, Inc. Water conservation can be achieved by educating the public on irrigation best practices, restricting irrigation to specific hours or days, and implementing a leak detection program. Leaks can contribute to non-revenue water, which are quantities of water either lost between the points of source and delivery or unmetered and unpaid for water used. Based on the volumes of water produced and billed as stated in the 2017 WMCP, the total apparent non-revenue water within the system was approximately 15 percent during the five-year period from 2010 to 2015. Refer to Chapter 5 for further discussion on unaccounted for water.

The City has employed several basic conservation programs, including annual water audits, system-wide radio read metering, a unit-based water rate structure, leak detection and repair, and public education processes.

Water Supply and Treatment Deficiencies

Recommended Fire Flow

The City's ability to provide recommended fire flow depends on supply from supplemental well sources. The City's water reservoir is unable to provide the needed fire flows (NFF) with all sources offline, as the transmission line is incapable of delivering the required flow alone. In general, with three sources online, adequate fire flow can be delivered throughout the system other than in a few localized regions that are slightly deficient. Various improvement alternatives and/or combinations of alternatives could resolve this deficiency, including adding an additional source, increasing the water reservoir transmission line capacity, or a combination of both.

Maximum Daily Demand

Assuming the largest source is offline, the ability to supply the projected MDD in year 2042 is deficient by approximately 2.1 MGD. Adding emergency backup power to Well No. 3 would decrease the risk of experiencing such a situation; however, the scenario should still be considered due to other risks that could result in a lost source, such as equipment failure, maintenance, contamination, etc. An additional source with a capacity of 1,670 gpm would allow the City to exercise their full water right withdrawal rate with the largest source offline and the remaining sources operating no more than 21 hours per day. Increasing the capacity of either Well No. 1 or 2 would give the ability to provide the MDD up to but not long beyond the planning year.

Any new source should have adequate emergency backup power. Adding a new source would require that a transfer application adding the additional point of appropriation to the City's various other water rights certificates and permits, or new water right permit, be approved by the OWRD.

Well No. 1 Mechanical Building

The Well No. 1 mechanical building is showing significant signs of deterioration due to age. Additionally, both rooms are undersized and spatially constrained. Due to the increased price of chlorine gas, unreliable supply of chlorine gas and sodium hypochlorite, and safety concerns associated with the existing chlorine gas disinfection system, the City is considering switching to on-site generation of sodium hypochlorite for drinking water disinfection. Neither the existing chlorine gas room or wellhead mechanical room has adequate space to accommodate the installation of new systems. Therefore, the City is considering replacing the structure entirely to provide adequate space for the installation of new electrical equipment.

Well No. 3 Electrical, Instrumentation, and Controls

Currently, Well No. 3 is equipped with a soft starter and does not have standby power. While providing backup power and a VFD is not required, doing so will increase the source's reliability and operational flexibility. Standby power will reduce the risk of losing the source during utility outages. Replacing the soft starter with a VFD would allow the City to maintain distribution system pressure while taking the water storage reservoir and/or transmission line offline for maintenance or replacement.

Water Supply and Treatment Considerations

The City of Sisters' existing water supply and treatment systems currently meet residential, commercial, and industrial water demands. The City currently relies on supplemental well water in conjunction with available storage to provide NFF. As the City continues to grow, the increase in demand will reduce the amount of well water available to supplement NFF. If no additional source capacity is added to the system, the increase in demand from continued growth will reduce available fire flows during peak demand periods. Options to avoid this deficiency include increasing well pumping capacities and/or the construction of a new well. However, these improvements may not be necessary if other improvements, such as the installation of new and/or upsizing water supply lines, are made.

According to the Oregon Water Resources memo, "Response to Technical Assistance Request: Groundwater Mitigation Program - Purpose in Relation to Observed Groundwater Level Trends," the City of Sisters is located in an area in which groundwater levels trend with climate. The primary source of the local groundwater level and hydraulic gradient (flow direction) is groundwater recharge on the eastern slopes of the Cascade Range from rainfall and snowmelt. Existing aquifer levels are shown to change with time in response to local and mountain precipitation and, in general, are currently higher than when groundwater level recording began. While long-term climate predictions may not be adequately demonstrated, prolonged droughts and low mountain snowfalls could negatively impact groundwater levels in the City. If groundwater levels decline, the City could see a reduction in well production, and the elevation of pump intakes may need to be reduced.

Point of entry treatment systems at each source are adequate for the City's needs. However, conversion to on-site generation of sodium hypochlorite from chlorine gas systems would improve reliability and reduce annual operation and maintenance (O&M) costs for the City.

Alternative water sources and associated treatment measures are discussed herein. The following criteria have been considered for each water supply alternative:

- Water quality and water quality consistency
- Source capacity
- O&M requirements
- Impact on system reliability
- Operation with existing storage reservoirs

Supply and Treatment Development Alternatives

Well No. 1 Improvement Alternative

Well No. 1 is the only source with a chlorine gas disinfection system. The existing mechanical building is undersized and, due to spatial constraints, cannot accommodate the installation of new mechanical and electrical equipment or an on-site generation system. Well No. 1 is a reliable production well with good water quality that will continue to provide drinking water for the City. Converting to an on-site sodium hypochlorite generation system would increase the reliability and safety of the source, in addition to reducing O&M costs.

Well No. 1 Pump Station Improvements

Under this alternative, the existing CMU building, including its foundation, would be entirely demolished, while protecting the wellhead. The existing generator set, automatic transfer switch (ATS), flowmeter, and pump motor would be salvaged and reinstalled with the new facility. An entirely new CMU building would be constructed around the existing well. The building would have a layout similar to the buildings at Wells No. 3 and 4, with a single room housing the well discharge head, motor, discharge manifold, on-site generation system, and all electrical, instrumentation, and controls (EI&C). The existing generator set, ATS, and flowmeter would be salvaged and reinstalled outdoors, and a new well water level monitoring system would be included.

The anticipated year 2023 project cost to complete the work described is $808,000. A detailed cost estimate is presented on Figure 3-1.

New Groundwater Source Development Alternatives

With the largest producing source offline and remaining sources limited to 21 hours of operation per day, it was determined that the City's MDD is projected to exceed the design source supply in year 2028. Assuming a new 2.2 MG reservoir is constructed (see Chapter 4 for discussion regarding reservoir capacity), the equalization storage should be capable of accounting for periods of peak demand until approximately 2035 while retaining an emergency reserve volume equal to one day of ADD. Additional supply will then be needed. Either an entirely new source could be developed, or the capacity of one of the existing sources could be increased. Adding a new source would allow the City to exercise their full certified withdrawal rate and provide water beyond the planning period. Increasing the capacity of one of the existing sources could defer the requirement of a new source to the end of the planning period, but eventually a new source will be needed. To exercise the City's full permitted withdrawal rate by either developing a new source or increasing the capacity of the existing sources, either a permanent water right transfer or permit amendment from the OWRD would be needed. A new permit to use groundwater could also be applied for to increase the total permitted groundwater withdrawal rate.

Construct a New Well No. 5

Under this alternative, a new source would be constructed and connected to the system with approximately 600 linear feet of 12-inch transmission line, assuming the Edgington Road Transmission Line Improvement project, which is discussed further in Chapter 5, is completed prior to development of the new source. The City has already obtained a parcel adequate for the new source southwest of the city limits. Figure 3-2 shows the location of the proposed source and connection to the existing distribution system. The project would include a new mechanical building, standby power, on-site generation system, and all necessary EI&C. Assuming the new source is constructed with a sustainable yield of 1,670 gpm, the City would be able to exercise their full water right allocation with the largest source offline and the remaining sources operating for no more than 21 hours per day.

The anticipated year 2023 project cost to complete the work described is $2,102,000. A detailed cost estimate is presented on Figure 3-3.

Increase the Capacity of Well No. 2

Under this alternative, the Well No. 2 pumps would be replaced with a higher capacity pump and motor, and the pump setting would be reduced in elevation (set deeper in the well) to accommodate potential declines in static groundwater levels. The extent of increased capacity and associated improvements would require further investigation, including aquifer and well pump tests to confirm the well's sustainable yield. Additionally, the City would need to add Well No. 2 as an additional point of appropriation to other existing water rights. Because the viability of this alternative is uncertain at this time, no detailed improvement work item list or cost estimate has been developed. The City may wish to explore the viability of this option in the future.

Well No. 3

Well No. 3 is a good producing source with a capacity of approximately 1,550 gpm under normal conditions. The well is equipped with a soft starter, which does not allow for the pump rate to be adjusted to maintain a specific discharge pressure. The source does not have standby power and will not operate during utility outages.

Well No. 3 Pump Station Improvements

A VFD and standby power would be installed at Well No. 3. This would reduce the risk of losing the source during utility outages and provide operational flexibly. These improvements would allow the City to take the existing reservoir and transmission lines offline temporarily for maintenance or replacement.

The anticipated year 2023 project cost to complete the work described is $372,000. A detailed cost estimate is presented on Figure 3-4.

Water Supply and Treatment Recommendations

To address potential water supply capacity deficiencies to meet projected future water demand expected to arise within the planning period, it is recommended that the City either develop a new source, increase the capacity of either Well No. 1 or 2, or both. Assuming the City constructs an additional 2.2 MG of storage (discussed in Chapter 4) and assuming the largest producing source was offline, the City would need to construct and bring online a new source or increase the capacity of an existing source by year 2035.

To add redundancy and operational flexibility to the system, it is recommended that the City install a VFD and standby power to Well No. 3. This will reduce the chance of the City relying on only three of four sources during utility interruptions, and add the ability to run Well No. 3 based on a distribution set point pressure.

To maintain Well No. 1 in good working order and convert from gas chlorination to on-site generation of sodium hypochlorite, it is recommended the City reconstruct the Well No. 1 mechanical building in its entirety. This will provide adequate space to install new EI&C, resolve aging infrastructure deficiencies, and reduce O&M costs and safety concerns associated with the existing chlorine gas disinfection system.

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
WELL NO. 1 PUMP STATION IMPROVEMENTS
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 27,500	All Req'd	$ 27,500
2	Project Safety, Temporary Traffic Control, and Quality Control	LS	20,000	All Req'd	20,000
3	Construction Survey	LS	8,000	All Req'd	8,000
4	Demolition of Existing Facilities	LS	25,000	All Req'd	25,000
5	Site Work and Landscaping	LS	15,000	All Req'd	15,000
6	Concrete Masonry Unit Building	SF	370	400	148,000
7	Painting	LS	10,000	All Req'd	10,000
8	Electrical Work	LS	70,000	All Req'd	70,000
9	Heating, Ventilation, and Air Conditioning	LS	35,000	All Req'd	35,000
10	Plumbing	LS	7,500	All Req'd	7,500
11	Instrumentation and Controls	LS	50,000	All Req'd	50,000
12	On-site Hypochlorination Generation System	LS	110,000	All Req'd	110,000
13	Mechanical Work	LS	80,000	All Req'd	80,000
				Subtotal Estimated Construction Cost	**$ 606,000**
				Construction Contingency (15%)	91,000
				Total Estimated Construction Cost	**$ 697,000**
				Preliminary, Design, and Construction Engineering (15%)	105,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 802,000**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 1,000
				Deschutes County Permitting (Land use, Building, Plumbing)	5,000
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 6,000**
				TOTAL ESTIMATED PROJECT COST	**$ 808,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

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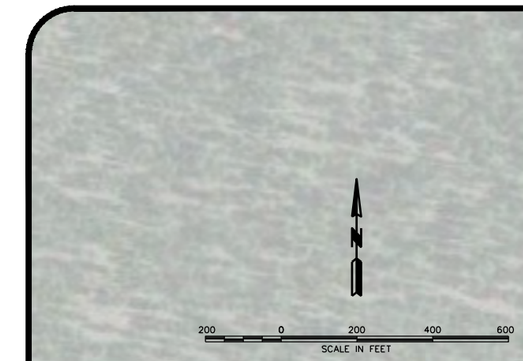
CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
WELL NO. 1 PUMP STATION IMPROVEMENTS
PRELIMINARY COST ESTIMATE

FIGURE
3-1



EDGINGTON RD.

TO CITY LIMITS

EDGINGTON ROAD TRANSMISSION LINE EXTENSION

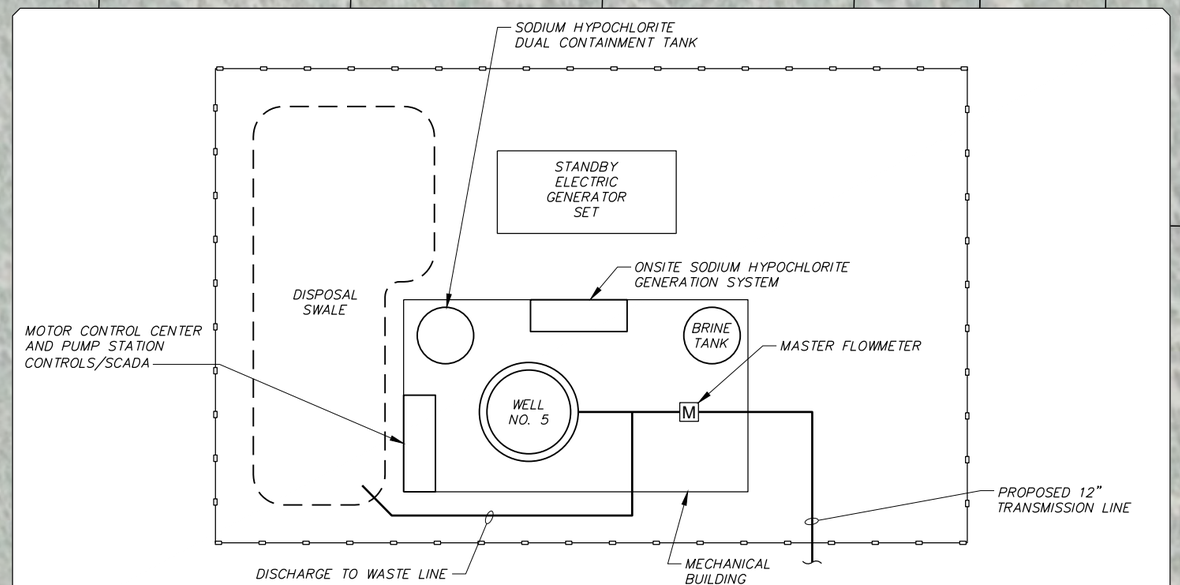
PROPOSED WELL NO. 5. SEE PROPOSED WELL NO. 5 PUMP STATION SCHEMATIC PLAN, THIS SHEET

PROPOSED 12" W

EDGINGTON ROAD TRANSMISSION LINE EXTENSION

EDGINGTON RD.

TO RESERVOIR



PROPOSED WELL NO. 5 PUMP STATION SCHEMATIC PLAN

N.T.S.

LEGEND

- WELL
- IMPROVEMENTS
- TAX LOT BOUNDARY

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
GROUNDWATER SOURCE DEVELOPMENT
CONSTRUCT A NEW WELL NO. 5

FIGURE
3-2

X:\Clients\Sisters OR\446-08 WSMP\CAD\WSMP-446-08-FIG3-2.dwg, Layout1, 3/28/2023 9:21 AM, dchristman

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
CONSTRUCT A NEW WELL NO. 5
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 73,750	All Req'd	$ 73,750
2	Project Safety, Temporary Traffic Control, and Quality Control	LS	30,000	All Req'd	30,000
3	Construction Survey	LS	15,000	All Req'd	15,000
4	Clearing and Grubbing	ACRE	7,500	0.5	3,750
5	Drilling and Construction of New Well	LS	450,000	All Req'd	450,000
6	Well Development	HOUR	500	24	12,000
7	Aquifer Testing	LS	45,000	All Req'd	45,000
8	Well Pump, Column, Discharge Head, and Motor	LS	140,000	All Req'd	140,000
9	Site Work and Landscaping	LS	20,000	All Req'd	20,000
10	Generator Set and Automatic Transfer Switch	LS	80,000	All Req'd	80,000
11	Concrete Masonry Unit Building	SF	370	400	148,000
12	Painting	LS	10,000	All Req'd	10,000
13	Electrical Work	LS	85,000	All Req'd	85,000
14	Heating, Ventilation, and Air Conditioning	LS	35,000	All Req'd	35,000
15	Plumbing	LS	7,500	All Req'd	7,500
16	Instrumentation and Controls	LS	100,000	All Req'd	100,000
17	On-site Hypochlorination Generation System	LS	110,000	All Req'd	110,000
18	Mechanical Work	LS	80,000	All Req'd	80,000
19	Gravel Access Drive	SY	15	400	6,000
20	Chain Link Fence and Gates	LF	30	200	6,000
21	Install 12-inch Polyvinyl Chloride Pipe	LF	180	600	108,000
22	12-inch Butterfly Valve	EA	3,000	1	3,000
23	Connect to Existing Water Line	EA	2,000	1	2,000
24	Surface Restoration	SY	12	1,000	12,000
				Subtotal Estimated Construction Cost	**$ 1,582,000**
				Construction Contingency (15%)	237,000
				Total Estimated Construction Cost	**$ 1,819,000**
				Preliminary, Design, and Construction Engineering (15%)	273,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 2,092,000**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 5,000
				Deschutes County Permitting (Land use, Building, Plumbing)	5,000
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 10,000**
				TOTAL ESTIMATED PROJECT COST	**$ 2,102,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

CONSTRUCT A NEW WELL NO. 5
PRELIMINARY COST ESTIMATE

FIGURE
3-3

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
WELL NO. 3 PUMP STATION IMPROVEMENTS
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 13,000	All Req'd	$ 13,000
2	Construction Survey	LS	3,500	All Req'd	3,500
3	Generator Set and Automatic Transfer Switch	LS	135,000	All Req'd	135,000
4	150 Horsepower Variable Frequency Drive	LS	40,000	All Req'd	40,000
5	Site Work	LS	15,000	All Req'd	15,000
6	Electrical Work	LS	40,000	All Req'd	40,000
7	Controls and Instrumentation Work	LS	30,000	All Req'd	30,000
8	Fencing	LF	30	100	3,000
				Subtotal Estimated Construction Cost	**$ 279,500**
				Construction Contingency (15%)	42,000
				Total Estimated Construction Cost	**$ 321,500**
				Preliminary, Design, and Construction Engineering (15%)	48,200
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 369,700**
				Other Estimated Project Costs	
				General Permitting	$ 2,000
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 2,000**
				TOTAL ESTIMATED PROJECT COST	**$ 372,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
WELL NO. 3 PUMP STATION IMPROVEMENTS
PRELIMINARY COST ESTIMATE

FIGURE
3-4

Chapter 4 - Water Storage

Introduction

This chapter presents information on the City of Sisters' water storage facilities. The purpose for storage in municipal water systems is discussed. The condition and needs of the City's existing water storage reservoirs are outlined, and recommended storage improvements to meet current and projected year 2042 design criteria are presented. Different types and locations for storage facility improvements are outlined.

General

Water storage facilities are constructed to meet several purposes. First, storage reservoirs are often used to provide control for well or booster pump station operation. When a reservoir drops a few feet or more from the full level, the water level can be used as a control for water supply pump activation. The amount of storage required for this type of control is called "operating storage." Second, stored water must be available to supply water during periods in which the demand for water exceeds the available water supply. This reserve is called "equalization storage." An example of this would be where system demands exceed the capacity of the water supply to the reservoir. Third, reserve storage is usually provided to supply unusually high, short-duration demands, such as fire flows. This is referred to as "fire reserve." Finally, reserve storage is often provided for emergencies that may arise and interfere with production from water supply sources. Such emergencies could be created by power outages, mechanical equipment failure, or sudden water contamination. The amount of storage to be provided for an emergency depends on the likelihood and the impact of such an occurrence. The amount of emergency storage provided usually becomes a balance between need and affordability. This storage allowance is called "emergency reserve."

Storage facilities can be located at approximately the same elevation as the entrance to the water distribution system. Storage facilities of this type require continuous operation of a booster pump station to maintain distribution system pressure. Storage facilities can also be elevated, in which case the water is stored at an elevation considerably above the distribution system to generate adequate system pressure. For example, a water elevation of 120 feet above a distribution system would generate a static pressure of approximately 50 pounds per square inch (psi). Reservoirs may be elevated by locating them on natural ground elevated above the service area or by construction on top of a structural support system.

Storage reservoirs are generally constructed of either steel, reinforced concrete, or prestressed concrete. The choice of construction material is usually based on an economic analysis. Reservoirs may be constructed either aboveground or buried, with the choice based on cost, location, and appearance.

The remainder of this chapter reviews the City's existing storage facilities, presents a discussion of future storage needs, and provides options for satisfying those needs.

Preserving Water Reservoir Water Quality

To preserve water quality, water needs to adequately circulate in and out of the storage reservoir. This is often done by providing separate inlet and outlet pipes to and from reservoirs, providing continuous

mechanical mixing, and, when possible, connecting a water supply source directly to the reservoir. The recommended complete water storage turnover time is three to five days. When estimating turnover using volume calculations, consideration should be given to potential short-circuiting and stagnation that affect the actual turnover duration.

Where water sources are located remotely from water reservoirs, water turnover also needs to account for volume within pipelines that convey water between the facilities. This is the case in the City of Sisters, where sources are located at the distribution system and a transmission line approximately 2 miles long conveys water between the sources and the water reservoir. When the sources are off, water flows out of the reservoir to the system, resulting in a declining water level in the reservoir. Eventually, a water supply pump is called to operate to fill the reservoir, which reverses the flow in the transmission main to fill the reservoir back up. Unless a significant volume of water is taken from the reservoir in each cycle, the water does not get fully exchanged in the transmission line. This could lead to water stagnation and water quality issues. Fresh supply water could simply be moved back and forth in the transmission line and not actually be delivered to the reservoir. This concept is visually presented on Figure 4-1. Stagnant water that is not properly exchanged in the reservoir will show a drop in chlorine levels, potentially allowing bacteria and other organisms to develop in the water and potentially cause taste and odor issues.

To determine the operational volumes based on turnover time, typically one fill cycle per day is assumed. Because all City water sources are groundwater with good water quality, a turnover time of five days is assumed to be an adequate starting point for this system. To provide a complete turnover in five days, the operational volume must be at least the total reservoir volume divided by five days plus the volume stored in the transmission line between the reservoir and distribution system. Currently, the volume of water in the Sisters transmission line is approximately 105,000 gallons. Given these conditions, the recommended operational volume of the existing reservoir is 425,000 gallons. Based on continuous monitoring of water quality, the turnover time can be adjusted by increasing or decreasing the operational volume of the reservoir.

The City should continuously monitor fill cycle frequency and adjust the operational storage accordingly. With any improvements made, it is important to maintain the quality of water stored in a reservoir and set water supply pump operations to allow adequate circulation of fresh water into the reservoir with each pump cycle and adequate water storage turnover.

Existing Facilities

The City's water storage system consists of one 1.6 million gallon (MG) enclosed concrete tank storage reservoir. A 2.5 MG open air storage reservoir adjacent to the concrete tank remains empty after discontinued use following the Surface Water Treatment Rule enacted in 1989 and is no longer connected to the City's water system. The City has no plans to restore the open air storage reservoir. The City's reservoir location is shown on Figure 1-1 in Chapter 1. The following section summarizes the operational characteristics of the City's existing storage reservoirs.

Pole Creek Reservoir

The Pole Creek Reservoir is an embankment dam open air reservoir originally used to store water diverted from Pole Creek. The dam was constructed in the 1960s with an embankment approximately 16 feet high and a total storage volume of 2.5 MG. Circa 2000, the surface water

system was taken offline due to the high treatment and disinfection costs to meet requirements of the Surface Water Treatment Rule enacted in 1989. The reservoir is currently not used, and the site may be used for construction of a new water storage reservoir. The reservoir is located on land owned by the federal government managed by the U.S. Forest Service (USFS).

1.6 Million Gallon Concrete Reservoir

The City's single 1.6 MG enclosed concrete reservoir was constructed in 1995. The reservoir is a partially buried, prestressed concrete tank manufactured by Morse Bros., Inc., in Harrisburg, Oregon, which later became a member of Knife River in 1998. The reservoir is built of 40 precast wall panels and 40 precast roof panels. The panels were delivered to the site, assembled, and prestressed on a cast-in-place concrete floor. The closure strips were infilled, and a shotcrete overlay was applied to the wall sections. The reservoir is in a timbered area located on USFS land. The City was granted a conditional use permit for the construction and continued operation of the storage reservoir, piping, and building structure on the site. The site is fenced and topped with barbed wire, with access through a locked gate.

The cylindrical reservoir has a 112-foot inner diameter with a finished floor elevation at 3,327 feet (National Geodetic Vertical Datum of 1929 [NGVD 29]). The reservoir is furnished with a 12-inch inlet pipe, a 12-inch outlet pipe, a 12-inch floor drain, and a 12-inch overflow drain. The outlet pipe is set vertically 6 inches above the finished floor to provide a silt stop. The overflow drainpipe is set horizontally with the invert elevation at 3,349 feet (NGVD 29). The reservoir roof is accessed by an exterior ladder that extends to a fenced catwalk on one access hatch. A second access hatch located on the opposite side of the tank has a single safety railing near the roof edge. A roof vent provides atmospheric air pressure equalization. The reservoir is equipped with one ultrasonic level transmitter and one submersible pressure transducer, which are used to control the City's wells. A chlorination system in the adjacent control house can be used in case of an emergency.

The reservoir was rehabilitated in 2003 by replacing the original closure pours and reconditioning the entire roof structure. The interior was also cleaned prior to being placed back in service. At the time (after nine years of service), there was very little sediment accumulation. During a site inspection in 2021, efflorescence was observed on the reservoir wall's exterior shotcrete application. In most locations the efflorescence appears to be the result of rainwater runoff from the roof and is concentrated below roof panel joints. The damage is very minor, and the inspection report indicates the reservoir is in "very good condition" overall. The City should conduct regular inspections of the shotcrete to address any areas found to have excessive efflorescence or spalling.

The reservoir is connected to the distribution system through a single 12-inch asbestos cement (AC) pipe that allows flow in either direction depending on whether the reservoir is filling or draining. Near the reservoir, the 12-inch AC pipe splits to various lines utilizing various check valves to allow the reservoir to be filled from one end and drained from the other.

TABLE 4-1
EXISTING STORAGE FACILITIES

Reservoir Capacity (MG)	Construction Material	Reservoir Diameter (feet)	Reservoir Height (feet)	High Operating Level (feet)	Low Operating Level (feet)	Backup Water Supply Wells Start (feet)	Year of Construction
1.6	Concrete	112	25	23	16	15 and 14	1995

Storage Requirements

Water storage is usually provided for several purposes. Various methods are used to calculate the volumes of each type of storage component required. Most involve a rational approach to estimating the volume of each storage component, consisting of operation, equalization, fire reserve, and emergency. The decision can then be made as to which component controls and what storage volumes will actually be necessary. For example, the decision may be made to provide storage for operation, equalization, and fire reserve only, assuming any emergency storage would be available from the fire reserve. If this option were selected, there may not be adequate fire storage available if there is a sustained power outage or if a well pump is out of service. For this reason, it is recommended that all four of the storage components be considered when evaluating the City's potential storage needs. Figure 4-2 shows typical, existing, and proposed reservoir storage components. Based on population forecasts and rational approaches to reservoir component sizing, it is recommended that the City construct an additional 2.2 MG of storage for a total of 3.8 MG to provide adequate storage through the planning year. A quantification for each storage component is described in the following sections and shown on Figure 4-3.

Operating Storage

Operating storage is generally provided to facilitate operation of water supply pumps in a water system. For example, when water system demands result in the water level lowering in a reservoir, the water level will reach a certain point that can be used to trigger activation of the supply well pumps to refill the reservoir. The storage needed to activate water supply sources is typically referred to as operating storage. This zone of operation can be set as desired but is often set to help ensure circulation occurs during each pump run cycle, allowing water to cycle through the reservoir to help maintain water quality while keeping the reservoir as full as possible. As discussed previously, due to the long transmission line between the reservoir and the City, operational storage in this case is based on turnover. At the existing reservoir site, operational storage should be at least the total reservoir volume divided by five days plus the volume of water within the reservoir transmission line.

Existing Operating Storage

As discussed previously, the minimum recommended operating storage for the existing reservoir is one-fifth of the total storage volume plus the volume within the reservoir transmission lines, or 425,000 gallons. The reservoir is currently set to lower 7 feet from the full level before the primary water supply pump is called to operate and fill the reservoir. This corresponds to an operational storage volume of approximately 516,000 gallons, which is approximately 32 percent of the total available storage. If the level drops an additional 1 or 2 feet, the first and second backup water supply pumps will be called to run, respectively. During normal demand, the reservoir feeds the City by gravity flow for approximately 18 to 24 hours before wells are called to run. Filling the reservoir then takes between 12 and 16 hours. This practice currently exchanges approximately 500,000 gallons in the reservoir each cycle, which is adequate to meet the recommended turnover time.

Proposed Operating Storage

As discussed further in Chapter 5, multiple phases of improvements to the reservoir transmission lines are proposed. Assuming all improvements proposed in Chapter 5 will be completed, the volume within the proposed transmission lines would be approximately 250,000 gallons. The total volume of the existing and proposed reservoirs is 3.8 MG. Based on preserving water quality with a turnover of five days, the minimum recommended operating volume of the proposed facilities is 1.0 MG.

Equalization Storage

Equalization storage must be provided to balance the difference between periods of peak demand and available water supply capacity. Depending on the available source supply compared with the peak period demand, this may occur during a two-hour fire flow scenario or during the MDD, depending on which scenario results in the highest equalization volume. These are shown on Table 4-3 as Equalization Method Scenarios 1 and 2, respectively. Each method takes the difference between the peaking periods' average demand and available source supply and multiplies that rate by the peaking period duration to calculate the total equalization storage volume required.

Existing Equalization Storage

Based on providing the current (year 2022) estimated maximum daily demand (MDD) (2,050 gallons per minute [gpm]) plus the NFF (2,500 gpm) of 4,550 gallons per minute (gpm) for two hours and using the available supply capacity of 3,050 gpm, 180,000 gallons must come from the reservoirs.

Interim Year 2035 Equalization Storage

The interim year is that in which the reservoir's equalization storage can no longer provide the difference between periods of peak demand and available source supply while maintaining a minimum emergency reserve allocated volume discussed below. Assuming the City's storage is increased to a total of 3.8 MG, this is the year that construction of a new source or an increase in available source supply must be brought online. Under these conditions, the equalization storage needed is the difference between the MDD and the supply flow available, or approximately 1,060,000 gallons.

Year 2042 Equalization Storage

It is anticipated that by year 2042 a new source will have been developed and the City will be capable of exercising the full water right withdrawal rate. It is shown that under these assumptions the equalization storage needed is the difference between the MDD and the supply flow available, or approximately 692,000 gallons.

Fire Reserve

Reserve storage for fire suppression is usually determined by the maximum needed fire flow rate and duration. However, because NFF has already been accounted for in equalization storage Method 1, on Table 4-2 fire reserve is shown as zero.

Emergency Storage

Emergency storage reserve is usually provided for a minimum of one to three days of average daily demand (ADD) to supply demand during a power outage, mechanical problems, or other problems that would interrupt the reliable supply of water. In most cases, this reserve would be sized to provide water for the amount of time needed to repair or replace a well pump, water supply source pump, or other equipment. Emergency storage can be reduced by discretion when multiple water supply sources are available and equipped with adequate standby power. Due to the number of water supply sources with backup power available in Sisters, Public Works staff believe that emergency reserves based on one day of ADD would be appropriate. Emergency reserves below one day of ADD are not considered a critical deficiency as typical water system function is not dependent on emergency storage. However, an emergency reserve of less than one day of ADD does not provide the level of safety the City deems necessary.

Table 4-2 shows the City's current (year 2022) and future (year 2042) recommended storage capacities.

TABLE 4-2
RECOMMENDED CITY STORAGE VOLUMES

Type of Storage	Volume (gallons)	
	Current Year 2022	Planning Year 2042
Operational Storage	425,000	1,000,000
Equalization Storage	180,000	692,000
Fire Reserve[1]	0	0
Emergency Reserve	1,034,500	2,082,000
Total Recommended Storage	**1,640,000**	**3,794,000**
Available Storage	1,600,000	3,800,000[2]
Additional Recommended Storage	**40,000**	**0**

[1]Fire reserve accounted for in equalization storage.

[2]Assuming an additional 2.2 MG of storage is constructed.

Storage Requirements Summary

The four storage components described herein require a total of approximately 1,640,000 gallons for the current year, indicating that the existing storage capacity has just recently become insufficient to be able to provide the City's emergency reserve allocation of one day of ADD. Assuming an additional 2.2 MG of storage is constructed for a total of 3.8 MG, the available storage will become inadequate to provide water in periods of peak demand in year 2035, in which the source capacity must be increased. Assuming an additional source is constructed such that the City can withdraw their full water right, the 3.8 MG of recommended storage will remain adequate through year 2042. At that time, the City may consider either constructing more storage, or reevaluating the recommended reservoir storage components to determine if the construction of additional storage may be deferred.

Existing Water Reservoir Condition

To evaluate potential existing water reservoir deficiencies or operational issues that could affect the City's storage needs, a reservoir inspection and assessment was provided by DN Tanks, Inc., for inclusion in this Water System Master Plan (WSMP) Update. A summary of the inspection report and related existing reservoir improvements are also discussed.

Summary of Inspection Report

A thorough interior and exterior inspection of the City's water reservoir was completed on May 16, 2022, by DN Tanks, Inc. A copy of the 2022 inspection report for the Morse Bros., Inc., 1.6 MG prestressed concrete storage tank is included in Appendix F.

In general, the inspection found that prestressed reinforcement and structural concrete walls and columns were in excellent condition with limited or no signs of corrosion or deterioration. Efflorescence was visible on the exterior of the tank where shotcrete was applied. A prior repair visible on the tank floor is showing signs of failure with a loss of material. Daylighting was visible in the tank, indicating loss of filler materials in the construction joints. The exterior roof is in fair condition with visible deterioration of a previously applied coating.

Items that are Acceptable

- Interior concrete columns are not cracking or spalling and no visible deficiencies were identified.
- Interior concrete walls are in excellent condition.
- Prestressed steel is not showing signs of corrosion.

Inspection Items Repaired During the Development of this WSMP Update

- Construction joints on the tank roof.

Items Needing Repair or Replacement

- Remove epoxy repair coating on tank floor and replace it with elastomeric coating.
- Repair concrete spalls on the underside of the tank roof.
- Apply protective coating to exterior roof.
- Recoat exterior walls with paint system.

The City should continue to monitor for settling cracks along the tank roof, walls, and floor; and delaminating shotcrete; and conduct repairs if necessary. The coating failures should also be monitored and repaired, if necessary. Steps should be taken to prevent or repair further deterioration of the exterior roof and concrete joints. The repairs noted in the inspection could help extend the service life and avoid potential water quality concerns with water intrusion.

Water Quality-related Improvements

The existing water reservoir does not have an effective means of circulating water, which can lead to stratification. Stratification of water can depress chlorine residuals in the reservoir, which can give treated water unpleasant odors or tastes and may even pose health risks to customers. Sufficient chlorine residuals are also important for maintaining good water quality within the distribution system and preventing organic buildup in pipes.

The City should continue to monitor water reservoir water quality. If stratification is observed, it is recommended the City install mixers to maintain sufficient chlorine residuals. Due to the variation in flows between winter and summer seasons, when the total storage is increased to the proposed 3.8 MG, the City should monitor reservoir turnover times and consider reducing the stored volume during low demand periods to maintain average turnover times to less than five days.

Recommended Water Reservoir Maintenance Improvements

Structural and cosmetic maintenance improvements should be completed regularly to extend the useful life of storage tanks and reduce repair costs. The City's forthcoming Capital Improvements Plan includes several maintenance-related projects for the existing water reservoir and are presented below.

- Rehabilitate the roof surface and reapply the protective coating.
- Remove existing epoxy repair and replace it with elastomeric coating.
- Repair construction joint fill material.
- Repair spalling concrete.
- Recoat exterior walls with paint system.

The total estimated maintenance/repair cost for the existing water reservoir is $250,000.

Potential Reservoir Capacity Improvement Options

This section discusses potential reservoir improvement options for consideration to serve the long-term water storage needs of the City of Sisters.

Reservoir Types

As previously discussed, storage reservoirs may be constructed of either steel, reinforced concrete, or prestressed concrete and have different configurations. Examples of typical storage reservoir types are shown on Figure 4-4. The choice is usually based on an economic analysis of both capital and operational costs and aesthetics associated with the particular installation. Further discussion of reservoir types follows.

For ground-level type reservoirs of 1.0 MG or less, steel reservoirs are usually less expensive to construct when compared to concrete reservoirs. There are two primary types of steel reservoirs: glass-fused bolted steel reservoirs and painted welded steel reservoirs. Glass-fused bolted steel reservoirs are comparable in cost to painted welded steel reservoirs and can result in less

maintenance costs over the life of the reservoir because sandblasting and recoating are normally not needed. However, glass-fused bolted steel reservoirs are susceptible to leaking due to the many bolts and mastic seals, and the appearance of glass-fused bolted steel reservoirs cannot be changed after installation. The long-term life cycle of glass-fused bolted steel reservoirs is also not known as they were introduced to the municipal water supply market in the late 1970s and early 1980s.

It is often desirable for reservoirs to serve the distribution system by gravity flow. Two options to achieve this include constructing a ground-level storage reservoir at a higher elevation than the service area or constructing an elevated reservoir in the vicinity of the service area. Elevated reservoirs are more expensive than ground-level reservoirs when providing similar storage volumes. However, transmission main lengths can often be reduced and the cost of additional transmission main lengths should be considered when comparing reservoir construction costs.

Elevated reservoir types include:

- Standpipe style, in which the height significantly exceeds the diameter and water is stored throughout the entire height of the tank.
- Spherical style, with a water storage sphere placed atop a single structural pedestal.
- Pillar style, which are similar to spherical tanks but have a larger diameter center pillar that can be utilized to house equipment, storage, or offices.

Refer to Figure 4-4 for pictures of each reservoir type.

Standpipe style reservoirs can be constructed of bolted steel or coated, welded steel. Storage from the lower portion of a standpipe reservoir is not always available to fully pressurize the system by gravity flow and sometimes requires booster pumps to maintain distribution system pressure when reservoir levels are low. Depending on site soil and seismic characterizations, standpipe style reservoirs are generally limited to a maximum height of 120 feet. This results in a maximum system pressure in the immediate vicinity of the standpipe reservoir of approximately 50 psi.

Both spherical and pillar style reservoirs have the benefit (over standpipe style) of storing more volume at a higher elevation near the top of the structure. Spherical reservoirs are generally welded steel that is epoxy or polyurethane coated. The pillar style reservoirs can either have a concrete pillar and steel storage area (composite tank) or consist of all-steel construction. Spherical and pillar style elevated storage reservoirs normally have higher capital costs than standpipe style reservoirs.

Water Storage Reservoir Type Life Cycle Cost Analysis

Consideration should be taken by the City when selecting the type of water storage reservoir to best meet the City's short- and long-term needs. Each type of storage reservoir has distinct advantages that can be demonstrated through determining present worth costs over a specific future time period. The life cycle cost analysis discussed hereafter considered all costs associated with the construction and maintenance of each reservoir type over a lifespan of 75 years. For the purpose of this analysis, the proposed reservoir was assumed to have the same height as the City's existing 1.6 MG reservoir and a volume of 2.2 MG. It should be noted that the design life of welded steel and prestressed concrete reservoirs was estimated to be 75 years, while the glass-fused bolted steel reservoir's design life was estimated to be 50 years, though a bolted steel reservoir may last longer than 50 years. To account for the disproportionate design life of the reservoir types, a replacement investment cost was included in

the analysis at five-year intervals equal to the initial construction cost divided by the estimated design life. The construction cost inflation percentage was set to exceed the interest rate percentage associated with the value of improvement (present worth rate) to accurately reflect increased costs over time. Only the direct cost of the reservoir is included in this analysis, including foundation work and painting. Other work including yard piping, fencing, etc., was negated as it is assumed these costs will be similar amongst the various reservoir types. Figure 4-5 presents a summary table of the life cycle cost analysis. Descriptions of each water storage reservoir type are provided below.

Welded Steel Reservoir

A 2.2 MG welded steel reservoir is estimated to cost approximately $2,550,000 to construct based on previous water storage reservoir projects completed by Anderson Perry & Associates, Inc. The cost of constructing a welded steel storage reservoir falls between the other two reservoir types; however, significant maintenance costs are required to maintain storage performance and water quality. Maintenance costs include cleaning the reservoir every five years, maintaining the cathodic protection system, replacing sacrificial anodes every 25 years, and repairing potential damage to the reservoir walls. The most expensive maintenance cost would be to recoat the interior and exterior walls, which would cost approximately $750,000 every 30 years. A welded steel reservoir provides the highest 75-year present worth cost.

Glass-Fused Bolted Steel Reservoir

A 2.2 MG glass-fused bolted steel reservoir would have the lowest construction cost of cost approximately $2,350,000. This reservoir would follow the same maintenance procedures as a welded steel reservoir, excluding wall recoating. The roof of this reservoir is supported by a metal (usually aluminum) web truss. Depending on the ambient conditions inside the reservoir, the web truss will eventually exceed its service life and require replacement. For this analysis, the web truss life cycle was estimated at 25 years. A glass-fused bolted steel reservoir provides a 75-year present worth cost that is approximately $846,000 less than the welded steel reservoir based on this analysis.

Prestressed Concrete Reservoir

A 2.2 MG prestressed concrete reservoir is estimated to cost approximately $2,950,000 to construct, making it the most expensive storage reservoir option; however, maintenance costs over the service life of the reservoir would be minimal in comparison to the reservoir types previously discussed. Required maintenance would include cleaning the reservoir as needed, repairing damage that may occur to the tank exterior (cracking), and recoating the exterior as required. The lifespan of the exterior coat will depend on the conditions and climate the reservoir is exposed to but was estimated at 30 years for this analysis. Potential repairs are associated with concrete reservoirs that routine maintenance would not account for. An additional $100,000 was added for miscellaneous repairs that may be needed approximately halfway through the reservoir's 75-year design life. A prestressed concrete reservoir provides the lowest 75-year present worth cost.

Based on the storage reservoir type life cycle cost analysis performed, glass-fused bolted steel and welded steel reservoirs should be considered if low initial construction costs are desired. However, projecting over a 75-year operational period, these tanks will require significant investments toward

maintenance. A prestressed concrete reservoir would have a larger initial construction cost but would be less expensive over the 75-year design life due to less required maintenance.

Reservoir Options

The amount of future storage needed depends on the amount of emergency reserve the City determines is adequate to provide for emergency and unforeseen circumstances. It was determined that approximately 2.2 MG of additional storage would be adequate to meet the year 2042 projected growth while providing a reasonable amount of emergency reserve. One site option was identified for construction of the needed storage reservoir, which is directly adjacent to the existing 1.6 MG water reservoir. This site is more ideal than any other location, as it does not need to be elevated or constructed with a booster pump station to provide adequate distribution system pressure, the City has a pre-existing special use permit with the USFS for the land-use approval, and it can be easily connected to the existing system without additional transmission lines.

Recommended Storage Improvements and Cost

Based on discussions with City staff, a prestressed concrete reservoir is the preferred method of construction for any new water reservoir, as it has the lowest 75-year present worth cost, highest resilience to seismic activity, and will match better aesthetically with the existing tank. The site for the new reservoir, which is adjacent to the existing reservoir, is ideal, as its elevation in relation to the City provides adequate pressure without the need for booster pump stations.

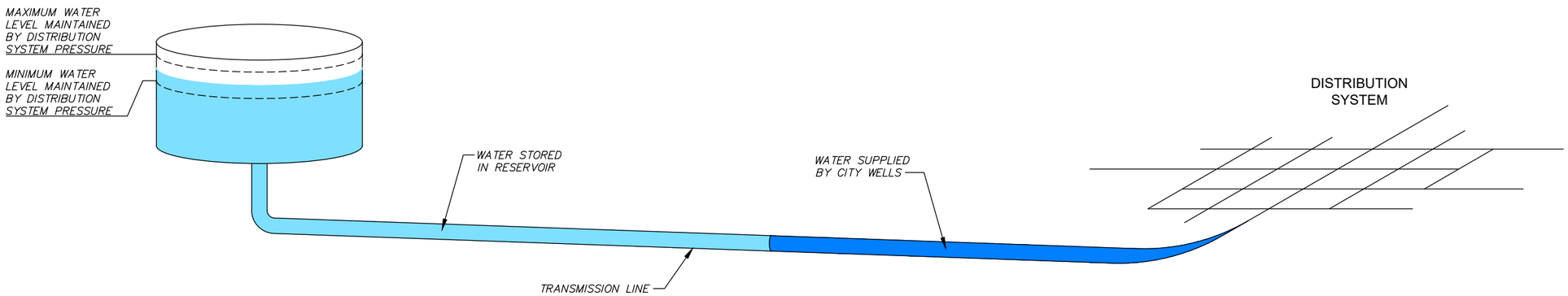
New 2.2 Million Gallon Prestressed Concrete Water Storage Reservoir and Site Improvements

Under this alternative, the City would construct a new ground-level, partially buried 2.2 MG prestressed concrete water storage reservoir and piping connecting the new reservoir to both the existing 1.6 MG concrete tank and transmission line. The total volume of the two tanks (3.8 MG combined) would accommodate the projected MDD during year 2042 with three-quarters of a day of ADD emergency reserve storage. This alternative assumes a new source is added to the system within the planning period prior to 2035. The new water storage reservoir would be constructed adjacent to and hydraulically connected to the existing concrete tank. Backflow prevention valves would be incorporated so when the tanks are filling and emptying, water would enter the inlet of the existing 1.6 MG tank and exit the new 2.2 MG tank. This operational process would ensure water is continuously cycled through both water reservoirs. Isolation valves would also be incorporated such that either tank could be taken offline while the other remains in service. Automatically actuated control valve(s) may be included, allowing simultaneous flow from both tanks into the transmission line during periods of peak demand. Rehabilitation of the existing 1.6 MG reservoir as previously discussed would be completed after the new tank is brought online.

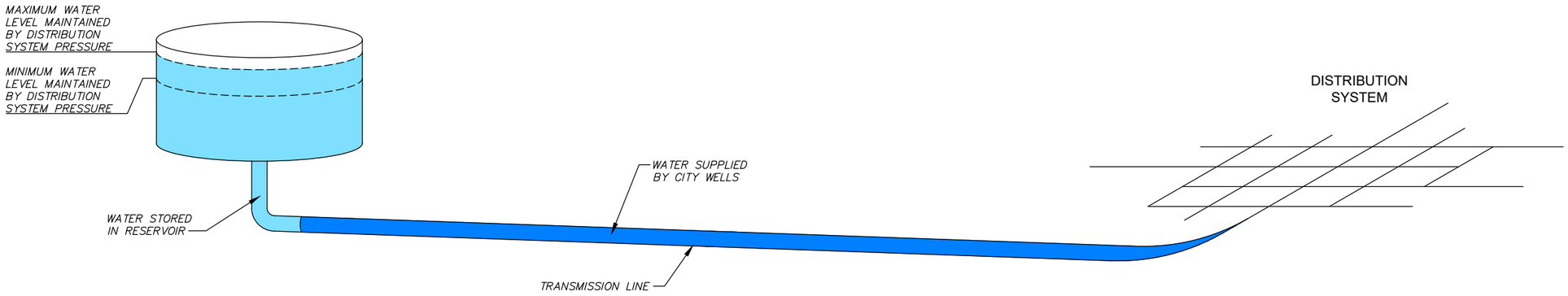
The proposed location for the reservoir, connection lines, and valve control boxes are shown on Figure 4-6. The reservoir base elevation and sidewall heights would be set to those of the existing reservoir so the tanks could be hydraulically connected without the need for additional control valves. The anticipated year 2023 project cost for the work described is $6,283,000 and includes rehabilitation of the existing reservoir. A detailed cost estimate is presented on Figure 4-7.

Recommended Storage Improvements

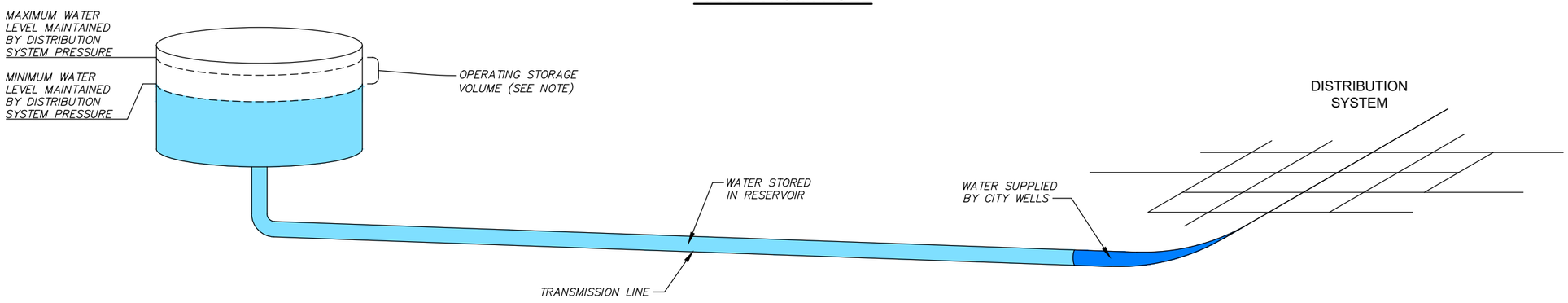
Based on findings of this WSMP Update and discussions with City staff, it is recommended an additional 2.2 MG of storage be constructed. The preferred type of reservoir based on life cycle costs is a prestressed concrete tank. Tank resilience to seismic activity is another benefit of this type of construction, though potential structural damage during the anticipated Cascadia earthquake is anticipated to be low. The location of the new reservoir will be adjacent to the existing reservoir for ease of connection to the existing system and per the pre-arranged agreement with the USFS for the proposed land use. The reservoir should be constructed at the same elevation as the existing tank to allow a hydraulic connection without additional control mechanisms. The new reservoir will need to be constructed prior to 2035 (or equivalent population of 5,715) or the City risks being unable to provide adequate flow during peak demand periods. To maintain adequate emergency reserve, the new reservoir should be constructed immediately.



RESERVOIR FILLING



RESERVOIR FULL



RESERVOIR DISCHARGING TO COMMUNITY

NOTE

IF OPERATING STORAGE VOLUME IS NOT LARGE ENOUGH, THE WATER STORED IN THE RESERVOIR MAY NOT BE EXCHANGED WITH FRESH WATER SUPPLIED BY THE BOOSTER PUMP STATIONS THROUGH THE DISTRIBUTION SYSTEM.

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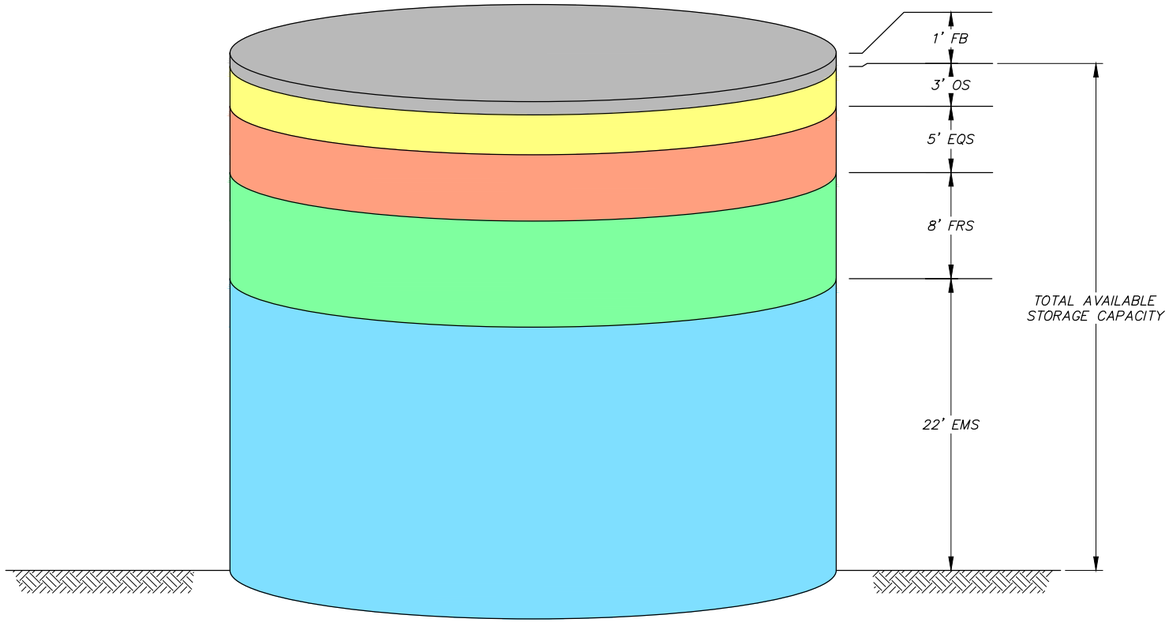
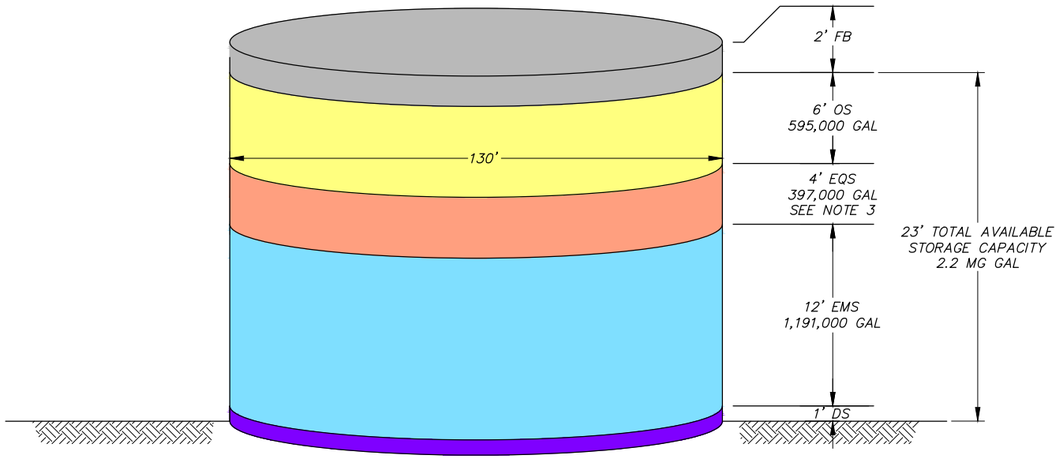
EXAMPLE RESERVOIR WATER EXCHANGE SCHEMATIC

FIGURE
4-1

EXAMPLE RESERVOIR OPERATING RANGES

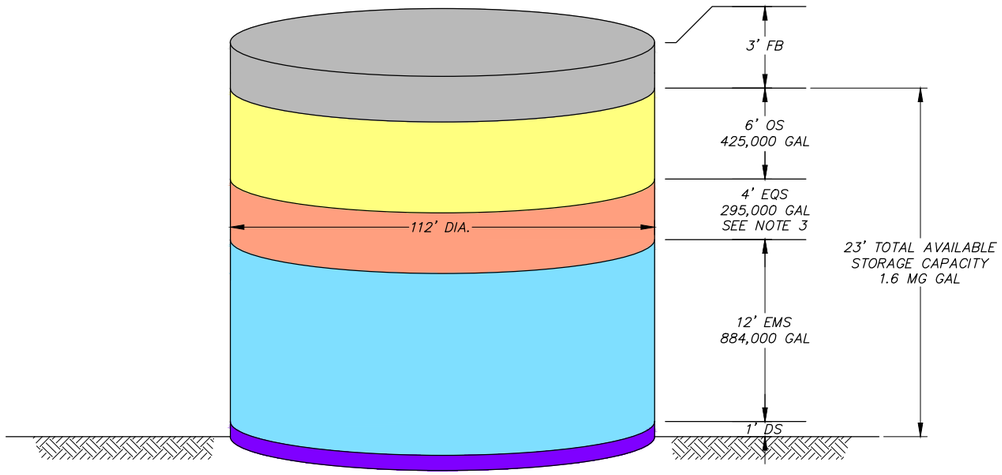


PROPOSED 2.2 MG RESERVOIR



1.6 MG RESERVOIR NO. 1 OPERATING RANGES

(CONSTRUCTED IN 1995)



LEGEND

- FREEBOARD (FB)
- OPERATING STORAGE (OS)
- EQUALIZING STORAGE (EQS)
- FIRE RESERVE STORAGE (FRS)
- EMERGENCY STORAGE (EMS)
- DEAD STORAGE (DS)

ABBREVIATIONS

FB	-	FREEBOARD
OS	-	OPERATING STORAGE
EQS	-	EQUALIZING STORAGE
FRS	-	FIRE RESERVE STORAGE
EMS	-	EMERGENCY STORAGE
MG	-	MILLION GALLON
GAL	-	GALLON
DS	-	DEAD STORAGE

NOTES

1. OPERATING RANGES ARE FOR PRESENTATION PURPOSES AND ARE APPROXIMATE.
2. STORAGE VOLUMES ARE BASED ON BOTH DESIGN CRITERIA AND TOTAL SYSTEM AVAILABLE STORAGE. VOLUMES SHOWN MAY NOT REFLECT ACTUAL RESERVOIR OPERATION.
3. FIRE RESERVE STORAGE NOT SHOWN AS FRS IS INCORPORATED IN EQUALIZING STORAGE.

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RESERVOIR STORAGE VOLUME SCHEMATIC

FIGURE

4-2

SUMMARY OF STORAGE DESIGN CRITERIA

	Year 2022	Interim Year 2035 (Increase Source Supply)	Planning Year 2042 (with new source)
Design Population[1]	3,437	5,715	6,917
Supply			
Average Daily Demand[2] (ADD) (gpcd)	301	301	301
ADD (gpd)	1,034,500	1,720,200	2,082,000
ADD (gpm)	720	1,190	1,450
Maximum Daily Demand[3] (MDD) (gpcd)	858	858	858
MDD (gpd)	2,948,400	4,902,600	5,933,700
MDD (gpm)	2,050	3,400	4,120
Estimated Supply Flow Available[4] (gpm)	3,050	3,050	4,160
Estimated Supply Flow Available[5] (gpd)	3,843,000	3,843,000	5,241,600
Needed Fire Flow (NFF) (gpm)	2,500	2,500	2,500
Fire Flow Duration (hour)	2	2	2
MDD plus NFF (gpm)	4,550	5,900	6,620
Storage			
Operating Storage[6] (gal)	425,000	1,000,000	1,000,000
Equalization Method Scenarios			
Method 1 - MDD plus NFF[7]	180,000	342,000	295,200
Method 2 - MDD[8] (gal)	0	1,060,000	692,000
Fire Reserve[9]	0	0	0
Emergency Reserve[10] (gal)	1,034,500	1,720,200	2,082,000
Total Recommended Storage (gal)	1,640,000	3,781,000	3,774,000

[1]Population estimate and projections from the Population Research Center at Portland State University.

[2]ADD calculated from historical records provided by City staff for years 2016 to 2020.

[3]MDD peaking factor of 2.85 x ADD calculated from historical records provided by City staff for years 2016 to 2020.

[4]Assumes the largest producing well is offline.

[5]Assumes a maximum operation of 21 hours per day.

[6]Transmission line volume plus total storage divided by five days.

[7]Difference between MDD plus NFF and estimated instantaneous supply flow available for three hours.

[8]Difference between MDD and estimated daily supply flow available.

[9]Fire flow is accounted for in equalization storage evaluation. No separate fire flow storage is needed for this evaluation.

[10]One-day supply at ADD, assuming only storage is used.

gal = gallons
gpcd = gallons per capita per day
gpd = gallons per day
gpm = gallons per minute

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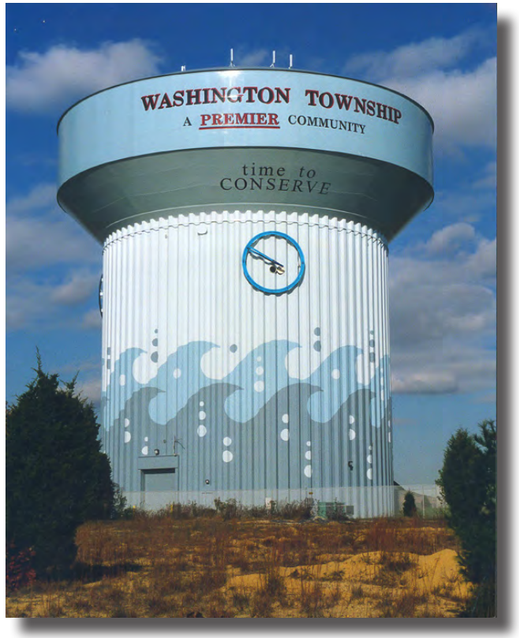
SUMMARY OF STORAGE DESIGN CRITERIA

FIGURE 4-3

Pillar Style Elevated Composite (Concrete/Steel) Reservoir - Plano, Texas (Courtesy of CB&I)



Pillar Style Elevated Steel Reservoir Washington Township, Pennsylvania (Courtesy of CB&I)

Spherical Elevated Steel Reservoir Clanton, Alabama (Courtesy of CB&I)

Standpipe Style Welded Steel Reservoir Moses Lake, Washington (courtesy of Rocamia Design)

Prestressed Concrete Reservoir Cypress College in Cypress, CA (courtesy of DN Tanks)

Ground Level Bolted Steel Reservoir - Cove, Oregon

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RESERVOIR TYPES

FIGURE
4-4

X:\Clients\Sisters OR\446-08 WSMP\Graphics\WSMP-446-08-FIG 4-4 ResTypes.indd, 09/09/22, 11:30 AM

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STORAGE RESERVOIR TYPE LIFE CYCLE COST ANALYSIS

Tank Characteristics	Diameter, ft	130
	Height, ft	24
	Capacity, MG	2.2
Time Value	Annual Inflation Rate	4.0%
	Present Worth Rate	3.0%

Maintenance Type	Data Description	Type of Tank: Welded Steel	Glass-Fused Bolted Steel	Prestressed Concrete
Design Life		75	50	75
1	Estimated Cost for Constructing New Tank[1]	$ 2,550,000	$ 2,350,000	$ 2,950,000
2	Repainting Cycle, years	30	N/A	30
	Interior Surface Area, SF	38,000	N/A	N/A
	Exterior Surface Area, SF	24,000	N/A	10,200
	Interior Repainting Cost, $/SF	$ 12	N/A	N/A
	Exterior Repainting Cost, $/SF	$ 12	N/A	$ 12
3	Reservoir Cleaning Cycle, years	5	5	5
	Cost for Cleaning Reservoir with Divers	$ 7,500	$ 7,500	$ 7,500
4	Check and Clean Cathodic Protection System, years	5	5	N/A
	Cost to Check and Clean Cathodic Protection System	$ 1,000	$ 1,000	N/A
5	Replace Sacrificial Anode, years	20	20	N/A
	Cost for Replacing Sacrificial Anode	$ 20,000	$ 10,000	N/A
6	Repair Tank Wall, years	10	10	10
	Cost for Repairing Tank Wall	$ 1,200	$ 1,000	$ 800
7	Replace Web Truss on Bolted Steel Tank, years	N/A	20	N/A
	Cost for Replacing Web Truss	N/A	$ 30,000	N/A
8	Miscellaneous Repairs, years	N/A	N/A	40
	Cost for Miscellaneous Repairs	N/A	N/A	$ 100,000
9	Replacement Investment Deposit, years	5	$ 5	5
	Deposit Amount	$ 170,000	$ 235,000	$ 197,000

	Expenditure Costs					
Years in the Future	**Welded Steel Maintenance Type**	**Welded Steel Expense**	**Glass-Fused Bolted Steel Maintenance Type**	**Glass-Fused Bolted Steel Expense**	**Prestressed Concrete Maintenance Type**	**Prestressed Concrete Expense**
0	1,9	$ 2,720,000	1,9	$ 2,585,000	1,9	$ 3,147,000
5	3,4,9	$ 187,335	3,4,9	$ 255,552	3,9	$ 214,622
10	3,4,6,9	$ 197,929	3,4,6,9	$ 269,302	3,6,9	$ 226,126
15	3,4,9	$ 206,338	3,4,9	$ 281,476	3,9	$ 236,393
20	3,4,5,6,9	$ 242,270	3,4,5,6,7,9	$ 345,147	3,6,9	$ 249,064
25	3,4,9	$ 227,269	3,4,9	$ 310,029	3,9	$ 260,373
30	2,3,4,6,9	$ 1,234,282	3,4,6,9	$ 326,710	2,3,6,9	$ 437,885
35	3,4,9	$ 250,324	3,4,9	$ 341,478	3,9	$ 286,786
40	3,4,5,6,9	$ 293,916	3,4,5,6,7,9	$ 418,723	3,6,9	$ 449,336
45	3,4,9	$ 275,717	3,4,9	$ 376,118	3,9	$ 315,877
50	3,4,6,9	$ 291,309	3,4,6,9	$ 396,355	3,6,9	$ 332,809
55	3,4,9	$ 303,686	3,4,9	$ 414,272	3,9	$ 347,920
60	2,3,4,5,6,9	$ 1,685,004	3,4,5,6,7,9	$ 490,128	2,3,6,9	$ 585,118
65	3,4,9	$ 334,492	3,4,9	$ 512,513	3,9	$ 383,213
70	3,4,6,9	$ 353,408	3,4,6,9	$ 500,514	3,6,9	$ 403,754
75	3,4,9	$ 368,423	3,4,9	$ 502,583	3,9	$ 422,087
	Present Worth Cost:	$ 9,172,000		$ 8,326,000		$ 8,299,000

[1]Includes tank foundation, materials, construction/installation, and painting only. All other project costs typical of all reservoir types (clearing and grubbing, fencing, yard piping, etc.) are excluded from this comparison.

ft = feet
MG = million gallons
SF = square feet
$/SF = Cost per square foot

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STORAGE RESERVOIR TYPE
LIFE CYCLE COST ANALYSIS

FIGURE
4-5

N

60 0 60 120 180
SCALE IN FEET

EDGINGTON ROAD
TRANSMISSION LINE EXTENSION

REFER TO CHAPTER 5

RESERVOIR TO WHYCHUS CREEK
JUNCTION TRANSMISSION LINE
REPLACEMENT

POLE CREEK DRAIN
LINE OUTLET

REFER TO CHAPTER 5

EXISTING 12-INCH DRAIN
LINE TO REMAIN

ABANDON EXISTING
AC PIPE

ABANDON EXISTING PVC
OUTLET LINE

CONNECT TO EXISTING
DRAIN LINE

1.6 MG RESERVOIR
OVERFLOW AND DRAIN LINE

NEW 18-INCH DI
PIPE, TYP.

EXISTING 1.6 MG WATER
STORAGE RESERVOIR

NEW WATER CONTROL
VALVE BOX

TRANSFER LINE

2.2 MG RESERVOIR
BYPASS LINE

1.6 MG BYPASS LINE

OUTLET

INLET

2.2 MG RESERVOIR
OVERFLOW AND DRAIN LINE

NEW WATER VALVE
CONTROL BOX

OUTLET

NEW 2.2 MG WATER STORAGE
RESERVOIR

INLET

TRANSFER LINE/1.6 MG BYPASS LINE

LEGEND

- NORMAL FLOW
- BYPASS FLOW
- ABANDON PIPE
- IMPROVEMENTS

EXISTING

- 12" WATER LINE

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NEW 2.2 MG RESERVOIR SCHEMATIC SITE PLAN

FIGURE
4-6

X:\Clients\Sisters OR\446-08 WSMP\CAD\WSMP-446-08-FIG4-6.dwg, Layout1, 3/27/2023 5:05 PM, dchristman

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
NEW 2.2 MG PRESTRESSED CONCRETE WATER STORAGE RESERVOIR AND SITE IMPROVEMENTS
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 225,750	All Req'd	$ 225,750
2	Project Safety, Temporary Traffic Control, and Quality Control	LS	100,000	All Req'd	100,000
3	Construction Survey	LS	15,000	All Req'd	15,000
4	Clearing and Grubbing	ACRE	7,500	2	15,000
5	Rehabilitate existing 1.6 Million Gallon (MG) Reservoir	LS	250,000	All Req'd	250,000
6	Site Work including Excavation, Embankment, etc.	LS	190,000	All Req'd	190,000
7	Reservoir Pad	SY	65	1,500	97,500
8	2.2 MG Prestressed Concrete Reservoir	GAL	1.30	2,200,000	2,860,000
9	18-inch Ductile Iron Reservoir Site Piping	LF	240	2,300	552,000
10	Connect to Existing Water Line	EA	2,250	3	6,750
11	Control Valves, Vaults, Fittings, etc.	LS	180,000	All Req'd	180,000
12	Exterior Tank Wall Painting	SF	10	10,200	102,000
13	Appurtenances	LS	55,000	All Req'd	55,000
14	Gravel Access Drive	SY	15	600	9,000
15	Chain Link Fence and Gates	LF	30	600	18,000
16	Electrical Work	LS	35,000	All Req'd	35,000
17	Instrumentation and Controls	LS	35,000	All Req'd	35,000
				Subtotal Estimated Construction Cost	**$ 4,746,000**
				Construction Contingency (15%)	712,000
				Total Estimated Construction Cost	**$ 5,458,000**
				Preliminary, Design, and Construction Engineering (15%)	819,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 6,277,000**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 3,300
				General Permitting	2,700
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 6,000**
				TOTAL ESTIMATED PROJECT COST	**$ 6,283,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

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WATER SYSTEM MASTER PLAN UPDATE
NEW 2.2 MG PRESTRESSED CONCRETE
WATER STORAGE RESERVOIR
AND SITE IMPROVEMENTS
PRELIMINARY COST ESTIMATE

FIGURE
4-7

Chapter 5 - Distribution System

Introduction

This chapter discusses the City of Sisters' existing water distribution system, which delivers water to residential, commercial, and industrial users. Components of the distribution system include pipelines, valves, fittings, water meters, water service lines, and fire hydrants. The City's distribution system has been evaluated for both present and future needs. Recommended distribution system improvements have been developed to address existing identified deficiencies and provide future service to help meet both Oregon Health Authority - Drinking Water Services (DWS) requirements and Oregon Fire Code (OFC) fire flow requirements.

Existing Distribution System

The City's water distribution system dates to the 1930s, with the majority of the City's water lines being installed in the 1980s and later. The majority of the original water system was upgraded in 1993 with C900 polyvinyl chloride (PVC) mains. Since 1993, the City has continued replacing portions of galvanized and asbestos cement (AC) lines with C900 PVC. Only a few localized areas are still served by old undersized pipe. Currently, the City has one pressure zone. The City's four wells pump directly into the distribution system. The City's single water storage reservoir is connected to the distribution system through a transmission line network with one section of a single 12-inch AC pipe and a second section of a 12-inch PVC pipe in parallel with a 12-inch AC pipe.

The existing distribution system layout, including fire hydrant locations and pipe size and locations, is shown on the Existing Water System Map included at the end of this Water System Master Plan (WSMP) Update. The City maintains an ArcGIS Online subscription with Esri to support the City's mapping, visualization, and analysis needs. The water system mapping application, which includes location and attribute information of City-owned assets, is maintained and administered by Anderson Perry & Associates, Inc. (AP). The GIS network was utilized to create the Existing Water System Map and was checked for accuracy by the City's Public Works Department. Additional information for the City's water distribution system was obtained from previous WSMPs and water system improvements Record Drawings provided by the City.

Piping

The City has approximately 200,000 feet of piping in its distribution system. The distribution system piping consists of steel, AC, ductile iron (DI), high density polyethylene (HDPE), and PVC. Piping within the distribution system generally ranges from 4- to 16-inch diameter, with the majority being 4-, 6-, 8-, 10-, and 12-inch piping. No existing fire hydrants are served by a 4-inch or smaller water line. A summary of majority pipe sizes and their approximate associated lengths is provided on Table 5-1.

TABLE 5-1
WATER DISTRIBUTION SYSTEM PIPING

Size	Length (feet)	Percentage
4-inch	7,481	3.8
6-inch	9,239	4.7
8-inch	65,494	33.2
10-inch	36,498	18.5
12-inch	78,711	39.8
Total	**197,423**	**100**

Currently, seven buried and one suspended water line creek crossings are located throughout the system. One crossing on Pole Creek near the water storage reservoir consists of AC pipe installed in the 1960s spanning the creek diagonally. Whychus Creek has seven water line crossings consisting of two AC pipe under-creek crossings installed in the 1960s, three PVC and one HDPE under-creek crossings, and one DI bridge crossing on South Creekside Drive.

Booster Pump Stations

The City of Sisters does not have a booster pump station. The City is not considering installing a booster pump station. The only need for a booster pump station will arise if a future water storage reservoir is constructed below the elevation of the existing reservoir or the need arises that requires the creation of an additional pressure zone.

Water Meters

The City of Sisters' system has approximately 2,049 water service connections as of September 2022. All service connections are metered. The City's current Public Works Standards and Specifications require that all new meter installations include meter transceiver units (MXUs) that permit off-site meter reading via radio signals. Water meters will deteriorate, wear, or become damaged with time, thus producing inaccurate readings. Inaccurate meters tend to under-register water consumption or record no water use at all. Oversized meters for a customer's level of usage will also tend to under-register water use. Due to the system's non-revenue water (discussed later in this chapter), which may be in part the result of meter inaccuracies, the City is considering introducing a meter replacement program. The program would replace inaccurate meters, registers, and endpoints that have been in service for 15 or more years. The meter replacement program will replace old, worn-out meters with new units equipped with MXUs. Meters between 10 to 15 years of age will be tested, calibrated, or replaced as needed. The City has an active water meter testing program with an eight-bay testing bench at the Public Works Department headquarters.

Following implementation of the meter replacement program, the City will monitor and replace water meters in the system as they fail. It is important to replace old water meters so the City continues to obtain accurate water usage readings and associated customer billings. The City should plan and budget for replacing meters based on a 20-year life.

Distribution System Pressure

The City of Sisters is relatively uniform in elevation and, therefore, does not have the need for separate pressure zones. The distribution system usually operates with system pressures between 55 and 80 pounds

per square inch (psi). Distribution system pressure is generally established by the level in the water storage reservoir, with major variations produced by friction losses in the reservoir transmission line and minor variations produced by friction losses in the distribution system. Discussions herein will refer to system baseline pressure. This is the pressure that would be experienced at any reference point in the system with no demand, all City wells off. This baseline pressure is the difference between the reservoir level and the reference point.

Major variations in system pressure occur when the reservoir is either being filled or withdrawn from. This is a result of the diameter and length of the reservoir transmission line network. System pressure will either rise above or drop below the baseline pressure, depending on whether the reservoir transmission line is filling or drawing from the reservoir, respectively.

With all City wells off, system pressure is the product of the reservoir level static head minus friction losses through the reservoir transmission line and distribution system. As system demand increases from zero, system pressure will reduce from the baseline pressure due to friction losses from the reservoir to the places of use.

During periods when one or more wells are on and system demand is greater than source production, places of use will be drawing from a combination of well source supply and storage from the reservoir. In this scenario, system pressure will reduce from the baseline pressure, but less than when all wells are off.

With one or more wells on and no system demand, system pressure will increase from the baseline pressure as friction losses develop due to flow in the reservoir transmission line as the reservoir is filled. In this scenario, system pressure will be the product of the reservoir level static head plus the friction losses through the reservoir transmission line.

During periods when one or more wells are on and system demand is lower than source production, places of use will be drawing from well water only at the same time the reservoir is being filled. In this scenario, system pressure will increase from the baseline pressure, but less than when system demand is higher.

This section outlines the fact that system pressure will both rise above and drop below a reference point's baseline pressure depending on system demand and well operations at a given point in time. The highest pressures will develop when system demand is low and the reservoir is filling during well pumping. The lowest pressures will develop when all wells are off and system demand is high. The resulting variations in system pressure are high and noticeable by users. This fluctuation in pressure could be reduced by increasing reservoir transmission line network pipe sizes.

Refer to the Water System Modeling section of this chapter for further discussion.

Distribution System Water Quality

Coliform Bacteria

The City routinely obtains three samples each month from the distribution system and one sample taken at each source for analysis of total coliform and *E. coli.* Routine sample results are on file with the DWS from 1997. In the City's distribution system, total coliforms and *E. coli* were absent in all samples to date.

Lead and Copper

The City has also obtained samples from the distribution system to satisfy chemical analysis requirements for total lead and copper. The action levels for lead and copper are 0.015 and 1.3 milligrams per liter (mg/L), respectively, based on the 90th percentile of 10 to 20 samples taken from taps throughout the distribution system. All 90th percentile sample results available through the DWS have been below the action level for lead or copper. Two 20-count samples taken in January and July 2022 resulted in 90th percentile lead concentrations of 0.0068 and 0.0017 mg/L, respectively. The City is currently required to perform sample rounds annually. Corrosion control facilities are typically only considered when the action level for either lead or copper is exceeded. The City's water does not have corrosive properties.

Disinfection Byproducts

The City takes routine samples for disinfection byproducts that include total haloacetic acids (HAA5) and total trihalomethanes (TTHM). Records for both HAA5 and TTHM date back to September 2004. No sampling events for HAA5 or TTHM exceeded the maximum contaminant level of 0.060 mg/L and 0.080 mg/L, respectively. HAA5 and TTHM analytical results are available on DWS's Drinking Water Data Online website. Because all of the City's water is produced by groundwater wells with very low levels of natural organic materials, the formation of TTHM and HAA5 is unlikely.

Fire Protection

General

The City is responsible for maintaining fire hydrants within city limits, while the Sisters-Camp Sherman Fire District is responsible for providing fire protection within city limits. The City's water distribution system supplies pressure and flow capacity in support of fire protection throughout the City. DWS regulations and the 2019 OFC require the entire water system maintain a minimum 20 psi residual pressure at all times (i.e., high demand periods, fire flow events, etc.). As discussed in Chapter 2, the recommended fire flow is 2,500 gallons per minute (gpm) in public facility zones, 2,000 gpm in general commercial and light industrial zones, and 1,500 gpm in residential zones. Per the 2019 OFC, the existing elementary school requires a fire flow higher than 3,500 gpm due to a combination of floor area and building construction. However, the school is being replaced and the City engineer informed Anderson Perry & Associates, Inc., that the new school has a needed fire flow of less than 2,000 gpm. The 2017 Insurance Services Office, Inc., Public Protection Classification summary report included as Appendix G identified the existing elementary school area as deficient for available fire flow. Fire hydrant spacing was not mentioned in the memorandum.

Generally, the City's water system provides the City engineer-recommended fire flows to the majority of the City with supplemental well water. The discussion presented herein is intended to provide caution concerning the actual available fire flows from the City's distribution system and fire hydrants. The available fire flows as calculated by the hydraulic model, assuming recommended improvements are in place, will continue to provide such flows as the City grows, and are discussed in more detail later in this chapter.

Fire Hydrant Flow Tests

In January 2022, the City and the Sisters-Camp Sherman Fire District conducted fire hydrant flow tests on four fire hydrants in the distribution system with special instruction from AP and in accordance with American Water Works Association (AWWA) Manual M17. The hydrant flow test results are included in Appendix H for reference. Based on the hydrant flow test results, the City's water system is able to deliver fire flows ranging from approximately 1,400 to 2,100 gpm, with no wells in operation.

Fire Hydrant Limitations

Field system pressures may differ from the reported pressures in the fire hydrant flow tests due to varying system operating conditions such as demand, reservoir levels, well pump settings, and the elevation and piping configuration supplying a specific fire hydrant.

Generally, the fire flow tests are conducted by opening one fire hydrant at a time. If large enough main lines and system pressures are present, individual fire hydrants can typically provide flows in the range of 800 to 1,200 gpm from a small port and nearly 2,000 gpm from both small ports and the larger "pumper" port, assuming the hydrant has a large port. The system residual pressures, main line sizes, and looping likely dictate what fire flows are available as opposed to the physical limitations of the fire hydrants. To achieve the maximum flow available in an area during a fire, more than one fire hydrant would need to be used to approach the maximum expected main capacity shown by the water system computer model.

Generally, the City's water system is capable of providing adequate fire flows to all areas. As the City grows, some improvements will be necessary to maintain existing fire flow capacities. Those improvements are discussed later in this chapter.

Fire Hydrant Coverage

The OFC outlines maximum recommended fire hydrant spacing depending on several factors, such as fire flow requirements of the area, the number of fire hydrants in the area, if the area is on a dead-end street or has limited access, etc. As required by the 2019 OFC, the maximum spacing between any two hydrants for a fire flow requirement of 1,750 gpm or less is 500 feet, and as little as 350 feet for a fire flow requirement of 3,500 to 4,000 gpm. The maximum required distance from any point of a street or road frontage to a hydrant is 250 feet for 1,750 gpm or less and 210 feet for 3,500 to 4,000 gpm.

The Sisters-Camp Sherman Fire District takes responsibility for fire hydrant coverage and informs the City's Public Works Department of any areas that need additional fire hydrants. No areas have been identified by the Fire District as needing additional fire hydrants at this time. Fire hydrant spacing was not determined as part of this WSMP Update effort.

Theoretical Fire Flows

In some cases, the available flow from a fire hydrant is calculated using a theoretical formula. The formula assumes the water supply "feeding" the tested area is generally not limited and the 20 psi residual pressure resulting from the fire flow occurs where the hydrants are being tested. In reality, there are likely other connections in the distribution system, such as users in the City on small

diameter main lines or at higher elevation areas, that would fall below 20 psi sooner than the formula predicts. Considering this, the theoretical formula can overestimate available fire flows at 20 psi. The hydraulic computer modeling completed as part of this WSMP Update, as discussed later in this chapter, will present more accurate available fire flows than theoretical formulas would.

Water System Modeling

General

A computer hydraulic model evaluates distribution system pressure and flows during a simulated water use demand scenario. As part of this WSMP Update, a detailed computer hydraulic water model of the City's water system was utilized to analyze system pressures, and available fire flows from the City's distribution system. A general description and the results of each computer run performed for both the existing and improved water systems are discussed herein.

Available system fire flows are determined under maximum daily demand (MDD) conditions. Hydraulic computation of system fire flows does not evaluate individual hydrant capacities but indicates the maximum flow the system can provide to a specific location while maintaining a minimum residual pressure of 20 psi to all points of delivery. Typical water system demands used for the computer model include the peak hourly demand (PHD), the MDD, and fire flow demands discussed herein and in Chapter 2.

The computer model also utilizes detailed information about the distribution system pipes. Each individual pipe was assigned a roughness coefficient based on the pipe material (PVC, DI, AC, steel, etc.). This allows the water model program to calculate water main line pressure losses under any demand condition desired, including fire flow analyses. Junctions were identified in the water model that allowed the model to compute where and at what elevation pipe intersections occur. Water demands can then be placed on the distribution system at each junction to simulate PHD or MDD use demands.

Calibration Model Development

The water model for this WSMP Update was developed using the Innovyze InfoWater Pro 2023.3 modeling software. The model utilized a GIS geodatabase exported from the ArcGIS Online subscription that the City maintains with Esri. This geodatabase provided pipe locations, length, size, and material for the entire distribution system including well and reservoir transmission lines. The reservoir was modeled using parameters from the Record Drawings. Each of the City's four wells was modeled using available data, which included the approximate water level of the aquifer and well pump curves and set points provided by the City. Elevations were assigned to all near ground-level facilities using publicly available light detection and ranging (LiDAR) data available through the Oregon Department of Geology and Mineral Industries, Oregon LiDAR Consortium.

The model was calibrated using fire hydrant test with all wells shut off, simulating flow from the reservoir only. Pipe roughness coefficients were adjusted until the simulated static and residual pressures at a specific location best matched those reported in the January 2022 fire hydrant flow tests (refer to Appendix H). The calibrated model simulates field-observed conditions within 10 percent of field-tested fire flow data. The best fit model was developed by applying Hazen-

Williams roughness coefficients ranging from 125 and 150. The roughness coefficient of 125 was used for AC transmission lines, which had the greatest effect on model results.

Model Water Demands

System water demands for years 2020, 2022, and 2042 were derived from the design criteria presented in Chapter 2. Demands for specific service accounts were not provided for this WSMP Update. Therefore, demands for each scenario were distributed evenly throughout the distribution system at junctions representing tees and crosses. These locations are referred to as "Demand Nodes" in the model. Demand was removed from junctions in close proximity on a case by case basis to prevent high concentrations of demand from being applied in localized areas within the model.

Five demand scenarios were modeled:

1. Base year 2020 with average daily demand (ADD)
2. Existing year 2022 with PHD
3. Existing year 2022 with MDD
4. Planning year 2042 with PHD
5. Planning year 2042 with MDD

Available fire flow was determined for each hydrant lateral for MDD scenarios and compared with recommended fire flow based on the underlying zone. The demand conditions used in modeling the system are described on Table 5-3.

TABLE 5-3
WATER MODEL SYSTEM DEMAND SCENARIOS

Demand Scenario	System Demand (gpm)	Junction Demand[1] (gpm)
2020 ADD	670	2.38
2022 PHD	3,428	12.16
2022 MDD with NFF	2,050	7.27
2042 PHD	6,745	23.92
2042 MDD with NFF	4,120	14.61

[1]Demand applied to each of the 282 "Demand Node" junctions.

Model Scenarios

2020 Calibration Scenario - Average Daily Demand with Hydrant Tests

The calibration model was used as the base model. The year 2020 ADD was distributed evenly throughout the model. The reservoir level was set to 20 feet above finish floor, and all wells were set to off. The static and residual pressures at each of the four hydrant locations were

analyzed by applying the measured test flow to the specific junction representing the hydrant. Pipe roughness coefficients were adjusted until static and residual pressures at each location were within 10 percent of the measured tests.

2022 Peak Hourly Demand - System Pressure

The 2020 calibration model above was used as the base model. The 2022 PHD was distributed evenly throughout the model. The reservoir level was set to 17.0 feet above finish floor to represent a level indicative of the low operating level just prior to the well pumps being called to run. All four wells were set with an initial condition of off and pressure-dependent start and stop set points provided by the City representing current operations. The modeled results were evaluated for residual system pressure at all locations of delivery.

2022 Maximum Daily Demand - Available Fire Flow

The 2020 calibration model above was used as the base model. The 2022 MDD was distributed evenly throughout the model. The reservoir level was set to 12.6 feet above finish floor to represent a level indicative of the emergency reserve level. Well No. 3 was set to off to represent the largest producing source offline. The remaining wells were set with an initial condition of off and pressure-dependent start and stop set points provided by the City representing current operations. Available fire flow was determined at the location of all hydrant laterals. Available fire flow represents the maximum flow that the system can deliver to a specific location while maintaining a minimum residual pressure of 20 psi throughout the system at all places of delivery during the MDD.

2042 Scenario 1 Peak Hourly Demand - System Pressure

The 2020 calibration model above was updated with planned main line improvements including the Creekside Drive Extension, Edgington Road Transmission Line Extension, and the reservoir to Whychus Creek Tee Transmission Line Replacement with Upsizing. The transmission line from the Whychus Creek tee to the city limits near Well No. 1 was removed to represent a scenario where this line was removed from service. The 2042 PHD was distributed evenly throughout the model. The reservoir level was set to 12.6 feet above finish floor to represent a level indicative of the emergency reserve level. All Wells were set with an initial condition of off and pressure-dependent start and stop set points provided by the City representing current operations. The modeled results were evaluated for residual system pressure at all locations of delivery.

2042 Scenario 2 Peak Hourly Demand - System Pressure

The 2042 Scenario 1 PHD model above was updated with a transmission line replacement from the Whychus Creek tee to the city limits near Well No. 1, a new Well No. 5 with a capacity of 1,670 gpm, and a low pressure start set point of 42 psi. The modeled results were evaluated for residual system pressure at all locations of delivery. This scenario represents conditions where all recommended improvements projects are complete.

2042 Scenario 1 Maximum Daily Demand - Available Fire Flow

The 2042 Scenario 1 PHD model above was used as the base model. The 2042 MDD was distributed evenly throughout the model. Well No. 3 was set to off to represent the largest

producing source offline. Available fire flow was determined at the location of all hydrant laterals.

2042 Scenario 2 Maximum Daily Demand - Available Fire Flow

The 2042 Scenario 2 PHD model above was used as the base model. The 2042 MDD was distributed evenly throughout the model. Well No. 3 was set to off to represent the largest producing source offline. Available fire flow was determined at the location of all hydrant laterals.

Model Results

System Pressure

The following paragraphs address system pressures under various demand and improvement scenarios.

2022 Peak Hourly Demand - Residual System Pressures

The system pressure ranges under the 2022 PHD demand scenario are presented on Figure 5-1. The system provides pressures ranging from approximately 51 to 91 psi. The City has adequate pressure to meet DWS regulations, and improvements are not required to provide additional pressure to the system under this scenario. In this scenario, it was observed that low pressure set points called Wells No. 2, 3, and 4 to run. The pressures shown on Figure 5-1 represent residual system pressure with Wells No. 2, 3, and 4 being on, and Well No. 1 being off.

2042 Scenario 1 Peak Hourly Demand - Residual System Pressure

The system pressures under the 2042 Scenario 1 PHD demand scenario are presented on Figure 5-2. This scenario incorporates the 16-inch transmission line extension from the reservoir to city limits on Edgington Road and the replacement of the existing 12-inch AC transmission line from the reservoir to the Whychus Creek tee with 16-inch DI pipe. As shown on Figure 5-2, the system provides pressures ranging from approximately 42 to 82 psi. In this scenario, it was observed that Wells No. 2, 3, and 4 were all called to run by their low pressure set points. Assuming the transmission line upgrades included in this scenario have been completed, the City has adequate pressure to meet DWS regulations through the planning year, and additional improvements are not required to provide additional pressure to the system.

2042 Scenario 2 Peak Hourly Demand - Residual System Pressure

The system pressures under the 2042 Scenario 2 PHD demand scenario are presented on Figure 5-3. This scenario incorporates all improvements included in Scenario 1 with the addition of a new Well No. 5 and a transmission line replacement from the Whychus Creek tee to city limits near Well No. 1. As shown on Figure 5-3, the system provides pressures ranging from approximately 45 to 85 psi. In this scenario, it was observed that Wells No. 2, 3, and 4 were all called to run by their low pressure set points.

Fire Flows

Available fire flows were evaluated at each fire hydrant to help calculate the water system's ability to deliver flow to that node while maintaining a residual pressure of 20 psi at all other places of delivery in the distribution system. Many fire nodes have available fire flows greater than the associated hydrant can provide. As discussed previously in this chapter, typically multiple hydrants are needed to withdraw the total available fire flow. The available fire flow presented here implies the water system's ability to deliver the indicated flow to a general area and not specific capacities of individual hydrants.

Available Fire Flow at 2022 Maximum Daily Demand

Figure 5-4 shows the available fire flow at existing fire nodes under the 2022 MDD. As shown on Figure 5-4, available fire flows at fire nodes range from approximately 750 gpm to more than 3,500 gpm.

Available Fire Flow at 2042 Maximum Daily Demand Scenario 1

Figure 5-5 shows the available fire flow at existing fire nodes under the 2042 MDD with the recommended improvements (not including a new Well No. 5) and assuming the transmission line from the Whychus Creek tee to city limits near Well No. 1 is offline. As shown on Figure 5-5, available fire flows at fire nodes range from approximately 1,450 gpm to more than 3,500 gpm.

Available Fire Flow at 2042 Maximum Daily Demand Scenario 2

Figure 5-6 shows the available fire flow at fire nodes under the 2042 MDD with the addition of a new Well No. 5 and the transmission line replacement from the Whychus Creek tee to city limits near Well No. 1. As shown on Figure 5-6, available fire flows at fire nodes range from approximately 1,500 gpm to more than 3,500 gpm.

Limitations of Distribution Water Model Results

Available fire flows reported from the water model analysis indicate theoretical distribution system piping capacity. Actual field conditions and headloss in fire hydrants may reduce fire flows beyond what is indicated. Additionally, full capacity hydrant tests may be needed to verify available flows greater than 2,000 gpm because the theoretical fire flows modeled depend on system pressure to drop to an extent that multiple well pumps are called to run, which provide supplemental water and increase system capacity. Single hydrant tests that utilize the AWWA M17 method will not account for additional capacity provided by wells that pump directly into the distribution system when called to run.

Recommended Distribution System Improvements

The following provides a summary of model results observed for various components of the proposed system improvements presented in Chapters 3, 4, and 5. It is important that proposed water supply, storage, and distribution system improvements are modeled together. This helps to verify future system operation and avoids potential oversizing of some system components without accounting for improvements in other areas of the system. The discussion below is intended to

focus on system performance measures associated with specific water supply, storage, or distribution system improvements.

New 12-inch and 16-inch Transmission Lines

During the development and evaluation of water model scenarios, it was determined that under the 2042 MDD, the existing distribution system is not able to provide the recommended fire flows to industrial, commercial, and public facility zones. The available fire flows declined with increased demand and fell below 2,000 gpm systemwide as demands approached the 2042 MDD. During development and evaluation of the year 2042 available fire flow scenarios, it was determined that either an additional transmission line would be needed or the existing transmission lines would need to be replaced with larger diameter pipes. Through discussions with City staff, the preferred alternative was determined to be to construct a new transmission line aligned on Edgington Road. A new transmission line would provide system redundancy, increased flow capacity to the west side of the City where higher fire flows are recommended, and add the ability to stage other transmission line improvement projects with the reservoir online. It is also recommended that the existing 12-inch AC transmission lines be replaced with DI pipe, due to age and the risk of being damaged from uprooting by encroaching tree roots.

The hydraulic modeling exercise showed that if all of the above recommended transmission line improvements were complete, using 12-inch pipe would effectively provide the recommended fire flow through year 2042. However, to continue to operate the system while staging improvements where one or more sections of transmission line may be offline, add a degree of redundancy, and allow for future growth beyond the 20-year horizon, it is recommended that the Edgington Road extension and a portion of AC pipe replacement from the reservoir to the Whychus Creek tee junction use 16-inch pipe. At the lower portion of AC pipe replacement below the Whychus Creek tee junction where a newer portion of parallel 12-inch PVC transmission line exists, a 12-inch pipe would suffice. It is recommended that all sections added or replaced in forested areas utilize DI pipe to mitigate susceptibility to damage caused by wildfires. When wildfires burn over areas with PVC pipe, the ground can become hot enough that the PVC pipe melts and allows chemicals to be released into the water system, which can cause contamination requiring a complete replacement of melted pipe. This hazard would be mitigated by utilizing DI pipe.

It is recommended the Edgington Road extension be completed first to allow the other portions of work to be completed with the reservoir online, followed by the reservoir to Whychus Creek tee junction.

Replacement of Aging Water Lines

The City of Sisters' distribution system has been well-maintained, and improvements replacing old pipe with new PVC since the year 2000 have resulted in the majority of the distribution system having a sufficient remaining useful life. Older piping in the system consisting of AC and steel was installed in the 1960s. Existing steel pipe is approaching the end of its original useful life while AC pipe is inherently brittle, with special training and equipment needed to repair or tap such lines. The City should plan on replacing any remaining sections of AC pipe within the 20-year planning period of this WSMP Update. The remaining steel pipes should be monitored for corrosion and leaks by the City, as this can lead to water quality issues. Two additional areas

of AC pipe aside from the 12-inch transmission lines discussed previously are identified as follows:

1. The 12-inch distribution main on South Elm Street from East Tyee Drive to East Hood Avenue.

2. Multiple 4-inch AC lines within the Edge O The Pines subdivision from East Cascade Avenue to East Black Butte Avenue on North Locust Lane, North Maple Lane, and North Tamarack Street. When replaced, these lines should be upsized to 8-inch PVC.

Undersized Main Lines

Undersized main lines with diameters of 6 inches or less in a distribution system can cause problems with system capacity, pressures, and water quality. Undersized mains can become a particular problem in industrial and commercial areas where higher fire flows are required. A minimum water line size of 8-inch diameter is recommended for new water main installations in residential areas. Large residential, commercial, or industrial developments may require larger pipe sizes depending on specific development needs.

For the purposes of this WSMP Update, undersized main lines have been identified as those that do not allow the recommended fire flow capacity at existing fire hydrants and the minimum pressure criteria as shown on Figure 2-1 in Chapter 2. The only undersized main line resulting in inadequate fire flow capacities is a 2,550 linear foot line providing water to the wastewater treatment plant pump station.

Dead-End Main Lines and Internal Looping

Similar to undersized main lines, dead-end main lines in a distribution system can cause problems with fire flow capacity, pressures, and water quality. The City's distribution system is well-looped and only a few dead-end main lines exist. It is difficult to eliminate all dead-end main lines from a system. Physical limitations, such as stream crossings and undeveloped land, or other limitations, such as no customers in the area, can result in dead-end lines. It is recommended that lines be continuously looped to the extent possible as expansion occurs or physical constraints allow.

Providing additional looping would benefit two locations within the system through increasing water circulation and available fire flow. These were incorporated in the 2042 water model scenarios as follows:

1. The 12-inch PVC on Camp Polk Road from East Barclay Drive to Sun Ranch Drive.

2. The 12-inch PVC along the city limits from East Desperado Trail to Creekside Drive.

Meter Replacements

Most of the City's water service meters are located within the landscaping strip or the back of the sidewalk on property frontages tapped from adequately sized mains. One location remains on Hood Avenue Alley where older meters are on an undersized 4-inch steel main line. It is

recommended the 4-inch alley main line be abandoned and these meters be replaced with new facilities on West Hood Avenue and West Washington Avenue.

Recommended Distribution System Improvements Summary and Estimated Total Project Cost

Chapter 6 summarizes each recommended water system capital improvements project with figures showing the location, extent, and priority of each. Presented hereafter is a summary and cost estimate for each recommended distribution system project.

Edge O The Pines Main Replacements

This project will include replacing approximately 3,850 linear feet (LF) of 4-inch AC main lines from East Cascade Avenue to East Black Butte Avenue on North Locust Lane, North Maple Lane, and North Tamarack Street. The new lines will be upsized to 8-inch PVC, and asphalt surface will be required in paved areas. The anticipated year 2023 project cost is $1,567,000. A detailed cost estimate is presented on Figure 5-7.

Edgington Road Transmission Line Extension

This project will include installing approximately 12,100 LF of 16-inch PVC pipe. Butterfly valves will be spaced no more than 1,000 LF apart. The location of the new installation will be along Edgington Road from the reservoir connection point to city limits near the middle and high schools. The installation cost assumes the full depth of backfill is Class B backfill. The anticipated year 2023 project cost is $3,635,000. A detailed cost estimate is presented on Figure 5-8.

Reservoir to Whychus Creek Junction Transmission Line Replacement

This project will include installing approximately 5,425 LF of 16-inch DI pipe. Butterfly valves will be spaced no more than 1,000 LF apart. The location of the new installation will be parallel to the existing 12-inch AC pipe. The installation cost assumes Class B backfill will be placed to 1 foot above the top of pipe with the remaining backfill material being unprocessed Class A native material. The anticipated year 2023 project cost is $1,466,000. A detailed cost estimate is presented on Figure 5-9.

Whychus Creek Junction to West Hood Avenue Transmission Line Replacement

This project will include installing approximately 6,910 LF of 12-inch DI pipe from the Whychus Creek junction to the city limits with Class A native backfill from 1 foot above the top of the pipe and 2,300 LF of 12-inch PVC pipe from the city limits to West Hood Avenue with full depth Class B backfill. Butterfly valves will be spaced no more than 1,000 LF apart. The project crosses areas of mapped wetlands and waterways and, therefore, will likely require a temporary stream channel diversion, waterway enhancement, and riparian plantings. Asphalt surface restoration will be required in areas of existing pavement. The anticipated year 2023 project cost is $2,504,000. A detailed cost estimate is presented on Figure 5-10.

Creekside Drive Extension

This project will include installing approximately 1,160 LF of 12-inch PVC pipe from the end of South Creekside Drive to Desperado Trail. The extension crosses both Highway 126 and Highway 20, which

will likely require trenchless pipe installation by boring or jacking. Fire hydrants will be spaced no more than 500 feet apart. The anticipated year 2023 project cost is $654,000. A detailed cost estimate is presented on Figure 5-11.

Hood Avenue South Alley Service Reconnections

This project will include relocating six water services on Hood Avenue Alley between Pine Street and Ash Street with new meters. The work will include tapping of mains, new water service lines, new meter assemblies and valve boxes, and various types of surface restoration. The anticipated year 2023 project cost is $103,000. A detailed cost estimate is presented on Figure 5-12.

Camp Polk Road Extension

This project will include installing approximately 825 LF of 12-inch PVC pipe on Camp Polk Road from East Barclay Drive to Sun Ranch Drive. The anticipated year 2023 project cost is $319,000. A detailed cost estimate is presented on Figure 5-13.

Maintenance Records

One of the important operational functions regarding the City's distribution system is to keep accurate records of various system components. Currently, the City does not have an asset management system in place to assist with recordkeeping and maintenance task scheduling but does keep all records electronically. Recordkeeping becomes increasingly valuable as time passes in terms of planning future improvements and replacing old or deteriorated components. It is recommended the City continue to keep and improve upon recordkeeping. For example, accurate records should be kept on all water meters installed so, in the future, these meters can be periodically pulled, checked for accuracy, and replaced as needed. The City should continue to keep records of all hydrants, valves, and other distribution system components. The distribution system evaluation in this WSMP Update did not include determining existing fire hydrant, valve, and water meter condition. Hydrants should be checked, at least annually, for proper operation, and all water valves should be exercised, at least annually, with records kept on the operating condition, location, etc.

Summary

In general, the City's distribution system is in good condition and areas within the system have been identified for expansion and improvement as industrial and commercial growth occurs. Few areas were identified to have undersized and dead-end water lines. The City's existing system relies heavily on supplemental well water to provide recommended fire flow in conjunction with stored water. After completing the recommended improvements, the City's water system will have almost no aging lines or undersized mains and should be able to provide recommended fire flow throughout the City through the planning year and beyond.

To Sweet Home

WELL NO. 3

20

242

SISTERS

WELL NO. 2

T. 15 S., R. 10 E., W.M.

2,000 0 2,000

SCALE IN FEET

Whychus Creek

126

WELL NO. 4

To Redmond

WELL NO. 1

20

Whychus Creek

THREE CREEK RD.

NF-1605

To Bend

12" TRANSMISSION LINES

NF-1605

R

Maxar

LEGEND

- 20 TO 40 PSI
- 40 TO 60 PSI
- 60 TO 80 PSI
- 80 TO 100 PSI
- (R) RESERVOIR
- (W) WELL
- DISTRIBUTION SYSTEM PIPING
- CITY LIMITS

NOTES

1. SYSTEM PRESSURES SHOWN ARE BASED UPON A COMPUTER HYDRAULIC MODEL. FIELD VERIFY SYSTEM PRESSURE PRIOR TO MAKING IMPROVEMENTS.
2. PHD = PEAK HOURLY DEMAND

HYDRAULIC MODEL SCENARIO PARAMETERS

TOTAL SYSTEM DEMAND: 4.94 MGD

WELL INITIAL STATUS AND LOW PRESSURE (PUMP ON) SET POINT:

WELL NO. 1: STANDBY-34 PSI
WELL NO. 2: STANDBY-38 PSI
WELL NO. 3: STANDBY-47 PSI
WELL NO. 4: STANDBY-42 PSI

RESERVOIR TANK LEVEL: 17.0 FT

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

EXISTING WATER DISTRIBUTION SYSTEM PRESSURES AT 2022 PHD

FIGURE
5-1

X:\Clients\Sisters OR\446-08 WSMP\GIS\446-08_WSMP.aprx, WSMP 446-08-Fig5-1, 3/20/2023 9:48 AM, dchristman

To Sweet Home

126

20

242

WELL NO. 3

CAMP POLK ROAD EXTENSION

SISTERS

WELL NO. 2

T. 15 S., R. 10 E., W.M.

2,000 0 2,000

SCALE IN FEET

Whychus Creek

WELL NO. 4

126

CREEKSIDE DRIVE EXTENSION

To Redmond

WELL NO. 1

20

Whychus Creek

THREE CREEK RD.

NF-1605

16" PVC TRANSMISSION LINE

EXISTING 12" PVC TRANSMISSION LINE

DECOMMISSIONED TRANSMISSION LINE

To Bend

NF-1605

16" DI TRANSMISSION LINE

18" DI RESERVOIR SITE PIPING

NEW 2.2 MG RESERVOIR

Maxar

LEGEND

- 20 TO 40 PSI
- 40 TO 60 PSI
- 60 TO 80 PSI
- 80 TO 100 PSI
- (R) EXISTING RESERVOIR
- (W) EXISTING WELL
- (R) NEW RESERVOIR
- EXISTING DISTRIBUTION SYSTEM PIPING
- CAPITOL IMPROVEMENTS PROJECT RECOMMENDED
- DECOMMISSIONED PIPE
- CITY LIMITS

NOTES

1. SYSTEM PRESSURES SHOWN ARE BASED UPON A COMPUTER HYDRAULIC MODEL. FIELD VERIFY SYSTEM PRESSURE PRIOR TO MAKING IMPROVEMENTS.
2. PHD = PEAK HOURLY DEMAND

HYDRAULIC MODEL SCENARIO PARAMETERS

TOTAL SYSTEM DEMAND: 9.71 MGD

WELL INITIAL STATUS AND LOW PRESSURE (PUMP ON) SET POINT:

WELL NO. 1: STANDBY-34 PSI
WELL NO. 2: STANDBY-38 PSI
WELL NO. 3: STANDBY-47 PSI
WELL NO. 4: STANDBY-42 PSI

RESERVOIR TANK LEVEL: 12.6 FT

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

PROPOSED WATER DISTRIBUTION SYSTEM PRESSURES AT 2042 PHD - SCENARIO 1

FIGURE
5-2

X:\Clients\Sisters OR\446-08 WSMP\GIS\446-08_WSMP.aprx, WSMP-446-08-Fig5-2, 5/2/2023 10:58 AM, jvanroggen

To Sweet Home

126

20

242

WELL NO. 3

CAMP POLK ROAD EXTENSION

SISTERS

WELL NO. 2

T. 15 S., R. 10 E., W.M.

2,000 0 2,000

SCALE IN FEET

Whychus Creek

WELL NO. 4

12" PVC DISTRIBUTION MAIN

CREEKSIDE DRIVE EXTENSION

126

To Redmond

EXISTING 12" PVC TRANSMISSION LINE

WELL NO. 1

20

NEW WELL NO. 5
1,670 GPM

Whychus Creek

THREE CREEK RD.

NF-1605

16" PVC TRANSMISSION LINE

12" PVC TRANSMISSION LINE

12" DI TRANSMISSION LINE

To Bend

NF-1605

16" DI TRANSMISSION LINE

18" DI RESERVOIR SITE PIPING

NEW 2.2 MG RESERVOIR

Maxar

LEGEND

- 20 TO 40 PSI
- 40 TO 60 PSI
- 60 TO 80 PSI
- 80 TO 100 PSI
- (W) EXISTING WELL
- (R) EXISTING RESERVOIR
- (R) NEW RESERVOIR
- (W) NEW WELL
- EXISTING DISTRIBUTION SYSTEM PIPING
- CAPITOL IMPROVEMENTS PROJECT RECOMMENDED
- CITY LIMITS

NOTES

1. SYSTEM PRESSURES SHOWN ARE BASED UPON A COMPUTER HYDRAULIC MODEL. FIELD VERIFY SYSTEM PRESSURE PRIOR TO MAKING IMPROVEMENTS.
2. PHD = PEAK HOURLY DEMAND

HYDRAULIC MODEL SCENARIO PARAMETERS

TOTAL SYSTEM DEMAND: 9.71 MGD

WELL INITIAL STATUS AND LOW PRESSURE (PUMP ON) SET POINT:

WELL NO. 1: STANDBY-34 PSI
WELL NO. 2: STANDBY-38 PSI
WELL NO. 3: STANDBY-47 PSI
WELL NO. 4: STANDBY-42 PSI
WELL NO. 5: STANDBY-42 PSI

RESERVOIR TANK LEVEL: 12.6 FT

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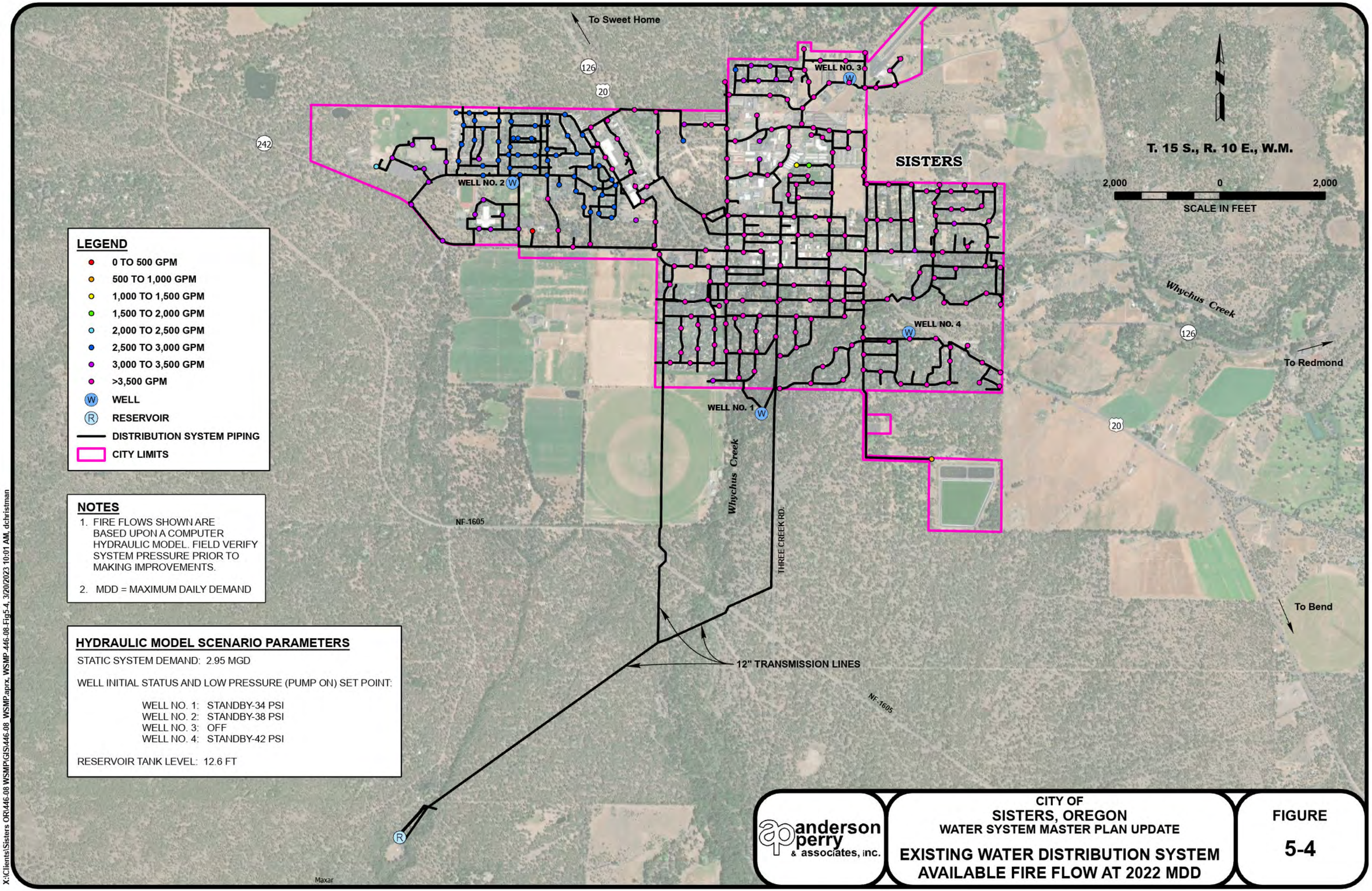
CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

PROPOSED WATER DISTRIBUTION SYSTEM PRESSURES AT 2042 PHD - SCENARIO 2

FIGURE
5-3

X:\Clients\Sisters OR\446-08 WSMP\GIS\446-08_WSMP.aprx, WSMP-446-08-Fig5-3, 5/2/2023 10:59 AM, jvanroggen



LEGEND

- 0 TO 500 GPM
- 500 TO 1,000 GPM
- 1,000 TO 1,500 GPM
- 1,500 TO 2,000 GPM
- 2,000 TO 2,500 GPM
- 2,500 TO 3,000 GPM
- 3,000 TO 3,500 GPM
- >3,500 GPM
- W WELL
- R RESERVOIR
- DISTRIBUTION SYSTEM PIPING
- CITY LIMITS

NOTES

1. FIRE FLOWS SHOWN ARE BASED UPON A COMPUTER HYDRAULIC MODEL. FIELD VERIFY SYSTEM PRESSURE PRIOR TO MAKING IMPROVEMENTS.
2. MDD = MAXIMUM DAILY DEMAND

HYDRAULIC MODEL SCENARIO PARAMETERS

STATIC SYSTEM DEMAND: 2.95 MGD

WELL INITIAL STATUS AND LOW PRESSURE (PUMP ON) SET POINT:

WELL NO. 1: STANDBY-34 PSI
WELL NO. 2: STANDBY-38 PSI
WELL NO. 3: OFF
WELL NO. 4: STANDBY-42 PSI

RESERVOIR TANK LEVEL: 12.6 FT

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

EXISTING WATER DISTRIBUTION SYSTEM AVAILABLE FIRE FLOW AT 2022 MDD

FIGURE
5-4

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To Sweet Home

126

20

242

WELL NO. 3

CAMP POLK ROAD EXTENSION

SISTERS

WELL NO. 2

T. 15 S., R. 10 E., W.M.

2,000 0 2,000

SCALE IN FEET

Whychus Creek

WELL NO. 4

CREEKSIDE DRIVE EXTENSION

126

To Redmond

20

WELL NO. 1

Whychus Creek

THREE CREEK RD.

NF-1605

16" PVC TRANSMISSION LINE

EXISTING 12" PVC TRANSMISSION LINE

DECOMMISSIONED TRANSMISSION LINE

To Bend

NF-1605

16" DI TRANSMISSION LINE

18" DI RESERVOIR SITE PIPING

NEW 2.2 MG RESERVOIR

Earthstar Geographics

LEGEND

- 0 TO 500 GPM
- 500 TO 1,000 GPM
- 1,000 TO 1,500 GPM
- 1,500 TO 2,000 GPM
- 2,000 TO 2,500 GPM
- 2,500 TO 3,000 GPM
- 3,000 TO 3,500 GPM
- >3,500 GPM
- EXISTING WELL
- EXISTING RESERVOIR
- NEW RESERVOIR
- DISTRIBUTION SYSTEM PIPING
- CAPITOL IMPROVEMENTS PROJECT RECOMMENDED
- DECOMMISSIONED PIPE
- CITY LIMITS

NOTES

1. FIRE FLOWS SHOWN ARE BASED UPON A COMPUTER HYDRAULIC MODEL. FIELD VERIFY SYSTEM PRESSURE PRIOR TO MAKING IMPROVEMENTS.
2. MDD = MAXIMUM DAILY DEMAND

HYDRAULIC MODEL SCENARIO PARAMETERS

STATIC SYSTEM DEMAND: 5.93 MGD

WELL INITIAL STATUS AND LOW PRESSURE (PUMP ON) SET POINT:

WELL NO. 1: STANDBY-34 PSI
WELL NO. 2: STANDBY-38 PSI
WELL NO. 3: OFF
WELL NO. 4: STANDBY-42 PSI

RESERVOIR TANK LEVEL: 12.6 FT

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anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

PROPOSED WATER DISTRIBUTION SYSTEM
AVAILABLE FIRE FLOW AT 2042 MDD
SCENARIO 1

FIGURE
5-5

LEGEND

- 0 TO 500 GPM
- 500 TO 1,000 GPM
- 1,000 TO 1,500 GPM
- 1,500 TO 2,000 GPM
- 2,000 TO 2,500 GPM
- 2,500 TO 3,000 GPM
- 3,000 TO 3,500 GPM
- >3,500 GPM
- (R) NEW RESERVOIR
- (W) NEW WELL
- (W) EXISTING WELL
- (R) EXISTING RESERVOIR
- CAPITOL IMPROVEMENTS PROJECT RECOMMENDED
- DISTRIBUTION SYSTEM PIPING
- CITY LIMITS

NOTES

1. FIRE FLOWS SHOWN ARE BASED UPON A COMPUTER HYDRAULIC MODEL. FIELD VERIFY SYSTEM PRESSURE PRIOR TO MAKING IMPROVEMENTS.
2. MDD = MAXIMUM DAILY DEMAND

HYDRAULIC MODEL SCENARIO PARAMETERS

TOTAL SYSTEM DEMAND: 5.93 MGD

WELL INITIAL STATUS AND LOW PRESSURE (PUMP ON) SET POINT:

WELL NO. 1: STANDBY-34 PSI
WELL NO. 2: STANDBY-38 PSI
WELL NO. 3: OFF
WELL NO. 4: STANDBY-42 PSI
WELL NO. 5: STANDBY-42 PSI

RESERVOIR TANK LEVEL: 12.6 FT

To Sweet Home
126
20
242
WELL NO. 3
CAMP POLK ROAD EXTENSION
SISTERS
WELL NO. 2
T. 15 S., R. 10 E., W.M.
2,000 0 2,000
SCALE IN FEET
Whychus Creek
WELL NO. 4
12" PVC DISTRIBUTION MAIN
CREEKSIDE DRIVE EXTENSION
To Redmond
EXISTING 12" PVC TRANSMISSION LINE
WELL NO. 1
NEW WELL NO. 5
1,670 GPM
NF-1605
16" PVC TRANSMISSION LINE
12" PVC TRANSMISSION LINE
THREE CREEK RD.
12" DI TRANSMISSION LINE
To Bend
16" DI TRANSMISSION LINE
18" DI RESERVOIR SITE PIPING
NEW 2.2 MG RESERVOIR
Earthstar Geographics

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
PROPOSED WATER DISTRIBUTION SYSTEM AVAILABLE FIRE FLOW AT 2042 MDD SCENARIO 2

FIGURE
5-6

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
EDGE O THE PINES MAIN REPLACEMENTS
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 51,500	All Req'd	$ 51,500
2	Project Safety, Temporary Traffic Control, and Quality Control	LS	65,000	All Req'd	65,000
3	Construction Survey	LS	12,000	All Req'd	12,000
4	Water Service Meter Assembly	EA	2,250	110	247,500
5	Water Service Line	LF	30	1,650	49,500
6	Water Service Line Tap	EA	350	110	38,500
7	Install 8-inch Polyvinyl Chloride Water Line	LF	135	3,850	519,750
8	Trench Resurfacing in Existing Asphalt Concrete Pavement (Full Lane Restoration)	TON	130	1,200	156,000
9	Connect to Existing Pipe	EA	3,000	12	36,000
10	Fire Hydrant Assembly	EA	6,500	1	6,500
				Subtotal Estimated Construction Cost	**$ 1,182,250**
				Construction Contingency (15%)	177,000
				Total Estimated Construction Cost	**$ 1,359,250**
				Preliminary, Design, and Construction Engineering (15%)	204,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 1,563,250**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 3,300
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 3,300**
				TOTAL ESTIMATED PROJECT COST	**$ 1,567,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
EDGE O THE PINES
MAIN REPLACEMENTS
PRELIMINARY COST ESTIMATE

FIGURE
5-7

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
EDGINGTON ROAD TRANSMISSION LINE EXTENSION
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 133,300	All Req'd	$ 133,300
2	Project Safety, Temporary Traffic Control, and Quality Control	LS	30,000	All Req'd	30,000
3	Construction Survey	LS	20,000	All Req'd	20,000
4	Clearing and Grubbing	ACRE	500	4	2,000
5	Connect to Existing Water Line	EA	3,500	2	7,000
6	Install 16-inch Polyvinyl Chloride Water	LF	200	12,100	2,420,000
7	16-inch Butterfly Valve	EA	4,500	13	58,500
8	Fire Hydrant Assembly	EA	6,500	2	13,000
9	Gravel Surface Restoration	TON	20	3,110	62,200
				Subtotal Estimated Construction Cost	**$ 2,746,000**
				Construction Contingency (15%)	412,000
				Total Estimated Construction Cost	**$ 3,158,000**
				Preliminary, Design, and Construction Engineering 15%)	474,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 3,632,000**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 3,300
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 3,300**
				TOTAL ESTIMATED PROJECT COST	**$ 3,635,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
EDGINGTON ROAD TRANSMISSION LINE EXTENSION
PRELIMINARY COST ESTIMATE

FIGURE
5-8

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
RESERVOIR TO WHYCHUS CREEK JUNCTION
TRANSMISSION LINE REPLACEMENT
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 48,700	All Req'd	$ 48,700
2	Project Safety, Temporary Traffic Control, and Quality Control	LS	30,000	All Req'd	30,000
3	Construction Survey	LS	20,000	All Req'd	20,000
4	Clearing and Grubbing	ACRE	7,500	2.5	18,750
5	Connect to Existing Water Line	EA	3,500	3	10,500
6	Install 16-inch Ductile Iron Water Line	LF	170	5,425	922,250
7	16-inch Butterfly Valve	EA	4,500	6	27,000
9	Seeding, Fertilizing, and Mulching	ACRE	3,500	2.8	9,800
				Subtotal Estimated Construction Cost	**$ 1,087,000**
				Construction Contingency (15%)	163,000
				Total Estimated Construction Cost	**$ 1,250,000**
				Preliminary, Design, and Construction Engineering 15%)	188,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 1,438,000**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 3,300
				Wetland Delineation, Stream Function Assessment Method, and Joint Permit Application	25,000
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 28,300**
				TOTAL ESTIMATED PROJECT COST	**$ 1,466,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
RESERVOIR TO WHYCHUS CREEK JUNCTION
TRANSMISSION LINE REPLACEMENT
PRELIMINARY COST ESTIMATE

FIGURE
5-9

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
WHYCHUS CREEK JUNCTION TO WEST HOOD AVENUE
TRANSMISSION LINE REPLACEMENT
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 80,500	All Req'd	$ 80,500
2	Project Safety, Temporary Traffic Control, and Quality Control	LS	130,000	All Req'd	130,000
3	Construction Survey	LS	15,000	All Req'd	15,000
4	Clearing and Grubbing	ACRE	7,500	4	30,000
5	Asphalt Pavement Sawcutting	LF	2	4,600	9,200
6	Connect to Existing Water Line	EA	2,000	13	26,000
7	12-inch Ductile Iron Water Line	LF	130	6,910	898,300
8	12-inch Polyvinyl Chloride Water Line	LF	160	2,300	368,000
9	Temporary Stream Channel Diversion	LS	30,000	All Req'd	30,000
10	Waterway Enhancement	LS	60,000	All Req'd	60,000
11	Riparian Plantings	LS	30,000	All Req'd	30,000
12	Seeding, Fertilizing, and Mulching	ACRE	3,500	3	10,500
13	Trench Resurfacing in Existing Asphalt Concrete Pavement (Full Lane Restoration)	TON	130	700	91,000
14	12-inch Butterfly Valve	EA	3,000	19	57,000
15	Fire Hydrant Assembly	EA	6,500	1	6,500
				Subtotal Estimated Construction Cost	**$ 1,842,000**
				Construction Contingency (15%)	276,000
				Total Estimated Construction Cost	**$ 2,118,000**
				Preliminary, Design, and Construction Engineering (15%)	318,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 2,436,000**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 3,300
				Wetland Delineation, Stream Function Assessment Method, and Joint Permit Application	65,000
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 68,300**
				TOTAL ESTIMATED PROJECT COST	**$ 2,504,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
WHYCHUS CREEK JUNCTION TO WEST HOOD AVENUE TRANSMISSION LINE REPLACEMENT PRELIMINARY COST ESTIMATE

FIGURE
5-10

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
CREEKSIDE DRIVE EXTENSION
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 22,500	All Req'd	$ 22,500
2	Project Safety, Temporary Traffic Control, and Quality Control	LS	35,000	All Req'd	35,000
3	Construction Survey	LS	6,000	All Req'd	6,000
4	Connect to Existing Water Line	EA	3,500	2	7,000
5	Install 12-inch Polyvinyl Chloride Water Line	LF	160	1,160	185,600
6	Boring Tool Setup	EA	40,000	2	80,000
7	Highway Jack, Bore, Casing, and Ductile Iron Pipe	LF	725	180	130,500
8	Fire Hydrant Assembly	EA	6,500	2	13,000
9	12-inch Butterfly Valves	EA	3,000	3	9,000
10	Surface Restoration	SY	10	140	1,400
				Subtotal Estimated Construction Cost	**$ 490,000**
				Construction Contingency (15%)	74,000
				Total Estimated Construction Cost	**$ 564,000**
				Preliminary, Design, and Construction Engineering (15%)	85,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 649,000**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 3,300
				General Permitting	2,000
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 5,300**
				TOTAL ESTIMATED PROJECT COST	**$ 654,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

CREEKSIDE DRIVE EXTENSION
PRELIMINARY COST ESTIMATE

FIGURE
5-11

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
HOOD AVENUE SOUTH ALLEY SERVICE RECONNECTIONS
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 2,100	All Req'd	$ 2,100
2	Project Safety, Temporary Traffic Control, and Quality Control	LS	35,000	All Req'd	35,000
3	Construction Survey	LS	3,500	All Req'd	3,500
4	Water Service Meter Assembly	EA	2,250	6	13,500
5	Water Service Line	LF	30	360	10,800
6	Water Service Line Tap	EA	350	6	2,100
7	Cap Existing Tee	EA	1,500	2	3,000
8	Asphalt, Curb, and Sidewalk Repair	EA	600	6	3,600
9	Surface Restoration	SY	20	120	2,400
				Subtotal Estimated Construction Cost	**$ 76,000**
				Construction Contingency (15%)	11,000
				Total Estimated Construction Cost	**$ 87,000**
				Preliminary, Design, and Construction Engineering (15%)	13,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 100,000**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 825
				General Permitting	2,000
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 2,825**
				TOTAL ESTIMATED PROJECT COST	**$ 103,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
HOOD AVENUE SOUTH ALLEY
SERVICE RECONNECTIONS
PRELIMINARY COST ESTIMATE

FIGURE
5-12

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
CAMP POLK ROAD EXTENSION
PRELIMINARY COST ESTIMATE
(YEAR 2023 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE[1]	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 11,000	All Req'd	$ 11,000
2	Project Safety, Temporary Traffic Control,	LS	35,000	All Req'd	35,000
3	Construction Survey	LS	2,500	All Req'd	2,500
4	Connect to Existing Water Line	EA	3,500	2	7,000
5	Install 12-inch Polyvinyl Chloride Water Line	LF	160	825	132,000
6	Fire Hydrant Assembly	EA	6,500	2	13,000
7	12-inch Butterfly Valve	EA	3,000	2	6,000
8	Trench Resurfacing in Existing Asphalt Concrete Pavement (Full Lane Restoration)	TON	130	250	32,500
				Subtotal Estimated Construction Cost	**$ 239,000**
				Construction Contingency (15%)	36,000
				Total Estimated Construction Cost	**$ 275,000**
				Preliminary, Design, and Construction Engineering (15%)	41,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2023 DOLLARS)	**$ 316,000**
				Other Estimated Project Costs	
				Oregon Health Authority Plan Review	$ 3,300
				Subtotal Other Estimated Project Costs (2023 Dollars)	**$ 3,300**
				TOTAL ESTIMATED PROJECT COST	**$ 319,000**

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

Chapter 6 - Recommended System Improvements and Improvements Prioritization

Introduction

This chapter summarizes the proposed improvements to the water system identified in this Water System Master Plan (WSMP) Update to address deficiencies and support anticipated growth and increased demands.

Summary of Improvements

Presented hereafter is a summary of the recommended improvements that have been identified based on the evaluation and computer water modeling efforts completed as part of this WSMP Update. For a more comprehensive discussion with respect to the different elements (supply, storage, and distribution) of the water system and detailed evaluation, the reader is encouraged to reference other chapters in this WSMP Update. Figures 6-1 and 6-2 provide the priority, location, and extent of each capital improvement project discussed herein.

Water Supply and Treatment

To accommodate population growth, update equipment nearing the end of its useful life, protect source water capacity, and enhance the operational safety of disinfection systems, it is recommended the City implement the following measures. These recommendations, with notes related to the implementation, are listed in order of priority.

- Rebuild the Well No. 1 Mechanical Building and Install an On-site Generation System
    - Obtain land use approval from Deschutes County for the existing non-conforming facility. Non-conforming implies the existing facility was constructed and operational prior to the adoption and implementation of current land use ordinances.
    - Design and construct selected facility improvements including an on-site generation system to replace the existing chlorine gas system, which will enhance the operational safety of the facility.
- Install Backup Power and a Variable Frequency Drive (VFD) on Well No. 3
    - Procure and install selected equipment at the existing facility.
- Construct Well No. 5 and Transmission Line Extension
    - Submit a water right transfer to add an additional point of appropriation to the City's various permits and certificates.
    - Obtain Deschutes County land use approval for the proposed facility.

- Design and construct the facilities.
- "Prove up" to obtain certificated water rights for the transferred groundwater rights.

Water Storage

The City's water storage system consists of one storage reservoir with a total available storage volume of 1.6 million gallons (MG). The recommended storage is based on the amount of emergency reserve the City believes is necessary to accommodate unforeseen circumstances and emergencies. Through various discussions between consultants and City operators, it was concluded one day of average daily demand would adequately prepare the City for such circumstances. Adopting this methodology, it is seen that the City's existing storage is currently inadequate by approximately 40,000 gallons. Assuming an additional source is brought online by year 2035 such that the City can exercise their full water right withdrawal rates with the largest producing source offline, the total recommended storage for the planning year 2042 is approximately 3.8 MG. It was decided among City staff and Anderson Perry & Associates, Inc., that an additional 2.2 MG of storage should be constructed, for a total of 3.8 MG available.

Another element of storage is redundancy. The City currently relies on their only existing reservoir and is unable to take the tank offline for any reason. It is recommended the City have at least two reservoirs so either one can be taken offline when necessary for cleaning, inspection, maintenance, and repair. Due to the existing emergency reserve storage inadequacy and lack of redundancy, it is recommended the City construct additional storage as soon as possible. Once the new reservoir is completed and online, the existing concrete reservoir should be rehabilitated.

Water Distribution

In general, the City's distribution system is well-looped and has few dead-end lines. Currently, a single 12-inch asbestos cement (AC) transmission line exists from the reservoir to the Whychus Creek tee junction. This line is susceptible to damage due to uprooting should a nearby tree fall and does not have redundancy to keep the reservoir online if the existing line needs to be taken offline. Recommended distribution system improvements have been separated into three categories: high priority improvements, medium priority improvements, and long-term/future development improvements. The following provides a general description of the improvements included in each category.

High Priority Improvements

1. Install a new 16-inch polyvinyl chloride (PVC) transmission line from the existing reservoir to city limits near the middle and high schools on Edgington Road.

2. Install a new 16-inch ductile iron (DI) transmission line from the existing reservoir to the Whychus Creek junction.

Medium Priority Improvements

1. Replace existing AC distribution mains in the Edge O The Pines subdivision.

2. Install a new 12-inch PVC water main on Camp Polk Road from East Barclay Drive to East Sun Ranch Drive.

3. Install a new 12-inch DI transmission line from the Whychus Creek junction to the city limits and replace the existing 12-inch AC water main from East Tyee Drive to East Hood Avenue with new 12-inch PVC pipe.

4. Install a new 12-inch PVC distribution main along the city limits from the end of South Creekside Drive to East Desperado Trail.

5. Reconnect existing Hood Avenue South Alley water services with new taps, lines, meter assemblies, and valve boxes from either West Hood Avenue or West Washington Avenue.

Long-Term/Future Development Improvements

No other long-term development improvements are needed. An ongoing meter replacement program to replace aging service meters should be implemented.

Capital Improvements Plan

Introduction

A Capital Improvements Plan (CIP) provides a framework to prioritize and implement the City's facility and infrastructure asset improvement process over a specified time period. A CIP is a financing and construction plan for projects that require significant capital investment and are essential to safeguarding the financial health of the City, while providing continued delivery of utility and other services to citizens and businesses.

As part of this WSMP Update, the City developed a CIP based on identified deficiencies and improvements required to address the water system needs of the City for the next 20 years. The CIP will need to be reviewed and updated periodically (at least every five years) to accommodate changing community needs, additional improvements that may be identified through time, and changes in financial resources. The CIP lists the City's capital improvements projects, places the projects in a priority order (subject to periodic review), and schedules the projects for funding and construction.

The CIP is a tool to be used in the development of responsible and progressive financial planning. The CIP forms the basis for making annual capital budget decisions and supports the City's continued commitment to sound, long-term financial planning and direction.

The CIP identifies and prioritizes short-, medium-, and long-term capital projects of all types based on the water system master planning process. Capital water system improvements projects will be coordinated with the annual budget process to maintain full utilization of available resources. For each capital improvements project, the CIP provides a variety of information including a project

description and the service need to be addressed, a proposed timetable, and proposed funding levels. Capital water system improvements projects will be prioritized with the most urgent projects first. Ongoing operation costs are not included in the CIP estimated project costs.

Identified Improvements Estimated Costs and Implementation Time Frames

The year 2023 estimated costs for the recommended water system improvements are summarized on Table 6-1. Detailed cost estimates for each component of the system (water supply, storage, and distribution) are included in figures referenced in Chapters 3, 4, and 5. It is recommended the estimated costs be increased by an annual inflation rate to account for potential increases in project costs to the year the improvements are actually completed.

TABLE 6-1
RECOMMENDED WATER SYSTEM IMPROVEMENT PROJECTS, IMPLEMENTATION TIME FRAME, AND TOTAL ESTIMATED PROJECT COST[1]

Implementation Priority	Chapter	Improvement Type	Recommended Improvement	Total Estimated Project Cost and Implementation Time Frame (2023 Dollars)		
				2023 to 2027	2027 to 2032	2032 to 2042
1	3	Supply	Install VFD and backup power at Well No. 3.	$372,000		
2	3	Supply, Treatment	Rebuild the Well No. 1 pump station building and install a new on-site generation system.	$808,000		
3	4	Storage	Construct new 2.2 MG water storage tank and rehabilitate the existing 1.6 MG water storage tank.	$6,283,000		
4	5	Distribution	Install a new 16-inch PVC transmission line on Edgington Road from the existing reservoir to city limits near the middle and high schools.	$3,635,000		
5	5	Distribution	Install a new 16-inch DI transmission line from the existing reservoir to Whychus Creek junction.	$1,466,000		
6	5	Distribution	Replace existing AC distribution mains in the Edge O The Pines subdivision.		$1,567,000	
7	5	Distribution	Install new 12-inch PVC water main on Camp Polk Road Extension from East Barclay Drive to East Sun Ranch Drive.		$319,000	

Implementation Priority	Chapter	Improvement Type	Recommended Improvement	Total Estimated Project Cost and Implementation Time Frame (2023 Dollars)		
				2023 to 2027	2027 to 2032	2032 to 2042
8	5	Distribution	Install a new 12-inch DI transmission line from the Whychus Creek junction to East Tyee Drive and replace the existing 12-inch AC water main from East Tyee Drive to East Hood Avenue with new 12-inch PVC pipe.		$2,504,000	
9	5	Distribution	Install new 12-inch PVC main from East Desperado Trail to Creekside Drive.		$654,000	
10	5	Distribution	Reconnect existing Hood Avenue South Alley water services with new taps, lines, meter assemblies, and meter boxes from either West Hood Avenue or West Washington Avenue.		$103,000	
11	3	Supply	Construct new Well No. 5 and transmission line.			$2,102,000
Annually	5	Distribution	Ongoing water service meter replacement.	50 per year at $400 each = $20,000 per year	50 per year at $400 each = $20,000 per year	50 per year at $400 each = $20,000 per year
			TOTALS	$12.6 M	$5.2 M	$2.1 M
TOTAL RECOMMENDED IMPROVEMENTS COST (2023 Dollars) YEARS 2023 THROUGH 2042						$19.9 M

[1]All costs shown are in 2023 dollars. Estimated project costs were prepared using methodology established by the City and City Engineers with reference to pre-pandemic itemized bids inflated by 4.5 percent from the referenced project bid date to year 2023. Total estimated project costs must be re-evaluated prior to the implementation time frame to account for inflation, supply chain cost escalations, contractor availability, and general market volatility. Due to the recent volatility of the market and supply chain shortages, actual costs may vary significantly.

M = million

Action Items

The following action items and implementation steps will need to be made by the City of Sisters to implement the desired water system improvements projects. The steps outlined are general in nature and include the major steps that need to be undertaken. It should be noted that these implementation steps, as presented hereafter, may be different if the City elects to delay projects and pursue improvements in the future.

Implementation Steps

- The City will need to submit and obtain approval of this WSMP Update from the Oregon Health Authority - Drinking Water Services.
- The City will need to finalize and adopt this WSMP Update and the recommended improvements once agencies review and approve the draft WSMP Update.
- The City will need to schedule a One Stop meeting with the funding agencies to discuss potential funding options for recommended improvements where project costs exceed the amount of which the City could self-fund the project.
- If Business Oregon funding is identified as a potential source in the One Stop meeting, the City and Business Oregon will draft a Project Notification and Intake Form.
- The City will need to hold public information meetings to inform citizens of the need for and scope of the improvements projects, answer questions, and explain the need for increases in user fees as presented in Chapter 7.
- The City will need to develop a funding plan for the desired improvements at the time frames indicated in the CIP.
- Working with various funding agencies, the City will need to prepare funding applications, as applicable, for the associated water system improvements projects and submit them to the appropriate funding agencies.

PRIORITY 1
INSTALL BACKUP POWER AND VFD ON WELL NO. 3

PRIORITY 7
CAMP POLK ROAD EXTENSION

PRIORITY 6
EDGE O THE PINES REPLACE EXISTING AC LINES

PRIORITY 9
CREEKSIDE DR EXTENSION

PRIORITY 10
HOOD AVE ALLEY/S. PINE STREET TO S. ASH STREET SERVICE RECONNECTIONS

PRIORITY 8
INSTALL NEW 12-INCH PVC DISTRIBUTION MAIN FROM E. TYEE DRIVE TO E. HOOD AVENUE

PRIORITY 2
REBUILD WELL NO. 1 PUMP STATION

PRIORITY 8
INSTALL NEW 12-INCH DI TRANSMISSION LINE FROM WHYCHUS CREEK JUNCTION TO E. TYEE DRIVE.

PRIORITY 4
INSTALL NEW 16-INCH PVC TRANSMISSION LINE FROM RESERVOIR TO CITY LIMITS NEAR SCHOOLS

PRIORITY 11
CONSTRUCT NEW WELL NO. 5, PUMP STATION AND TRANSMISSION LINE

SISTERS

Whychus Creek

EDGINGTON RD.

20

242

126

600 0 600 1200 1800
SCALE IN FEET

LEGEND

- WELL
- WATER METER
- IMPROVEMENTS

EXISTING

- 2" WATER LINE
- 4" WATER LINE
- 6" WATER LINE
- 8" WATER LINE
- 10" WATER LINE
- 12" WATER LINE
- CITY LIMITS

FIGURE 6-2

FIGURE 6-2

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CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

PROPOSED CAPITAL IMPROVEMENT PROJECTS
PRIORITY, DESCRIPTION, AND LOCATION

FIGURE
6-1

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FIGURE 6-1

FIGURE 6-1

EDGINGTON RD.

WHYCHUS CREEK JUNCTION

PRIORITY 4
INSTALL NEW 16-INCH PVC TRANSMISSION LINE FROM RESERVOIR TO CITY LIMITS NEAR SCHOOLS

PRIORITY 8
INSTALL NEW 12-INCH DI TRANSMISSION LINE FROM WHYCHUS CREEK JUNCTION TO E. TYEE DRIVE.

PRIORITY 5
INSTALL NEW 16-INCH DI TRANSMISSION LINE FROM RESERVOIR TO WHYCHUS CREEK JUNCTION

PRIORITY 3
CONSTRUCT NEW 2.2 MG WATER STORAGE RESERVOIR. SEE FIGURE 4-6

N

600 0 600 1200 1800
SCALE IN FEET

LEGEND

- WELL
- WATER METER
- IMPROVEMENTS

EXISTING

- 2" WATER LINE
- 4" WATER LINE
- 6" WATER LINE
- 8" WATER LINE
- 10" WATER LINE
- 12" WATER LINE
- CITY LIMITS

X:\Clients\Sisters OR\446-08 WSMP\CAD\WSMP-446-08-FIG6-2.dwg, Layout1, 3/28/2023 7:23 AM, dchristman

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

PROPOSED CAPITAL IMPROVEMENT PROJECTS PRIORITY, DESCRIPTION, AND LOCATION

FIGURE

6-2

Chapter 7 - Current Financial Status and Project Financing

Introduction

This chapter summarizes the financial status of the City of Sisters' Water Department, identifies alternatives for financing water system improvements, and discusses the use of System Development Charges (SDCs) to finance eligible existing and future improvements. A summary of state and federal funding programs is presented, including a review of funding options potentially available to the City for water system improvements. To construct some or all the recommended improvements, it is important for the City of Sisters to develop a project financing and implementation plan (or Capital Improvements Plan [CIP] as identified in Chapter 6). Finally, of the CIP projects proposed, a list of SDC-eligible projects is provided.

Current Water Use Rates and Revenues

Operation and maintenance of the existing water system is financed through the City's annual budget. Revenue is obtained from monthly water user fees, account setup fees, and service connection fees.

Water Use Rates

A summary of the existing water rate structure is shown on Table 7-1.

TABLE 7-1
EXISTING WATER RATE STRUCTURE[1]

Meter Size	Monthly Allotment (cubic feet)	Monthly Base Rate	Consumption Rate (per 100 cubic feet)
5/8-inch	0	$18.69	$1.00
3/4-inch	0	$18.69	$1.00
1-inch	0	$20.96	$1.00
1-1/2-inch	0	$20.96	$1.00
2-inch	0	$23.22	$1.00
3-inch or Larger	0	$56.64	$1.00

[1] *Based on rates established in Resolution No. 2022-15 effective July 1, 2022.*

The City's current rate structure is based on a uniform base rate (no volume) and additional charge for consumption. This means that the customer is charged a base rate once, plus a flat rate for every 100 cubic feet used. Currently, the City's monthly base rate for all customers varies from $18.69 to $56.64, depending on meter size. For every 100 cubic feet used, customers pay $1.00.

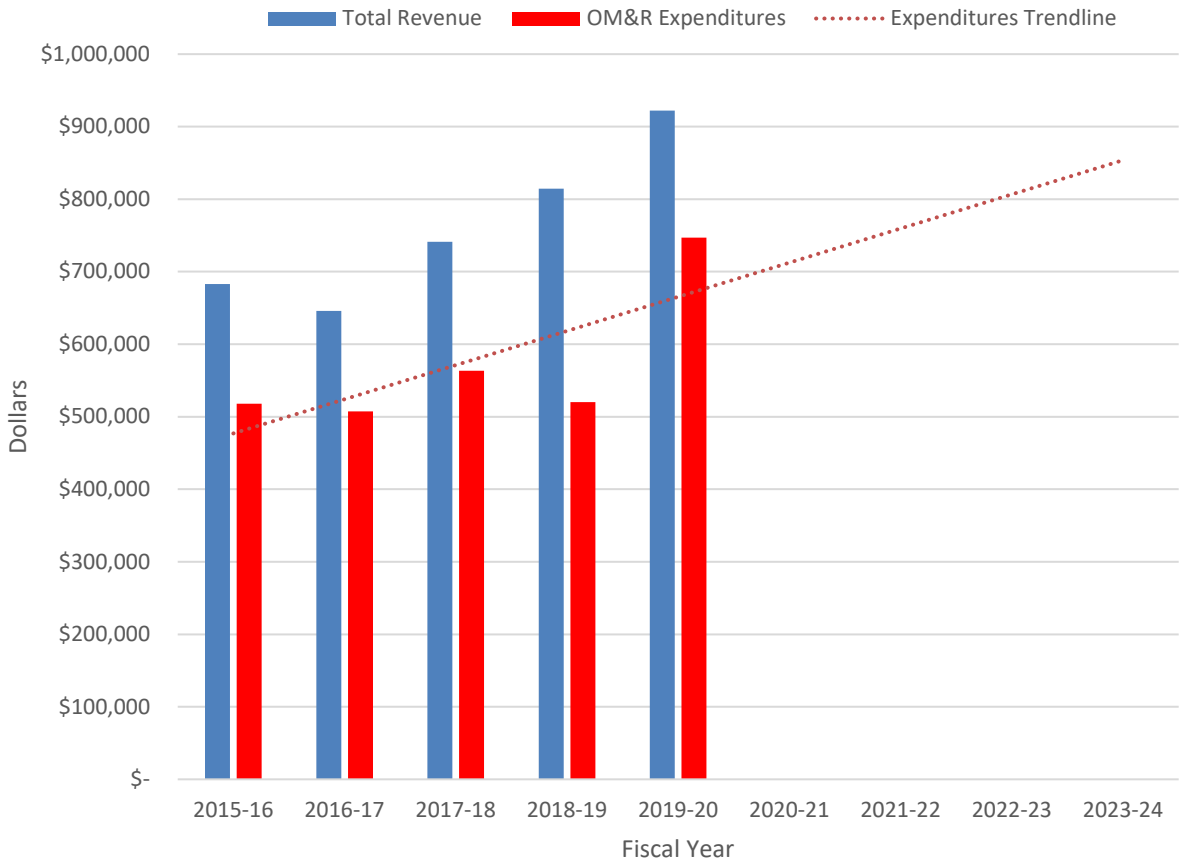
Current Financial Status

The annual cost of operating and maintaining the City's water system is summarized on Figure 7-1. The costs presented were obtained from the City's audited financial statements and include all costs for the water system, materials and services, capital improvements, and debt service.

Historical and Projected Budget Trends

The City's Water Department revenues have exceeded annual operation, maintenance, and replacement (OM&R) for all five years for which data were available. A graphical plot of the City of Sisters' water system budget for the Water Department funds, showing total revenue and total expenditures, is presented on Chart 7-1.

CHART 7-1
HISTORICAL AND PROJECTED BUDGET



Capital Improvements Plan

During development of this Water System Master Plan (WSMP) Update, the City elected to take a CIP approach for the less expensive maintenance and existing system replacement-related work with the potential to pursue outside funding for the more expensive water system improvements projects. The CIP approach requires City funds to be allocated each year within the Water Department to complete necessary repairs and upgrades to the water system. If the City seeks outside funding, customer water

rates would likely need to be raised to allow loans to be paid back over time. Projects that may require outside funding include the construction of new water supply sources, transmission and distribution pipelines, and storage reservoirs, as discussed in previous chapters of this WSMP Update. Water system improvements outlined in Chapter 6 have been prioritized so the most critical projects, related to the quality and reliability of the existing water system, are recommended to be completed first.

Water System Improvements Funding

To pursue the potential larger recommended water system improvements projects presented in Chapter 6, the City may choose to obtain outside funding assistance. Outside funding assistance would enable a needed water system improvements project to be implemented sooner than a CIP approach would normally allow. For informational purposes, a summary of state and federal grant and loan programs that can provide financial assistance for municipal improvement projects is included herein. These programs offer various levels of funding aimed at different types of projects. These include programs administered by the U.S. Economic Development Administration (EDA), Business Oregon, United States Department of Agriculture - Rural Development (RD), and others.

These agencies can provide low interest loan funding and, possibly, grant funding for assisting communities on public works projects. Some of the funding programs provide funding only if the improvements address documented water quality compliance issues. A summary of potential funding programs follows.

Summary of Potential Funding Programs

The following section briefly summarizes the primary funding programs available to assist the City with a water system improvements project. Most of these agencies require an evaluation of water rates needed to support a loan for water system improvements both as a condition of receiving monies and prior to being considered for grant funds. The monthly user rates discussed in this section can represent a combination of monthly usage fees and/or taxes.

State Grant and Loan Programs

Business Oregon

Special Public Works Fund

The Special Public Works Fund (SPWF) program was established by the Oregon Legislature in 1985 to primarily provide loan funding for municipally owned infrastructure and other facilities that support economic and community development in Oregon. Loans and grants are available to municipalities for planning, designing, purchasing, improving, and constructing municipally owned facilities, replacing owned essential community facilities, and emergency projects because of a disaster.

For design and construction projects, loans are primarily available; however, grants are available for and limited to projects that will create and/or retain traded-sector jobs. A traded-sector industry sells its goods or services into nationally or internationally competitive markets. The maximum grant award is $500,000 or 85 percent of the project cost, whichever is less. The grant amount per project is based on up to $5,000 per eligible job created or retained. Loans range in size from less than $100,000 to $10 million. The

SPWF can offer very attractive interest rates that reflect tax-exempt market rates for creditors. Loan terms can be up to 25 years or the useful life of the project, whichever is less. If the City of Sisters can tie the needed improvements to job creation, the SPWF may be an available funding source for water system improvements.

Community Development Block Grant Program

The primary objective of the Community Development Block Grant (CDBG) program is development of viable (livable) urban communities by expanding economic opportunities and providing decent housing and a suitable living environment principally for persons of low and moderate incomes.

This is a federally funded grant program. The state receives an annual allocation from Housing and Urban Development for the CDBG program. Grant funding is subject to applicant need, availability of funds, and any other restrictions in the state's Method of Distribution (i.e., program guidelines). It is not possible to determine how much, if any, grant funds may be awarded prior to an analysis of the application and financial information.

Eligibility for the CDBG program requires that greater than 51 percent of persons within the community fall into the low to moderate income (LMI) category. According to the City and Deschutes County demographics utilized by Business Oregon, which was based on 2019 data available from Business Oregon, the City of Sisters had approximately 42 percent of the population within the LMI category. This puts the City below the threshold to qualify for CDBG funds. However, several communities have completed local income surveys, showing that, in fact, 51 percent or more of the population was in the LMI category.

Safe Drinking Water Revolving Loan Fund

The Safe Drinking Water Revolving Loan Fund (SDWRLF) is primarily a loan program for the construction and/or improvement of public and private water systems to address regulatory compliance issues. This is accomplished through two separate programs: the SDWRLF for collection, treatment, distribution, and related infrastructure, and the Drinking Water Source Protection Fund for protection of sources of drinking water prior to system intake. The SDWRLF program can lend a significant portion to projects, depending on the City's financial capability. Loan amounts greater than $3 million or with more than $750,000 principal forgiveness require approval through Business Oregon's Infrastructure Finance Authority Board. The standard SDWRLF loan term is 20 years or the useful life of project assets, whichever is less. Loan terms up to 30 years may be available for "disadvantaged communities." This program offers subsidized interest rates for all successful projects. Interest rates for a standard loan start at 80 percent of the state/local bond rate. Interest rates for loans to disadvantaged communities are based on a sliding scale between the interest rate for a standard loan and 1 percent. Communities may be eligible for some of the principal on their SDWRLF loan to be "forgiven." This forgivable loan feature is like a grant and is offered to disadvantaged communities. Special consideration, including partial principal forgiveness, is provided to projects qualifying or having Green Project Reserve components. The SDWRLF program appears to be a potential funding source available to the City, provided a potential regulatory requirement can be addressed with the improvements.

Water/Wastewater Financing Program

This is a loan and grant program that provides for the design and construction of public infrastructure when needed to ensure compliance with the Safe Drinking Water Act (SDWA) or the Clean Water Act (CWA). To be eligible, a system must have received, or is likely to soon receive, a notice of non-compliance by the appropriate regulatory agency associated with the SDWA or CWA.

While primarily a loan program, grants are available for municipalities that meet eligibility criteria. The loan/grant amounts are determined by financial analysis of the applicant's ability to afford a loan (debt capacity, repayment sources, current and projected utility rates, and other factors). The maximum loan term is 25 years or the useful life of the infrastructure financed, whichever is less. The maximum loan amount is $10 million per project and is determined by financial review and may be offered through a combination of direct and/or bond-funded loans. Loans are generally repaid with utility revenues or voter-approved bond issues. A limited tax general obligation pledge may also be required. Creditworthy applicants may be funded through the sale of state revenue bonds. The maximum grant is $750,000 per project based on a financial analysis. An applicant is not eligible for grant funds if the applicant's annual median household income (MHI) is equal to or greater than 100 percent of the state average MHI for the same year.

Business Oregon - Regional Development Officer

Since program eligibility and funds availability may change from year to year, potential applicants are encouraged to contact their respective Regional Development Officer to obtain the most accurate and up-to-date information for each program.

Federal Grant and Loan Programs

Rural Development

This agency can provide financial assistance to communities with a population of less than 10,000 through both loans and direct grants. Under the loan program, the agency purchases local bonds. The interest rate for these bonds is dependent on the MHI of the community and other factors and varies from year to year based on other economic factors nationally. The fixed interest rate varies but is generally approximately 3.0 to 4.0 percent with a repayment period of up to 40 years. Applying for this type of funding is a lengthy process involving development of an environmental report and a detailed funding application.

The agency presently requires communities to establish average residential user costs in the range of similar systems with similar demographics before the community qualifies for grant funds. It should be noted that loans without grant funds may be acquired from RD that may not require rates to reach this level, depending on the results of an RD funding analysis. The user costs must provide sufficient revenue to pay for all system OM&R costs and pay for the local debt service incurred because of the project. All project costs above this level may be paid for by grant funds, up to given limits, which are usually not more than 45 percent of the total project cost. The objective of the RD loan/grant program is to keep the cost for utilities in small, rural communities at a level similar to what other communities are paying.

Another of the agency's requirements is that loan recipients establish a reserve fund of 10 percent of the bond repayment during the first ten years of the project, which can make the net interest rate higher if such a reserve does not already exist. The RD program requires either revenue or general obligation bonds to be established through the agency for the project (refer to the Local Financing Options section of this chapter for further discussion). These bonds can usually be purchased for a period of 40 years if desired. A combination loan and grant from RD may be an option for the City of Sisters to implement water system improvements.

U.S. Economic Development Administration

The EDA has grant and loan funds like those available through Business Oregon's SPWF program. Monies are available to public agencies to fund projects that stimulate the economy of an area, and the overall goal of the program is to create or retain jobs. The EDA has invested a great deal of money in Oregon to fund public works improvement projects in areas where new industries were locating or planned to locate in the future. In addition, the agency has a program known as the Public Works Impact Program to fund projects in areas with extremely high rates of unemployment. This program also received an increased federal funding allocation through the CARES Act in 2020. This program is targeted toward creating additional jobs and reducing the unemployment rate in the area. If the City's water system improvements can be linked directly to industrial expansion or job retention/expansion, the City could be in a competitive position to receive funding under EDA programs.

Pursuing Potential Outside Project Funding Assistance

Based on the estimated costs provided herein, the City may elect to pursue loan funding for large capital improvements projects. If a water system improvements project is pursued, it is recommended the City thoroughly investigate potential available funding sources to verify the best funding package is obtained for the project. The following sections provide information on pursuing funding through Business Oregon or other local financing sources. This assumes the City is looking for outside funding assistance to fund large capital improvements projects as discussed in this WSMP Update.

Preliminary Equivalent Dwelling Units

When projecting future revenue for a water system, an equivalent dwelling unit (EDU) analysis is usually completed. One EDU is intended to represent the average residential water use for a given city. As an example, a residential account would represent one EDU. A commercial or industrial account with similar water usages to the average residential use would also be considered one EDU. A commercial account such as a restaurant with three times the typical water usage as an average residential account would be considered three EDUs.

The City of Sisters does not use EDUs to bill customers. The City bills according to meter size and consumption as defined in Resolution No. 2022-15. The meter size the City utilizes to determine the base rate for each customer is shown on Table 7-1. Table 7-2 below shows the relationship between the base rate for each meter size compared to a standard residential meter (5/8-inch or 3/4-inch). The meter size factor is determined by taking the base rate for the given meter size and dividing that number by the base rate for a standard residential meter.

TABLE 7-2
BASE RATE COMPARISON

Meter Size	Connections[1]	Monthly Base Rate	Meter Size "Factor"	Total Base Rates (EDU)
5/8-inch	-	$18.69	1.0	-
3/4-inch	1,563	$18.69	1.0	1,563
1-inch	234	$20.96	1.1	257
1-1/2-inch	36	$20.96	1.1	40
2-inch	44	$23.22	1.2	53
3-inch or Larger	9	$56.64	3.0	27
Total	**1,886**			**1,940**

[1]Number of connections as of September 2021.

In lieu of a typical EDU analysis, where average residential water consumption is the main factor behind a "base rate," a meter size factor can be considered an equivalent analysis. Most funding agencies will use EDUs as a basis for estimating future annual revenue and debt capacity for a city. The EDU determination is intended to equitably distribute water costs among all users. The EDU determination helps funding agencies determine the maximum loan (debt) amount a city can incur prior to being considered for grant funds for their water system improvements project. The analysis presented hereafter for the City's future water rate revenue and estimated debt capacity is based on the preliminary determination of 1,940 EDUs.

One Stop Meeting and Project Notification and Intake Form

To evaluate all potential project funding options, a One Stop meeting is generally requested of Business Oregon and other funding agencies that then meet with City staff to discuss the project and funding needs and identify the funding program best suited for the project. To avoid requiring city representatives to travel to Salem, Business Oregon has recently been holding these meetings locally or through video or telephone conferencing. Business Oregon utilizes a Project Notification and Intake Form (PNIF) to outline a city's project, including the needs, project requirements, affected area, estimated project cost, time frame, schedule, etc. Business Oregon evaluates the project based on information presented on the PNIF and the results of the One Stop meeting to determine the best funding program suited to the project. The city is usually invited to submit a funding application to the best funding program(s) identified in the One Stop meeting.

Local Financing Options

Regardless of the ultimate project scope and agency from which funds are obtained, the City of Sisters may need to develop authorization to incur debt (i.e., bonding) for the recommended improvements. The need to develop authorization to incur debt depends on funding agency requirements and provisions in the City Charter. The need for bonding by the City has been eliminated by most state funding programs. However, if a bond election is required, there are generally two options the City may use for its bonding authority: general obligation bonds and revenue bonds. General obligation bonds require a vote of the people to give the City the authority to repay the debt service through tax assessments, water revenues, or a combination of both. The City's taxing authority provides the guarantee for the debt. Revenue bonds are financed through revenues of the water system. Authority to issue revenue bonds can come in two forms. One would

be through a local bond election similar to that needed to sell a general obligation bond, and the second would be through Council action authorizing the sale of revenue bonds, if the City Charter allows. If more than 5 percent of the registered voters do not object to the bonding authority resolution during a 60-day remonstrance period, the City would have authority to sell these revenue bonds.

Oregon law currently requires a 50 percent voter turnout to pass a bonded debt tax measure unless the election is held in May or November. May and November elections require only a majority of those who voted to pass a bonded debt tax measure. Due to current tax measure limitations in Oregon, careful consultation with experienced, licensed bonding attorneys should occur if the City begins to obtain bonding authority for the recommended water system improvements.

System Development Charges Review

State law creates a framework for local SDCs and specifies how, when, and for which improvements they can be imposed. SDCs may consist of a reimbursement fee, an improvement fee, or both. Improvement fees are associated with capital improvements to be constructed, while reimbursement fees are designed to recover the costs associated with capital improvements already constructed or under construction. SDC revenues may only be used for capital costs; they cannot be used for ongoing facility or system maintenance or for projects that either correct existing system deficiencies or replace existing capacity. The statutes put some constraints on the costs that may be included in each fee component:

- Reimbursement fees exclude existing facility costs funded by gifts or grants and costs associated with “used capacity” (facility capacity needed to meet existing development service demands).
- Improvement fees are based on the projected costs of capital improvements included on an SDC capital project list that expand capacity to meet the service demands of future system users.

An SDC methodology based on a combined reimbursement and improvement fee structure must demonstrate that the charge is not based on providing the same system capacity. Beyond these constraints, the statutes provide flexibility in determining SDC amounts and methodologies, provided that new users contribute no more than an equitable share of costs.

Local governments must establish SDCs by ordinance or resolution and through a public process. They must have a methodology to calculate reimbursement and improvement fees and provide a credit if a developer finances certain improvements. Local governments must also provide a review procedure through which anyone may challenge an expenditure of SDC revenue if it is out of compliance with state requirements.

Local governments are required to prepare a capital improvements program or comparable plan, prior to the establishment of an improvement SDC, that includes a list of the improvements the jurisdiction intends to fund with improvement fee revenues and the estimated timing, cost, and eligible portion of each improvement. This requirement was an added provision to the original statute to provide greater transparency on the basis for improvement fee costs and expenditures. Since reimbursement fees are based on facilities already constructed or under construction, the project list requirement is not applicable.

A list of SDC-eligible project costs proposed by this WSMP Update is shown on Table 7-3. As shown, roughly $13.0 million of proposed capital improvements project costs are eligible to be financed with SDC fees.

TABLE 7-3
SDC-ELIGIBLE PROJECTS AND ASSOCIATED COSTS

Project	Total Estimated Project Cost (2022 Dollars)	Portion of Project Cost Eligible for Funding by SDCs	SDC-eligible Cost	Explanation
Construct a new 2.2 MG water storage tank and rehabilitate the existing 1.6 MG water storage tank.	$6,283,000	100 percent	$6,283,000	Needed to provide additional storage capacity for fire flow and flow equalization resulting from forecasted growth.
Install a new 16-inch PVC transmission line from the reservoir to the Whychus Creek junction.	$3,635,000	100 percent	$3,635,000	Increased flow capacity needed to meet peak demands and fire flow rates due to forecasted growth.
Install a new 12-inch PVC water main on Camp Polk Road Extension from East Sun Ranch Drive to East Barclay Drive.	$319,000	100 percent	$319,000	Needed to compensate for the reduction in available fire flow rates due to forecasted growth.
Install a new 12-inch PVC main from East Desperado Trail to Creekside Drive.	$654,000	100 percent	$654,000	Needed to compensate for the reduction in available fire flow rates due to forecasted growth.
Construct a new Well No. 5 and transmission line.	$2,102,000	100 percent	$2,102,000	Needed to provide additional supply capacity resulting from forecasted growth.
Total SDC-Eligible Portion of Total CIP Costs:			**$12,993,000**	

MG = million gallons

PVC = polyvinyl chloride

Recommended Improvements Summary

The key to implementing the recommended improvements outlined in this WSMP Update is the ability of the City to secure monies to fund these improvements, while working closely with its citizens to inform them of the water system needs and the necessity for increased water user rates.

Water system improvements as outlined in this WSMP Update are intended to provide the City with a reliable, quality water system that will meet the needs of the City for the planning period and beyond. With the CIP approach, the City may reduce the need to borrow additional funds while completing the CIP-identified improvements projects. However, this approach can limit the speed at which more expensive improvements are implemented. If the City requires the immediate implementation of water

system improvements due to rapid growth or aging infrastructure, funding from the programs summarized herein may be sought. Both options may require water rates to be raised to adequately fund the recommended system improvements over the 20-year planning period.

CITY OF SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE
WATER DEPARTMENT FUNDS

	Revenue			Expenditures					
Fiscal Year	Charges for Services	Other Income[1]	Total Revenue	Personal Services	Materials and Services	Capital Improvements	Debt Service	Total Expenditures	Excess Revenue Over (Under) Expenditures
2015-2016	$ 610,778	$ 72,255	$ 683,033	$ 220,912	$ 224,354	$ 72,597	$ -	$ 517,863	$ 165,170
2016-2017	$ 629,736	$ 16,328	$ 646,064	$ 220,721	$ 285,446	$ -	$ 1,254	$ 507,421	$ 138,643
2017-2018	$ 717,290	$ 23,986	$ 741,276	$ 234,893	$ 280,098	$ 44,445	$ 4,023	$ 563,459	$ 177,817
2018-2019	$ 775,870	$ 38,674	$ 814,544	$ 264,064	$ 252,349	$ 3,216	$ 657	$ 520,286	$ 294,258
2019-2020	$ 882,099	$ 40,230	$ 922,329	$ 302,340	$ 285,750	$ 158,183	$ 656	$ 746,929	$ 175,400

[1]Other Income comes from licenses and fees, intergovernmental, interest on investments, and miscellaneous.

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WATER SYSTEM MASTER PLAN UPDATE

WATER DEPARTMENT FUNDS

FIGURE
7-1

Appendices Table of Contents

CITY COUNCIL

Agenda Item Summary

Meeting Date: June 14, 2023 **Staff:** Woodford

Type: Ordinance **Dept:** CDD

Subject: Public Hearing for City File No. CP 22-02, Comprehensive Plan Amendment to adopt the updated Wastewater Master Plan.

Action Requested: Approval of Ordinance 531 for a Comprehensive Plan Amendment to adopt the updated Wastewater Facilities Master Plan (Planning File #CP 22-02) and replace and supersede the prior Wastewater Master Plan.

Background: On May 18, 2023, the Planning Commission approved a Comprehensive Plan Amendment request to update the Wastewater Master Plan (WWMP) during a public hearing.

All communities in Oregon are required to have a Comprehensive Plan that addresses the Statewide Planning Goals. Goal 11 relates to Public Facilities and Services and Oregon Administrative Rules (OAR) 660-011 implement the Goal, which requires that a city develop and adopt a public facility plan for areas within an urban growth boundary containing a population greater than 2,500 persons. The purpose of the plan is to help assure that urban development in such urban growth boundaries is guided and supported by types and levels of urban facilities and services appropriate for the needs and requirements of the urban areas to be serviced, and that those facilities and services are provided in a timely, orderly and efficient manner.

The City of Sisters last adopted a WWMP in 2016, which examined water needs to serve the population of Sisters into 2035. That Plan recommended that a population forecast update be prepared at a minimum of every 5 years, and, if necessary, corresponding revisions be made to the capital facilities plan. Regular population forecast updates ensure that the capital facilities plan would remain closely aligned with current population and current demand on City infrastructure.

According to OAR 660-011-0045 (Adoption and Amendment Procedures for Public Facility Plans), the governing body of the city responsible for development of the public facility plan shall adopt the plan as a supporting document to the jurisdiction's Comprehensive Plan. The proposed updated WWMP will be a component of the Sisters Comprehensive Plan by reference and thus an Amendment to the Comprehensive Plan is required to approve the updated Plan. Planning Commission recommendation and City Council approval are required.

This WWMP Update focuses on the City's existing wastewater system components, future demand, collection facilities, treatment and effluent disposal. The WWMP Update includes an analysis of the existing systems and their performance, an evaluation of system needs and

improvement alternatives, and a summary of the City's current wastewater improvements financial status and potential funding opportunities for improvements.

Recommendation: Staff and Planning Commission recommend that City Council review and formally adopt Ordinance No. 531.

Attachments:

- Attachment A – Ordinance No. 531
  - Exhibit A – Staff Findings
  - Exhibit B – Adoption Draft of the Updated Wastewater Facility Plan
    The draft plan can be found at the link above.

ORDINANCE NO. 531

AN ORDINANCE ADOPTING AMENDMENTS TO THE SISTERS WASTEWATER FACILITIES PLAN TO ALIGN CAPITAL FACILITIES PLANNING WITH THE CURRENT POPULATION FORECAST.

WHEREAS, the City of Sisters ("City"), in accordance with Statewide Land Use Goal 11 and its implementing regulations, adopted the Sisters Wastewater Facilities Plan ("Master Plan") to plan for the wastewater needs of the community;

WHEREAS, the Master Plan is a component of the City's Comprehensive Plan;

WHEREAS, the Master Plan was last updated in 2016;

WHEREAS, the Master Plan recommends that a population forecast update be prepared at a minimum of every 5 years to ensure that capital facility plans remain closely aligned with current population projections;

WHEREAS, analysis revealed current and future system deficiencies in City's wastewater system based on the current population forecast;

WHEREAS, the City, as the applicant for file number CP-22-02, proposed legislative amendments to the Master Plan to identify solutions to such current and future system deficiencies (collectively, the "Amendments");

WHEREAS, in accordance with Sisters Development Code Chapter 4.1, legislative amendments to the Comprehensive Plan are processed as a Type IV application;

WHEREAS, the Department of Land Conservation and Development received notice of the proposed Amendments at least 35 days prior to the first evidentiary hearing;

WHEREAS, after due notice, a public hearing on the Amendments was held before the Sisters Planning Commission ("Planning Commission") on May 18, 2023;

WHEREAS, the Sisters Planning Commission, after receiving public testimony and other evidence and fully deliberating the matter, recommended that the Sisters City Council ("City Council") adopt the proposed Amendments;

WHEREAS, after due notice, a public hearing was scheduled before the City Council on June 14, 2023; and

WHEREAS, after reviewing the staff report and the Planning Commission's recommendation, receiving public testimony and other evidence, and deliberating the matter fully, the City Council voted to adopt the Amendments.

NOW, THEREFORE, THE CITY OF SISTERS ORDAINS AS FOLLOWS:

1. Findings. The findings contained in the recitals and those found in the staff report delivered at the June 14, 2023, public hearing before City Council, and attached hereto as Exhibit A, are hereby adopted.

2. Amendments. The Amendments, which are incorporated into the updated Master Plan attached hereto as Exhibit B, are hereby adopted as City's public facility plan for wastewater and made part of City's Comprehensive Plan.

3. Authorization. The city manager, or designee, is authorized to execute any documents and to take such actions as are necessary to further the purposes and objectives of this Ordinance.

4. Severability; Corrections. If any section, subsection, sentence, clause, and/or portion of this Ordinance 531 (this "Ordinance") is for any reason held invalid, unenforceable, and/or unconstitutional, such invalid, unenforceable, and/or unconstitutional section, subsection, sentence, clause, and/or portion will (a) yield to a construction permitting enforcement to the maximum extent permitted by applicable law, and (b) not affect the validity, enforceability, and/or constitutionality of the remaining portion of this Ordinance. This Ordinance may be corrected by order of the City Council to cure editorial and/or clerical errors.

This Ordinance was PASSED by the City Council by a vote of ___ for and ___ against and APPROVED by the mayor on this 14th day of June 2023.

_____
Michael Preedin, Mayor

ATTEST:

_____
Kerry Prosser, City Recorder

Exhibit A

STAFF REPORT

[attached]

STAFF REPORT
Community Development Department

FILE NUMBERS: Sisters Wastewater Facilities Plan Update / City File #: CP 22-02

APPLICANT: City of Sisters

REQUEST: Comprehensive Plan Amendment to update the Sisters Wastewater Master Plan

APPLICABLE CRITERIA: City of Sisters Development Code (SDC):
Chapter 4.1 – Types of Applications and Review Procedures
Oregon Revised Statutes
Oregon Administrative Rules

HEARING DATE: June 14, 2023 at 6:30 pm (City Council)
May 18, 2023 at 5:30 pm (Planning Commission)

CITY STAFF: Scott Woodford, Community Development Director

I. BACKGROUND:

All communities in Oregon are required to have a Comprehensive Plan that addresses the Statewide Planning Goals. One of the goals is Goal 11: Public Facilities and Services. Associated with Goal 11 are Administrative Rules that implement it: OAR 660-011 – Public Facilities Planning. These rules require that a city or county develop and adopt a public facility plan for areas within an urban growth boundary containing a population greater than 2,500 persons. The purpose of the plan is to help assure that urban development in such urban growth boundaries is guided and supported by types and levels of urban facilities and services appropriate for the needs and requirements of the urban areas to be serviced, and that those facilities and services are provided in a timely, orderly and efficient arrangement.

The City of Sisters last updated and adopted a Wastewater Master Plan in 2016, which examined wastewater needs to serve the population of Sisters into 2035. That Plan recommended that a population forecast update be prepared at a minimum of every 5 years, and, if necessary, corresponding revisions be made to the capital facilities plan. Regular population forecast updates ensure that the capital facilities plan would remain closely aligned with current population and current demand on City infrastructure.

According to OAR 660-011-0045 (Adoption and Amendment Procedures for Public Facility Plans), the governing body of the city or county responsible for development of the public facility plan shall adopt the plan as a supporting document to the jurisdiction's comprehensive plan. The proposed updated Wastewater Maser Plan is a component of the Sisters Comprehensive Plan by reference and thus an Amendment to the Comprehensive Plan is required to approve the updated Plan, thus the purpose of the Planning Commission and City Council review.

II. **EXHIBITS:** The Exhibit that make up the record in this matter is the Draft Wastewater Master Plan (**Note:** Exhibits are available for review on the City of Sisters website at the following link: **https://www.ci.sisters.or.us/sites/default/files/fileattachments/city_council/page/22850/wastewater_facility_plan_update_sisters_446-08_draft_05.31.23_reduced.pdf**

III. **CONCLUSIONARY FINDINGS:** The following findings relate to compliance with applicable criteria to this land use application:

City of Sisters Development Code (SDC):
Chapter 4.1 – Types of Applications and Review Procedures

- City of Sisters Comprehensive Plan
- Statewide Planning Goals

SISTERS DEVELOPMENT CODE

CHAPTER 4.1 – TYPES OF APPLICATIONS AND REVIEW PROCEDURES

4.1.100 Purpose
The purpose of this chapter is to establish standard decision-making procedures that will enable the City, the applicant, and the public to reasonably review applications and participate in the local decision-making process in a timely and effective way.

Staff Finding: Staff finds that this provision is advisory.

4.1.200 Description of Permit/Decision-Making Procedures
All land use and development permit applications, except building permits, shall be decided by using the procedures contained in this Chapter. General provisions for all permits are contained in Section 4.1.700. Specific procedures for certain types of permits are contained in Section 4.1.200 through 4.1.600. The procedure "type" assigned to each permit governs the decision-making process for that permit. There are four types of permit/decision-making procedures: Type I, II, III, and IV. These procedures are described in subsections A-D below. In addition, Table 4.1.200 lists all of the City's land use and development applications and their required permit procedure(s).

…

D. Type IV Procedure (Legislative). Type IV procedures apply to legislative matters. Legislative matters involve the creation, revision, or large-scale implementation of public policy (e.g., adoption of land use regulations, zone changes, and comprehensive plan amendments which apply to entire districts). Type IV matters are considered initially by the Planning Commission with final decisions made by the City Council and appeals possible to the Oregon Land Use Board of Appeals.

Table 4.1.200
Summary of Development Decisions/Permit by Type of Decision-making Procedure

Action	Decision Type	Applicable Regulations
Comprehensive Plan Amendment	Type IV	Comprehensive Plan

Staff Finding: The City is proposing an amendment to its WWFP, which will "involve the creation, revision, or large-scale implementation of public policy (e.g., adoption of land use regulations, zone changes, and comprehensive plan amendments which apply to entire districts)," thus compliance with a Type IV procedure is required.

E. Notice of all Type III and IV hearings will be sent to public agencies and local jurisdictions (including those providing transportation facilities and services) that may be affected by the proposed action. Affected jurisdictions could include ODOT, the Department of Environmental Quality, the Oregon Department of Aviation, and neighboring jurisdictions.

***Staff Findings*:** The procedures outlined in the sections above were followed in the review of this application.

4.1.600 Type IV Procedure (Legislative)

A. Application requirements. See 4.1.700.

B. Notice of Hearing.

1. Required hearings. A minimum of two hearings, one before the Planning Commission and one before the City Council, are required for all Type IV applications, except annexations where only a hearing by the City Council is required.

Staff Finding: A minimum of two hearings will be provided – at least one before the Planning Commission and at least one before the City Council.

2. Notification requirements. Notice of public hearings for the request shall be given by the Community Development Director or designee in the following manner:

a. At least 20 days, but not more than 40 days, before the date of the first hearing on an ordinance that proposes to amend the comprehensive plan or any element thereof, or to adopt an ordinance that proposes to rezone property, a notice shall be prepared in conformance with ORS 227.175 and mailed to:

1. Each owner whose property would be rezoned in order to implement the ordinance (i.e., owners of property subject to a comprehensive plan amendment shall be notified if a zone change would be required to implement the proposed comprehensive plan amendment);
2. Any affected governmental agency.
3. Recognized neighborhood groups or associations affected by the ordinance;
4. Any person who requests notice in writing;
5. For a zone change affecting a manufactured home or mobile home park, all mailing addresses within the park, in accordance with ORS 227.175.
6. Owners of airports shall be notified of a proposed zone change in accordance with ORS 227.175.

Staff Finding: Staff reviewed the requirements in Section 4.1.600 (B)(2)(a) and did not provide any notice, as staff found that the criteria for notice was not met in this case.

b. At least 14 calendar days before the scheduled Planning Commission public hearing date, and 14 calendar days before the City Council hearing date, notice shall be published in a newspaper of general circulation in the City.
c. The Community Development Director or designee shall:
    1. For each mailing of notice, file an affidavit of mailing in the record as provided by Subsection a; and
    2. For each published notice, file in the record the affidavit of publication in a newspaper that is required in subsection b.
d. The Department of Land Conservation and Development (DLCD) shall be notified in writing of proposed comprehensive plan and development code amendments at least 35 days before the first public hearing at which public testimony or new evidence will be received.
e. Notifications for annexation shall follow the provisions of this Chapter and ORS 199.

Staff Finding: Staff provided notice in accordance with 4.1.600 (B)(2)(b). The notice was published in the Nugget newspaper on April 5, 2023, at least 14 days prior to the initial April 20, 2023 public hearing (where it was continued to the May 18, 2023 public hearing). A second hearing is required and will be held by City Council, at which time notice will again be posted in compliance with this section.

……..

E. <u>Decision-Making Considerations</u>. The recommendation by the Planning Commission and the decision by the City Council shall be based on consideration of the following factors:

1. Approval of the request is consistent with the Statewide Planning Goals;

Staff Finding: Staff has reviewed the request for a Comprehensive Plan Amendment with the Statewide Planning Goals and finds the Amendment to be consistent with all of the applicable goals. See more detail below.

Goal 1 Citizen Involvement: To develop a citizen involvement program that insures the opportunity for citizens to be involved in all phases of the planning process.

Staff Finding: The WWFP is a guiding document for wastewater facilities for the next twenty years. Typically, there is not a significant amount of public outreach during the formation of the Plan, but throughout the development of this WWFP Update, multiple presentations describing the proposed improvements were presented to the Public Works Advisory Board (PWAB), the City Council, and the Sisters Planning Commission. The development of the WWFP Update was closely coordinated with Public Works staff. The WWFP Update was presented to PWAB on March 8, 2022, and June 14, 2022. The WWFP Update was also presented to the City Council on August 10, 2022, and was subsequently given to the Planning Commission on October 20, 2022.

The process for approval of the WWFP is detailed in 4.1.600. The adoption process requires public hearings and notifications as outlined in 4.1.600.B. 4.1.600.B.1 states that two hearings are required, one Planning Commission hearing and one City Council hearing, for application approval. The Planning Commission public hearing date is set for May 18, 2023. The City Council date is pending. The City provided noticing in accordance with 4.1.600.B.2. Type IV Procedure (Legislative) Notice of Hearing, which details the required public hearing notification process. In compliance with 4.1.600.B.2.a, the City met the required notice timelines to the

parties affected. In compliance with 4.1.600.B.2.b, the city also published notice in the local newspaper. Additionally, the Department of Land Conservation and Development was notified in writing by the city as required in 4.1.600.B.2.d. The City filed the required affidavits per 4.1.600.B.2.c.. The amendment does not include any annexations, therefore 4.1.600.B.2.e is not applicable.

The City included the required content as specified in 4.1.600.C. Based on the preceding findings, the process for adoption of the amendment complies with Goal 1 and meets the requirements of the State's citizen involvement provisions.

Goal 2 Land Use Planning: To establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions.

Staff Finding: The Sisters 2040 Comprehensive Plan is the planning and policy framework tool for decisions and actions related to use of land in the Sisters Urban Area. The plan was adopted September 22, 2021, with an effective date of October 22, 2021. The WWFP complies with and is consistent with the goals and policies set in the Comprehensive Plan, specifically the section on Public Facilities.

Sisters' established planning and policy framework, including but not limited to the Comprehensive Plan and Development Code, has been acknowledged to be consistent with state law and provide adequate factual basis for decisions and actions. As adopted as a contextual document to this framework, the amendment is consistent with Statewide Planning Goal 2.

Goal 3 - Agricultural Land: To preserve and maintain agricultural lands.

Staff Finding: The majority of the WWFP concerns the lands within the Sisters Urban Growth Boundary, which does not contain any agricultural land. A portion of land outside of the city boundaries, the city owned Lazy Z Ranch, does play a role in the municipal wastewater treatment process and is in Deschutes County and zoned EFU (Exclusive Farm Use). In 2007, the city acquired a portion of the Lazy Z Ranch to dispose of treated effluent and biosolids, which is applied to 45 acres of 231 owned acres of agricultural land through an irrigation line. The acreage is planted with hay/alfalfa/grass and cut each year for sale, thus continuing the agricultural use of the property. Therefore, the proposed amendment is consistent with Statewide Planning Goal 4.

Goal 4 - Forest Land: To conserve forest lands.

Staff Finding: Goal 4 is not applicable as the WWFP does not affect any forest plan designations or uses.

Goal 5 - Open Spaces, Scenic and Historic Areas, and Natural Resources: To conserve open space and protect natural and scenic resources.

Staff Finding: The WWFP is mostly concerning improvements that are underground and therefore do not impact open spaces, scenic and historic areas, or natural resources. Other areas, such as the existing treatment ponds and the portion Lazy Z Ranch where effluent is spread already exist and are not proposed to be further negatively impacted in the future. In

fact, improvements are proposed to Lazy Z that would enhance open spaces and natural resources, specifically with proposals to construct wetlands on the property and the construction of nature trails. Therefore, the amendment is consistent with Statewide Planning Goal 5.

Goal 6 - Air, Water and Land Resources Quality: To maintain and improve the quality of the air, water, and land resources of the state.

Staff Finding: According to State law, all wastewater must be stored, treated, and disposed of by land application following sound irrigation practices and conform to an Oregon Department of Environmental Quality-approved Recycled Water Use Plan. The city will comply with this requirement as part of implementation of the WWFP.

Wychus Creek is the primary surface waterbody located in the vicinity of the City of Sisters. Some of the proposed collection system improvements will occur in the vicinity of this waterbody, although no impacts are anticipated. Best management practices will be employed to control potential erosion and sedimentation that could temporarily impact water quality.

According to the WWFP, projects recommended in the Plan have the potential to temporarily affect air quality. Short-term impacts include emissions from equipment operation and dust generated from construction activities. No substantial particulate matter or detrimental emissions will be released as a result of the projects. It is unlikely that the Oregon Department of Environmental Quality (DEQ) will require air quality permits for the project.

In general, the WWFP recommendations promote the improvement of air, water and land resource quality and therefore the amendment is in compliance with Statewide Planning Goal 6.

Goal 7 - Areas Subject to Natural Disasters and Hazards: To protect life and property from natural disasters and hazards.

Staff Finding: This amendment does not directly address potential natural disasters and hazards. These hazards are addressed in other planning processes such as the Natural Disaster Mitigation Plan. Therefore, this amendment is consistent with Statewide Planning Goal 7.

Goal 8 - Recreational Needs: To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts.

Staff Finding: The provisions of this amendment do not specifically address recreational needs, although the improvements to facilities on the Lazy Z Ranch outside of city boundaries include approximately 23 acres of irrigated land and the construction of 16 acres of wetlands, 4 wet acres of forested ponds, and 2 miles of streams, along with public trails. These improvements will provide recreational opportunities for the community as a portion of it will be public access. Therefore, this amendment is consistent with Statewide Planning Goal 8.

Goal 9 - Economic Development: To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon 's citizens.

Staff Finding: This amendment does not directly impact or inhibit economic activities or propose any zoning designation changes; however, provision of a reliable and adequate wastewater system will assist the community in meeting its growth obligations and help ensure continued economic development and health into the future. Therefore, this amendment is consistent with Statewide Planning Goal 9.

Goal 10 - Housing: To provide for the housing needs of the citizens of the state.

Staff Finding: The provisions of this amendment do not specifically address the planning or development of housing, although one purpose of the Plan update is to ensure that as the community grows, adequate wastewater facilities are also developed commensurately to support our housing needs. Therefore, this amendment is consistent with Statewide Planning Goal 10.

Goal 11 - Public Facilities and Services: To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.

Staff Finding: The provisions of this amendment contemplate the provision and expansion of wastewater facilities to keep pace with new growth, so as to meet our housing, employment and recreational needs into the future. Therefore, this amendment is consistent with Statewide Planning Goal 11.

Goal 12- Transportation: To provide and encourage a safe, convenient and economic transportation system.

Staff Finding: This amendment does not directly address potential transportation needs, which are addressed in other planning processes, namely the Transportation System Plan. Nonetheless, this amendment will not change the functional classification of an existing or planned transportation facility. Nor will it change standards implementing a functional classification system. Further, it will not permit types or levels of land uses which would result in levels of travel or access that are inconsistent with the functional classification of a transportation facility or reduce the performance standards of any facility. Therefore, Statewide Planning Goal 12 is not implicated by this amendment.

Goal 13 - Energy Conservation: To conserve energy.

Staff Finding: The proposed improvements will aid in reducing inefficiencies that currently exist within the wastewater collection, treatment, and disposal systems. The Lazy Z Ranch improvements will provide needed irrigation and storage capacity, the collection system will receive updated equipment and lift station redundancy, and the WWTF will have current issues addressed and provide maintenance relief, helping extend the life of the complete wastewater system. Also, the proposed improvements will upgrade or replace the existing electrical equipment; add lift station capacity; upgrade lift station pumps, headworks screen, and aerators to new, more efficient models; and provide ease of operation. These improvements will also help reduce the overall power consumption for each improvement of identified equipment. Therefore, the proposed amendment is consistent with Statewide Planning Goal 13.

Goal 14 - Urbanization: To provide for an orderly and efficient transition from rural to urban land use.

Staff Finding: One of the primary purposes of the WWFP is to ensure that the city maintains adequate wastewater treatment capacity as the city urbanizes into the future. Consequently, the Plan utilizes population projections into the future to highlights necessary improvements, the cost to provide them and the implementation timeframe necessary to keep pace with the anticipated growth. Doing so will "provide for an orderly and efficient transition from rural to urban land use" as the Urban Growth Boundary expands in the future. Therefore, the proposed amendment is consistent with Statewide Planning Goal 14.

> ***Goal 15 - Willamette River Greenway: To protect, conserve, enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the Willamette River Greenway.***

Staff Finding: Goal 15 is not applicable to the Sisters UGB and the amendment does not interfere with compliance with Statewide Planning Goal 15.

> ***Goal 16 through 19 (Estuarine Resources, Coastal Shorelands, Beaches and Dunes. and Ocean Resources):***

Staff Finding: There are no coastal, ocean, estuarine, or beach and dune resources within the Sisters UGB. Therefore, these goals are not relevant, and the amendment will not affect compliance with Statewide Planning Goals 16 through 19.

1. ***Approval of the request is consistent with the Comprehensive Plan; and***

Staff Finding: The 2040 Sisters Comprehensive Plan (adopted September 22, 2021) includes Public Facilities goals outlined in section 9. The following goals and policies are applicable to the proposed amendment:

- Goal 9: Plan and develop a timely, orderly, and efficient arrangement of water, wastewater, stormwater, transportation, and other public facilities to support the City's continued operation and future development.

  Policy 9.1 The City shall be proactive in planning, financing, managing, and obtaining lands, facilities, equipment, and other system elements to ensure the safe and efficient operation of the public facilities and services for which it is primarily responsible, including water, wastewater, stormwater, and transportation facilities and services.

  Policy 9.2 The City shall continue to update its water and wastewater supply system to meet current and new State and Federal health requirements, and domestic and emergency needs.

  Policy 9.3 The City shall continue to assess System Development Charges to finance the impacts of growth on public facilities in an equitable and efficient manner.

  Policy 9.4 The City of Sisters Public Works Standards shall be periodically updated and improved for specificity, accuracy, and consistency with County, State and Federal requirements, and should incorporate innovative strategies and initiatives based on cost-effective and scientifically-proven principles.

Policy 9.5 The City shall continue to promote water management and conservation strategies to reduce impacts on the City's water supply system. Strategies could include reduced use of irrigation; tiered billing system tied to water use; incentives or requirements for use of water-efficient fixtures; use of drought-tolerant plants; or other similar strategies or incentives.

Policy 9.6 The City shall pursue additional water rights as needed to ensure adequate capacity to meet water demands identified in the City's Water System Plan.

Policy 9.7 The City shall continue to explore strategies for wastewater reuse and use of biosolids as a means of helping to meet future effluent disposal demands.

Policy 9.8 The City shall plan for all properties within the city limits to be able to be provided with water, sewer and transportation facilities; will support the provision of electrical, internet and phone utilities; and will plan for adequate public facilities to be provided to properties in the urban growth boundary.

Policy 9.9 Public facilities and all utilities (phone, cable, internet, and power), where feasible shall be located underground and required "to and through" when a property is developed or redeveloped, in order to ensure that neighboring properties can be served in the future.

Policy 9.13 The City shall coordinate with Sisters Ranger District on planning on Forest Service property within and adjacent to the city limits.

Policy 9.15 The City shall consider potential impacts from natural hazards, such as wildfire, when locating its Public Works facilities and equipment.

As evidenced in the proposed WWFP, it fully complies with and implements the applicable goals and policies of the Comprehensive Plan, specifically the Public Facilities section. It complies with the overarching Public Facilities goal language to "plan and develop a timely, orderly, and efficient arrangement of water, wastewater, stormwater, transportation, and other public facilities to support the City's continued operation and future development." Therefore, this criterion is satisfied.

2. ***The property and affected area is presently provided with adequate public facilities, services and transportation networks to support the use, or such facilities, services and transportation networks are planned to be provided concurrently with the development of the property. The applicant must demonstrate that the property and affected area shall be served with adequate public facilities, services and transportation networks to support maximum anticipated levels and densities of use allowed by the District without adversely impacting current levels of service provided to existing users; or applicant's proposal to provide concurrently with the development of the property such facilities, services and transportation networks needed to support maximum anticipated level and density of use allowed by the District without adversely impacting current levels of service provided to existing users.***

Staff Finding: The affected area of the WWFP is the entire Sisters Urban Growth Boundary, both in its existing boundaries and any future areas of expansion. These areas are either presently provided with adequate public facilities or will be served with adequate facilities in the future, as the improvements

and expansions recommended in the WWFP are implemented concurrently with development.

The WWFP utilizes the latest population projections prepared by the Population Research Center at Portland State University, dated June 30, 202, through the planning year of 2042, resulting in a population within city limits of 6,917 by 2042. These numbers are used to demonstrate that the affected area will be served with adequate public facilities and services to support the maximum anticipated levels of demand without adversely affecting existing users. Therefore, this criterion is satisfied.

3. Compliance with 4.7.600, Transportation Planning Rule (TPR) Compliance

Staff Finding: 4.7.600 Transportation Planning Rule Compliance states:

> ***A. When a development application includes a proposed comprehensive plan amendment or land use district change, the proposal shall be reviewed by the City to determine whether it significantly affects a transportation facility, in accordance with Oregon Administrative Rule (OAR) 660-012-0060. Significant means the proposal would:***
>
> > ***1. Change the functional classification of an existing or planned transportation facility. This would occur, for example, when a proposal is projected to cause future traffic to exceed the capacity of "collector" street classification, requiring a change in the classification to an "arterial" street, as identified by the Transportation System Plan; or***
> >
> > ***2. Change the standards implementing a functional classification system; or***
> >
> > ***3. Allow types or levels of land use that would result in levels of travel or access what are inconsistent with the functional classification of a transportation facility; or***
> >
> > ***4. The effect of the proposal would reduce the performance standards of a public utility or facility below the minimum acceptable level identified in the Transportation System Plan.***

Adoption of the amendment will not change the functional classification of an existing or planned transportation facility. Nor will it change standards implementing a functional classification system. Further, it will not allow types or levels of land uses which would result in levels of travel or access which are inconsistent with the functional classification of a transportation facility or reduce the performance standards of any facility. Therefore, Statewide Planning Goal 12 is not implicated by this amendment.

> ***B. Amendments to the Comprehensive Plan and land use standards which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan. This shall be accomplished by one of the following:***
>
> > ***1. Limiting allowed land uses to be consistent with the planned function of the transportation facility;***

Or

2. ***Amending the Transportation System Plan to ensure that existing, improved, or new transportation facilities are adequate to support the proposed land uses consistent with the requirement of the Transportation Planning Rule; or,***

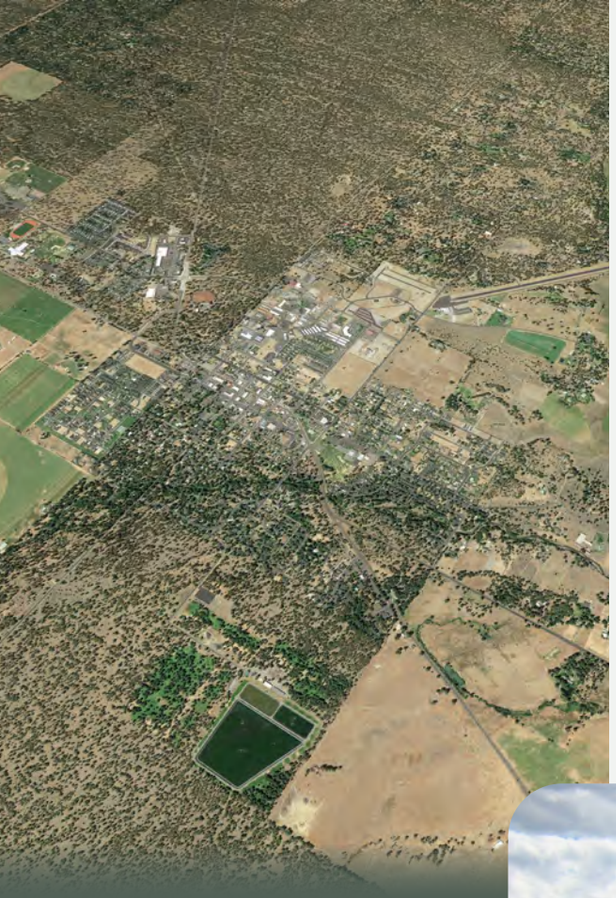
3. ***Altering land use designations, densities, or design requirements to reduce demand for automobile travel and meet travel needs through other modes of transportation.***

Staff Finding: The amendment does not significantly affect a transportation facility and therefore do not interfere with compliance of 4.7.600B. This criterion is satisfied.

Exhibit B

AMENDED SISTERS WASTEWATER FACILITIES MASTER PLAN

[attached]



Draft

City of Sisters, Oregon

Wastewater Facilities Plan Update

2023

anderson perry & associates, inc.

engineering · surveying · natural resources

REDMOND, OR. LA GRANDE, OR. WALLA WALLA, WA. HERMISTON, OR.

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WASTEWATER FACILITIES PLAN UPDATE

FOR

CITY OF SISTERS, OREGON

2023

ANDERSON PERRY & ASSOCIATES, INC.

La Grande, Redmond, Hermiston, and Enterprise, Oregon
Walla Walla, Washington

 Job No. 446-08

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APPENDICES

Section 1 - Project Planning

General

The City of Sisters, Oregon, owns and operates a conventional gravity wastewater collection system integrated with four existing lift stations, a mechanical screening facility at the headworks, and three wastewater lagoons to process and store municipal wastewater at the wastewater treatment facility (WWTF). The wastewater collection and treatment systems operate under the authority of a Water Pollution Control Facilities (WPCF) Permit issued by the Oregon Department of Environmental Quality (DEQ). The City's WPCF Permit authorizes the use of recycled water that meets, at minimum, Class D treatment criteria as defined by the Oregon Administrative Rules. Discharging to Waters of the State is not permitted. All wastewater must be stored, treated, and disposed of by land application following sound irrigation practices and must conform to a DEQ-approved Recycled Water Use Plan. Between April and October, the City's treated wastewater is land-applied for irrigation purposes on dikes, forested land, and on pastureland at the Lazy Z Ranch near the WWTF using K-Line irrigation.

The City's WPCF Permit expires on December 31, 2025. The WPCF Permit allows a maximum annual average daily influent flow of 0.38 million gallons per day. With the City's anticipated growth, the WPCF Permit will likely require updating to be in accordance with future flows. The WPCF Permit includes current effluent limits for total coliform and *E. coli*, along with influent and recycled water monitoring requirements. However, the WPCF Permit does not include other quantified effluent parameters, such as five-day biochemical oxygen demand or total suspended solids removal efficiencies. Additionally, the WPCF Permit outlines waste disposal limitations, system monitoring and reporting requirements and procedures, compliance conditions and schedules, and special conditions. The current WPCF Permit requirements are discussed in detail in Section 2. A copy of the current WPCF Permit is included in Appendix A.

In the past, the City has been in compliance with permit conditions. The most recent DEQ inspection was conducted on August 25, 2015, and no compliance issues were documented for the permit period. At the time this Wastewater Facilities Plan (WWFP) Update was prepared, a fully certified Level 3 WWTF operator was employed by the City.

Location

The City of Sisters is located on the western side of central Oregon in Deschutes County. The location and vicinity maps are shown on Figure 1-1 and the major wastewater system components are shown on Figure 1-2. The study area encompasses land within the city limits and the urban growth boundary (UGB).

The City is located approximately 22 miles northwest of Bend and 19 miles west of Redmond, along U.S. Highway 20. Deschutes County is bordered by Lane County to the west, Klamath and Lake Counties to the south, Crook County to the east, and Jefferson County to the north. The City is nestled at the eastern edge of the Deschutes National Forest with views of the Three Sisters volcanic peaks, which are part of the Cascade Volcanic Arc, a segment of the Cascade Range.

The elevation of Deschutes County varies from 2,867 feet above mean sea level (AMSL) east of Terrebonne to 10,358 feet AMSL at South Sisters Peak. Elevations in the city limits range between approximately 3,180 feet and 3,230 feet AMSL. The City's WWTF and land application sites are located south-southwest of the City.

The area's popularity has brought considerable growth and many opportunities for the City. The region around the City has become a hub for art, recreation, tourism, and more. The City is primarily a residential community with a significant tourist-based economy. The City has a vibrant commercial district located on either side of U.S. Highway 20 and room for considerable expansion within the industrial district. A zoning system that restricts industrial development to designated areas, while permitting mixed-use residential development in areas zoned for industrial purposes, was developed by the City. The zoning within the city limits and UGB is presented on Figure 1-3.

Transportation

U.S. Highway 20 and Oregon Route 126 merge in Sisters to form Cascade Avenue, the main thoroughfare through the city center. The two highways split east of Sisters, with Oregon Route 126 heading to Redmond and U.S. Highway 20 heading to Bend. West of Sisters, Oregon Route 242 splits off the combined Oregon Route 126 and U.S. Highway 20.

Land Use

Figure 1-3 shows the current zoning in the City and the land use classifications identified within the UGB. Commercial areas are primarily located in the City's core and in the downtown area along U.S. Highway 20. Residential areas surround the City's commercial areas and occupy a vast majority of the land within the UGB. The City's industrial areas are located in the northeastern portion of the UGB near the Sisters Eagle Airport.

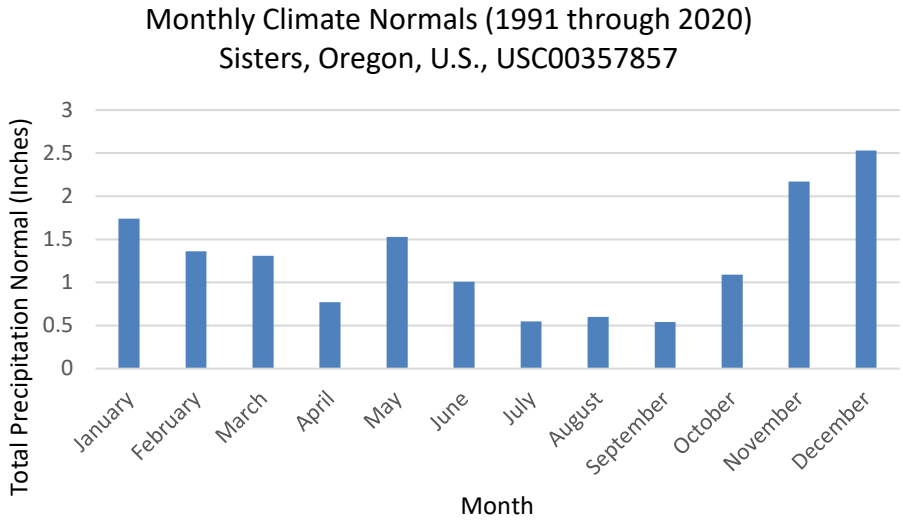
Environmental Resources Present

Climate

The City of Sisters can be characterized as one of the more arid regions of Oregon but with a four-season climate with cold winters; warm, dry summers; and pleasant springs and falls. Surrounding mountain ranges influence the climate in the area considerably. The high surrounding mountains to the west help protect the area from severe storms and intercept a substantial portion of the moisture, so the area remains relatively dry. Most of the precipitation falls in the spring and fall. Heavy snow produces a year-round snowpack in the mountains, with snow starting in November and continuing into February.

Based on the National Oceanic and Atmospheric Administration (NOAA) and Western Regional Climate Center for Sisters, the average monthly low temperature is approximately 20° Fahrenheit (F) (December and January), and the average monthly high temperature is 85°F (July). The area's average annual precipitation is 15.20 inches, and the average snowfall is approximately 30 inches. Using information obtained from NOAA, the 30-year precipitation normal for the City of Sisters are summarized on Chart 1-1. The nearest rain gauge is located in Sisters Oregon.

CHART 1-1
PRECIPITATION 30-YEAR NORMAL



Floodplains

Wychus Creek runs through the City of Sisters as it flows northeast to the Deschutes River downstream of the City of Redmond. According to the Federal Emergency Management Agency (FEMA) Map Service Center, FEMA Flood Insurance Rate Map Panel No. 41017C0245E has been assigned to the City and areas identified for improvement.

Soils

Typically, soils throughout the City are designated as Lundgren sandy loam and Ermabell loamy fine sand. According to a web soil survey on the U.S. Department of Agriculture Natural Resources Conservation Service website for the area encompassing the city limits and the UGB, approximately 65 percent of the area consists of Lundgren sandy loam, Ermabell loamy fine sand, Wanoga-Fremkle-Rock outcrop complex, Omahaling fine sandy loam, and Henkle-Lava flow-Fryrear complex. No digital data are available for the remaining 35 percent; however, its makeup is most likely similar. For a more detailed description of soil types in and around the City of Sisters, refer to the 2016 Recycled Water Use Plan in Appendix B.

Flora and Fauna

Biological resources in the area include numerous fish, bird, and mammal species. The Metolius River, which is incorporated into the larger system surrounding Sisters, passes approximately 30 miles north of the City. The nearest water source is Whychus Creek, which runs through the southern section of the City. Whychus Creek inhabits fish species such as rainbow trout while mammals such as mule deer, elk, bobcats, coyotes, and gray wolves also inhabit this area. The U.S. Fish and Wildlife Service Information for Planning and Consultation (IPaC) tool was utilized to identify endangered species and migratory birds that may exist or could potentially be affected by activities in Sisters. No critical habitats were found within the immediate area; however, it is important to meet all permit requirements to mitigate any negative effects to habitats that

endangered species inhabit. The IPaC tool identified two endangered species in the region and nine migratory birds. These species are summarized on Tables1-1 and 1-2.

TABLE 1-1
ENDANGERED SPECIES

Common Name	Scientific Name	Status
Gray wolf	*Canis lupus*	Endangered
Monarch butterfly	*Danaus plexippus*	Candidate

TABLE 1-2
MIGRATORY BIRDS

Common Name	Scientific Name
American white pelican	*Pelecanus erythrorhynchos*
Bald eagle	*Haliaeetus leucocephalus*
Black swift	*Cypseloides niger*
Cassin's finch	*Carpodacus cassinii*
Evening grosbeak	*Coccothraustes vespertinus*
Lewis's woodpecker	*Melanerpes lewis*
Olive-sided flycatcher	*Contopus cooperi*
Pinyon jay	*Gymnorhinus cyanocephalus*
Rufous hummingbird	*Selasphorus rufus*

Population Trends

To estimate future wastewater system demands, population projections must be made. Projections are usually made on the basis of an annual percentage increase estimated from past growth rates tempered by future expectations. Significant population fluctuations are typical in smaller communities, as demonstrated by the City's rapid growth, and it is difficult to accurately predict the population of a smaller community over any extended period of time. The addition or removal of a major business, industry, or recreational facility in the community can significantly affect the population and the overall wastewater system needs.

The period of time over which the population is to be projected usually depends on the type of improvements to be considered. Improvements that will require long-term financing should be designed for no less than the term of the financing. Facilities readily expanded or modified are normally designed for a period of 10 to 20 years. Facilities not easily modified or expanded, such as buried pipelines and storage reservoirs, may be designed for their expected life, which is usually 40 to 50 years or more. This WWFP Update has been written for a 20-year planning period.

Historic Population

The population of the City of Sisters, according to the June 30, 2022, certified estimate by the Portland State University Population Research Center (PRC), is 3,220 for the year 2020 and 3,437 for the year 2022. The PRC is the official source of population data available in Oregon between the official Census data generated at the beginning of each decade. Projections are usually made based on an annual percentage increase estimated from past growth rates combined with future expectations. Overall, the population of the City has increased significantly. The City's average

growth rate from 2010 to 2020 was approximately 4.7 percent per year. Historical and forecasted population data are presented on Table 1-3.

TABLE 1-3
HISTORICAL AND FORECASTED POPULATION DATA

Historical			Forecasted				
2010	**2020**	**AAGR (2010-2020)**	**2022**	**2047**	**2072**	**AAGR (2022-2047)**	**AAGR (2047-2072)**
2,040	3,220	4.7 percent	3,437	7,911	14,881	3.3 percent	2.5 percent

AAGR = average annual growth rate

The City of Sisters' population at the 2010 Census was 2,040. The certified population estimate by the PRC for 2020 was 3,220 with a calculated AAGR of 4.7 percent. The AAGR between the years 2022 and 2047 is 3.3 percent and 2.5 percent between the years 2047 and 2072. For the years between 2040 and 2045, the AAGR is approximately 2.76 percent, which follows the PRC population estimates of 6,551 for 2040 and 7,505 for 2045. The historical population plus the projected annual growth rate established by the PRC results in a 20-year (2042) design population estimate of 6,917. This WWFP Update uses 6,917 as the 20-year design population inside the City's UGB.

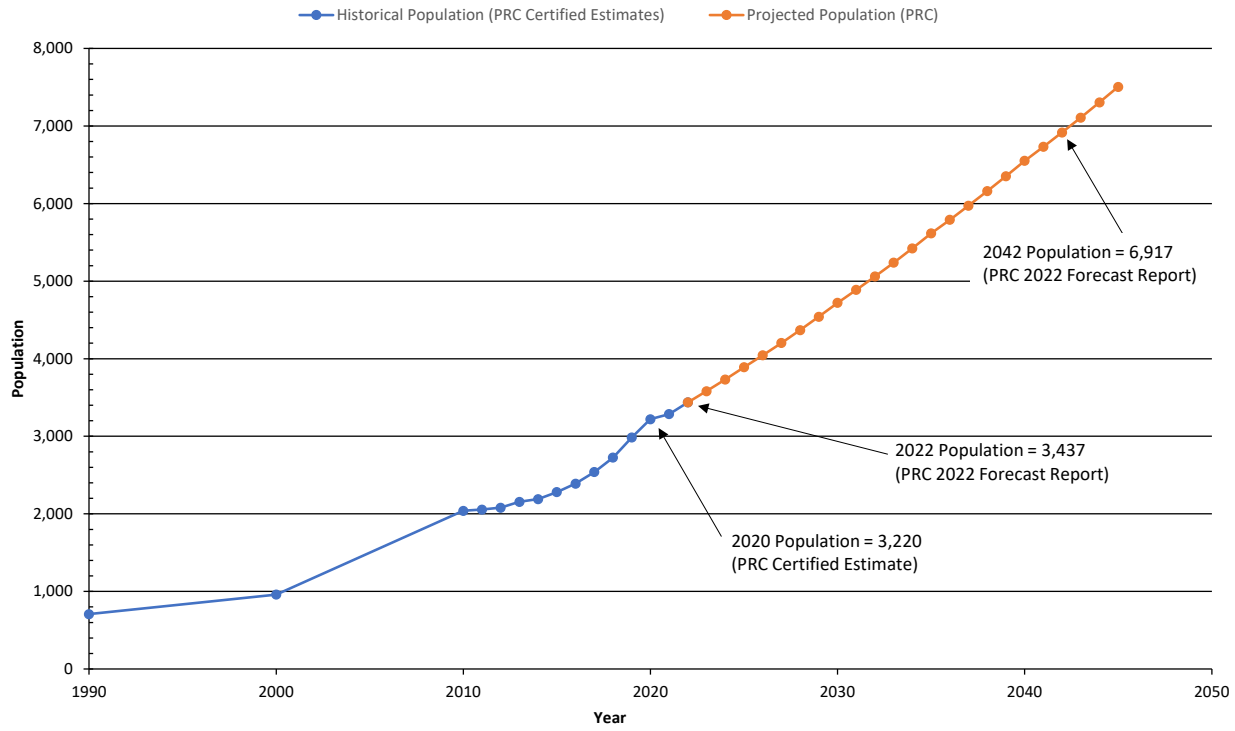
The improvements necessary to the collection system require accurate counts of the entire connected population within the UGB. In addition, areas of potential development outside the UGB could increase the effective service population if incorporated. The potential for growth outside the UGB was considered when analyzing the City's collection, treatment, and disposal systems to help aid in conservative planning. However, specific locations outside the UGB are not identified as a part of this WWFP Update.

Population Projections

In accordance with Oregon Revised Statutes 195.033, the PRC is responsible for establishing and maintaining population forecasts for cities in Oregon. Past population figures from the PRC and the Census show the City's population has increased steadily from 708 in 1990 to 959 in 2000 and 3,220 in 2020. This represents a historical growth rate between 1990 and 2000 of approximately 3.1 percent per year and between 2000 and 2020 of approximately 6.2 percent per year. The City has experienced AAGRs of 6 to 10 percent between 2016 and 2020, which is a significantly higher rate than projected by the PRC and what other areas of Oregon experienced during the same time frame. PRC's population estimate for 2020 of 3,220 is used as the basis for the current population and water use analysis in the development of this WWFP Update.

The PRC forecast indicates that the City's population will increase to 6,551 and 7,505 in years 2040 and 2045, respectively. This equates to an annual rate of 2.76 percent between 2040 and 2045. The 2042 population was determined via interpolation. See Chart 1-2 below.

CHART 1-2
HISTORICAL POPULATION



Community Engagement

Throughout the development of this WWFP Update, multiple presentations describing the proposed improvements were presented to the Public Works Advisory Board (PWAB), the City Council, and the Sisters Planning Commission. The development of the WWFP Update was closely coordinated with Public Works staff. The WWFP Update was presented to PWAB on March 8, 2022, and June 14, 2022. The WWFP Update was also presented to the City Council on August 10, 2022, and was subsequently given to the Planning Commission on October 20, 2022.

To Sweet Home

T. 15 S., R. 10 E., W.M.

2,000 0 2,000

SCALE IN FEET

To Redmond

Sisters

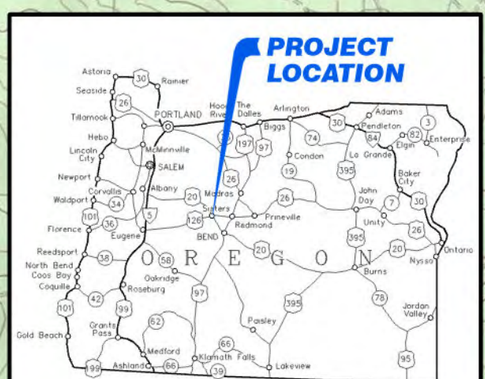
EXISTING WASTEWATER TREATMENT FACILITY

To Bend

LEGEND

- LAZY Z RANCH SITE
- CITY LIMITS
- URBAN GROWTH BOUNDARY

PROJECT LOCATION



VICINITY MAP

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

LOCATION AND VICINITY MAPS

FIGURE
1-1

To Sweet Home

SUN RANCH PACKAGED LIFT STATION

BARCLAY PACKAGED LIFT STATION

Sisters

ROPE STREET LIFT STATION

FIVE PINES PACKAGED LIFT STATION

To Redmond

1,500 0 1,500

SCALE IN FEET

FORESTED IRRIGATION AREA (26.2 ACRES)

FORESTED IRRIGATION AREA (29.3 ACRES)

DIKE IRRIGATION AREA (11.8 ACRES)

K-LINE IRRIGATION AREA (45 ACRES)

EXISTING WASTEWATER TREATMENT FACILITY

To Bend

LEGEND

- MANHOLE
- LIFT STATION
- LABORATORY
- GRAVITY SEWER MAIN
- PRESSURE SEWER
- IRRIGATED AREA
- CITY LIMITS
- URBAN GROWTH BOUNDARY

Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

MAJOR WASTEWATER SYSTEM COMPONENTS

FIGURE
1-2

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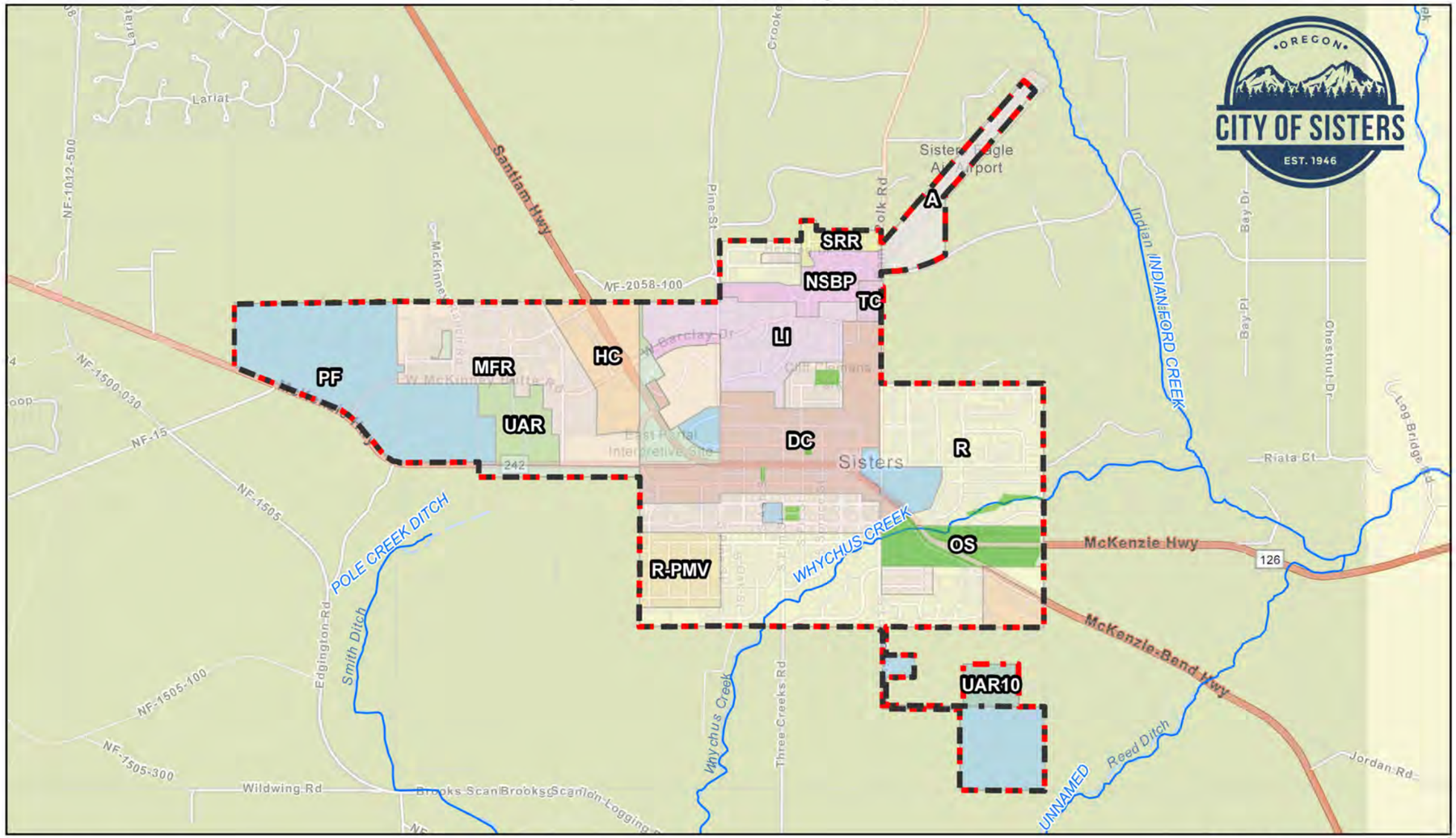
City of Sisters Zoning Map



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- City Limits
- UGB
- Parks
- Streams
- Taxlots

Zoning

- Airport
- Downtown Commercial
- Highway Commercial
- Tourist Commercial
- Open Space
- Public Facility
- Light Industrial
- N. Sisters Bus. Park
- Multi-Family Residential
- Residential
- Sun Ranch Residential
- R - Pine Meadow Village
- Urban Area Reserve
- Urban Area Reserve 10

1:36,112

0 0.2 0.4 0.8 mi

0 0.35 0.7 1.4 km

State of Oregon GEO, Esri Canada, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA

City of Sisters

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

ZONING MAP

FIGURE
1-3

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Section 2 - Existing Facilities

Introduction

In this section, the existing wastewater collection, treatment, and disposal facilities are described and an evaluation is provided. Additionally, a brief history of the construction of the existing wastewater treatment facility (WWTF) is presented.

History

Wastewater System History

Between 2000 and 2002, the City of Sisters constructed a municipal wastewater system fed by a 12-inch diameter pressure sewer main. The 12-inch pressure sewer main leaves the Rope Street Lift Station where the gravity sewer collection system converges. The polyvinyl chloride (PVC) mains in the gravity collection system vary in diameter from 6 to 24 inches. The gravity collection system also includes four wastewater lift stations. A map of the existing collection system is included as Figure 2-1. Influent sewage is pumped through an electromagnetic flowmeter and into the mechanically cleaned wedge wire screen of the headworks at the WWTF. The WWTF consists of a three-cell aerated lagoon system. Lagoons No. 1 and 2 are aerated and aerated/settling lagoons, respectively, and are each approximately 2.4 acres with operating water depths of 9 feet. Wastewater then enters Lagoon No. 3, which serves as a storage lagoon and is approximately 18 acres in size with a storage volume of approximately 213 acre-feet (69.4 million gallons). Wastewater in the winter holding lagoon (Lagoon No. 3) is held until irrigation is permitted by the Water Pollution Control Facilities (WPCF) Permit, then flow enters the chlorine contact pipe. In the chlorine contact pipe, which was part of the 2001 WWTF construction, wastewater from Lagoon No. 3 is dosed with sodium hypochlorite for disinfection. The volume of the 36-inch diameter and 1,140-foot long chlorine contact pipe allows for more than the necessary 60 minutes of detention time needed before the treated wastewater is pumped to the various land application sites by the irrigation pumps located at the control building. A map of the existing WWTF is included as Figure 2-2, while a process schematic of the existing WWTF is included as Figure 2-3. The City irrigates approximately 112 acres of land, which consists of 55.5 acres of natural forest, 11.8 acres of lagoon dike areas, and 45 acres of pastureland at the Lazy Z Ranch with K-Line irrigation. Since the construction of the WWTF, the aeration system in the primary cell and supervisory control and data acquisition system were both upgraded in 2020, and biosolids were removed in 2021. In 2020, the 7.5 horsepower (Hp) aerators in Lagoon No. 1 were replaced with 15 Hp aerators and the electrical systems were upgraded to accommodate the larger load. In 2007, the City acquired a portion of the Lazy Z Ranch for future wastewater effluent needs. Treated effluent is applied to 45 acres of pastureland at the Lazy Z Ranch through K-Line irrigation installed in 2019. A map of the existing site irrigation is included as Figure 2-4. The proposed Lazy Z Ranch Master Plan's improvements are further detailed in Sections 4 and 5. In addition, biosolids were removed from Lagoon 1 in 2021 and land-applied at the Lazy Z Ranch.

Historical Wastewater Data

This section provides a review of the historical wastewater data for the City's WWTF. Information provided in this section was obtained from the City's Discharge Monitoring Reports (DMRs).

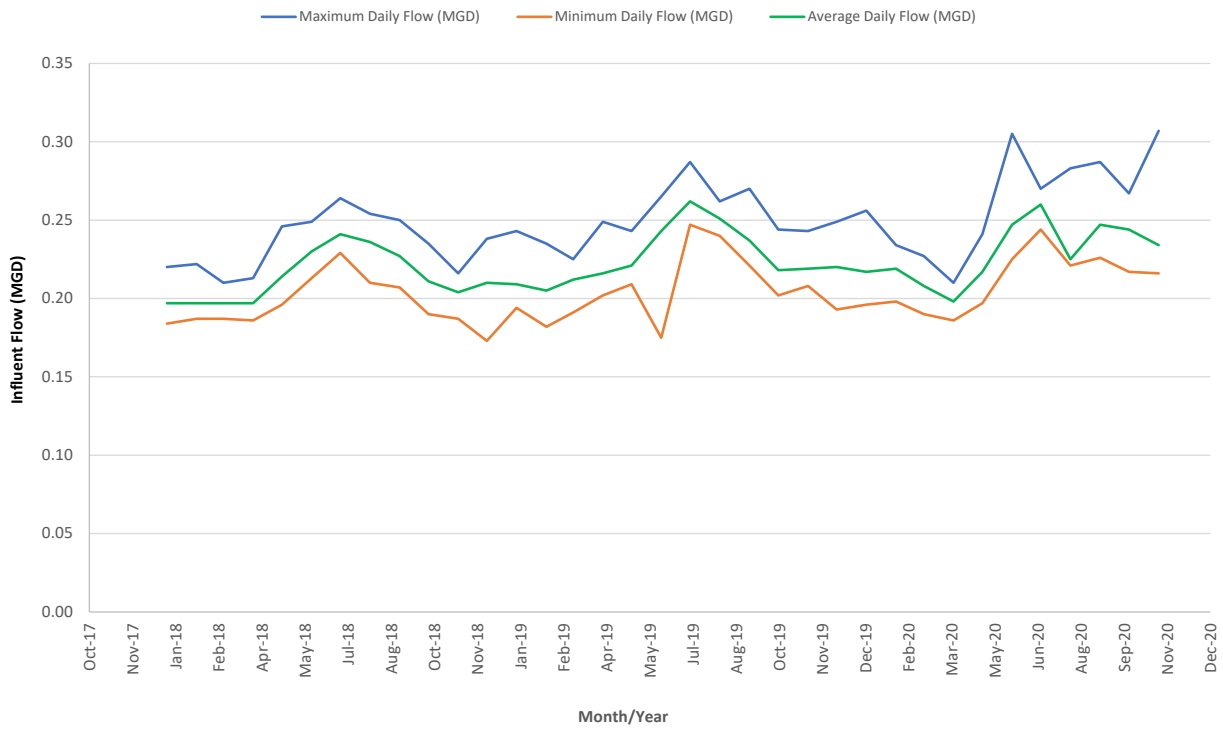
Historic wastewater influent flows and pollutant loadings received at the WWTF for the period between January 2018 and December 2020 are included in a summary of the City's DMRs shown in Appendix C. An understanding of current influent flow and load patterns is necessary to project future flows and loads for the 20-year planning period. These projected influent flows and loads have been utilized to develop design criteria, which are used to size future wastewater system facilities. Effluent design criteria, which define the level of treatment needed and help determine viable effluent discharge methods, are outlined later in this section, while the proposed treatment facility improvements and alternatives are discussed in Section 4.

Wastewater Flows

The City's historical influent flows for the operation period of January 2018 through December 2020, as provided by the DMRs, including maximum, minimum, and average flow characteristics, are shown on Chart 2-1. According to the available data, the maximum daily flow of 0.307 million gallons per day (MGD) occurred in November 2020. The minimum daily flow of 0.173 MGD occurred in December 2018. The average annual flow (AAF) for the period of DMR data was 0.224 MGD or approximately 69 gallons per capita day (gpcd) at the estimated population of 3,220 for 2020.

The flows shown on Chart 2-1 reflect high flows around July that likely correspond to the peak in tourist visitation in the area and the annual events the City holds during the summer. The average base flow was gathered based on the average of the daily flows for a 14-day period with no precipitation. A selected period from April 7, 2020, to April 21, 2020, was utilized. Data were taken from the National Oceanic and Atmospheric Administration daily summaries for Bend, Oregon. No precipitation data were available from a local weather station, requiring the use of data from Bend due to its proximity and weather patterns that are similar to the City of Sisters. Based on the data, the average base flow is 0.196 MGD or approximately 61 gpcd using the 2020 population of 3,220. It is assumed that infiltration and inflow (I/I) is minimal because of the relatively new wastewater collection system. Therefore, the flows for February through April 2020, which are similar to the average, reflect a more accurate representation of actual base wastewater flows. The existing maximum monthly flow of 0.262 MGD was recorded in July 2019.

CHART 2-1
HISTORICAL MONTHLY INFLUENT FLOWS



Data collected from many domestic wastewater systems like the City's indicate that AAFs usually range from 80 to 120 gpcd. The City's AAF is approximately 70 gpcd. As shown on Chart 2-1, the peak flow generally occurs between May and August each year, which is typically when tourist season is occurring.

Infiltration and Inflow

I/I is unwanted flows entering the wastewater collection system. I/I in a collection system can occur during different events at different times of the year. Early spring rain and runoff in the months of March or April elevate groundwater levels, and groundwater, in turn, infiltrates into any available weakness in a wastewater collection system. Specifically, the components of I/I are defined as follows:

- Infiltration - Water entering the collection system and service connections from the ground through such means as, but not limited to, defective pipes, pipe joints, and defective service line connections or manhole walls. Infiltration does not include, and is distinguished from, inflow.
- Inflow - Water discharged into a collection system and service connections from such sources as, but not limited to, roof drains, cellars, yard and area drains, foundation drains, sump pumps, cooling water discharges, drains from springs and swampy areas, manhole covers, cross connections from storm sewers and combined sewers, catch basins, stormwater, surface runoff, and street washes or drainage.

- I/I - The total quantity of water from both infiltration and inflow without distinguishing the source.

Most cities have some I/I contributing to their wastewater collection system. Excessive I/I can be a problem because these flows must be treated along with normal wastewater flows and take up valuable treatment capacity at a city's treatment facility, which results in larger facilities required to manage the extraneous flows. Excessive I/I is defined as the quantity of I/I that can be economically eliminated from a collection system by rehabilitation or other means, as determined by a cost analysis that compares the cost effectiveness of correcting the I/I conditions with the total cost for transportation and treatment of I/I.

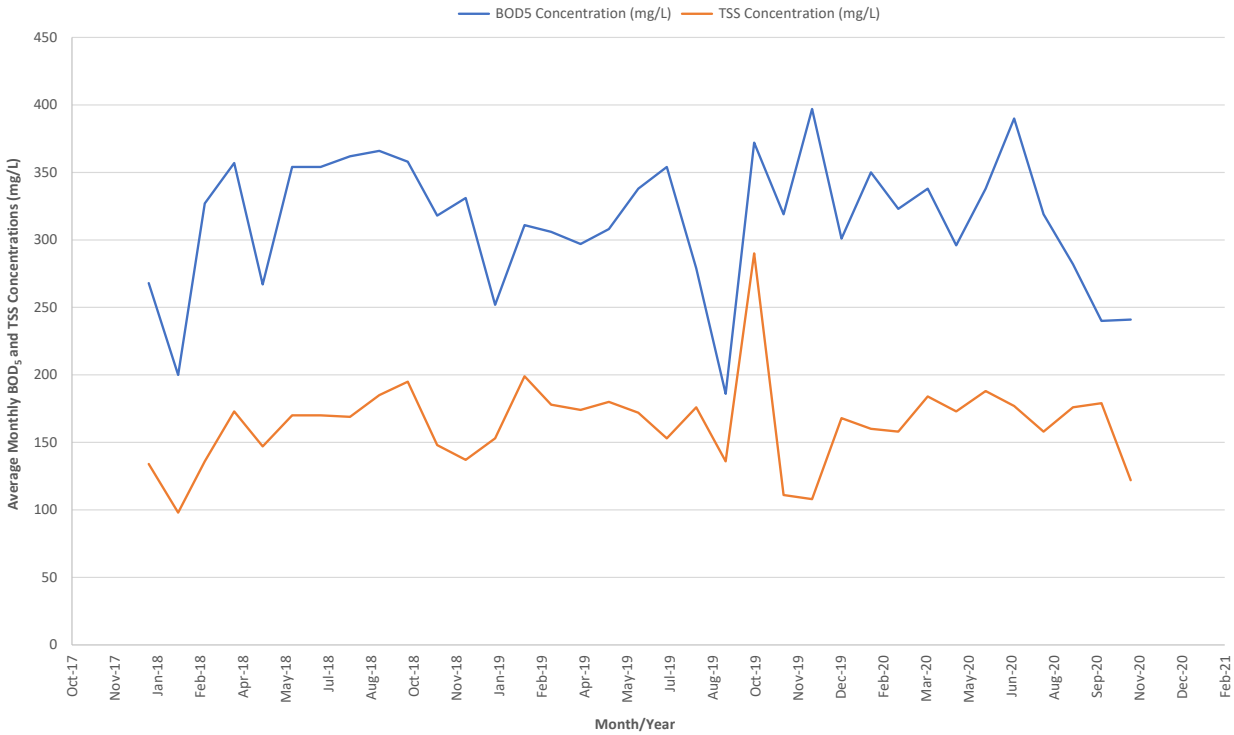
I/I has not been a concern for the City of Sisters. New ASTM D3034 PVC sewer lines were installed in 2001 and air tests were performed on the completed lines. If any I/I sources are found and their removal from the system through a manhole or pipeline repair is completed, the reduction in the total volume of wastewater the City must treat and dispose of may provide additional cost savings to the City.

Based on a review of the City's DMRs and Chart 2-1, there may be some infiltration into the gravity sewer system; however, I/I volumes, if any exist, appear to be minimal. For the years 2018 through 2020, flow trends are similar and do not suggest that I/I is occurring. Furthermore, review of the City's per capita flows from the design criteria show low per capita flows. The wet weather per capita flow indicates no I/I issues. Due to the City's low per capita flows and relatively new and watertight wastewater collection system, I/I was determined not to be a concern and was not analyzed further.

Wastewater Loading

Figure 2-5 shows the average influent mass loadings for five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) based on the DMR records from January 2018 through December 2020. The average monthly concentrations for BOD_5 and TSS are plotted on Chart 2-2 for the analysis period.

CHART 2-2
HISTORICAL AVERAGE MONTHLY FIVE-DAY BIOCHEMICAL OXYGEN DEMAND AND TOTAL SUSPENDED SOLIDS CONCENTRATIONS



The base year 2020 influent BOD_5 of 587 pounds per day (lbs/day) is within expected ranges, though the TSS mass loading of 306 lbs/day is much lower than average. Data collected from many domestic wastewater systems like the City of Sisters' indicate that average BOD_5 and TSS per capita contributions typically range from 0.11 to 0.33 pounds per capita per day (lbs/capita/day), with a typical load of 0.2 lbs/capita/day. The City's average annual mass loadings for BOD_5 and TSS are 0.18 lbs/capita/day or 587 lbs/day, and 0.10 lbs/capita/day or 306 lbs/day, respectively. Typical reasons for low TSS loads are related to I/I issues in the system; however, a similar dilution of the BOD_5 could be expected, as BOD_5 loadings are typically similar to TSS loadings. Based on an analysis of the City's existing influent, a reason for the apparent difference between influent BOD_5 and TSS could not be identified.

For domestic wastewater with minor industrial contribution and moderate I/I, the BOD_5 and TSS concentrations historically tend to range between 190 and 220 milligrams per liter (mg/L), though the increased use of higher efficiency water fixtures and appliances has led to higher concentrations. According to the data, the WWTF's average influent BOD_5 concentration was approximately 314 mg/L and the average influent TSS concentration was approximately 164 mg/L. The BOD_5 concentrations are slightly higher than typical ranges, which is likely due to the minimal I/I, along with the implementation of water efficient fixtures in town. However, as previously discussed, the average influent TSS is below the normal range.

Wastewater Flow Projections

Domestic

Wastewater flow projections for the 2042 design year were made using the existing base flow per capita wastewater contributions and 2042 design year population of 6,917 extrapolated to the end of the 20-year planning period. Due to low per capita flows and the collection system's condition, I/I is not a concern and is anticipated to be minimal. Typically, I/I will remain constant over a planning period because I/I does not generally increase proportionally with population. For these reasons, I/I was not analyzed further.

Industrial

The domestic wastewater flow projections are based solely on growth within the residential and commercial sectors. No separate industrial flow component was considered in projecting future conditions. Certain industries could locate within the City by utilizing the industrial-zoned districts; however, the City mainly focused on the portion of residential and commercial capacity. The calculated capacities show an allowance for limited industrial growth within the City through the planning period. Current plans for the City do not anticipate substantial industrial growth, so a majority of the unused capacity will serve the residential and commercial growth of the City. However, the unused system capacity will not account for high flow and/or load contributing industries, such as food processing or data centers. If a high flow or load contributing industry were to locate within the City of Sisters, the wastewater system would need to be reevaluated to ensure enough capacity is available to accommodate the new industry, or the industry would need to be responsible for a sufficient pre-treatment process or for treatment and disposal/reuse of their own wastewater.

Mass Loadings

Domestic and Commercial

The domestic and commercial design mass loadings (BOD_5 and TSS) to the WWTF were estimated based on the average influent per capita BOD_5 and TSS contributions projected to the end of the 20-year planning period and using the year 2042 design population of 6,917 (i.e., mass loading [BOD_5 or TSS] = contribution [BOD_5 or TSS] lbs/capita/day x 6,917). Using the design mass loadings of 0.18 and 0.10 lbs/capita/day for BOD_5 and TSS, respectively, yields year 2042 domestic mass loadings of 1,260 and 658 lbs/day, respectively. Due to the below average loadings sampled from the City's wastewater system, a modified load was also calculated and included in the design criteria shown on Figure 2-5. Though BOD_5 loading observed is typical for domestic wastewater, the TSS lbs/capita/day were much lower than typical. Additional sampling and observation did not reveal a cause for these low loadings. To provide a more conservative estimate for BOD_5 and TSS, the lbs/capita/day loadings were increased from 0.18 for BOD_5 and 0.10 for TSS to 0.20 for both. The higher modified lbs/capita/day value, therefore, increased the domestic mass modified loadings to 1,383 for both BOD_5 and TSS. These resulting modified design loads were used for analysis of the existing WWTF.

Industrial

As discussed earlier, a separate industrial mass loading component was not considered in projecting future loading conditions. Should any industrial users decide to locate in the City, the City may require the development of an Industrial Pretreatment Program.

Design Criteria

The projected wastewater flows and loadings were summarized on Figure 2-5 as design criteria. These design criteria were used in the evaluation of the existing wastewater facilities and developing recommended improvements. Figure 2-5 summarizes the wastewater flows and loadings for the base year 2020, the current year (as of the writing of this report) of 2022, and the design year of 2042 based on the project population increase. Figure 2-5 should be referred to during the review of subsequent sections of this WWFP Update, as it provides key information about the wastewater system improvements and alternatives developed and evaluated herein.

Conditions of Existing Facilities

Collection System Description and Evaluation

Description

Construction of the City's wastewater collection system occurred between 2000 and 2002. The system consists of a conventional gravity sewer network with collector lines, trunklines, and a few pressurized sewer lines. The majority of the gravity trunklines are oriented to follow the natural grade of the existing ground to allow for gravity conveyance to the Rope Street Lift Station. The collection system also includes three packaged lift stations (Barclay, Sun Ranch, and Five Pines) to help feed the Rope Street Lift Station. From the Rope Street Lift Station, sewage is pumped to the WWTF via a 12-inch pressure sewer main. The 12-inch pressurized sewer main follows S. Locust Street prior to entering the WWTF. Since the City's collection system is relatively new, most of the gravity sewer pipes are of adequate size and material. A map of the existing collection system is shown on Figure 2-1. The map shows the collection system's gravity trunklines and pressure sewer lines, the locations of the City's packaged lift stations, the Rope Street Lift Station, and the WWTF.

Rope Street Lift Station Evaluation

The Rope Street Lift Station is the primary lift station that collects gravity sewer wastewater and pumps it through the 12-inch pressure sewer main to the WWTF. The lift station building is of brick wall construction with enameled fencing and contains a triplex submersible pump configuration. A wetwell is located within the building and accessed through two access hatches. The generator, electrical panel, and gantry crane are also located inside the building. The emergency generator is sized to provide service for the three submersible pumps. A 24-inch influent pipe is connected to the lift station to provide additional wetwell volume under high flow conditions. The Rope Street Lift Station was constructed with the rest of the collection system and WWTF between 2000 and 2002, making the lift station approximately 20 years old, which is the typical life expectancy for lift station equipment and components.

The triplex pumps are KSB wet-installed submersible motor pumps. The operating design parameters for the pumps are 37 Hp, 480-volt, 3-phase, 60-hertz, and provide 450 gallons per minute (gpm). From discussions with the City, the pumps have significant problems with ragging, generally affecting at least one pump per week. All three pumps have been rebuilt, and new impellers were installed in approximately 2010. With the current layout of the lift station, the interior is a Class I, Division 1 classified area; however, the electrical components do not meet code for this classification.

Package Lift Station Analysis

Three satellite, or packaged, lift stations help transfer wastewater to the Rope Street Lift Station. These lift stations are Smith & Loveless, Inc., packaged units with self-priming centrifugal pumps and were installed in 2004. The packaged lift stations are duplex pump systems capable of providing up to 260 gpm with operating designs of 3 Hp, 1,200 revolutions per minute, and 480-volt, 3-phase power. The City has noted that monthly ragging is a current issue from construction debris being fed into one of the packaged lift stations. The packaged lift stations do not have power surge protection. None of the packaged lift stations have on-site backup power; however, City staff are obtaining bids for a portable back-up generator that can be used to power any of the three lift stations.

Subdivision Pressure Sewer Analysis

The wastewater collection system has a couple of additional pressure sewer lines in addition to the pressure sewer main running from the Rope Street Lift Station to the WWTF. Currently, one subdivision, on E. Creekside Court, utilizes a pressure sewer line that connects to a manhole on E. Cascade Avenue. The subdivision has individual grinder pumps to pump effluent to the pressure sewer main along E. Creekside Court. The City expressed the desire to replace the grinder pump pressure sewer system and implement a gravity sewer and lift station setup. Switching to a gravity sewer system would reduce the maintenance and costs associated with the grinder pump system.

Trunkline Analysis

In 2001, the City of Sisters installed all new ASTM D3034 PVC pipe. The sewer lines were air tested and no I/I concerns were noted. Due to the relatively new sewer system, the City's trunkline capacities are anticipated to meet the City's anticipated growth but required analysis to confirm if the future flow demands could be met. For this analysis, identified collection system trunklines were examined to determine the current maximum flow capacities and if they are adequately sized for future demands. As-built drawings of the identified trunklines were gathered by the City to help analyze and determine the current and projected capacity of the collection system.

Early discussions helped identify the trunklines that required an in-depth analysis for the collection system. Areas within the city limits and urban growth boundary anticipated to receive growth and expansion were also discussed. Trunklines in these areas were analyzed as directed by the City and Public Works staff due to their familiarity with problematic areas, along with trunklines Anderson Perry & Associates, Inc., identified due to potential slope issues and collection system trunklines prone to bottlenecking. Potential slope issues for trunklines are

caused by inadequate slopes, and locations prone to bottlenecks can be the result of merging flows as flow heads to a common destination, such as a lift station. The trunkline locations were also analyzed due to the surrounding infrastructure and where the highest increase in flows is to be expected. South of Cascade Avenue, the City is predominantly fully developed and is not anticipated to see flows increase. No issues with the collection system were mentioned in discussion of these areas. Within the northern half of the City, additional infrastructure could be easily accommodated, and the start of future growth can be seen. For this reason, most trunklines analyzed were in the northern half of the City. Figure 2-6 shows the locations of the analyzed trunklines.

The trunkline analysis, as previously mentioned, was conducted on the identified collection system trunklines anticipated to be bottlenecks or areas of limited slope in the system. The identified trunklines were the 8-inch PVC lines on Barclay Drive, Larch Street, the southern half of Locust Street, and a short section of W. McKinney Butte Road. For 10-inch PVC, the pipelines of Black Butte Avenue and the northern half of Locust Street were analyzed. For 12-inch PVC lines, E. Diamond Peak Avenue, W. McKinney Butte Road, and Camp Polk Road were included. Lastly, the 15- and 18-inch PVC trunkline along U.S. Highway 20 on the western half of the City was analyzed. The City provided as-built drawings for the identified sections to determine slopes and find bottlenecks. One section of pipe, the 12-inch diameter sewer along W. McKinney Butte Road, did not have as-built drawings available; therefore, the minimum allowable slope outlined in the Washington State Department of Ecology's "Criteria for Sewage Works Design (Orange Book)" for the specific pipe diameter was used. Once the trunkline data were obtained, the maximum capacity of the trunklines was calculated using Manning's equation. All trunklines analyzed met or exceeded the minimum slope outlined in the Orange Book. Once it was determined that all trunklines analyzed met the minimum slope requirements and the maximum capacity was calculated, potential future flows were established.

Flow estimates for residential areas were determined based on average annual per capita flows outlined in the design criteria plus a peaking factor of 4. The Portland State University Population Research Center's average people per household was used to establish a flow rate per residence, and the number of residences or space for additional residences was estimated from satellite imagery and tax lot information included in the City's GIS database. Additional flows were estimated using the Orange Book for stores, businesses, parks, and hotels, to provide an accurate flow estimate. The analysis also investigated flows if full build-out of identified areas were to occur within the 20-year planning period. Once all anticipated flows were estimated for each trunkline analyzed, a comparison against the maximum capacities of the identified trunklines was completed. Based on those comparisons, each trunkline had a capacity exceeding the anticipated flows.

Based on the analyses conducted on the City's trunklines, the anticipated future flows, and the future flows at full build-out, the trunklines appear to have capacity that exceeds the anticipated flows. For further details of the trunkline analysis, refer to Table 2-1 for the location of the analyzed trunklines.

TABLE 2-1
TRUNKLINE ANALYSIS

Name	Slope (ft/ft)	Diameter/ Material	Capacity (MGD)	Projected Flow (MGD)
W. McKinney Butte Road	0.0022	12-inch PVC	0.98	0.55
W. McKinney Butte Road	0.010 to 0.015	8-inch PVC	0.71 to 0.87	0.55
W. U.S. Highway 20	0.0015	15-inch PVC	1.47	0.89
S. Hood Street	0.0012	18-inch PVC	2.14	1.54
E. Black Butte Avenue	0.0028 to 0.0266	10-inch PVC	0.68 to 2.11	0.40
N. Locust Street/Camp Polk Road	0.0028 to 0.0078	10-inch PVC	0.68 to 1.14	0.27
W. Barclay Drive	0.0040 to 0.0361	8-inch PVC	0.45 to 1.35	0.03
E. Barclay Drive	0.0040 to 0.0361	10-inch PVC	0.82 to 2.45	0.23
Camp Polk Road/Barclay Drive	0.0020	12-inch PVC	0.94	0.25
E. Diamond Peak Avenue	0.0025 to 0.0050	12-inch PVC	1.05 to 1.48	0.02

Assumptions:

The trunkline capacities were determined by 65 gpcd average annual flow, a peaking factor of 4.0, a roughness coefficient of 0.013, the trunkline being three-quarters full flow, and an assumed full build-out of areas surrounding the identified trunklines.

Trunkline slopes were determined by as-built drawings provided by the City or assumed as the minimum allowable slope for the identified pipe diameter per the "Recommended Standards for Wastewater Facilities (10 States Standards)."

ft/ft = feet per foot

Wastewater Treatment Facility Description and Evaluation

Description

The City's WWTF was constructed between 2000 and 2002 and consists of a headworks, a three-cell lagoon system (two aerated lagoons and a storage lagoon), and a chlorine contact pipe to provide treatment of the City's domestic wastewater. The lagoons were constructed with exposed 60 mil high density polyethylene liners. Wastewater from Lagoon No. 3 flows through a 1,140-foot long, 36-inch diameter PVC chlorine contact pipe for effluent disinfection prior to land application. Since construction of the WWTF, no major improvements have occurred, except for an aeration system upgrade in 2018. In 2007, the City acquired a portion of the Lazy Z Ranch pastureland to further increase their existing irrigation capacity and provide capability for future expansion of the irrigation capacity of the WWTF.

The first structure in the WWTF is the control building, where wastewater is measured through an electromagnetic flowmeter, followed by the headworks, where influent is screened to remove large solids and inorganic material and the grit is settled out. Wastewater then flows to the first of two aerated lagoons. The second half of Lagoon No. 2 is used for settling. Flow then enters the third lagoon, which is used for holding wastewater until times of water reuse through irrigation. Prior to irrigating, the wastewater travels through a chlorine contact pipe to achieve adequate detention time, then irrigation pumps in the control building distribute treated effluent to land application sites.

Wastewater flows in a series operation starting with Lagoon No. 1 and ending with Lagoon No. 3. Lagoons No. 1 and 2 are aerated and aerated/settling lagoons, respectively, and are approximately 2.4 acres each with water depths of 9 feet. The biological treatment process is aided by six aerators in Lagoon No. 1 that were replaced in 2020 and two aerators in Lagoon No. 2. Wastewater enters Lagoon No. 3, which serves as a storage lagoon. Lagoon No. 3 has three aerators for additional treatment and to aid in odor control, though this cell is primarily used in the winter to store effluent to be land-applied from April 1 to October 31. Wastewater exiting Lagoon No. 3 is disinfected with chlorine at a control structure prior to traveling through the 36-inch diameter chlorine contact pipe. Table 2-2 illustrates the lagoon geometric design criteria. Figures 2-2 and 2-3 provide the general layout and process schematic of the City's WWTF and its associated components described herein, respectively.

TABLE 2-2
LAGOON GEOMETRIC DATA

Parameter	Lagoon No. 1	Lagoon No. 2	Lagoon No. 3
Nominal Dike Height, feet	13	13	16
Minimum Water Depth, feet	10	10	13
Maximum Water Depth, feet	10	10	15
Surface Area, acres	2.41	2.41	18.0
Maximum Usable Storage Volume			
ac-ft	19.5	19.5	213
MG[1]	6.36	6.36	69.44

[1] *MG = ac-ft x 0.326*
ac-ft = acre-feet
MG = million gallons

The City's treatment lagoons (Lagoons No. 1 and 2) can be described as partially mixed aerated lagoons. Typically, partially mixed lagoons provide only enough aeration to satisfy the oxygen requirements of the system. However, due to recent aeration system upgrades in Lagoon No. 1, the aerated lagoons appear to be receiving more aeration or mixing than required to satisfy the minimum oxygen requirements. The surface aerators do not provide energy to keep all TSS in suspension. Therefore, some accumulation of solids occurs during normal operating conditions. Lagoon No. 1 relies on the surface aerators to transfer the needed oxygen and provide some level of mixing. In Lagoon No. 2, the area downstream of the two surface mixers acts as a settlement zone prior to wastewater being disinfected and transferred to the storage pond (Lagoon No. 3).

Existing System Water Balance

To assess the City's lagoon storage and irrigation capacities from the overall operation of the wastewater system, a water balance was developed. A water balance is a means to account for all water entering and leaving the lagoon system. The influent flow is shown as well as the estimated effects of evaporation, precipitation, and outflow irrigation volumes. This balance provides an estimate that accounts for all inflow to and outflow from the system. The water balance for the existing system is shown on Figure 2-7.

According to the existing system water balance, the City currently has a net positive cumulative storage volume of 30 ac-ft; however, this is due to the City purposely keeping 30 ac-ft in the storage lagoon during the winter months to ensure the lagoon aerators can be kept in operation to avoid removing the aerators prior to the lagoon freezing over. The water balance also indicates the WWTF is able to meet current demands. However, the rapid growth the City is experiencing is expected to quickly deplete the storage and irrigation capacities and require additional means to provide capacity to the wastewater treatment system. The proposed improvements water balance provides a representation of the additional storage capacity needed and how the proposed Lazy Z Ranch improvements will provide the necessary capacity. With the forecasted 2042 population, the estimated influent flows were input into the water balance with the associated proposed improvements discussed in the Lazy Z Ranch Master Plan. The storage lagoon will continue to end the irrigation season with approximately 30 ac-ft.

Wastewater Treatment Facility Evaluation

General

The evaluation of all the WWTF processes was undertaken to determine the adequacy of the existing WWTF to meet the current and future wastewater needs of the City of Sisters. The evaluation used published and commonly accepted design criteria related to each process of the system. The design criteria shown on Figure 2-5 were also used extensively in the evaluation.

Preliminary Treatment (Headworks)

The headworks contains two channels, with a manually cleaned coarse bar screen in the bypass channel and a mechanically cleaned wedge wire screen in the other to remove inorganics and debris. Under normal operation, influent is processed through the wedge wire screen. During emergency conditions, such as power loss or during high flow periods, the bypass channel may be utilized to control influent flows. The headworks concrete structure appeared to be in adequate condition as observed during the site visit and kickoff meeting on September 22, 2021.

The wedge wire screen was installed with the WWTF between 2000 and 2002. The screen is a Lakeside Equipment Corporation mechanical unit, with a rotary 1/4-inch bar drum-style screen. During discussions with the City regarding the reliability of their screening unit, the primary concern identified was frequent freezing issues experienced during winter. A secondary concern is the potential for ragging of the aerators. Wedge wire screens have often been ineffective at removing wipes and rags from wastewater, allowing such materials to accumulate in downstream processes and potentially damaging downstream mechanical equipment.

Influent flow is metered using an electromagnetic flowmeter at the control building in the pump room upstream of the wedge wire screen. Per the City's WPCF Permit, the flowmeter is verified annually to ensure accurate reading.

Lagoon Analysis

As previously mentioned in this section, Lagoons No. 1 and 2 can be described as partially mixed aerated lagoons and are currently providing more than the minimum oxygen requirement due to recent upgrades. However, these upgrades do not provide enough energy to keep all TSS in

suspension. For this analysis, the lagoons were treated as partially mixed lagoons providing the minimum required mixing for oxygen transfer, as doing so presents a conservative analysis of the treatment capacity available in the lagoons. Partially mixed aerated lagoons are designed based primarily on aeration requirements, organic loading rate, and detention time. The aeration requirement is defined as the amount of oxygen needed to treat the organic content in the City's wastewater. The organic loading rate is represented by the BOD_5 unit loading rate per acre of lagoon wet area, as indicated on Table 2-3. Typical design criteria for partially mixed aerated lagoons are shown on Table 2-3.

TABLE 2-3
TYPICAL DESIGN CRITERIA FOR PARTIALLY MIXED AERATED LAGOONS[1]

Design Parameter	Unit	Value	
		Range	Typical
Aeration Requirement	lbs O_2/Hp-hr	1 to 2	1.5
Organic Loading Rate	lbs BOD_5/acre-day	50 to 180	125
Detention Time	Days	10 to 30	20

[1] Taken from Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy, Inc., 4th Edition.

lbs O_2/Hp-hr = pounds of oxygen per horsepower per hour

lbs BOD_5/acre-day = pounds of five-day biochemical oxygen demand per acre per day

Additionally, BOD_5 reduction is required for effective and efficient disinfection of wastewater. Adequate aeration and dissolved oxygen are important to ensure overloading does not occur and to mitigate unpleasant odors. Partially mixed aerated lagoon facilities are considered to be adequately sized when they are able to consistently reduce BOD_5 concentrations to 45 mg/L on average or lower. The following equation, based on first-order reaction kinetics, is used to design and analyze the size of partially mixed aerated lagoons:

Cn/Co = 1/(1+(kt/n))^n

Where Cn is effluent BOD_5 concentration
Co is the influent BOD_5 concentration
k is the reaction rate constant
t is the detention time in days
n is the number of lagoon cells

Depending on available mixing, the reaction rate constant ranges from 0.25 to 1.0 at 20° Celsius (C) wastewater temperature; however, per the "Water Environment Federation Manual of Practice
No. 8 Design of Water Resource Recovery Facilities" (commonly referred to as MOP 8), it has been typical practice to model partially mixed aerated lagoons using a reaction rate constant of 0.276. As such, a base reaction rate constant of 0.276 was used in the analysis of the City's partially mixed aerated lagoons. Because bacterial growth and activity are heavily impacted by the temperature of the wastewater, the following equation was used to adjust the base reaction rate constant:

k = k20*(1.036)^(T-20) Cn/Co = 1/(1+(kt/n))^n

Where k20 is the base reaction rate constant at 20°C, or 0.276
T is the average temperature of the wastewater in the lagoons
k is the temperature adjusted reaction rate constant

Finally, the temperature of the wastewater varies throughout the year. To estimate the lagoon wastewater temperature based on ambient air temperature, Metcalf & Eddy published the following equation:

Tw = (A*f*Ta*Tin)/(A*f+Q)

Where Tw is the temperature of the lagoon water in degrees Fahrenheit (°F)
A is the area of the water surface in square feet
f is a constant of 0.000012
Ta is the average ambient air temperature in °F
Q is the influent wastewater flow rate
Tin is the temperature of the influent flow in °F

Using these equations, an assumed 14°C influent wastewater temperature, and average ambient temperatures for the summer and winter, the wastewater lagoon treatment capacity was modelled and analyzed at various key times throughout the year. Based on this analysis, the City's WWTF has adequate capacity based on its footprint and will require as much as 2,000 lbs/day of oxygen available for proper treatment. If 1.5 lbs O_2/Hp-hr is estimated to be made available by the City's existing aerators, 3,780 pounds of oxygen would be delivered to the two aerated lagoons per day, resulting in more than adequate aeration capacity in the City's lagoons. Additionally, the City's aerated lagoons are anticipated to have a detention time ranging from 25 to 30 days depending on the time of year, thus, the aerated lagoon system would also meet the typical criteria outlined on Table 2-3. To promote conservative analysis of the lagoon capacity, the City's storage lagoon's (Lagoon No. 3's) potential additional treatment of the wastewater was not included.

Though the existing aerators and aerated lagoons appear to be adequately sized to meet the demands at the design year, it is important to note that the aerators in Lagoons No. 2 and 3 are more than 15 years old and are likely reaching the end of their useful life. When the City replaced the six aerators in Lagoon No. 1, the old aerators were kept for use as spare parts to keep Lagoons No. 2 and 3 running longer. The City should schedule replacement of the remaining aerators within the planning period of this report.

Treatment efficiency of lagoons varies due to seasonal changes. Winter "ice-over," spring turnover, and seasonal algae blooms affect treatment. With winter "ice-over" conditions, oxygen transfer is reduced, and anoxic conditions can occur. BOD_5 reductions may become reduced. This is typical of lagoons in the Northwest and can affect the ability to properly treat wastewater. As long as lagoon storage capacity is available, this is generally acceptable. Spring lagoon turnovers as temperatures begin to rise can produce the same results. Algae blooms cause an increase in the pH of the water and create a condition requiring high chlorine demands for disinfection. This too is a natural feature of lagoons in the Northwest. Should algae blooms raise the pH high enough that chlorination rates become excessive or disinfection becomes

inconsistent, the City should consider installing a floating cover over the settling cell to inhibit algae growth.

Sludge Processing

Sludge generated from treatment of the City's wastewater settles in each lagoon. Sludge removal is performed as needed, as wastewater treatment results in gradual accumulation of solids over time. Depending on the system, biosolids removal may not be required often, but regular biosolids removal is necessary for adequate wastewater treatment, as excessive solids accumulation reduces treatment capacity and treatment efficacy. However, to spread out the cost of solids removal and reduce the amount of land required for application by reducing the volume of solids removed at a time, the City has elected to remove solids from one lagoon at a time at shorter intervals (five to
ten years) between solids removal. Solids were removed from Lagoon No. 1 in 2019, which cost the City approximately $200,000. Future biosolids removal costs are anticipated to be similar, plus 5 percent inflation per year. The last application of biosolids land-applied at the Lazy Z Ranch site was in 2021. Sludge was hauled in liquid form directly from the lagoon via a tanker truck to the land application site. All accumulated sludge is being stored in the lagoons.

Wastewater Disinfection System

The City disinfects wastewater with a sodium hypochlorite chlorination system. The chlorination room is an isolated room located in the control building where sodium hypochlorite is mixed with potable water and conveyed to the effluent transfer structure located on the western dike of Lagoon No. 3. After chlorine injection, chlorinated wastewater travels through a 1,140-foot long, 36-inch diameter chlorine contact pipe prior to being pumped to the land application sites to allow for adequate chlorine contact time. The major concerns with the chlorine contact pipe are the lack of redundancy for the system and no available method to clean the contact pipe. Regular cleaning of the chlorine contact pipe is important for reducing the amount of chlorine required for proper disinfection. As sediment and other organic materials settle in the contact pipe, they react with the chlorine and use chlorine that would otherwise kill bacteria. Typical practice is to clean out the chlorine contact pipe regularly to improve chlorination efficiency. Per "White's Handbook of Chlorination and Alternative Disinfectants, 5th Edition," by Black and Veatch Corporation, typical chlorine demand for proper disinfection in secondary effluent ranges from 3 to 8 mg/L. As chlorine demands reach or exceed 8 mg/L required for adequate disinfection, it is recommended that the City clean out the chlorine contact pipe and other disinfection components as needed.

Effluent Disposal and Land Application System

Facility Description

The City is permitted to dispose of treated wastewater via land application to natural forest land, lagoon dikes, and pastureland at the Lazy Z Ranch with K-Line irrigation. Currently, the land application sites are located in the vicinity of the WWTF and at the Lazy Z Ranch. The planned improvements for the Lazy Z Ranch will mainly expand and improve existing irrigation infrastructure to the south near McKenzie-Bend Highway. The City is permitted to dispose of treated effluent between April 1 and October 31. The City conveys treated effluent utilizing

irrigation pumps to the land application sites through 8-inch headers for forest land and pastures and a 4-inch diameter pipe for dike irrigation mains. Current irrigation consists of production and beneficial reuse of Class D recycled water, as approved by the WPCF Permit. Historically, the City has met the treatment and monitoring requirements associated with Class D recycled water. City staff report no issues with the irrigation system but expressed the desire for the addition of variable frequency drives on the 100 Hp pumps for electrical energy efficiency purposes. Currently, the City owns and operates all land application sites. The existing irrigation system is shown on Figure 2-4.

The land application system consists of irrigation pumps inside the control building located in the northwest corner of the WWTF. The three effluent irrigation pumps, two 100 Hp and one 15 Hp, are capable of a combined pumping rate of approximately 2,125 gpm and convey treated wastewater to the land application sites through an 8-inch header with 6-inch lines to forest and pastureland irrigation and 4-inch lines to dike irrigation locations. Each irrigation location is controlled with an individual valve for flow operation. The irrigation pumps were installed with the WWTF between 2000 and 2002 and are reportedly working satisfactorily. In 2008, the pump motors were rewound. There have been no reports of poor conditions or complaints of inadequate size for proper maintenance of the irrigation pumps for the existing control building that houses the irrigation pumps.

In 2007, the City acquired a portion of the Lazy Z Ranch to dispose of treated effluent and biosolids, which consists of 231 acres of agricultural land approximately 3,000 feet southeast of the WWTF. Treated effluent is applied to 45 acres of pasture through K-Line irrigation installed in 2019.

Permit Requirements and Compliance History

Currently, the City's WWTF is regulated by WPCF Permit No. 101779, which has established effluent limitations and effluent monitoring and testing requirements for the City's WWTF. Discharge to Waters of the State is not permitted. All wastewater must be stored, treated, and disposed of by land application following sound irrigation practices and conform to an Oregon Department of Environmental Quality-approved Recycled Water Use Plan (RWUP).

Current effluent limitations for the City's WWTF are given in the WPCF Permit, a copy of which is included in Appendix A. These limitations are based on parameters of the City's method of disposal. During times of recycled water use, grab samples are taken prior to land application to confirm treated effluent received Class D treatment as defined in Oregon Administrative Rules (OAR) 340-055. Along with grab samples, all monitoring requirements are tested at the required frequencies for the parameters outlined in the WPCF Permit. The City's current WPCF Permit includes influent and recycled water monitoring requirements. Effluent limits for total coliform and *E. coli* are enforced; however, effluent parameters for BOD_5 and TSS only require weekly values and monthly averages to be reported. Additionally, waste disposal limitations, compliance conditions and schedules, and special conditions specific to the City are all outlined in the WPCF Permit. The monthly influent and recycled water use monitoring and reporting requirements the City must adhere to are provided on Tables 2-4 and 2-5. Tables 2-1 and 2-2, along with Appendix A, provide additional information on WPCF Permit requirements.

TABLE 2-4
WATER POLLUTION CONTROL FACILITIES PERMIT INFLUENT MONITORING REQUIREMENTS

Parameter	Time Period	Minimum Frequency	Sample Type	Report
Total Flow (MGD)	Year-round	Daily	Measurement	Daily Totals Monthly Maximum Monthly Minimum Monthly Average Monthly Total
Flowmeter Verification	Year-round	Annually	Verification	Completed or Not Completed (Pass, Fail)
BOD_5 and TSS (mg/L)	Year-round	Weekly	Composite	Monthly Averages Weekly Values
pH (S.U.)	Year-round	Three Times per Week	Grab	Monthly Maximum Monthly Minimum Monthly Average

S.U. = Standard units

TABLE 2-5
WATER POLLUTION CONTROL FACILITIES PERMIT
RECYCLED WATER MONITORING REQUIREMENTS

Parameter	Minimum Frequency	Sample Type
Total Flow (MGD) or Quantity Irrigated (in/ac)	Daily	Measurement
Flowmeter Calibration	Annually	Verification
Chlorine, Total Residual (mg/L)	Daily	Grab
pH	Three Times per Week	Grab
E. coli Bacteria	Once a Week	Grab[1]
Total Coliform	Once a Week	Grab[1]
Total P and Total N	Annually	Grab

[1] *The permittee is only required to sample for either* E. coli *or total coliform, not both, for an individual use. If the permittee is irrigating on crops requiring only Class D quality effluent,* E. coli *must be monitored. If the permittee irrigates/reuses effluent for Class C uses, total coliform must be monitored.*
in/ac = inches per acre
N = nitrogen
P = phosphorus

During times of land application with treated effluent, the City pumps treated effluent to natural forest land, lagoon dikes, and pastureland at the Lazy Z Ranch. Grab samples are taken and tested at the minimum frequencies for the parameters outlined in the WPCF Permit. A Groundwater Monitoring Plan is currently not required for the land application sites. However, under the WPCF Permit, the City is required to submit an Annual Recycled Water Use Report that describes the effectiveness of the recycled water system in complying with the DEQ-approved RWUP, OAR 340-055. Additionally, the City must submit a land application plan that meets the requirements of OAR 340-050-0031(7).

Biosolids, which are a natural byproduct of the wastewater treatment process, accumulate in the City's lagoons. The current method of handling the biosolids accumulation is by removal once every

five to ten years, or as the accumulation of biosolids warrants removal. The City previously had the biosolids removed and land-applied at the Lazy Z Ranch site in 2021. The associated biosolids removal cost is approximately $200,000 in 2022 dollars and is anticipated to increase at a 5 percent inflation rate each year. The Lazy Z Ranch land application site is City-owned pastureland where crops of pasture grass are grown. A Groundwater Monitoring Plan is currently not required for the biosolids land application site. When land application of biosolids is not permitted, the biosolids accumulate in the lagoons until land application is permissible.

Treatment and Regulatory Requirements

Liquids Treatment

The City's existing headworks, a three-cell lagoon system (two aerated lagoons and a storage lagoon), and a chlorine contact pipe provide treatment to the City's domestic wastewater. Treated effluent concentration limits are provided by the WPCF Permit. When discharging to the land application site, the City's recycled water must meet Class D recycled water requirements at a minimum. Class D recycled water is a treated wastewater that has been oxidized and disinfected. Class D recycled water shall not exceed a 30-day log mean of 126 *E. coli* organisms per
100 milliliters (mL) and 406 *E. coli* organisms per 100 mL in any single sample for *E. coli*.

Solids Treatment

Currently, the City has an approved Biosolids Management Plan (BMP) with the DEQ. The BMP provides guidelines and regulations the City must follow when disposing of its biosolids.

Compliance History

To date, the City has not had compliance issues with the land application system or site. However, the City's rapid growth and the system nearing capacity will require development of additional land for continued compliance. The Master Plan includes improvements to continue compliance with the City's irrigation.

Financial Status of Existing Facilities

Preliminary Equivalent Dwelling Unit Analysis

When projecting future revenue for a wastewater system, an equivalent dwelling unit (EDU) analysis is usually completed. One EDU is intended to represent the average residential wastewater contribution for a "typical" user for a given city. As an example, each residential connection in Sisters would represent one EDU. A commercial or industrial connection user with wastewater flows similar to the average residential flow would also be considered one EDU. A commercial connection such as a café, with three times the typical wastewater flows as an average residential sewer connection, would be considered three EDUs. The City determines residential EDUs at a rate of one EDU per dwelling and commercial EDUs at a rate of one EDU per 501.337 cubic feet of "winter-average" water use. Winter-average water use is measured as the average water use between the preceding October billing period through the April billing period.

To estimate the number of EDUs in the City, the City's water consumption for the year 2020 was analyzed, as it was the most recent data available. Since specific sewer connection data were not available when this WWFP Update was prepared, it was assumed that the number of residential sewer connections/EDUs was equal to the number of residential water connections. The number of EDUs for industrial/commercial and City connections has been estimated based on the 2020-21 income from sewer receipts for the 2020-21 fiscal year and the base sewer charge of $40.78 per month per EDU.

Based on the EDU analysis, the City has 1,775 wastewater system accounts that represent 2,228 EDUs. Note that the category of each of these EDUs may differ from what is shown on Table 2-6 due to the assumptions made. Most funding agencies will use this type of EDU analysis as a basis for estimating future yearly revenues and debt capabilities for a city. The EDU determination is intended to equitably distribute wastewater system costs among all users. The EDU determination helps funding agencies determine the maximum loan (debt) amount a city can afford to service.

Although a detailed analysis of the City's current sewer rate structure is beyond the scope of this Wastewater Facilities Plan (WWFP) Update, some discussion of the existing rate structure and current and future wastewater system budgets is included. As a general rule, most utility rate structures include funding for periodic minor system improvements and maintenance items, payroll costs for staff, and a set-aside for future improvements. A summary of the monthly wastewater rate information is presented hereafter. Copies of the City's most recent sewer rate resolutions and sewer fund budget summary were used to summarize this information and can be found in Appendix D.

TABLE 2-6
PRELIMINARY EQUIVALENT DWELLING UNITS ANALYSIS

Connection Type	Total Number of Accounts	Estimated EDUs
Residential	1,477	1,477
Industrial/Commercial	254	751
Total	**1,731**	**2,228**

Income

Operation and maintenance (O&M) of the existing wastewater system is financed through the City's annual budget. Revenue is obtained primarily from sewer user fees. The current monthly wastewater rates at the time this WWFP Update was prepared are summarized on Table 2-7.

TABLE 2-7
MONTHLY WASTEWATER RATE INFORMATION

Type of User	Current Wastewater Rate
Residential and Commercial	$40.78 per EDU

The City has a variable sewer rate structure for businesses, schools, and other facilities based on their water usage. Revenue generated from the City's sewer service fees and connection fees is presented on Table 2-8. Rates are reviewed annually and revised periodically to provide enough

revenue to pay the total operation, maintenance, and replacement (OM&R) costs of the wastewater system.

TABLE 2-8
SEWER SERVICE REVENUE

Fiscal Year	Total Revenue from Sewer Service Fees and Investment Income
2018-19	$1,051,510
2019-20	$1,159,290
2020-21	$1,169,503*

**Fiscal Year 2020-21 budget, not actual revenue*

Annual Operation and Maintenance Costs

The annual O&M cost for the City's wastewater system is summarized on Table 2-9. The costs presented were obtained from the City's financial statements and include all costs for the wastewater system, such as OM&R, personnel services, debt service, etc. These data are presented to provide insight into the magnitude of costs required to operate the City's existing wastewater system. For funding and other financial analysis, it is recommended that the financial statements be reviewed in detail to refine the costs prior to considering any available revenue for future debt purposes. As shown on Table 2-9, the City's existing sewer debt service costs approximately $332,000 per year.

TABLE 2-9
ANNUAL SEWER OPERATION AND MAINTENANCE COSTS

	Expenses by Fiscal Year		
Expenditure Category	2018-19	2019-20	2020-21
Personnel Services	$251,979	$286,617	$355,501
Materials and Services	$250,472	$290,202	$321,822
Capital Improvements	$4,800	$24,436	$353,000
Debt Service	$333,284	$334,153	$332,245
Transfers Out	$6,800	$12,480	$13,300

SUN RANCH PACKAGED LIFT STATION

BARCLAY PACKAGED LIFT STATION

NF-2058-100

ROPE STREET LIFT STATION

FIVE PINES PACKAGED LIFT STATION

McKinney Ranch Rd

W Hill Way

W US-20

W Barclay Dr

W McKinney Butte Rd

N Pine St

Camp Polk Rd

Barclay Dr

Sun Ranch Dr

Cliff Clemens Park

E Main Ave

Sisters

E Cascade Ave

East Portal Interpretive Site

McKenzie Hwy

W Hood Ave

E Hood Ave

S Larch St

Village Green Park

Creekside City Park

Three Sisters Overnight Park

Sisters

McKenzie-Bend Hwy

TO WASTEWATER TREATMENT FACILITY

Smith Ditch

Edgington Rd

20

242

126

PS

LEGEND

- MANHOLE
- SERVICE CLEANOUT
- LIFT STATION
- GRAVITY SEWER MAIN
- PRESSURE SEWER
- SERVICE LINE
- IRRIGATED AREA
- CITY LIMITS
- URBAN GROWTH BOUNDARY

800 0 800

SCALE IN FEET

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

EXISTING COLLECTION SYSTEM

FIGURE
2-1

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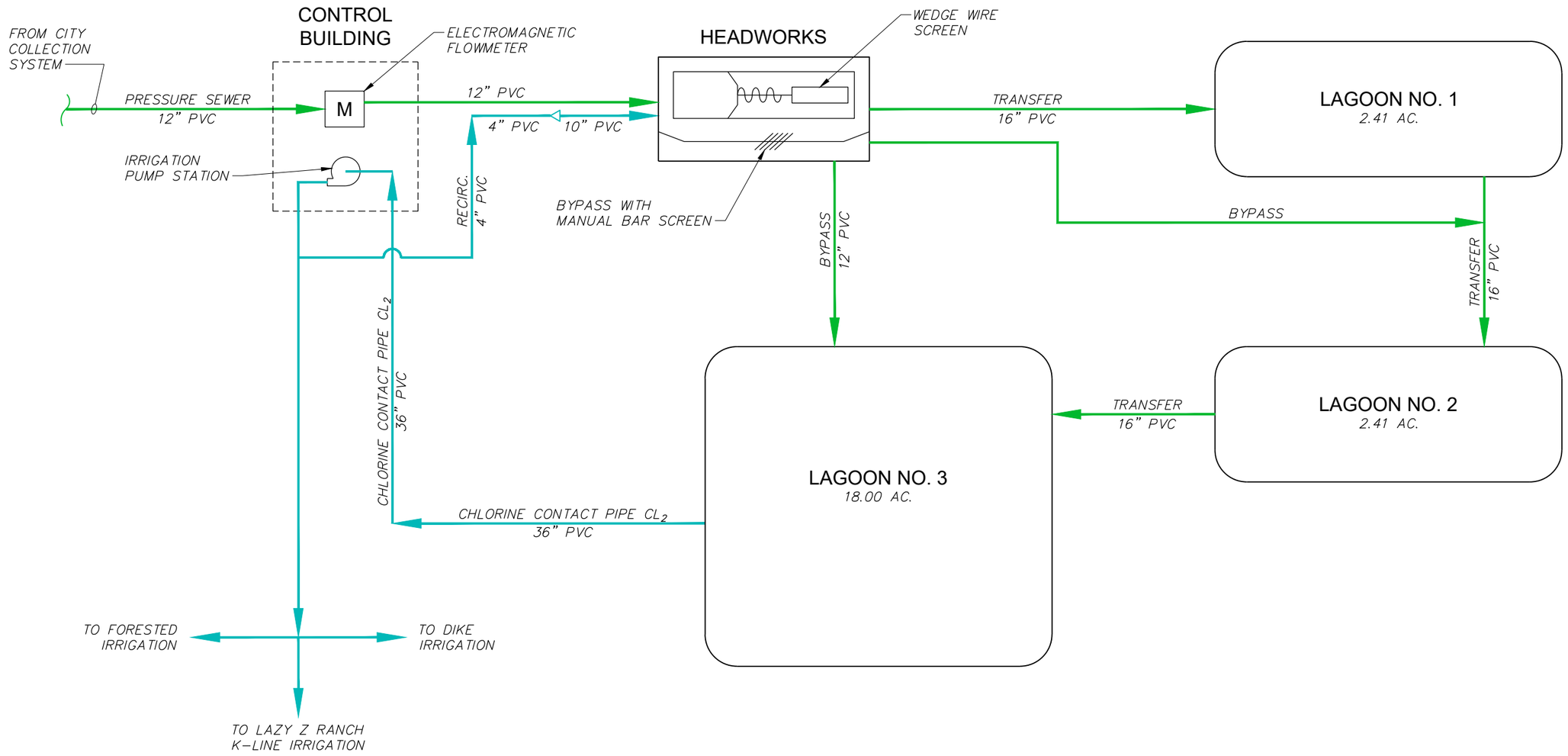
CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

EXISTING WASTEWATER TREATMENT FACILITY

FIGURE
2-2



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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

WASTEWATER TREATMENT FACILITY EXISTING PROCESS SCHEMATIC

FIGURE 2-3

FORESTED IRRIGATION
26.2 ACRES

S. LOCUST ST.

FORESTED IRRIGATION
29.3 ACRES

WASTEWATER TREATMENT FACILITY

EXTG. DIKE IRRIGATION
11.8 ACRES

20

MCKENZIE - BEND HIGHWAY

JORDAN RD.

K-LINE IRRIGATION
45 ACRES

MCKENZIE - BEND HIGHWAY

Reed Ditch

N

LEGEND

TAX LOT BOUNDARY

CITY LIMITS

URBAN GROWTH BOUNDARY

300 0 300 600 900
SCALE IN FEET

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

EXISTING SITE IRRIGATION

FIGURE
2-4

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DESIGN CRITERIA

	Base Year 2020	Current Year 2022	Design Year 2042	
Population[1]	3,220	3,437	6,917	
Base Wastewater Flow, MGD[2]	0.196	0.209	0.421	
Per Capita Flow, gpcd	61	61	61	
I/I, MGD[3]	0.028	0.028	0.028	
Average Annual Flow, MGD[4]	0.224	0.237	0.449	
Per Capita Flow, gpcd	70	69	65	
Average Dry Weather Flow, MGD	0.209	0.223	0.434	
Per Capita Flow, gpcd	65	65	63	
Average Wet Weather Flow, MGD	0.237	0.250	0.462	
Per Capita Flow, gpcd	74	73	67	
Maximum Month Flow, MGD	0.281	0.294	0.506	
Per Capita Flow, gpcd	87	86	73	
Peak Hour Flow, MGD[5]	0.896	0.956	1.925	
Per Capita, gpcd	278	278	278	
Average Influent BOD_5, mg/L[6]	314	316	336	Modified Load
lbs/day	587	626	1260	1,383
lbs/capita/day	0.18	0.18	0.18	0.20
Average Influent TSS, mg/L[7]	164	165	176	Modified Load
lbs/day	306	327	658	1,383
lbs/capita/day	0.10	0.10	0.10	0.20

[1] Base year 2020 and current year 2022 populations based on reported estimates by the Portland State University Population Research Center (PRC), June 30, 2022. The 2042 population was projected using an average annual increase of 2.76 percent between the years 2040 and 2045 as determined from the Deschutes County PRC Forecast Summary Table for Sisters, Oregon.

[2] Based on the average of the daily flows for a 14-day period from April 7, 2020, to April 21, 2020. Dates taken were from NOAA Daily Summaries for Bend, Oregon, on precipitation data for Station USC00350694.

[3] I/I assumed not to change from 2020 to 2042.

[4] Based on average monthly flow from DMRs from January 2018 to December 2020.

[5] Based on an assumed factor of 4.0 times the average annual flow.

[6] Based on average data collected from DMRs between January 2018 and December 2020.

BOD_5 = five-day biochemical oxygen demand
DMRs = Discharge Monitoring Reports
gpcd = gallons per capita per day
I/I = infiltration and inflow
lbs/capita/day = pounds per capita per day
lbs/day = pounds per day
MGD = million gallons per day
mg/L = milligrams per liter
NOAA = National Oceanic and Atmospheric Administration
TSS = total suspended solids

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

DESIGN CRITERIA

FIGURE 2-5

SUN RANCH PACKAGED LIFT STATION

BARCLAY PACKAGED LIFT STATION

NF-2058-100

ROPE STREET LIFT STATION

FIVE PINES PACKAGED LIFT STATION

TO WASTEWATER TREATMENT FACILITY

McKinney Ranch Rd

W Barclay Dr

Barclay Dr

Camp Polk Rd

Sun Ranch Dr

W Hood Ave

E Hood Ave

N Pine St

S Larch St

S Elm St

S Pine St

S Cedar St

S Spruce St

W Main Ave

E Main Ave

E Cascade Ave

W US-20

US-20

W Cliff Way

W McKinney Butte Rd

McKenzie Hwy

McKenzie-Bend Hwy

East Portal Interpretive Site

Cliff Clemens Park

Village Green Park

Creekside City Park

Three Sisters Overnight Park

Sisters

Smith Ditch

Edgington Rd

20

242

126

PS

LEGEND

- MANHOLE
- SERVICE CLEANOUT
- LIFT STATION
- ANALYZED TRUNKLINE
- GRAVITY SEWER MAIN
- PRESSURE SEWER
- SERVICE LINE
- IRIGATED AREA
- CITY LIMITS
- URBAN GROWTH BOUNDARY

800 0 800

SCALE IN FEET

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

ANALYZED TRUNKLINES

FIGURE
2-6

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
EXISTING SYSTEM WATER BALANCE

Month	Holding Lagoon Initial Volume (ac-ft)	Influent Flow (gpd)[1]	Monthly Influent Flow (ac-ft)	Rainfall (in)	Evaporation (in)[2]	Net (in)	Net Evaporation (ac-ft)	Crop Irrigation Requirements (in)[3]	Crop Irrigation (in)[4]	Forest Irrigation (ac-ft)	Lagoon Dike Irrigation (ac-ft)	K-Line Irrigation (ac-ft)	Supplemental Fresh Water (ac-ft)	Final Volume (ac-ft)[5]
October	30.00	227,354	21.63	0.95	1.00	(0.05)	(0.10)	0.44	0.52	14.71	9.33	1.94	0.00	25.55
November	25.55	228,397	21.03	2.10	1.00	1.10	2.09	0.00	0.00	0.00	0.00	0.00	0.00	48.67
December	48.67	229,440	21.83	2.27	1.00	1.27	2.42	0.00	0.00	0.00	0.00	0.00	0.00	72.92
January	72.92	217,968	20.74	2.24	1.00	1.24	2.36	0.00	0.00	0.00	0.00	0.00	0.00	96.01
February	96.01	213,796	18.37	1.45	1.00	0.45	0.86	0.00	0.00	0.00	0.00	0.00	0.00	115.24
March	115.24	221,096	21.03	1.12	1.00	0.12	0.23	0.88	1.04	0.00	0.00	3.88	0.00	132.62
April	132.62	225,268	20.74	0.79	4.25	(3.46)	(6.58)	2.81	3.31	2.96	1.58	12.40	0.00	129.84
May	129.84	230,483	21.93	0.78	6.14	(5.36)	(10.19)	3.51	4.13	11.42	4.85	15.49	0.00	109.81
June	109.81	292,014	26.88	0.61	6.69	(6.08)	(11.56)	3.81	4.48	17.44	6.08	16.81	0.00	84.82
July	84.82	273,242	25.99	0.38	8.66	(8.28)	(15.75)	4.64	5.46	24.42	8.48	20.47	29.51	71.21
August	71.21	261,770	24.90	0.41	7.91	(7.50)	(14.26)	3.92	4.61	31.13	10.51	17.29	22.00	44.92
September	44.92	247,169	22.76	0.40	5.42	(5.02)	(9.55)	2.42	2.85	36.45	9.61	10.68	0.00	1.40
TOTAL		**239,000**	**267.83**	**13.50**	**45.07**	**(31.57)**	**(60.04)**	**22.43**	**26.39**	**138.52**	**50.44**	**98.96**	**51.51**	

Notes:

[1] Based on year 2019 DMRs (the highest continuous year of flows from the City's 2018 to 2020 DMR data) and PRC certified population estimate for 2020 population of 3,220 people.

[2] From the WRCC for the Bend 7 NE Evaporation Station.

[3] From the U.S. Bureau of Reclamation (Reclamation) AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station.

[4] From the Reclamation AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station, divided by 0.85 for irrigation efficiency.

[5] Final volume was maintained above or approximately equal to 30 ac-ft to ensure surface aerators are kept in operation and to avoid the need for removing the unutilized aerators prior to the lagoon freezing over.

ac-ft = acre-feet
DMR = Discharge Monitoring Report
gpd = gallons per day
in = inches
PRC = Portland State University Population Research Center
WRCC = Western Regional Climate Center

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CITY OF
SISTERS, OREGON
WASTWATER FACILITES PLAN UPDATE

EXISTING SYSTEM WATER BALANCE

FIGURE
2-7

Section 3 - Need for Project

Introduction/General

As discussed in previous sections, concerns have been identified that show the need for improvements to the City's existing wastewater infrastructure. Though there have not been any known violations to the City's existing Water Pollution Control Facilities (WPCF) Permit, aging infrastructure and substantial growth and population require improvement to the City's existing collection system, wastewater treatment plant, and recycled water disposal system. Information about the identified needs and deficiencies is detailed below.

Health, Sanitation, Environmental Regulations, and Security

As stated previously, there have not been any known violations to the City's existing WPCF Permit, nor have there been any noted concerns regarding the health, sanitation, or security of the City's existing wastewater infrastructure. However, should the capacity of the existing facilities be exceeded in the future, there is potential for regulation violations or negative impact to public health. Additional information about capacity concerns is discussed hereafter.

Aging Infrastructure and Reasonable Growth

The City's wastewater treatment facilities were constructed in the early 2000s. As such, some of the components are starting to show signs of wear and aging. The results of the wastewater treatment facilities evaluation are summarized below.

Wastewater Collection System

The following deficiencies were noted:

- The Rope Steet Lift Station is having ragging issues and the pumps need to be replaced. The lift station building and various items, such as the electrical panel, are old or have deteriorated over time.
- An additional lift station is needed on the west side of the City to relieve capacity from the Rope Street Lift Station.
- The current pressure sewer at E. Creekside Court needs to be replaced with a gravity sewer main and lift station.

Gravity Sewer Infiltration and Inflow

Based on review of the discharge monitoring reports, design criteria per capita flows, and the current collection system condition, the City is not concerned with infiltration and inflow (I/I) being present in the collection system. Typically, the amount of I/I is assumed not to change over a 20-year design period. If I/I becomes an issue, a reduction in I/I flows would increase or recoup the City's ability to properly treat and dispose of its wastewater.

Wastewater Treatment Facility

The following deficiencies were noted:

- The headworks screen is susceptible to freezing issues due to the open channel and no outdoor protection cover. The headworks need to be updated.
- There is no way to clean the chlorine contact basin. A cleaning structure needs to be constructed for future chlorine use.
- The surface aerators in Lagoons No. 2 and 3 are nearing the end of their service life and need to be replaced during the planning period.

Treated Wastewater Disposal/Irrigation System

The following deficiencies were noted:

- Additional disposal and storage capacity is needed to accommodate growth.
- The irrigation pumps need variable frequency drives added to adjust pumping rates.
- To properly land-apply treated wastewater at agronomic rates, all proposed Lazy Z Ranch improvements developed in Phases 1 and 2 need to be constructed/implemented.

Lazy Z Ranch

The identified improvements, along with additional information and a further in-depth review, are included in the Master Plan included in Appendix E.

To continue to meet WPCF Permit requirements and maintain compliance with the Oregon Department of Environmental Quality, the City will need to improve the WWTF disposal area. Keeping up with the City's continued growth and having facilities in place to accommodate that growth is of the highest importance. In Section 4, alternatives to improve the City's WWTF, including the collection and irrigation systems, are developed and evaluated to address the deficiencies identified in this section.

Section 4 - Alternatives Considered

General

In this section, alternatives to improve the wastewater collection, treatment, and disposal systems and irrigation facilities for the City of Sisters are developed and evaluated to address the deficiencies identified in Section 3. First, the wastewater collection system is discussed with improvements and alternatives presented. Next, a discussion of the wastewater treatment facility (WWTF) improvements and any identified alternatives considered in this Wastewater Facilities Plan (WWFP) Update is provided. Following the WWTF improvements, the irrigation improvements and alternatives developed in the Lazy Z Ranch Master Plan and revised throughout the completion of this WWFP Update are discussed. The selected alternatives are detailed further in Section 5.

Design Criteria

Figure 2-5 summarizes basic wastewater design criteria used in this WWFP Update for the base year 2020, current year 2022, and design year 2042. Figure 2-5 shows the 2042 design year's population, flows, and anticipated future influent wastewater strength characteristics. Figure 2-5 should be referred to during the review of subsequent sections of this WWFP Update, as it provides key information on the wastewater system improvements and alternatives developed and evaluated herein. Additional information about how the design criteria were developed is included in Section 2 of this WWFP Update.

Wastewater Collection System Improvements

Rope Street Lift Station Improvements

The Rope Street Lift Station improvements would include replacing the submersible pumps, updating and replacing the electrical and controls, and relocating the standby generator outdoors. An interior wall would be constructed to separate the wetwell from the electrical components so the room housing the electrical components will no longer be classified as Class I, Division 1. Discussion was held regarding the potential to upsize the pumps to provide the additional capacity necessary for the anticipated 2042 flows. However, upsizing the submersible pumps from the current 37 horsepower (Hp) is anticipated to increase operation and maintenance (O&M) costs and substantially decrease the ease of pump serviceability. The generator located inside the building would be relocated to outside the building to provide space for the interior wall and allow the electrical and control room classification to be reduced to Class I, Division 2.

Instead of increasing the pump size at the Rope Street Lift Station, a second large lift station is proposed to be constructed on the west side of the City that pumps directly to the WWTF. Additional information about the Westside Lift Station will be discussed hereafter.

Estimated Total Project Cost

The estimated total project cost for the recommended Rope Street Lift Station improvements is approximately $624,000 (in 2022 dollars). Figure 4-1 provides a breakdown of estimated costs for this alternative.

Advantages

- Simplified O&M and reduces recurring issues.
- Includes new equipment upgrades and provides a barrier to separate the Class I, Division 1 environment of the wetwell area from the electrical components.
- The Rope Street Lift Station would no longer require upsizing to accommodate wastewater flows with the addition of the Westside Lift Station.
- Non-clog submersible pumps would reduce ragging issues, thereby reducing maintenance needs.
- Improved safety and longevity of the lift station, plus the electrical components can generally be repaired and replaced as necessary to increase their expected useful life.
- Rehabilitating the lift station is more cost-effective than completely replacing the lift station with a new lift station.
- The improvements outlined herein are anticipated to help maintain the City's compliance with the Water Pollution Control Facilities (WPCF) Permit requirements throughout the 20-year planning period.

Disadvantages

- Due to implementation of the majority of the improvements within a short time frame, higher capital costs would occur earlier in the planning period.
- The proposed upgrades and rehabilitation of the Rope Street Lift Station would not provide the necessary capacity to accommodate the anticipated 2042 flows; therefore, additional capacity provided by an additional lift station would be required.

Westside Lift Station

The Westside Life Station is a proposed lift station that would be located in the western half of the City to help reduce flow to the Rope Street Lift Station and is considered a high priority for the City. Constructing a new lift station would benefit the wastewater collection system. First, the Rope Street Lift Station would no longer require upsizing of its pumps to handle anticipated flows over the 20-year planning period. The new lift station would also decrease O&M costs, decrease the difficulty of pump maintenance, and improve reliability by the use of smaller pump sizes. Additionally, the Westside Lift Station would create partial redundancy for the collection system and lower the backup of wastewater at a single location in the case of emergency.

During the analysis of the proposed Westside Lift Station, estimates of the anticipated flows were calculated. The total area of the city limits and urban growth boundary (UGB) of the City of Sisters was divided by the area of the City that would contribute sewer flows to be directed to the Westside Lift Station. To free up capacity in the collection system on the north side of the City, the Barclay Lift Station would be redirected to the Westside Lift Station once it has been constructed. The piping for the redirection was previously installed and would simply need to be connected upon the completion of the Westside Lift Station project. The estimated area the Westside Lift Station would serve is approximately 38 percent. Utilizing the 2042 design population's peak hour flow of

1.925 million gallons per day (MGD), the Westside Lift Station could receive an estimated flow of approximately 0.733 MGD. Based on the anticipated flows, the pump capacity of the lift station was determined. Though a duplex lift station could be implemented at the Westside Lift Station, the flows and redundancy requirements involved would likely require a pump much larger than the current pumps at the Rope Street Lift Station. The use of three smaller pumps to meet redundancy requirements would allow easier maintenance of the lift station due to lower pump weights. Therefore, a triplex system was determined to be beneficial for the proposed Westside Lift Station. A triplex system with two pumps operating, each with capacities of 300 gallons per minute, would surpass the anticipated Westside Lift Station flow for the 2042 design criteria. The Westside and Rope Street Lift Stations combined would give the City the capacity it requires. The proposed location of the Westside Lift Station is shown on Figure 4-2. Figure 4-2 presents the new lift station, which includes approximately 4,200 linear feet of pressure sewer that would connect to the existing pressure sewer on Locust Street. With the construction of this new lift station, the Barclay packaged lift station would be rerouted, allowing some of the gravity sewer trunklines in the industrial part of the City to become available.

Estimated Total Project Cost

The estimated total project cost for the proposed Westside Lift Station is approximately $2,165,000 (in 2022 dollars). Figure 4-3 provides a breakdown of estimated costs for this alternative.

Advantages

- Provides the additional capacity needed.
- The collection system would be less reliant on the Rope Street Lift Station, and system capacity would be increased without needing to upsize the Rope Street Lift Station pumps.
- The improvements outlined herein are anticipated to allow the City to continue to meet its WPCF Permit requirements into the 20-year planning period.

Disadvantages

- Due to implementation of the majority of the improvements within a short time frame, higher capital costs would occur earlier in the planning period.

Creekside Court Lift Station

As mentioned in Section 2, the existing pressure sewer and septic tank effluent pumping system in the subdivision on E. Creekside Court is proposed to be abandoned and replaced with a gravity sewer system and lift station setup. The existing pressure sewer would be abandoned with the addition of a gravity line serving the entire subdivision on the east side of the City. The proposed gravity sewer main would run southwest of the cul-de-sac, then south to the McKenzie-Bend Highway via a packaged lift station. A packaged lift station, much like the previous satellite packaged lift stations present in the City's wastewater collection system, would be placed at the cul-de-sac. The new pipeline would connect to an existing manhole near Desperado Trail. Again, this would further improve the redundancy of the wastewater collection system and provide additional

capacity. Tying into the pressure sewer main line farther down the line would provide less bottlenecking near the Rope Street Lift Station. In addition, the switch from pressure sewer in the subdivision on E. Creekside Court would provide reduced maintenance and costs associated with the pumps located in the subdivision. The proposed location of the Creekside Court Lift Station is shown on Figure 4-4.

Estimated Total Project Cost

The estimated total project cost for the proposed Creekside Court Lift Station improvements is approximately $1,159,000 (in 2022 dollars). Figure 4-5 provides a breakdown of estimated costs for this alternative.

Advantage

- Reduces O&M components compared to the existing pressure sewer system.

Disadvantage

- Due to implementation of the majority of the improvements within a short time frame, higher capital costs would occur earlier in the planning period.

General Collection System

The trunklines of areas anticipated to see the largest increase in flows throughout the 20-year planning period were analyzed utilizing the as-built drawings provided by the City to confirm possible bottlenecking locations and areas where the anticipated flows may be higher than the existing pipe capacities. The gravity sewer main lines running to lift stations were analyzed, and all other trunklines analyzed are anticipated to have adequate capacity throughout the 20-year planning period. As shown on Table 2-1 and Figure 2-6 in Section 2, many of the analyzed existing trunklines are located near the edge of the city limits and existing UGB. These trunklines could be connected to future sewer lines that may be needed for development that could occur by expansion of the current UGB and annexation. Though these trunklines appear to have capacity in excess of what is anticipated to be required to accommodate projected growth in the next 20 years, it is recommended that more detailed utility feasibility analysis be performed for any proposed development or annexation that may result in an expansion of the UGB.

Due to the relatively new and watertight operating collection system and the results of the trunkline analysis, no improvements were evaluated and further developed. Since infiltration and inflow is not a concern and the pipe material, diameter, and slopes are of sufficient design, the system was determined to have the necessary capacity for the entirety of the 2042 design period. No improvements or cost estimates were prepared.

Although the existing trunklines appear to be adequately sized for the projected flows, there is a concern regarding the 10-inch trunkline that runs along Camp Polk Road and Black Butte Avenue and its ability to serve the industrial part of the City. Current projections, using a peaking factor of 4 and assuming minimum pipe slopes show that the 10-inch trunkline appears to have adequate capacity. However, if a high water-using industry, such as a food processing industry or data center, is added, the trunkline may meet or exceed its capacity faster than expected. As such, it is

recommended that the City reanalyze the trunkline and the industrial zone every five years with the regular update to this WWFP Update to ensure that the trunkline's capacity is not exceeded. If flows grow at a rate faster than projected in this area, an additional interceptor line may need to be constructed to intercept flows from the industrial zone at the intersection of Camp Polk Road and Black Butte Avenue and take them along the north edge of the city limits directly to the Rope Street Lift Station.

Wastewater Treatment Facility Operational Improvements

Regardless of the WWTF improvement and effluent disposal alternatives selected by the City, certain issues with components of the existing WWTF need to be addressed, such as freezing and the ragging issues with the headworks, no methods or accessibility available for cleaning the chlorine contact pipe, and replacement of the old aerators in Lagoons No. 2 and 3. All of the proposed improvements for the headworks, chlorine contact pipe, and aerators are shown on Figure 4-6.

Headworks Improvements

Currently, the headworks operates using a wedge wire screen with a manual bar screen as a backup for emergency situations. Discussions and some early cost estimates were evaluated with the City regarding the addition of a headworks building or the use of an outdoor protection package. The addition of a headworks building would provide a controlled environment for the headworks screen, eliminating the current freezing issues while providing further storage and protection for any equipment to be stored in the building. The existing wedge wire headworks screen would be replaced with a perforated headworks screen to address the ragging issues. After discussion with the City regarding both options, it was decided that the headworks building was not a feasible option for improving the WWTF. First, the addition of a building has a high cost-to-benefit ratio over the outdoor protection package. Second, the location of the headworks is relatively tight due to it sitting on top of the lagoon dike, thus reducing the space on which a building could be placed. Finally, the removal and replacement of the headworks screen requires space and a building would limit the working area. Therefore, to resolve the headworks freezing and ragging issues, it is recommended that the existing wedge wire headworks screen be replaced with a perforated screen with an associated cold weather package.

Estimated Total Project Cost

The estimated total project cost for the recommended headworks improvements is approximately $471,000 (in 2022 dollars). Figure 4-7 provides a breakdown of estimated costs for this alternative.

Advantages

- Utilizing an outdoor protection package versus constructing a new building is lower in cost and makes replacement of the headworks screen easier.
- The perforated screen would reduce rag accumulation downstream, thus reducing equipment operational issues and maintenance requirements.
- The outdoor weather protection would guard against freezing during winter months.

- The improvements outlined herein would address the City's current issues and provide updated equipment to the headworks throughout the 20-year planning period.

Disadvantages

- Weather protection, especially in the form of heat tape, can require additional maintenance.
- The lack of a building also requires maintenance procedures to occur outside in the elements.

Chlorine Contact System Improvements

Cleaning chlorine contact pipes is a necessary maintenance item, and a variety of options to accomplish this are available. Typically, cleanout structures or fittings are set every 200 to 400 feet to provide access to the chlorine contact pipe(s) and remove buildup.

Installing a vault including the necessary pipe, fittings, etc., to allow access to the chlorine contact pipe for occasional cleaning by flushing or pigging the chlorine contact pipe is recommended. This option would provide a considerably lower cost than other alternatives, along with lower O&M costs compared to a larger wetwell, building, or pumps that would otherwise be installed. Currently, the system does not have automatic dosing of the chlorine; however, this is not a concern due to the high detention times throughout the WWTF and relatively consistent effluent irrigation pumping rates.

Estimated Total Project Cost

The estimated total project cost for the recommended chlorine contact system improvements is approximately $97,000 (in 2022 dollars). Figure 4-8 provides a breakdown of estimated costs for this alternative.

Advantages

- Lower capital costs.
- Simplified O&M.
- The improvements would provide a simple and cost-effective solution for allowing regular cleaning of the chlorine contact pipe.

Disadvantages

- Construction of the improvements would likely need to occur during winter when the City is not irrigating, as the contact pipe must be taken offline to allow for construction.

Lagoons No. 2 and 3 Aerator Replacement

The existing lagoon aerators are near the end of their useful life. The aerators in Lagoons No. 2 and 3 are recommended to be replaced on an as-needed basis, along with the associated electrical improvements necessary to accommodate the new aerators. If the City elects to upsize the 7.5 Hp

aerators to 15 Hp aerators, the electrical and controls would require improvements. Although there is not an immediate need to upsize the aerators from a treatment standpoint, operational and maintenance advantages come with having standardized equipment in the WWTF. As such, the cost estimate associated with the replacement of the aerators was developed assuming upsizing to 15 Hp to help with budgeting regardless of the City's decision.

Estimated Total Project Cost

The estimated total project cost for the recommended aerator replacement improvements is approximately $443,000 (in 2022 dollars). Figure 4-9 provides a breakdown of estimated costs for this alternative.

Advantages

- Reduced maintenance frequency.
- Standardization of equipment at the WWTF.

Treatment Facility Effluent Disposal and Irrigation Improvements

In this section, the WWTF effluent disposal improvements and alternatives are discussed. The existing WWTF has served the City effectively for many years. However, as discussed in Section 2 and in the Master Plan, the WWTF's current storage and irrigation systems are nearing capacity.

In evaluating improvements and potential alternatives developed in the Master Plan, existing system flows, WPCF Permit requirements, and future water quality and quantity limiting parameters were considered. Facilities have been sized using maximum monthly flows. Criteria used to evaluate the alternatives are described and cost estimates for each alternative were developed.

The Master Plan provides a water balance, which utilized the proposed storage and irrigation volumes the phased improvements are anticipated to provide to determine if adequate storage and irrigation for the 2042 design period is achieved. The water balance shows the means of wastewater influent and outflow from the lagoon system to the land application sites. The proposed water balance and details on the assumptions used for the water balances are provided on Figure 4-10. The proposed improvements for both phases of the Master Plan are shown on Figure 4-11 for reference. Improvements and alternatives discussed previously are summarized below.

Lazy Z Ranch Master Plan Summary

The Master Plan was prepared in August 2021 by Anderson Perry & Associates, Inc., for the City of Sisters. The Master Plan introduced options for recycled water use and alternatives for beneficial reuse by utilizing the Lazy Z Ranch after the remaining land is acquired. The methods described below are from the Master Plan found in Appendix E. From these options and alternatives, the City outlined desired improvements and determined phases for improvement implementation. All desired improvements outlined were placed into two phases. Originally, Phase 1 was to include Pivot 1, Pivot 2, and general irrigation, while Phase 2 was to include the wetlands, forested ponds and streams, and a future wheel line. However, based on Portland State University's Population Research Center data for the population forecast updated on June 30, 2022, revisions to the phases and timing of improvements were deemed necessary. Based on these new estimates, additional storage and disposal capacity is

anticipated to be necessary much earlier in the planning period. The identified improvements from the Master Plan are as follows, including a summary of how the new phasing of improvements will be implemented.

Methods of Irrigation and Irrigation Uses

K-Line Irrigation

K-Line irrigation offers advantages in capital cost and flexibility. This form of irrigation consists of impact sprinklers mounted in protective pods made of durable plastic. The sprinklers are connected to each other via flexible hoses that allow the sprinklers to be oriented in a variety of ways to fit the shape of the irrigation site. This flexibility is one of the key advantages of the K-Line system. Additionally, capital costs for K-Line systems are typically low. However, the K-Line system requires more operational attention, as the pods must be manually moved from location to location in the irrigation area to cover the entire area. The typical practice is to move the system after every 24 hours of irrigation. Additionally, the sprinklers used in K-Line systems are small and often plastic, making them more susceptible to blockages and increasing maintenance requirements. Due to the operational disadvantages associated with K-Line systems, the City has expressed interest in replacing its existing K-Lines with more robust, operationally friendly infrastructure.

Center Pivot Irrigation

Center pivot irrigation offers advantages in its minimal maintenance requirements and automated operation. This form of irrigation uses a movable pipe structure that rotates around a central pivot point. The pipe structure is mounted on drive towers that use electric motorized wheels to rotate the structure. These systems can be set to automatically run with different run times and rotational speeds. The key advantages of center pivot systems include automation of the system, which minimizes operational requirements, along with durability, resulting in low maintenance requirements. However, this system has a higher capital cost than other systems and is limited to irrigate circular or rectangular areas of land. Additionally, center pivot systems are generally more visible than other systems.

Wheel Line Irrigation

Wheel line irrigation offers a mid-level option between K-Line irrigation and center pivot irrigation. While a wheel line is more expensive than a K-Line system, the capital cost for wheel line irrigation is typically lower than center pivot irrigation. Similar to the K-Line irrigation system, a wheel line is often moved every 24 hours and requires operator attention to do so. However, the wheel line infrastructure is generally more durable than the K-Line system and typically requires less maintenance.

Crop Irrigation

Crop irrigation is a beneficial use frequently used in many rural communities. Though the type of crop that can be irrigated with recycled water varies with the quality of recycled water per Oregon Administrative Rules (OAR) 340-055 (e.g., Class D recycled water cannot be used to irrigate crops for human consumption), crops tend to use more water and make better use of

the nitrogen found in recycled water. Currently, the City contracts out the harvest of the pasture grass grown at the Lazy Z Ranch.

Forested Area Irrigation

Currently, the City irrigates the naturally forested areas near the WWTF using a solid set irrigation system. These areas generally consist of pine trees with juniper trees mixed in. Though irrigating forested areas does not generally require as much water as the irrigation of pasture areas or crops, irrigation of forested areas better allows preservation of the natural beauty of the area. Additionally, the City is recognized as a Tree City, referring to their commitment to preserving local forested areas. Since the City already has irrigation infrastructure in place, maintaining the existing infrastructure and continuing to irrigate the forested areas would be advantageous.

Dike Irrigation

In addition to irrigating the forested areas near the WWTF, the City irrigates the dikes and embankments surrounding the City's wastewater treatment lagoons. Grass grown on the dikes is cut every year after the irrigation season. Irrigation and maintenance of grass on the dikes helps inhibit weed growth and is more aesthetically appealing compared to covering the dikes with rock or leaving the earthwork exposed. Additionally, the growth of grass on the lagoon dikes helps protect against erosion.

Recycled Water Wetlands

Recycled water wetlands are either lined or unlined to provide additional disposal. The soils at the Lazy Z Ranch are highly permeable and not conducive to the development of an unlined wetland, so only a lined wetland would likely be utilized. Wetlands provide beneficial use of recycled water via disposal of the water (through evaporation and transpiration) and additional treatment/polishing of the water via natural processes that improve its quality. Additionally, wetlands provide habitat for wildlife along with public interaction through trail systems, educational interpretive hubs, and wildlife viewing.

Forested Ponds and Streams

Forested ponds and streams may also be lined or unlined for additional disposal. As mentioned in the Recycled Water Wetlands paragraph above, the area has highly permeable soils, resulting in the need for lined ponds and streams. Recycled water disposal would primarily occur via evaporation. Advantages of using forested ponds and streams for disposal of recycled water include additional nature trails and hiking areas, enhancing natural habitat for wildlife, and enhancing the natural beauty of the Lazy Z Ranch and surrounding area. The primary disadvantage of using forested ponds and streams is they are not specifically listed in OAR 340-055 as an approved beneficial use for polished Class D recycled water. As a result, specific procedures mentioned in the Master Plan would need to be followed. As discussed in the Master Plan, the forested ponds and streams would only follow the lined wetlands. The lined wetlands would be sized to provide additional polishing and disinfection.

Lazy Z Ranch Master Plan Phase 1 Improvements

The improvements determined as part of the revised Phase 1 from the Master Plan include the installation of Pivot 2, which is a quarter pivot that would provide approximately 23 acres of irrigated land, and the construction of 16 acres of wetlands, 4 wet acres of forested ponds, and 2 miles of streams. This combination will provide an immediate increase in irrigation and storage volume for the City, along with providing additional recreational activities. The quarter pivot, and the addition of the half pivot as part of Phase 2 of the Lazy Z Ranch improvements, are to replace the existing K-Line irrigation system in the pastureland. With the City's largest concern being the capacity of the WWTF, this improvements phase provides the largest storage and irrigation option within the entire Lazy Z Ranch.

Lazy Z Ranch Master Plan Phase 2 Improvements

The improvements chosen as part of the revised Phase 2 include a half pivot providing approximately 47 acres of irrigation and wheel line irrigation of 14 acres. These improvements provide the remaining irrigation capacity the City will eventually need and utilize the entire site of the Lazy Z Ranch. These improvements will be included in later development as determined by the City during a Public Works Advisory Board presentation and meeting.

Updated Lazy Z Ranch Phase 1

As previously discussed, the improvements proposed for expanding the disposal and irrigation capacity for the WWTF has two proposed phases. Both phases were revised throughout the preparation of this WWFP Update. Phase 1 improvements include the installation of Pivot 2, which is a quarter pivot that would provide approximately 23 acres of irrigated land and the construction of 16 acres of wetlands, 4 wet acres of forested ponds, and 2 miles of streams. Phase 1 would provide approximately 50 acre-feet (ac-ft) of additional capacity to the overall irrigation system. Assuming an average depth of 1-1/2 feet throughout the wetlands, the added storage capacity of Phase 1 is approximately 75 ac-ft. All improvements in Phase 1 are anticipated to be implemented within the next five years. The rapid population growth the City has experienced and is anticipated to continue to experience requires upgrades to continue to meet WPCF Permit requirements throughout the 20-year planning period. The Phase 1 improvements would provide a larger, more immediate increase in storage and irrigation capacity while adding recreational benefits to the City. The revised timeline and implementation of the Master Plan improvements should allow the City to maintain compliance with its WPCF Permit. Since the WPCF Permit is set to expire on December 31, 2025, having the necessary storage and irrigation capacity is necessary for the system's operation and provides further reasoning to implement the Phase 1 improvements within the next five years.

Estimated Total Project Cost

The estimated total project cost for the revised Lazy Z Ranch Phase 1 improvements is approximately $5,200,000 (in 2022 dollars). Figure 4-12 provides a breakdown of estimated costs for this alternative.

Advantages

- The majority of the improvements would be made early in the design period, providing the City with a large amount of storage and irrigation capacity along with providing additional recreational opportunities in the City.
- The improvements in Phase 1 address the City's concern with wastewater storage.

Disadvantages

- Higher capital costs would occur earlier in the planning period due to the majority of the improvements being implemented within a short time frame.

Updated Lazy Z Ranch Phase 2

Phase 2 of the revised Lazy Z Ranch proposed improvements includes the second of the two pivots. Pivot 1 is anticipated to provide 47 acres of irrigation, and the installation of wheel line irrigation is anticipated to provide 14 acres of irrigation. Phase 2 would utilize the remaining capacity and site of the Lazy Z Ranch. An additional 61 acres is anticipated to be implemented in the next five to ten years. Additional advantages and disadvantages of different phasing options are discussed in greater detail in the Master Plan found in Appendix E.

Estimated Total Project Cost

The estimated total project cost for the revised Lazy Z Ranch Phase 2 improvements is approximately $550,000 (in 2022 dollars). Figure 4-12 provides a breakdown of estimated costs for this alternative.

Advantages

- Utilization of the additional capacity from the improvements along with additional recreational opportunities in the City.
- Rehabilitation and improvement of systems that require excessive maintenance.
- The improvements outlined herein are anticipated to allow the City to continue to meet WPCF Permit requirements into the 20-year planning period.

Disadvantages

- Higher capital costs would occur earlier in the planning period due to the majority of the improvements outlined in the Master Plan and the WWFP Update being implemented within a short time frame.

Biosolids Removal

Biosolids removal is a necessary part of the lagoon wastewater treatment process. It is recommended that biosolids be removed every five to ten years, unless necessary at a different interval. The estimated total project cost for the removal of biosolids is approximately $200,000, with a projected increase of 5 percent per year beginning in 2022.

Summary

The most critical of the proposed improvements outlined in this section are those required to address the substantial growth the City has been experiencing. Each alternative discussed in this section was presented to the City for review and selection. The improvements selected by the City, along with a proposed Capital Improvements Plan, are further examined in Section 6.

Environmental Impacts

Preliminary Environmental Review

Introduction

This section presents a preliminary environmental review of the selected wastewater system improvements. As the project is developed further and funding sources are researched, a more detailed report should be completed to meet specific agency requirements.

Affected Environment/Environmental Consequences

Land Use

The City of Sisters is located in northwestern Deschutes County in central Oregon. The majority of land in the immediate vicinity is privately owned and is used for livestock grazing or irrigated crop farming. Located at an elevation of 3,182 feet above mean sea level, the area is located in the shadow of the Three Sisters volcanic peaks and is known as the gateway to the Cascades.

The proposed collection system and WWTF improvements are within the city limits and the urban growth boundary (UGB). These improvements are not anticipated to require a Conditional Use Permit (CUP). However, the improvements to the Lazy Z Ranch are located outside the UGB and will require a CUP.

Important Farmland

The soils in the area of the City of Sisters are generally considered good for farming and agriculture. The primary soil types in the vicinity are summarized on Table 4-1. In general, the soils are classified in variations of loam, with some variety due to the volcanic history of the region.

TABLE 4-1
FARMLAND CLASSIFICATION, SUMMARY BY MAP UNIT, DESCHUTES COUNTY, OREGON

Map Unit Symbol	Map Unit Name	Rating
18D	Bluesters gravelly sandy loam, 15 to 50 percent slopes	Farmland of Statewide Importance
47A	Ermabell loamy fine sand, 0 to 3 percent slopes	Farmland of Statewide Importance
62D	Henkle-Lava flows-Fryrear complex, 15 to 50 percent slopes	Not Prime Farmland

Map Unit Symbol	Map Unit Name	Rating
85A	Lundgren sandy loam, 0 to 3 percent slopes	Farmland of Statewide Importance
94A	Omahaling fine sandy loam, 0 to 5 percent slopes	Farmland of Statewide Importance
157C	Wanoga-Fremkle-Rock outcrop complex, 0 to 15 percent slopes	Farmland of Statewide Importance
159C	Wilt sandy loam, 0 to 15 percent slopes	Farmland of Statewide Importance

As stated earlier, the proposed collection system and WWTF improvements are located within the UGB. However, the improvements to the Lazy Z Ranch are located outside the city limits on land zoned Exclusive Farm Use - Sisters/Cloverdale Subzone (EFUSC), adjacent to land zoned Forest Use 1. Though the irrigation infrastructure meets the permitted uses for this zoning, the implementation of the ponds, streams, and associated parks appears to require a CUP per Chapter 18.16.030 of the Deschutes County Code. The construction of wetlands appears to be a permitted use for EFUSC-zoned areas.

Floodplains

As shown on the Federal Emergency Management Agency's Flood Insurance Rate Map Panel No. 41017C0245E, the Special Flood Hazard Areas (SFHAs), or areas subject to flooding during a 100-year flood event, are relatively small and generally limited to the immediate vicinity of Wychus Creek. Most of the proposed improvements are well outside the SFHAs. However, the Creekside Court Lift Station improvements are located near the creek and associated SFHAs. Care must be taken during design and construction of the lift station to locate the lift station wetwell, valve vault (if applicable), and all electrical, controls, and appurtenances outside the SFHAs. No permanent impacts to the 100-year flood zone are anticipated. Any activity within floodplains, if deemed necessary during design, will be required to comply with applicable local floodplain development standards.

Wetlands

The National Wetlands Inventory Map identified some freshwater emergent wetlands and Whychus Creek within the vicinity, specifically northwest of the Lazy Z Ranch property. A wetland determination/delineation should be completed prior to construction of the Lazy Z Ranch improvements. Wetlands will be avoided if possible. If avoidance is impracticable or unfeasible, permits will be obtained and appropriate environmental documents prepared prior to construction.

Cultural/Historical Resources

A search of the National Register of Historic Places was conducted. Two historic buildings appear to be listed within the City of Sisters. The majority of the proposed improvements will be located in existing rights-of-way that have been previously disturbed.

Additional requirements may be necessary depending on federal involvement (funding or permits), which may necessitate compliance with Section 106 of the National Historic Preservation Act. If no federal nexus is identified, the project must still comply with Oregon Revised Statutes (ORS) 97.740, ORS 358.905-358.961, and ORS 390.235 and OAR 736-051-0090, which protects Native American cairns, graves, and associated items; items of cultural patrimony; and archaeological sites on non-federal and private lands. Additional archaeological surveying, testing, and/or permitting may be required to comply with state laws.

Biological Resources

Important fish and wildlife habitat in the area includes the Wychus Creek and associated riparian areas. Riparian areas are critical to the health of streams, as riparian vegetation provides shade and temperature regulation for the streams, provides cover for aquatic organisms, and stabilizes streambanks to prevent erosion.

No crossings are anticipated to be required as a part of any of the proposed improvements. No impacts to any threatened, endangered, or rare species or habitat are anticipated. If impacts to waterbodies are unavoidable, appropriate permits and mitigation will be completed.

Water Quality

Wychus Creek is the primary surface waterbody located in the vicinity of the City of Sisters. Some of the proposed collection system improvements will occur in the vicinity of this waterbody, although no impacts are anticipated. Best management practices will be employed to control potential erosion and sedimentation that could temporarily impact water quality.

Impacts to Groundwater

The project area does not lie in a Sole Source Aquifer or Critical Groundwater Area. The project is located within the Deschutes Groundwater Mitigation Area, which regulates groundwater withdrawal and mitigation. This project does not involve any groundwater removal, so Deschutes Groundwater Mitigation Area regulations do not apply. No impacts to groundwater are anticipated. However, it is best practice to install groundwater monitoring wells downgradient of irrigation sites and the unlined wetland sites to monitor and verify groundwater is not being negatively impacted.

Socioeconomic/Environmental Justice

No elderly or minority populations residing adjacent to the area will be impacted by the project. No business or residential relocations will be required as part of the project.

Completion of the project is necessary to provide adequate wastewater conveyance, treatment, and disposal for the anticipated population growth over the 20-year planning period.

Air

The collection system improvements fall within the city limits and UGB and, as such, are subject to the City of Sisters' ordinances. Dust concerns can usually be addressed by spraying water on the affected areas as needed to reduce dust.

The project has the potential to temporarily affect air quality. Short-term impacts include emissions from equipment operation and dust generated from construction activities. No substantial particulate matter or detrimental emissions will be released as a result of the project. It is unlikely that the Oregon Department of Environmental Quality (DEQ) will require air quality permits for the project.

Noise

The proposed improvements will not emit additional noise. However, construction activities will create significant intermittent and temporary noise. To minimize impacts, work will generally be confined to the project area during daylight hours. Construction activities will be subject to any City and/or County noise ordinances.

Traffic

During construction, temporary increases in traffic due to construction vehicles may occur. No permanent or long-term impacts to transportation are anticipated as a result of most of the proposed improvements, with the exception of the access to the proposed parking areas for some of the Lazy Z Ranch improvements. Access to this site is via a state highway. As a result, collaboration with the Oregon Department of Transportation will be required during the design and construction of the Lazy Z Ranch Phase 1 improvements, and any required access permit and/or traffic study requirements must be met.

Hazardous Material

The potential for buried asbestos cement (AC) pipe exists in the work areas, as some of the City's original water pipes were composed of AC. The proposed lift station improvements and associated piping modifications may cross or expose existing AC lines, abandoned or otherwise.

Environmental records were reviewed for identified hazardous and solid waste sites, cleanup sites, and leaking and underground storage tanks using information on the DEQ Environmental Cleanup Site Information (ECSI) website. According to the ECSI database, 15 cleanup sites are located in the vicinity of the City of Sisters. Of the 15 sites, ten have no further action required. Of the five remaining cleanup sites, contaminated groundwater has been suspected in Township 15 South, Range 10 East. The Lazy Z Ranch improvements are located in this region; however, the use of groundwater is not anticipated to be required as a result of these improvements. Additionally, a cleanup site south of Township 15, Range 10, Section 5 has been identified, along with the old Forest Service Whychus Pit. None of these records appear to be adjacent to the project.

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
ROPE STREET LIFT STATION IMPROVEMENTS
PRELIMINARY COST ESTIMATE
(YEAR 2022 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 23,000	All Req'd	$ 23,000
2	Removal and Demolition of Existing Equipment and Components	LS	25,000	All Req'd	25,000
3	Wetwell Improvements	LS	10,000	All Req'd	10,000
4	New Submersible Pumps and Accessories	LS	170,000	All Req'd	170,000
5	Heating, Ventilation, and Air Conditioning and Piping Modifications	LS	60,000	All Req'd	60,000
6	Structure Modifications	LS	50,000	All Req'd	50,000
7	Electrical and Controls	LS	100,000	All Req'd	100,000
8	Generator Improvements	LS	35,000	All Req'd	35,000
				Subtotal Estimated Construction Cost	**$ 473,000**
				Construction Contingency (15%)	70,000
				Total Estimated Construction Cost	**$ 543,000**
				Preliminary, Design, and Construction Engineering (15%)	81,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2022 DOLLARS)	**$ 624,000**

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
ROPE STREET LIFT STATION IMPROVEMENTS
PRELIMINARY COST ESTIMATE

FIGURE 4-1

PROPOSED WESTSIDE LIFT STATION

PROPOSED PRESSURE SEWER LINE

CONNECT TO EXISTING PRESSURE SEWER LINE

TO WASTEWATER TREATMENT FACILITY

Sisters Rd Warehouse

East Portal Interpretive Site

Cliff Clemens Park

Village Green Park

Creekside City Park

Sisters

W US-20

NF-2058-030

N Pine St

S Pine St

N Oak St

S Oak St

S Hood St

S Pine Meadow St

S Cottonwood St

N Fir St

N Larch St

N Locust St

N Locust Ln

N Maple St

N Elm St

N Spruce St

S Oak St

S Ash St

S Elm St

S Fir St

S Spruce St

S Locust St

W Adams Ave

E Adams Ave

W Main Ave

E Main Ave

E Green Ridge Ave

W Cascade Ave

E Cascade Ave

W Hood Ave

E Hood Ave

W Washington Ave

E Washington Ave

W Jefferson Ave

E Jefferson Ave

W St Helens Ave

E Black Butte Ave

McKenzie Hwy

20

126

LEGEND

- PS PROPOSED LIFT STATION
- EXISTING MANHOLE
- EXISTING SERVICE CLEANOUT
- NEW PRESSURE SEWER LINE
- EXISTING GRAVITY SEWER MAIN
- EXISTING PRESSURE SEWER
- EXISTING SERVICE LINE
- CITY LIMITS
- URBAN GROWTH BOUNDARY

300 0 300

SCALE IN FEET

Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community, Esri Community Maps Contributors, Oregon State Parks, State of Oregon GEO, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Cen

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

PROPOSED WESTSIDE LIFT STATION AND PRESSURE SEWER LINE

FIGURE
4-2

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CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
WESTSIDE LIFT STATION
PRELIMINARY COST ESTIMATE
(YEAR 2022 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 76,000	All Req'd	$ 76,000
2	Traffic Control	LS	50,000	All Req'd	50,000
3	Site Work	LS	40,000	All Req'd	40,000
4	Concrete Masonry Unit Building and Furnishings	LS	130,000	All Req'd	130,000
5	Crushed Surfacing	CY	20	250	5,000
6	Precast Concrete Wetwell	LS	30,000	All Req'd	30,000
7	Valve Vault	LS	10,000	All Req'd	10,000
8	Submersible Pumps, Rails, and Appurtenances	LS	125,000	All Req'd	125,000
9	Mechanical Work including Piping, Valves, Fittings, and Appurtenances	LS	55,000	All Req'd	55,000
10	Gantry Crane	LS	10,000	All Req'd	10,000
11	Electrical Work	LS	100,000	All Req'd	100,000
12	Control and Instrumentation Work	LS	135,000	All Req'd	135,000
13	Standby Power Generator System	LS	120,000	All Req'd	120,000
14	Heating, Ventilation, and Air Conditioning	LS	50,000	All Req'd	50,000
15	Potable Water System	LS	5,000	All Req'd	5,000
16	8-inch Pressure Sewer	LF	80	4,500	360,000
17	Natural Ground Surface Restoration	SY	20	2,600	52,000
18	Asphalt Surface Restoration	TON	130	2,000	260,000
19	Fencing	LS	15,000	All Req'd	15,000
20	Painting	LS	10,000	All Req'd	10,000
				Subtotal Estimated Construction Cost	**$ 1,638,000**
				Construction Contingency (15%)	245,000
				Total Estimated Construction Cost	**$ 1,883,000**
				Preliminary, Design, and Construction Engineering (15%)	282,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2022 DOLLARS)	**$ 2,165,000**

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

WESTSIDE LIFT STATION
PRELIMINARY COST ESTIMATE

FIGURE
4-3

E Cascade Ave

E Timber Pine Dr

S Timber Pine Pl

S Timber Creek Pl

Whychus Creek

E Creekside Ct

S Creekside Dr

20

126

Sisters

McKenzie Hwy

McKenzie-Bend Hwy

E Desperado Trl

Ranger Ct

PS

ABANDON EXISTING PRESSURE SEWER LINE

PROPOSED CREEKSIDE LIFT STATION

REPLACE EXISTING PRESSURE SEWER LINE WITH NEW GRAVITY MAIN

PROPOSED PRESSURE SEWER LINE

CONNECT TO EXISTING MANHOLE

200 0 200

SCALE IN FEET

LEGEND

- PROPOSED LIFT STATION
- EXISTING MANHOLE
- EXISTING SERVICE CLEANOUT
- LIFT STATION
- NEW GRAVITY SEWER MAIN
- NEW PRESSURE SEWER LINE
- EXISTING GRAVITY SEWER MAIN
- EXISTING PRESSURE SEWER
- EXISTING SERVICE LINE
- CITY LIMITS
- URBAN GROWTH BOUNDARY

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

PROPOSED CREEKSIDE LIFT STATION AND PRESSURE SEWER LINE

FIGURE
4-4

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
CREEKSIDE COURT LIFT STATION
PRELIMINARY COST ESTIMATE
(YEAR 2022 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 42,000	All Req'd	$ 42,000
2	Temporary Protection, Direction of Traffic, and Project Safety	LS	5,000	All Req'd	5,000
3	Site Work	LS	25,000	All Req'd	25,000
4	Removal and Demolition of Existing Pumps and Controls	EA	5,000	23	115,000
5	Precast Concrete Wetwell	LS	30,000	All Req'd	30,000
6	Packaged Lift Station with Pumps, Controls, and Appurtenances	LS	120,000	All Req'd	120,000
7	Crushed Surfacing for Lift Station Site	CY	50	20	1,000
8	Mechanical Work including Piping, Valves, Fittings, and Appurtenances	LS	55,000	All Req'd	55,000
9	4-inch Gravity Sewer Services	LF	50	380	19,000
10	8-inch Gravity Sewer Main	LF	90	1,400	126,000
11	6-inch Pressure Sewer Main	LF	65	1,100	71,500
12	Gravel Surface Restoration	SY	20	2,400	48,000
13	Manhole	EA	6,500	5	32,500
14	McKenzie Highway Bore Crossing	LS	98,000	All Req'd	98,000
15	Electrical Service	LS	50,000	All Req'd	50,000
16	Asphalt Surface Restoration	Ton	130	300	39,000
				Subtotal Estimated Construction Cost	**$ 877,000**
				Construction Contingency (15%)	131,000
				Total Estimated Construction Cost	**$ 1,008,000**
				Preliminary, Design, and Construction Engineering (15%)	151,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2022 DOLLARS)	**$ 1,159,000**

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

CREEKSIDE COURT LIFT STATION
PRELIMINARY COST ESTIMATE

FIGURE
4-5

EXISTING CONTROL BUILDING WITH IRRIGATION PUMP STATION

EXISTING 12" PRESSURE SEWER FROM COLLECTION SYSTEM

EXISTING 36" CHLORINE CONTACT PIPE

EXISTING HEADWORKS AND WEDGE WIRE SCREEN

HEADWORKS IMPROVEMENTS

CHLORINE CONTACT BASIN IMPROVEMENTS

EXISTING TRANSFER STRUCTURE

LAGOON NO. 1

LAGOON NO. 2

LAGOON NO. 3

EXISTING LAGOON AERATOR, TYP

EXISTING TRANSFER STRUCTURE

EXISTING TRANSFER STRUCTURE

REPLACE LAGOON AERATOR (TYP. 5)

N

100 0 100 200 300
SCALE IN FEET

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

PROPOSED WASTEWATER TREATMENT FACILITY IMPROVEMENTS

FIGURE
4-6

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
HEADWORKS IMPROVEMENTS
PRELIMINARY COST ESTIMATE
(YEAR 2022 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 17,000	All Req'd	$ 17,000
2	Project Safety/Quality Control	LS	10,000	All Req'd	10,000
3	Removal and Demolition of Existing Equipment and Components	LS	10,000	All Req'd	10,000
4	Screen and Accessories	LS	200,000	All Req'd	200,000
5	Headworks Piping, Fittings, Valving, etc.	LS	15,000	All Req'd	15,000
6	Bypass Pumping, Piping, and Controls	LS	5,000	All Req'd	5,000
7	Electrical and Instrumentation	LS	50,000	All Req'd	50,000
8	Screen Weatherproofing	LS	50,000	All Req'd	50,000
				Subtotal Estimated Construction Cost	**$ 357,000**
				Construction Contingency (15%)	53,000
				Total Estimated Construction Cost	**$ 410,000**
				Preliminary, Design, and Construction Engineering (15%)	61,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2022 DOLLARS)	**$ 471,000**

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

HEADWORKS IMPROVEMENTS
PRELIMINARY COST ESTIMATE

FIGURE
4-7

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
CHLORINE CONTACT SYSTEM IMPROVEMENTS
PRELIMINARY COST ESTIMATE
(YEAR 2022 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 4,000	All Req'd	$ 4,000
2	Project Safety/Quality Control	LS	2,000	All Req'd	2,000
3	Site Work	LS	20,000	All Req'd	20,000
4	Precast Concrete Vault	LS	10,000	All Req'd	10,000
5	Mechanical Work including Piping, Valves, Fittings, and Appurtenances	LS	20,000	All Req'd	20,000
6	Vault Connection to Existing Chlorine Contact Pipe	LS	5,000	All Req'd	5,000
7	Bypass Pumping, Piping, and Controls	LS	10,000	All Req'd	10,000
8	Surface Restoration	CY	20	150	3,000
				Subtotal Estimated Construction Cost	**$ 74,000**
				Construction Contingency (15%)	11,000
				Total Estimated Construction Cost	**$ 85,000**
				Preliminary, Design, and Construction Engineering (15%)	12,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2022 DOLLARS)	**$ 97,000**

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
CHLORINE CONTACT
SYSTEM IMPROVEMENTS
PRELIMINARY COST ESTIMATE

FIGURE
4-8

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
LAGOONS NO. 2 AND 3 AERATOR REPLACEMENT
PRELIMINARY COST ESTIMATE
(YEAR 2022 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 16,000	All Req'd	$ 16,000
2	Project Safety/Quality Control	LS	5,000	All Req'd	5,000
3	Removal and Demolition of Existing Equipment and Components	LS	15,000	All Req'd	15,000
4	Pond Aerators and Accessories	LS	200,000	All Req'd	200,000
5	Electrical Work	LS	50,000	All Req'd	50,000
6	Controls and Instrumentation	LS	50,000	All Req'd	50,000
				Subtotal Estimated Construction Cost	**$ 336,000**
				Construction Contingency (15%)	50,000
				Total Estimated Construction Cost	**$ 386,000**
				Preliminary, Design, and Construction Engineering (15%)	57,000
				TOTAL ESTIMATED IMPROVEMENTS COST (2022 DOLLARS)	**$ 443,000**

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
LAGOONS NO. 2 AND 3
AERATOR REPLACEMENT
PRELIMINARY COST ESTIMATE

FIGURE
4-9

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
PROPOSED IMPROVEMENTS WATER BALANCE

Month	Holding Lagoon Initial Volume (ac-ft)	Influent Flow (gpd)[1]	Monthly Influent Flow (ac-ft)	Rainfall (in)	Evaporation (in)[2]	Net (in)	Net WWTF Evaporation (ac-ft)	Net Forested Ponds Evaporation (ac-ft)	Forested Ponds Seepage (ac-ft)	Net Wetland Evaporation (ac-ft)	Unlined Wetland Seepage (ac-ft)	Pasture Irrigation Requirements (in)[3]	Pasture Irrigation (in)[4]	Forest Irrigation (ac-ft)	Lagoon Dike Irrigation (ac-ft)	Pivot 1 Irrigation (ac-ft)	Pivot 2 Irrigation (ac-ft)	Future Wheel Line Irrigation (ac-ft)	Supplemental Fresh Water (ac-ft)	Final Volume (ac-ft)[5]
October	30.00	457,562	43.53	0.95	1.00	(0.05)	(0.10)	(0.02)	0.00	(0.07)	0.00	0.44	0.52	20.87	9.33	2.03	0.98	0.60	0.00	39.54
November	39.54	459,660	42.32	2.10	1.00	1.10	2.09	0.37	0.00	1.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	85.78
December	85.78	461,759	43.93	2.27	1.00	1.27	2.42	0.42	0.00	1.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	134.24
January	134.24	438,671	41.73	2.24	1.00	1.24	2.36	0.41	0.00	1.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	180.40
February	180.40	430,276	36.97	1.45	1.00	0.45	0.86	0.15	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	218.98
March	218.98	444,968	42.33	1.12	1.00	0.12	0.23	0.04	0.00	0.16	0.00	0.88	1.04	0.00	0.00	4.06	1.96	1.21	0.00	254.51
April	254.51	453,364	41.74	0.79	4.25	(3.46)	(6.58)	(1.15)	0.00	(4.61)	0.00	2.81	3.31	4.20	1.58	12.98	6.25	3.86	0.00	255.03
May	255.03	463,858	44.13	0.78	6.14	(5.36)	(10.19)	(1.79)	0.00	(7.15)	0.00	3.51	4.13	16.21	4.85	16.21	7.81	4.82	0.00	230.14
June	230.14	587,694	54.11	0.61	6.69	(6.08)	(11.56)	(2.03)	0.00	(8.11)	0.00	3.81	4.48	24.74	6.08	17.59	8.48	5.23	0.00	200.43
July	200.43	549,913	52.32	0.38	8.66	(8.28)	(15.75)	(2.76)	0.00	(11.04)	0.00	4.64	5.46	34.65	8.48	21.43	10.33	6.37	0.00	141.96
August	141.96	526,825	50.12	0.41	7.91	(7.50)	(14.26)	(2.50)	0.00	(10.00)	0.00	3.92	4.61	44.17	10.51	18.10	8.72	5.38	4.88	83.31
September	83.31	497,441	45.80	0.40	5.42	(5.02)	(9.55)	(1.67)	0.00	(6.69)	0.00	2.42	2.85	51.71	9.61	11.17	5.39	3.32	0.00	30.00
TOTAL		**481,000**	**539.03**	**13.50**	**45.07**	**(31.57)**	**(60.04)**	**(10.52)**	**0.00**	**(42.09)**	**0.00**	**22.43**	**26.39**	**196.55**	**50.44**	**103.57**	**49.92**	**30.79**	**4.88**	

Notes:

[1] Based on PRC forecast population estimate for 2042 population of 6,917 people.

[2] From the WRCC for the Bend 7 NE Evaporation Station.

[3] From the U.S. Bureau of Reclamation (Reclamation) AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station.

[4] From the Reclamation AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station, divided by 0.85 for irrigation efficiency.

[5] Final volume was maintained above or approximately equal to 30 ac-ft to ensure surface aerators are kept in operation and to avoid the need for removing the unutilized aerators prior to the pond freezing over.

ac-ft = acre-feet
gpd = gallons per day
in = inches
PRC = Portland State University Population Research Center
WRCC = Western Regional Climate Center
WWTF = wastewater treatment facility

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
PROPOSED IMPROVEMENTS
WATER BALANCE

FIGURE
4-10

FORESTED IRRIGATION
49.45 ACRES

S. LOCUST ST.

FORESTED IRRIGATION
29.3 ACRES

EXISTING WASTEWATER TREATMENT FACILITY

EXTG. DIKE IRRIGATION
11.8 ACRES

20

MCKENZIE - BEND HIGHWAY

PHASE 2 IMPROVEMENTS

1/2 MILE TRAIL

POTENTIAL VIEWPOINT

WHEEL LINE IRRIGATION
14 ACRES

PIPED DITCH

PIVOT IRRIGATION
47.1 ACRES

100' BUFFER, TYP.

JORDAN RD.

PUBLIC PARKING

PHASE 1 IMPROVEMENTS

FUTURE PETERSON RIDGE TRAIL CONNECTOR

PIVOT IRRIGATION
22.7 ACRES

100' BUFFER, TYP.

ISLAND, TYP.

PUMP

WETLANDS
16 WET ACRES

LINED TREATMENT WETLAND

1 MILE TRAIL

2 MILE TRAIL

FORESTED PONDS AND STREAMS
4 WET ACRES
2 MILES STREAMS

Pond

Reed Ditch

MCKENZIE - BEND HIGHWAY

N

400 0 400 800 1200
SCALE IN FEET

LEGEND

- PRIVATE TAXLOTS
- CITY LIMITS
- URBAN GROWTH BOUNDARY
- FOREST, POND, AND STREAMS
- WETLAND
- IRRIGATION
- REQUIRED SETBACK
- PHASE 1 IMPROVEMENTS
- PHASE 2 IMPROVEMENTS

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

LAZY Z RANCH
PROPOSED PHASED IMPROVEMENTS

FIGURE
4-11

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CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
LAZY Z RANCH PHASE 1 AND 2 IMPROVEMENTS
PRELIMINARY COST ESTIMATE
(YEAR 2022 COSTS)

Beneficial Use	Cost
Wetland	$ 1,270,000
Forested Ponds and Streams	1,750,000
Pivot 1	320,000
Pivot 2	270,000
General	510,000
Future Wheel Line	140,000
Subtotal	**$ 4,260,000**
Contingency, Engineering, and Administration (35%)	1,490,000
Total	**$ 5,750,000**

Phase 1

Beneficial Use	Cost
Pivot 1	$ 320,000
Wetland	1,270,000
Forested Ponds and Streams	1,750,000
General	510,000
Subtotal	**$ 3,850,000**
Contingency, Engineering, and Administration (35%)	1,350,000
Total	**$ 5,200,000**

Phase 2

Beneficial Use	Cost
Pivot 2	$ 270,000
Future Wheel Line	140,000
Subtotal	**$ 410,000**
Contingency, Engineering, and Administration (35%)	140,000
Total	**$ 550,000**

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CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
LAZY Z RANCH PHASE 1 AND 2 IMPROVEMENTS
PRELIMINARY COST ESTIMATE

FIGURE
4-12

Section 5 - Selection of an Alternative

Introduction

As shown in the previous section, the majority of needed improvements were relatively straightforward to evaluate. The City is not currently in need of a new wastewater treatment facility; as such, alternatives for replacing their existing aerated lagoon system were not considered at this time. However, several improvements are needed to address aging infrastructure, increase capacity in the collection system, and improve the City's disposal capacity. As such, the selected improvements are presented in the form of a capital improvements plan. Following is additional discussion and rationale behind the selected alternatives presented in the previous section.

Cost and Effectiveness Certification

The following is discussion about cost implications considered with the development of the various improvement alternatives. This discussion is organized by facility.

Collection System Improvements

The Rope Street Lift Station requires updates due to electrical code issues, ongoing maintenance concerns, and deterioration of equipment due to age. Options considered included the complete replacement of the lift station; however, much of the infrastructure is in good shape and should be reused. As such, the most cost-effective and responsible option is to rehabilitate the existing lift station.

The Westside Lift Station is required to free capacity in multiple locations of the City's collection system and aid the City in meeting the growing demands anticipated to occur based on the population projections discussed previously. The new lift station will be constructed to match the renovated Rope Street Lift Station to allow standardization of equipment between the two lift stations. Standardizing equipment in this manner allows the City to have fewer replacement components on hand, which reduces both direct costs and implicit costs.

Wastewater Treatment Facility Improvements

The proposed headworks improvements, though relatively lower priority, have been considered to provide the most cost-effective option for improvement. Simply providing a cold weather package is much less expensive than constructing a building around the headworks. Though such cold weather protection packages introduce an additional component that requires maintenance, the construction of a building over the headworks would also provide additional components requiring maintenance attention.

Treatment Facility Effluent Disposal and Irrigation Improvements

The discussion and comparison of alternatives are presented in greater detail in the Lazy Z Ranch Master Plan, included in Appendix E. As discussed in the Master Plan, the selected alternatives for expanding the City's effluent disposal capacity were among the most cost-effective, both from a

capital cost point of view and an operation and maintenance (O&M) point of view, that still meet the City's goals for the Lazy Z Ranch property.

Non-monetary Factors

Several non-monetary factors have led to the proposed alternatives selected as a part of the development of this WWFP. Discussion about some of these factors is organized by facility below.

Collection System Improvements

Many of the improvements for the Rope Street Lift Station are driven by a need to meet updated electrical code requirements. Doing so will improve safety at the lift station. In addition, the replacement of the lift station pumps and other components requiring substantial operator attention will reduce the frequency of operator contact with wastewater due to related maintenance activities.

The Westside Lift Station Improvements will provide some resilience to the City's wastewater collection system. With its implementation, less flow will go to the Rope Street Lift Station, and less of the City will rely on the Rope Street Lift Station for wastewater service. Additionally, the City has opted to construct the Westside Lift Station to emulate the rehabilitated Rope Street Lift Station to promote operator familiarity and allow for greater standardization in the City's collection system.

The Creekside Court Lift Station's construction will provide substantially more reliable wastewater service to the Creekside Court community. The City will receive fewer calls from residents having issues with their wastewater system, as the grinder pumps will all be taken offline, thus reducing potential points of conflict between public works staff and the residents. Additionally, removing the grinder pumps and centralizing the system in this location will reduce the potential for untreated wastewater to spill into the environment or come into contact with the public.

Wastewater Treatment Facility Improvements

Most of the proposed improvements for the wastewater treatment facility are intended to improve the ease of O&M at the WWTF. The weatherproof package on the headworks screen will improve functionality and better protect the equipment from the elements, while the installation of a perforated-plate screen will better protect the downstream aerators. The addition of a cleanout port on the chlorine contact pipe will make it easier to clean the chlorine contact pipe regularly, which will in turn improve disinfection efficacy. The replacement of the aerators will not only standardize the equipment but will also improve the treatment efficacy of the City's aerated lagoons and effectively increase the City's wastewater treatment capacity.

Treatment Facility Effluent Disposal and Irrigation Improvements

The proposed improvements will provide substantial benefit to multiple aspects of life for the City of Sisters. First, the proposed improvements will help address the City's concerns with effluent storage and disposal capacity. In addition, the construction of the wetlands and forested ponds and streams will provide additional wildlife habitat for a large variety of species while expanding the City's existing parks system.

Section 6 - Proposed Project

Introduction

This section presents the selected improvements to meet the wastewater collection, treatment, and disposal needs of the City of Sisters for the 20-year planning period. These improvements were selected by the City after careful consideration of the various impacts, objectives, and criteria discussed in Section 4 and the review, evaluation, and consideration of associated cost estimates.

Preliminary Project Design

Based on discussions with the City, the preferred wastewater treatment facility (WWTF) improvement alternatives have been identified, with aggressive implementation schedules identified for most of the proposed improvements to help keep pace with the City's extensive growth. The collection system improvements will also be implemented early in the planning period with the construction of new lift stations (Westside and Creekside Court) and the rehabilitation of the Rope Street Lift Station. This approach will continue to provide the means to have the necessary capacity in the collection, treatment, and disposal systems. The improvements will help avoid potential future regulations associated with the Water Pollution Control Facilities Permit. The City has pursued land needed for the new irrigation systems outlined in the Lazy Z Ranch Master Plan. As a result, and after discussion with the City, the following preferred improvements have been identified. A map containing all the proposed capital improvements is shown on Figure 6-1 for reference.

Collection System Improvements

The proposed improvements to the City's existing wastewater collection system consist of the following:

- Rope Street Lift Station to be rehabilitated to address current issues.
- Westside Lift Station to be constructed to provide system capacity.
- Creekside Court Lift Station to be constructed, along with the abandonment of the pressure sewer in the subdivision on E. Creekside Court to reduce the City's maintenance issues.

Wastewater Treatment Facility Improvements

The proposed improvements to the City's existing WWTF consist of the following:

- Replace the wedge wire headworks screen with a perforated screen and install an outdoor weather protection package.
- Install a vault with blind flange at the north end of the chlorine contact pipe for periodic flushing and cleaning.
- Replace the aerators in Lagoons No. 2 and 3 and update the electrical equipment to ensure compatibility with the new aerators.
- Install variable frequency drives on the irrigation pumps to allow adjustment of irrigation pumping rates.

Treated Wastewater Disposal System Improvements

The proposed improvements to the City's treated effluent disposal and irrigation systems consist of the following:

Phase 1

- Install Pivot 2, the quarter pivot, providing 23 acres of irrigation.
- Construct 16 acres of wetlands.
- Construct 4 wet acres of forested ponds and 2 miles of streams.

Phase 2

- Install Pivot 1, the half pivot, providing 47 acres of irrigation.
- Install the wheel line, providing 14 acres of irrigation.

Project Schedule

For the City of Sisters to successfully implement the selected wastewater system improvements (WWSI) presented herein, the City will need to coordinate directly with the Oregon Department of Environmental Quality (DEQ), U.S. Department of Agriculture Rural Development (RD), and Business Oregon to pursue federal, state, and potentially local financing opportunities provided through low interest loans and potential grants. It is recommended the City pursue funding for the full project, seeking to utilize available low interest loan and grant funds.

The City has elected to proceed with the WWSI project. Once the DEQ has approved this WWFP Update, their approval will be included in Appendix F. The following implementation plan outlines the key steps for project implementation. The following outlines only the major steps that need to be followed.

Item No.	Implementation Item	Time Frame
1.	Submit draft WWFP Update to City and agencies for review.	May 2023
2.	Finalize and adopt the WWFP Update.	Spring/Summer 2023
3.	Attend One Stop meeting.	Summer 2023
4.	Prepare and submit funding application(s) to appropriate agency(ies).	Summer/Fall 2023
5.	Finalize project funding.	Winter 2024
6.	Design system improvements.	Winter 2024 through Summer 2024
7.	Submit design documents for agency(ies) review.	Summer 2024
8.	Advertise, bid, and award construction project.	Winter 2024-25
9.	Project construction.	Winter 2025 through Winter 2026
10.	Project startup and construction completion.	Spring 2026
11.	Project closeout.	Summer 2026

Item No.	Implementation Item	Time Frame
12.	Monitor system performance to determine impact of improvements, report impacts to the DEQ, and determine the need for future improvements.	Two years after project closeout

It should be noted that these implementation steps assume the City is able to secure project funding in summer/fall 2023 and that project design occurs in 2023 concurrent with the pursuit of funding. Should delays occur in securing project funding, completion of the project will likely be delayed. The key to implementing the City's WWSI project, as outlined herein, is the ability of the City to acquire low interest loan funding. The City will have to work closely with its citizens to inform them of the system needs and the need for an increase in sewer user costs.

The WWSI discussed and evaluated in this WWFP Update are to provide the City of Sisters with a reliable and quality wastewater system. The outlined improvements are anticipated to meet the current and future needs of the City throughout the 20-year design and into the future.

Permit Requirements

As shown on Figure 6-1, the majority of the proposed improvements are located within the city limits. City building permits will be acquired as appropriate. Proposed improvements on the Lazy Z Ranch are located outside the city limits on parcels zoned by Douglas County as Exclusive Farm Use (EFU). Both the construction of wetlands and the application of biosolids and treated wastewater are approved uses for EFU zones. However, the implementation of ponds, streams, and associated parks is anticipated to require a Conditional Use Permit (CUP) per Chapter 18.16.030 of the Deschutes County Code. As such, a CUP is anticipated to be required.

Where needed, access permits, Joint Permit Applications, and county building permits will be acquired. Any projects resulting in total ground disturbance of 1 acre or more will acquire a general stormwater discharge permit.

Sustainability Considerations

The improvements selected by the City of Sisters provide aspects of sustainability including water and energy efficiency and system resiliency.

Water and Energy Efficiency

The proposed improvements will aid in reducing inefficiencies that currently exist within the wastewater collection, treatment, and disposal systems. The Lazy Z Ranch improvements will provide needed irrigation and storage capacity, the collection system will receive updated equipment and lift station redundancy, and the WWTF will have current issues addressed and provide maintenance relief, helping extend the life of the complete wastewater system. Also, the proposed improvements will upgrade or replace the existing electrical equipment; add lift station capacity; upgrade lift station pumps, headworks screen, and aerators to new, more efficient models; and provide ease of operation. These improvements will also help reduce the overall power consumption for each improvement of identified equipment.

Other (System Resiliency)

The proposed system improvements will provide the City with the ability to easily maintain its current wastewater collection, treatment, and disposal/irrigation systems, since most of the equipment will be newly upgraded or see the addition of similar products. The WWTF will continue to operate in a similar manner as before but with the addition of a few components to the overall system. However, most of the outlined improvements follow previously installed and utilized components, such as the packaged lift station at E. Creekside Court, which will bring a level of familiarity for system operators. Maintenance will be reduced to simpler tasks due to the installation of new equipment, and the focus will be standard upkeep of components instead of problem solving. The wastewater collection, treatment, and disposal/irrigation systems will be more resilient upon completion of the proposed improvements.

Total Project Cost Estimate

Based on discussions with City staff, the City Council, and the Public Works Advisory Board, a proposed Capital Improvements Plan has been identified. Table 6-1 summarizes this plan, including proposed implementation time frames and associated project costs.

TABLE 6-1
CAPITAL IMPROVEMENTS PLAN AND TIME FRAME

Improvement	Implementation Time Frame	Anticipated Cost (2022 Dollars)
Lazy Z Ranch Phase 1	Less than Five Years	$5,130,000
Rope Street Lift Station Improvements	Less than Five Years	$624,000
Westside Lift Station	Less than Five Years	$2,165,000
Creekside Court Lift Station	Less than Five Years	$1,159,000
Biosolids Removal	Five to Ten Years	$200,000
Lagoons No. 2 and 3 Aerator Replacement	Five to Ten Years	$443,000
Lazy Z Ranch Phase 2	More than Ten Years	$620,000
Chlorine Contact System Improvements	More than Ten Years	$97,000
Headworks Improvements	More than Ten Years	$471,000
TOTAL IMPROVEMENTS COST		**$10,909,000**

Summary of Estimated Total Costs

The estimated total project costs are summarized on Table 6-1. The year 2022 cost shown on Table 6-1 was estimated utilizing associated rates of 2019 and prior with a 5 percent inflation rate per year to the projected year 2022, as this provides the City with a more consistent anticipated cost for the capital improvements. The rates are also shown as if all capital improvements were constructed during the same construction period although some improvements are slated for a later date. The total year 2022 estimated project cost is $10,909,000.

Debt Repayment and Financing Options

State and Federal Grant and Loan Programs

A number of state and federal grant and loan programs can provide assistance on municipal improvement projects to Oregon cities. These programs offer various levels of funding aimed at

different types of projects. These include programs administered by RD, the U.S. Economic Development Administration (EDA), Business Oregon, the DEQ, and others. These agencies can provide low interest loan funding, and possibly grant funding, to assist communities with public works projects. Most of these agencies will require an increase in sewer rates to support a loan for WWSI, both as a condition of receiving monies and prior to being considered for grant funds. It should be noted that the monthly user rates discussed in this section can represent a combination of monthly usage fees and taxes.

The following section briefly summarizes the primary funding programs potentially available to assist the City of Sisters with a WWSI project.

Summary of State Funding Programs

Business Oregon Finance Programs

Community Development Block Grant Program

The primary objective of the Community Development Block Grant (CDBG) program is the development of viable (livable) urban communities by expanding economic opportunities and providing decent housing and a suitable living environment principally for persons of low and moderate income.

This is a grant program. The state receives an annual allocation from the U.S. Department of Housing and Urban Development for the CDBG program. Grant funding is subject to applicant need, availability of funds, and any other restrictions in the state's Method of Distribution (i.e., program guidelines). It is not possible to determine how much, if any, grant funds may be awarded prior to an analysis of the application and financial information.

Eligibility for the CDBG program requires a low to moderate percent income of more than 51 percent. The City of Sisters' percentage of low to moderate income is 42.41 percent, based on the 2021 Low to Moderate Income Summary data used by the CDBG program, so it appears that funding from the CDBG program is not available to the City at this time.

Water/Wastewater Financing Program

This is a loan and grant program that provides for the design and construction of public infrastructure when needed to ensure compliance with the Safe Drinking Water Act (SDWA) or the Clean Water Act (CWA). To be eligible, a system must have received, or is likely to soon receive, a Notice of Non-Compliance by the appropriate regulatory agency associated with the SDWA or the CWA.

While primarily a loan program, grants are available for municipalities that meet eligibility criteria. Loan/grant amounts are determined by a financial analysis of the applicant's ability to afford a loan (debt capacity, repayment sources, current and projected utility rates, and other factors). One criterion utilized by Business Oregon finance programs is an affordability index rate. The affordability index rate is calculated by taking a city's median household income (MHI), multiplying it by 1.25 percent, and dividing by 12 months to obtain an

estimated monthly cost. The calculated cost is assumed to be what the users in the community can afford to pay in utility charges. The affordability index is often utilized as a minimum threshold for eligibility for grants and low interest loans. Sisters' MHI is discussed later in this section.

The maximum loan term for this program is 25 years or the useful life of the infrastructure financed, whichever is less. Loan amounts are determined by financial review and may be offered through a combination of direct and/or bond funded loans. Loans are generally repaid with utility revenues or voter approved bond issues. A limited tax general obligation pledge may also be required. "Creditworthy" borrowers may be funded through the sale of state revenue bonds.

Due to the City not having a current or anticipated compliance issue, funding from the Water/Wastewater Financing Program is not likely.

Special Public Works Fund

The Special Public Works Fund (SPWF) program was established by the Oregon Legislature in 1985 to provide primarily loan funding for municipally owned infrastructures and other facilities that support economic and community development in Oregon. Loans and grants are available to municipalities for planning, designing, purchasing, improving, and constructing municipally owned facilities.

For design and construction projects, loans are primarily available; however, grants are available for projects that will create and/or retain traded-sector jobs. A traded-sector industry sells its goods or services into nationally or internationally competitive markets. Loans range in size from less than $100,000 to $10 million. The SPWF can offer very attractive interest rates that reflect tax-exempt market rates for very good quality creditors. Loan terms can be up to 25 years or the useful life of the project, whichever is less. The maximum grant award is $500,000 or 85 percent of the project cost, whichever is less. The grant amount per project is based on up to $5,000 per eligible job created or retained. Since job creation or retention is not a main goal of the City's selected improvements project, the SPWF will likely not be a viable alternative for the City.

For Business Oregon Programs - Contact Regional Development Officer

Since program eligibility and funds availability may change from year to year, potential applicants are encouraged to contact their respective regional development officer to obtain the most accurate and up-to-date information for each program.

Clean Water State Revolving Fund Loan Program

Oregon's Clean Water State Revolving Fund (CWSRF) program, administered by the DEQ, supports communities by funding projects that improve water quality and environmental outcomes for the state of Oregon. The program is dedicated to working with small communities and on projects that increase financial and environmental sustainability, climate resiliency, and water and energy efficiency.

The CWSRF program offers below-market rate loans and bond purchases to public agencies for planning, design, construction, and implementation of the following water quality improvement projects:

- Wastewater collection, treatment, water reuse, and disposal systems.
- Nonpoint source water pollution control projects.
- Development and implementation of management plans for federally designated estuaries in Oregon (Tillamook Bay and the lower Columbia River).

The U.S. Environmental Protection Agency requires the CWSRF program to develop a project priority list. Currently, the DEQ awards funding without regard to project score or ranking because the program has sufficient funds to finance all projects ready to proceed. This ensures the fund is utilized in a timely manner. In the event the program does not have sufficient funds available to offer funding to all projects that are ready to proceed, the DEQ will award funding to projects that are ready to proceed in priority order based on project score.

The CWSRF program charges interest rates that are calculated based on criteria defined in Oregon Administrative Rules 340-054-0065. Different interest rates and other financial terms apply to different types of loans and to loans of differing repayment periods. Rates are adjusted quarterly, based on the average Bond Buyer rates of the previous quarter, as published by the Federal Reserve. The average interest rate on CWSRF loans in 2021 was less than 2 percent, though rates are increasing due to the current economic environment. Current interest rates can be found on the DEQ's website: https://www.oregon.gov/deq/wq/cwsrf/Pages/CWSRF-Rates.aspx. Once a loan is signed, the interest rate is fixed for the life of the loan.

For design and construction loans, an annual fee equal to 0.5 percent of the unpaid balance is collected once annually. A loan reserve equal to one-half of the debt service is called out in the borrower's financial statements.

The CWSRF program can also sometimes provide principal forgiveness in combination with a loan for eligible communities. To be eligible, the project must either support a community with an MHI below the statewide rate or meet Green Project guidelines. The CWSRF program has a limited amount of money available for principal forgiveness each year. If the community is eligible and money is available at the time of loan signing, the DEQ can offer principal forgiveness for 50 percent of the loan amount, for a maximum amount of $500,000. Based on the 2020 American Community Survey 5-year Estimates, the 2020 MHI for the City of Sisters was $75,662, while the 2020 MHI for the state of Oregon was $65,667.

The CWSRF program is anticipated to be a low-interest loan source for the City of Sisters.

Summary of Federal Grant and Loan Programs

Rural Development

RD can provide financial assistance to communities with a population of less than 10,000 through both loans and direct grants. Under the loan program, the agency purchases local bonds. The interest rate for these bonds is dependent on the MHI of the community and other factors and

varies from year to year based on other economic factors nationally. The market interest rate varies but has recently been approximately 2.5 to 3.5 percent with a repayment period of up to 40 years. Applying for this type of funding is a lengthy process involving development of an environmental report and a detailed funding application.

RD presently requires communities to establish average residential user costs in the range of similar systems with similar demographics. The objective of the RD loan/grant program is to keep the cost for utilities in small, rural communities at a level similar to what other communities are paying. Based on the City's MHI, it will likely not qualify for RD grants.

Another of the agency's requirements is that loan recipients establish a reserve fund of 10 percent of the bond repayment during the first 10 years of the project, which can make the net interest rate higher. The RD program requires either revenue or general obligation bonds to be established through the agency for the project (refer to the Local Financing Options section of this section for further discussion). These bonds can usually be purchased for a period of 40 years if grant funding is also received. A loan from RD may be an option for the City of Sisters to implement WWSI.

U.S. Economic Development Administration

The EDA has grant and loan funds like those available through Business Oregon's SPWF program. Monies are available to public agencies to fund projects that stimulate the economy of an area, and the overall goal of the program is to create or retain jobs. The EDA helps fund public works improvement projects in areas where new industries are locating or plan to locate in the future. In addition, the agency has a program known as the Public Works Impact Program to fund projects in areas with extremely high rates of unemployment. This program is targeted toward creating additional jobs and reducing the unemployment rate in the area. Unless the City's WWSI can be linked directly to industrial expansion or job retention, the City will likely not be in a competitive position to receive funding under these EDA programs.

Funding Summary

The DEQ's CWSRF program and RD appear to be the most attractive funding sources for the City's WWSI project. These programs appear to be funding sources that can provide the needed funds to potentially make the proposed improvements financially feasible for the City.

It is important for the City to consult with funding agencies early in the project development stages to understand which funding programs would provide the most attractive funding package for the proposed improvements. This consultation with funding agencies is usually done at a One Stop meeting, which is described in more detail later in this section. The remainder of this section focuses on evaluating loan capacities and funding options for the City's WWSI project, assuming the project is funded with a loan only and considering the programs' eligibility criteria described above.

Debt Capacity

To determine the City's ability to fund a WWSI project, Figures 7-1 and 7-2 were prepared. Figure 7-1 outlines the amount of debt capacity the City could service via their monthly sewer receipts, while Figure 7-2 outlines the amount of system development charge (SDC) revenue that would be required to service and/or offset loans of various quantities. Several assumptions were made, as follows:

- Wastewater user fee revenue is based on 2,228 equivalent dwelling units (EDUs).
- Wastewater system expenditures for the budget year 2021-22 were set at $1,362,568 per year. The budget year 2021-22 was used, as this was the most recent budget information available as provided by the City.
- Future debt service was calculated based on RD financing of 4 percent interest for a 40-year repayment period, a typical Business Oregon loan at 4 percent interest for a 20-year repayment period, and a CWSRF loan at 3 percent interest for a 20-year repayment period, depending on which financing program is able to assist the City.

Since the majority of the proposed improvements are required to increase the capacity of the City's wastewater collection, treatment, and disposal systems due to the substantial growth occurring and that is projected to continue, the majority of the proposed improvements are eligible for reimbursement by SDC revenue. Based on the components of each proposed improvements project that are required to address the need for additional capacity, Table 6-2 summarizes the amount of each capital improvement that would be eligible for different City revenue sources.

TABLE 6-2
CAPITAL IMPROVEMENTS BREAKDOWN BY REVENUE STREAM

Improvement	Anticipated Cost (2022 Dollars)	Sewer Operating Fund Eligible	Sewer Development Charge Eligible	Park Development Fund Eligible
Lazy Z Ranch Phase 1	$5,130,000	$0	$4,617,000	$513,000
Rope Street Lift Station Improvements	$624,000	$624,000	$0	$0
Westside Lift Station	$2,165,000	$0	$2,165,000	$0
Creekside Court Lift Station	$1,159,000	$1,159,000	$0	$0
Biosolids Removal	$200,000	$200,000	$0	$0
Lagoons No. 2 and 3 Aerator Replacement	$443,000	$221,500	$221,500	$0
Lazy Z Ranch Phase 2	$620,000	$0	$620,000	$0
Chlorine Contact System Improvements	$97,000	$97,000	$0	$0
Headworks Improvements	$471,000	$471,000	$0	$0
TOTAL IMPROVEMENTS COST	**$10,909,000**	**$2,772,500**	**$7,623,500**	**$513,000**

As shown on Table 6-2, approximately $7,623,500 (approximately 70 percent of the projected costs associated with the Capital Improvements Plan [CIP]) would be eligible for SDC revenue reimbursement. Additionally, based on the CIP outlined on Table 6-1 in Section 6 and the information presented on Table 6-2, a total of $9,078,000 is anticipated to be required for the short-term improvements (all projects planned for implementation within the next five years). Of the $9,078,000, $1,783,000 must be entirely paid for by the Sewer Operating Fund, while $6,782,000 would be eligible for SDC reimbursement and $513,000 would be eligible for reimbursement from the City's Park Development Fund.

Based on the financing information available when this WWFP Update was prepared and on Figures 7-1 and 7-2, wastewater rates could be approximately $60 per month for the estimated total project cost of $9,078,000, if the entire project were funded with only a loan and no reserve or SDC funds were used to

reduce the loan. However, the City has already accumulated a Sewer Operating Fund reserve of more than $1.5 million and an SDC reserve of approximately $2.5 million. Additionally, the City has an annual capital improvements budget of $353,000 and secured, via an agreement with the U.S. Forest Service, approximately $200,000 for construction of the Westside Lift Station. To adequately cover the $7,623,500 of SDC-eligible project costs without using the City's Sewer Operating Fund but instead allocating the $2.5 million dollars of SDC reserve to help cover the construction costs, the City would likely need to generate approximately $475,000 in annual SDC revenue based on the interest rate assumptions outlined above. Due to the existing economic climate, interest rates have been rising. As such, it is key the City set up a One Stop meeting with funding agencies as soon as possible to begin the process for securing low-interest loans.

Additional analysis should be performed during the next revision of this WWFP Update to determine the funding requirements and/or rate impacts for the remaining projects outlined in the CIP presented on Table 6-1. As these additional costs are much smaller than the short-term projects and the need for these projects may occur after existing debt service has been paid off, these long-term projects are anticipated to have a much lower impact on the City's sewer rates.

Therefore, the City's portion of the debt service income would be less than shown herein. In addition, retiring of an older existing debt payment will free up income to help support new debt. These potential rates confirm that it is important for the City to pursue lower interest rates to assist with project financing. As the City meets with the funding agencies and applies for loans, a more precise estimation of the impact to the City's sewer rates can be determined.

It is important to note that the estimated loan capacities shown on Figure 7-1 are based on the current EDU estimate and may need to be verified as project funding proceeds. It should be recognized that this is only a preliminary analysis and the financial assumptions and figures presented in this WWFP Update should be refined as project implementation proceeds in the future and as agreements are drafted with funding agencies.

Project Funding Options

To complete all the recommended improvements, low interest loan funds will need to be acquired. Actual funding amounts and breakdowns will be based on a financial review completed by each agency and could vary from the estimated amounts shown herein. Other potential funding measures may be available to the City to reduce the potential rate increase impact on the City's customers. It will be important for the City to work directly with a Business Oregon regional development officer, RD area specialist, and DEQ finance administrators to evaluate these options.

Project One Stop Meeting

To evaluate all potential project funding options, a One Stop meeting is generally requested by a city. One Stop meetings are often scheduled in Salem or the city, upon request, where representatives of RD, Business Oregon, and other funding agencies meet with the city to discuss the project and funding needs. This joint meeting provides a forum to evaluate and identify the most suitable funding package for the project and the city. After the meeting, the city is usually invited to submit a funding application to the preferred funding program(s) identified in the One Stop meeting.

Local Financing Options

Regardless of the ultimate project scope and agency from which loan funds may be obtained, the City of Sisters may need to develop authorization to incur debt (i.e., bonding) for the needed project improvements. The need to develop authorization to incur debt depends on funding agency requirements and provisions in the City Charter. RD requires a city to obtain bonding authorization to incur debt.

There are generally two options a city may use for its bonding authority: general obligation bonds and revenue bonds. General obligation bonds require a vote of the people to give the City the authority to repay the debt service through tax assessments, sewer rate revenues, or a combination of both. The taxing authority of the City provides the guarantee for the debt. Revenue bonds are financed through revenues of the wastewater system. Authority to issue revenue bonds can come in two forms. One would be through a local bond election similar to that needed to sell a general obligation bond, and the second would be through council action authorizing the sale of revenue bonds, if the City Charter allows. If citizens do not object to the bonding authority resolution during a 60-day remonstrance period, the City would have authority to sell these revenue bonds.

The RD program accepts either revenue bonds or general obligation bonds. Bonding is not required for the Business Oregon and CWSRF programs. Due to current tax measure limitations in the state of Oregon, careful consultation with experienced, licensed bonding attorneys needs to be made if the City of Sisters begins the process of obtaining bonding authority for the proposed WWSI. It would be wise for the City to consult their City Charter and attorney to see if debt for the wastewater system can be assumed.

In addition, the City can utilize SDCs to help fund projects that address growth-related capacity needs. SDCs are charges established by a city that developers must pay in order to connect to the sewer system.

PROPOSED WESTSIDE LIFT STATION SERVICE BASIN

EXISTING PRESSURE SEWER SYSTEM TO BE ABANDONED

PROPOSED CREEKSIDE LIFT STATION SERVICE BASIN

PROPOSED WESTSIDE LIFT STATION

PROPOSED CREEKSIDE LIFT STATION

WASTEWATER TREATMENT FACILITY IMPROVEMENTS SEE FIGURE 4-6

LAZY Z RANCH DISPOSAL AND IRRIGATION SITE

LEGEND

- EXISTING MANHOLE
- EXISTING SERVICE CLEANOUT
- PROPOSED LIFT STATION
- EXISTING LIFT STATION
- EXISTING LABORATORY
- PROPOSED GRAVITY SEWER MAIN
- PROPOSED PRESSURE SEWER LINE
- EXISTING GRAVITY SEWER MAIN
- EXISTING PRESSURE SEWER
- EXISTING SERVICE LINE
- PROPOSED BASIN
- LAZY Z RANCH DISPOSAL AND IRRIGATION SITE
- CITY LIMITS
- URBAN GROWTH BOUNDARY

1,500 0 1,500

SCALE IN FEET

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE

CAPITAL IMPROVEMENTS

FIGURE
6-1

Section 7 - Conclusions and Recommendations

Based on the Capital Improvements Plan, included on Table 7-1, a majority of the proposed improvements will be implemented in the short term. As a result, the City will want to pursue funding quickly to allow the expeditious implementation of the short-term capital improvements.

TABLE 7-1
CAPITAL IMPROVEMENTS PLAN

Improvement	Implementation Time Frame	Anticipated Cost (2022 Dollars)
Lazy Z Ranch Phase 1	Less than Five Years	$5,130,000
Rope Street Lift Station Improvements	Less than Five Years	$624,000
Westside Lift Station	Less than Five Years	$2,165,000
Creekside Court Lift Station	Less than Five Years	$1,159,000
Biosolids Removal	Five to Ten Years	$200,000
Lagoons No. 2 and 3 Aerator Replacement	Five to Ten Years	$443,000
Lazy Z Ranch Phase 2	More than Ten Years	$620,000
Chlorine Contact System Improvements	More than Ten Years	$97,000
Headworks Improvements	More than Ten Years	$471,000
TOTAL IMPROVEMENTS COST		**$10,909,000**

As discussed previously, the City of Sisters will need to coordinate directly with the Oregon Department of Environmental Quality (DEQ), U.S. Department of Agriculture Rural Development, and Business Oregon to pursue federal, state, and potentially local financing opportunities provided through low interest loans and potential grants. The proposed project implementation schedule has been included as Table 7-2.

TABLE 7-2
PROJECT IMPLEMENTATION PLAN

Item No.	Implementation Item	Time Frame
1.	Submit draft Wastewater Facilities Plan (WWFP) Update to City and agencies for review.	May 2023
2.	Finalize and adopt the WWFP Update.	Spring/Summer 2023
3.	Attend One Stop meeting.	Summer 2023
4.	Prepare and submit funding application(s) to appropriate agency(ies).	Summer/Fall 2023
5.	Finalize project funding.	Winter 2024
6.	Design system improvements.	Winter 2024 through Summer 2024
7.	Submit design documents for agency(ies) review.	Summer 2024
8.	Advertise, bid, and award construction project.	Winter 2024-25
9.	Project construction.	Winter 2025 through Winter 2026
10.	Project startup and construction completion.	Spring 2026
11.	Project closeout.	Summer 2026

Item No.	Implementation Item	Time Frame
12.	Monitor system performance to determine impact of improvements, report impacts to the DEQ, and determine the need for future improvements.	Two years after project closeout

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
PRELIMINARY SEWER RATE ANALYSIS FOR LOAN CAPACITY

RATE[1]		REVENUE		EXPENDITURES			FINANCING OPTIONS		
Account Charge (per month)	Total EDUs	Sewer Receipts[2]	Other[3]	Estimated OM&R Costs[4]	Existing Debt Service[5]	Revenue Available for Future Debt Service[6]	RD Loan Capacity[7]	Typical Business Oregon Loan Capacity[8]	CWSRF Loan Capacity[9]
$ 40.78	2,228	$ 1,090,500.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 159,932.00	$ -	$ -	$ -
$ 49.00	2,228	$ 1,310,064.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 379,496.00	$ 7,511,000.00	$ 5,157,000.00	$ 5,646,000.00
$ 50.00	2,228	$ 1,336,800.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 406,232.00	$ 8,040,000.00	$ 5,521,000.00	$ 6,044,000.00
$ 51.00	2,228	$ 1,363,536.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 432,968.00	$ 8,570,000.00	$ 5,884,000.00	$ 6,441,000.00
$ 52.00	2,228	$ 1,390,272.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 459,704.00	$ 9,099,000.00	$ 6,248,000.00	$ 6,839,000.00
$ 53.00	2,228	$ 1,417,008.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 486,440.00	$ 9,628,000.00	$ 6,611,000.00	$ 7,237,000.00
$ 54.00	2,228	$ 1,443,744.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 513,176.00	$ 10,157,000.00	$ 6,974,000.00	$ 7,635,000.00
$ 55.00	2,228	$ 1,470,480.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 539,912.00	$ 10,686,000.00	$ 7,338,000.00	$ 8,033,000.00
$ 56.00	2,228	$ 1,497,216.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 566,648.00	$ 11,216,000.00	$ 7,701,000.00	$ 8,430,000.00
$ 57.00	2,228	$ 1,523,952.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 593,384.00	$ 11,745,000.00	$ 8,064,000.00	$ 8,828,000.00
$ 58.00	2,228	$ 1,550,688.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 620,120.00	$ 12,274,000.00	$ 8,428,000.00	$ 9,226,000.00
$ 59.00	2,228	$ 1,577,424.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 646,856.00	$ 12,803,000.00	$ 8,791,000.00	$ 9,624,000.00
$ 60.00	2,228	$ 1,604,160.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 673,592.00	$ 13,332,000.00	$ 9,154,000.00	$ 10,021,000.00
$ 61.00	2,228	$ 1,630,896.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 700,328.00	$ 13,861,000.00	$ 9,518,000.00	$ 10,419,000.00
$ 62.00	2,228	$ 1,657,632.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 727,064.00	$ 14,391,000.00	$ 9,881,000.00	$ 10,817,000.00
$ 63.00	2,228	$ 1,684,368.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 753,800.00	$ 14,920,000.00	$ 10,244,000.00	$ 11,215,000.00
$ 64.00	2,228	$ 1,711,104.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 780,536.00	$ 15,449,000.00	$ 10,608,000.00	$ 11,612,000.00
$ 65.00	2,228	$ 1,737,840.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 807,272.00	$ 15,978,000.00	$ 10,971,000.00	$ 12,010,000.00
$ 66.00	2,228	$ 1,764,576.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 834,008.00	$ 16,507,000.00	$ 11,334,000.00	$ 12,408,000.00
$ 67.00	2,228	$ 1,791,312.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 860,744.00	$ 17,037,000.00	$ 11,698,000.00	$ 12,806,000.00
$ 68.00	2,228	$ 1,818,048.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 887,480.00	$ 17,566,000.00	$ 12,061,000.00	$ 13,203,000.00
$ 69.00	2,228	$ 1,844,784.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 914,216.00	$ 18,095,000.00	$ 12,424,000.00	$ 13,601,000.00
$ 70.00	2,228	$ 1,871,520.00	$ 79,000.00	$ 677,323.00	$ 332,245.00	$ 940,952.00	$ 18,624,000.00	$ 12,788,000.00	$ 13,999,000.00

Notes:

[1] The current base rate for wastewater is $40.78 per month per EDU.

[2] Budgeted revenue for the 2021-22 fiscal year from sewer receipts.

[3] Budgeted revenue for the 2021-22 fiscal year from service charges, licenses and fees, intergovernmental income, interest/loan proceeds, and miscellaneous income sources.

[4] Budgeted OM&R costs for the 2021-22 fiscal year (includes personnel services, materials and services, and capital improvements).

[5] Budgeted debt service for the 2021-22 fiscal year.

[6] Revenue available for future debt service = Sewer Receipts + Other revenue sources - Estimated OM&R Costs - Existing Debt Service. Does not include future increases in OM&R costs.

[7] Assumes loan funding at 4 percent for 40 years (does not assume any reserve payment). Values rounded to nearest $1,000.

[8] Assumes loan funding at 4 percent for 20 years (does not assume any reserve payment). Values rounded to nearest $1,000.

[9] Assumes loan funding at 3 percent for 20 years (does not assume any reserve payment). Values rounded to nearest $1,000.

CWSRF = Clean Water State Revolving Fund
EDU = equivalent dwelling unit
OM&R = Operation, maintenance, and replacement
RD = Rural Development

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
PRELIMINARY SEWER RATE ANALYSIS
FOR LOAN CAPACITY

FIGURE
7-1

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
PRELIMINARY SYSTEM DEVELOPMENT CHARGE REVENUE ANALYSIS FOR LOAN CAPACITY

REVENUE ANALYSIS			FINANCING OPTIONS		
SDC Revenue[1]	Existing Debt Service[2]	Revenue Available for Future Debt Service[3]	RD Loan Capacity[4]	Typical Business Oregon Loan Capacity[5]	CWSRF Loan Capacity[6]
$ 150,000.00	$ 76,000.00	$ 74,000.00	$ -	$ -	$ -
$ 175,000.00	$ 76,000.00	$ 99,000.00	$ 1,959,000.00	$ 1,345,000.00	$ 1,473,000.00
$ 200,000.00	$ 76,000.00	$ 124,000.00	$ 2,454,000.00	$ 1,685,000.00	$ 1,845,000.00
$ 225,000.00	$ 76,000.00	$ 149,000.00	$ 2,949,000.00	$ 2,025,000.00	$ 2,217,000.00
$ 250,000.00	$ 76,000.00	$ 174,000.00	$ 3,444,000.00	$ 2,365,000.00	$ 2,589,000.00
$ 275,000.00	$ 76,000.00	$ 199,000.00	$ 3,939,000.00	$ 2,704,000.00	$ 2,961,000.00
$ 300,000.00	$ 76,000.00	$ 224,000.00	$ 4,434,000.00	$ 3,044,000.00	$ 3,333,000.00
$ 325,000.00	$ 76,000.00	$ 249,000.00	$ 4,928,000.00	$ 3,384,000.00	$ 3,704,000.00
$ 350,000.00	$ 76,000.00	$ 274,000.00	$ 5,423,000.00	$ 3,724,000.00	$ 4,076,000.00
$ 375,000.00	$ 76,000.00	$ 299,000.00	$ 5,918,000.00	$ 4,064,000.00	$ 4,448,000.00
$ 400,000.00	$ 76,000.00	$ 324,000.00	$ 6,413,000.00	$ 4,403,000.00	$ 4,820,000.00
$ 425,000.00	$ 76,000.00	$ 349,000.00	$ 6,908,000.00	$ 4,743,000.00	$ 5,192,000.00
$ 450,000.00	$ 76,000.00	$ 374,000.00	$ 7,402,000.00	$ 5,083,000.00	$ 5,564,000.00
$ 475,000.00	$ 76,000.00	$ 399,000.00	$ 7,897,000.00	$ 5,423,000.00	$ 5,936,000.00
$ 500,000.00	$ 76,000.00	$ 424,000.00	$ 8,392,000.00	$ 5,762,000.00	$ 6,308,000.00
$ 525,000.00	$ 76,000.00	$ 449,000.00	$ 8,887,000.00	$ 6,102,000.00	$ 6,680,000.00
$ 550,000.00	$ 76,000.00	$ 474,000.00	$ 9,382,000.00	$ 6,442,000.00	$ 7,052,000.00
$ 575,000.00	$ 76,000.00	$ 499,000.00	$ 9,877,000.00	$ 6,782,000.00	$ 7,424,000.00
$ 600,000.00	$ 76,000.00	$ 524,000.00	$ 10,371,000.00	$ 7,121,000.00	$ 7,796,000.00
$ 625,000.00	$ 76,000.00	$ 549,000.00	$ 10,866,000.00	$ 7,461,000.00	$ 8,168,000.00
$ 650,000.00	$ 76,000.00	$ 574,000.00	$ 11,361,000.00	$ 7,801,000.00	$ 8,540,000.00
$ 675,000.00	$ 76,000.00	$ 599,000.00	$ 11,856,000.00	$ 8,141,000.00	$ 8,912,000.00
$ 700,000.00	$ 76,000.00	$ 624,000.00	$ 12,351,000.00	$ 8,480,000.00	$ 9,284,000.00

Notes:

[1]SDC Revenue quantity does not necessarily reflect an actual regular revenue but is instead meant to demonstrate hypothetical revenues required for various loan repayments.

[2]Existing debt service is from the City's purchase of the Lazy Z Ranch property.

[3]Revenue available for future debt service = SDC Revenue - Existing Debt Service.

[4]Assumes loan funding at 4 percent for 40 years (does not assume any reserve payment). Values rounded to nearest $1,000.

[5]Assumes loan funding at 4 percent for 20 years (does not assume any reserve payment). Values rounded to nearest $1,000.

[6]Assumes loan funding at 3 percent for 20 years (does not assume any reserve payment). Values rounded to nearest $1,000.

CWSRF = Clean Water State Revolving Fund
RD = Rural Development
SDC = System Development Charge

Appendices Table of Contents

APPENDIX A
Water Pollution Control Facilities Permit

WATER POLLUTION CONTROL FACILITIES PERMIT

Department of Environmental Quality
475 NE Bellevue Dr. Suite 110, Bend, OR 97701
Telephone: 541-388-6146
(541) 388-6146
Issued pursuant to ORS 468B.050

ISSUED TO:

City of Sisters
P.O. Box 39
Sisters, OR 97759

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Method of Disposal
Domestic Sewage	001	Recycled Water Reuse

SYSTEM TYPE AND LOCATION:

Domestic Sewage Lagoons
912 S. Locust Street
T15S, R10 EWM, S09; TL 1002
Longitude -121.538480;
Latitude 44.280506
Sisters, Oregon

RIVER BASIN INFORMATION:

Basin: Deschutes
Sub-Basin: Upper Deschutes
LLID: 1213357444600-20.47-N
County: Deschutes
Nearest surface stream which would receive waste if it were to discharge: Whychus Creek formally called Squaw Creek

Treatment System Class: I
Collection System Class: II

Issued in response to Application No. 968002 received December 17, 2010.

This permit is issued based on the land use findings in the permit record.

Don Butcher, Water Quality Permit Manager
Eastern Region

January 22, 2016
Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

All direct a discharge to surface waters is prohibited.

SCHEDULE A

Waste Disposal Limitations

1. The permittee is authorized to construct, operate, and maintain wastewater collection, treatment and disposal systems to serve the City of Sisters in accordance with the conditions set forth in this permit.

2. The wastewater collections, treatment and land application system must not be hydraulically or organically loaded in excess of their respective, DEQ approved design capacities. At full build-out, however, the annual average daily influent flow must not exceed 0.38 MGD.

3. All wastewater treatment and disposal systems must be operated in compliance with the following conditions:

   a. No discharge to state waters is permitted. All wastewater must be stored and treated for disposal by land application following sound irrigation practices.

   b. Recycled Wastewater
      i. Prior to land application of the recycled water, it must receive at least Class D treatment as defined in OAR 340-055. Class D recycled water must not exceed a 30-day log mean of 126 E. coli organisms per 100 milliliters and 406 E. coli organisms per 100 milliliters in any single sample. Class C recycled water must not exceed a 7 day median of 23 organisms/100 milliliters and no two consecutive samples must exceed 240 organisms/100 milliliters.
      ii. Irrigation must conform to a Recycled Water Use Plan approved by DEQ and meet the required setbacks as defined in OAR 340-055.
      iii. The City of Sisters must restrict public access to the reuse site(s) for the protection of public health.
      iv. Treated effluent may only be irrigated on land between April 1 through October 31 for dissipation by evapotranspiration and controlled seepage by following sound irrigation practices unless otherwise approved in writing by DEQ.
      v. Recycled water equipment must be operated so as to prevent:
         (A) Prolonged ponding of treated recycled water on the ground surface;
         (B) Surface runoff or subsurface drainage through drainage tile;
         (C) The creation of odors, fly and mosquito breeding or other nuisance conditions;
         (D) The overloading of land with nutrients, organics, or other pollutant parameters; and
         (E) Impairment of existing or potential beneficial uses of groundwater.
         (F) Until otherwise approved in writing by the Department via a revised reclaimed water use plan, treated effluent must only be reused on Class D beneficial uses.

4. The storage lagoon must be lowered sufficiently by the end of the irrigation season to ensure maximum practicable storage capacity during the non-irrigation months.

5. The permittee must, during all times of treatment and disposal, provide personnel whose primary responsibilities are to assure the continuous performance of the disposal system in accordance with the conditions of this permit.

6. No activities must be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater and process related residuals must be managed and disposed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040).

SCHEDULE B

1. System Monitoring Requirements

The permittee must monitor the operation and efficiency of all treatment and disposal facilities. Sampling and measurements taken as required herein must be representative of the nature of the wastewater, and must be taken under normal operating conditions. Unless otherwise agreed to in writing by the Department of Environmental Quality, data collected, and submitted must include but not necessarily be limited to the following parameters and minimum frequencies:

a. Influent Monitoring and Reporting Requirements

Table B 1: Influent Monitoring

Item or Parameter	Time Period	Minimum Frequency	Sample Type/Required Action	Report
Total Flow (MGD)	Year-round	Daily	Measurement	Daily totals Monthly maximum Monthly minimum Monthly average Monthly total
Flow Meter Verification	Year-round	Annually	Verification	Completed or not completed (Pass, Fail)
BOD_5 and TSS (mg/L)	Year-round	Weekly	Composite	Monthly averages Weekly values
pH (S.U.)	Year-round	3/week	Grab	Monthly maximum Monthly minimum Monthly average

b. Recycled Water Monitoring Requirements:

Table B2: Recycled Water Monitoring

Item or Parameter	Minimum Frequency	Sample Type/Required Action
Total Flow (MGD) or Quantity Irrigated (in/ac)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
Chlorine, Total Residual (mg/L)	Daily	Grab
pH	3/Week	Grab
E. coli Bacteria	1/Week	Grab*
Total Coliform	1/Week	Grab*
Total P and Total N	Annually	Grab
Annual Irigation		

*The permittee is only required to sample for either E. coli or total coliform, but not both for an individual use. If the permittee is irrigating on crops requiring only Class D quality effluent, E. coli must be monitored. If the permittee irrigates/reuses effluent for Class C uses, total coliform must be monitored.

2. Reporting Procedures

a. Monitoring results must be reported on DEQ approved forms. Reports must be submitted to DEQ's Eastern Region – Bend office by the 15th day of the following month.

b. State monitoring reports must identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports must also identify each system classification as found on page one of this permit.

c. Monitoring reports must also include a record of the quantity and method of use of all sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

d. The laboratory used by the permittee to analyze samples must have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results must be included in the report, but not used in calculations required by this permit. When possible, the permittee must re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

e. By no later than January 15 of each year, the permittee must submit to DEQ an annual report describing the effectiveness of the recycle water system to comply with the approved recycle water use plan, the rules of Division 55, and the limitations and conditions of this permit applicable to reuse of recycled water. The review is to provide a summary of land application conducted at each site which is adequate to demonstrate that reuse water was applied agronomically and/or hydraulic loading rates, and that required site management practices were followed.

SCHEDULE C

Compliance Conditions and Schedules

a. Within 180 days the permittee must update their recycled water use plan for DEQ approval. A recycled water use plan must describe how the wastewater treatment system owner will comply with OAR 340-055 (refer to OAR 340-055-0025).

b. The permittee is expected to meet the compliance date that have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director or his authorized representative may revise a schedule of compliance if he determines good and valid cause resulting from events over which the permittee has little or no control.

SCHEDULE D

Special Conditions

1. Prior to constructing or modifying any wastewater control facilities, detailed plans and specifications shall be approved in writing by DEQ. After approval of the plans, all construction shall be in strict conformance with the plans unless otherwise approved in writing by DEQ.

2. Within 6 months of such time as the sewage lagoons require removal of accumulated biosolids, the permittee shall submit a biosolids management plan that complies with the Department's biosolids management regulations as established in OAR 340-50.

3. This permit may be modified to incorporate any applicable standard for sewage sludge use or disposal promulgated under section 405(d) of the Clean Water Act, if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or controls a pollutant or practice not limited in this permit.

4. The permittee must, during all times of disposal, provide personnel to ensure the continuous performance of the disposal system within the limitations of this permit. In the event that any condition of this permit or DEQ rules are violated, the permittee must immediately take action to correct the violation and to notify DEQ **within 24 hours** at: DEQ's Eastern Region Water Quality Program Office (541) 388-6146.

   Response: In response to a notification, DEQ may conduct an investigation to evaluate the nature and extent of the problem, and may require additional corrective actions, as necessary. Compliance with this requirement does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

5. All materials and equipment, including but not limited to tanks, pumps, controls, valves, etc. must be installed, operated, and maintained in accordance with manufacturer's minimum specifications.

6. The permittee must immediately notify the DEQ Bend office (phone 388-6146) of any occurrence of surfacing sewage so corrective action can be coordinated between the permittee and DEQ. When the DEQ offices are not open, the permittee must report the incident to the Oregon Emergency Response System (phone 1-800-452-0311).

7. Emergency Response and Public Notification Plan

   a. The permittee must develop, and maintain and implement an Emergency Response and Public Notification Plan (the Plan) per Schedule F, Section B, and Conditions 5 & 6. The permit holder must develop the plan within six months of permit issuance and update the Plan annually to ensure that telephone and email contact information for applicable public agencies are current and accurate. An updated copy of the plan must be kept on file at the wastewater treatment facility for Department review. The latest plan revision date must be listed on the Plan cover along with the reviewer's initials or signature.

8. Recycled Water Use Plan

   a. In order to distribute recycled water for reuse, the permittee must develop, have and maintain and implement a DEQ-approved Recycled Water Use Plan meeting the requirements in OAR 340-055-0025. The permittee must submit substantial modifications to an existing plan to DEQ for approval at least 60 days prior to making the proposed changes. Conditions in the Plan are enforceable requirements under this permit.

9. The permittee must meet the requirements for use of recycled water under Division 55, including the following:

   a. All recycled water must be managed in accordance with the approved Recycled Water Use Plan. No substantial changes must be made in the approved plan without written approval by DEQ.

   b. The permittee must notify DEQ within 24 hours if it is determined that the treated effluent is being used in a manner not in compliance with OAR 340-055. When the DEQ offices are not open, the permittee must report the incident of noncompliance to the Oregon Emergency Response System (Telephone Number 1-800-452-0311).

   c. No recycled water must be made available to a person proposing to recycle unless that person certifies in writing that they have read and understand the provisions in Division 55. This written certification must be kept on file by the sewage treatment system owner and be made available to DEQ for inspection.

   e. Treated effluent must not be irrigated on ground that is frozen, snow-covered, or saturated with water. The volume of irrigated effluent and its total nitrogen loading must not exceed that established in a DEQ-approved recycled water use plan.

   f. Unless otherwise approved in writing by DEQ, a vegetative cover must be maintained on the land irrigation area at all times. Vegetation is to be periodically cut and removed to ensure maximum evapotranspiration and nutrient capture.

10. Operator Certification

The permittee must comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and designate a supervisor whose certification corresponds with the classification of the collection and/or treatment system as specified on page 1 of this permit.

   a. Definitions

      i. "Supervise" means to have full and active responsibility for the daily onsite technical operation of a wastewater treatment system or wastewater collection system.
      ii. "Supervisor" or "designated operator", means the operator delegated authority by the permittee for establishing and executing the specific practice and procedures for operating the wastewater treatment system or wastewater collection system in accordance with the policies of the owner of the system and any permit requirements.
      iii. "Shift Supervisor" means the operator delegated authority by the permittee for executing the specific practice and procedures for operating the wastewater treatment

system or wastewater collection system when the system is operated on more than one daily shift.

iv. "System" includes both the collection system and the treatment systems.

b. The permittee must have its system supervised by one or more operators who hold a valid certificate for the type of wastewater treatment or wastewater collection system, and at a grade equal to or greater than the wastewater system's classification as specified on page 1 of this permit.

c. The permittee's wastewater system may not be without the designated supervisor for more than 30 days. During this period, there must be another person available to supervisor who is certified at no more than one grade lower than the classification of the wastewater system. The permittee must delegate authority to this operator to supervise the operation of the system.

d. If the wastewater system has more than one daily shift, the permittee must have another properly certified operator available to supervisor operation of the system. Each shift supervisor, if any, must be certified at no more than one grade lower than the system classification.

e. The permittee is not required to have a supervisor on site at all times; however, the supervisor must be available to the permittee and operator at all times.

f. The permittee must notify DEQ in writing of the name of the system supervisor. The permittee may replace or re-designate the system supervisor with another properly certified operator at any time and must notify DEQ in writing within 30 days of replacement or re-designation of operator in charge. As of this writing, the notice of replacement or re-designation must be sent to Water Quality Division, Operator Certification Program, 2020 SW 4th Avenue, Suite 400, Portland, OR 97201. This address may be updated in writing by DEQ during the term of this permit.

g. When compliance with paragraph (c) of Item 8 in this section is not possible or practicable because the system supervisor is not available or the position is vacated unexpectedly, and another certified operator is not qualified to assume supervisory responsibility, the Director may grant a time extension for compliance with the requirements in response to a written request from the system owner. The Director will not grant an extension longer than 120 days unless the system owner documents the existence of extraordinary circumstances.

11. DEQ may reopen the Schedules in this permit, if necessary, to include new or revised conditions.

12. If warranted, at any time, DEQ may evaluate the need for or require a full assessment of the facilty's impact on groundwater quality.

SCHEDULE F

WPCF GENERAL CONDITIONS – DOMESTIC FACILITIES

SECTION A. STANDARD CONDITIONS

1. Duty to Comply with Permit

The permittee must comply with all conditions of this permit. Failure to comply with any permit condition is a violation of Oregon Revised Statutes (ORS) 468B.025 and grounds for an enforcement action. Failure to comply is also grounds for the Department to modify, revoke, or deny renewal of a permit.

2. Property Rights and Other Legal Requirements

Issuance of this permit does not convey any property rights of any sort, or any exclusive privilege, or authorize any injury to persons or property or invasion of any other rights, or any infringement of federal, tribal, state, or local laws or regulations.

3. Liability

The Department of Environmental Quality or its officers, agents, or employees may not sustain any liability on account of the issuance of this permit or on account of the construction or maintenance of facilities or systems because of this permit.

4. Permit Actions

After notice by the Department, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including but not limited to the following:

a. Violation of any term or condition of this permit, any applicable rule or statute, or any order of the Commission;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.

5. Transfer of Permit

This permit may not be transferred to a third party without prior written approval from the Department. The Department may approve transfers where the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of this permit and the rules of the Commission. A transfer application and filing fee must be submitted to the Department.

6. Permit Fees

The permittee must pay the fees required by Oregon Administrative Rules.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

At all times the permittee must maintain in good working order and properly operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to comply with the terms and conditions of this permit.

2. Standard Operation and Maintenance

All waste collection, control, treatment, and disposal facilities or systems must be operated in a manner consistent with the following:

a. At all times, all facilities or systems must be operated as efficiently as possible in a manner that will prevent discharges, health hazards, and nuisance conditions.

b. All screenings, grit, and sludge must be disposed of in a manner approved by the Department to prevent any pollutant from the materials from reaching waters of the state, creating a public health hazard, or causing a nuisance condition.

c. Bypassing untreated waste is generally prohibited. Bypassing may not occur without prior written permission from the Department except where unavoidable to prevent loss of life, personal injury, or severe property damage.

3. Noncompliance and Notification Procedures

If the permittee is unable to comply with conditions of this permit because of surfacing sewage; a breakdown of equipment, facilities or systems; an accident caused by human error or negligence; or any other cause such as an act of nature, the permittee must:

a. Immediately take action to stop, contain, and clean up the unauthorized discharges and correct the problem.

b. Immediately notify the Department's Regional office so that an investigation can be made to evaluate the impact and the corrective actions taken, and to determine any additional action that must be taken.

c. Within 5 days of the time the permittee becomes aware of the circumstances, the permittee must submit to the Department a detailed written report describing the breakdown, the actual quantity and quality of waste discharged, corrective action taken, steps taken to prevent a recurrence, and any other pertinent information.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or liability for failure to comply.

4. Wastewater System Personnel

The permittee must provide an adequate operating staff that is duly qualified to carry out the operation, maintenance, and monitoring requirements to assure continuous compliance with the conditions of this permit.

5. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs that threatens public health, the permittee must take such steps as are necessary to alert the public, health agencies and other affected entities (e.g., public water systems) about the extent and nature of the discharge in accordance with the notification procedures developed under General Condition B.6. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

6. Emergency Response and Public Notification Plan

The permittee must develop and implement an emergency response and public notification plan that identifies measures to protect public health from overflows, bypasses or upsets that may endanger public health. At a minimum the plan must include mechanisms to:

a. Ensure that the permittee is aware (to the greatest extent possible) of such events;
b. Ensure notification of appropriate personnel and ensure that they are immediately dispatched for investigation and response;
c. Ensure immediate notification to the public, health agencies, and other affected public entities (including public water systems). The overflow response plan must identify the public health and other officials who will receive immediate notification;
d. Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained;
e. Provide emergency operations; and
f. Ensure that DEQ is notified of the public notification steps taken.

SECTION C. MONITORING AND RECORDS

1. Inspection and Entry

The permittee must at all reasonable times allow authorized representatives of the Department to:

a. Enter upon the permittee's premises where a waste source or disposal system is located or where any records are required to be kept under the terms and conditions of this permit;

b. Have access to and copy any records required by this permit;

c. Inspect any treatment or disposal system, practices, operations, monitoring equipment, or monitoring method regulated or required by this permit; or

d. Sample or monitor any substances or permit parameters at any location at reasonable times for the purpose of assuring permit compliance or as otherwise authorized by state law...

2. Averaging of Measurements

Calculations of averages of measurements required for all parameters except bacteria must use an arithmetic mean; bacteria must be averaged as specified in the permit.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures specified in the most recent edition of **Standard Methods for the Examination of Water and Wastewater**, unless other test procedures have been approved in writing by the Department and specified in this permit.

4. Representative Sampling

Sampling and measurements taken as required herein must be representative of the volume and nature of the monitored discharge when discharging or land applying. Monitoring points must not be changed without notification to and the approval of DEQ.

5. Retention of Records

The permittee must retain records of all monitoring and maintenance information, including all calibrations, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. The Department may extend this period at any time.

SECTION D. REPORTING REQUIREMENTS

1. Plan Submittal

Pursuant to Oregon Revised Statute 468B.055, unless specifically exempted by rule, construction, installation, or modification of disposal systems, treatment works, or sewerage systems may not commence until plans and specifications are submitted to aud approved in writing by the Department. All construction, installation, or modification shall be in strict conformance with the Department's written approval of the plans.

2. Change in Discharge

Whenever a facility expansion, production increase, or process modification is expected to result in a change in the character of pollutants to be discharged or in a new or increased discharge that will exceed the conditions of this permit, a new application must be submitted together with the necessary reports, plans, and specifications for the proposed changes. A change may not be made until plans have been approved and a new permit or permit modification has been issued.

3. Signatory Requirements

All applications, reports, or information submitted to the Department must be signed and certified by the official applicant of record (owner) or authorized designee.

4. Twenty-Four Hour Reporting

The permittee must report any noncompliance that may endanger health or the environment. Any information must be provided orally (by telephone) to DEQ or to the Oregon Emergency Response System (1-800-452-0311) as specified below within 24 hours from the time the permittee becomes aware of the circumstances.

a. Overflows.

(1) Oral Reporting within 24 hours.

i. For overflows other than basement backups, the following information must be reported to the Oregon Emergency Response System (OERS) at 1-800-452-0311. For basement backups, this information should be reported directly to DEQ.

a) The location of the overflow;
b) The receiving water (if there is one);
c) An estimate of the volume of the overflow;
d) A description of the sewer system component from which the release occurred (e.g., manhole, constructed overflow pipe, crack in pipe); and
e) The estimated date and time when the overflow began and stopped or will be stopped.

ii. The following information must be reported to the Department's Regional office within 24 hours, or during normal business hours, whichever is first:

a) The OERS incident number (if applicable) along with a brief description of the event.

(2) Written reporting within 5 days.

i. The following information must be provided in writing to the Department's Regional office within 5 days of the time the permittee becomes aware of the overflow:

a) The OERS incident number (if applicable);
b) The cause or suspected cause of the overflow;
c) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
d) Steps taken or planned to mitigate the impact(s) of the overflow and a schedule of major milestones for those steps; and
e) (for storm-related overflows) The rainfall intensity (inches/hour) and duration of the storm associated with the overflow.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

b. Other instances of noncompliance.

(1) The following instances of noncompliance must be reported:

i. Any unanticipated bypass that exceeds any effluent limitation in this permit;
ii. Any upset that exceeds any effluent limitation in this permit;
iii. Violation of maximum daily discharge limitation for any of the pollutants listed by the Department in this permit; and
iv. Any noncompliance that may endanger human health or the environment.

(2) During normal business hours, the Department's Regional office must be called. Outside of normal business hours, the Department must be contacted at 1-800-452-0311 (Oregon Emergency Response System).

(3) A written submission must be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission must contain:

i. A description of the noncompliance and its cause;
ii. The period of noncompliance, including exact dates and times;
iii. The estimated time noncompliance is expected to continue if it has not been corrected;
iv. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and
v. Public notification steps taken, pursuant to General Condition B.6.

(4) The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

SECTION E. DEFINITIONS

1. *BOD_5* means five-day biochemical oxygen demand.
2. *TSS* means total suspended solids.
3. *FC* means fecal coliform bacteria.
4. *NH_3-N* means Ammonia Nitrogen.
5. *NO_3-N* means Nitrate Nitrogen.
6. *NO_2-N* means Nitrite Nitrogen.
7. *TKN* means Total Kjeldahl Nitrogen.
8. *Cl* means Chloride.
9. *TN* means Total Nitrogen.
10. "*Bacteria*" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.
11. *Total residual chlorine* means combined chlorine forms plus free residual chlorine.
12. *mg/l* means milligrams per liter.
13. *ug/l* means micrograms per liter.
14. *kg* means kilograms.
15. *GPD* means gallons per day.
16. *MGD* means million gallons per day.
17. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.
18. *Composite sample* means a combination of samples collected, generally at equal flow or time intervals over a 24-hour period.
19. *Week* means a calendar week of Sunday through Saturday.
20. *Month* means a calendar month.
21. *Quarter* means January through March, April through June, July through September, or October through December.

Permit Evaluation Report

Oregon Department of Environmental Quality
Eastern Region – Bend Office
475 NE Bellevue Drive, Suite 110
Bend, OR 97701

State of Oregon Department of Environmental Quality

Permittee:	City of Sisters P.O. Box 39 Sisters, OR 97759
File Information:	File Number: 81850 Permit Number: 101779 Expiration Date: December 31, 2025
Source Contact:	Paul Bertagna 541-323-5212
Facility Name & Location:	Sisters Wastewater Treatment Plant 912 S. Locust Street; Sisters OR 97759 T15S, R10EWM, S09; Tax Lot 1002 and 1002A1 Longitude -121.538480; Latitude 44.280506 Deschutes County
LLID:	LLID: 1213357444600-20.47-N
Receiving Stream/Basin:	Whychus Creek (no discharge) – formally called Squaw Creek; USGS Deschutes Basin; Upper Deschutes Sub-basin
Proposed Action:	Issue Permit Application Number: 968002 Date Received: December 17, 2010
Source Category:	Domestic
Sources Covered:	Domestic Sewage Lagoon and Irrigation Reuse
Permit Type:	WPCF-Domestic
Permit Writer:	Lawrence Brown REHS Environmental Health Specialist Date Prepared: November 13, 2015

Introduction

The City of Sisters operates a domestic sewage wastewater collection and treatment system under a DEQ Water Pollution Control Facility (WPCF) permit #101779 which was last issued on July 12, 2005. This permit has an expiration date of February 28, 2011. However, because DEQ received a timely WPCF permit renewal application from the City of Sisters their permit remains in effect pursuant to OAR 340-045-0040.

In response to the City of Sisters permit renewal application, I have drafted a proposed permit for permit issuance. My evaluation report describes any concerns as well as permit requirements for effluent limitations, monitoring and reporting, compliance schedules, and special conditions necessary to carry out state and federal law.

Land Use Approval

On file is a signed land use compatibility statement from the Deschutes County Planning Department dated July 26, 1999 for a municipal wastewater treatment facility indicating that the use is compatible with the Land Conservation and Development Commission-acknowledged comprehensive plan or complies with statewide planning goals.

Wastewater Treatment Facilities Description

The City of Sisters wastewater treatment system consists of a collection system that collects sewage and directs it to various pump stations where sewage is then pumped to a three-cell aerated lagoon system with winter holding capacity. The wastewater treatment plant and effluent reuse site for the City of Sisters is located on the south ½ of Section 9, Township 15 South, Range 10 East of the Willamette Meridian.

Treatment is provided with two 2.41 acre aerated lagoons followed by an 18 acre storage lagoon and 100.3 acres of land utilized for automated land irrigation reuse purposes (88.5 acres of natural forest land and 11.8 acres of lagoon dikes consisting of pasture grass). The land reuse system diverts the majority of the effluent to the natural forest area. Prior to land application of the recycled water to the forest area, it must receive at least Class D treatment as defined in OAR 340-055.

The City of Sisters uses chlorination to meet this treatment level Class D where Class D recycled water must not exceed a 30-day log mean of 126 E. coli organisms per 100 milliliters and no more than 406 E. coli organisms per 100 milliliters in any single sample. With this level of treatment it is required that the site be restricted to public access for public health protection. Managing access and exposure to recycled water is the primary mechanism for protection of public health at reuse sites.

The City is currently limited to the quantity of treated effluent that can be land applied on the existing 100.3 acre land application reuse site. For future increase in flows the City looked at expanding their irrigation reuse sites to include the Lazy Z Ranch. This would allow for expansion of waste water disposal capacity and provide in-stream benefits to Whychus Creek by transferring irrigation water rights back to Whychus Creek.

The City of Sisters then purchased the Lazy Z Ranch property which includes both: T15, R10, S10; TL 704 (105.26 acres) and T15, R10, S15; TL 200 (125.68 acres) for a total of 230.94 acres. However, only TL 200 has received land use approval, to date, from Deschutes County - signed and dated August 6, 2008. The use of effluent on this property was found to be in compliance with applicable local land use regulations.

In November of 2006, DEQ evaluated the Lazy Z Ranch site for the use of recycled water for beneficial purposes. The soils mostly consist of a sandy loam to loamy sand ranging 30 to 45 inches in soil depth. DEQ determined that the site appeared to be suitable for the land application of treated effluent and should be able to support a crop for nutrient removal. However, before using this site the City is required to update their recycled water reuse plan for DEQ approval.

Environmental Issues
The aquifer, which will receive the percolate from the spray field is about 15 feet below the ground surface during the growing season. In review of their recycled water reuse plan and past operations DEQ has determined that the application rates and site management practices for the land application activities are protective of public health and have a low potential for adversely impacting groundwater quality.

Based on DEQ's screening criteria for groundwater review no further groundwater information is needed at this time. However, DEQ may evaluate the need for a full assessment of the facility's impact on groundwater quality at the next permit renewal or sooner if there is any evidence of an adverse impact resulting from the facilities operation or the facility fails to operate in accordance with permit conditions.

Compliance History
The most recent DEQ inspection was conducted on August 25, 2015. The City of Sisters was found to be in compliance with permit conditions. Additionally, no compliance issues have been documented in file for the permit period.

As a permit condition, the permittee must report incidents of noncompliance.

PROPOSED PERMIT LIMITS AND CONDITIONS

Schedule A - Waste Disposal Limitations
No discharge to state waters is permitted. All wastewater is treated in aerated lagoons, stored through the non-irrigation season and irrigated on DEQ approved land application sites following sound irrigation management practices. Additionally, the wastewater collections, treatment and land application system must not be hydraulically or organically loaded in excess of their respective, DEQ approved design capacities. Recycled water must conform to a recycled water use plan approved by DEQ. Prior to land application recycled water must be treated to at least Class D as stipulated in OAR 340-055.

Effluent is irrigated at agronomic rates and only during the irrigation season. In addition, the lagoon cells are lined to prevent leakage. Based upon this, the Department believes the proposed facility will have no adverse impact on groundwater quality and therefore complies with the Department's groundwater protection regulations in OAR 340-40.

Schedule B - Minimum Monitoring and Reporting Requirements
The monitoring requirements of Schedule B are the primary means of ensuring that permit limitations are being met. The monitoring data also provides DEQ with information to evaluate the performance of the wastewater treatment facility. The authority to require periodic reporting by permittee's is included in ORS 468.065(5). The proposed monitoring and reporting requirements are based upon DEQ's monitoring and reporting requirements for similar facilities of this type and size.

Schedule C - Compliance Conditions and Schedules:
DEQ is requesting that the permittee submit an updated water reuse plan for DEQ approval.

Schedule D - Special Conditions:
Prior to constructing new or modifying existing wastewater systems, detailed plans and specifications must be submitted to DEQ for review and approval in writing. Qualified personnel must also be available to operate and maintain the wastewater treatment system to help ensure that the wastewater treatment facility functions as designed. Additionally, this section includes operator certification requirements to assure an appropriate operator for this type of wastewater system. The operator certification level as

listed on the front page of the permit was calculated using DEQ's Certified Operator Determination Worksheet – See Appendix A of this evaluation report. This is a change from the prior permit where the number of people served has increased putting the collection system in a Class II category.

This schedule also contains the normal conditions for facilities that reuse reclaimed wastewater. DEQ is not requiring a biosolids management plan at this time since the system will not routinely remove, treat and dispose of biosolids. A plan will be required, however, at such time as biosolids are needed to be removed from the system.

Schedule F – General Conditions:
This schedule includes conditions and definitions that are applicable to all WPCF permits in Oregon of this type.

Public Participation
The City of Sisters has submitted a complete permit renewal application. DEQ should send the draft permit documents to the applicant for review and comment, and then proceed with a Category II permitting action for public notification.

Appendix A – Certified Operator Determination Worksheet

Oregon Department of Environmental Quality

Wastewater System Classification Worksheet for Operator Certification

STEP 1: Criteria for Classifying Wastewater Treatment Systems (OAR 340-049-0025)					
Wastewater System Common Name:	Sisters Wastewater Treatment Plant				
Location:	912 S. Locust St.; Sisters OR 97759		Region:	Eastern Region	
County:	Deschutes		Date:		
Facility ID:	File #81850; Permit #101779		Classified by:	LMB	
Design ADWF (Influent MDG):	0.38 MGD		**WWC Class:**	II	
Design Population*:	3747		WWT Class:	I	
Design BOD (Influent lbs/day):			or SWWS:		
			If SWWS, connections:		
Is this a change from a prior classification?	Yes		Total Points:	26	
1. Design Population	3747	or Population Equivalent			
Based on:	Flow (gallons/person/day)	99.3	BOD (pounds/person/day)	0.256	
2,001 to 5,000				1.5	1.5
2. Average Dry Weather Flow (Design Capacity)					
Greater than 0.1 to 0.5 MGD				1.5	1.5
3. Unit Processes					
Preliminary Treatment and Plant Hydraulics					
Grit Removal (mechanical)				2.0	2.0
Screen(s) (in-situ or mechanical, coarse solids only)				1.0	1.0
Pump/Lift Station(s) (pumping of main flow)				2.0	2.0
Secondary, Advanced, and Tertiary Treatment					
Stabilization Lagoons (1 or more cells with primary aeration)				7.0	7.0
Disinfection					
Liquid Chlorine Disinfection				2.0	2.0
6. Sampling and Laboratory Testing					
Sample for BOD, Total Suspended Solids (performed by outside lab)				2.0	
BOD or Total Suspended Solids analysis (performed at treatment plant)				4.0	4.0
Bacteriological analysis (performed by outside lab)				1.0	
Bacteriological analysis (performed at wastewater treatment plant lab)				2.0	
Nutrient, Heavy Metals, or Organic analysis (performed by outside lab)				*3.0	1.0
STEP 2: Complexity Reflected in OAR 340-049 0020(4)					
Note: *This step may justify a higher classification. Points shown are given as guidance.*					
Class B, C, D and Non-disinfected Recycle (surface & subsurface)				3.0	3.0
Standby power				1.0 - 3.0	1.0
Description:					
				Total	26.0

Small Wastewater Treatment and Collection Systems			
less than 500 design population or < 150 connections, and 30 total points or less			
Wastewater Treatment Systems		**Wastewater Collection Systems**	
Class I:	30 total points or less	**Class I:**	1,500 or less design population
Class II:	31-55 total points	**Class II:**	1,501 15,000 design population
Class III:	56-75 total points	**Class III:**	15,001 to 50,000 design population
Class IV:	76 or more points	**Class IV:**	50,001 or more design population

APPENDIX B
2016 Recycled Water Use Plan

Oregon Department of Environmental Quality

RECYCLED WATER USE PLAN SUMMARY

Directions: Check (✓) appropriate boxes for tables and provide brief narrative where necessary. Submit with Recycled Water Use Plan to DEQ.

State of Oregon Department of Environmental Quality

APPLICANT INFORMATION

Facility Name: City of Sisters Waste Water Treatment Plant
Address: 912 S. Locust Street, Sisters OR 97759
Contact Name/Phone Number: Paul Bertagna/541-323-5212

TYPE OF WASTEWATER TREATMENT PLANT

☐	Activated Sludge	☐	Re-circulating Gravel/Sand Filter
☐	Mechanically Aerated Lagoon	☐	Rotating Biological Filter
☑	Aerated Lagoon	☐	Other (Specify):

Average Dry Weather Flow, million gallons per day (MGD): _____

TREATMENT CLASS IN ACCORDANCE WITH OAR 340-055-0012

☐	Class A	☐	Class C
☐	Class B	☑	Class D
☐	Non-Disinfected water		

TREATMENT EFFICIENCY CAPABILITY DURING REUSE

☐	Tertiary Treatment	☐	85% or more BOD/TSS removal
☐	95% or more BOD/TSS removal	☐	Rotating Biological Filter
☐	90% or more BOD/TSS removal	☑	Other (Specify): 80% TSS removal efficiency

DISINFECTION METHOD

☑	Chlorine injection just prior to irrigation
☐	Chlorine injection with storage of recycled water
☐	Chlorine injection after storage just prior to irrigation
☐	UV exposure just prior to irrigation
☐	UV exposure with storage of recycled water
☐	UV exposure after storage just prior to irrigation
☐	Other (specify):

STORAGE IMPOUNDMENT	Y	N
Is there a storage facility proposed for this project?	☐	☑
If yes, at the WWTP	☐	☑
If yes, located at a location other than the WWTP	☐	☑

If yes to either of the above, specify the location and length of time the storage facility will be used:

ARE THERE ALARMS FOR VARIOUS UNIT PROCESSES?	Y	N
Are alarms independent of the normal power supply of the plant?	☐	☑
Failure of a disinfection treatment process?	☑	☐
Failure of a clarification process? N/A	☐	☐
Failure of a coagulation process? N/A	☐	☐
Failure of a filtration process? N/A	☐	☐
Are the alarms on separate circuit breakers from the reuse pumps?	☑	☐
Is the Recycled Water back-up generator tested regularly? N/A	☐	☐

IN THE EVENT OF POWER LOSS:	Y	N
Can the plant continue to discharge?	☐	☑
Can there be any irrigation of non-disinfected water?	☐	☑

If no to either of the above, specify control measures that will be in place to stop the irrigation as soon as possible.

The irrigation pumps cannot operate without power so the entire system will not run and the auto-dialer will call out to our on-call personnel that there has been a power outage.

RECYCLED WATER WILL BE BENEFICIALLY USED FOR THE FOLLOWING (CHECK ALL THAT APPLY):

✓	Beneficial Purpose	Class				
		A	B	C	D	ND
	Irrigation					
☑	Fodder, fiber, seed crops not intended for human ingestion, commercial timber	Y	Y	Y	Y	Y
☐	Firewood, ornamental nursery stock, Christmas trees	Y	Y	Y	Y	N
☐	Sod	Y	Y	Y	Y	N
☐	Pasture for animals	Y	Y	Y	Y	N
☐	Processed food crops	Y	Y	Y	N	N
☐	Orchards or vineyards if an irrigation method is used to apply recycled water directly to the soil	Y	Y	Y	N	N
☐	Golf courses, cemeteries, highway medians, industrial or business campuses	Y	Y	Y	N	N
☐	Any agricultural or horticultural use	Y	N	N	N	N
☐	Parks, playgrounds, school yards, residential landscapes, other landscapes accessible to the public	Y	N	N	N	N
☐	**Industrial, Commercial, or Construction**					
☐	Industrial cooling	Y	Y	Y	N	N
☐	Rock crushing, aggregate washing, mixing concrete	Y	Y	Y	N	N
☐	Dust control	Y	Y	Y	N	N
☐	Nonstructural fire fighting using aircraft	Y	Y	Y	N	N
☐	Street sweeping or sanitary sewer flushing	Y	Y	Y	N	N
☐	Stand alone fire suppression systems in commercial and residential buildings	Y	Y	N	N	N
☐	Non-residential toilet or urinal flushing, floor drain trap priming	Y	Y	N	N	N
☐	Commercial car washing	Y	N	N	N	N
☐	Fountains when the water is not intended for human consumption	Y	N	N	N	N

✓	Beneficial Purpose	Class				
		A	B	C	D	ND
☐	**Impoundments or Artificial Groundwater Recharge**					
☐	Water supply for landscape impoundments including, but not limited to, golf course water ponds and non-residential landscape ponds	Y	Y	Y	N	N
☐	Restricted recreational impoundments	Y	Y	N	N	N
☐	Nonrestricted recreational impoundments including, but not limited to, recreational lakes, water features accessible to the public, and public fishing ponds	Y	N	N	N	N
☐	Artificial groundwater recharge	Y	N	N	N	N
☐	**Other (describe):**					

PAGES 4 & 5 REQUIRED FOR IRRIGATION ONLY

THE IRRIGATION AREA WILL BE USED FOR THE FOLLOWING (CHECK ALL THAT APPLY):

☑	Crops (specify types): Orchard Grass
☐	Pasture
☑	Forest
☐	Public access areas (specify types):
☐	Natural areas (specify species or mix):
☐	Other (specify):

APPLICATION RATE	Y	N
Will irrigation be controlled not to exceed the water consumption rate of the crop being grown?	☑	☐
Will irrigation be controlled not to exceed the nutrient requirements of the crop being grown?	☑	☐

What is the proposed application rate of the recycled water? Varies, see RWUP Section 7.0

Acreage of irrigation site Varies, see RWUP Section 7.0

The months that irrigation will be permitted April to October

If irrigation occurs with Class C recycled water at nighttime, will the public access be restricted to allow for sunlight contact on irrigated water? ☐ Yes ☐ No N/A

If so, specify length of time _____

TRANSMISSION & DISTRIBUTION LINES/PIPES	Y	N
At the end of the irrigation day, will the transport lines/pipes be drained back to the wastewater treatment facility?	☐	☑
Is there a gate/ball shut off valve at the irrigation pump?	☑	☐
Is there an in line pressure relief valve to by-pass reuse water back into the source basin if there is a line transmission plug?	☐	☑
At the cessation of the irrigation season, will the transport lines/pipes be flushed and cleaned?	☐	☑
Is there a gate/ball shut off valve at the irrigation field, or at each irrigation zone?	☑	☐

ZONED LAND USE OF IRRIGATION SITE (CHECK ALL THAT APPLY)

☑	Exclusive Farm Use (EFU)	☐	Industrial
☐	Forestry	☐	State/Federal lands
☐	Rural Residential	☐	Other (Specify):

ZONED LAND USE OF AREA AROUND IRRIGATION SITE (CHECK ALL THAT APPLY)

☑	Exclusive Farm Use (EFU)	☐	Industrial
☐	Forestry	☐	State/Federal lands
☐	Rural Residential	☐	Other (Specify):

Prevailing wind direction during irrigation season (specify): North

Will irrigation be restricted when winds exceed 10 MPH?: Yes

THE NEAREST DEVELOPED PROPERTY FROM IRRIGATION SITE (ft):

North boundary: 1455' to TL 1510100000708
South boundary: 155' to TL 1510140000800 (SOUTHEAST)
East boundary: 120' to TL 1510140000400 AND TL 151040000300
West boundary: 1385' to TL 1510000001401 (NORTHWEST)
What is the nearest developed property downwind of irrigation site (specify type and distance): TL 1510100000708, Single Family Residence, zoned EFUSC.
Are there any playgrounds, schools, or public parks within ½ mile of irrigation site? (specify): No.

DOMESTIC WELLS	**Y**	**N**
Are there any domestic wells or other domestic water sources located within the irrigation site?	☐	☑
Are there any domestic wells or other domestic water sources located within 150', 100, or 50' of the irrigation site?	☐	☑
If yes to either of the above, identify the number of wells or sources and identify their location on the attached site plan.		

POTENTIAL RUN-OFF POINTS ARE LOCATED AT THE (CHECK ALL THAT APPLY):

☐	North boundary (specify): ALL RUNOFF WILL BE CONTROLLED ON SITE
☐	South boundary (specify):
☐	East boundary (specify):
☐	West boundary (specify):

PUBLIC ACCESS WILL BE CONTROLLED BY THE FOLLOWING (CHECK ALL THAT APPLY):

☑	No trespassing or warning signs (specify spacing): 200'
☑	Fencing (specify type): Barb Wire
☐	Other (specify):

BARRIERS ON BOUNDARIES THAT MAY MITIGATE AEROSOL DRIFT (CHECK ALL THAT APPLY)

☑	Natural vegetation (specify height and width): Ponderosa Pine and Juniper, up to 2' diameter, and 50' height.
☐	Natural topography (specify):
☐	Tree or fence row (specify height):
☑	Other (specify): native shrubs and grasses
☐	None:

IRRIGATION METHOD (CHECK ALL THAT APPLY)

☑	Set sprinkler heads with spray height of 20'____ and spray diameter of 140'____
☐	Wheel irrigation line with spray height of _____ and spray diameter of _____
☐	Big gun irrigation with spray height of _____ and spray diameter of _____
☐	Other (specify):

IRRIGATION EQUIPMENT SPECIFICATIONS (insert more rows as needed)

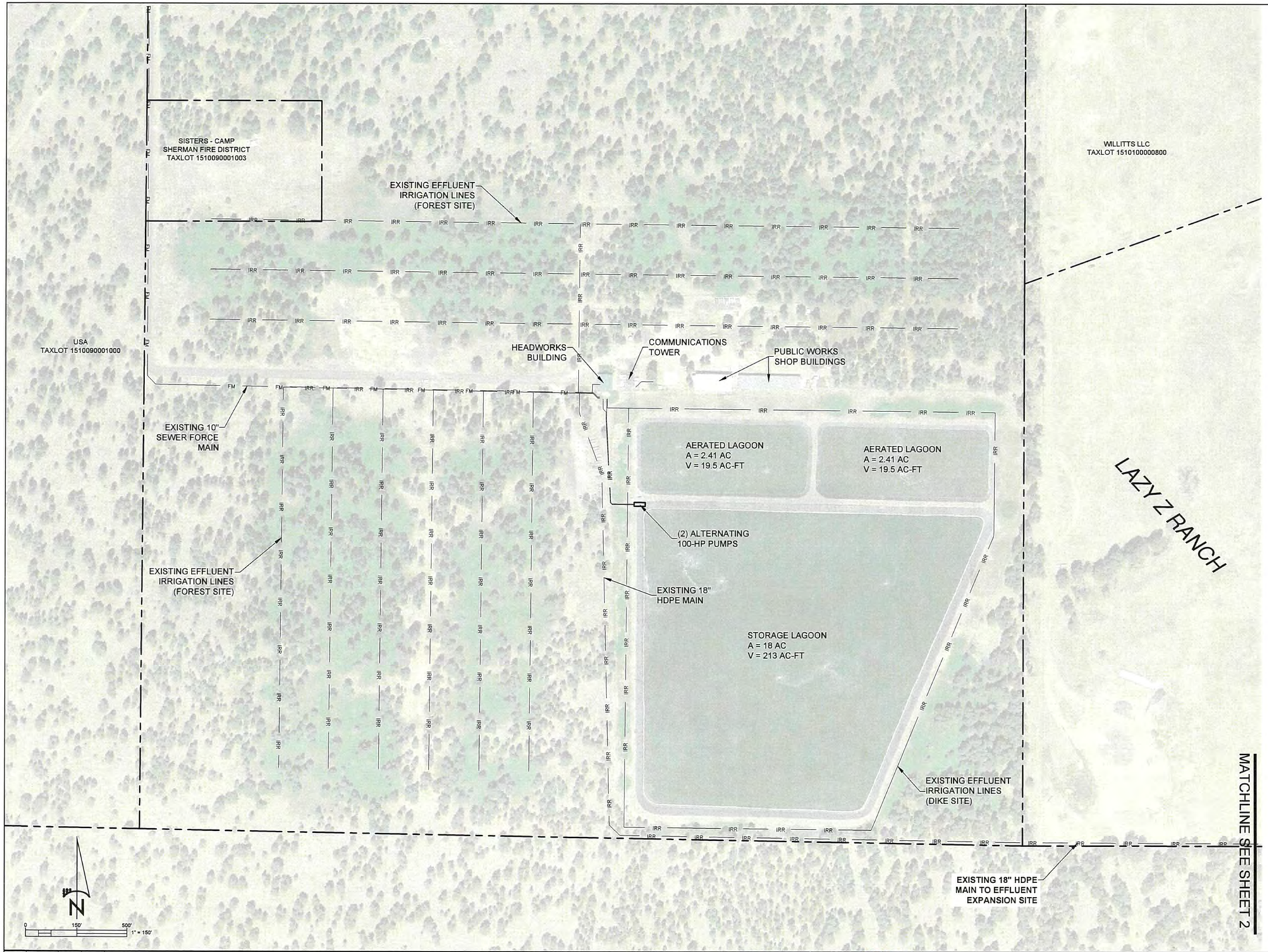
Sprinkler head types (brand and model)	Irrigation zones/cells	PSI operating ranges
RAINBIRD, RAIN GUN SR3003/F3002	4 - 6 Zones	40 TO 100 PSI

REQUIRED ATTACHEMENTS:

1. Overhead scale diagram/plan view of the wastewater treatment plant that identifies the treatment and disinfection components of the plant.
2. Overhead scale diagram/plan view of the transport line from wastewater treatment plant to the reuse area.
3. Overhead scale diagram/plan of the irrigation site showing surrounding properties and irrigation system layout.
4. A full copy of the Recycled Water Use Plan.

HEALTH DIVISION REVIEW COMMENTS:

Print Form



SITE NOTES:

GENERAL:

OWNER/APPLICANT:	CITY OF SISTERS
PROPERTY:	WASTE WATER TREATMENT PLANT
PROPERTY ADDRESS:	1000 SOUTH LOCUST ST., SISTERS, OR, 97759
PROPERTY SIZE:	108.60 ACRES
ZONING:	F1, PF, UAR10
TAXLOT NUMBER:	1510090001002

NOTE: SEE FIGURE 2: PROCESS SCHEMATIC IN THE RECYCLED WATER USE PLAN FOR TREATMENT AND DISINFECTION COMPONENTS OF THE PLANT.

LEGEND:

- PROPERTY LINE
- SETBACK LINE
- IRR — EXISTING IRRIGATION LINE
- FM — EXISTING SEWER FORCE MAIN

PRELIMINARY - NOT FOR CONSTRUCTION

NO.	DATE	BY	APPR	REVISIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING.
0" 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

REGISTERED PROFESSIONAL ENGINEER — OREGON — JULY 31, 2007 — ERIK J. HUFFMAN — PRELIMINARY
RENEWS: JUNE 30, 2017

CITY OF SISTERS INCORPORATED 1946

BECON
549 SW MILL VIEW WAY, SUITE 105
BEND, OREGON 97702
(541) 633-3140
www.beconeng.com

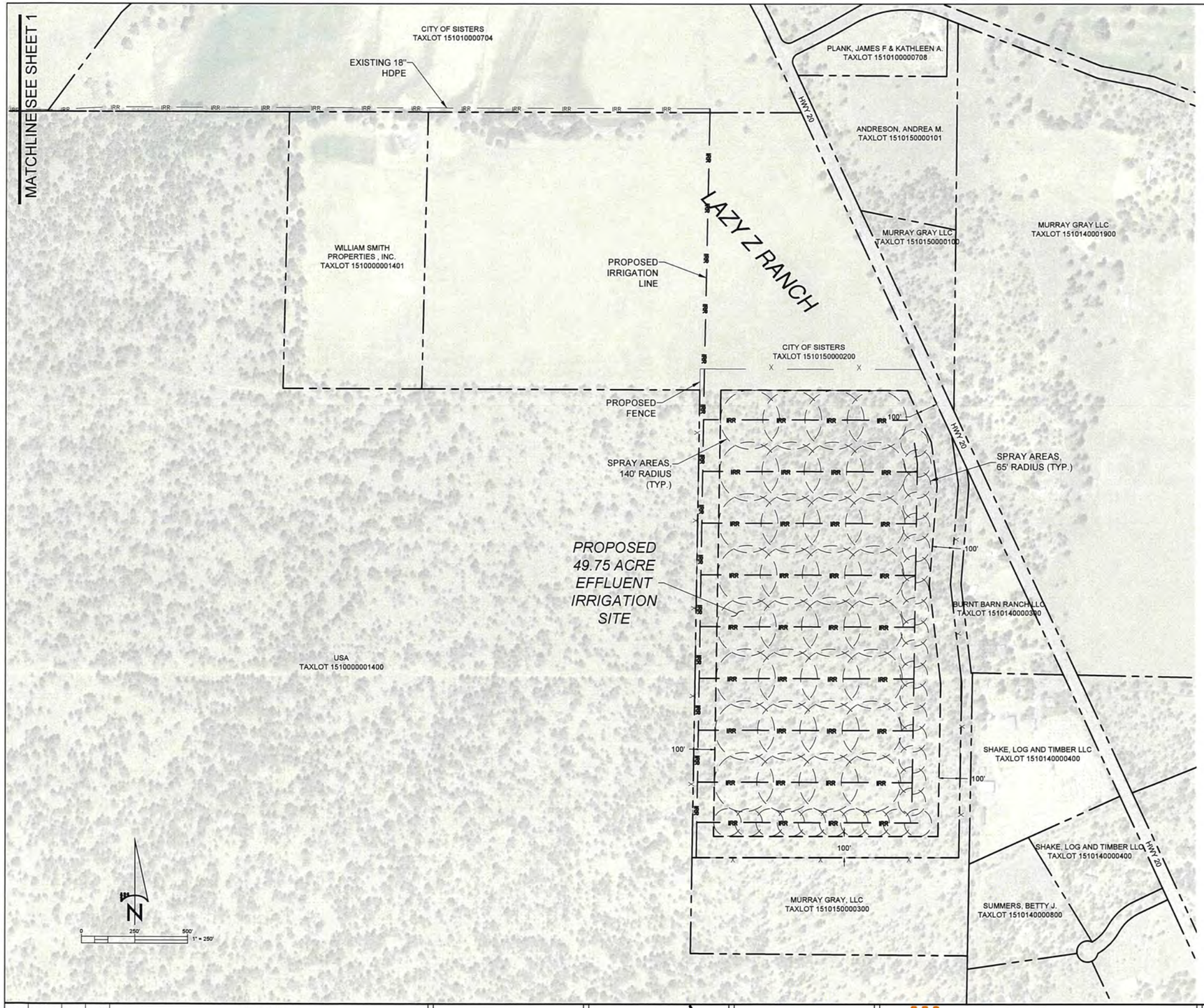
DESIGNED BY:	DRAWN BY:	CHECKED BY:	SCALE:
EJH	JLB	EJH	1" = 150'
DATE: 09 - 22 - 2016		PROJECT NO: 13702.119	

CITY OF SISTERS
RECYCLED WATER USE PHASE 1 EXPANSION

WASTE WATER TREATMENT PLANT

DRAWING NO. P1

SHEET NO. 1 of 2



SITE NOTES

GENERAL:

OWNER/APPLICANT:	CITY OF SISTERS
PROPERTY:	LAZY Z RANCH
PROPERTY ADDRESS:	68355 HWY 20, SISTERS, OR, 97759
PROPERTY SIZE:	125.68 ACRES
ZONING:	EFUSC
TAXLOT NUMBER:	1510150000200

PHASE 1 EFFLUENT IRRIGATION EXPANSION:

PROJECT AREA:	49.75 ACRES
IRRIGATION PIPE:	≈ 12,660 - LF
PROPERTY LINE SETBACK:	100 - FT

LEGEND:

- PROPERTY LINE
- SETBACK LINE
- PROPOSED EFFLUENT IRRIGATION LINE
- PROPOSED FENCE
- EXISTING IRRIGATION LINE
- SPRAY AREA

PRELIMINARY - NOT FOR CONSTRUCTION

NO.	DATE	BY	APPR	REVISIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING.
0" 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

REGISTERED PROFESSIONAL ENGINEER — OREGON — JULY 31, 2007 — ERIC J. HUFFMAN — PRELIMINARY
RENEWS: JUNE 30, 2017

CITY OF SISTERS INCORPORATED 1946

BECON
549 SW MILL VIEW WAY, SUITE 105
BEND, OREGON 97702
(541) 633-3140
www.beconeng.com

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SCALE:
EJH	JLB	EJH	1" = 250'

DATE: 09 - 22 - 2016
PROJECT NO: 13702.119

CITY OF SISTERS
RECYCLED WATER USE PHASE 1 EXPANSION

SITE PLAN

DRAWING NO. P2

SHEET NO. 2 of 2

2016 Recycled Water Use Plan

City of Sisters, Oregon

October 2016

PREPARED BY:

BECON CIVIL ENGINEERING AND LAND SURVEYING

549 SW MILL VIEW WAY, 105

BEND, OREGON 97702

TABLE OF CONTENTS

Recycled Water Use Plan
For
City of Sisters
WPCF Permit No. 101779
File No. 81850

Facility: City of Sisters Wastewater Treatment Plant
912 S. Locust Street
Sisters, Oregon 97759

Physical Address:
1000 South Locust Street
Sisters, Oregon 97759

Mailing Address:
520 East Cascade, PO Box 39
Sisters, Oregon 97759

Contact: Paul Bertagna
Phone: 541.323.5212
Email: pbertagna@ci.sisters.or.us

October 2016

1.0 INTRODUCTION

1.1 OVERVIEW

The City of Sisters wastewater system operates under a Water Pollution Control Facilities Permit, Number 101779, which was last issued on January 22, 2016. An initial Wastewater Recycled Water use Plan was completed in April of 2002 by HGE Inc. for the irrigation of 100.3-Acres of land in the South ½ of Section 9. For future increase in flows the City is expanding their irrigation reuse sites to include the Lazy Z Ranch property. The property is City owned and includes both: T15, R10, S10; TL 704 (100.26 acres) and T15, R10, S15; TL 200 (125.68 acres) for a total of 225.64 acres. However, only TL 200 has received land use approval, to date, from Deschutes County - signed and dated August 6, 2008. The permit conditions require submission of an updated Recycled Water Use Plan (RWUP) prior to effluent discharge to the new site.

The City of Sisters 2016 Wastewater Capital Facilities plan identify the need to expand their effluent irrigation facilitates to obtain capacity for future flows. A wastewater reuse and conservation planning study, by Newton Consultants, Inc. (2013) was used to determine the feasibility for effluent irrigation in the Lazy Z property. Shown in Figure 1 are the City's existing wastewater system facilities and proposed irrigation expansion sites. Phase 1 (planned for 2017), Phase 2 (planned for 2031), and future phases (after 2035) are incorporated into this Recycled Water Use Plan update.

Recycled water usage of treated effluent will allow the City of Sisters to meet water quality standards of the State of Oregon, and to maintain compliance with conditions of the Water Pollution Control Facilities Permit. ***This RWUP supersedes any previous plans.***

1.2 CONTACTS

The City of Sisters is the end user and recycled water generator for the waste water treatment plant (WWTP), located at the following address:

1000 S Locust St.
Sisters, Oregon 97759

Paul Bertagna is the Public Works Director and WWTP operator, his contact information is listed below:

Director of Public Works
Paul Bertagna
(541) 323-5212
pbertagna@ci.sisters.or.us

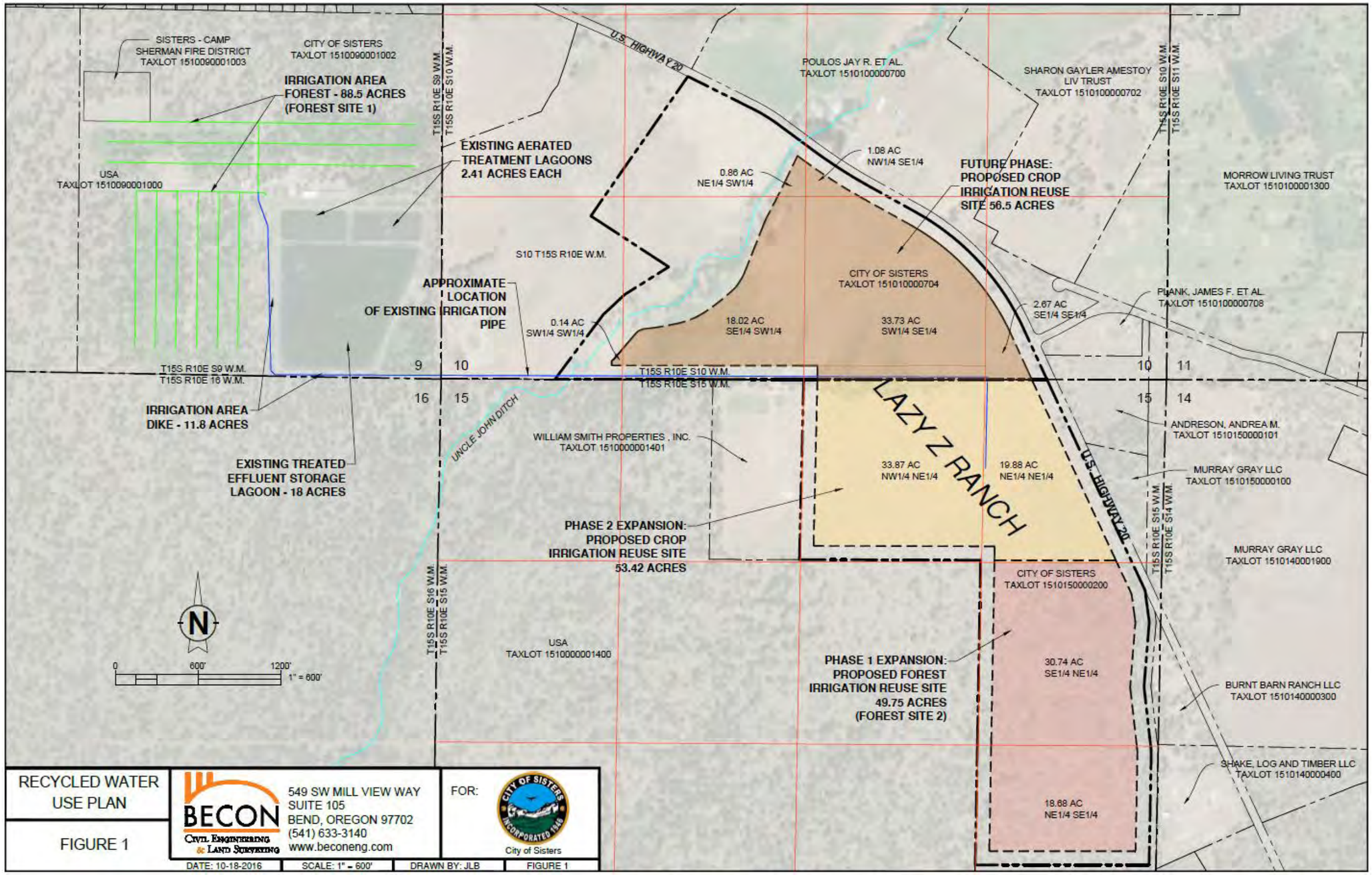


Figure 1: Recycled Water Use Plan Exhibit Map

2.0 BENEFICIAL PURPOSES

Beneficial purposes lie at the core of the recycled water use program and can influence wastewater treatment, monitoring, as well as public health and environmental concerns.

Beneficial Purpose	Class of Water	Quantity (mgd)	Frequency
• Irrigation of orchard grass • Compliance with WPCF permit, and to provide capacity for future wastewater flows.	D	0.522 mgd	April – October

3.0 WASTEWATER TREATMENT

3.1 EXISTING WASTEWATER SYSTEM

The City wastewater system has been operating since 2002. Gravity collection system piping varies from 6" to 24" diameter PVC wastewater mains, with four (4) wastewater pump stations. A 12" diameter pressure main of 9350 lineal feet carries wastewater flows from Pump Station # 1 in the City, directly to the Wastewater Treatment Plant. The wastewater treatment plant is a 3-cell aerated lagoon system with winter holding. Two aerated treatment cells are 2.41 acres, providing for a capacity of 19.5 Ac. Ft. An 18-acre aerated winter holding lagoon is provided for storage, containing 213 Ac. Ft. of storage.

Total inflow for the 2015 year was 70.8 million gallons, with a summer average of 233,570 gpd (gallons per day) and winter average of 153,770 gpd. Shown in Figure 2 is the process schematic for the City of Sisters WWTP.

3.2 EXISTING EFFLUENT IRRIGATION SYSTEM

The existing recycled water use irrigation site is a 108.60-Acre site on the South ½ of Section 9, T15S, 10E, W.M. Land reuse of the stored water is provided on 88.5 acres of natural forest and 11.8 acres of dike and lawn areas (100.3-Acres Total). Application is applied at agronomic rates. The existing (year 2002) recycled water use plan limits irrigation to 13.2 and 47.4 million gallons of dike and forest irrigation respectively. The treatment plant produces Class D quality for both the treated and recycled water. A full copy of the approved WPCF permit is in Appendix C of this document.

The irrigation site surrounds the wastewater treatment and holding ponds. Three separate irrigation systems are provided. Each of the two forest irrigation sites is served by a 10-inch diameter PVC irrigation header from the effluent pumps located in the control building. The dike irrigation system is fed through a looped 4-inch diameter irrigation system. A marking ribbon is buried with the pipe to indicate non-potable water. Two alternating 100 HP pumps are provided to deliver treated recycled water to the forest irrigation system, and a single 15 HP pump is provided to deliver water to the dike irrigation system. An existing pipeline exists on the Lazy Z Ranch property (see Figure I), which may be used for irrigation purposes.

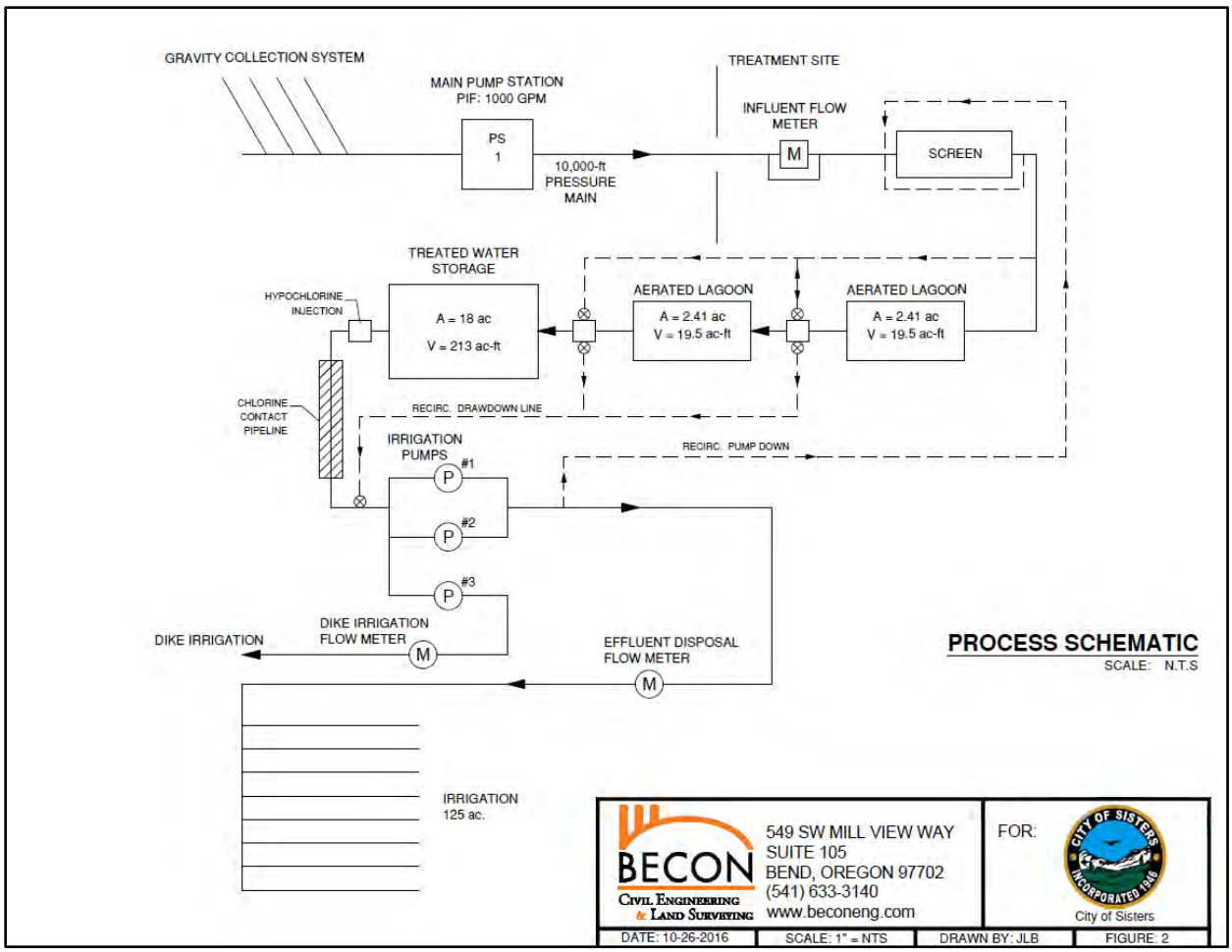


Figure 2: Water Treatment Plant Schematic

3.3 INFLUENT FLOW MEASUREMENT AND SAMPLING

Influent flow measurement is provided in the pump room of the control building for the wastewater treatment plant. The meter is an 8" ASA electromagnetic flow meter which has been calibrated annually since installation. Influent sampling is provided by an ISCO 3710FR refrigerated sampler located in the pump room of the control building at the treatment plant. This is a 24-hour composite sampler which provides composite data for influent BODs and TSS.

3.4 DISINFECTION FACILITIES

Disinfection of effluent at the Sisters plant is provided by chlorination, specifically through sodium hypo-chlorite. Equipment includes a Lightnin chemical mixer, a 500-gallon polyethylene sodium hypo-chlorite tank, a Wallace & Tiernan chemical feed pump, a Grundgs Fost back-up chemical feed pump, a Gas Mastrrr 3-hp flash mixer, a vacuum regulator, rate controller, ejector water supply system, and a chlorine contact pipeline. The chlorine contact pipeline is 1,140 feet of 36" PVC piping buried in the dike along the west side of lagoon # 1 and the holding pond. A Gas Mastrrr Series 32 chlorine induction feeder-flash mixer is provided in the transfer structure from the holding pond to the chlorine contact pipeline. This unit provides a positive flash mix of sodium hypo- chlorite solution which flows through the chlorine contact pipeline toward the land reuse system. A sampling tap is provided on the effluent

(reuse) piping to allow for sampling of effluent pumped from the reuse pumps to either of the two reuse systems provided. Disinfection facilities are controlled through the SCADA system with the PLC provided.

3.5 EFFLUENT REUSE SYSTEM

The effluent reuse facilities are intended to discharge treated and disinfected effluent for land reuse through irrigation of both forest land and lagoon dikes and lawns on the treatment plant site. The effluent reuse system that is in place includes a holding pond for storage, a chlorine contact line for effluent disinfection, three irrigation pumps, a re-circulation system, and a sprinkler system to provide reuse on treatment plant lagoon dikes and lawn areas, and on 88.5 acres of forest land. Additional area for reuse is set aside for buffer to adjacent properties on the North, East and South boundaries of the treatment plant site, in compliance with Oregon DEQ regulations.

Prior to land reuse, the effluent is disinfected in 1,140 feet of 36" chlorine contact line, which provides for a minimum detention time of 60 minutes at peak discharge flows of 1,000 gpm. Sodium hypochlorite from the 500 gallon HDPE storage tank is mixed with effluent from Lagoon No. 3, in the chlorine contact facility. Effluent is discharged to forest land and pond dikes and lawn areas from April 1 to October 31 and stored in the holding pond during the remaining months. The storage lagoon must be lowered sufficiently by the end of the irrigation season to ensure maximum practicable storage capacity during the no irrigation months.

The land reuse system diverts the majority of the effluent to 88.5 acres of forest land, and the remaining to the treatment plant lagoon dikes and lawn areas (11.8 acres). The effluent is pumped to these locations using three pumps. Two 100 HP, 1000 gpm capacity pumps transport effluent to the forest land, while one 15 HP, 125 gpm capacity pushes the water to the dike. The effluent is carried to the forest land in a 10" main line which branches out into 8" lines across the irrigation area. There are flow meters stationed after the pumping facility that are measuring the quantity of effluent traveling to both the forest land and dike.

Both effluent reuse systems provided for discharge from the Sisters WWTP are controlled through the SCADA system, with the Programmable Logic Controller provided. Both the SCADA system and the PLC have been in use since the plant became operational, and equipment of this type and age becomes outdated, is not supported and difficult to repair due to availability of parts. Both the SCADA system and the PLC will need to be replaced in the near future.

3.6 EFFLUENT FLOW MEASUREMENT AND SAMPLING

Effluent flow measurements are provided in the pump room of the control building for the WWTP. Two meters are provided, with one on the dike and lawn reuse system, and one on the forest reuse system. Each meter is an ASA model IF6 electromagnetic flow meter, which have been calibrated annually since installation. Grab samples are taken out of the transfer structure before the effluent enters the chlorine contact line. These samples are then tested for concentration of E.coli. Flow measurements are recorded in the SCADA system provided. Flowmeter performance has been excellent, all the units were rebuilt in 2007 due to the pump building inadvertently flooding. All flow meters are flow tested and calibrated annually to ensure accuracy within specifications.

4.0 RECYCLED WATER MONITORING AND SAMPLING

OAR 340-055 defines the regulations for land application of recycled water.

i. Prior to land application of the recycled water, it must receive at least Class D treatment as defined in OAR 340-055. Class D recycled water must not exceed a 30-day log mean day log mean of 126 E. coli organisms per 100 milliliters and 406 E. coli organisms per 100 milliliters in any single sample. Class C recycled water must not exceed a 7 day median of 23 organisms/100 milliliters and no two consecutive samples must exceed 240 organisms/100 milliliters.

ii. Irrigation must conform to a Recycled Water Use Plan approved by DEQ and meet the required setbacks as defined in OAR 340-055.

iii. The City of Sisters must restrict public access to the reuse site(s) for the protection of public health.

iv. Treated effluent may only be irrigated on land between April 1 through October 31 for dissipation by evapotranspiration and controlled seepage by following sound irrigation practices unless otherwise approved in writing by DEQ.

v. Recycled water equipment must be operated so as to prevent:

   a) Prolonged ponding of treated recycled water on the ground surface;

   b) Surface runoff or subsurface drainage through drainage tile;

   c) The creation of odors, fly and mosquito breeding or other nuisance conditions;

   d) The overloading of land with nutrients, organics, or other pollutant parameters; and

   e) Impairment of existing or potential beneficial uses of groundwater.

   f) Until otherwise approved in writing by the Department via a revised reclaimed water use plan, treated effluent must only be reused on Class D beneficial uses.

4.1 EFFLUENT MONITORING

Monthly discharge monitoring reports (DMR) are sent to the DEQ before the 15th day of the following month providing monitoring and sampling information for the WWTP including the reuse facility as required by the WPCF permit and summarized in Table 1. The recycled water applied to the irrigation field is measured daily when the system is in use. During the irrigation operation in 2015 there was a total of 5.46 and 72.57 million gallons applied to the dike and forest respectively.

Table 1: Recycled Monitoring Program

Item or Parameter	Minimum Frequency	Type of Sample
Total Inflow to WWTP	Daily	Measurement
Total reuse flows (recycled water)	Daily	Measurement
Flow Meter Verification	Annually	Verification
E. Coli	Weekly	Grab
Nitrogen Nitrate (NH_3-N)	Annually	Grab
Inspect Lagoon	Daily	Visual
Inspect Lagoon Liner	Daily	Visual

4.2 WATER QUALITY

Operations have experienced no problems in meeting permit conditions for E. coli. Effluent nutrient data for August 2015 indicated the following: Nitrate Nitrogen (NO_3-N): 0.03 mg/l. Nutrient levels are reasonable and do not raise concerns regarding system performance or effluent loadings.

5.0 SYSTEM MAINTENANCE AND CONTINGENCY PROCEDURES

The WWTP recycled water facilities will be maintained, per OAR 340-055-0025(1)(f), as well as a description of contingency procedures, per OAR 340-055-0025 (1)(d). The City of Sisters has submitted system maintenance and contingency procedures to Oregon DEQ as part of the submittal documents for the WPCF permit in 2002. The City maintains copies of the system maintenance and contingency procedures and are available upon request.

6.0 PUBLIC HEALTH AND ENVIRONMENTAL CONTROLS

6.1 ACCESS AND EXPOSURE CONTROLS

The irrigation sites are on City owned property with the required setbacks for Class D recycled water. Public access is prevented from entry into the existing and proposed area by barb wire fences around the irrigation site, a 6 foot chain link site with barb wire around the treatment plant site, and locked gates for both. Signs are posted around the perimeter of the irrigation field to indicate the water is not safe for drinking and that effluent is being applied as irrigation. Access and exposure are addressed as follows:

- Staff are the only people authorized to enter the site.
- The general public does not have access to the site.
- There are no grazing animals allowed on the site.
- The irrigation water is not used for sod, nursey stock or Christmas trees.
- The irrigation water is not used for commercial or industrial uses.
- The irrigation site is posted.
- All supervisors and staff working near the site are educated regarding access restrictions for this land application site.
- Irrigation over spray shall be monitored during windy days to ensure the buffer zones are not violated. When wind velocities exceed 10 mph, irrigation should stop or be reduced to prevent over spray on neighboring properties if this situation was to occur.
- When winds are high staff will assure that the buffer zones are not violated or the irrigation system will be turned off.
- The lagoon is fenced and gated.

6.2 SETBACKS

The required setbacks for Class D recycled water are as follows (per ORS 340-055-0012):

- 100 feet from the property line
- 100 feet from a water supply
- 70 feet from food preparation sites or drinking fountains.

6.3 NOTIFICATION

OAR 340-055 requires notification of recycled water use. There are two audiences for notification: personnel and the public. The notification methods used for each audience are as follows:

- Personnel:
  - Employees who will be working near the site are educated about the recycled water reuse program.
  - The irrigation site is posted with signs.
- The general public is notified through the WPCF permitting process through the Oregon Department of Environmental Quality.

6.4 SITE MANAGEMENT PRACTICES

Site management practices include the following:

- When using recycled water for irrigation, the perimeter of the site is posted with signs indicating that recycled water is not safe for drinking.
- When the ground is frozen, no irrigation is done.
- If the wind is high, no irrigation is done.
- Irrigation is done only when maintenance staff are on duty.
- Irrigation of fodder, fiber, seed crops not intended for human ingestion, sod, commercial timber, firewood, ornamental nursery stock, or Christmas trees is prohibited for three days before harvesting.

7.0 LAND APPLICATION PLAN

OAR 340-055-0025(2)(a) establishes additional requirements for recycled water use plans when conventional irrigation is used. In general, this includes a site characterization, description of the irrigation system, soils and crops, application rates, site management practices and public access control. Some of these items have already been described, such as the system description (Section 3), and site management and public access control (Section 6). The reader may refer to earlier sections of this plan for these items.

7.1 PROPOSED EFFLUENT IRRIGATION EXPANSION

The proposed recycled water use irrigation site, also known as the Lazy Z Ranch property, is approximately 225.6-Acres and located directly east from the existing Wastewater Treatment Plant. The site is divided into 2 lots, T15, R10, S10; TL (Taxlot) 704 (100.26 acres) and T15, R10, S15; TL 200 (125.68 acres) for a total of 225.64 acres (See Figure 1). The city anticipates using the 49.75-Acres forested area (Phase 1) and a 53.42-Acre crop land area (Phase 2) for effluent irrigation.

The Lazy Z Ranch property provides multiple possibilities for effluent reuse expansion. Both forest irrigation and crop irrigation sites are available. Both Phase 1 and Phase 2 have been incorporated into this Recycle Water Use Plan update.

A flow balance is provided in Table A and Table B (see Appendix B), considering available holding capacity and effluent reuse through the constructed irrigation systems described previously. The flow balance was developed assuming a lifetime for the effluent system of 10 and 20 years, to the year 2025 and 2035 respectively. Assuming that growth projections are accurate, and that estimated agronomic usage of the recycled water are accurate, the existing facilities cannot provide adequate area for disposal of flows.

In the 2025 water balance (Table A) the existing effluent irrigation system will continue to operate at threshold levels (see Table 1). The Phase 1 expansion site (Forest Site 2) will operate at irrigation rates necessary to lower the holding pond storage to the initial depth (6'). As shown in the 2035 water balance (Table B), the forest sites and the dike will operate at the irrigation application limit. The crop site will operate at irrigation rates required to lower the holding pond storage to the initial depth (6.0'). Irrigation discharge may be modified if necessary as long as the application rates in Table 2 are not exceeded on any give season, peak month, and peak day.

7.1.1 Phase 1 – Forest Irrigation Effluent Expansion – TL 200

A 49.75-Acre forested area is available for effluent irrigation at the southeast corner of the Lazy Z Ranch property. The Phase 1 effluent expansion will be fully implemented during 2017. Phase 1 is included in the 2025 and 2035 water balance computations for this Recycled Water Use Plan update (Table A and B).

7.1.2 Phase 2 – Future Crop Irrigation Effluent Expansion – TL 200

A 53.42-Acre crop land area is available for effluent irrigation in the southeast portion of the Lazy Z Ranch property. It is anticipated that this area would have a permitted application rate of 25.5 inches per

year and could be connected to the existing pipeline which terminates in the center of the site. A wastewater reuse study by Newton Consultants Inc., completed in June 2013, identified multiple crop irrigation applications, grass crop is assumed. The City anticipates to implement Phase 2 by 2031. Phase 2 was incorporated into the water balance computations for 2035 conditions. Phase 2 will conform to DEQ requirements for Class D recycled water.

7.1.3 Future Phase – Future Crop Irrigation Effluent Expansion – TL 704

An additional 56.5-Acres of land is available for crop irrigation. The wastewater reuse study by Newton Consultants Inc., identified multiple crop irrigation applications, all to take place after 2035. The Future Phase was included in the water balance computations for 2035 conditions. The future phase will conform to DEQ requirements for Class D recycled water.

7.2 SITE CHARACTERIZATION

A USGS topo map, NRCS soil maps, and soil series descriptions for the proposed area described are included in Appendix A**.** The proposed irrigation expansion site (TL 200 described above) is located at 68355 HWY 20, Sisters, Oregon 97759. The site has the following characteristics:

- Land Use Zone: Exclusive Farm Use (to be rezoned to Public Facilities prior to any irrigation expansion activity).
- Size: 125.68 Acres

Rain fall and evaporation data was obtained from the Western Regional Climate Center (WRCC 2016).

- Annual Average Rainfall: 13.5 inches
- Annual Evaporation: 51.68 inches
- Average Annual Temperatures: average annual max – 84.4°F, average annual Min – 20.9°F
- Topography: Slope is roughly 0 – 2.5%
- Elevation: 3180-FT to 3230-FT
- Setbacks from property Line: 100-FT
- Not located in a flood plain.
- Depth to Groundwater: Based on City well logs, depth varies from 63 – 113 feet.
- Winter ground can be frozen.
- Winds can be moderate. Prevailing wind direction is north per the National Oceanic and Atmospheric Administration (NOAA 2016).

The 2002 Wastewater Reclaimed Water Use Plan calculated an application rate of 28.79-in/acre per season in the Dike and 14.3-inches/acre per season in the forest (an efficiency coefficient of 70% was applied to compensate for evaporation losses during the application). The City now uses an efficiency coefficient of 75% for all future planning purposes. Application rate limits (using a 75% efficiency coefficient) per the Soil and Water Reuse Reports, prepared by Wert & Associates, Inc. (1998 and 2007) are shown in Table 2 below:

Table 2: Irrigation Application Rate Limits

Application	Dike	Forest	Crop
Seasonal Amount	34”	19.1”	34”

Peak Month (July)	8.3”	7.3”	8.3”
Peak Daily	0.4”	0.2”	0.4”

7.3 PHASE 1: FOREST EFFLUENT IRRIGATION EXPANSION

The City will expand their irrigation to the 49.75 – Acre site at the southeast corner of the Lazy Z Ranch Property. Using data from existing Lagoons, the wastewater will contain:

NO_{3-}	0.5 mg/l
NH_4	0.5 mg/l
TKN	9.0 mg/l
Total Nitrogen:	10 mg/l

- Water Application:
  - There are no Oregon State University extension bulletins for water consumption of the existing stand of ponderosa pine, lodgepole pine, pine-sage, and bitter brush. Literature review was made by Wert and Associates, Inc. (1998) to determine application rates.
  - Total Irrigated area is 49.75 – Acres with Setbacks.
  - See water balance computations in Appendix B for application rates per month.
  - The peak daily irrigation rate shall be 0.2”, or 290,096 gpd.
  - The total irrigation volume is 19.10 inches over a 7-month period (April – October). The amount applied through irrigation is within the applications rate limits (see Table 2).
- Nitrogen Loading:
  - Based on literature and Wert and Associates, Inc. (1998) concluded that applying 1.3 Acre-Feet of wastewater to the existing forest will add 35 lbs of available nitrogen per acre. Based on this result, 2132 lbs of organic nitrogen loading will be applied to the site per year.
  - Total volume applied is 25,802,683 gallons or 97,637,780 liters.

    Nitrogen loading in mg: 967,060,000 mg

    Total concentration = 9.9 mg/l (less than 10 mg/L)
- Cropping Program:
  - The site will be mowed 2 to 3 times per irrigation season. Mowing’s will be disposed of or moved to a non-irrigation site. Herbicides will be applied annually to control weeds.

7.4 PHASE 2: CROP EFFLUENT IRRGATION EXPANSION

The 53.42-Acre site will be planted with hay/alfalfa/grass. No other crops are proposed. Using data from existing Lagoons, the wastewater will contain:

NO3	0.5 mg/l
NH_4	0.5 mg/l
TKN	9.0 mg/l
Total Nitrogen:	10 mg/l

- Water Application:
  - Consumptive use rates by month for pasture grasses grown in the Bend/Sisters are were taken from Oregon State University Extension Bulletin 8530.
  - Total irrigated area is 53.42 – Acres (with setbacks).
  - The crop will require about 3" of water per month (see water balance computation in Appendix B).
  - The peak daily irrigation rate shall be 0.4 inches or 580,193 gpd (see Table 2).
  - The total irrigation volume is 19.50 inches over a 7-month period (April – October). The amount applied through irrigation is within the applications rate limits (see Table 2).
- Nitrogen Loading:
  - Per the 2007 Soil and Water Reuse Report by Wert and Associates, Inc., the average organic concentration of 10 mg/l or 27 lbs of nitrogen per 1 Acre-Foot of wastewater. Oregon State University recommends orchard grass for the site. For orchard grass, 3 Acre-Feet/Acre of wastewater will be applied which will contain 81 pounds of organic nitrogen per acre.
  - The calculated irrigation discharge is 19.5 inches per year, or 86.8 Acre-Feet, which is equivalent to 2344 lbs of organic nitrogen loading per year.
  - Total volume applied is 11,695,352 gallons or 44,271,723 liters.

    Nitrogen loading in mg: 1,063,200,000 mg

    Total concentration = 5.6 mg/l (less than 10 mg/L)
  - The orchard grass will need an additional 119 lb/acre of nitrogen fertilizer.
- Cropping Program:
  - The crop will absorb nutrients, be harvested and be removed from the site for beneficial use.

7.5 IRRIGATION MANAGEMENT AND SCHEDULING

7.5.1 Irrigation Site: Startup

During each startup of either irrigation system, the chief operator should make certain that disinfection facilities are fully operational, and should verify that water quality testing is provided to assure compliance with the WPCF permit conditions. This will require activation of the chlorination system provided, and testing to assure that permit conditions are being met prior to discharge of the treated effluent for reuse purposes.

7.5.2 Irrigation Site: Field Observations

During April through October, field observations should be made daily, or when effluent reuse is being utilized, of the site for evidence of runoff. All irrigation water must percolate into the ground for usage by the disposal site. The irrigation rate must be maintained at agronomic rates. Aerosol drift from the application site should be observed and reported if excessive distances are observed. A wind monitoring system is provided from the weather station, and should function to limit irrigation during periods when excessive wind conditions are experienced on site.

7.5.3 Recording: Verification of Permit Conditions prior to Disposal

The City should maintain records of water quality testing at any time that effluent reuse is anticipated for either of the irrigation sites provided. Compliance will be required for both E.coli, and for total coliform, and actual testing data should be reported on the Daily Monitoring Report, for submittal to the Oregon Department of Environmental Quality on a monthly basis.

7.5.4 Recording: Flow Meter Records, Pump Time and Rainfall

The City should maintain influent and effluent flow meter records for all flow meters provided, with information provided through physical measurements verified against records maintained in the SCADA system provided. Similar records should be maintained for daily pump times and rainfall monitored during the irrigation period. Operational records and rainfall shall be recorded in order to review final management of reclaimed water usage and potential operational requirements. Since irrigation needs will be limited to specific application periods, the irrigation equipment can be operated through the SCADA system to apply effluent reuse when irrigation can best be applied for beneficial usage, with storage being maintained in the interim.

7.5.5 Operational Conditions

City staff should maintain records for operational conditions on the effluent reuse sites. Records shall include: 1) amount of effluent applied to each irrigation site, 2) ability to control storage and irrigation needs, and 3) agricultural concerns or benefits with water available for effluent reuse.

7.5.6 Summary of Record-Keeping

Reporting of water quality testing as addressed by the WPCF permit, (E. coli and coliform), irrigation site field observations, and operational conditions will be important for long term operation of the reclaimed water use site. Effluent flow meter readings and rainfall will need to be recorded daily.

- A summary of the reporting needs is as follows:
- Daily influent flows, in gpd, into the Wastewater Treatment Facility
- Daily water quality E.coli numbers to show compliance with permit conditions
- Daily water quality coliform numbers to show compliance with permit conditions
- Daily effluent flow meter records for the effluent irrigation and disposal systems
- Daily pump records, in hours, for each of the irrigation pumps being utilized
- Daily rainfall volumes, in 1/100th inches
- Irrigation rates and volumes on a daily basis
- Field observations of potential locations for runoff, and photos of any runoff occurrences

7.6 SITE MONITORING PLAN

Soil sampling will be used to monitor the nutrient balance with regards to the soil fertility of the sites. Soil sampling will take place at all forest and crop effluent irrigation sites. The sampling procedure shall be per section 7.6.1, or per the latest Oregon State University (OSU) Extension Service soil sampling guide.

7.6.1 General Soil Sampling Procedures

On forest sites sampling shall be done along one irrigation line for uniformity and consistency. On crop sites sampling shall be done in a simple random pattern. At least 30 samples shall be taken from each effluent irrigation site. Sampling shall be conducted every two years in the forest sites and annually in the crop sites. Sampling will take place at the end of each irrigation season (November). The soil sampling process is listed below:

1. Proper information and materials shall be obtained (Education Extension from OSU).
2. Proper sampling tools/equipment shall be used (e.g. soil auger, shovel, bucket etc.). Equipment must be clean, specifically free of fertilizer. Galvanized buckets or rusted tools/equipment shall not be used. Tools shall be used properly.
3. Unusual areas shall be avoided. This includes but is not limited to abandoned farmsteads, feed lots, manure piles, fences eroded knolls, low areas, and salty or wet spots shall be avoided or sampled separately.
4. Sites shall be divided into areas for sampling. (i.e. Forest Site 1, Forest Site 2, Crop Site 1 etc.).
5. Samples shall be taken to a 3-ft depth at 1-ft increments (1^{st} sample at 1-ft depth, 2^{nd} sample at 2-ft depth etc.).
6. Composite samples shall be analyzed for each site. The composite sample is a mixture of all the samples within the site. The composite sample shall be well mixed.
7. Moist soil samples shall be kept cool at all times (during and after sampling). Samples can be frozen or refrigerated for extended periods of time without adverse effects. If samples cannot be refrigerated or frozen after collection, they shall be air dried or taken directly to the testing laboratory.
8. All data shall be collected, stored, and documented.

7.6.2 Soil Sample Analysis

The City shall sample for nitrate (NO_{3-}), nitrite (NO_{2-}), ammonia (NH_4), Total Kjeldahl Nitrogen (TKN), and phosphorus (P). Samples shall be sent to laboratories that are certified by the North American Proficiency Testing (NAPT) program. The NH_4 will be lost to vitalization when it is irrigated. Most of the nitrogen will be in the form of algae cells. When the algae is spread on the soil it will be mineralized into forms available to plants. (Wert, 2007).

REFERENCES

*References available upon request.

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Nored, R.D. "Wastewater Reclaimed Water Use Plan." *HGE, Inc.* (April 2002).

Wert, S. "Soil and Water Reuse Report for Sister Wastewater Project." *Wert & Associates, Inc.* (February 1998).Print.

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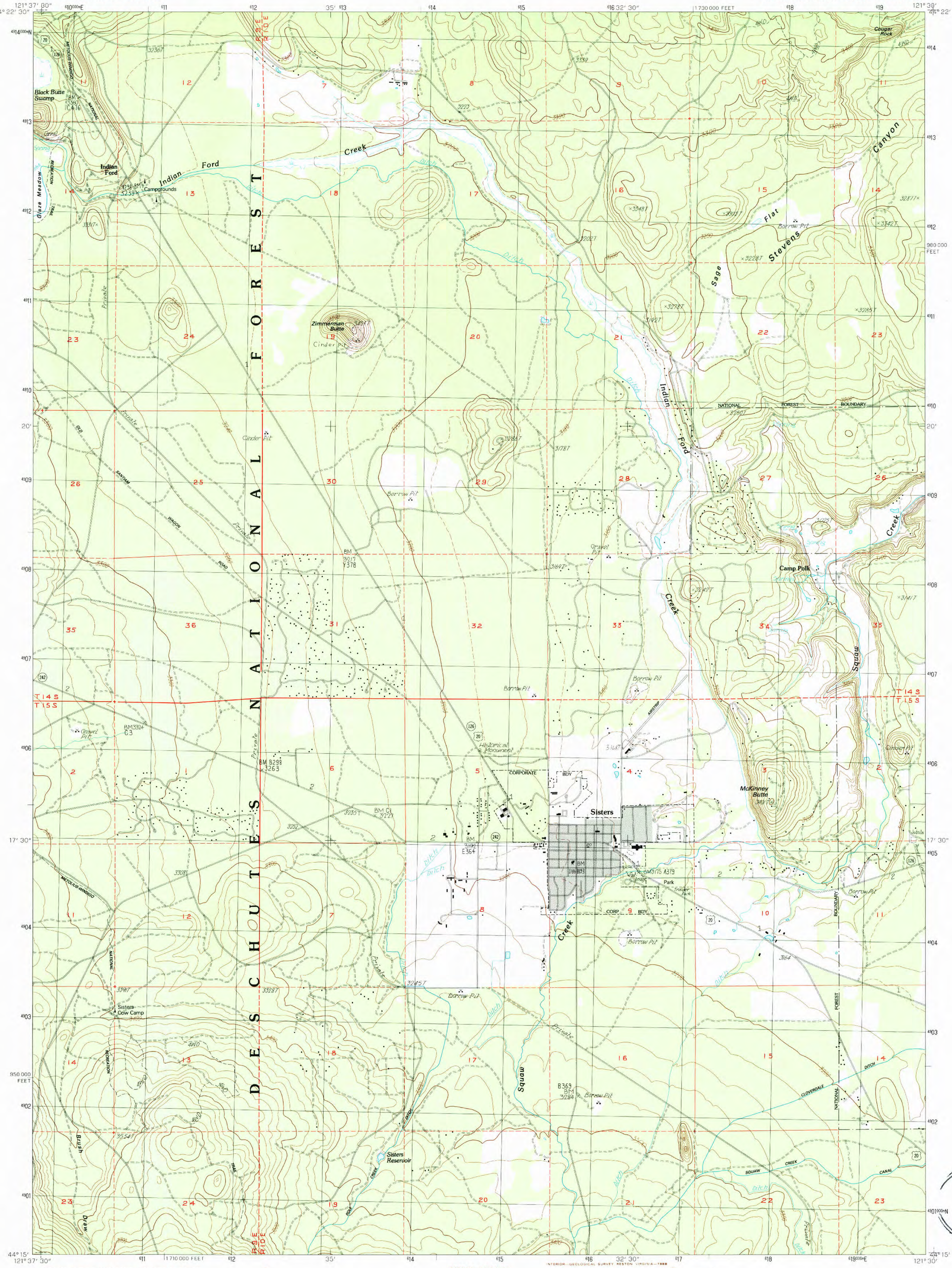
APPENDIX A

- USGS Topo Maps
- NRCS soil maps, and soil series descriptions

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SISTERS QUADRANGLE
OREGON—DESCHUTES CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



PRODUCED BY THE UNITED STATES GEOLOGICAL SURVEY
CONTROL BY ..... USGS, NOS/NOAA AND STATE OF OREGON
COMPILED FROM AERIAL PHOTOGRAPHS TAKEN 1957
FIELD CHECKED 1959
LIMITED REVISION FROM AERIAL PHOTOGRAPHS TAKEN 1982 AND 84
FIELD CHECKED... 1985. MAP EDITED 1988
PROJECTION ..... LAMBERT CONFORMAL CONIC
GRID: 1000-METER UNIVERSAL TRANSVERSE MERCATOR ..... ZONE 10
10,000-FOOT STATE GRID TICKS ..... OREG., SOUTH ZONE
UTM GRID DECLINATION ..... 1°00′ EAST
1980 MAGNETIC NORTH DECLINATION ..... 19°00′ EAST
VERTICAL DATUM ..NATIONAL GEODETIC VERTICAL DATUM OF 1929
HORIZONTAL DATUM ..... 1927 NORTH AMERICAN DATUM

To place on the predicted North American Datum of 1983, move the projection lines as shown by dashed corner ticks (21 meters north and 92 meters east)

There may be private inholdings within the boundaries of any Federal and State Reservation shown on this map

Public Land Survey System is shown as published in 1959 and verified or supplemented in 1985

No distinction made between houses, barns, and other buildings

PROVISIONAL MAP
Produced from original manuscript drawings. Information shown as of date of field check. T

NORTH

SCALE 1:24 000

1 .5 0 KILOMETERS 1 2
1000 0 METERS 1000 2000
1 .5 0 MILES 1
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10 000 FEET

CONTOUR INTERVAL 20 FEET
SUPPLEMENTARY CONTOUR INTERVAL 10 FEET

To convert meters to feet multiply by 3.2808
To convert feet to meters multiply by 0.3048

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092

OREGON
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Black Butte
2 Little Squaw Back
3 Squaw Back Ridge
4 Black Crater
5 Henkle Butte
6 Trout Creek Butte
7 Three Creek Butte
8 Tumalo Dam

ADJOINING 7.5' QUADRANGLE NAMES

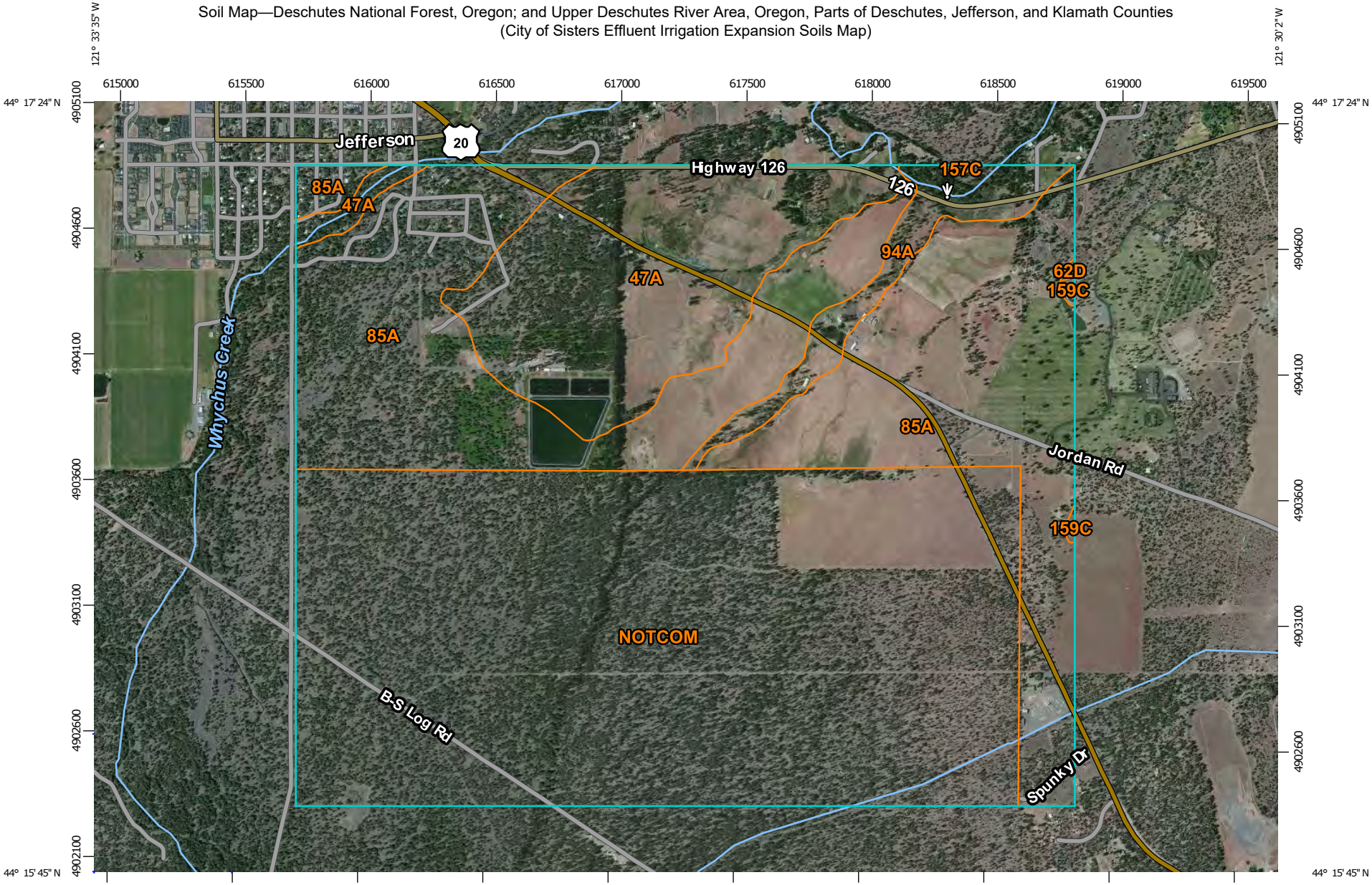
ROAD LEGEND

Improved Road
Unimproved Road
Trail
Interstate Route U.S. Route State Route

SISTERS, OREG.
PROVISIONAL EDITION 1988
44121-C5-TF-024

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1988

Soil Map—Deschutes National Forest, Oregon; and Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties
(City of Sisters Effluent Irrigation Expansion Soils Map)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Deschutes National Forest, Oregon
Survey Area Data: Version 2, Dec 5, 2013

Soil Survey Area: Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties
Survey Area Data: Version 11, Sep 18, 2015

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 20, 2010—Sep 4, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Deschutes National Forest, Oregon (OR605)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
NOTCOM	No Digital Data Available	960.8	48.8%
Subtotals for Soil Survey Area		**960.8**	**48.8%**
Totals for Area of Interest		**1,967.4**	**100.0%**

Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties (OR620)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
47A	Ermabell loamy fine sand, 0 to 3 percent slopes	283.0	14.4%
62D	Henkle-Lava flows-Fryrear complex, 15 to 50 percent slopes	0.7	0.0%
85A	Lundgren sandy loam, 0 to 3 percent slopes	658.1	33.5%
94A	Omahaling fine sandy loam, 0 to 5 percent slopes	61.9	3.1%
157C	Wanoga-Fremkle-Rock outcrop complex, 0 to 15 percent slopes	0.7	0.0%
159C	Wilt sandy loam, 0 to 15 percent slopes	2.2	0.1%
Subtotals for Soil Survey Area		**1,006.6**	**51.2%**
Totals for Area of Interest		**1,967.4**	**100.0%**

APPENDIX B

- Water balance computations for 2025 and 2035 conditions.

City of Sisters Recycled Water Use Plan

Table I

Water Balance for Aerated Treatment, Holding, and Irrigation (2025 Conditions) - Balance Including Evaporation on Treatment and Holding Ponds

Holding Pond Constants:
*Assume 6' Water on 10/01 for Start

Treatment Pond Constants:
Water Surface Area 4.82 ac

Annual Irrigation:

Forest Irrigation Site 1	88.5	ac
Forest Irrigation Site 2	49.75	ac
Dike Irrigation	11.8	ac

Crop: Forest Land With Dike Irrigation System

Crop Irrigation Req.		
Dike	25.5	in/acre
Forest Site 1	14.3	in/acre
Forest Site 2	10.5	in/acre

Mo.	Holding Pond Initial Volume (Ac-ft)	Initial Depth flow (ft) [1]	Influent Flow (gpd)	Monthly Influent Flow (Ac-ft)	Rainfall (in)	Evaporation from Ponds (in)	Net (in)	Net Ponds Evap. (Ac-ft)	Irrigation Discharge Forest Site 1 (Ac-ft)	Irrigation Discharge Forest Site 2 (Ac-ft)	Irrigation Discharge Dikes (Ac-ft)	Final Volume (Ac-ft)	Final Depth (ft)		Irrigation Discharge Forest Site 1 (in/acre)	Irrigation Discharge Forest Site 2 (in/acre)	Irrigation Discharge Dikes (in/acre)
Oct.	30.07	6.00	253833.49	24.15	0.95	3.29	-2.34	-3.92	0.00	0.00	2.95	47.35	7.12		0.00	0.00	3.00
Nov.	47.35	7.12	255011.19	23.48	2.10	1.80	0.30	0.51	0.00	0.00	0.00	71.34	8.65		0.00	0.00	0.00
Dec.	71.34	8.65	258576.80	24.60	2.27	0.00	2.27	3.91	0.00	0.00	0.00	99.86	10.42		0.00	0.00	0.00
Jan.	99.86	10.42	251085.03	23.89	2.24	0.00	2.24	3.94	0.00	0.00	0.00	127.69	12.12		0.00	0.00	0.00
Feb.	127.69	12.12	244023.90	20.97	1.45	0.00	1.45	2.60	0.00	0.00	0.00	151.25	13.51		0.00	0.00	0.00
Mar.	151.25	13.51	256936.59	24.45	1.12	0.00	1.12	2.04	0.00	0.00	0.00	177.74	15.05		0.00	0.00	0.00
Apr.	177.74	15.05	250384.62	23.05	0.79	5.26	-4.47	-8.27	7.38	4.15	2.95	178.05	15.07		1.00	1.00	3.00
May	178.05	15.07	259330.41	24.67	0.78	7.25	-6.47	-11.97	14.75	8.29	2.95	164.77	14.30		2.00	2.00	4.25
June	164.77	14.30	297566.50	27.40	0.61	8.70	-8.09	-14.84	25.81	14.51	4.18	132.82	12.42		3.50	3.50	5.50
July	132.82	12.42	303571.73	28.88	0.38	10.17	-9.79	-17.60	36.88	16.58	5.41	85.24	9.52		5.00	4.00	6.00
Aug.	85.24	9.52	288543.87	27.45	0.41	9.06	-8.65	-15.06	29.50	8.29	5.90	53.94	7.55		4.00	2.00	7.50
Sept.	53.94	7.55	278602.13	25.65	0.40	6.15	-5.75	-9.79	26.55	6.22	7.38	29.66	5.97		3.60	1.50	4.75
Total				298.65	13.5	51.68	-38.18	-68.44	140.9	58.0	31.7				19.1	14.0	34.0
														75% Efficiency	**14.33**	**10.50**	**25.50**

Notes: 1. Depth at deep end. 4.0 foot depth corresponds to 0.0 foot depth at shallow end of pond. The end of season depth is approximately 6 feet in order to keep the surface aerators in operation and to avoid the need for removing the unutilized aerators prior to the pond freezing over.
2. Application rates in water balance are lower than allowable rates. See Section 6.1 for allowable application rates in each area.

Table II

Water Balance for Aerated Treatment, Holding, and Irrigation (2035 Conditions) - Balance Including Evaporation on Treatment and Holding Ponds

Holding Pond Constants:
*Assume 6' Water on 10/01 for Start

Treatment Pond Constants:
Water Surface Area 4.82 ac

Annual Irrigation:

Forest Irrigation Site 1	88.5	ac
Forest Irrigation Site 2	49.75	ac
Dike Irrigation	11.8	ac
Crop	53.42	ac

Irrigation Required:

Dike	25.5	in/acre
Forest Site 1	14.3	in/acre
Forest Site 2	14.3	in/acre
Crop	14.6	in/acre

Mo.	Holding Pond Initial Volume (Ac-ft)	Initial Depth flow (ft) [1]	Influent Flow (gpd)	Monthly Influent Flow (Ac-ft)	Rainfall (in)	Evaporation from Ponds (in)	Net (in)	Net Ponds Evap. (Ac-ft)	Irrigation Discharge Forest Site 1 (Ac-ft)	Irrigation Discharge Forest Site 2 (Ac-ft)	Irrigation Discharge Dikes (Ac-ft)	Irrigation Discharge Crop (Ac-ft)	Final Volume (Ac-ft)	Final Depth (ft)		Irrigation Discharge Forest Site 1 (in/acre)	Irrigation Discharge Forest Site 2 (in/acre)	Irrigation Discharge Dikes (in/acre)	Irrigation Discharge Crop (in/acre) [2]
Oct.	30.07	6.00	348825.48	33.19	0.95	3.29	-2.34	-3.92	9.96	5.60	2.46	11.13	30.20	6.01		1.35	1.35	2.50	2.50
Nov.	30.20	6.01	350443.91	32.27	2.10	1.80	0.30	0.50	0.00	0.00	0.00	0.00	62.97	8.12		0.00	0.00	0.00	0.00
Dec.	62.97	8.12	355343.87	33.81	2.27	0.00	2.27	3.89	0.00	0.00	0.00	0.00	100.67	10.47		0.00	0.00	0.00	0.00
Jan.	100.67	10.47	345048.46	32.83	2.24	0.00	2.24	3.94	0.00	0.00	0.00	0.00	137.44	12.70		0.00	0.00	0.00	0.00
Feb.	137.44	12.70	335344.85	28.82	1.45	0.00	1.45	2.61	0.00	0.00	0.00	0.00	168.87	14.54		0.00	0.00	0.00	0.00
Mar.	168.87	14.54	353089.85	33.59	1.12	0.00	1.12	2.06	0.00	0.00	0.00	0.00	204.53	16.58		0.00	0.00	0.00	0.00
Apr.	204.53	16.58	344085.93	31.68	0.79	5.26	-4.47	-8.40	18.44	10.36	4.43	14.47	180.11	15.19		2.50	2.50	4.50	3.25
May	180.11	15.19	356379.50	33.91	0.78	7.25	-6.47	-11.98	22.13	12.44	4.43	13.36	149.69	13.42		3.00	3.00	5.00	3.00
June	149.69	13.42	408924.67	37.65	0.61	8.70	-8.09	-14.70	29.50	16.58	4.92	11.13	110.51	11.08		4.00	4.00	6.00	2.50
July	110.51	11.08	417177.24	39.69	0.38	10.17	-9.79	-17.34	36.88	20.73	5.90	12.24	57.11	7.75		5.00	5.00	8.00	2.75
Aug.	57.11	7.75	396525.50	37.73	0.41	9.06	-8.65	-14.76	18.44	10.36	7.87	12.24	31.16	6.07		2.50	2.50	6.00	2.75
Sept.	31.16	6.07	382863.27	35.25	0.40	6.15	-5.75	-9.63	5.53	3.11	5.90	12.24	30.00	6.00		0.75	0.75	2.00	2.75
Total				410.41	13.50	51.68	38.18	-67.73	140.9	79.2	35.9	86.8				19.10	19.10	34.00	19.50
															75% Efficiency	**14.33**	**14.33**	**25.50**	**14.63**

Notes:
1. Depth at deep end. 4.0 foot depth corresponds to 0.0 foot depth at shallow end of pond. The end of season depth is approximately 6 feet in order to keep the surface aerators in operation and to avoid the need for removing the unutilized aerators prior to the pond freezing over.
2. Application rates in water balance are lower than allowable rates. See Section 6.1 for allowable application rates in each area.

APPENDIX C

Water Pollution Control Facilities (WPCF) Permit No. 101779, Expires December 31, 2025.

WATER POLLUTION CONTROL FACILITIES PERMIT

Department of Environmental Quality
475 NE Bellevue Dr. Suite 110, Bend, OR 97701
Telephone: 541-388-6146
(541) 388-6146
Issued pursuant to ORS 468B.050

ISSUED TO:

City of Sisters
P.O. Box 39
Sisters, OR 97759

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Method of Disposal
Domestic Sewage	001	Recycled Water Reuse

SYSTEM TYPE AND LOCATION:

Domestic Sewage Lagoons
912 S. Locust Street
T15S, R10 EWM, S09; TL 1002
Longitude -121.538480;
Latitude 44.280506
Sisters, Oregon

RIVER BASIN INFORMATION:

Basin: Deschutes
Sub-Basin: Upper Deschutes
LLID: 1213357444600-20.47-N
County: Deschutes
Nearest surface stream which would receive waste if it were to discharge: Whychus Creek formally called Squaw Creek

Treatment System Class: I
Collection System Class: II

Issued in response to Application No. 968002 received December 17, 2010.

This permit is issued based on the land use findings in the permit record.

Don Butcher, Water Quality Permit Manager
Eastern Region

January 22, 2016
Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

All direct a discharge to surface waters is prohibited.

SCHEDULE A

Waste Disposal Limitations

1. The permittee is authorized to construct, operate, and maintain wastewater collection, treatment and disposal systems to serve the City of Sisters in accordance with the conditions set forth in this permit.

2. The wastewater collections, treatment and land application system must not be hydraulically or organically loaded in excess of their respective, DEQ approved design capacities. At full build-out, however, the annual average daily influent flow must not exceed 0.38 MGD.

3. All wastewater treatment and disposal systems must be operated in compliance with the following conditions:

   a. No discharge to state waters is permitted. All wastewater must be stored and treated for disposal by land application following sound irrigation practices.

   b. Recycled Wastewater
      i. Prior to land application of the recycled water, it must receive at least Class D treatment as defined in OAR 340-055. Class D recycled water must not exceed a 30-day log mean of 126 E. coli organisms per 100 milliliters and 406 E. coli organisms per 100 milliliters in any single sample. Class C recycled water must not exceed a 7 day median of 23 organisms/100 milliliters and no two consecutive samples must exceed 240 organisms/100 milliliters.
      ii. Irrigation must conform to a Recycled Water Use Plan approved by DEQ and meet the required setbacks as defined in OAR 340-055.
      iii. The City of Sisters must restrict public access to the reuse site(s) for the protection of public health.
      iv. Treated effluent may only be irrigated on land between April 1 through October 31 for dissipation by evapotranspiration and controlled seepage by following sound irrigation practices unless otherwise approved in writing by DEQ.
      v. Recycled water equipment must be operated so as to prevent:
         (A) Prolonged ponding of treated recycled water on the ground surface;
         (B) Surface runoff or subsurface drainage through drainage tile;
         (C) The creation of odors, fly and mosquito breeding or other nuisance conditions;
         (D) The overloading of land with nutrients, organics, or other pollutant parameters; and
         (E) Impairment of existing or potential beneficial uses of groundwater.
         (F) Until otherwise approved in writing by the Department via a revised reclaimed water use plan, treated effluent must only be reused on Class D beneficial uses.

4. The storage lagoon must be lowered sufficiently by the end of the irrigation season to ensure maximum practicable storage capacity during the non-irrigation months.

5. The permittee must, during all times of treatment and disposal, provide personnel whose primary responsibilities are to assure the continuous performance of the disposal system in accordance with the conditions of this permit.

6. No activities must be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater and process related residuals must be managed and disposed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040).

SCHEDULE B

1. System Monitoring Requirements

The permittee must monitor the operation and efficiency of all treatment and disposal facilities. Sampling and measurements taken as required herein must be representative of the nature of the wastewater, and must be taken under normal operating conditions. Unless otherwise agreed to in writing by the Department of Environmental Quality, data collected, and submitted must include but not necessarily be limited to the following parameters and minimum frequencies:

a. Influent Monitoring and Reporting Requirements

Table B 1: Influent Monitoring

Item or Parameter	Time Period	Minimum Frequency	Sample Type/Required Action	Report
Total Flow (MGD)	Year-round	Daily	Measurement	Daily totals Monthly maximum Monthly minimum Monthly average Monthly total
Flow Meter Verification	Year-round	Annually	Verification	Completed or not completed (Pass, Fail)
BOD_5 and TSS (mg/L)	Year-round	Weekly	Composite	Monthly averages Weekly values
pH (S.U.)	Year-round	3/week	Grab	Monthly maximum Monthly minimum Monthly average

b. Recycled Water Monitoring Requirements:

Table B2: Recycled Water Monitoring

Item or Parameter	Minimum Frequency	Sample Type/Required Action
Total Flow (MGD) or Quantity Irrigated (in/ac)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
Chlorine, Total Residual (mg/L)	Daily	Grab
pH	3/Week	Grab
E. coli Bacteria	1/Week	Grab*
Total Coliform	1/Week	Grab*
Total P and Total N	Annually	Grab
Annual Irigation		

*The permittee is only required to sample for either E. coli or total coliform, but not both for an individual use. If the permittee is irrigating on crops requiring only Class D quality effluent, E. coli must be monitored. If the permittee irrigates/reuses effluent for Class C uses, total coliform must be monitored.

2. Reporting Procedures

a. Monitoring results must be reported on DEQ approved forms. Reports must be submitted to DEQ's Eastern Region – Bend office by the 15th day of the following month.

b. State monitoring reports must identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports must also identify each system classification as found on page one of this permit.

c. Monitoring reports must also include a record of the quantity and method of use of all sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

d. The laboratory used by the permittee to analyze samples must have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results must be included in the report, but not used in calculations required by this permit. When possible, the permittee must re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

e. By no later than January 15 of each year, the permittee must submit to DEQ an annual report describing the effectiveness of the recycle water system to comply with the approved recycle water use plan, the rules of Division 55, and the limitations and conditions of this permit applicable to reuse of recycled water. The review is to provide a summary of land application conducted at each site which is adequate to demonstrate that reuse water was applied agronomically and/or hydraulic loading rates, and that required site management practices were followed.

SCHEDULE C

Compliance Conditions and Schedules

a. Within 180 days the permittee must update their recycled water use plan for DEQ approval. A recycled water use plan must describe how the wastewater treatment system owner will comply with OAR 340-055 (refer to OAR 340-055-0025).

b. The permittee is expected to meet the compliance date that have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director or his authorized representative may revise a schedule of compliance if he determines good and valid cause resulting from events over which the permittee has little or no control.

SCHEDULE D

Special Conditions

1. Prior to constructing or modifying any wastewater control facilities, detailed plans and specifications shall be approved in writing by DEQ. After approval of the plans, all construction shall be in strict conformance with the plans unless otherwise approved in writing by DEQ.

2. Within 6 months of such time as the sewage lagoons require removal of accumulated biosolids, the permittee shall submit a biosolids management plan that complies with the Department's biosolids management regulations as established in OAR 340-50.

3. This permit may be modified to incorporate any applicable standard for sewage sludge use or disposal promulgated under section 405(d) of the Clean Water Act, if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or controls a pollutant or practice not limited in this permit.

4. The permittee must, during all times of disposal, provide personnel to ensure the continuous performance of the disposal system within the limitations of this permit. In the event that any condition of this permit or DEQ rules are violated, the permittee must immediately take action to correct the violation and to notify DEQ **within 24 hours** at: DEQ's Eastern Region Water Quality Program Office (541) 388-6146.

   Response: In response to a notification, DEQ may conduct an investigation to evaluate the nature and extent of the problem, and may require additional corrective actions, as necessary. Compliance with this requirement does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

5. All materials and equipment, including but not limited to tanks, pumps, controls, valves, etc. must be installed, operated, and maintained in accordance with manufacturer's minimum specifications.

6. The permittee must immediately notify the DEQ Bend office (phone 388-6146) of any occurrence of surfacing sewage so corrective action can be coordinated between the permittee and DEQ. When the DEQ offices are not open, the permittee must report the incident to the Oregon Emergency Response System (phone 1-800-452-0311).

7. Emergency Response and Public Notification Plan

   a. The permittee must develop, and maintain and implement an Emergency Response and Public Notification Plan (the Plan) per Schedule F, Section B, and Conditions 5 & 6. The permit holder must develop the plan within six months of permit issuance and update the Plan annually to ensure that telephone and email contact information for applicable public agencies are current and accurate. An updated copy of the plan must be kept on file at the wastewater treatment facility for Department review. The latest plan revision date must be listed on the Plan cover along with the reviewer's initials or signature.

8. Recycled Water Use Plan

   a. In order to distribute recycled water for reuse, the permittee must develop, have and maintain and implement a DEQ-approved Recycled Water Use Plan meeting the requirements in OAR 340-055-0025. The permittee must submit substantial modifications to an existing plan to DEQ for approval at least 60 days prior to making the proposed changes. Conditions in the Plan are enforceable requirements under this permit.

9. The permittee must meet the requirements for use of recycled water under Division 55, including the following:

   a. All recycled water must be managed in accordance with the approved Recycled Water Use Plan. No substantial changes must be made in the approved plan without written approval by DEQ.

   b. The permittee must notify DEQ within 24 hours if it is determined that the treated effluent is being used in a manner not in compliance with OAR 340-055. When the DEQ offices are not open, the permittee must report the incident of noncompliance to the Oregon Emergency Response System (Telephone Number 1-800-452-0311).

   c. No recycled water must be made available to a person proposing to recycle unless that person certifies in writing that they have read and understand the provisions in Division 55. This written certification must be kept on file by the sewage treatment system owner and be made available to DEQ for inspection.

   e. Treated effluent must not be irrigated on ground that is frozen, snow-covered, or saturated with water. The volume of irrigated effluent and its total nitrogen loading must not exceed that established in a DEQ-approved recycled water use plan.

   f. Unless otherwise approved in writing by DEQ, a vegetative cover must be maintained on the land irrigation area at all times. Vegetation is to be periodically cut and removed to ensure maximum evapotranspiration and nutrient capture.

10. Operator Certification

The permittee must comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and designate a supervisor whose certification corresponds with the classification of the collection and/or treatment system as specified on page 1 of this permit.

   a. Definitions

      i. "Supervise" means to have full and active responsibility for the daily onsite technical operation of a wastewater treatment system or wastewater collection system.
      ii. "Supervisor" or "designated operator", means the operator delegated authority by the permittee for establishing and executing the specific practice and procedures for operating the wastewater treatment system or wastewater collection system in accordance with the policies of the owner of the system and any permit requirements.
      iii. "Shift Supervisor" means the operator delegated authority by the permittee for executing the specific practice and procedures for operating the wastewater treatment

system or wastewater collection system when the system is operated on more than one daily shift.

iv. "System" includes both the collection system and the treatment systems.

b. The permittee must have its system supervised by one or more operators who hold a valid certificate for the type of wastewater treatment or wastewater collection system, and at a grade equal to or greater than the wastewater system's classification as specified on page 1 of this permit.

c. The permittee's wastewater system may not be without the designated supervisor for more than 30 days. During this period, there must be another person available to supervisor who is certified at no more than one grade lower than the classification of the wastewater system. The permittee must delegate authority to this operator to supervise the operation of the system.

d. If the wastewater system has more than one daily shift, the permittee must have another properly certified operator available to supervisor operation of the system. Each shift supervisor, if any, must be certified at no more than one grade lower than the system classification.

e. The permittee is not required to have a supervisor on site at all times; however, the supervisor must be available to the permittee and operator at all times.

f. The permittee must notify DEQ in writing of the name of the system supervisor. The permittee may replace or re-designate the system supervisor with another properly certified operator at any time and must notify DEQ in writing within 30 days of replacement or re-designation of operator in charge. As of this writing, the notice of replacement or re-designation must be sent to Water Quality Division, Operator Certification Program, 2020 SW 4th Avenue, Suite 400, Portland, OR 97201. This address may be updated in writing by DEQ during the term of this permit.

g. When compliance with paragraph (c) of Item 8 in this section is not possible or practicable because the system supervisor is not available or the position is vacated unexpectedly, and another certified operator is not qualified to assume supervisory responsibility, the Director may grant a time extension for compliance with the requirements in response to a written request from the system owner. The Director will not grant an extension longer than 120 days unless the system owner documents the existence of extraordinary circumstances.

11. DEQ may reopen the Schedules in this permit, if necessary, to include new or revised conditions.

12. If warranted, at any time, DEQ may evaluate the need for or require a full assessment of the facilty's impact on groundwater quality.

SCHEDULE F

WPCF GENERAL CONDITIONS – DOMESTIC FACILITIES

SECTION A. STANDARD CONDITIONS

1. Duty to Comply with Permit

The permittee must comply with all conditions of this permit. Failure to comply with any permit condition is a violation of Oregon Revised Statutes (ORS) 468B.025 and grounds for an enforcement action. Failure to comply is also grounds for the Department to modify, revoke, or deny renewal of a permit.

2. Property Rights and Other Legal Requirements

Issuance of this permit does not convey any property rights of any sort, or any exclusive privilege, or authorize any injury to persons or property or invasion of any other rights, or any infringement of federal, tribal, state, or local laws or regulations.

3. Liability

The Department of Environmental Quality or its officers, agents, or employees may not sustain any liability on account of the issuance of this permit or on account of the construction or maintenance of facilities or systems because of this permit.

4. Permit Actions

After notice by the Department, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including but not limited to the following:

a. Violation of any term or condition of this permit, any applicable rule or statute, or any order of the Commission;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.

5. Transfer of Permit

This permit may not be transferred to a third party without prior written approval from the Department. The Department may approve transfers where the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of this permit and the rules of the Commission. A transfer application and filing fee must be submitted to the Department.

6. Permit Fees

The permittee must pay the fees required by Oregon Administrative Rules.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

At all times the permittee must maintain in good working order and properly operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to comply with the terms and conditions of this permit.

2. Standard Operation and Maintenance

All waste collection, control, treatment, and disposal facilities or systems must be operated in a manner consistent with the following:

a. At all times, all facilities or systems must be operated as efficiently as possible in a manner that will prevent discharges, health hazards, and nuisance conditions.

b. All screenings, grit, and sludge must be disposed of in a manner approved by the Department to prevent any pollutant from the materials from reaching waters of the state, creating a public health hazard, or causing a nuisance condition.

c. Bypassing untreated waste is generally prohibited. Bypassing may not occur without prior written permission from the Department except where unavoidable to prevent loss of life, personal injury, or severe property damage.

3. Noncompliance and Notification Procedures

If the permittee is unable to comply with conditions of this permit because of surfacing sewage; a breakdown of equipment, facilities or systems; an accident caused by human error or negligence; or any other cause such as an act of nature, the permittee must:

a. Immediately take action to stop, contain, and clean up the unauthorized discharges and correct the problem.

b. Immediately notify the Department's Regional office so that an investigation can be made to evaluate the impact and the corrective actions taken, and to determine any additional action that must be taken.

c. Within 5 days of the time the permittee becomes aware of the circumstances, the permittee must submit to the Department a detailed written report describing the breakdown, the actual quantity and quality of waste discharged, corrective action taken, steps taken to prevent a recurrence, and any other pertinent information.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or liability for failure to comply.

4. Wastewater System Personnel

The permittee must provide an adequate operating staff that is duly qualified to carry out the operation, maintenance, and monitoring requirements to assure continuous compliance with the conditions of this permit.

5. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs that threatens public health, the permittee must take such steps as are necessary to alert the public, health agencies and other affected entities (e.g., public water systems) about the extent and nature of the discharge in accordance with the notification procedures developed under General Condition B.6. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

6. Emergency Response and Public Notification Plan

The permittee must develop and implement an emergency response and public notification plan that identifies measures to protect public health from overflows, bypasses or upsets that may endanger public health. At a minimum the plan must include mechanisms to:

a. Ensure that the permittee is aware (to the greatest extent possible) of such events;
b. Ensure notification of appropriate personnel and ensure that they are immediately dispatched for investigation and response;
c. Ensure immediate notification to the public, health agencies, and other affected public entities (including public water systems). The overflow response plan must identify the public health and other officials who will receive immediate notification;
d. Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained;
e. Provide emergency operations; and
f. Ensure that DEQ is notified of the public notification steps taken.

SECTION C. MONITORING AND RECORDS

1. Inspection and Entry

The permittee must at all reasonable times allow authorized representatives of the Department to:

a. Enter upon the permittee's premises where a waste source or disposal system is located or where any records are required to be kept under the terms and conditions of this permit;

b. Have access to and copy any records required by this permit;

c. Inspect any treatment or disposal system, practices, operations, monitoring equipment, or monitoring method regulated or required by this permit; or

d. Sample or monitor any substances or permit parameters at any location at reasonable times for the purpose of assuring permit compliance or as otherwise authorized by state law...

2. Averaging of Measurements

Calculations of averages of measurements required for all parameters except bacteria must use an arithmetic mean; bacteria must be averaged as specified in the permit.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures specified in the most recent edition of **Standard Methods for the Examination of Water and Wastewater**, unless other test procedures have been approved in writing by the Department and specified in this permit.

4. Representative Sampling

Sampling and measurements taken as required herein must be representative of the volume and nature of the monitored discharge when discharging or land applying. Monitoring points must not be changed without notification to and the approval of DEQ.

5. Retention of Records

The permittee must retain records of all monitoring and maintenance information, including all calibrations, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. The Department may extend this period at any time.

SECTION D. REPORTING REQUIREMENTS

1. Plan Submittal

Pursuant to Oregon Revised Statute 468B.055, unless specifically exempted by rule, construction, installation, or modification of disposal systems, treatment works, or sewerage systems may not commence until plans and specifications are submitted to and approved in writing by the Department. All construction, installation, or modification shall be in strict conformance with the Department's written approval of the plans.

2. Change in Discharge

Whenever a facility expansion, production increase, or process modification is expected to result in a change in the character of pollutants to be discharged or in a new or increased discharge that will exceed the conditions of this permit, a new application must be submitted together with the necessary reports, plans, and specifications for the proposed changes. A change may not be made until plans have been approved and a new permit or permit modification has been issued.

3. Signatory Requirements

All applications, reports, or information submitted to the Department must be signed and certified by the official applicant of record (owner) or authorized designee.

4. Twenty-Four Hour Reporting

The permittee must report any noncompliance that may endanger health or the environment. Any information must be provided orally (by telephone) to DEQ or to the Oregon Emergency Response System (1-800-452-0311) as specified below within 24 hours from the time the permittee becomes aware of the circumstances.

a. Overflows.

(1) Oral Reporting within 24 hours.

i. For overflows other than basement backups, the following information must be reported to the Oregon Emergency Response System (OERS) at 1-800-452-0311. For basement backups, this information should be reported directly to DEQ.

a) The location of the overflow;
b) The receiving water (if there is one);
c) An estimate of the volume of the overflow;
d) A description of the sewer system component from which the release occurred (e.g., manhole, constructed overflow pipe, crack in pipe); and
e) The estimated date and time when the overflow began and stopped or will be stopped.

ii. The following information must be reported to the Department's Regional office within 24 hours, or during normal business hours, whichever is first:

a) The OERS incident number (if applicable) along with a brief description of the event.

(2) Written reporting within 5 days.

i. The following information must be provided in writing to the Department's Regional office within 5 days of the time the permittee becomes aware of the overflow:

a) The OERS incident number (if applicable);
b) The cause or suspected cause of the overflow;
c) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
d) Steps taken or planned to mitigate the impact(s) of the overflow and a schedule of major milestones for those steps; and
e) (for storm-related overflows) The rainfall intensity (inches/hour) and duration of the storm associated with the overflow.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

b. Other instances of noncompliance.

(1) The following instances of noncompliance must be reported:

i. Any unanticipated bypass that exceeds any effluent limitation in this permit;
ii. Any upset that exceeds any effluent limitation in this permit;
iii. Violation of maximum daily discharge limitation for any of the pollutants listed by the Department in this permit; and
iv. Any noncompliance that may endanger human health or the environment.

(2) During normal business hours, the Department's Regional office must be called. Outside of normal business hours, the Department must be contacted at 1-800-452-0311 (Oregon Emergency Response System).

(3) A written submission must be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission must contain:

i. A description of the noncompliance and its cause;
ii. The period of noncompliance, including exact dates and times;
iii. The estimated time noncompliance is expected to continue if it has not been corrected;
iv. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and
v. Public notification steps taken, pursuant to General Condition B.6.

(4) The Department may waive the written report on a case-by-case basis if the oral report has been received
within 24 hours.

SECTION E. DEFINITIONS

1. *BOD_5* means five-day biochemical oxygen demand.
2. *TSS* means total suspended solids.
3. *FC* means fecal coliform bacteria.
4. *NH_3-N* means Ammonia Nitrogen.
5. *NO_3-N* means Nitrate Nitrogen.
6. *NO_2-N* means Nitrite Nitrogen.
7. *TKN* means Total Kjeldahl Nitrogen.
8. *Cl* means Chloride.
9. *TN* means Total Nitrogen.
10. "*Bacteria*" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.
11. *Total residual chlorine* means combined chlorine forms plus free residual chlorine.
12. *mg/l* means milligrams per liter.
13. *ug/l* means micrograms per liter.
14. *kg* means kilograms.
15. *GPD* means gallons per day.
16. *MGD* means million gallons per day.
17. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.
18. *Composite sample* means a combination of samples collected, generally at equal flow or time intervals over a 24-hour period.
19. *Week* means a calendar week of Sunday through Saturday.
20. *Month* means a calendar month.
21. *Quarter* means January through March, April through June, July through September, or October through December.

APPENDIX C
Discharge Monitoring Reports

CITY OF SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
DISCHARGE MONITORING REPORT SUMMARY

	Influent								Effluent						
Date	Total Monthly Flow (MG)	Maximum Daily Flow (MGD)	Minimum Daily Flow (MGD)	Average Daily Flow (MGD)	Daily Max pH	Daily Min pH	BOD_5 Conc. (mg/L)	TSS Conc. (mg/L)	Dike Quantity Irrigated (in/acre)	Forest Quantity Irrigated (in/acre)	Forest 2 Quantity Irrigated (in/acre)	Average Daily Quantity Chlorine Used (lbs)	*E. Coli* Concentration (CFU/100 ml)	Maximum pH	Minimum pH
Jan-18	6.118	0.220	0.184	0.197	7.34	7.17	268	134							
Feb-18	5.526	0.222	0.187	0.197	7.33	7.05	200	98							
Mar-18	6.124	0.210	0.187	0.197	7.33	6.90	327	136							
Apr-18	5.926	0.213	0.186	0.197	7.36	7.01	357	173	1.37			7.0	1.00	7.40	7.00
May-18	6.634	0.246	0.196	0.214	7.29	7.01	267	147	4.81	2.06		6.0	1.00	7.20	7.10
Jun-18	6.890	0.249	0.213	0.230	7.34	6.71	354	170	6.57	3.22		8.0	1.50	7.30	7.10
Jul-18	7.479	0.264	0.229	0.241	7.25	6.71	354	170	9.33	5.43		9.0	2.86	8.00	7.20
Aug-18	7.331	0.254	0.210	0.236			362	169	6.67	3.77		10.0	2.03	7.82	7.11
Sep-18	6.796	0.250	0.207	0.227	7.59	6.89	366	185	5.37	3.10		9.0	2.52	7.18	7.86
Oct-18	6.500	0.235	0.190	0.211	7.25	7.10	358	195	2.25	1.12		9.0	1.00	7.91	7.21
Nov-18	6.106	0.216	0.187	0.204	7.25	6.85	318	148							
Dec-18	6.521	0.238	0.173	0.210			331	137							
Jan-19	6.504	0.243	0.194	0.209	7.37	7.10	252	153							
Feb-19	5.747	0.235	0.182	0.205	7.42	6.91	311	199							
Mar-19	6.584	0.225	0.191	0.212	7.25	6.94	306	178							
Apr-19	6.477	0.249	0.202	0.216	7.32	7.11	297	174	1.61	0.64		9.9	1.00	7.42	7.29
May-19	6.865	0.243	0.209	0.221	7.41	7.17	308	180	4.93	2.03	0.44		4.63	7.28	7.11
Jun-19	8.421	0.423	0.175	0.280	7.44	7.13	338	172	6.18	3.77			20.80	7.60	7.25
Jul-19	8.126	0.287	0.247	0.262	7.36	7.10	354	153	8.62	5.28		9.0	10.09	7.38	7.11
Aug-19	7.777	0.262	0.240	0.251	7.33	7.13	279	176	10.69	6.73			9.60	7.38	7.23
Sep-19	7.137	0.270	0.221	0.237	7.86	7.11	186	136	9.77	4.88	3.00	12.0	18.60		
Oct-19	6.770	0.244	0.202	0.218	7.39	7.11	372	290	9.49		3.18	9.0	2.60	8.52	7.70
Nov-19	6.568	0.243	0.208	0.219	7.49	6.25	319	111							
Dec-19	6.825	0.249	0.193	0.220	7.31	6.63	397	108							
Jan-20	6.734	0.256	0.196	0.217	7.25	6.75	301	168							
Feb-20	6.352	0.234	0.198	0.219	7.27	7.01	350	160							
Mar-20	6.435	0.227	0.190	0.208	7.25	6.64	323	158							
Apr-20	5.926	0.210	0.186	0.198	7.21	7.12	338	184	1.62			3.5	0.00	7.39	7.01
May-20	6.712	0.241	0.197	0.217	7.31	7.11	296	173	3.83	0.46	0.44	4.7	8.00	7.40	7.00
Jun-20	7.405	0.305	0.225	0.247	7.29	7.11	338	188	3.80	5.27	5.20	7.2	18.10	7.42	7.18
Jul-20	8.059	0.270	0.244	0.260	7.28	7.17	390	177	4.20	3.80	3.80	7.9	7.70	8.40	7.38
Aug-20	6.974	0.283	0.221	0.225	7.49	7.11	319	158	2.22	1.05	1.05	7.8	15.00	8.11	7.50
Sep-20	7.437	0.287	0.226	0.247	7.31	6.62	282	176	5.32	1.20	1.20	15.0	3.70	8.20	7.19
Oct-20	7.586	0.267	0.217	0.244	7.61	7.11	240	179	5.28		3.74	7.0	9.10	7.87	7.10
Nov-20	7.046	0.307	0.216	0.234	7.91	7.00	241	122							
Dec-20															
Maximum	8.421	0.423	0.247	0.280	7.91	7.17	397	290	10.69	6.73	5.20	15.0	20.80	8.52	7.86
Minimum	5.526	0.210	0.173	0.197	7.21	6.62	186	98	1.37	0.46	0.44	3.5	0.00	7.18	7.00
Average	6.812	0.254	0.204	0.224	7.37	6.99	314	164	5.43	3.17	2.45	8.4	6.71	7.66	7.23

BOD = biochemical oxygen demand
CFU = colony forming units
ft = feet
in/acre = inches per acre
lbs = pounds
MG = million gallons
MGD = million gallons per day
mg/L = milligrams per liter
ml = milliliters
TKN = total Kjeldahl nitrogen
TSS = total suspended solids

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
WASTEWATER FACILITIES PLAN UPDATE
DISCHARGE MONITORING REPORT SUMMARY

APPENDIX
C

APPENDIX D
Sewer Rate Resolution and Budget Summary

Sewer Fund

RESPONSIBLE MANAGER: Paul Bertagna, Public Works Director

DESCRIPTION: The Sewer Fund supports the City's wastewater utility which ensures the safe collection and discharge of wastewater effluent under the requirements of the City's National Pollutant Discharge Elimination System (NPDES) permit.

Fund Resources
This fund is an enterprise fund meaning it is self-supporting with expenses paid from its own revenue sources. The main source of revenue is from sewer charges. Other sewer revenue is provided through service fees and sewer connections.

Review of FY 2020/21 Department Work Plan:
Objectives that were accomplished include:

- Developed the Scope and procured a consultant for the Lazy Z master plan and started the mater planning project (*Council Goal)
- Designed the Variable Frequency Drives for the 100 hp effluent pumps to provide energy savings and operational efficiency (*Council Goal)
- Completed the Bio-solids Removal in our primary lagoon (*Council Goal)
- Completed 100% design and developed Bid doc's/specifications for the Locust St. sewer line relocation and procure construction easements (*Council Goal)
- Designed and bid the Rope St. Pump station improvements that includes new and larger capacity pumps and related equipment (*Council Goal)
- Updated Sewer Rate Model and verified adequate fund balance for the 5 yr forecast (*Council Goal)
- Conducted GIS GPS accuracy survey and modified GIS layers as needed

Objectives for FY 2021/22 Department Work Plan:

- Construct the Locust St. sewerline re-locate project (*Council Goal)
- Update the 2016 Wastewater Capital Facilities Plan (*Council Goal)
- Update the 10 yr Capital Improvement Plan (*Council Goal)
- Design/Bid/Construct 75KW Solar Panel installation at the Wastewater Treatment Plant (*Council Goal)
- Complete the procurement and install of the Variable Frequency Drives on the 100 hp effluent pumps to provide energy savings and operational efficiency (*Council Goal)
- Develop a Wildfire Resiliency Plan for the Wastewater Treatment Systems (*Council Goal)
- Procure a portable back-up generator for the City's (3) satellite pumpstations
- Design and construct the generator transfer switches for the Portable power source
- Construct the Rope St. pumpstation improvements

SEWER FUND BUDGET SUMMARY:

RESOURCES	FY 2018/19 ACTUAL	FY 2019/20 ACTUAL	FY 2020/21 BUDGET	FY 2021/22 MANAGER PROPOSED	FY 2021/22 COMMITTEE APPROVED	FY 2021/22 COUNCIL ADOPTED
Revenues:						
Sewer Receipts	$ 952,300	$ 1,078,584	$ 1,090,500	$ 1,160,000	$ 1,160,000	$ 1,160,000
Charges For Services	18,031	17,357	11,900	20,000	20,000	20,000
Licenses And Fees	8,753	10,578	8,000	8,000	8,000	8,000
Intergovernmental	-	-	30,000	154,536	154,536	154,536
Interest/Loan Proceeds	33,348	31,434	16,000	8,000	8,000	8,000
Rental income	10,000	16,000	-	-	-	-
Miscellaneous	29,078	5,337	13,103	12,650	12,650	12,650
Total Revenues	**1,051,510**	**1,159,290**	**1,169,503**	**1,363,186**	**1,363,186**	**1,363,186**
Beginning Fund Balance	1,328,241	1,532,416	1,700,714	1,670,821	1,670,821	1,670,821
TOTAL RESOURCES	**$ 2,379,751**	**$ 2,691,706**	**$ 2,870,217**	**$ 3,034,007**	**$ 3,034,007**	**$ 3,034,007**

REQUIREMENTS	FY 2018/19 ACTUAL	FY 2019/20 ACTUAL	FY 2020/21 BUDGET	FY 2021/22 MANAGER PROPOSED	FY 2021/22 COMMITTEE APPROVED	FY 2021/22 COUNCIL ADOPTED
Expenditures:						
Personnel Services	$ 251,979	$ 286,617	$ 310,184	$ 355,501	$ 355,501	$ 355,501
Materials & Services	250,472	290,202	331,106	321,822	321,822	321,822
Capital Improvements	4,800	24,436	355,850	353,000	353,000	353,000
Debt Service	333,284	334,153	335,917	332,245	332,245	332,245
Total Expenditures	**840,535**	**935,408**	**1,333,057**	**1,362,568**	**1,362,568**	**1,362,568**
Unappropriated Reserves	-	-	-	-	-	-
Operating Contingency	-	-	41,181	112,886	112,886	112,886
Reserves	-	-	1,483,379	1,545,253	1,545,253	1,545,253
Transfers Out	6,800	12,480	12,600	13,300	13,300	13,300
TOTAL REQUIREMENTS	**$ 847,335**	**$ 947,888**	**$ 2,870,217**	**$ 3,034,007**	**$ 3,034,007**	**$ 3,034,007**

NET TOTAL	**$ 1,532,416**	**$ 1,743,818**	**$ -**	**$ -**	**$ -**	**$ -**

		FY 2018/19 ACTUAL	FY 2019/20 ACTUAL	FY 2020/21 BUDGET	FY 2021/22 MANAGER PROPOSED	FY 2021/22 COMMITTEE APPROVED	FY 2021/22 COUNCIL ADOPTED
05 - SEWER FUND							
RESOURCES							
REVENUE							
05-4-00-301	INTEREST EARNED	$ 33,348	$ 31,434	$ 16,000	$ 8,000	$ 8,000	$ 8,000
05-4-00-314	PUBLIC WORKS FEES	8,753	10,578	8,000	8,000	8,000	8,000
05-4-00-327	SEWER RECEIPTS	952,300	1,078,584	1,090,500	1,160,000	1,160,000	1,160,000
05-4-00-337	OVERNIGHT PARK SEWER RECEIPTS	18,031	17,357	11,900	20,000	20,000	20,000
05-4-00-354	PROPERTY RENTAL	10,000	16,000	-	-	-	-
05-4-00-360	MISCELLANEOUS	24,337	1,603	5,000	5,000	5,000	5,000
05-4-00-362	REFUNDS/REIMBURSEMENTS	1,991	1,034	5,903	6,000	6,000	6,000
05-4-00-381	SEWER TAP FEE	2,750	2,700	2,200	1,650	1,650	1,650
05-4-00-389	PLAN CHECK FEES	-	-	-	-	-	-
REVENUE SUBTOTAL		**1,051,510**	**1,159,290**	**1,139,503**	**1,208,650**	**1,208,650**	**1,208,650**
GRANTS & PASS THROUGHS							
05-4-00-640	STATE GRANTS	-	-	30,000	154,536	154,536	154,536
TOTAL GRANTS & PASS THROUGHS		**-**	**-**	**30,000**	**154,536**	**154,536**	**154,536**
TOTAL REVENUES		**1,051,510**	**1,159,290**	**1,169,503**	**1,363,186**	**1,363,186**	**1,363,186**
BEGINNING FUND BALANCE							
05-4-00-400	**BEGINNING FUND BALANCE**	**1,328,241**	**1,532,416**	**1,700,714**	**1,670,821**	**1,670,821**	**1,670,821**
TOTAL BEGINNING FUND BALANCE		**1,328,241**	**1,532,416**	**1,700,714**	**1,670,821**	**1,670,821**	**1,670,821**
TOTAL RESOURCES		**$ 2,379,751**	**$ 2,691,706**	**$ 2,870,217**	**$ 3,034,007**	**$ 3,034,007**	**$ 3,034,007**
REQUIREMENTS							
OPERATING CONTINGENCIES							
05-5-00-400	OPERATING CONTINGENCY	$ -	$ -	$ 41,181	$ 112,886	$ 112,886	$ 112,886
05-5-00-410	RESERVE FOR FUTURE EXPENDITURES	-	-	590,859	518,751	518,751	518,751
TOTAL OPERATING CONTINGENCIES		**-**	**-**	**632,040**	**631,637**	**631,637**	**631,637**
RESERVES							
05-5-00-445	CAPITAL REPLACEMENT RESERVE	-	-	706,920	745,302	745,302	745,302

		FY 2018/19 ACTUAL	FY 2019/20 ACTUAL	FY 2020/21 BUDGET	FY 2021/22 MANAGER PROPOSED	FY 2021/22 COMMITTEE APPROVED	FY 2021/22 COUNCIL ADOPTED
05-5-00-450	CAPITAL IMPROVEMENT RESERVE	-	-	185,600	281,200	281,200	281,200
TOTAL RESERVES		**-**	**-**	**892,520**	**1,026,502**	**1,026,502**	**1,026,502**
TRANSFERS							
05-5-00-602	TRANSFER TO CITY HALL FUND	6,800	12,480	12,600	13,300	13,300	13,300
TOTAL TRANSFERS		**6,800**	**12,480**	**12,600**	**13,300**	**13,300**	**13,300**
EXPENDITURES							
PERSONNEL SERVICES							
SALARIES AND WAGES		155,299	176,631	184,481	212,803	212,803	212,803
PAYROLL TAXES, INSURANCE, AND BENEFITS		96,680	109,986	125,703	142,698	142,698	142,698
TOTAL PERSONNEL SERVICES		**251,979**	**286,617**	**310,184**	**355,501**	**355,501**	**355,501**
MATERIALS & SERVICES							
05-5-00-704	RECRUITMENT	52	-	-	-	-	-
05-5-00-705	ADVERTISING	-	-	-	-	-	-
05-5-00-706	AUDIT FEES	5,173	1,454	5,000	5,000	5,000	5,000
05-5-00-710	COMPUTER SOFTWARE MAINT.	3,303	4,102	4,000	11,500	11,500	11,500
05-5-00-712	CHEMICALS	3,859	3,603	4,500	4,500	4,500	4,500
05-5-00-713	DEVELOPMENT REVIEW	10,162	9,960	8,000	8,000	8,000	8,000
05-5-00-714	OFFICE SUPPLIES	1,019	1,135	1,050	1,050	1,050	1,050
05-5-00-715	POSTAGE	5,906	5,793	5,900	5,900	5,900	5,900
05-5-00-717	OFFICE EQUIPMENT	-	600	500	500	500	500
05-5-00-718	LEASES	-	1,100	-	500	500	500
05-5-00-721	COPIER/PRINTER	1,168	768	800	800	800	800
05-5-00-726	CONTRACTED SERVICES	7,864	28,938	57,000	25,000	25,000	25,000
05-5-00-727	PERMITS & FEES	11,046	10,529	8,500	8,500	8,500	8,500
05-5-00-733	DUES & SUBSCRIPTIONS	310	1,936	400	400	400	400
05-5-00-735	TELEPHONE	2,686	2,835	3,100	3,100	3,100	3,100
05-5-00-736	CELLULAR PHONES	712	910	1,100	1,100	1,100	1,100
05-5-00-740	EDUCATION	624	541	1,500	1,500	1,500	1,500
05-5-00-743	ELECTRICITY	51,702	50,913	55,000	60,000	60,000	60,000
05-5-00-746	SMALL TOOLS & EQUIPMENT	2,581	870	5,000	7,700	7,700	7,700
05-5-00-755	GAS/OIL	5,366	4,342	4,500	6,000	6,000	6,000
05-5-00-765	SEWER SYSTEM IMPROVEMENTS	18,154	10,620	15,000	15,000	15,000	15,000
05-5-00-766	INS: COMP/LIA/UMB	13,490	14,077	15,000	15,000	15,000	15,000

		FY 2018/19 ACTUAL	FY 2019/20 ACTUAL	FY 2020/21 BUDGET	FY 2021/22 MANAGER PROPOSED	FY 2021/22 COMMITTEE APPROVED	FY 2021/22 COUNCIL ADOPTED
05-5-00-768	INTERNAL GEN FUND SERVICES	9,600	9,854	10,071	10,222	10,222	10,222
05-5-00-770	SEWER LOCATE SERVICE	226	276	250	250	250	250
05-5-00-771	MEDICAL TESTING & SERVICES	299	48	200	200	200	200
05-5-00-772	ROW FRANCHISE FEE	66,661	75,501	76,335	81,200	81,200	81,200
05-5-00-775	LABORATORY FEES	2,617	1,403	1,000	1,000	1,000	1,000
05-5-00-777	LEGAL FEES	338	595	1,000	3,500	3,500	3,500
05-5-00-780	CREDIT CARD FEE	7,564	11,943	3,500	3,500	3,500	3,500
05-5-00-782	UNIFORMS	725	612	1,500	1,500	1,500	1,500
05-5-00-787	SEWER SYSTEM REPAIRS	1,489	29,010	25,000	25,000	25,000	25,000
05-5-00-789	MILEAGE/TRAVEL REIMBURSEMT	51	-	200	200	200	200
05-5-00-790	MISCELLANEOUS	121	-	-	-	-	-
05-5-00-793	MEETINGS/WORKSHOPS	118	69	200	200	200	200
05-5-00-795	SUPPLIES	4,462	2,868	6,000	4,000	4,000	4,000
05-5-00-796	VEHICLE MAINTENANCE	11,024	2,997	10,000	10,000	10,000	10,000
05-5-00-799	BAD DEBT EXPENSE	-	-	-	-	-	-
TOTAL MATERIALS & SERVICES		**250,472**	**290,202**	**331,106**	**321,822**	**321,822**	**321,822**
DEBT SERVICE							
05-5-00-817	REFUNDING BONDS PRINCIPAL	157,000	162,000	167,000	171,000	171,000	171,000
05-5-00-818	REFUNDING BONDS INTEREST	175,250	171,250	166,315	161,245	161,245	161,245
05-5-00-820	IFA LOAN PAYMENT - PRINCIPAL	943	839	2,554	-	-	-
05-5-00-821	IFA LOAN PAYMENT - INTEREST	91	64	48	-	-	-
05-5-00-822	LOAN PAYMENT/REFUND	-	-	-	-	-	-
TOTAL DEBT SERVICE		**333,284**	**334,153**	**335,917**	**332,245**	**332,245**	**332,245**
CAPITAL OUTLAY							
05-5-00-906	CAPITAL OUTLAY	4,800	24,436	355,850	183,000	183,000	183,000
05-5-00-926	LOCUST ST. SEWER LINE RELOCATE	-	-	-	170,000	170,000	170,000
TOTAL CAPITAL OUTLAY		**4,800**	**24,436**	**355,850**	**353,000**	**353,000**	**353,000**
TOTAL EXPENDITURES		**840,535**	**935,408**	**1,333,057**	**1,362,568**	**1,362,568**	**1,362,568**
TOTAL REQUIREMENTS		**$ 847,335**	**$ 947,888**	**$ 2,870,217**	**$ 3,034,007**	**$ 3,034,007**	**$ 3,034,007**
05-SEWER FUND NET TOTAL		**$ 1,532,416**	**$ 1,743,818**	**$ -**	**$ -**	**$ -**	**$ -**

RESOLUTION NO. 2017-20

A RESOLUTION ESTABLISHING RATES FOR CITY SEWER SERVICE.

WHEREAS, the City of Sisters ("City") is a provider of sanitary sewer service; and

WHEREAS, Section 13.45.020(2) of the Sisters Municipal Code ("SMC") provides that each user of City sewer shall be assigned an appropriate number of equivalent dwelling units ("EDUs"), a measurement of average waste water use for a single-family residence, to determine a user's sewer use; and

WHEREAS, City presently uses a "winter average" of monthly water use between January and March to determine a commercial user's average water use outside of the irrigation season and thus their EDUs; and

WHEREAS, SMC 13.45.020(3) provides that the Sisters City Council (the "City Council") may establish by resolution the rates to be paid per EDU of sewer usage; and

WHEREAS, FCS Group completed a utility rate study for the City, which identified recommended sewer service rates and proposed to expand the "winter average" evaluation period to October to April; and

WHEREAS, City Council desires to adopt new sewer service rates and expand the "winter average" evaluation period as recommended by FCS Group.

NOW, THEREFORE, BE IT RESOLVED that the City of Sisters resolves as follows:

1. Findings. The above-stated findings contained in this Resolution No. 2017-20 (this "Resolution") are hereby adopted.

2. Assignment of EDUs. Sewer usage shall be determined based on the following assignment of EDUs:

Residential EDU Rate:	***1 per dwelling***
Commercial EDU Rate:	***1 per 501.337 cubic feet of "winter-average" water use***
"Winter Average":	***Effective July 1, 2018, "winter-average" shall be measured as average water use between the preceding November billing period through the April billing period. Effective July 1, 2019, "winter-average" shall be measured as average water use between the preceding October billing period through the April billing period.***

3. Fees. Pursuant to SMC Section 13.45.020(3), the City Council establishes the following rate for sewer service from the City to be effective July 1, 2018:

Per EDU Rate:	***$37.77***

3. Miscellaneous. This Resolution is hereby made part of City's fee resolution, Resolution No. 2017-21 (the "Fee Resolution"). The provisions of the Fee Resolution that are not amended or modified by this Resolution remain unchanged and in full force and effect. The provisions of this Resolution are severable. If any

section, subsection, sentence, clause, and/or portion of this Resolution is for any reason held invalid, unenforceable, and/or unconstitutional, such invalid, unenforceable, and/or unconstitutional section, subsection, sentence, clause, and/or portion will (a) yield to a construction permitting enforcement to the maximum extent permitted by applicable law, and (b) not affect the validity, enforceability, and/or constitutionality of the remaining portion of this Resolution. All pronouns contained in this Resolution and any variations thereof will be deemed to refer to the masculine, feminine, or neutral, singular or plural, as the identity of the parties may require. The singular includes the plural and the plural includes the singular. The word "or" is not exclusive. The words "include," "includes," and "including" are not limiting. This Resolution may be corrected by order of the Council to cure editorial and/or clerical errors.

ADOPTED by the City Council of the City of Sisters and signed by the mayor this 29th day of November, 2017.

Chuck Ryan, Mayor

ATTEST:

Kerry Prosser, City Recorder

City of Sisters

WATER AND SEWER UTILITY RATE STUDY

FINAL REPORT
September 2017

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FCS GROUP
Solutions-Oriented Consulting

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Section I. EXECUTIVE SUMMARY

The City of Sisters (City) contracted with FCS GROUP in 2017 to conduct a rate study for its water and sewer utilities. The project included the following tasks:

Water Rate Study

The water rate study focused on developing water rates to reflect the cost of providing service. Consistent with industry-approved ratemaking practices, this analysis included determining revenue requirements and developing rate structure alternatives to collect the targeted amount of revenue.

Exhibit ES-1 provides the recommended near-term water rate strategy:

Exhibit ES-1: Summary of Existing & Recommended Water Rates

Monthly Water Rates	Existing 2017	Proposed 2018	*Projected* 2019	*Projected* 2020	*Projected* 2021	*Projected* 2022
Base Rate:						
5/8" x 3/4" Meter	$20.59	$15.50	*$16.05*	*$16.77*	*$17.36*	*$18.02*
1" or 1-1/2" Meter	$23.09	$17.38	*$18.00*	*$18.80*	*$19.47*	*$20.21*
2" Meter	$25.58	$19.25	*$19.95*	*$20.83*	*$21.57*	*$22.39*
3" or Larger Meter	$62.40	$46.96	*$48.65*	*$50.82*	*$52.62*	*$54.61*
Volume Included in Base Rate	1,000 cf	None	*None*	*None*	*None*	*None*
Volume Rate per 100 cf[1]	$1.00	$1.00	*$1.00*	*$1.00*	*$1.00*	*$1.00*

[1]Applies to usage above the amount included in the base rate.

The rates shown in **Exhibit ES-1** reflect the following findings and proposed changes:

- 2.0% annual rate revenue increases, driven primarily by capital funding requirements that the City has embedded in its water rates. It is worth noting that these increases are also partially attributable to rising operating costs, particularly for employee benefits that the City expects will increase by 25.0% every two years.

- Removal of the 1,000 cubic feet (cf) allowance currently built into the City's base rates. With this change, customers will pay the volume rate on all water usage. The scenario preferred by City staff contemplates reducing the base rates to account for the increased revenue from volume charges, and retaining the existing volume rate for the five-year study period.

Sewer Rate Study

The sewer rate study focused on developing sewer rates to reflect the cost of providing service. Consistent with industry-approved ratemaking practices, this analysis included determining revenue requirements and developing rate structure alternatives to collect the targeted amount of revenue.

Exhibit ES-2 provides the recommended near-term sewer rate strategy:

Exhibit ES-2: Summary of Existing & Recommended Sewer Rates

Monthly Sewer Rates	Existing 2017	Proposed 2018	Projected 2019	2020	2021	2022
Monthly Rate per EDU	$39.00	$35.96	*$36.65*	*$37.36*	*$38.09*	*$38.83*
Non-Residential "Winter" Period	Jan – Mar	Oct – Apr	Oct – Apr	Oct – Apr	Oct – Apr	Oct – Apr

The rates shown in **Exhibit ES-2** reflect the following findings and proposed changes:

- 2.0% annual rate revenue increases, which the sewer utility needs to cover capital funding requirements that the City has embedded in its sewer rates.

- Adjustment of the "winter" period that the City uses to calculate non-residential equivalent dwelling units (EDUs). The scenario preferred by City staff expands the winter period (currently January – March) to include October, November, December, and April. This change intends to improve equity by recognizing that a number of the City's non-residential customers do not exhibit representative water usage patterns during the January – March billing periods. With this adjustment, the City can decrease the monthly rate per EDU based on the increased number of EDUs assigned to some of its non-residential customers.

Exhibit ES-3 provides a forecast of the combined water/sewer bill that a typical residential customer would pay:

Exhibit ES-3: Combined Residential Bill Forecast

Monthly Residential Bill	Existing 2017	Proposed 2018	Projected 2019	2020	2021	2022
Water Bill @ 700 cf	$20.59	$22.50	*$23.05*	*$23.77*	*$24.36*	*$25.02*
Sewer Bill	39.00	35.96	*36.65*	*37.36*	*38.09*	*38.83*
Total Bill	$59.59	$58.46	*$59.70*	*$61.13*	*$62.45*	*$63.85*
Change From Prior Year		-$1.13	*+$1.24*	*+$1.43*	*+$1.32*	*+$1.40*
% Change From Prior Year		-1.9%	*+2.1%*	*+2.4%*	*+2.2%*	*+2.2%*

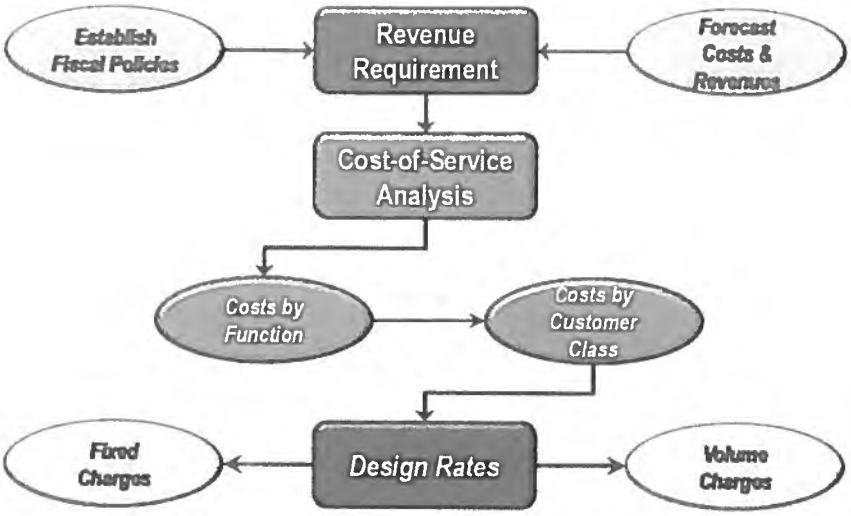
Exhibit ES-3 shows a representative residential bill decreasing by 1.9% under the proposed 2018 rates, due to a decrease in the sewer charge. The subsequent-year increases vary from $1.24 to $1.43, and are generally consistent with the aggregate increases in the utilities' annual costs.

Appendix A and **Appendix B** include printouts of the detailed water rate analysis and sewer rate analysis, respectively.

Section II. INTRODUCTION

The City of Sisters (City) contracted with FCS GROUP in 2017 to conduct a rate study for its water and sewer utilities. **Exhibit 1** shows the ratemaking process commonly used in the utility industry.

Exhibit 1: Ratemaking Methodology



- The first phase defines the amount of revenue that the utility needs to meet its annual financial obligations including operating expenses, capital outlay, debt payments, and other needs attributable to the City's financial policies.

- The second step allocates the revenue requirement to customer classes based on their demands and service characteristics. This phase usually begins with an allocation of the revenue requirement to functions of service, which vary by utility.

- Once the amount of revenue to recover from each customer class is known, the final step involves designing rates that generate the targeted amount of revenue. The City requested the development of alternative rate structures that could potentially improve attainment of the City's policy goals (such as equitable cost recovery and incentives to use water efficiently).

A rate study can include any or all of these phases. The study requested by the City included an evaluation of revenue requirements and development of rate structure alternatives, but not an explicit allocation of costs to customer classes. This study relies on the inter-class cost allocations embedded in the City's existing rates, with potential variations among the rate structure alternatives.

Section III. POLICY FRAMEWORK

III.A. FISCAL POLICIES

The financial plan is based on a framework of fiscal policies that promote the financial integrity and stability of the City's utilities. The ensuing discussion provides a brief summary of the key policies addressed by the City and incorporated into this analysis.

III.B. RESERVES

Like any business, a municipal utility requires certain minimum levels of cash reserves to operate. These reserves address the variability and timing of revenues and expenses as well as occasional disturbances in activities. Given the City's responsibility to provide essential services to its customers at a certain standard, protection against financial disruption is even more important than it would be for private-sector or non-essential counterparts. In addition, a defined reserve structure serves to maintain appropriate segregation of funds and promote the use of resources for their intended purposes. This analysis assumes the following structure of reserves for the City's utilities:

- **Operating Reserves.** Operating reserves provide an unrestricted fund balance to accommodate the short-term cycles of revenues and expenses, addressing unanticipated expenses or revenue shortfalls. This analysis assumes a minimum balance equal to two months (17%) of projected operating expenses, which, based on the operating expense projections in the City's 2017-18 Budget, equates to about $85,000 for the water utility and $92,000 for the sewer utility.

- **Capital Improvement Reserve.** The City sets aside cash funding for capital improvement projects in a reserve embedded within the Water/Sewer Funds. This reserve does not have an explicit minimum balance, but the City sets annual transfers based on an average of annual capital project expenditures. It periodically reviews the accrued balance, recalibrating the annual transfers as needed to attain the targeted funding levels.

- **Capital Replacement Reserve.** Also part of the Water/Sewer Funds, the City maintains a reserve dedicated to the replacement of equipment and vehicles. This reserve does not have an explicit minimum balance, but the City sets annual transfers based on the replacement cost allocated to each utility (amortized over the expected life of the related assets). It periodically reviews the accrued balance, recalibrating the annual transfers as needed to attain the targeted funding levels.

- **SDC Fund.** Consistent with the requirements established in Section 223.307 of the Oregon Revised Statutes (ORS) regarding the expenditure of system development charges (SDCs), the City maintains a separate SDC Fund to ensure that reimbursement fee and improvement fee revenues are spent on eligible capital projects.

III.C. SYSTEM REINVESTMENT

A best-management practice in the utility industry, system reinvestment involves setting aside funds to accumulate cash for immediate and future asset replacements. The policy intent is to promote stable and moderate long-term rates and avoid burdening any single generation of customers with the cost of asset replacement. Absent a formal asset replacement plan, system reinvestment policies most often link the annual funding provision to depreciation as a measure of the annual decline in asset value. The City funds system reinvestment via transfers to the Capital Improvement Reserve and Capital Replacement Reserve. Based on projected capital needs, the City plans to make annual transfers of approximately $149,000 for the water utility and $46,000 – $188,000 for the sewer utility. Note that the sewer utility's transfers include an additional $142,000 in 2018 and $128,000 in 2019 to fund near-term capital improvements – beyond 2019, the sewer utility's transfers remain at $46,000 per year based on anticipated equipment and vehicle replacement needs.

III.D. FINANCIAL PERFORMANCE STANDARDS

This analysis evaluates the sufficiency of each utility's revenues to meet its financial obligations including operation and maintenance (O&M) expenses, debt repayment, rate-funded capital needs, and any other policy-based needs. It determines the amount of revenue needed in a given year to meet that year's expected financial obligations, in the context of two revenue sufficiency tests:

- ***Cash Flow Sufficiency Test.*** The cash flow test determines whether or not each utility's annual revenues are sufficient to cover the known cash requirements for each year of the planning period. These cash requirements typically include O&M expenses, debt service payments, rate-funded capital outlays, and any additions to reserve balances.

- ***Coverage Test.*** The coverage test evaluates the utilities' ability to meet applicable bond coverage requirements, as specified by the City's bond covenants and internal debt policies.

In determining the annual revenue requirement, the test with the greatest deficiency generally drives the rate increase in any given year. It is worth noting that the City can temporarily waive the requirements of the cash flow test as part of a conscious decision to phase in rate increases, as long as its operating reserve balance is sufficient to absorb the resulting cash flow deficit. The coverage test, however, must always be met as failure to do so may result in a downgrading of the City's credit rating. Because the City does not currently have any water or sewer utility debt that requires coverage, the cash flow test defines the utilities' revenue requirements.

Section IV. Revenue Requirement Analysis

IV.A. General Methodology

The revenue requirement is the amount of revenue that a utility's rates must generate to enable it to meet its various financial obligations. This analysis has two main purposes – it serves as a means of evaluating the utility's fiscal health and adequacy of current rate levels, and it sets the revenue basis for near-term and long-term rate planning. The rate revenue requirement is defined as the net difference between total revenue needs and the revenue generated through non-rate sources. Hence, the revenue requirement analysis involves defining and forecasting both needs and resources.

IV.B. Operating Forecast

Operating costs are initially based on the 2018 Budget, with adjustments for inflation and any anticipated future changes such as changes to programs or staffing levels. The key assumptions and inputs used to develop the operating forecast are described in further detail below:

Operating Revenue

- ***Annual Customer Growth:*** Varies from 2.6 – 2.8% per year, based on estimates from City staff.
- ***Rate Revenue:*** Determined by applying the existing rate structures to projected customer counts and water demand (based on detailed utility billing statistics and expected growth).
- ***Other Operating Revenue:*** Based on the 2018 Budget, assumed to remain constant over the forecast period (no escalation).
- ***Interest Earnings:*** Calculated based on projected reserve balances, assuming an earnings rate of about 0.9% per year (based on the 2016 average Oregon Short-Term Fund interest rate)

Operating Expenses

- ***Operation and Maintenance (O&M) Costs:*** Generally based on the 2018 Budget, with adjustments for inflation at the following rates:

Escalator	Assumed Rate	Applies To
General Cost Inflation	1.8% per year	Most operating expenses
Labor Cost Inflation	2.6% per year	Salaries and wages
PERS Escalation	25.0% every other year	Retirement benefit costs
Medical Cost Escalation	Water: 3.6% per year; Sewer: 13.2% per year	Non-PERS benefit costs

- ***Franchise Fees:*** Set to 7.0% of rate revenue.

Debt Service

- ***Existing Debt:*** The sewer utility currently has one outstanding debt obligation, the 2016 Full Faith and Credit Refunding Bonds (with an annual payment of approximately $333,000). Both utilities also make annual transfers to the City Hall Fund to repay a loan; the water utility's share is around $9,000 per year, and the sewer utility's share is on the order of $12,000 – $13,000 per year. The water utility does not have any other outstanding debt.

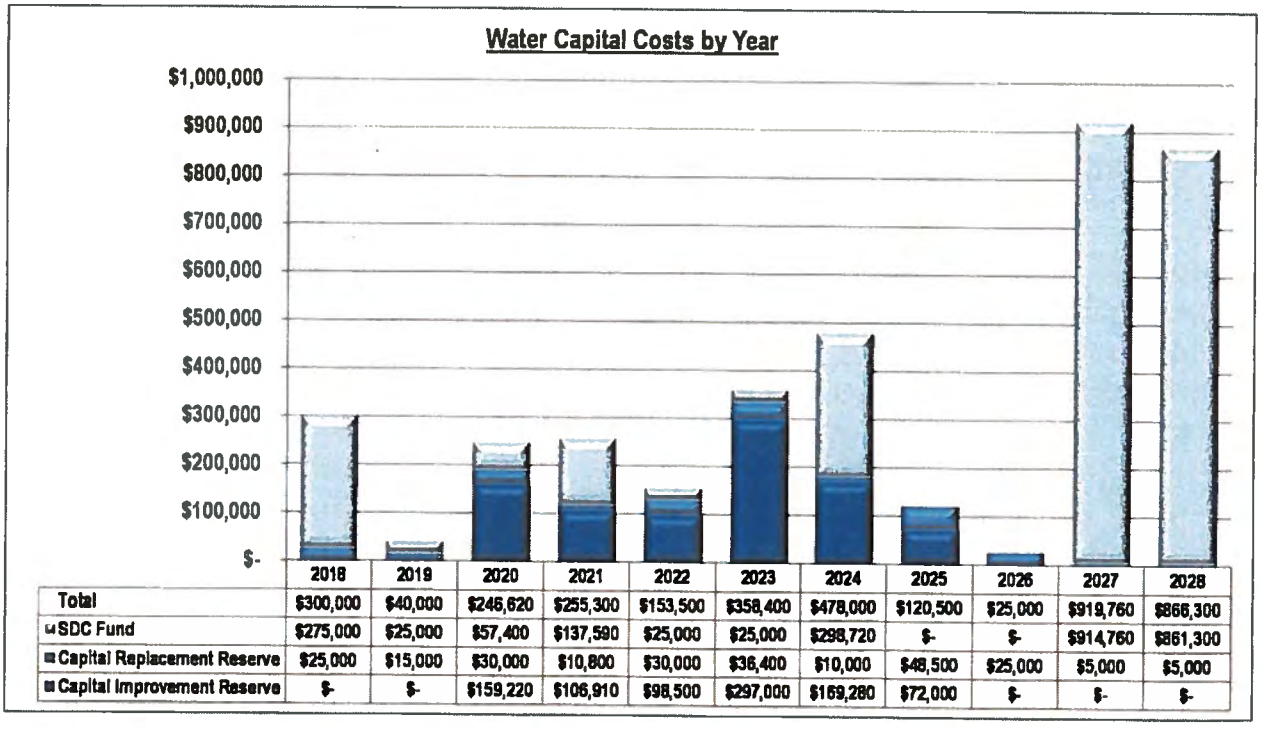
IV.C. CAPITAL FORECAST

The capital forecast involves developing a funding strategy for the annual project expenditures contemplated in the utilities' capital improvement plans (CIPs). Potential funding sources include existing cash balances, incoming rate and SDC revenues, external grants/contributions, and debt (if necessary). Given the magnitude and variability of capital project expenditures, rates most often fund an ongoing contribution for capital projects (system reinvestment) rather than direct expenditures. The ensuing discussion considers each utility's capital forecast separately.

Water Utility

Exhibit 2 summarizes the water utility CIP and anticipated funding strategy.

Exhibit 2: Summary of Water Capital Costs & Funding Strategy



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Total	$300,000	$40,000	$246,620	$255,300	$153,500	$358,400	$478,000	$120,500	$25,000	$919,760	$866,300
SDC Fund	$275,000	$25,000	$57,400	$137,590	$25,000	$25,000	$298,720	$-	$-	$914,760	$861,300
Capital Replacement Reserve	$25,000	$15,000	$30,000	$10,800	$30,000	$36,400	$10,000	$48,500	$25,000	$5,000	$5,000
Capital Improvement Reserve	$-	$-	$159,220	$106,910	$98,500	$297,000	$169,280	$72,000	$-	$-	$-

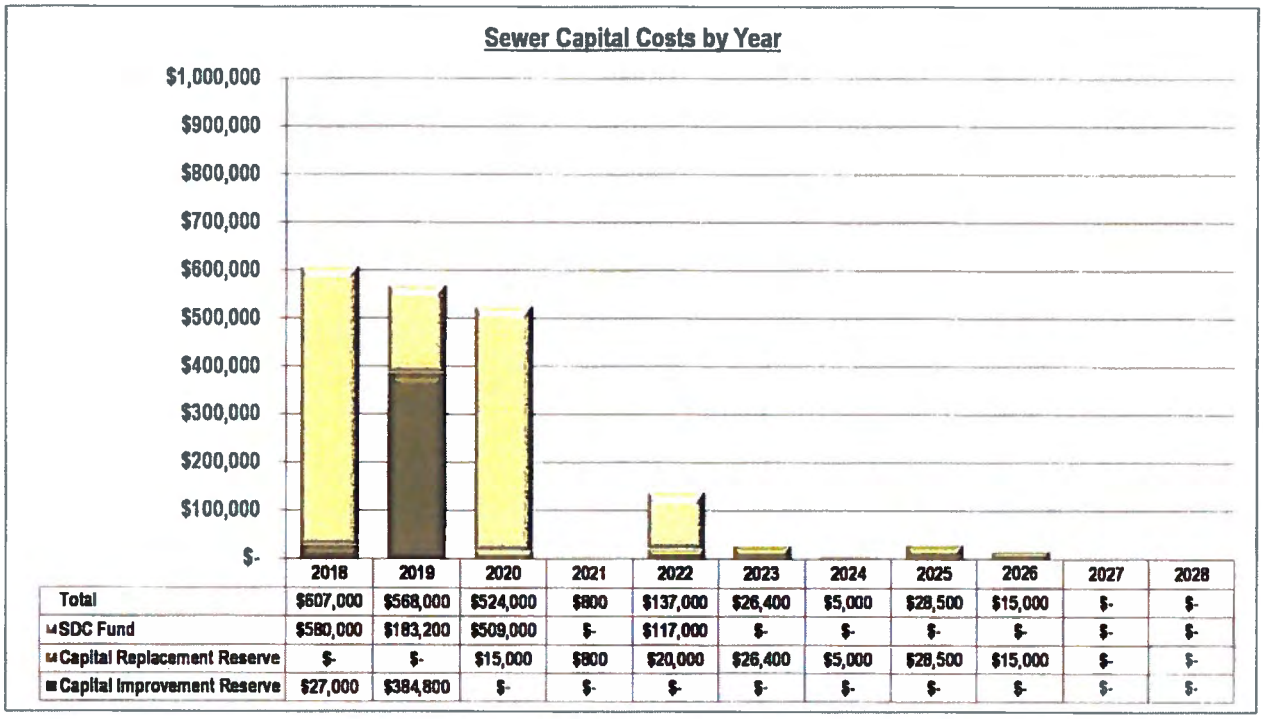
Exhibit 2 indicates that the water utility will spend $995,420 on capital projects that it plans to complete between 2018 and 2022. The full capital program through 2028 includes $3.8 million of anticipated expenditures, with the remaining $2.8 million occurring outside of the five-year planning period. Existing cash balances in the Capital Improvement Reserve, Capital Replacement Reserve,

and SDC Fund appear to be adequate to fund the projected expenditures without any new debt issuance. It is worth noting that this finding relies to an extent on the assumption that water rates fund approximately $149,000 per year in system reinvestment.

Sewer Utility

Exhibit 3 summarizes the sewer utility CIP and anticipated funding strategy.

Exhibit 3: Summary of Sewer Capital Costs & Funding Strategy



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Total	$607,000	$568,000	$524,000	$800	$137,000	$26,400	$5,000	$28,500	$15,000	$-	$-
SDC Fund	$580,000	$183,200	$509,000	$-	$117,000	$-	$-	$-	$-	$-	$-
Capital Replacement Reserve	$-	$-	$15,000	$800	$20,000	$26,400	$5,000	$28,500	$15,000	$-	$-
Capital Improvement Reserve	$27,000	$384,800	$-	$-	$-	$-	$-	$-	$-	$-	$-

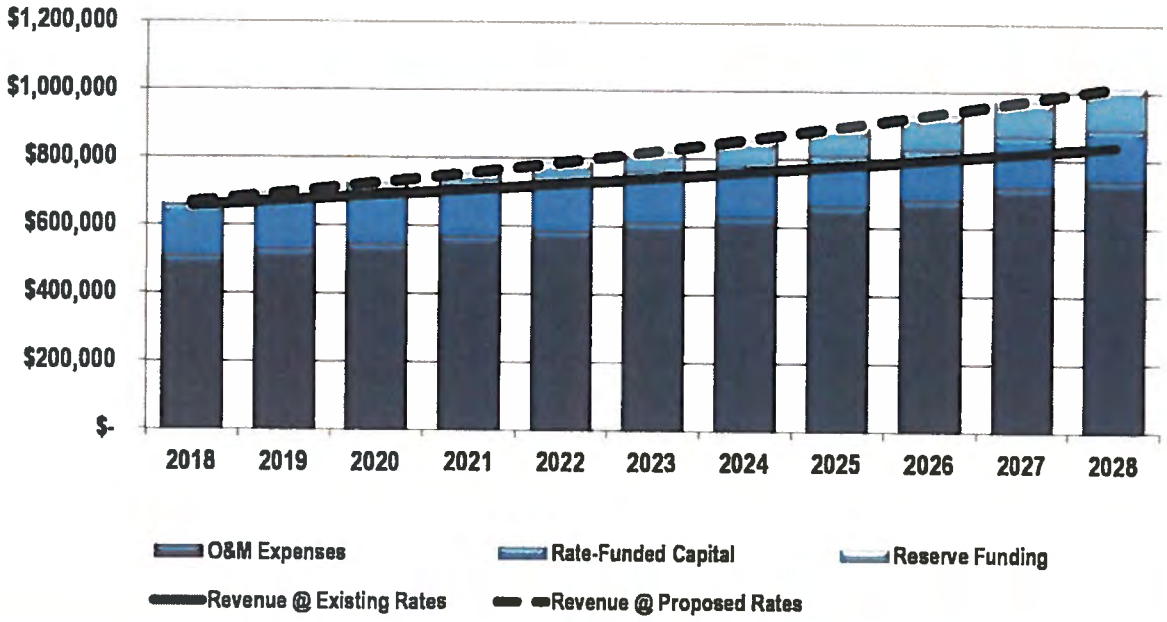
Exhibit 3 indicates that the sewer utility will spend $1,836,800 on capital projects that it plans to complete between 2018 and 2022. The full capital program through 2031 includes $2.7 million of anticipated expenditures, with the remaining $0.9 million occurring outside of the five-year planning period. In addition to these costs, the sewer utility will have to fund 50% of the cost of the West Side Pump Station and Force Main project (total estimated cost of $1.5 million). Since the timing of this project depends on the U.S. Forest Service, **Exhibit 3** does not include this project. Existing cash balances in the Capital Improvement Reserve, Capital Replacement Reserve, and SDC Fund appear to be adequate to fund the projected expenditures without any new debt issuance. It is worth noting that this finding relies to an extent on the assumption that sewer rates fund approximately $46,000 – $188,000 per year in system reinvestment.

IV.D. EVALUATION OF REVENUE SUFFICIENCY

Water Utility

Exhibit 4 summarizes the annual revenue requirements for the water utility based on the forecast of revenues, expenses, and fund balances.

Exhibit 4: Water Utility Revenue Requirement Summary

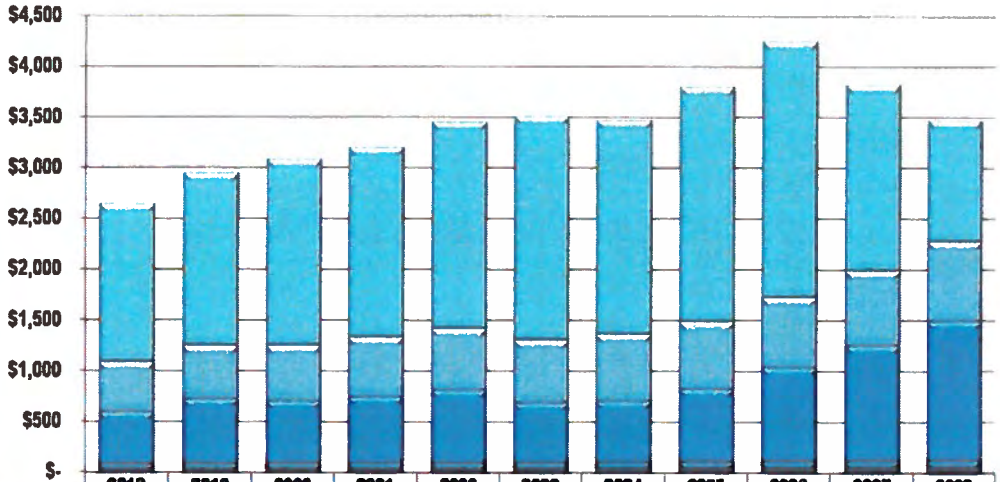


Water Revenue Req. ($000s)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Expenses											
Operating Expenses	$508	$528	$544	$567	$584	$611	$628	$661	$680	$720	$741
System Reinvestment	149	149	149	149	149	149	149	149	149	149	149
Total	**$657**	**$677**	**$693**	**$716**	**$733**	**$760**	**$777**	**$810**	**$829**	**$869**	**$890**
Revenues											
Rate Revenue @ Existing Rates	$595	$611	$628	$644	$662	$680	$698	$717	$737	$757	$778
Other Revenue	61	61	61	61	61	61	61	61	61	61	62
Total	**$656**	**$672**	**$689**	**$705**	**$723**	**$741**	**$759**	**$778**	**$798**	**$818**	**$840**
Net Cash Flow @ Existing Rates	**($1)**	**($5)**	**($4)**	**($11)**	**($10)**	**($19)**	**($18)**	**($32)**	**($31)**	**($51)**	**($50)**
Annual Rate Increase	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**
Rate Revenue After Increases	**$607**	**$636**	**$667**	**$698**	**$731**	**$766**	**$802**	**$841**	**$881**	**$923**	**$968**
Net Cash Flow After Increases	**$11**	**$17**	**$32**	**$38**	**$54**	**$61**	**$79**	**$83**	**$102**	**$104**	**$125**

Exhibit 4 indicates that at existing rates, the water utility is generating enough revenue to cover operating expenses and most of the planned transfers to the Capital Improvement Reserve and Capital Replacement Reserve (system reinvestment). There is a slight cash-flow deficit that appears to grow over time with inflation, especially in employee benefit costs (assumed 25.0% increase every two years). The proposed rate revenue strategy of 2.0% annual increases intends to cover this deficit and generate additional reserve funding for capital needs.

Exhibit 5 summarizes the projected ending balances for the water utility's reserves:

Exhibit 5: Projected Water Utility Ending Fund Balances ($000s)



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
SDC Fund	$1,559	$1,703	$1,831	$1,868	$2,032	$2,202	$2,105	$2,311	$2,524	$1,833	$1,195
Capital Replacement Reserve	$496	$531	$550	$589	$610	$624	$664	$667	$693	$739	$786
Capital Improvement Reserve	$512	$634	$614	$652	$714	$584	$600	$715	$924	$1,134	$1,369
Operating Reserve	$85	$88	$91	$94	$97	$102	$105	$110	$113	$120	$123

Exhibit 5 generally shows the water utility maintaining a total ending cash balance between $3.0 and $4.0 million, including the following components:

- An Operating Reserve balance increasing from $85,000 to $123,000, based on the policy target of two months (approximately 17%) of operating expenses. This analysis transfers any excess cash flow to the Capital Improvement Reserve to provide additional funding for capital projects.

- A Capital Improvement Reserve balance increasing from $512,000 to $1.4 million. This ending balance reflects $902,910 of capital project spending from 2018 – 2025, and appears to increase beyond 2025 because the City has yet to evaluate its longer-term capital needs.

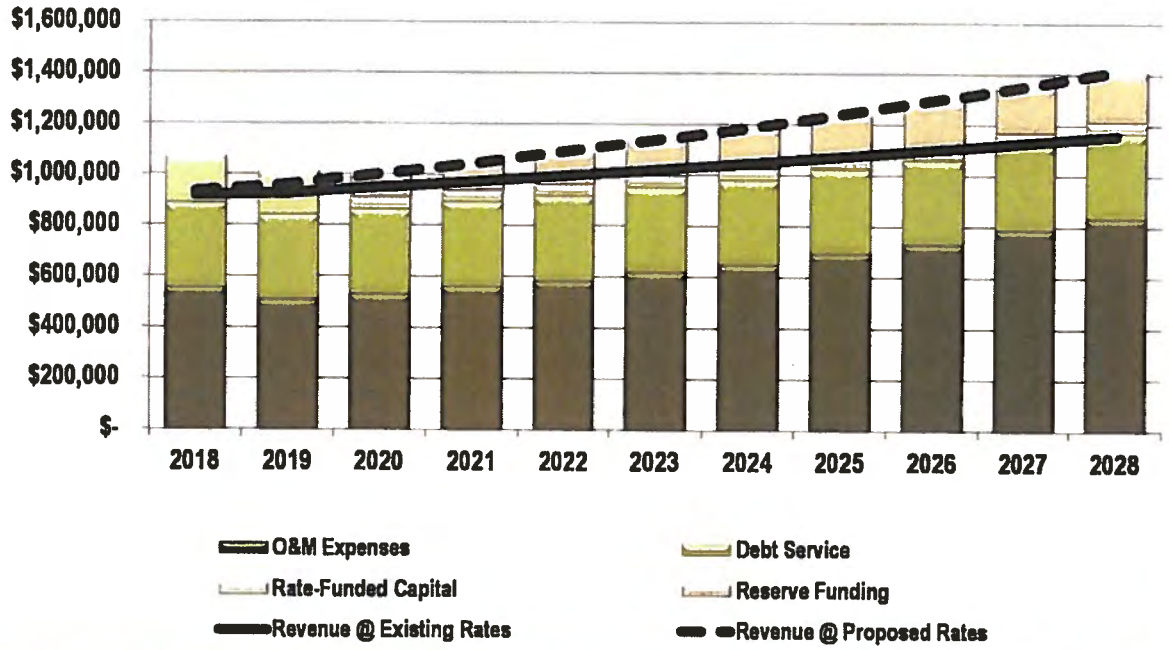
- A Capital Replacement Reserve balance increasing from $496,000 to $786,000, which reflects an investment of $240,700 in the replacement of vehicles and equipment. As the City's contributions to this reserve are based on an allocation of $1.2 million in replacement costs to the water utility, this balance will decline over time as the City completes its replacement program.

- An SDC Fund balance declining from $1.6 to $1.2 million. **Exhibit 5** shows an increasing balance from 2018 – 2026 as the City collects SDCs, but shows drops in the available balance in 2027 and 2028 as the City invests its SDC revenue in a new transmission main and Well #4.

Sewer Utility

Exhibit 6 summarizes the annual revenue requirements for the sewer utility based on the forecast of revenues, expenses, and fund balances.

Exhibit 6: Sewer Utility Revenue Requirement Summary

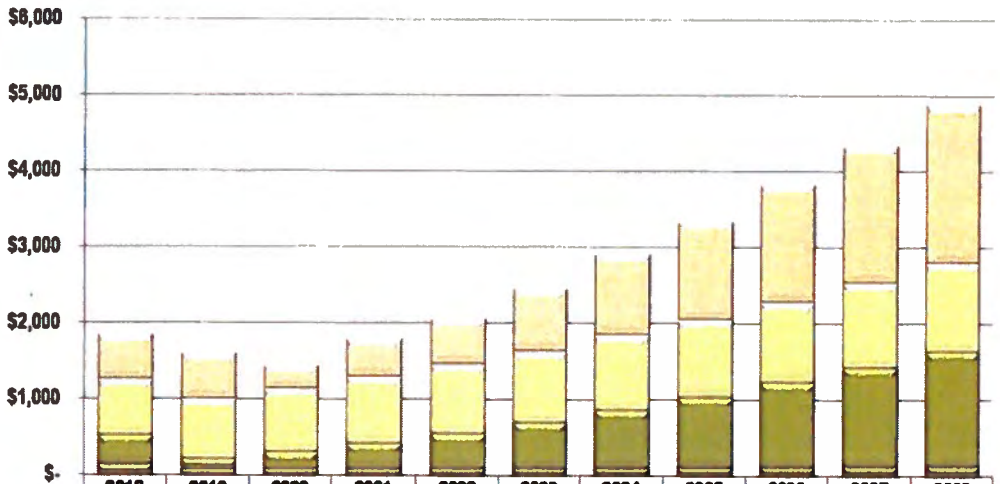


Sewer Revenue Req. ($000s)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Expenses											
Operating Expenses	$551	$507	$528	$557	$582	$618	$647	$693	$728	$787	$832
Debt Service	333	332	333	333	332	332	332	332	332	333	332
System Reinvestment	188	174	46	46	46	46	46	46	46	46	46
Total	**$1,072**	**$1,013**	**$907**	**$936**	**$960**	**$996**	**$1,025**	**$1,071**	**$1,106**	**$1,166**	**$1,210**
Revenues											
Rate Revenue @ Existing Rates	$871	$893	$917	$939	$963	$988	$1,014	$1,040	$1,067	$1,096	$1,125
Other Revenue	45	32	31	32	32	32	32	32	32	32	32
Total	**$916**	**$925**	**$948**	**$971**	**$995**	**$1,020**	**$1,046**	**$1,072**	**$1,099**	**$1,128**	**$1,157**
Net Cash Flow @ Existing Rates	**($156)**	**($88)**	**$41**	**$35**	**$35**	**$24**	**$21**	**$1**	**($7)**	**($38)**	**($53)**
Annual Rate Increase	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**
Rate Revenue After Increases	**$888**	**$929**	**$973**	**$1,016**	**$1,063**	**$1,113**	**$1,165**	**$1,219**	**$1,276**	**$1,336**	**$1,399**
Net Cash Flow After Increases	**($140)**	**($55)**	**$93**	**$106**	**$128**	**$140**	**$161**	**$167**	**$187**	**$185**	**$202**

Exhibit 6 indicates that the sewer utility has a short-term cash flow deficit in 2018 and 2019 due to the planned system reinvestment transfers and other capital outlays. When the system reinvestment transfers drop in 2020 (after the City has funded its near-term improvement projects), the sewer utility's revenue at existing rates appears to be adequate to cover its costs. Longer-term, inflationary cost increases will create a cash flow deficit unless the City imposes comparable increases in its sewer rates. The proposed rate revenue strategy of 2.0% annual increases intends to generate additional reserve funding for capital needs.

Exhibit 7 summarizes the projected ending balances for the sewer utility's reserves:

Exhibit 7: Projected Sewer Utility Ending Fund Balances ($000s)



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
SDC Fund	$590	$602	$308	$506	$605	$828	$1,059	$1,299	$1,546	$1,807	$2,078
Capital Replacement Reserve	$738	$791	$828	$881	$914	$942	$991	$1,017	$1,057	$1,112	$1,167
Capital Improvement Reserve	$374	$129	$220	$323	$450	$588	$750	$915	$1,104	$1,289	$1,494
Operating Reserve	$148	$84	$88	$93	$97	$103	$108	$115	$121	$131	$139

Exhibit 7 shows the sewer utility's total ending cash balance increasing from $1.9 million to $4.9 million, including the following components:

- An Operating Reserve balance ending 2018 with $148,000, dropping to $84,000 due to transfers to the Capital Improvement Reserve in 2019, and increasing to $139,000 (based on the policy target of two months of operating expenses).

- A Capital Improvement Reserve balance increasing from $374,000 to $1.5 million. This ending balance reflects $411,800 of capital project spending from 2018 – 2026, and appears to increase in the future because the City has yet to evaluate its longer-term capital needs.

- A Capital Replacement Reserve balance increasing from $738,000 to $1.2 million, which reflects an investment of $110,700 in the replacement of vehicles and equipment. As the City's contributions to this reserve are based on an allocation of $1.3 million in replacement costs to the sewer utility, this balance will decline over time as the City completes its replacement program.

- An SDC Fund balance increasing from $590,000 to $2.1 million. The sewer utility's capital improvement program includes $1.4 million in SDC-eligible project costs from 2018 – 2028, but the City expects to collect $2.5 million in SDC revenue during the same period.

Section V. Rate Structure Analysis

V.A. General Methodology

The revenue requirement analysis establishes the amount of rate revenue that the City must collect from each utility through rates, informing across-the-board adjustments to the existing rate structure. The City also requested the development of rate structure alternatives that could improve the alignment of the City's rates with its policy objectives (such as equitable cost recovery).

The rate structure analysis involved the following key steps:

- Review detailed customer billing data (customer counts by meter size, monthly water usage), using the prevailing rate structure and the amount of revenue actually reported by the City to validate the accuracy of the data. This is a critical step, as using accurate billing data to develop rates leads to more accurate projections of future revenue.

- Set fixed and variable charges to generate the targeted amount of revenue. Note that the rate alternatives presented are revenue-neutral to the revenue requirements shown in **Exhibit 4** and **Exhibit 6** (rate revenue after increases).

V.B. Water Rates

The City's current rate structure consists of a base rate that increases with meter size and volume rate that applies to water usage above 1,000 cubic feet (cf) per month. This rate structure charges all customers for 1,000 cf per month, whether or not they actually use that much water – while this feature promotes revenue stability, it recovers a disproportionate share of costs from low users and provides limited incentive to use water efficiently. To improve equity and conservation incentives, the City requested alternate water rate scenarios that eliminate the 1,000 cf built into the base rate.

Exhibit 8 summarizes the City's current and recommended water rates:

Exhibit 8: Summary of Existing & Recommended Water Rates

Monthly Water Rates	Existing 2017	Proposed 2018	Projected 2019	2020	2021	2022
Base Rate:						
5/8" x 3/4" Meter	$20.59	$15.50	*$16.05*	*$16.77*	*$17.36*	*$18.02*
1" or 1-1/2" Meter	$23.09	$17.38	*$18.00*	*$18.80*	*$19.47*	*$20.21*
2" Meter	$25.58	$19.25	*$19.95*	*$20.83*	*$21.57*	*$22.39*
3" or Larger Meter	$62.40	$46.96	*$48.65*	*$50.82*	*$52.62*	*$54.61*
Volume Included in Base Rate	1,000 cf	None	*None*	*None*	*None*	*None*
Volume Rate per 100 cf[1]	$1.00	$1.00	*$1.00*	*$1.00*	*$1.00*	*$1.00*

[1]Applies to usage above the amount included in the base rate.

The proposed 2018 rates shown in **Exhibit 8** are based on the 2018 revenue requirement after the planned 2.0% revenue increase (approximately $607,000 per **Exhibit 4**). Because extending the volume rate to all usage generates additional revenue relative to the existing rate structure, the proposed 2018 rate structure reflects a reduction to the base rates to remain consistent with the targeted revenue level.

In addition to the proposed rates shown in **Exhibit 8**, this analysis included the development of several other rate structure alternatives:

- Across-the-board adjustment to the existing structure
- Elimination of volume built into the base rate, proportional reduction of base and volume rates
- Elimination of volume built into the base rate, reduction of base rates only, application of future increases to both base and volume rates

The City opted against these alternatives for various reasons. For example, the across-the-board scenario retained the 1,000 cubic feet built into the base rate and failed to address the equity concerns that triggered this analysis. The other alternatives would have improved the equity of the City's rate structure, but did not align as well with the City's policy objectives as the proposed structure.

V.C. SEWER RATES

The City currently charges a monthly sewer rate of $39.00 per equivalent dwelling unit (EDU). For the purpose of imposing this rate, the City defines residential customers as one EDU per dwelling unit and calculates EDUs for non-residential customers based on their winter-average water use. One non-residential EDU equates to 3,750 gallons per day (501 cf per month) of water usage during the months of January – March.

Using winter consumption in sewer rate calculations is standard practice because it does not include irrigation water use and adequately represents the amount of water that enters the sewer system. However, it is important to recognize the nature of the City's customer base and economic cycles. January – March has historically been a slow time of year for economic activity in the City, and as a result there are a number of non-residential customers for which those three months are not representative of "normal" usage patterns.

Exhibit 9 summarizes the City's current and recommended sewer rates:

Exhibit 9: Summary of Existing & Recommended Sewer Rates

Monthly Sewer Rates	Existing	Proposed	*Projected*			
	2017	2018	*2019*	*2020*	*2021*	*2022*
Monthly Rate per EDU	$39.00	$35.96	*$36.65*	*$37.36*	*$38.09*	*$38.83*
Non-Residential "Winter" Period	Jan – Mar	Oct – Apr	Oct – Apr	Oct – Apr	Oct – Apr	Oct – Apr

The proposed sewer rate structure shown in **Exhibit 9** expands the "winter period" for calculating non-residential EDUs to include the months of October, November, December, and April. This change increases the number of non-residential EDUs by approximately 29%, enabling the City to

decrease the monthly rate per EDU and remain revenue-neutral to the amount of revenue targeted for 2018 ($888,000 per **Exhibit 6**).

In addition to the proposed rate shown in **Exhibit 9**, this analysis included the development of several other rate structure alternatives:

- Across-the-board adjustment to the existing structure
- Expansion of non-residential "winter" period to include October, November, and December
- Expansion of non-residential "winter" period to include September, October, November, December, April, and May

The City opted against these alternatives for various reasons. For example, the across-the-board scenario retained the January – March winter averaging period for non-residential customers and failed to address the equity concerns that triggered this analysis. The other alternatives would have improved the equity of the City's rate structure, but would have resulted in a different allocation of costs to non-residential customers relative to the proposed structure.

V.D. COMBINED RESIDENTIAL BILL IMPACTS

Exhibit 10 provides a forecast of the combined water and sewer bill for a single-family residence with a 3/4" water meter and 700 cf of monthly water usage.

Exhibit 10: Combined Residential Bill Forecast

Monthly Residential Bill	Existing	Proposed	Projected			
	2017	2018	2019	2020	2021	2022
Water Bill @ 700 cf	$20.59	$22.50	$23.05	$23.77	$24.36	$25.02
Sewer Bill	39.00	35.96	36.65	37.36	38.09	38.83
Total Bill	$59.59	$58.46	$59.70	$61.13	$62.45	$63.85
Change From Prior Year		-$1.13	+$1.24	+$1.43	+$1.32	+$1.40
% Change From Prior Year		-1.9%	+2.1%	+2.4%	+2.2%	+2.2%

Exhibit 10 shows a representative residential bill decreasing by 1.9% under the proposed 2018 rates, due to a decrease in the sewer charge. The subsequent-year increases vary from $1.24 to $1.43, and are generally consistent with the aggregate increases in the utilities' annual costs.

APPENDIX E
Lazy Z Ranch Master Plan

LAZY Z RANCH MASTER PLAN

AUGUST 2021

Prepared for the
City of Sisters, Oregon

anderson perry

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LAZY Z RANCH MASTER PLAN

FOR

CITY OF SISTERS, OREGON

2021

ANDERSON PERRY & ASSOCIATES, INC.

La Grande, Redmond, and Hermiston, Oregon
Walla Walla, Washington

Job No. 446-06

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Introduction

The City of Sisters, Oregon, has experienced considerable growth in recent years. Based on current flows, the City's existing irrigation land used for recycled water disposal at the wastewater treatment facility is near or at capacity. Additionally, the City is projected to experience substantial growth over the next 20 years. As such, the City is investigating options for increasing its capacity for recycled water disposal in a manner that complements the open space and view corridors in the City.

Recycled Water Use Options

This Lazy Z Ranch Master Plan investigated multiple beneficial reuse options for disposal of the City's recycled water and the anticipated requirements for each reuse option. Based on this investigation, it is anticipated that the City will be able to continue its production of Class D recycled water under Oregon Administrative Rules 340-055 and still use a combination of the following beneficial reuse options to dispose of its recycled water:

- Forested irrigation
- Pasture irrigation
- Lined wetlands
- Forested ponds and streams

Beneficial Reuse Alternatives

Based on the above beneficial reuse options, two different layout alternatives were developed and presented on Figures 4-1 and 4-3. One of these alternatives uses two irrigation pivots for additional pasture irrigation, while the other alternative replaces the smaller of the two irrigation pivots with larger recycled water wetlands. As discussed in this Lazy Z Ranch Master Plan, it is most cost effective for the City to seek funding for and construct the improvements at one time to take advantage of lower construction costs. However, if the City is unable to find adequate funding before requiring expansion of its beneficial reuse systems, multiple phasing options for each alternative were prepared and are outlined in Chapter 6.

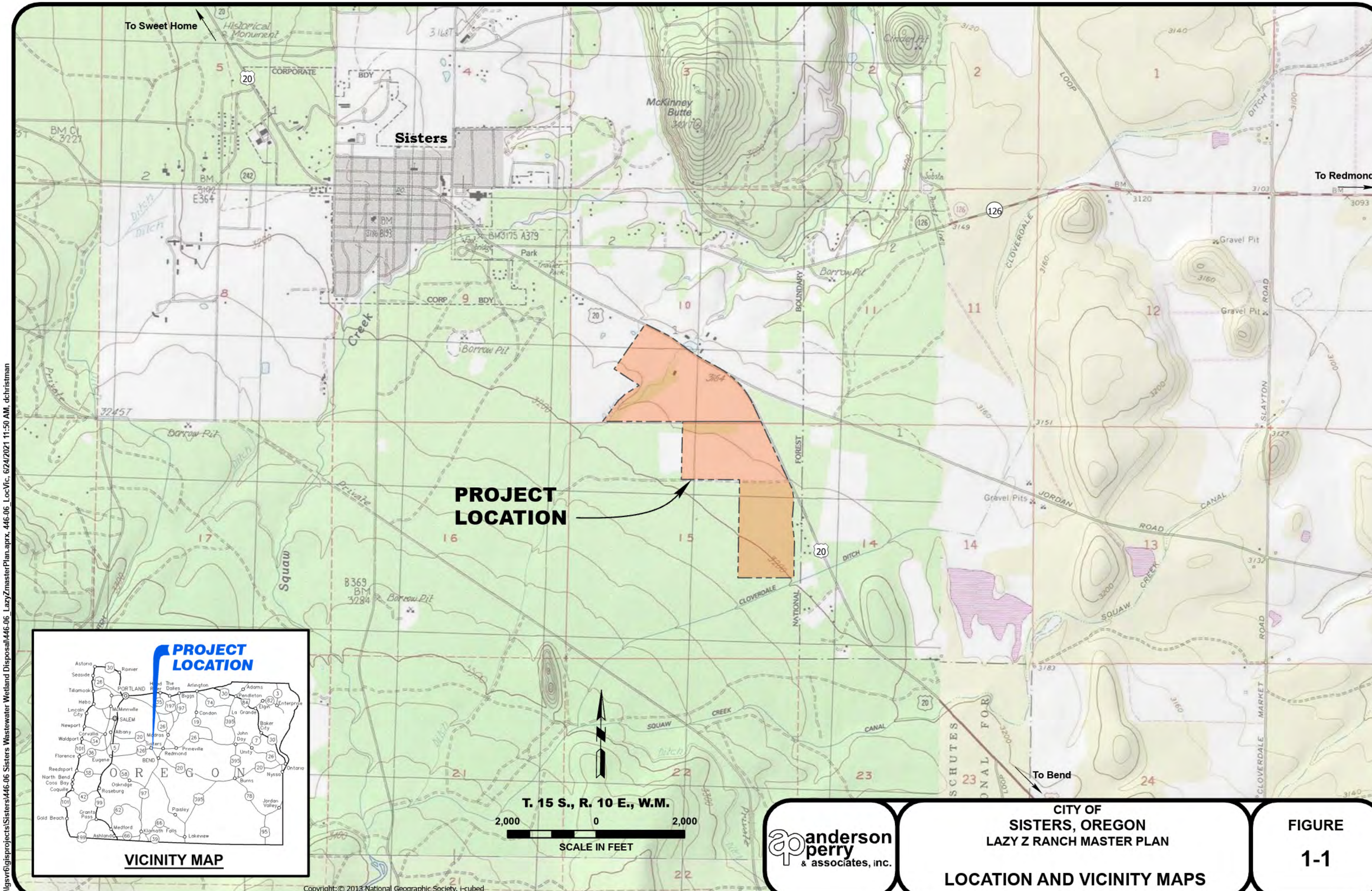
Chapter 1 - Introduction

The City of Sisters, Oregon, has a population of 3,018 and is located near the Three Sisters volcanic peaks. The City's wastewater treatment facility consist of a collection system and an aerated lagoon wastewater treatment plant that produces Class D recycled water beneficially reused for irrigation in and around the Lazy Z Ranch. Location and vicinity maps are included on Figure 1-1.

The region around the City has become a hub for art, recreation, tourism, and more. The area's popularity has brought considerable growth and many opportunities and challenges to City planning. The City's projected growth over the next 20 years will require an increase in the City's ability to dispose of treated wastewater. As such, the City is investigating options for increasing its capacity for treated wastewater disposal while complementing the open space and view corridors in the City.

The purpose of this Lazy Z Ranch Master Plan is to develop and evaluate the City's options for expanding its wastewater disposal to provide direction to City officials, staff, residents, and the City's Public Works Department to implement selected improvements. This Plan will outline the anticipated requirements for the evaluated options based on Oregon Administrative Rules (OAR) Chapter 340 Division 055 (OAR 340-055) as managed by the Oregon Department of Environmental Quality. For reference purposes, a copy of OAR 340-055 is included as Appendix A.

In addition to OAR 340-055, this Plan references the City's 2016 Recycled Water Use Plan as prepared by Becon Civil Engineering and Land Surveying and the Sisters Country Vision. The reader of this Plan is encouraged to refer to these documents.



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CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN

LOCATION AND VICINITY MAPS

FIGURE
1-1

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Chapter 2 - Background Information

Site Description

The land where the recycled water is applied is zoned as Exclusive Farm Use (EFU) in Deschutes County, Oregon. The establishment of pasture and forest irrigation is an allowed use for this zoning. Additionally, the creation, restoration, or enhancement of wetlands and the land application of reclaimed water are allowed uses in an EFU zone. These uses will require prior written notification to the Oregon Department of Environmental Quality (DEQ).

A tax lot map showing the City of Sisters, Oregon's existing irrigation sites and the Lazy Z Ranch is presented on Figure 2-1. The existing irrigation sites are located on City-owned property located in Township 15 South, Range 10 East, Section 9, Tax Lot 1002, while the Lazy Z Ranch is located on City-owned property located in Township 15 South, Range 10 East, Sections 10 and 15, Tax Lots 704 and 200.

Site Characterization

The site characterization of the recycled water use site consists of climate, topography, and hydrology, in addition to a description of soils and crops.

Climate, Topography, and Hydrology

The City lies in one of the more arid regions of Oregon, with an average precipitation of approximately 13.5 inches per year. Typically, the months of November through March receive more than 1 inch of monthly precipitation, with no month averaging more than 2.3 inches of precipitation. According to the Western Regional Climate Center, the average annual maximum temperature is 60.7°F, and the average annual minimum temperature is 30.6°F. Average monthly precipitation is presented on Table 2-1.

TABLE 2-1
AVERAGE MONTHLY PRECIPITATION

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Precipitation (inches)	2.24	1.45	1.12	0.79	0.78	0.61	0.38	0.41	0.4	0.95	2.1	2.27

The City is located east of the three volcanic peaks for which it is named. Elevations in the city limits range between approximately 3,180 feet and 3,230 feet above mean sea level. The City's wastewater treatment facility (WWTF) is located south of the City.

Soils

According to well logs in the vicinity of the irrigation sites, the static water level ranges substantially across the City's land application sites, up to 200 feet below ground surface. Additionally, multiple wells dug in the same locations have resulted in substantially different static water levels within feet of each other, suggesting that a confining layer exists in the strata of soils at the Lazy Z Ranch. Well logs confirm that layers of basalt and other igneous rocks are prevalent in the area. These igneous

rock layers are likely providing the confining layer that is separating shallow groundwater from deep groundwater. The well logs show layers of shallow basalt overburdened by rocks, gravels, sands, and topsoil, with underlying layers of lava rock and other igneous materials.

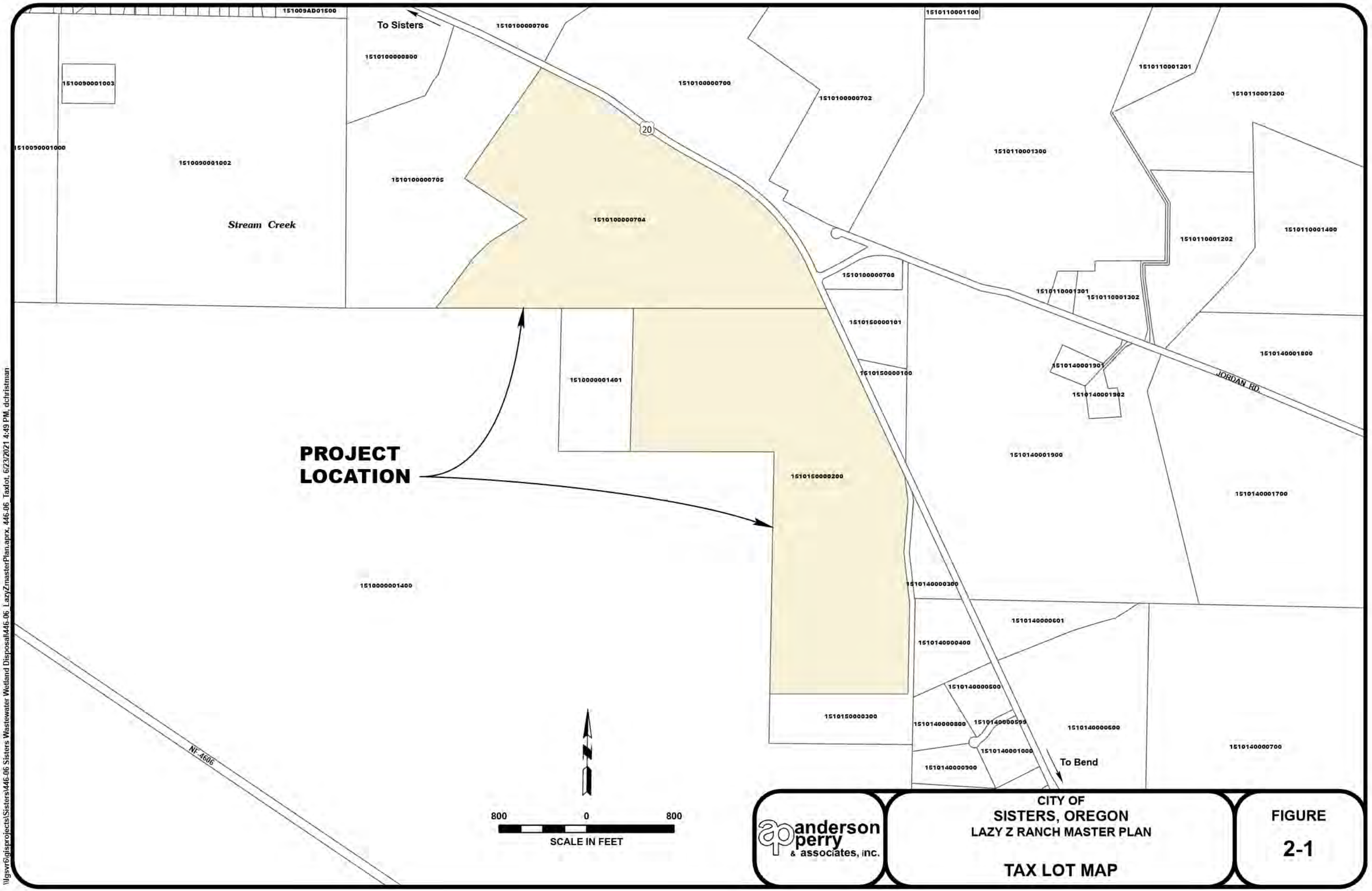
In addition, a Natural Resources Conservation Service Custom Soil Resource Report was developed for the land application sites and their vicinity (see Appendix B). The Custom Soil Resource Report shows high soil transmissivity, with the majority of Ksat values ranging between 1.98 and 5.95 inches per hour. There is one small strip of land in the vicinity of Reed Ditch that has moderately high to high transmissivity, with a Ksat value between 0.57 and 1.98 inches per hour. Most of the site is considered well drained, with a low available water capacity of approximately 3.8 inches. The land in the vicinity of Reed Ditch is somewhat poorly drained, with an available water capacity of approximately 7.0 inches.

Existing Wastewater Treatment Facility Operation

The City's WWTF receives and processes raw sewage from a mix of residential and commercial sources. The City's WWTF consists of an influent lift station that pumps raw sewage through the WWTF influent flowmeter to the headworks. The raw sewage is screened in the headworks to remove inorganic solids before flowing by gravity to the aerated lagoons. The City operates two 2.41-acre aerated lagoons for biological oxidation of the wastewater. Treated wastewater is then stored in an 18-acre treated water storage lagoon during the irrigation off-season. Following the storage lagoon is a chlorine injection vault and chlorine contact pipeline. Treated wastewater is disinfected and then pumped via the City's irrigation pumps to the City's land application sites.

Wastewater received at the City's WWTF is treated to produce Class D recycled water, which is currently applied for beneficial use at various irrigation sites located in the vicinity of the WWTF and at the Lazy Z Ranch, as shown on Figure 2-2. The irrigation sites consist of 88 acres of forested land, 11.8 acres of dikes around the treatment and storage lagoons, and approximately 45 acres of pasture. Of the 88 acres of forested land, approximately 55 acres are currently irrigated. Based on the City's existing irrigation infrastructure, the City's irrigation land at the WWTF is at, or near capacity, for disposal of its recycled water. As such, the City wants to develop additional beneficial reuse options at the Lazy Z Ranch to expand its existing recycled water disposal capacity. The City provides Class D recycled water to each location. In accordance with Oregon Administrative Rules (OAR) 340-055 and the City's Water Pollution Control Facilities Permit, other permitted beneficial uses for Class D recycled water allowed by the OAR may be used in the future. The City is required to notify the DEQ in writing of any changes in beneficial use before they occur.

All irrigation sites are currently owned and operated by the City.



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CITY OF
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TAX LOT MAP

FIGURE
2-1

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MCKENZIE HIGHWAY
126
20
MCKENZIE - BEND HIGHWAY
FORESTED IRRIGATION
26.2 ACRES
S. LOCUST ST.
FORESTED IRRIGATION
29.3 ACRES
WASTEWATER TREATMENT PLANT
EXTG. DIKE IRRIGATION
11.8 ACRES
K-LINE IRRIGATION
45 ACRES
JORDAN RD
REED DITCH
MCKENZIE - BEND HIGHWAY
N

LEGEND

- PRIVATE TAXLOTS
- CITY LIMITS
- URBAN GROWTH BOUNDARY
- W WELL

500 0 500 1000 1500
SCALE IN FEET

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CITY OF
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LAZY Z RANCH MASTER PLAN

EXISTING SITE IRRIGATION

FIGURE
2-2

R:\Sisters\446-06_Wastewater_Wetland_Disposal\Drafting\446-06_MP-ExSiteIrrig.dwg, 11x17, 7/7/2021 11:26 AM, gsaurbier

Chapter 3 - Recycled Water Use Options

This chapter briefly outlines the general requirements for the beneficial reuse of treated wastewater (recycled water) and the options available to the City of Sisters, Oregon, based on the City's existing wastewater treatment facility (WWTF).

Recycled Water Use Requirements

The beneficial use of recycled water is governed by Oregon Administrative Rules (OARs) Chapter 340 Division 055 (OAR 340-055). In OAR 340-055, five qualities (or classes) of recycled water are identified. A summary of these classes of recycled water, their permitted beneficial uses in accordance with OAR 340-055, and their respective treatment and monitoring requirements is included on Figure 3-1. In addition, Anderson Perry & Associates, Inc., prepared the Preliminary Findings Memorandum (PFM) (see Appendix C) to outline the anticipated requirements for the City's potential beneficial reuse options for their recycled water.

As shown on Figure 3-1 and discussed in the PFM, disinfection requirements for each class of recycled water vary substantially. As such, permissible uses for each class of recycled water also vary, as lower disinfection qualities result in increased use restrictions. Additionally, the requirements for restricting access to the recycled water use sites varies by both class and beneficial use. The differences in access restrictions will be summarized during the discussion of the different beneficial use options available to the City.

Recycled Water Quality Options

Aerated lagoon WWTFs are generally capable of producing the following classes of recycled water: nondisinfected recycled water, Class D recycled water, and Class C recycled water. Because the production of Classes B and A recycled water qualities would likely require replacement of the City's existing WWTF to allow reliable production of these higher quality recycled water classes, Classes B and A will not be discussed as options for the City's beneficial reuse. Due to the limited permitted beneficial uses for nondisinfected recycled water and the fact that the City's WWTF has consistently produced Class D recycled water, nondisinfected recycled water will also not be discussed as an option.

Class D Recycled Water

The City's existing WWTF is currently permitted for the production and beneficial reuse of Class D recycled water. The City has been successful in consistently meeting the treatment and monitoring requirements associated with this class of recycled water. Historically, the City has used their recycled water to irrigate grass on the dikes surrounding the treatment and storage lagoons at the WWTF and to irrigate the forested and pasture areas in the WWTF's vicinity. As noted on Figure 3-1, the following are additional beneficial uses permitted for Class D recycled water per OAR 340-055: irrigation for growing seed crops not intended for human ingestion, commercial timber, firewood, sod, ornamental nursery stock, or Christmas trees.

The City has expressed interest in using wetlands and a system of ponds/streams as beneficial reuse options that enhance the aesthetic of the Lazy Z Ranch in a manner consistent with the Sisters

Country Vision Action Plan (see Appendix D). Though this form of beneficial use is not explicitly listed as a beneficial use permitted for Class D recycled water, Class D recycled water may be used for any beneficial purpose authorized in writing by the Oregon Department of Environmental Quality (DEQ). To receive such an authorization, the DEQ may request information or include limitations or conditions on the City's Water Pollution Control Facilities Permit to ensure the protection of public health and environment. Additionally, the DEQ may confer with the Oregon Department of Human Services before giving such an authorization. The City of Prineville, Oregon, encountered a situation like Sisters' and received authorization for the disposal of recycled water via unlined wetlands. To receive this authorization, it is anticipated that the requirements outlined in the PFM must be met (see Appendix C).

City of Prineville Wastewater Treatment Facility

The City of Prineville operates an aerated lagoon wastewater treatment plant similar to that operated by the City of Sisters. Prineville produces a Class D recycled water. Their recycled water leaves Prineville's WWTF and enters a wetland complex. Prineville's wetland complex consists of lined treatment wetlands followed by unlined disposal wetlands. The purpose of the lined treatment wetlands is to provide additional treatment/polishing of the recycled water by reducing the potential pathogen counts of the Class D recycled water before it enters the unlined disposal wetlands.

Based on experience with Prineville's WWTF and wetland disposal complex, the City could continue to produce Class D recycled water that is then reused in wetlands, ponds, and streams, provided that a portion of the wetlands is lined and used for additional treatment of the recycled water. This portion of the wetlands would require fencing or some form of barrier to discourage public contact, along with signage notifying the public of the use of recycled water.

Class C Recycled Water

Currently, the existing WWTF does not produce recycled water that consistently meets the requirements of Class C recycled water. Because the storage lagoon is uncovered and exposed to the elements, wastewater quality can vary with weather and other environmental conditions. During the summer, algae blooms can occur, typically leading to higher total suspended solids (TSS) concentrations in the storage lagoon. During periods of high TSS concentrations, the disinfection effectiveness can be negatively impacted, leading to higher coliform counts in the recycled water. There are generally two approaches that could be taken to address these concerns. These options include either substantially increasing the chlorine dosing rates or modifying the storage lagoon to combat the potential for algae blooms and allow additional settling. Each option and corresponding advantages and disadvantages are outlined below.

Substantial Increase of Chlorine Dosing Rates

Substantially increasing the chlorine dosing rate could allow the WWTF to meet the disinfection requirements of Class C recycled water. However, the variation in effluent TSS can have significant impacts on the required dosing rate. TSS can act as a shield that protects the pathogens and other bacteria/viruses from the chlorine, which would in turn require substantial increases in chlorine dosing rates that would equate to much higher disinfection costs.

Furthermore, TSS is typically composed of natural organic matter in various stages of decomposition. TSS tends to react with chlorine, effectively wasting its disinfection potential, to create disinfection byproducts (DBPs), like chloroform and other trihalomethanes. These DBPs can pose both environmental hazards and health hazards.

Advantages: Low initial capital cost.

Disadvantages: High ongoing operation and maintenance costs, TSS can protect bacteria from disinfection (may not be effective), unpredictable, chlorination byproducts.

Storage Lagoon Modification

A common practice for reducing effluent TSS includes covering a portion of the storage lagoon to prevent algae growth. By covering the lagoon, sunlight is blocked, cause algae to die and allowing it to settle out of the water as it flows through the covered portion of the lagoon and on to later treatment processes. Baffles can also be added in the covered section to promote settling. These improvements could substantially improve the consistency in effluent TSS throughout the year. As a result, chlorine dosing rates would remain relatively consistent and fewer chlorination byproducts would be produced.

Advantages: More consistent effluent quality, easier to provide adequate chlorine dosing, lower chance for chlorination byproducts.

Disadvantages: High capital cost, requires more substantial modification to the existing WWTF.

Of the two water quality options, continued production of Class D recycled water is preferred. This option would not require any modifications to the City's existing WWTF; however, there are more requirements for preventing public access to Class D recycled water. These requirements will be discussed at greater length later in this Plan.

Potential Beneficial Uses

The City has expressed interest in exploring several beneficial reuse options. These options include expanding the City's existing effluent irrigation, wetlands, and forested ponds and streams. The regulatory requirements associated with each beneficial reuse option vary to ensure public health is adequately protected. Each beneficial use option and its associated regulatory requirements is discussed below.

Effluent Irrigation

Multiple options are available for irrigation of the City's recycled water. As previously stated, the City currently uses its recycled water to irrigate pasture at the Lazy Z Ranch. In addition, the City uses its recycled water to irrigate dikes around its treatment and storage lagoons, along with some of the forested areas in the vicinity of the WWTF. Irrigation can be applied in accordance with OAR 340-055.

Methods of Irrigation Application

OAR 340-055 references various acceptable methods for irrigation of recycled water. These methods include applying recycled water directly to the soil and sprinkler irrigation. The City currently uses sprinkler irrigation, and it is recommended to continue this practice. The PFM prepared for the City (Appendix C) outlines the regulatory requirements for sprinkler irrigation.

Potential sprinkler irrigation methods include K-lines, center pivots, wheel lines, solid sets, or hand lines. Hand lines are extremely labor intensive, making them untenable. Solid set irrigation has one of the highest per acre capital costs along with the disadvantage of having multiple risers that can be easily damaged by equipment. As such, the City plans to maintain their existing solid set systems, but no additional solid set systems are recommended for reclaimed water disposal. The primary irrigation methods considered by the City include K-line irrigation, center pivot irrigation, and wheel line irrigation. The advantages and disadvantages of each irrigation method are presented below.

K-Line Irrigation

K-line irrigation offers advantages in its capital cost and flexibility. This form of irrigation consists of impact sprinklers mounted in protective pods made of a durable plastic. The sprinklers are connected to each another via flexible hoses that allow the sprinklers to be oriented in a variety of ways to fit the shape of the irrigation site. This flexibility is one of the key advantages of the K-line systems. Additionally, capital costs for K-line systems are typically low. However, this system requires greater operational attention, as the pods must be manually moved from location to location in the irrigation area to cover the entire area. The typical practice is to move the system after every 24 hours of irrigation. Additionally, the sprinklers used in K-line systems are small and often plastic, making them more susceptible to blockages and increasing maintenance requirements. Due to the operational disadvantages associated with K-line systems, the City has expressed interest in replacing their existing K-lines with a more operationally friendly infrastructure.

Center Pivot Irrigation

Center pivot irrigation offers advantages in its minimal maintenance requirements and automated operation. This form of irrigation uses a movable pipe structure that rotates around a central pivot point. The pipe structure is mounted on drive towers that use electric, motorized wheels to rotate the structure. These systems can be set to automatically run with different run times and rotational speeds. The key advantages of center pivot systems include automation of the system, which minimizes operational requirements, along with the durability resulting in low maintenance requirements. However, this system has a higher capital cost than other systems and is limited to irrigate circular or rectangular areas of land. Additionally, center pivot systems are generally more visible than other systems.

Wheel Line Irrigation

Wheel line irrigation offers a middle-ground option between K-line irrigation and center pivot irrigation. While a wheel line costs more than a K-line system, wheel line capital cost is

typically lower than that of center pivot irrigation. Similar to the K-line irrigation system, a wheel line is often moved every 24 hours and requires operator attention to do so. However, the wheel line infrastructure is generally more durable than that of the K-line system and typically requires less maintenance.

Irrigation Uses

A variety of different crops and beneficial land irrigation options are available for the disposal and beneficial use of recycled water. Irrigation uses considered by the City include pasture, crops, forested areas, and the WWTF dikes. Each irrigation use is discussed below.

Pasture Irrigation

The City has already begun some pasture irrigation at the Lazy Z Ranch using a K-line irrigation system. Pasture irrigation provides advantages in reducing operational requirements and eliminating the need for manual harvest of the pasture vegetation, as wildlife and pasture grazing animals automatically and continuously "harvest" the crop. However, because grazing animals usually keep vegetation cut short, pastureland typically has lower water requirements than other crops, resulting in larger areas required to dispose of an equivalent quantity of water compared to crops. Additionally, these animals must be moved during irrigation.

Crop Irrigation

Crop irrigation has frequently been used as a beneficial use in many rural communities. Though the type of crop that can be irrigated with recycled water varies with the quality of recycled water per OAR 340-055 (e.g., Class D recycled water cannot be used to irrigate crops for human consumption), crops tend to use more water and can make better use of the nitrogen found in recycled water. The main disadvantage of irrigating crops with recycled water is the workforce required to harvest and process the crops.

Forested Area Irrigation

Currently, the City irrigates the naturally forested areas around the WWTF using a solid set irrigation system. These areas generally consist of juniper trees with various fir and pine trees mixed in. Though irrigating forested areas consisting of these varieties of trees does not generally require as much water as the irrigation of pasture areas or crops, irrigation of forested areas better allows preservation of the natural beauty of the area. Additionally, the City is recognized as a Tree City, showing the City's commitment to preserving its forested areas. Because the City has irrigation infrastructure in place, it would be advantageous to maintain the existing infrastructure and continue to irrigate these forested areas.

Dike Irrigation

In addition to irrigating the forested areas around the City's WWTF, the City also irrigates the dikes and embankments that surround the City's wastewater treatment lagoons. Though harvesting the grass that grows on the dikes due to this irrigation is difficult, the continued irrigation of this "landscape" area has minimal drawback, as the City already has

the irrigation infrastructure in place. The irrigation and maintenance of grass on the dikes helps inhibit weed growth and is more aesthetically appealing than covering the dikes with rock or leaving the earthwork exposed.

Recycled Water Wetlands

Recycled water wetlands can either be lined or unlined to provide additional disposal. However, discussed in the PFM (Appendix C), the soils at the Lazy Z Ranch are highly permeable and not conducive to the development of an unlined wetland, so only a lined wetland will be discussed. Wetlands provide beneficial use of recycled water via disposal of the water (through evaporation and transpiration) and additional treatment/polishing of the water via natural processes that improve its quality. Additionally, wetlands provide habitat for wildlife along with public interaction through trail systems, educational interpretive hubs, and wildlife viewing.

Forested Ponds and Streams

Forested ponds and streams can also be lined or unlined for additional disposal. Due to the highly permeable soils in the area, the ponds and streams would also be lined. Recycled water disposal would primarily occur via evaporation. Advantages of using forested ponds and streams for disposal of recycled water include additional nature trails and hiking areas, enhancing natural habitat for wildlife, and enhancing the natural beauty of the Lazy Z Ranch and surrounding area. The primary disadvantage of using forested ponds and streams is that they are not specifically listed in OAR 340-055 as an approved beneficial use for polished Class D recycled water. As a result, the procedure outlined in the PFM (Appendix C) would need to be followed.

RECYCLED WATER QUALITY STANDARDS AND REQUIREMENTS

Recycled Water Classification	Beneficial Use Description	Monitoring Requirements	Treatment Requirements
Non-disinfected	Irrigation for growing fodder, fiber, seed crops not intended for human ingestion, or commercial timber.	Per the facility owner's Water Polllution Control Facilities or National Pollutant Discharge Elimination System Permit.	Must be oxidized wastewater.
Class D	Any beneficial use defined above or for the irrigation of firewood, ornamental nursery stock, Christmas trees, sod, or pasture for animals.	Monitoring for *E. coli* once per week at a minimum. Recycled water must not exceed a 30-day log mean of 126 *E. coli* organisms per 100 milliliters (mL) and 406 *E. coli* oranisms per 100 mL in any single sample.	Must be an oxidized and disinfected wastewater that meets the monitoring requirements.
Class C	Any beneficial use defined above or for the irrigation of orchards or vineyards (applied directly to the soil), golf courses, cemeteries, highway medians, or industrial or business campuses; industrial cooling, rock crushing, aggregate washing, mixing concrete, dust control, nonstructural fire fighting using aircraft, street sweeping, or sanitary sewer flushing; water supply source for landscape	Monitoring for total coliform organisms once per week at a minimum. Recycled water must not exceed a median of 23 coliform organisms per 100 mL, based on results of the last seven days that analyses have been completed, and 240 total coliform organisms per 100 mL in any two consecutive samples.	Must be oxidized and disinfected wastewater that meets the monitoring requirements.
Class B	Any beneficial use defined above or for stand-alone fire suppression systems in commercial and residential buildings, non-residential toilet or urinal flushing, or floor drain trap priming; water supply source for restricted recreational impoundments,	Monitoring for total coliform organisms three times per week at a minimum. Recycled water must not exceed 2.2 total coliform organisms per 100 mL, based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 mL in any single sample.	Must be oxidized and disinfected wastewater that meets the monitoring requirements.
Class A	Any beneficial use defined above or for irrigation for any agricultural or horticultural use; landscape irrigation of parks, playgrounds, school yards, residential landscapes, or other landscapes accessible to the public; commercial car washing or fountains when the water is not intended for human consumption; water supply source for nonrestricted recreational impoundments; artificial groundwater recharge by surface infiltration methods or by subsurface injection in accordance with Oregon Administrative Rule (OAR) Chapter 340, Division 44. Direct injection into an underground source of drinking water is prohibited unless allowed by OAR Chapter 340, Division 44.	Monitoring for total coliform organisms must occur once per day at a minimum. Monitoring for turbidity must occur on an hourly basis at a minimum. Before disinfection, unless otherwise approved in writing by the department, the wastewater must be treated with a filtration process, and the turbidity must not exceed an average of 2 nephelometric turbidity units (NTU) within a 24-hour period, 5 NTU more than five percent of the time within a 24-hour period, and 10 NTU at any time. After disinfection, Class A recycled water must not exceed a median of 2.2 total coliform organisms per 100 mL based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 mL in any single sample.	Must be oxidized, filtered, and disinfected wastewater that meets the monitoring requirements.

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RECYCLED WATER QUALITY STANDARDS AND REQUIREMENTS

FIGURE 3-1

Chapter 4 - Beneficial Reuse Alternatives

Based on discussion with the City of Sisters, Oregon, and input from the Public Works Advisory Committee, two different conceptual layouts were developed. Each layout is described below.

Layout Alternative 1

This layout maintains the existing forested irrigation on the property surrounding the City's existing wastewater treatment facility (WWTF) along with the existing wastewater treatment lagoon dike irrigation as shown on Figure 4-1. In addition, this alternative utilizes two irrigation pivots, a wetland area, and an area with forested ponds and streams for the beneficial reuse of the City's recycled water. A summary of the different beneficial reuse options is included on Table 4-1.

TABLE 4-1
LAYOUT 1 BENEFICIAL REUSE

Beneficial Use	Size (acres)	Notes
Forested Irrigation	78.75	Existing
Dike Irrigation	11.80	Existing
Wetland	16.00	Wet acres
Forested Ponds and Streams	4.00	Four wet acres ponds with 2 miles of streams
Wheel Line Irrigation	14.00	None
Irrigation Pivot 1	22.70	Quarter pivot with end gun
Irrigation Pivot 2	47.10	Half pivot with end gun

To enhance the ability for community interaction and provide recreational and educational opportunities, a network of trails and informational markers would wind through the wetland and forested pond areas. An additional trail would meander between the wheel line irrigation area and pivot irrigation area from a viewpoint off U.S. Highway 20 to a future Peterson Ridge Trail connector. Due to public contact concerns, if this area is to be irrigated, it must be irrigated with the City's existing surface water rights for the Lazy Z Ranch.

Based on these areas, a water balance was prepared for the year 2040 planning horizon. This water balance is included on Figure 4-2. As shown on Figure 4-2, approximately 62.5 acre-feet of the City's surface water rights would be required (shown as supplemental freshwater on Figure 4-2) to fully meet the potential water demands of this alternative, which shows that the City has excess land available at the Lazy Z Ranch to meet the anticipated 2040 recycled water disposal demands. Even if the 14-acre wheel line irrigation area was not incorporated, approximately 25 acre-feet of the City's surface water rights would be required to fully meet the potential water demands of this alternative.

Layout Alternative 2

This layout would also maintain the City's existing forested irrigation on the property surrounding the City's existing WWTF along with the existing wastewater treatment lagoon dike irrigation as shown on Figure 4-3. In addition, this alternative would utilize one irrigation pivot, a larger wetland area, and an area with forested ponds and streams for the beneficial reuse of the City's recycled water. A summary of the different beneficial reuse options is included on Table 4-2.

TABLE 4-2
LAYOUT 2 BENEFICIAL REUSE

Beneficial Use	Size (acres)	Notes
Forested Irrigation	78.75	Existing
Dike Irrigation	11.80	Existing
Wetland	47.50	Wet acres
Forested Ponds and Streams	4.00	Four wet acres ponds with 2 miles of streams
Wheel Line Irrigation	14.00	
Irrigation Pivot 2	47.10	Half pivot with end gun

This layout would also incorporate networks of trails and informational markers through the wetland and forested pond areas, along with an additional trail meandering between the wheel line irrigation area and pivot irrigation area from a U.S. Highway 20 viewpoint to a future Peterson Ridge Trail connector. The area around the meandering trail to the future Peterson Ridge Trail connector would also be irrigated and enhanced with the City's existing surface water rights for the Lazy Z Ranch.

Based on these areas, a water balance was prepared for the year 2040 planning horizon. This water balance is included on Figure 4-4. As shown on the figure, approximately 95 acre-feet of the City's surface water rights would be required to fully meet the potential water demands of this alternative, which shows that the City has more capability for beneficial reuse of recycled water under this alternative.

Regulatory Requirements

As outlined in the attached Preliminary Findings Memorandum (see Appendix C), it is anticipated that the City can continue to produce Class D recycled water at their wastewater treatment facility for beneficial reuse under either alternative. Required setback distances vary depending on the beneficial reuse option. A summary of the required setback distances, signage, and other regulatory requirements for each alternative is outlined on Table 4-3.

TABLE 4-3
BENEFICIAL USE REQUIREMENTS

Beneficial Use	Required Setback Distance (feet)	Additional Requirements
Forested irrigation with impact sprinklers	100	Fencing or other barrier restricting public access along with signs notifying of recycled water use.
Dike irrigation with impact sprinklers	100	Fencing or other barrier restricting public access along with signs notifying of recycled water use.
Wetland	10	Simple barrier discouraging public access along with signs notifying of recycled water use.
Forested ponds and streams	10	Signs notifying of recycled water use.
Wheel line irrigation	100	Fencing or other barrier restricting public access along with signs notifying of recycled water use.
Irrigation pivot	100	Fencing or other barrier restricting public access along with signs notifying of recycled water use.

In addition to the requirements summarized above, the implementation of the forested ponds and streams should be completed after the recycled water is polished/further treated via the wetlands. As such, the wetlands must be constructed before the forested ponds and streams can be used for the beneficial reuse/disposal of the City's recycled water.

Furthermore, the City may be required to either develop a new Recycled Water Use Plan (RWUP) or prepare an addendum to the existing RWUP prior to expanding the City's recycled water uses.

Sisters Country Vision Compatibility

Each proposed layout aligns with the Sisters Country Vision and the strategies that have been identified in the 2019 Sisters Country Vision Action Plan (VAC). The proposed improvements would expand the City's ability to dispose of additional effluent and provide public open space and a gateway to the City through enhanced use of the Lazy Z Ranch site. Outlined below is additional discussion on the compatibility of the proposed layouts and the VAC.

Prosperous Sisters

The first strategy identified in the VAC for promoting a "prosperous economy rooted in arts and craft, recreation, entrepreneurship, and innovation" includes the strategic development of tourism. The development of the Lazy Z Ranch as outlined would provide a tourist attraction for the City that would provide both recreational and educational opportunities. Trail systems through the wetlands and ponds would have substantial opportunities for hiking and bird watching. Informational kiosks would help tourists know what different species of wildlife to look for while at the wetlands. The trail and viewpoint north of the pivot irrigation area would allow view of the historic Lazy Z Ranch. Kiosks along this trail and at the viewpoint could educate visitors about the history of the Lazy Z Ranch and its importance to the City of Sisters.

Livable Sisters

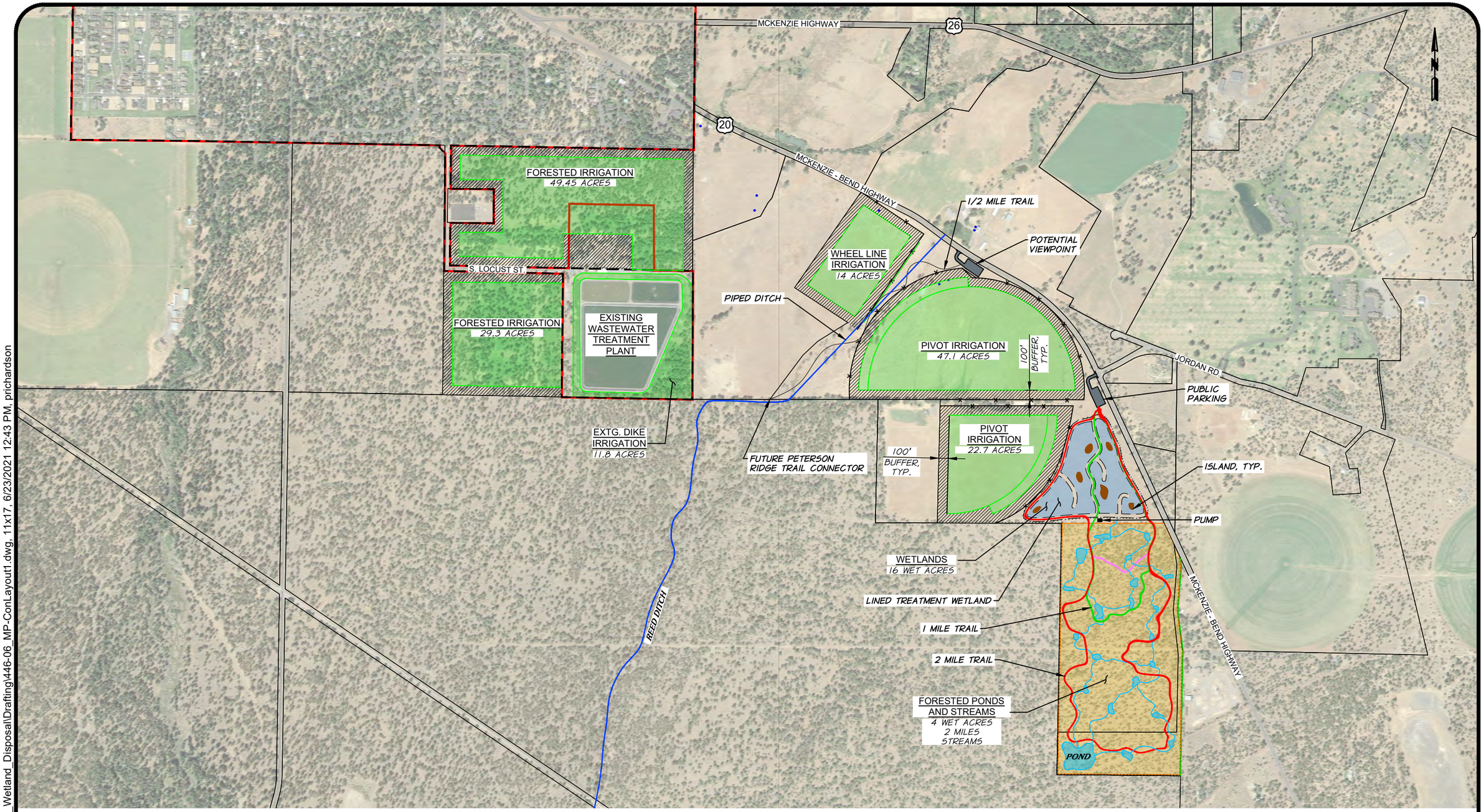
Multiple strategies are identified in the VAC for a livable "city and region that remain welcoming even as they grow" that align with both alternatives previously presented. The expansion of the trail systems at the wetlands, forested ponds and streams, and the area north of the irrigation pivots directly correlates with Strategy 4 of the VAC. The trails through the wetlands and forested ponds and streams would provide access to these areas for recreation, while the trail running north of the irrigation pivots could be connected to the Peterson Ridge Trail system. Additionally, the creation of these new public amenities and visitor attractions is a Strategy 5 goal per the VAC.

Resilient Sisters

Under the vision aspect to develop a resilient community, Strategy 3 is to promote an age-friendly community. The varying lengths of trails through the wetlands and forested ponds and streams will allow visitors of a wide variety of age and physical capabilities to enjoy the facilities.

VAC's Strategy 4 includes developing a Sisters Country that is resilient for all residents and discusses the need for drought and fire-resistant landscapes. The water used to fill the wetlands, ponds, and streams and irrigate the Lazy Z Ranch pastures will be the City's reclaimed water. Though there can be seasonal variations in wastewater flows, these variations typically follow consistent trends from

year to year. In addition, a certain base flow can typically be expected even during drought conditions, due to the consistent need for sewer service. As such, these consistent flows can help to protect the proposed improvements during drought conditions.



LEGEND

- PRIVATE TAXLOTS
- CITY LIMITS
- URBAN GROWTH BOUNDARY
- WELL
- FOREST, POND, AND STREAMS
- WETLAND
- IRRIGATION
- REQUIRED SETBACK

500 0 500 1000 1500
SCALE IN FEET

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN

CONCEPTUAL LAYOUT 1

FIGURE
4-1

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CITY OF SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
CONCEPTUAL LAYOUT 1
WATER BALANCE

Month	Holding Pond Initial Volume (ac-ft)	Influent Flow[1] (gpd)	Monthly Influent Flow (ac-ft)	Rainfall (in)	Evaporation[2] (in)	Net (in)	Net WWTP Evaporation (ac-ft)	Net Forested Ponds Evaporation (ac-ft)[3]	Forested Ponds Seepage (ac-ft)	Net Wetland Evaporation (ac-ft)	Unlined Wetland Seepage (ac-ft)	Pasture Irrigation Requirements (in)[4]	Pasture Irrigation (in)[5]	Forest Irrigation (ac-ft)	Pivot 1 Irrigation (ac-ft)	Pivot 2 Irrigation (ac-ft)	Lagoon Dike Irrigation (ac-ft)	Future Wheel Line Irrigation (ac-ft)	Supplemental Fresh Water (ac-ft)	Final Volume (ac-ft)[6]
October	30.00	369,882.51	35.19	0.95	1.00	-0.05	-0.10	-0.02	0.00	-0.07	0.00	0.44	0.52	3.40	0.98	2.03	0.51	0.60	0.00	57.49
November	57.49	371,598.64	34.21	2.10	1.00	1.10	2.09	0.42	0.00	1.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	95.68
December	95.68	376,794.40	35.85	2.27	1.00	1.27	2.42	0.49	0.00	1.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	136.12
January	136.12	365,877.50	34.81	2.24	1.00	1.24	2.36	0.48	0.00	1.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	175.42
February	175.42	355,588.12	30.56	1.45	1.00	0.45	0.86	0.17	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	207.60
March	207.60	374,404.31	35.62	1.12	1.00	0.12	0.23	0.05	0.00	0.16	0.00	0.88	1.04	6.79	1.97	4.05	1.02	1.21	0.00	228.61
April	228.61	364,856.87	33.59	0.79	4.25	-3.46	-6.58	-1.33	0.00	-4.61	0.00	2.81	3.31	21.69	6.28	12.95	3.25	3.86	0.00	201.65
May	201.65	377,892.55	35.95	0.78	6.14	-5.36	-10.19	-2.05	0.00	-7.15	0.00	3.51	4.13	27.10	7.85	16.17	4.06	4.82	0.00	158.21
June	158.21	433,609.63	39.92	0.61	6.69	-6.08	-11.56	-2.33	0.00	-8.11	0.00	3.81	4.48	29.42	8.52	17.56	4.41	5.23	0.00	111.01
July	111.01	442,360.36	42.08	0.38	8.66	-8.28	-15.75	-3.17	0.00	-11.04	0.00	4.64	5.46	35.82	10.37	21.38	5.37	6.37	33.50	77.32
August	77.32	420,461.98	40.00	0.41	7.91	-7.50	-14.26	-2.88	0.00	-10.00	0.00	3.92	4.61	30.26	8.76	18.06	4.53	5.38	29.00	52.18
September	52.18	405,975.02	37.38	0.40	5.42	-5.02	-9.55	-1.92	0.00	-6.69	0.00	2.42	2.85	18.68	5.41	11.15	2.80	3.32	0.00	30.02
		Total	**435.15**	**13.50**	**45.07**	**-31.57**	**-60.04**	**-12.10**	**0.00**	**-42.09**	**0.00**	**22.43**	**26.39**	**173.17**	**50.14**	**103.35**	**25.95**	**30.79**	**62.50**	

Notes:
[1] Based on Portland State University's forecasted 2040 population of 4,867 people.
[2] From the Western Regional Climate Center for the Bend 7 N.E. Evaporation Station.
[3] Assumes 2 miles of streams with 4-foot wide water surface on average and 3.5 acres of ponds.
[4] From the U.S. Bureau of Reclamation (Reclamation) AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station.
[5] From the Reclamation's AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station, divided by 0.85 for irrigation efficiency.
[6] Final volume was maintained above or approximately equal to 30 ac-ft to ensure surface aerators could be kept in operation and to avoid the need for removing the unutilized aerators prior to the pond freezing over.

ac = acre
ac-ft = acre-feet
evap. = evaporation
ft = feet
gpd = gallons per day
in = inch
WWTP = wastewater treatment plant

Treatment Lagoons Wet Area (ac):	**4.82**
Storage Pond Wet Area (ac):	**18.00**
Total WWTP Wet Area (ac):	**22.82**
Storage Pond Capacity (ac-ft):	**213.00**

	Area (ac)	Storage Depth (ft)	Additional Storage (ac-ft)	
Wetland	16.00	1.50	24.00	
Forested Ponds	4.60	0.00	0.00	
Pivot 1	22.80	-	-	
Pivot 2	47.00	-	-	
Lagoon Dike Irrigation	11.80	-	-	
Forested Irrigation	78.75	-	-	
Wheel Line Irrigation	14.00	-	-	
		Total	**24.00**	**ac-ft**
		Total Storage	**237.00**	**ac-ft**

Recycled Water Disposal Option	Disposal Capacity (ac-ft)
Wetland/Ponds	54.20
Pasture Irrigation	153.49
Wheel Line	30.79
Existing Irrigation	259.16
Total	497.63

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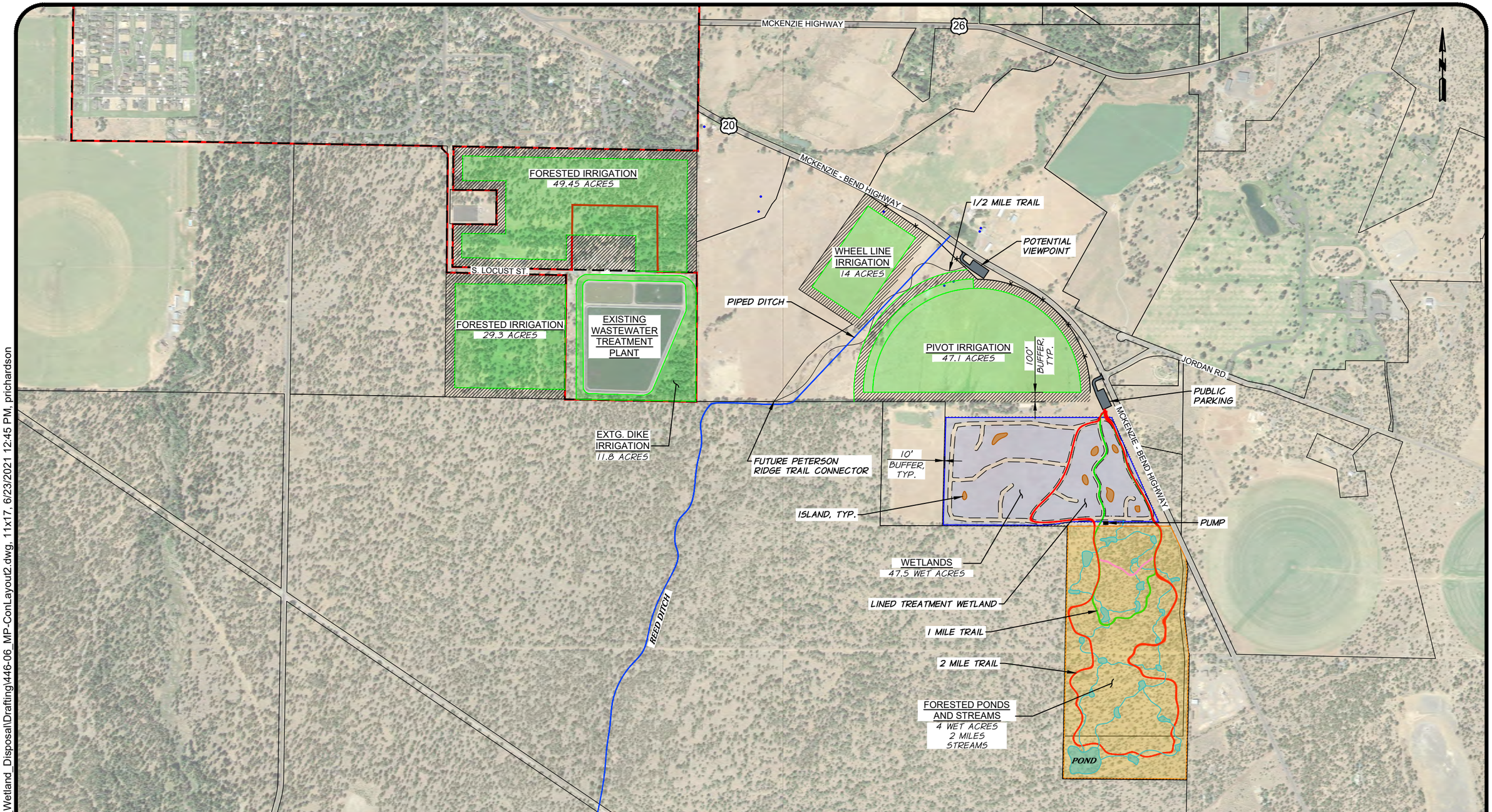
CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
CONCEPTUAL LAYOUT 1
WATER BALANCE

FIGURE
4-2



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LEGEND

- PRIVATE TAXLOTS
- CITY LIMITS
- URBAN GROWTH BOUNDARY
- WELL
- FOREST, POND, AND STREAMS
- WETLAND
- IRRIGATION
- REQUIRED SETBACK

500 0 500 1000 1500
SCALE IN FEET

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN

CONCEPTUAL LAYOUT 2

FIGURE
4-3

CITY OF SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
CONCEPTUAL LAYOUT 2
WATER BALANCE

Month	Holding Pond Initial Volume (ac-ft)	Influent Flow[1] (gpd)	Monthly Influent Flow (ac-ft)	Rainfall (in)	Evaporation[2] (in)	Net (in)	Net WWTP Evaporation (ac-ft)	Net Forested Ponds Evaporation (ac-ft)[3]	Forested Ponds Seepage (ac-ft)	Net Wetland Evaporation (ac-ft)	Unlined Wetland Seepage (ac-ft)	Pasture Irrigation Requirements (in)[4]	Pasture Irrigation (in)[5]	Forest Irrigation (ac-ft)	Pivot 1 Irrigation (ac-ft)	Pivot 2 Irrigation (ac-ft)	Lagoon Dike Irrigation (ac-ft)	Future Wheel Line Irrigation (ac-ft)	Supplemental Fresh Water (ac-ft)	Final Volume (ac-ft)[6]
October	30.00	369,882.51	35.19	0.95	1.00	-0.05	-0.10	-0.02	0.00	-0.20	0.00	0.44	0.52	3.40	0.00	2.03	0.51	0.60	0.00	58.34
November	58.34	371,598.64	34.21	2.10	1.00	1.10	2.09	0.42	0.00	4.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	99.42
December	99.42	376,794.40	35.85	2.27	1.00	1.27	2.42	0.49	0.00	5.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	143.19
January	143.19	365,877.50	34.81	2.24	1.00	1.24	2.36	0.48	0.00	4.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	185.74
February	185.74	355,588.12	30.56	1.45	1.00	0.45	0.86	0.17	0.00	1.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	219.11
March	219.11	374,404.31	35.62	1.12	1.00	0.12	0.23	0.05	0.00	0.48	0.00	0.88	1.04	6.79	0.00	4.05	1.02	1.21	0.00	242.40
April	242.40	364,856.87	33.59	0.79	4.25	-3.46	-6.58	-1.33	0.00	-13.70	0.00	2.81	3.31	21.69	0.00	12.95	3.25	3.86	0.00	212.64
May	212.64	377,892.55	35.95	0.78	6.14	-5.36	-10.19	-2.05	0.00	-21.22	0.00	3.51	4.13	27.10	0.00	16.17	4.06	4.82	0.00	162.98
June	162.98	433,609.63	39.92	0.61	6.69	-6.08	-11.56	-2.33	0.00	-24.07	0.00	3.81	4.48	29.42	0.00	17.56	4.41	5.23	0.00	108.33
July	108.33	442,360.36	42.08	0.38	8.66	-8.28	-15.75	-3.17	0.00	-32.78	0.00	4.64	5.46	35.82	0.00	21.38	5.37	6.37	60.00	89.78
August	89.78	420,461.98	40.00	0.41	7.91	-7.50	-14.26	-2.88	0.00	-29.69	0.00	3.92	4.61	30.26	0.00	18.06	4.53	5.38	35.25	59.96
September	59.96	405,975.02	37.38	0.40	5.42	-5.02	-9.55	-1.92	0.00	-19.87	0.00	2.42	2.85	18.68	0.00	11.15	2.80	3.32	0.00	30.04
		Total	**435.15**	**13.50**	**45.07**	**-31.57**	**-60.04**	**-12.10**	**0.00**	**-124.96**	**0.00**	**22.43**	**26.39**	**173.17**	**0.00**	**103.35**	**25.95**	**30.79**	**95.25**	

Notes:

[1] Based on Portland State University's forecasted 2040 population of 4,867 people.

[2] From the Western Regional Climate Center for the Bend 7 N.E. Evaporation Station.

[3] Assumes 2 miles of streams with 4-foot wide water surface on average and 3.5 acres of ponds.

[4] From the U.S. Bureau of Reclamation (Reclamation) AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station.

[5] From the Reclamation's AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon, Station divided by 0.85 for irrigation efficiency.

[6] Final volume was maintained above or approximately equal to 30 ac-ft to ensure surface aerators could be kept in operation and to avoid the need for removing the unutilized aerators prior to the pond freezing over.

ac = acre
ac-ft = acre-feet
ft = feet
gpd = gallons per day
in = inch
WWTP = Wastewater Treatment Plant

Treatment Lagoons Wet Area (ac):	**4.82**
Storage Pond Wet Area (ac):	**18.00**
Total WWTP Wet Area (ac):	**22.82**
Storage Pond Capacity (ac-ft):	**213.00**

	Area (ac)	Storage Depth (ft)	Additional Storage (ac-ft)	
Wetland	47.50	1.50	71.25	
Forested Ponds	4.60	0.00	0.00	
Pivot 2	47.00			
Lagoon Dike	11.80			
Forested Irrigation	78.75			
Wheel Line Irrigation	14.00			
		Total	**71.25**	**ac-ft**
		Total Storage	**284.25**	**ac-ft**

Recycled Water Disposal Option	Disposal Capacity (ac-ft)
Wetland/Ponds	137.07
Pasture Irrigation	103.35
Wheel Line	30.79
Existing Irrigation	259.16
Total	530.36

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
CONCEPTUAL LAYOUT 2
WATER BALANCE

FIGURE
4-4

Chapter 5 - Alternatives Cost Estimates

This chapter outlines preliminary cost estimates for each alternative previously metioned. Understanding the anticipated costs of each layout alternative may impact which alternative is eventually pursued by the City of Sisters, Oregon, and will help guide the City in its pursuit for funding. Discussion about the development of each cost estimate is included below. These cost estimates are provided for budgetary purposes.

Alternative 1

A preliminary construction cost estimate for Alternative 1 was developed based on the beneficial uses presented for this alternative in Chapter 4. This cost estimate is summarized by each beneficial use and is included on Table 5-1.

TABLE 5-1
ALTERNATIVE 1 PRELIMINARY COST ESTIMATE

Beneficial Use	Cost
Wetland	$1,200,000
Forested Ponds and Streams	$1,300,000
Pivot 1	$300,000
Pivot 2	$250,000
General	$480,000
Future Wheel Line	$130,000
Subtotal	**$3,400,000**
Contingency, Engineering, and Administration (35%)	$1,190,000
Total	**$4,590,000**

The cost for the wetland includes all earthwork for the impoundments and dikes, a 1-inch bentonite liner, 12 inches of soil placed over the bentonite liner, all required plantings, and wetland fencing. In addition, the costs for wetland piping, control structures, and the effluent lift station were included in the development of this cost estimate.

The forested ponds and streams cost estimate includes all earthwork, plantings, pathways, and bridges to develop the area as discussed in Chapter 4 and as shown on Figure 4-1. All pathways are assumed to be gravel paths; paved pathways would cost more. This cost also includes anticipated piping costs to convey the water from the wetlands to the primary pond.

Both pivot cost estimates include pivot infrastructure, end gun, booster pumps, an irrigation pump station, electrical work, piping, and fencing to construct the pivots as shown on Figure 4-1.

The “General” line item was included to cover improvements that did not fall under a specific beneficial reuse category. Included in this item are the wetlands parking area, the Lazy Z Ranch viewpoint shown just north of the pivots on Figure 4-1, and the Peterson Ridge Trail connector. In addition, a cost to replace and extend, as necessary, the effluent piping to the beneficial reuse sites on the Lazy Z Ranch was included.

The cost for the future wheel line included all piping, wheel line infrastructure, and fencing associated with this beneficial reuse item.

Alternative 2

A preliminary construction cost estimate for Alternative 2 was developed based on the beneficial uses presented for this alternative in Chapter 4. This cost estimate is summarized by each beneficial use and is included on Table 5-2.

TABLE 5-2
ALTERNATIVE 2 PRELIMINARY COST ESTIMATE

Beneficial Use	Cost
Wetland	$3,580,000
Forested Ponds and Streams	$1,300,000
Pivot 2	$325,000
General	$480,000
Future Wheel Line	$130,000
Subtotal	**$4,770,000**
Contingency, Engineering, and Administration (35%)	$1,670,000
Total	**$6,440,000**

The costs for each beneficial use line item included on Table 5-2 include the same components as those discussed previously for Alternative 1. As shown on Table 5-2, the costs for the forested ponds and streams, future wheel line, and general are the same as those for Alternative 1. The cost for Pivot 2 is higher under Alternative 2 than under Alternative 1 because Alternative 1 was able to divide some of the costs for the electrical work between the two pivot options, as there is not a substantial cost difference between the controls work or utility service work required for one pivot or two pivots.

The greatest cost difference between the two alternatives is the wetland cost. As discussed in Chapter 4, this alternative would incorporate approximately an additional 31 acres of wetland in lieu of Pivot 1. Based on the earthwork, liner, and plantings costs associated with the construction of these wetlands, the cost per acre to construct the wetlands is higher than that to construct an irrigation pivot.

Cost Considerations

As discussed, the capital cost to construct Alternative 1 is substantially lower than that to construct Alternative 2; however, potential funding opportunities should be considered that may help offset some of the cost disparity. Due to environmental benefits associated with wetlands, additional funding opportunities are available for the construction of these wetlands. The Oregon Parks and Recreation Department (OPRD) and the Oregon Department of Fish and Wildlife (ODFW) have grants available that could assist with these construction costs. OPRD awards more than $13 million in grants each year to support recreation on public lands, while ODFW provides grant funding for projects that conserve, enhance, or provide wildlife habitat or develop water in arid regions.

In addition, as shown on Figures 4-2 and 4-4, wetlands provide greater potential for beneficial reuse and disposal of recycled water per acre than pivots. As such, the increased wetland size would provide a

more efficient use of the Lazy Z Ranch property from a disposal standpoint and, therefore, provide greater recycled water use capacity than the construction of an irrigation pivot.

Chapter 6 - Beneficial Use Phasing

As discussed in Chapter 4, each proposed alternative provides excess capability for the reuse and disposal of the City of Sisters, Oregon's recycled water when compared to the anticipated 2040 demands. From an overall cost standpoint, it is most advantageous for the City to acquire funding for the entire project and construct it all at once. However, due to the excess capacity provided by either alternative presented in Chapter 4, the City will not need to construct all the proposed improvements at once to meet its disposal needs. The purpose of this chapter is to outline different options for phasing the beneficial uses to assist the City with its planning efforts.

Alternative 1 Phasing

The City's Discharge Monitoring Reports (DMRs) for the years 2018 through 2020 are summarized on Figure 6-1. Based on the highest continuous year of flows from these data, water balances representative of the City's current demands were prepared. Each water balance represents a different option for phasing for this alternative. These options are outlined further below.

Option 1

The first option involves the initial replacement of the City's K-line irrigation system with two irrigation pivots. Based on current flows from the City's DMRs, a water balance for this phase was prepared and is included on Figure 6-2. As shown, this phasing offers approximately 107 acre-feet of capacity to allow for population growth. Based on past Portland State University (PSU) population projections, this additional disposal capacity is anticipated to provide the City with adequate beneficial reuse capacity for the next 8 to 12 years.

Option 2

The second option incorporates the initial implementation of the wetland and forested ponds and streams, along with the maintenance of the existing K-line irrigation system. Based on current flows from the City's DMRs, a water balance for this phase was prepared and is included on Figure 6-3. As shown, this initial phase is anticipated to provide 80.5 acre-feet of additional disposal capacity. Based on past PSU population projections, this additional disposal capacity is anticipated to provide the City with adequate beneficial reuse capacity for the next five to nine years.

Alternative 2 Phasing

Two phasing options were explored for this alternative. The highest continuous year of flows from the City's 2018 to 2020 DMR data was used to prepare water balances representative of the City's current recycled water demands for each phasing option. These options are outlined further below.

Option 1

The first option initially replaces the existing K-line irrigation system with the wetlands and the forested ponds and streams. Based on current flows from the City's DMRs, a water balance for this phase was prepared and is included on Figure 6-4. As shown, this phasing option offers approximately 90 acre-feet of additional recycled water disposal capacity. Based on past PSU

population projections, this additional disposal capacity is anticipated to provide the City with adequate beneficial reuse capacity for the next six to ten years.

Option 2

The second option involves the initial installation of a half-circle pivot. Based on current flows from the City's DMRs, a water balance for this phase was prepared and is included on Figure 6-5. This option is anticipated to provide approximately 56.5 acre-feet of additional recycled water disposal capacity. Based on past PSU population projections, this disposal capacity is anticipated to provide the City with adequate beneficial reuse capacity for the next two to six years. To further increase the short-term disposal capacity under this option, the City could maintain its existing K-line irrigation system. Doing so would provide approximately 44 additional acre-feet of disposal capacity, which is anticipated to provide adequate beneficial reuse capacity for the next 7 to 11 years.

Phasing Advantages and Disadvantages

Generally, each alternative phasing option falls under one of the following categories: construct the wetlands and forested ponds and streams first, or construct the irrigation pivot(s) first. Discussion is included below regarding the advantages and disadvantages of these general categories.

Wetlands Phased First

The primary advantage of constructing the wetlands and forested ponds and streams first comes primarily from the parks and recreational benefits. The earlier the City invests in this improvement, the earlier the community could begin to benefit. Additionally, wildlife would benefit from the development of habitat.

The primary disadvantage of constructing the wetlands first is the initial capital cost. The wetlands and forested ponds and streams are anticipated to cost more than the irrigation pivots. However, construction costs increase each year. As such, postponing construction will result in escalated prices in the future.

The advantages and disadvantages of constructing the wetlands and forested ponds and streams first are summarized as follows:

- **Advantages**
    - Parks and recreational benefits
    - Development of natural habitat for wildlife
- **Disadvantages**
    - Cost

Irrigation Pivot(s) Phased First

There are multiple advantages from constructing the irrigation pivot(s) before the wetlands and forested ponds and streams. First, the irrigation pivot(s) are relatively inexpensive to construct. The City could construct the irrigation pivot(s) first to gain short-term disposal capacity. This time could be used to build the sewer fund, apply for funding, and increase sewer rates as needed to help

lower potential costs due to interest if the City receives any loans for the construction of improvements. In addition, the time of construction for irrigation pivots is relatively low.

The primary disadvantage of constructing the irrigation pivot(s) first is the initial lack of parks and recreational benefits.

The advantages and disadvantages of constructing the irrigation pivot(s) first are summarized as follows:

- **Advantages**
  - Cost
  - Allows additional time for funding acquisition
  - Short construction time
- **Disadvantages**
  - No public open space or recreational benefits

CITY OF SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
DISCHARGE MONITORING REPORT SUMMARY

	Influent								Effluent						
Date	Total Monthly Flow (MG)	Maximum Daily Flow (MGD)	Minimum Daily Flow (MGD)	Average Daily Flow (MGD)	Daily Max pH	Daily Min pH	BOD_5 Conc. (mg/L)	TSS Conc. (mg/L)	Dike Quantity Irrigated (in/acre)	Forest Quantity Irrigated (in/acre)	Forest 2 Quantity Irrigated (in/acre)	Average Daily Quantity Chlorine Used (lbs)	*E. Coli* Concentration (CFU/100 ml)	Maximum pH	Minimum pH
Jan-18	6.118	0.220	0.184	0.197	7.34	7.17	268	134							
Feb-18	5.526	0.222	0.187	0.197	7.33	7.05	200	98							
Mar-18	6.124	0.210	0.187	0.197	7.33	6.90	327	136							
Apr-18	5.926	0.213	0.186	0.197	7.36	7.01	357	173	1.37			7.0	1.00	7.40	7.00
May-18	6.634	0.246	0.196	0.214	7.29	7.01	267	147	4.81	2.06		6.0	1.00	7.20	7.10
Jun-18	6.890	0.249	0.213	0.230	7.34	6.71	354	170	6.57	3.22		8.0	1.50	7.30	7.10
Jul-18	7.479	0.264	0.229	0.241	7.25	6.71	354	170	9.33	5.43		9.0	2.86	8.00	7.20
Aug-18	7.331	0.254	0.210	0.236			362	169	6.67	3.77		10.0	2.03	7.82	7.11
Sep-18	6.796	0.250	0.207	0.227	7.59	6.89	366	185	5.37	3.10		9.0	2.52	7.18	7.86
Oct-18	6.500	0.235	0.190	0.211	7.25	7.10	358	195	2.25	1.12		9.0	1.00	7.91	7.21
Nov-18	6.106	0.216	0.187	0.204	7.25	6.85	318	148							
Dec-18	6.521	0.238	0.173	0.210			331	137							
Jan-19	6.504	0.243	0.194	0.209	7.37	7.10	252	153							
Feb-19	5.747	0.235	0.182	0.205	7.42	6.91	311	199							
Mar-19	6.584	0.225	0.191	0.212	7.25	6.94	306	178							
Apr-19	6.477	0.249	0.202	0.216	7.32	7.11	297	174	1.61	0.64		9.9	1.00	7.42	7.29
May-19	6.865	0.243	0.209	0.221	7.41	7.17	308	180	4.93	2.03	0.44		4.63	7.28	7.11
Jun-19	8.421	0.423	0.175	0.280	7.44	7.13	338	172	6.18	3.77			20.80	7.60	7.25
Jul-19	8.126	0.287	0.247	0.262	7.36	7.10	354	153	8.62	5.28		9.0	10.09	7.38	7.11
Aug-19	7.777	0.262	0.240	0.251	7.33	7.13	279	176	10.69	6.73			9.60	7.38	7.23
Sep-19	7.137	0.270	0.221	0.237	7.86	7.11	186	136	9.77	4.88	3.00	12.0	18.60		
Oct-19	6.770	0.244	0.202	0.218	7.39	7.11	372	290	9.49		3.18	9.0	2.60	8.52	7.70
Nov-19	6.568	0.243	0.208	0.219	7.49	6.25	319	111							
Dec-19	6.825	0.249	0.193	0.220	7.31	6.63	397	108							
Jan-20	6.734	0.256	0.196	0.217	7.25	6.75	301	168							
Feb-20	6.352	0.234	0.198	0.219	7.27	7.01	350	160							
Mar-20	6.435	0.227	0.190	0.208	7.25	6.64	323	158							
Apr-20	5.926	0.210	0.186	0.198	7.21	7.12	338	184	1.62			3.5	0.00	7.39	7.01
May-20	6.712	0.241	0.197	0.217	7.31	7.11	296	173	3.83	0.46	0.44	4.7	8.00	7.40	7.00
Jun-20	7.405	0.305	0.225	0.247	7.29	7.11	338	188	3.80	5.27	5.20	7.2	18.10	7.42	7.18
Jul-20	8.059	0.270	0.244	0.260	7.28	7.17	390	177	4.20	3.80	3.80	7.9	7.70	8.40	7.38
Aug-20	6.974	0.283	0.221	0.225	7.49	7.11	319	158	2.22	1.05	1.05	7.8	15.00	8.11	7.50
Sep-20	7.437	0.287	0.226	0.247	7.31	6.62	282	176	5.32	1.20	1.20	15.0	3.70	8.20	7.19
Oct-20	7.586	0.267	0.217	0.244	7.61	7.11	240	179	5.28		3.74	7.0	9.10	7.87	7.10
Nov-20	7.046	0.307	0.216	0.234	7.91	7.00	241	122							
Dec-20															
Maximum	8.421	0.423	0.247	0.280	7.91	7.17	397	290	10.69	6.73	5.20	15.0	20.80	8.52	7.86
Minimum	5.526	0.210	0.173	0.197	7.21	6.62	186	98	1.37	0.46	0.44	3.5	0.00	7.18	7.00
Average	6.812	0.254	0.204	0.224	7.37	6.99	314	164	5.43	3.17	2.45	8.4	6.71	7.66	7.23

BOD = biochemical oxygen demand
CFU = colony forming units
ft = Feet
in/acre = inches per acre
lbs = pounds
MG = million gallons
MGD = million gallons per day
mg/L = milligrams per liter
ml = milliliters
TKN = total Kjeldahl nitrogen
TSS = total suspended solids

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CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
DISCHARGE MONITORING
REPORT SUMMARY

FIGURE
6-1

CITY OF SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
ALTERNATIVE 1 - PHASING OPTION 1
WATER BALANCE

Month	Holding Pond Initial Volume (ac-ft)	Influent Flow[1] (gpd)	Monthly Influent Flow (ac-ft)	Rainfall (in)	Evaporation[2] (in)	Net (in)	Net Evap. (ac-ft)	Net Forested Ponds Evaporation (ac-ft)[3]	Forested Ponds Seepage (ac-ft)	Net Wetland Evaporation (ac-ft)	Unlined Wetland Seepage (ac-ft)	Pasture Irrigation Requirements (in)[4]	Pasture Irrigation (in)[5]	Forest Irrigation (ac-ft)	Pivot 1 Irrigation (ac-ft)	Pivot 2 Irrigation (ac-ft)	Lagoon Dike Irrigation (ac-ft)	Future Wheel Line Irrigation (ac-ft)	Supplemental Freshwater (ac-ft)	Final Volume (ac-ft)[6]
October	30	211,000.00	20.07	0.95	1.00	-0.05	-0.10	0.00	0.00	0.00	0.00	0.44	0.52	2.37	0.98	2.03	0.51	0.00	0.00	44.09
November	44.09	204,000.00	18.78	2.10	1.00	1.10	2.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.96
December	64.96	210,000.00	19.98	2.27	1.00	1.27	2.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	87.36
January	87.36	209,000.00	19.88	2.24	1.00	1.24	2.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	109.60
February	109.60	205,000.00	17.62	1.45	1.00	0.45	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	128.07
March	128.07	212,000.00	20.17	1.12	1.00	0.12	0.23	0.00	0.00	0.00	0.00	0.88	1.04	4.75	1.96	4.05	1.02	0.00	0.00	136.69
April	136.69	216,000.00	19.89	0.79	4.25	-3.46	-6.58	0.00	0.00	0.00	0.00	2.81	3.31	15.15	6.25	12.95	3.25	0.00	0.00	112.39
May	112.39	221,000.00	21.02	0.78	6.14	-5.36	-10.19	0.00	0.00	0.00	0.00	3.51	4.13	18.93	7.81	16.17	4.06	0.00	0.00	76.25
June	76.25	280,000.00	25.78	0.61	6.69	-6.08	-11.56	0.00	0.00	0.00	0.00	3.81	4.48	20.54	8.48	17.56	4.41	0.00	56.50	95.98
July	95.98	262,000.00	24.93	0.38	8.66	-8.28	-15.75	0.00	0.00	0.00	0.00	4.64	5.46	25.02	10.33	21.38	5.37	0.00	50.00	93.07
August	93.07	251,000.00	23.88	0.41	7.91	-7.50	-14.26	0.00	0.00	0.00	0.00	3.92	4.61	21.14	8.72	18.06	4.53	0.00	0.00	50.23
September	50.23	237,000.00	21.82	0.40	5.42	-5.02	-9.55	0.00	0.00	0.00	0.00	2.42	2.85	13.05	5.39	11.15	2.80	0.00	0.00	30.11
Total		**226,500.00**	**253.82**	**13.50**	**45.07**	**-31.57**	**-60.04**	**0.00**	**0.00**	**0.00**	**0.00**	**22.43**	**26.39**	**120.95**	**49.92**	**103.35**	**25.95**	**0.00**	**106.50**	

Notes:
[1] Based on the highest continuous year of flows from the City's 2018 to 2020 DMR data.
[2] From the Western Regional Climate Center for the Bend 7 NE Evaporation Station.
[3] Assumes 2 miles of streams with 4-foot wide water surface on average and 3.5 acres of ponds.
[4] From the U.S. Bureau of Reclamation (Reclamation) AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station.
[5] From the Reclamation AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station, divided by 0.85 for irrigation efficiency.
[6] Final volume was maintained above or approximately equal to 30 ac-ft to ensure surface aerators could be kept in operation and to avoid the need for removing the unutilized aerators prior to the pond freezing over.

ac = acre
ac-ft = acre-feet
DMR = Discharge Monitoring Report
evap. = evaporation
ft = feet
gpd = gallons per day
in = inches
WWTP = wastewater treatment plant

Treatment Lagoons Wet Area (ac): **4.82**
Storage Pond Wet Area (ac): **18.00**
Total WWTP Wet Area (ac): **22.82**
Storage Pond Capacity (ac-ft): **213.00**

	Area (ac)	Storage Depth (ft)	Additional Storage (ac-ft)	
Wetland	16.00	1.50	24.00	
Forested Ponds	4.60	0.00	0.00	
Pivot 1	22.70	-	-	
Pivot 2	47.00	-	-	
Lagoon Dike Irrigation	11.80	-	-	
Forested Irrigation	55.00	-	-	
Wheel Line Irrigation	0.00	-	-	
		Total	**24.00**	**ac-ft**
		Total Storage	**237.00**	**ac-ft**

Recycled Water Disposal Option	Disposal Capacity (ac-ft)
Wetland/Ponds	0.00
Pasture Irrigation	153.27
Wheel Line	0.00
Existing Irrigation	206.93
Total	360.20

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CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
ALTERNATIVE 1 - PHASING OPTION 1
WATER BALANCE

FIGURE
6-2

CITY OF SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
ALTERNATIVE 1 - PHASING OPTION 2
WATER BALANCE

Month	Holding Pond Initial Volume (ac-ft)	Influent Flow[1] (gpd)	Monthly Influent Flow (ac-ft)	Rainfall (in)	Evaporation[2] (in)	Net (in)	Net Evap. (ac-ft)	Net Forested Ponds Evaporation (ac-ft)[3]	Forested Ponds Seepage (ac-ft)	Net Wetland Evaporation (ac-ft)	Unlined Wetland Seepage (ac-ft)	Pasture Irrigation Requirements (in)[4]	Pasture Irrigation (in)[5]	Forest Irrigation (ac-ft)	Pivot 1 Irrigation (ac-ft)	Pivot 2 Irrigation (ac-ft)	Lagoon Dike Irrigation (ac-ft)	Future Wheel Line Irrigation (ac-ft)	Supplemental Freshwater (ac-ft)	Final Volume (ac-ft)[6]
October	30	211,000.00	20.07	0.95	1.00	-0.05	-0.10	0.38	0.00	1.33	0.00	0.44	0.52	2.37	0.98	0.00	0.51	0.00	0.00	44.40
November	44.40	204,000.00	18.78	2.10	1.00	1.10	2.09	0.38	0.00	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	63.56
December	63.56	210,000.00	19.98	2.27	1.00	1.27	2.42	0.38	0.00	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.23
January	84.23	209,000.00	19.88	2.24	1.00	1.24	2.36	0.38	0.00	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	104.76
February	104.76	205,000.00	17.62	1.45	1.00	0.45	0.86	0.38	0.00	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	121.51
March	121.51	212,000.00	20.17	1.12	1.00	0.12	0.23	0.38	0.00	1.33	0.00	0.88	1.04	4.75	1.96	0.00	1.02	0.00	0.00	132.47
April	132.47	216,000.00	19.89	0.79	4.25	-3.46	-6.58	1.63	0.00	5.67	0.00	2.81	3.31	15.15	6.25	0.00	3.25	0.00	0.00	113.83
May	113.83	221,000.00	21.02	0.78	6.14	-5.36	-10.19	2.35	0.00	8.19	0.00	3.51	4.13	18.93	7.81	0.00	4.06	0.00	0.00	83.32
June	83.32	280,000.00	25.78	0.61	6.69	-6.08	-11.56	2.56	0.00	8.92	0.00	3.81	4.48	20.54	8.48	0.00	4.41	0.00	30.50	83.12
July	83.12	262,000.00	24.93	0.38	8.66	-8.28	-15.75	3.32	0.00	11.55	0.00	4.64	5.46	25.02	10.33	0.00	5.37	0.00	50.00	86.72
August	86.72	251,000.00	23.88	0.41	7.91	-7.50	-14.26	3.03	0.00	10.55	0.00	3.92	4.61	21.14	8.72	0.00	4.53	0.00	0.00	48.36
September	48.36	237,000.00	21.82	0.40	5.42	-5.02	-9.55	2.08	0.00	7.23	0.00	2.42	2.85	13.05	5.39	0.00	2.80	0.00	0.00	30.10
Total		**226,500.00**	**253.82**	**13.50**	**45.07**	**-31.57**	**-60.04**	**17.28**	**0.00**	**60.09**	**0.00**	**22.43**	**26.39**	**120.95**	**49.92**	**0.00**	**25.95**	**0.00**	**80.50**	

[1] Based on highest continuous year of flows from the City's 2018 to 2020 DMR data.
[2] From the Western Regional Climate Center for the Bend 7 NE Evaporation Station.
[3] Assumes 2 miles of streams with 4-foot wide water surface on average and 3.5 acres of ponds.
[4] From the U.S. Bureau of Reclamation (Reclamation) AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station.
[5] From the Reclamation AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station, divided by 0.85 for irrigation efficiency.
[6] Final volume was maintained above or approximately equal to 30 ac-ft to ensure surface aerators could be kept in operation and to avoid the need for removing the unutilized aerators prior to the pond freezing over.

ac = acre
ac-ft = acre-feet
DMR = Discharge Monitoring Report
evap. = evaporation
ft = feet
gpd = gallons per day
in = inches
WWTP = wastewater treatment plant

Treatment Lagoons Wet Area (ac): **4.82**
Storage Pond Wet Area (ac): **18.00**
Total WWTP Wet Area (ac): **22.82**
Storage Pond Capacity (ac-ft): **213.00**

	Area (ac)	Storage Depth (ft)	Additional Storage (ac-ft)	
Wetland	16.00	1.50	24.000	
Forested Ponds	4.60	0.00	0.00	
Pivot 1	22.70	-	-	
Pivot 2	0.00	-	-	
Lagoon Dike Irrigation	11.80	-	-	
Forested Irrigation	55.00	-	-	
Wheel Line Irrigation	0.00	-	-	
		Total	**24.00**	**ac-ft**
		Total Storage	**237.00**	**ac-ft**

Recycled Water Disposal Option	Disposal Capacity (ac-ft)
Wetland/Ponds	77.37
Pasture Irrigation	49.92
Wheel Line	0.00
Existing Irrigation	206.93
Total	334.22

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
ALTERNATIVE 1 - PHASING OPTION 2
WATER BALANCE

FIGURE
6-3

CITY OF SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
ALTERNATIVE 2 - PHASING OPTION 1
WATER BALANCE

Month	Holding Pond Initial Volume (ac-ft)	Influent Flow[1] (gpd)	Monthly Influent Flow (ac-ft)	Rainfall (in)	Evaporation[2] (in)	Net (in)	Net WWTP Evap. (ac-ft)	Net Forested Ponds Evaporation (ac-ft)[3]	Forested Ponds Seepage (ac-ft)	Net Wetland Evaporation (ac-ft)	Unlined Wetland Seepage (ac-ft)	Pasture Irrigation Requirements (in)[4]	Pasture Irrigation (in)[5]	Forest Irrigation (ac-ft)	Pivot 1 Irrigation (ac-ft)	Pivot 2 Irrigation (ac-ft)	Lagoon Dike Irrigation (ac-ft)	Future Wheel Line Irrigation (ac-ft)	Supplemental Freshwater (ac-ft)	Final Volume (ac-ft)[6]
October	30	211,000.00	20.07	0.95	1.00	-0.05	-0.10	-0.02	0.00	-0.20	0.00	0.44	0.52	2.37	0.00	0.00	0.51	0.00	0.00	46.88
November	46.88	204,000.00	18.78	2.10	1.00	1.10	2.09	0.42	0.00	4.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	72.53
December	72.53	210,000.00	19.98	2.27	1.00	1.27	2.42	0.49	0.00	5.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.44
January	100.44	209,000.00	19.88	2.24	1.00	1.24	2.36	0.48	0.00	4.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	128.06
February	128.06	205,000.00	17.62	1.45	1.00	0.45	0.86	0.17	0.00	1.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	148.49
March	148.49	212,000.00	20.17	1.12	1.00	0.12	0.23	0.05	0.00	0.48	0.00	0.88	1.04	4.75	0.00	0.00	1.02	0.00	0.00	163.64
April	163.64	216,000.00	19.89	0.79	4.25	-3.46	-6.58	-1.33	0.00	-13.70	0.00	2.81	3.31	15.15	0.00	0.00	3.25	0.00	0.00	143.52
May	143.52	221,000.00	21.02	0.78	6.14	-5.36	-10.19	-2.05	0.00	-21.22	0.00	3.51	4.13	18.93	0.00	0.00	4.06	0.00	0.00	108.10
June	108.10	280,000.00	25.78	0.61	6.69	-6.08	-11.56	-2.33	0.00	-24.07	0.00	3.81	4.48	20.54	0.00	0.00	4.41	0.00	60.00	130.96
July	130.96	262,000.00	24.93	0.38	8.66	-8.28	-15.75	-3.17	0.00	-32.78	0.00	4.64	5.46	25.02	0.00	0.00	5.37	0.00	30.00	103.81
August	103.81	251,000.00	23.88	0.41	7.91	-7.50	-14.26	-2.88	0.00	-29.69	0.00	3.92	4.61	21.14	0.00	0.00	4.53	0.00	0.00	55.19
September	55.19	237,000.00	21.82	0.40	5.42	-5.02	-9.55	-1.92	0.00	-19.87	0.00	2.42	2.85	13.05	0.00	0.00	2.80	0.00	0.00	29.82
		Total	**253.82**	**13.50**	**45.07**	**-31.57**	**-60.04**	**-12.10**	**0.00**	**-124.96**	**0.00**	**22.43**	**26.39**	**120.95**	**0.00**	**0.00**	**25.95**	**0.00**	**90.00**	

[1] Based on highest continuous year of flows from the City's 2018 to 2020 DMR data.
[2] From the Western Regional Climate Center for the Bend 7 NE Evaporation Station.
[3] Assumes 2 miles of streams with 4-foot wide water surface on average and 3.5 acres of ponds.
[4] From the U.S. Bureau of Reclamation (Reclamation) AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station.
[5] From the Reclamation AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station, divided by 0.85 for irrigation efficiency.
[6] Final volume was maintained above or approximately equal to 30 ac-ft to ensure surface aerators could be kept in operation and to avoid the need for removing the unutilized aerators prior to the pond freezing over.

ac = acre
ac-ft = acre-feet
DMR = Discharge Monitoring Report
evap. = evaporation
ft = feet
gpd = gallons per day
in = inches
WWTP = wastewater treatment plant

Treatment Lagoons Wet Area (ac):	**4.82**
Storage Pond Wet Area (ac):	**18.00**
Total WWTP Wet Area (ac):	**22.82**
Storage Pond Capacity (ac-ft):	**213.00**

	Area (ac)	Storage Depth (ft)	Additional Storage (ac-ft)	
Wetland	47.50	1.50	71.25	
Forested Ponds	4.60	0.00	0.00	
Pivot 2	0.00			
Lagoon Dike	11.80			
Forested Irrigation	55.00			
Wheel Line Irrigation	0.00			
		Total	**71.25**	**ac-ft**
		Total Storage	**284.25**	**ac-ft**

Recycled Water Disposal Option	Disposal Capacity (ac-ft)
Wetland/Ponds	137.07
Pasture Irrigation	0.00
Wheel Line	0.00
Existing Irrigation	206.93
Total	344.00

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
ALTERNATIVE 2 - PHASING OPTION 1
WATER BALANCE

FIGURE
6-4

CITY OF SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
ALTERNATIVE 2 - PHASING OPTION 2
WATER BALANCE

Month	Holding Pond Initial Volume (ac-ft)	Influent Flow[1] (gpd)	Monthly Influent Flow (ac-ft)	Rainfall (in)	Evaporation[2] (in)	Net (in)	Net WWTP Evap. (ac-ft)	Net Forested Ponds Evaporation (ac-ft)[3]	Forested Ponds Seepage (ac-ft)	Net Wetland Evaporation (ac-ft)	Unlined Wetland Seepage (ac-ft)	Crop Irrigation Requirements (in)[4]	Crop Irrigation (in)[5]	Forest Irrigation (ac-ft)	Pivot 1 Irrigation (ac-ft)	Pivot 2 Irrigation (ac-ft)	Lagoon Dike Irrigation (ac-ft)	Future Wheel Line Irrigation (ac-ft)	Supplemental Freshwater (ac-ft)	Final Volume (ac-ft)[6]
October	30	211,000.00	20.07	0.95	1.00	-0.05	-0.10	0.00	0.00	0.00	0.00	0.44	0.52	2.37	0.00	2.03	0.51	0.00	0.00	45.07
November	45.07	204,000.00	18.78	2.10	1.00	1.10	2.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.94
December	65.94	210,000.00	19.98	2.27	1.00	1.27	2.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	88.34
January	88.34	209,000.00	19.88	2.24	1.00	1.24	2.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	110.58
February	110.58	205,000.00	17.62	1.45	1.00	0.45	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	129.05
March	129.05	212,000.00	20.17	1.12	1.00	0.12	0.23	0.00	0.00	0.00	0.00	0.88	1.04	4.75	0.00	4.05	1.02	0.00	0.00	139.63
April	139.63	216,000.00	19.89	0.79	4.25	-3.46	-6.58	0.00	0.00	0.00	0.00	2.81	3.31	15.15	0.00	12.95	3.25	0.00	0.00	121.58
May	121.58	221,000.00	21.02	0.78	6.14	-5.36	-10.19	0.00	0.00	0.00	0.00	3.51	4.13	18.93	0.00	16.17	4.06	0.00	0.00	93.26
June	93.26	280,000.00	25.78	0.61	6.69	-6.08	-11.56	0.00	0.00	0.00	0.00	3.81	4.48	20.54	0.00	17.56	4.41	0.00	0.00	64.96
July	64.96	262,000.00	24.93	0.38	8.66	-8.28	-15.75	0.00	0.00	0.00	0.00	4.64	5.46	25.02	0.00	21.38	5.37	0.00	56.50	78.88
August	78.88	251,000.00	23.88	0.41	7.91	-7.50	-14.26	0.00	0.00	0.00	0.00	3.92	4.61	21.14	0.00	18.06	4.53	0.00	0.00	44.76
September	44.76	237,000.00	21.82	0.40	5.42	-5.02	-9.55	0.00	0.00	0.00	0.00	2.42	2.85	13.05	0.00	11.15	2.80	0.00	0.00	30.03
		Total	**253.82**	**13.50**	**45.07**	**-31.57**	**-60.04**	**0.00**	**0.00**	**0.00**	**0.00**	**22.43**	**26.39**	**120.95**	**0.00**	**103.35**	**25.95**	**0.00**	**56.50**	

[1] Based on highest continuous year of flows from the City's 2018 to 2020 DMR data.
[2] From the Western Regional Climate Center for the Bend 7 NE Evaporation Station.
[3] Assumes 2 miles of streams with 4-foot wide water surface on average and 3.5 acres of ponds.
[4] From the U.S. Bureau of Reclamation (Reclamation) AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station.
[5] From the Reclamation AgriMet Crop Consumptive Use Crop Chart for the Bend, Oregon Station, divided by 0.85 for irrigation efficiency.
[6] Final volume was maintained above or approximately equal to 30 ac-ft to ensure surface aerators could be kept in operation and to avoid the need for removing the unutilized aerators prior to the pond freezing over.

ac = acre
ac-ft = acre-feet
DMR = Discharge Monitoring Report
evap. = evaporation
ft = feet
gpd = gallons per day
in = inches
WWTP = wastewater treatment plant

Treatment Lagoons Wet Area (ac): **4.82**
Storage Pond Wet Area (ac): **18.00**
Total WWTP Wet Area (ac): **22.82**
Storage Pond Capacity (ac-ft): **213.00**

	Area (ac)	Storage Depth (ft)	Additional Storage (ac-ft)	
Wetland	47.50	1.50	71.25	
Forested Ponds	4.60	0.00	0.00	
Pivot 2	47.00			
Lagoon Dike	11.80			
Forested Irrigation	55.00			
Wheel Line Irrigation	14.00			
		Total	**71.25**	**ac-ft**
		Total Storage	**284.25**	**ac-ft**

Recycled Water Disposal Option	Disposal Capacity (ac-ft)
Wetland/Ponds	0.00
Pasture Irrigation	103.35
Wheel Line	0.00
Existing Irrigation	206.93
Total	310.28

anderson perry & associates, inc.

CITY OF
SISTERS, OREGON
LAZY Z RANCH MASTER PLAN
ALTERNATIVE 2 - PHASING OPTION 2
WATER BALANCE

FIGURE
6-5

APPENDIX A
Oregon Administrative Rules 340-055

Department of Environmental Quality

Chapter 340

Division 55
RECYCLED WATER USE

340-055-0005
Purpose

These rules (OAR 340-055-0005 to 340-055-0030) prescribe requirements for the use of recycled water for beneficial purposes. The purpose of this division is to protect the environment and public health in the State of Oregon.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.015 & 468B.020
History:
DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0007
Policy

It is the policy of the Environmental Quality Commission to encourage the use of recycled water for domestic, agricultural, industrial, recreational, and other beneficial purposes in a manner which protects public health and the environment of the state. The use of recycled water for beneficial purposes will improve water quality by reducing discharge of treated effluent to surface waters, reduce the demand on drinking water sources for uses not requiring potable water, and may conserve stream flows by reducing withdrawal for out-of-stream use.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.015
History:
DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0010
Definitions

The following definitions apply to this division of rules:

(1) “Artificial Groundwater Recharge” means the intentional addition of water diverted from another source to a groundwater reservoir.

(2) "Beneficial Purpose" means a purpose where recycled water is utilized for a resource value, such as nutrient content or moisture, to increase productivity or to conserve other sources of water.

(3) “Department” means the Oregon Department of Environmental Quality.

(4) "Disinfected Wastewater" means wastewater that has been treated by a chemical, physical or biological process and meets the criteria if applicable to its classification for use as recycled water.

(5) “Filtered Wastewater” means an oxidized wastewater that meets the criteria defined in OAR 340-055-0012(7)(c).

(6) “Human Consumption” means water used for drinking, personal or oral hygiene, bathing, showering, cooking, or dishwashing.

(7) "Landscape Impoundment" means a body of water used for aesthetic purposes or other function that does not include public contact through activities such as boating, fishing, or body-contact recreation. Landscape impoundments include, but are not limited to, golf course water ponds or non-residential landscape ponds.

(8) "Nonrestricted Recreational Impoundment" means a constructed body of water for which there are no limitations on body-contact water recreation activities. Nonrestricted recreational impoundments include, but are not limited to, recreational lakes, water features accessible to the public, and public fishing ponds.

(9) "NPDES Permit" means a National Pollutant Discharge Elimination System permit as defined in OAR chapter 340, division 45.

(10) "Oxidized Wastewater" means a treated wastewater in which the organic matter is stabilized and nonputrescible, and which contains dissolved oxygen.

(11) "Person" means the United States and agencies thereof, any state, any individual, public or private corporation, political subdivision, governmental agency, municipality, copartnership, association, firm, trust estate, or any other legal entity.

(12) “Processed Food Crops” means those crops that undergo thermoprocessing sufficient to kill spores of Clostridium botulinum.

(13) “Recycled Water” means treated effluent from a wastewater treatment system which as a result of treatment is suitable for a direct beneficial purpose. Recycled water includes reclaimed water as defined in ORS 537.131.

(14) "Restricted Recreational Impoundment" means a constructed body of water that is limited to fishing, boating, and other non-body contact water recreation activities.

(15) “Sprinkler Irrigation” means the act of applying water by means of perforated pipes or nozzles operated under pressure so as to form a spray pattern.

(16) “Wastewater” or "Sewage" means the water-carried human or animal waste from residences, buildings, industrial establishments or other places, together with such groundwater infiltration and surface water as may be present. The admixture with sewage of wastes or industrial wastes shall also be considered “wastewater” within the meaning of this division.

(17) “Wastewater Treatment System” or "Sewage Treatment System" means an approved facility or equipment used to alter the quality of wastewater by physical, chemical or biological means or a combination thereof that reduces the tendency of the wastewater to degrade water quality or other environmental conditions.

(18) “Waters of the State” means lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the

State of Oregon, and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters which do not combine or effect a junction with natural surface or underground waters) that are located wholly or partially within or bordering the state or within its jurisdiction.

(19) "WPCF Permit" means a Water Pollution Control Facilities permit as defined in OAR chapter 340, division 45.

(20) “Wetlands” means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.005, 468B.030 & 468B.050
History:
DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0012
Recycled Water Quality Standards and Requirements

(1) Any person having control over the treatment or distribution or both of recycled water may distribute recycled water only for the beneficial purposes described in this rule, and must take all reasonable steps to ensure that the recycled water is used only in accordance with the standards and requirements of the rules of this division.

(2) Any person who uses recycled water may use recycled water only for the beneficial purposes described in this rule, and must comply with the standards and requirements of this rule and the rules of this division.

(3) The following requirements apply to nondisinfected recycled water.

(a) Beneficial Purposes. Nondisinfected recycled water may be used only for the following beneficial purposes and only if the rules of this division are met:

(A) Irrigation for growing fodder, fiber, seed crops not intended for human ingestion, or commercial timber; and

(B) Any beneficial purpose authorized in writing by the department pursuant to OAR 340-055-0016(6).

(b) Treatment. Nondisinfected recycled water must be an oxidized wastewater.

(c) Criteria. There are no disinfection criteria for nondisinfected recycled water.

(d) Monitoring. Monitoring must be in accordance with the wastewater treatment system owner’s NPDES or WPCF permit.

(e) Setback Distances. There must be a minimum of 150 feet from the edge of the irrigation site to a water supply source used for human consumption. Other site specific setback distances for irrigation necessary to protect public health and the environment must be established in the recycled water use plan and must be met when irrigating.

(f) Access and Exposure. Public access to the irrigation site must be prevented.

(g) Site Management.

(A) Irrigation with recycled water is prohibited for 30 days before harvesting.

(B) Sprinkler irrigation is prohibited unless authorized in advance and in writing by the department based on demonstration that public health and the environment will be adequately protected from aerosols.

(4) The following requirements apply to Class D recycled water.

(a) Beneficial Purposes. Class D recycled water may be used only for the following beneficial purposes and only if the rules of this division are met:

(A) Any beneficial purpose defined in subsection (3)(a) of this rule;

(B) Irrigation of firewood, ornamental nursery stock, Christmas trees, sod, or pasture for animals; and

(C) Any beneficial purpose authorized in writing by the department pursuant to OAR 340-055-0016(6).

(b) Treatment. Class D recycled water must be an oxidized and disinfected wastewater that meets the numeric criteria in subsection (c) of this section.

(c) Criteria. Class D recycled water must not exceed a 30-day log mean of 126 E. coli organisms per 100 milliliters and 406 E. coli organisms per 100 milliliters in any single sample.

(d) Monitoring. Monitoring for E. coli organisms must occur once per week at a minimum.

(e) Setback Distances.

(A) Where an irrigation method is used to apply recycled water directly to the soil, there must be a minimum of 10 feet from the edge of the site used for irrigation and the site property line.

(B) Where sprinkler irrigation is used, there must be a minimum of 100 feet from the edge of the site used for irrigation and the site property line.

(C) There must be a minimum of 100 feet from the edge of an irrigation site to a water supply source used for human consumption.

(D) Where sprinkler irrigation is used, recycled water must not be sprayed within 70 feet of an area where food is prepared or served, or where a drinking fountain is located.

(f) Access and Exposure.

(A) Animals used for production of milk must be restricted from direct contact with the recycled water.

(B) When using recycled water for irrigation of sod, ornamental nursery stock, or Christmas trees, the personnel at the use area must be notified that the water used is recycled water and is not safe for drinking. The recycled water use plan must specify how notification will be provided.

(g) Site Management.

(A) When irrigating, signs must be posted around the perimeter of the irrigation site stating recycled water is used and is not safe for drinking.

(B) Irrigation of fodder, fiber, seed crops not intended for human ingestion, sod, commercial timber, firewood, ornamental nursery stock, or Christmas trees is prohibited for three days before harvesting.

(5) The following requirements apply to Class C recycled water.

(a) Beneficial Purposes. Class C recycled water may be used only for the following beneficial purposes and only if the rules of this division are met:

(A) Any beneficial purpose defined in subsection (4)(a) of this rule;

(B) Irrigation of processed food crops;

(C) Irrigation of orchards or vineyards if an irrigation method is used to apply recycled water directly to the soil;

(D) Landscape irrigation of golf courses, cemeteries, highway medians, or industrial or business campuses;

(E) Industrial, commercial, or construction uses limited to: industrial cooling, rock crushing, aggregate washing, mixing concrete, dust control, nonstructural fire fighting using aircraft, street sweeping, or sanitary sewer flushing;

(F) Water supply source for landscape impoundments; and

(G) Any beneficial purpose authorized in writing by the department pursuant to OAR 340-055-0016(6).

(b) Treatment. Class C recycled water must be an oxidized and disinfected wastewater that meets the numeric criteria in subsection (c) of this section.

(c) Criteria. Class C recycled water must not exceed a median of 23 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 240 total coliform organisms per 100 milliliters in any two consecutive samples.

(d) Monitoring. Monitoring for total coliform organisms must occur once per week at a minimum.

(e) Setback Distances.

(A) Where an irrigation method is used to apply recycled water directly to the soil, there must be a minimum of 10 feet from the edge of the site used for irrigation and the site property line.

(B) Where sprinkler irrigation is used, there must be a minimum of 70 feet from the edge of the site used for irrigation and the site property line.

(C) There must be a minimum of 100 feet from the edge of an irrigation site to a water supply source used for human consumption.

(D) Where sprinkler irrigation is used, recycled water must not be sprayed within 70 feet of an area where food is being prepared or served, or where a drinking fountain is located.

(f) Access and Exposure.

(A) When irrigating for a beneficial purpose defined in subsection (4)(a) of this rule, the access and exposure requirements defined in subsection (4)(f) of this rule must be met.

(B) During irrigation of a golf course, a cemetery, a highway median, or an industrial or business campus, the public must be restricted from direct contact with the recycled water.

(C) If aerosols are generated when using recycled water for an industrial, commercial, or construction purpose, the aerosols must not create a public health hazard.

(D) When using recycled water for an agricultural or horticultural purpose where sprinkler irrigation is used, or an industrial, commercial, or construction purpose, the public and personnel at the use area must be notified that the water used is recycled water and is not safe for drinking. The recycled water use plan must specify how notification will be provided.

(g) Site Management.

(A) When irrigating for a beneficial purpose defined in subsection (4)(a) of this rule, the site management requirements defined in subsection (4)(g) of this rule must be met.

(B) When using recycled water for a landscape impoundment or for irrigating a golf course, cemetery, highway median, or industrial or business campus, signs must be posted at the use area and be visible to the public. The signs must state that recycled water is used and is not safe for drinking.

(C) Irrigation of processed food crops is prohibited for three days before harvesting.

(D) When irrigating an orchard or vineyard, the edible portion of the crop must not contact the ground, and fruit or nuts may not be harvested off the ground.

(E) When using recycled water for a landscape impoundment, aerators or decorative fixtures that may generate aerosols are allowed only if authorized in writing by the department.

(6) The following requirements apply to Class B recycled water.

(a) Beneficial Purposes. Class B recycled water may be used only for the following beneficial purposes and only if the rules of this division are met:

(A) Any beneficial purpose defined in subsection (5)(a) of this rule;

(B) Stand-alone fire suppression systems in commercial and residential buildings, non-residential toilet or urinal flushing, or floor drain trap priming;

(C) Water supply source for restricted recreational impoundments; and

(D) Any beneficial purpose authorized in writing by the department pursuant to OAR 340-055-0016(6).

(b) Treatment. Class B recycled water must be an oxidized and disinfected wastewater that meets the numeric criteria in subsection (c) of this section.

(c) Criteria. Class B recycled water must not exceed a median of 2.2 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 milliliters in any single sample.

(d) Monitoring. Monitoring for total coliform organisms must occur three times per week at a minimum.

(e) Setback Distances.

(A) Where an irrigation method is used to apply recycled water directly to the soil, there are no setback requirements.

(B) Where sprinkler irrigation is used, there must be a minimum of 10 feet from the edge of the site used for irrigation and the site property line.

(C) There must be a minimum of 50 feet from the edge of the irrigation site to a water supply source used for human consumption.

(D) Where sprinkler irrigation is used, recycled water must not be sprayed within 10 feet of an area where food is being prepared or served, or where a drinking fountain is located.

(f) Access and Exposure.

(A) During irrigation of a golf course, the public must be restricted from direct contact with the recycled water.

(B) If aerosols are generated when using recycled water for an industrial, commercial, or construction purpose, the aerosols must not create a public health hazard.

(C) When using recycled water for an agricultural or horticultural purpose where sprinkler irrigation is used, or an industrial, commercial, or construction purpose, the public and personnel at the use area must be notified that the water used is recycled water and is not safe for drinking. The recycled water use plan must specify how notification will be provided.

(g) Site Management.

(A) When irrigating for a beneficial purpose defined in subsection (4)(a) of this rule, the site management requirements defined in subsection (4)(g) of this rule must be met.

(B) When using recycled water for a landscape impoundment or for irrigating a golf course, cemetery, highway median, or industrial or business campus, signs must be posted at the use area and be visible to the public. The signs must state recycled water is used and is not safe for drinking.

(C) Irrigation of processed food crops is prohibited for three days before harvesting.

(D) When irrigating an orchard or vineyard, the edible portion of the crop must not contact the ground, and fruit or nuts may not be harvested off the ground.

(7) The following requirements apply to Class A recycled water.

(a) Beneficial Purposes. Class A recycled water may be used only for the following beneficial purposes and only if the rules of this division are met:

(A) Any beneficial purpose defined in subsection (6)(a) of this rule;

(B) Irrigation for any agricultural or horticultural use;

(C) Landscape irrigation of parks, playgrounds, school yards, residential landscapes, or other landscapes accessible to the public;

(D) Commercial car washing or fountains when the water is not intended for human consumption;

(E) Water supply source for nonrestricted recreational impoundments;

(F) Artificial groundwater recharge by surface infiltration methods or by subsurface injection in accordance with OAR chapter 340, division 44. Direct injection into an underground source of drinking water is prohibited unless allowed by OAR chapter 340, division 44; and

(G) Any beneficial purpose authorized in writing by the department pursuant to OAR 340-055-0016(6).

(b) Treatment. Class A recycled water must be an oxidized, filtered and disinfected wastewater that meets the numeric criteria in subsection (c) of this section are met.

(c) Criteria. Class A recycled water must not exceed the following criteria:

(A) Before disinfection, unless otherwise approved in writing by the department, the wastewater must be treated with a filtration process, and the turbidity must not exceed an average of 2 nephelometric turbidity units (NTU) within a 24-hour period, 5 NTU more than five percent of the time within a 24-hour period, and 10 NTU at any time, and

(B) After disinfection, Class A recycled water must not exceed a median of 2.2 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 milliliters in any single sample.

(d) Monitoring.

(A) Monitoring for total coliform organisms must occur once per day at a minimum.

(B) Monitoring for turbidity must occur on an hourly basis at a minimum.

(e) Setback Distances. Where sprinkler irrigation is used, recycled water must not be sprayed onto an area where food is being prepared or served, or onto a drinking fountain.

(f) Access and Exposure. When using recycled water for an agricultural or horticultural purpose where spray irrigation is used, or an industrial, commercial, or construction purpose, the public and personnel at the use area must be notified that the water used is recycled water and is not safe for drinking. The recycled water use plan must specify how notification will be provided.

(g) Site Management. When using recycled water for a landscape impoundment, restricted recreational impoundment, nonrestricted recreational impoundment, or for irrigating a golf course, cemetery, highway median, industrial or business campus, park, playground, school yard, residential landscape, or other landscapes accessible to the public, signs must be posted at the use area or notification must be made to the public at the use area indicating recycled water is used and is not safe for drinking. The recycled water use plan must specify how notification will be provided.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.030 & 468B.050
History:
Renumbered from 340-055-0015, DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0013
Exempted Use of Recycled Water

Recycled water used by a wastewater treatment system owner for landscape irrigation or for in plant processes at a wastewater treatment system is exempt from the rules of this division if:

(1) The recycled water is an oxidized and disinfected wastewater;

(2) The recycled water is used at the wastewater treatment system site where it is generated or at an auxiliary wastewater or sludge treatment facility that is subject to the same NPDES or WPCF permit as the wastewater treatment system. Contiguous property to the parcel of land upon which the treatment system is located is considered the wastewater treatment system site if under the same ownership;

(3) Spray or drift or both from the use does not occur off the site; and

(4) Public access to the site is restricted.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.050
History:
DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0016
General Requirements for Permitting the Use of Recycled Water

(1) NPDES or WPCF permit. A wastewater treatment system owner may not provide any recycled water for use unless authorized by a NPDES or WPCF permit issued by the department pursuant to OAR chapter 340, division 045.

(2) Recycled water use plan.

(a) Except for use of recycled water authorized by a NPDES or WPCF permit, a wastewater treatment system owner may not provide any recycled water for distribution or use or both until a recycled water use plan meeting the requirements of OAR 340-055-0025 has been approved in writing by the department. Upon approval of the plan, the permittee must comply with the conditions of the plan.

(b) Before approving or modifying any plan for the use of Class C, Class D, or nondisinfected recycled water, the department will submit the proposed plan to the Oregon Department of Human Services for comment.

(c) For use of recycled water previously authorized under a NPDES or WPCF permit but without a department approved recycled water use plan, the wastewater treatment system owner must submit a recycled water use plan to the department within one year of the effective date of these rules.

(3) Land application on land zoned exclusive farm use. A recycled water use plan will not be approved for the land application of recycled water on land zoned exclusive farm use until the requirements of ORS 215.213(1)(bb) and 215.283(1)(y) for recycled water are met.

(4) Compliance with this division. When the rules of this division require a limitation or a condition or both that conflicts with a limitation or a condition or both in an existing permit, the existing permit controls until the permit is modified or renewed by the department. When the existing permit is modified or renewed, the permittee will be given a reasonable compliance schedule to achieve new requirements if necessary.

(5) Additional permit limitations and conditions. The department may include additional permit limitations or conditions or both if it determines or has reason to believe additional requirements for the use of recycled water are necessary to protect public health or the environment or both.

(6) Authorization of other recycled water uses. The department may authorize through a NPDES or WPCF permit a use of recycled water for a beneficial purpose not specified in this division. When the department considers the authorization, it may request information and include permit limitations or conditions or both necessary to assure protection of public health and the environment. The department will confer with the Oregon Department of Human Services before authorizing other uses of Class C, Class D, or nondisinfected recycled water under this section.

(7) Setback distances. The department may consider and approve, on a case-by-case basis, a setback distance other than what is required in this division. For a reduced setback distance, it must be demonstrated to the department that public health and the environment will be adequately protected. The recycled water use plan must include any approved alternative setback distance.

(8) Public outreach and sign posting. When the rules of this division require the posting of signs at a use area, the department may, on a case-by-case basis, approve an alternative method for public outreach where it considers the method will assure an equivalent degree of public protection.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.030 & 468B.050
History:
Renumbered from 340-055-0015, DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0017
Treatment and Use of Recycled Water

(1) Alternative treatment process. The department may approve in writing an alternative wastewater treatment process not specified in the rules of this division if it is demonstrated that the treatment is equivalent to and can achieve the recycled water criteria required for a specific beneficial purpose.

(2) Additional treatment. A person using recycled water from a wastewater treatment system may provide additional treatment for a different class of recycled water that is identified in this division. The wastewater treatment system owner providing the additional treatment is subject to the rules of this division and must have a NPDES or WPCF permit issued by the department.

(3) Blending recycled water. The department may approve on a case-by-case basis blending recycled water with other water if proposed by a wastewater treatment system owner. Before blending recycled water, the owner must obtain written authorization from the department. In obtaining authorization, the wastewater treatment system owner must submit to the department, at a minimum the following:

(a) An operations plan,

(b) A description of any additional treatment process,

(c) A description of blending volumes, and

(d) A range of final recycled water quality at the compliance point identified in the NPDES or WPCF permit.

(4) Water right. The rules of this division do not create a water right under ORS chapters 536, 537, 539 or 540. A person must contact the Oregon Water Resources Department to determine water right requirements for the use of recycled water.

(5) Prohibited use for human consumption. The use of recycled water for direct human consumption, regardless of the treatment class, is prohibited unless approved in writing by the Oregon Department of Human Services, and after public hearing, and it is so authorized by the Environmental Quality Commission.

(6) Prohibited use for a public pool. The use of recycled water as a source of supply for a public pool, spa, or bathhouse is prohibited unless authorized in writing by the department and with written approval from the Oregon Department of Human Services. Public pools are subject to the requirements of ORS 448 and the Oregon Department of Human Services administrative rules.

(7) Transporting recycled water. A vehicle used to transport or distribute recycled water must not be used to transport water for human consumption, unless authorized in writing by the department. The vehicle must be clearly identified with the words “nonpotable water” written in letters at least six inches high and displayed on each side and rear of the vehicle unless otherwise authorized by the department.

(8) Impoundments. Constructed landscape, and restricted and nonrestricted recreational impoundments approved for use under the rules of this division are not considered waters of the state for water quality purposes. Impoundments used for wastewater treatment are subject to ORS 215.213 and 215.283.

(9) Wetlands.

(a) The term “waters of the state” as provided in OAR 340-055-0012(18) includes, but is not limited to, the following wetlands and discharge to any of these wetlands requires a NPDES permit issued by the Department pursuant to OAR chapter 340, division 45:

(A) Enhanced or restored wetlands;

(B) Existing natural wetlands; and

(C) Wetlands created as mitigation for loss of wetlands under the Clean Water Act, Section 404.

(b) Wetlands constructed on non-wetland sites and managed for wastewater treatment are exempt from the rules of this division and are not considered waters of the state for water quality purposes.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.030 & 468B.050
History:
Renumbered from 340-055-0015, DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0020
Groundwater Quality Protection

Recycled water will not be authorized for use unless all groundwater quality protection requirements in OAR chapter 340, division 40 are met. The requirements in OAR chapter 340, division 40 are considered to be met if the wastewater treatment system owner demonstrates recycled water will be used or land applied in a manner and at a rate that minimizes the movement of contaminants to groundwater and does not adversely impact groundwater quality. If the use of recycled water occurs within a designated groundwater management area, the department may require additional conditions to be met.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.150 - 468B.190
History:
DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0022
Monitoring and Reporting

(1) The department will include in a NPDES or WPCF permit authorizing the use of recycled water, at a minimum, the monitoring requirements in OAR 340-055-0012.

(2) When chlorine or a chlorine compound is used as a disinfecting agent, the department may specify in the NPDES or WPCF permit a minimum chlorine residual concentration. When other disinfecting agents are used, the department may require additional monitoring requirements to assure adequate disinfection.

(3) The department will include in a NPDES or WPCF permit authorizing the use of recycled water, a requirement that the wastewater treatment system owner submit an annual report to the department describing the effectiveness of the system to comply with the approved recycled water use plan, the rules of this division, and the permit limits and conditions for recycled water.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.030 & 468B.050
History:
Renumbered from 340-055-0015, DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0025
Recycled Water Use Plan

(1) A recycled water use plan must describe how the wastewater treatment system owner will comply with the rules of this division and must include, but is not limited to, the following:

(a) A description of the wastewater treatment system, including treatment efficiency capability;

(b) A detailed description of the treatment methods that will be used to achieve a specific class of recycled water and for what beneficial purpose;

(c) The estimated quantity of recycled water to be provided by the wastewater treatment system owner to the user, and at what frequency and for what beneficial purpose;

(d) A description of contingency procedures that ensure the requirements of this division are met when recycled water is provided for use;

(e) Monitoring and sampling procedures;

(f) A maintenance plan that describes how the wastewater treatment system equipment and facility processes will be maintained and serviced;

(g) If notification is required by the rules of this division, a description of how the public and personnel at the use area will be notified; and

(h) A description of any measuring and reporting requirements identified by the Oregon Water Resources Department after consultation with that agency.

(2) If Class B, C, or D, or nondisinfected recycled water is to be used for irrigation, a recycled water use plan must also include, but is not limited to, the following:

(a) A description and identification of the land application site, including the zoned land use of the irrigation site and surrounding area, a site map with setbacks, and distances of nearest developed property from all boundaries of the irrigation site;

(b) A description of the irrigation system, including storage, distribution methods, application methods and rates, and shut off procedures;

(c) A description of the soils and crops or vegetation grown at the land application site;

(d) A description of site management practices including, but not limited to, the timing of application, methods used to mitigate potential aerosol drift, and if required by this division, posting of signs or public outreach; and

(e) If public access control or notification is required by this division, descriptions of public access control and how the public and personnel will be notified.

(3) If Class A recycled water is to be used for the beneficial purpose of artificial groundwater recharge, a recycled water use plan must also include, but is not limited to, the following:

(a) A groundwater monitoring plan in accordance with OAR 340-040-0030(2);

(b) A determination if the recharge will be to a drinking water protection area;

(c) A description of the soils and characteristics;

(d) The distance from the recharge area to the nearest point of withdrawal and the retention time in the aquifer until the time of withdrawal; and

(e) Verification from Oregon Water Resources Department that a request for authorization for this use has been initiated.

(4) Conditions contained in a department approved recycled water use plan are NPDES or WPCF permit requirements.

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.030 & 468B.050
History:
DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

340-055-0030
Operational Requirements for the Treatment and Distribution of Recycled Water

(1) Bypassing. The intentional diversion of wastewater from any unit process in the wastewater treatment system for a beneficial purpose is not allowed, unless with the unit process out of service the recycled

water meets the criteria of this division for a specific class and beneficial purpose described in the recycled water use plan.

(2) Alarm devices. Alarm devices are required to provide warning of power loss and failure of process equipment essential to the proper operation of the wastewater treatment system and compliance with this division.

(3) Standby power. Unless otherwise approved in writing by the department, a wastewater treatment system providing recycled water for use must have sufficient standby power to fully operate all essential treatment processes. The department may grant an exception to this section only if the wastewater treatment system owner demonstrates that power failure will not result in inadequately treated water being provided for use and will not result in any violation of an NPDES or WPCF permit limit or condition or Oregon Administrative Rule.

(4) Redundancy. A wastewater treatment system that provides recycled water for use must have a sufficient level of redundant treatment facilities and monitoring equipment to prevent inadequately treated recycled water from being used or discharged to public waters.

(5) Distribution system requirements. Unless otherwise approved in writing by the department, all piping, valves, and other portions of the recycled water use system that is outside a building must be constructed and marked in a manner to prevent cross-connection with a potable water system. Unless otherwise approved in writing by the department or as required by the rules of this division, construction and marking must be consistent with sections (2), (3), (4), and (5) of the 1992 "Guidelines for the Distribution of Nonpotable Water" of the California-Nevada Section of the American Water Works Association.

(6) Cross-connection control. Connection between a potable water supply system and a recycled water distribution system is not authorized unless the connection is through an air gap separation approved by the department. A reduced pressure principle backflow prevention device may be used only when approved in writing by the department and the potable water system owner.

[Publications: Publications referenced are available from the agency.]

Statutory/Other Authority: ORS 468.020, 468.705 & 468.710
Statutes/Other Implemented: ORS 468B.030 & 468B.050
History:
DEQ 6-2008, f. & cert. ef. 5-5-08
DEQ 32-1990, f. & cert. ef. 8-15-90

APPENDIX B
Natural Resources Conservation Service
Custom Soil Resource Report

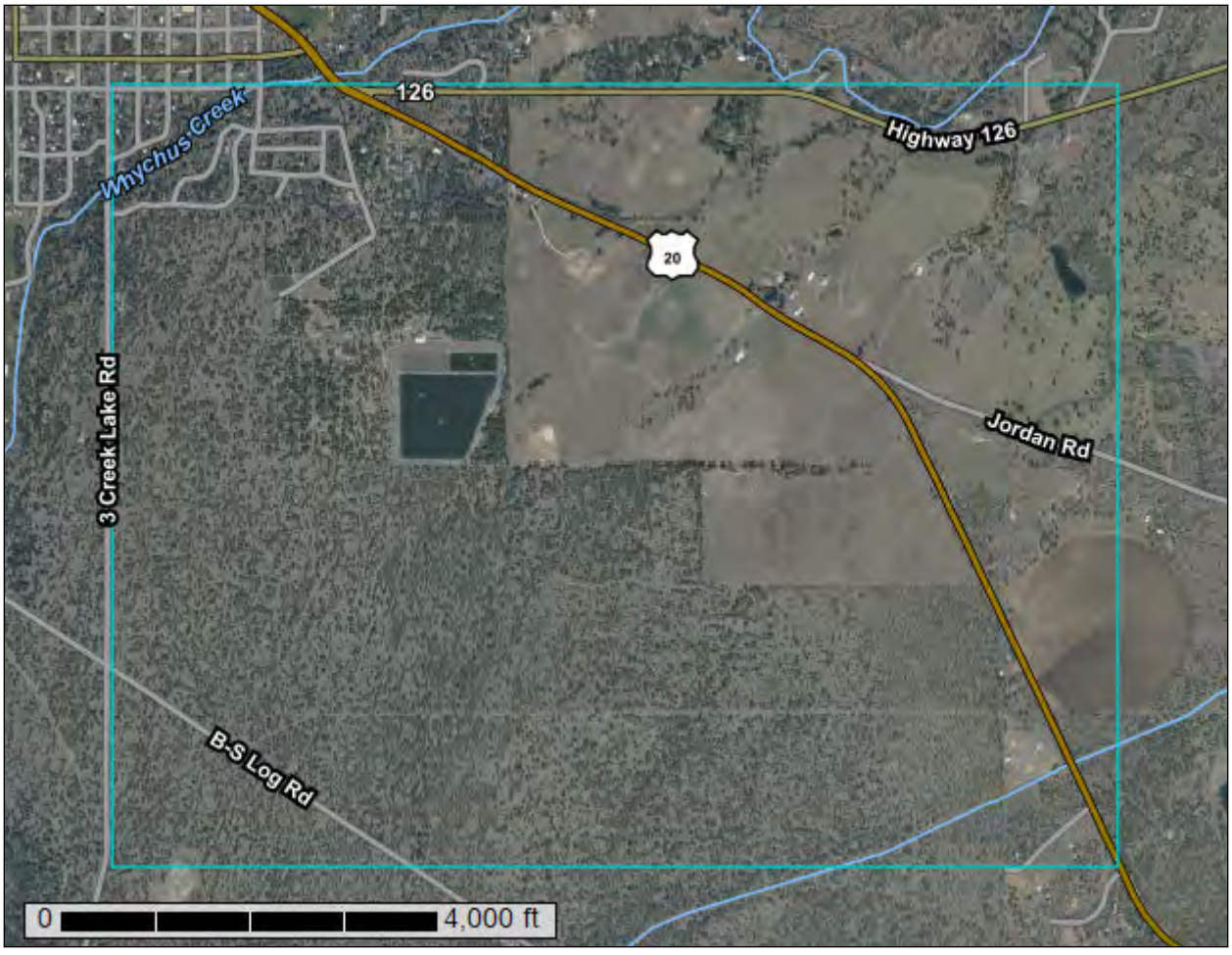
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Deschutes National Forest, Oregon; and Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties



January 15, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

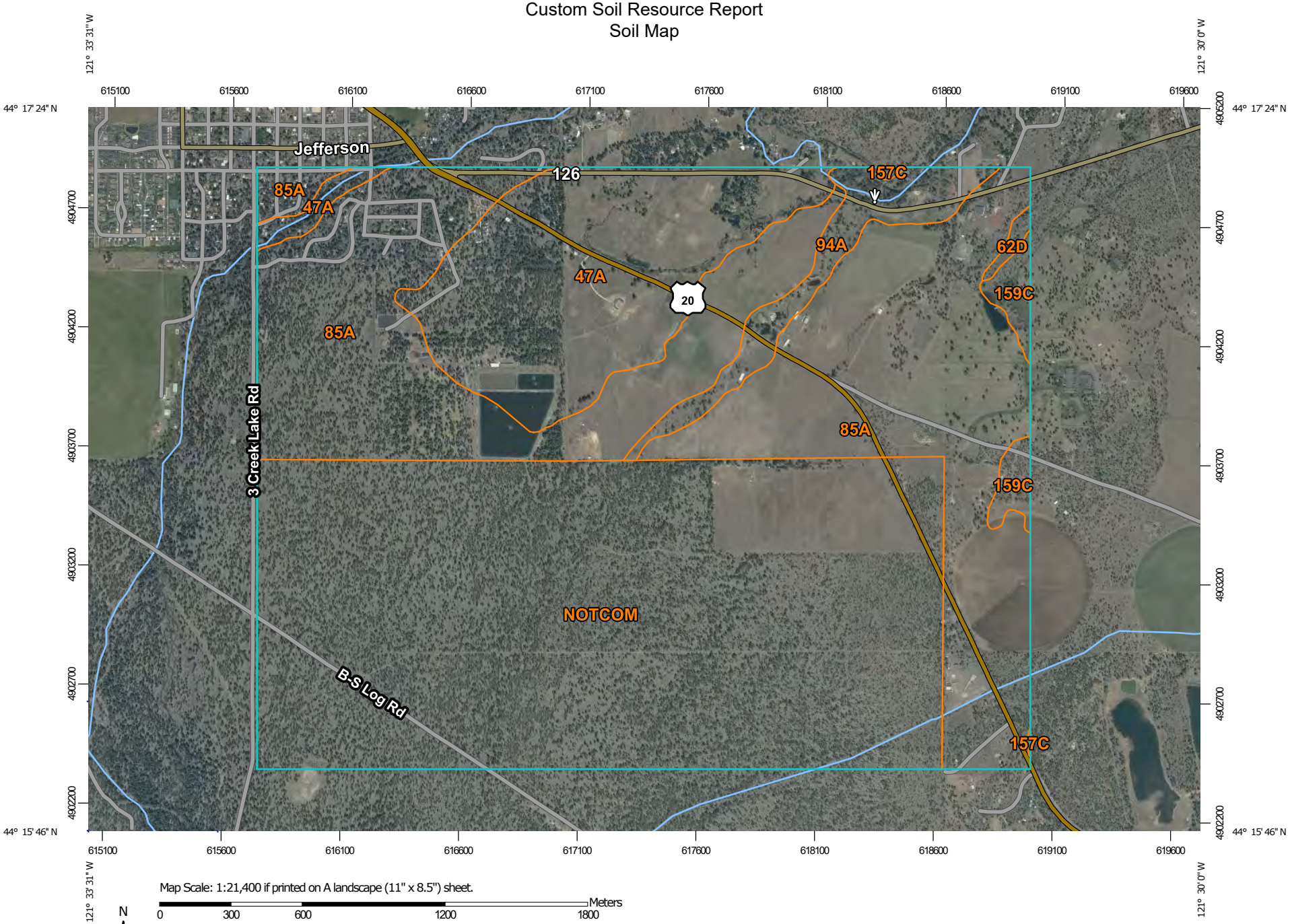
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:21,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 300 600 1200 1800

Feet
0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Deschutes National Forest, Oregon
Survey Area Data: Version 3, Sep 17, 2019

Soil Survey Area: Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties
Survey Area Data: Version 17, Sep 14, 2020

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 7, 2020—Jun 2, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
NOTCOM	No Digital Data Available	932.4	45.6%
Subtotals for Soil Survey Area		**932.4**	**45.6%**
Totals for Area of Interest		**2,042.8**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
47A	Ermabell loamy fine sand, 0 to 3 percent slopes	289.0	14.1%
62D	Henkle-Lava flows-Fryrear complex, 15 to 50 percent slopes	4.4	0.2%
85A	Lundgren sandy loam, 0 to 3 percent slopes	726.5	35.6%
94A	Omahaling fine sandy loam, 0 to 5 percent slopes	64.4	3.2%
157C	Wanoga-Fremkle-Rock outcrop complex, 0 to 15 percent slopes	1.5	0.1%
159C	Wilt sandy loam, 0 to 15 percent slopes	24.6	1.2%
Subtotals for Soil Survey Area		**1,110.4**	**54.4%**
Totals for Area of Interest		**2,042.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a

particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Deschutes National Forest, Oregon

NOTCOM—No Digital Data Available

Map Unit Composition

Notcom: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Notcom

Properties and qualities

Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties

47A—Ermabell loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 24b4
Elevation: 2,800 to 4,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 60 to 90 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Ermabell and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ermabell

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash over glacial outwash

Typical profile

H1 - 0 to 8 inches: loamy fine sand
H2 - 8 to 31 inches: loamy fine sand
H3 - 31 to 41 inches: fine sand
H4 - 41 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 40 to 60 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Available water capacity: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: A
Ecological site: F006XY708OR - Frigid Xeric Foothills 12 - 20 PZ
Hydric soil rating: No

Minor Components

Aquands, poorly drained
Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: Yes

62D—Henkle-Lava flows-Fryrear complex, 15 to 50 percent slopes

Map Unit Setting
National map unit symbol: 24f6
Elevation: 2,800 to 4,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 60 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition
Henkle and similar soils: 35 percent
Lava flows: 30 percent
Fryrear and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Henkle

Setting
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and colluvium over volcanic rock

Typical profile
Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 3 inches: very cobbly sandy loam
H2 - 3 to 18 inches: very cobbly sandy loam
H3 - 18 to 28 inches: unweathered bedrock

Properties and qualities
Slope: 15 to 50 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R006XB002OR - Frigid Xeric Lava Plains 12 - 16 PZ
Hydric soil rating: No

Description of Lava Flows

Typical profile

R - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Fryrear

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and colluvium over basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 4 inches: stony sandy loam
H2 - 4 to 19 inches: very stony sandy loam
H3 - 19 to 28 inches: very stony sandy loam
H4 - 28 to 38 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R006XB002OR - Frigid Xeric Lava Plains 12 - 16 PZ
Hydric soil rating: No

85A—Lundgren sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 24gn
Elevation: 2,800 to 4,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 60 to 90 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lundgren and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lundgren

Setting

Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash over glacial outwash

Typical profile

H1 - 0 to 14 inches: sandy loam
H2 - 14 to 23 inches: gravelly sandy loam
H3 - 23 to 38 inches: very gravelly loam
H4 - 38 to 60 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F006XY708OR - Frigid Xeric Foothills 12 - 20 PZ
Hydric soil rating: No

94A—Omahaling fine sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 24hq
Elevation: 2,800 to 4,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 60 to 90 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Omahaling and similar soils: 85 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Omahaling

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash over old alluvium

Typical profile

H1 - 0 to 19 inches: fine sandy loam
H2 - 19 to 23 inches: silt loam
H3 - 23 to 29 inches: gravelly sand
H4 - 29 to 48 inches: silt loam
H5 - 48 to 60 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Available water capacity: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R006XB100OR - WET MEADOW
Hydric soil rating: No

Minor Components

Aquolls, poorly drained
Percent of map unit: 4 percent
Landform: Flood plains
Hydric soil rating: Yes

157C—Wanoga-Fremkle-Rock outcrop complex, 0 to 15 percent slopes

Map Unit Setting
National map unit symbol: 242b
Elevation: 2,800 to 4,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 60 to 90 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Wanoga and similar soils: 35 percent
Fremkle and similar soils: 30 percent
Rock outcrop: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wanoga

Setting
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest, interfluve, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash over tuff or basalt

Typical profile
Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 13 inches: sandy loam
H2 - 13 to 25 inches: sandy loam
H3 - 25 to 35 inches: weathered bedrock
H4 - 35 to 45 inches: unweathered bedrock

Properties and qualities
Slope: 0 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock; 30 to 50 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water capacity: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: F006XY708OR - Frigid Xeric Foothills 12 - 20 PZ
Hydric soil rating: No

Description of Fremkle

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest, interfluve, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash over tuff or basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 4 inches: sandy loam
H2 - 4 to 15 inches: sandy loam
H3 - 15 to 25 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R006XB002OR - Frigid Xeric Lava Plains 12 - 16 PZ
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

159C—Wilt sandy loam, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 242d
Elevation: 2,800 to 4,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 42 to 47 degrees F
Frost-free period: 60 to 90 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wilt and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wilt

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest, interfluve, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash over residuum weathered from andesite

Typical profile

H1 - 0 to 13 inches: sandy loam
H2 - 13 to 26 inches: cobbly loam
H3 - 26 to 33 inches: very cobbly clay loam
H4 - 33 to 43 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F006XY708OR - Frigid Xeric Foothills 12 - 20 PZ
Hydric soil rating: No

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APPENDIX C
Preliminary Findings Memo

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MEMO

To:	Paul Bertagna, Public Works Director, City of Sisters
From:	Treyton Moore, E.I.
Subject:	**Lazy Z Ranch Master Plan** **Preliminary Findings Memo**
Date:	March 15, 2021
Job/File No.	446-06-02 (w/encl.)
cc:	Troy Rayburn, Project Coordinator, City of Sisters Brett Moore, P.E., Anderson Perry & Associates, Inc. (AP) Josh Robertson, P.E., AP

Introduction

The region around the City of Sisters has become a hub for art, recreation, tourism, and more. The area's popularity has brought considerable growth and many opportunities and challenges to City planning. The City's projected growth over the next 20 years will require the City to increase its ability to dispose of treated wastewater (recycled water). The purpose of this memo is to outline the different recycled water use options considered for the City's effluent disposal and the associated requirements for these beneficial reuse options pursuant to Oregon Administrative Rules (OAR) 340-055.

General Site Conditions

The City's approximately 231-acre recycled water use site is located southeast of the City at the Lazy Z Ranch. The general soils at the site are classified as sandy loams and loamy sands with high permeability rates. General depth to groundwater in the area is more than 80 inches.

Beneficial Reuse Options

The City has expressed interest in exploring several beneficial reuse options. The requirements for each option based on the quality of recycled water vary and are discussed hereafter. The quality of recycled water for use with these options is recommended based on this discussion.

- Lined wetlands
- Unlined wetlands
- Lined ponds and streams
- Pasture irrigation
- Forested irrigation

Beneficial Reuse Requirements

The City of Sisters currently produces Class D recycled water. Under OAR 340-055, five recycled water qualities, or classes, are discussed. A summary of these classes of recycled water is included on Table 1.

Table 1
Recycled Water Qualities

Class	Treatment Criteria*
Nondisinfected	No Criteria
D	126 *E. coli* organisms per 100 ml (30-day log mean) 406 *E. coli* organisms per 100 ml (any single sample)
C	23 total coliform organisms per 100 ml (seven-day median) 240 total coliform organisms per 100 ml (any consecutive two samples)
B	2.2 total coliform organisms per 100 ml (seven-day median) 23 total coliform organisms per 100 ml (single sample)
A	2.2 total coliform organisms per 100 ml (seven-day median) 23 total coliform organisms per 100 ml (single sample) Less than 2 NTU (24-hour average) Less than 5 NTU (up to 72 minutes over a 24-hour period) Less than 10 NTU (at any time)

*All classes of recycled water must be oxidized in addition to these criteria.
ml = milliliters
NTU = nephelometric turbidity unit

As shown on Table 1, disinfection requirements for the different classes of recycled water vary substantially. As such, permissible uses for each class of recycled water vary, as lower disinfection qualities result in more restrictions for use of that recycled water. Additionally, the requirements for restricting access to the recycled water use sites vary by class and by beneficial use. The following is additional information about each considered beneficial reuse option and the associated requirements.

Lined Wetlands/Lined Ponds and Streams

Both lined wetlands and lined ponds and streams are similar recycled water uses. Aside from the aesthetic contribution provided by the lined wetlands and lined ponds and streams, these beneficial purposes would allow recycled water disposal via evaporation and plant matter transpiration. Both the lined wetlands and the lined ponds and streams would likely be subject to the same requirements. These requirements are outlined below and organized by class of recycled water.

Nondisinfected Recycled Water

Lined wetlands/lined ponds and streams are not identified as beneficial purposes for nondisinfected recycled water under OAR 340-055. For this reason, this beneficial purpose would require

authorization in writing from the Oregon Department of Environmental Quality (DEQ). Additionally, public access to the site would have to be prevented, and a 150-foot buffer between the wetlands, ponds, and streams sites and any water supply sources used for human consumption would have to be maintained. For example, if any potable wells are located at or in the vicinity of the Lazy Z Ranch, the lined wetlands, ponds, and streams cannot be located within 150 feet of these wells. AP is unaware of any applications where nondisinfected recycled water is used for lined wetlands or lined ponds and streams. AP does not recommend attempting to use nondisinfected recycled water for this beneficial purpose.

Class D Recycled Water

Lined wetlands/lined ponds and streams are not identified as beneficial purpose for Class D recycled water under OAR 340-055. For this reason, this beneficial purpose would require authorization in writing from the DEQ. Although this purpose is not explicitly authorized by the DEQ, it has been allowed in some applications, such as for the City of Prineville's wastewater treatment facility (WWTF).

The City of Prineville currently produces Class D recycled water using aerated lagoons and a chlorine disinfection system, then uses lined wetlands followed by unlined wetlands to treat and dispose of the Class D recycled water. The purpose of the lined wetlands is to provide additional treatment/polishing of the recycled water. This process further reduces potential pathogens, improving the quality of the recycled water. The unlined wetlands provide additional treatment and disposal of the recycled water. At Prineville's WWTF, recycled water percolates through the unlined wetlands and flows through the soil to Crooked River.

Public access is allowed at the City of Prineville wetland site. Through coordination with the DEQ, it was determined that a simple cable delineator could be used around the lined treatment wetlands, while no barrier is provided between walking paths and the unlined disposal wetlands. For both types of wetlands, the City of Prineville maintains a minimum 10-foot setback distance between the wetlands and any public walking paths, along with signage to alert the public of the use of recycled water in the wetland system.

Based on the similarities between Prineville's WWTF and Sisters' WWTF, this beneficial purpose appears to be a viable option for disposing of Class D recycled water.

Class C Recycled Water

Class C recycled water is allowed for use as a water supply source for landscape impoundments such as wetlands or ponds under OAR 340-055. When used for this method, signs must be posted at the use area that are visible to the public and state that recycled water is used and is not safe for drinking. Additionally, a minimum 10-foot setback distance must be maintained between the impoundment and the property boundary. Furthermore, a 100-foot setback distance must be maintained between the impoundment and a water supply source used for human consumption.

Classes B and A Recycled Water

Both Classes B and A may be used as a water supply source for landscape impoundments such as wetlands or ponds under OAR 340-055. When used for this purpose, the same requirements regarding signage as those required for Class C recycled water apply. Additionally, no setback distances are required between the impoundment and the property boundary. Class B recycled water use requires a 50-foot setback distance between the impoundment and any water supply source used for human consumption.

Unlined Wetlands

Unlined wetlands must meet the same requirements as those outlined above for lined wetlands plus additional groundwater quality requirements. Unlined wetlands allow recycled water to percolate through the soil and into the groundwater, so these systems must also follow OAR 340-040, which outlines the groundwater quality requirements. The summarized requirements, as presented in OAR 340-040-0030, are included on the tables found in Attachment A. Based on past experience AP has with systems such as the City of Prineville's, use of an unlined wetland or other water feature would likely require implementation of monitoring wells. These wells monitor the groundwater for water surface elevation, pH, nitrate nitrogen, total nitrite/nitrate nitrogen, and conductivity. Reporting on groundwater monitoring is done on a quarterly basis.

As stated previously, the soils at the Lazy Z Ranch are anticipated to have relatively high permeabilities. For this reason, the acreage of unlined wetlands would have to be limited; unlined wetlands would likely tend to dry out if they were too large due to these anticipated high soil permeabilities.

Pasture Irrigation/Forested Irrigation

Both the pasture irrigation and forested irrigation options are similar and generally governed by the same restrictions. Additionally, OAR 340-055 states that nondisinfected wastewater may be used to irrigate fodder, fiber, and seed crops not intended for human ingestion, or for commercial timber. All other classes of recycled water (A through D) are held to higher treatment standards. Therefore, each class of recycled water may be used to irrigate pasture or forest, as long as the proper setback distances and guidelines related to the respective class of recycled water are met. These requirements are outlined on Table 2 below for sprinkler irrigation.

Table 2
Guidelines for Irrigating Recycled Water by Class

Class	Distance to Water Supply for Human Consumption	Distance to Food Preparation or Drinking Fountain	Public Access Requirements	Additional Restrictions	Property Line Setback Distance
Nondisinfected	150 feet	As required to protect public health and environment	Prevent all public access	Cease irrigation 30 days before harvest	As required to protect public health and environment

Class	Distance to Water Supply for Human Consumption	Distance to Food Preparation or Drinking Fountain	Public Access Requirements	Additional Restrictions	Property Line Setback Distance
D	100 feet	70 feet	Signage warning of recycled water use	Cease irrigation three days before harvest	100 feet
C	70 feet	70 feet	Signage warning of recycled water use	Cease irrigation three days before harvest	70 feet
B	50 feet	10 feet	Signage warning of recycled water use	Notify personnel of recycled water use	50 feet
A	No direct contact	No direct contact	Signage warning of recycled water use	Notify personnel of recycled water use	No direct contact

Recommendations

The City of Sisters currently produces Class D recycled water at its WWTF using aerated treatment lagoons and liquid chlorine disinfection. The City then disposes of its Class D recycled water via forested and pasture irrigation at multiple sites that include the following:

- Forested irrigation around the wastewater treatment lagoons
- Pasture irrigation at Lazy Z Ranch

As previously discussed, the restrictions for each recycled water beneficial purpose can vary substantially based on the class of the recycled water in question. The requirements for beneficial purpose generally become less strict as the quality of the recycled water increases; however, the difference in operational requirements necessary to advance from one class to the next often increases considerably. For these reasons, AP recommends that the City of Sisters continue to produce Class D recycled water for the proposed beneficial uses, as this would minimize impact to the operation of the City's existing WWTF.

To permit the use of Class D recycled water, any recycled water used in lined ponds/streams would first go through lined wetlands. The first section of wetlands would be used for additional treatment of the recycled water effluent to further reduce the number of pathogens in the water. A six-day detention time with a 12-inch wetland water depth is recommended. These treatment wetlands would have a simple barrier in addition to the signage and setback distances to discourage contact. The anticipated requirements for each beneficial reuse option are summarized on Table 3.

Table 3
Anticipated Regulatory Requirements for Recommended Beneficial Uses

Beneficial Use	Anticipated Requirements for Class D Recycled Water
Lined Wetland	Maintain a minimum 10-foot setback distance between wetlands and walking paths. Visibly post signage alerting the public of the use of recycled water in the wetlands. Provide simple fencing or a natural barrier around the treatment wetlands to discourage dog contact.
Lined Ponds/Streams	Maintain a minimum 10-foot setback distance between water surfaces and walking paths. Visibly post signage alerting the public of the use of recycled water in ponds/streams.
Unlined Wetland	Maintain a minimum 10-foot setback distance between wetlands and walking paths. Visibly post signage alerting the public to the use of recycled water in wetlands. Provide monitor wells and monitor regularly for nitrates and nitrites, along with any other DEQ-required water quality parameters, which are likely to include pH, conductivity, and groundwater elevation.
Pasture/Forested Irrigation	Maintain a 100-foot setback distance to any water supply for human consumption and property boundary. Maintain a 70-foot setback distance to any drinking fountain or food preparation area. Visibly post signage alerting the public to the use of recycled water for irrigation. Cease irrigation at least three days prior to harvest of any crops.

It is important to note that the anticipated requirements for the wetland and ponds options, both lined and unlined, are based on experience with similar applications in the City of Prineville and would be subject to DEQ review and approval. If the DEQ does not approve these uses for Class D recycled water, or if any additional requirements established by the DEQ have the potential to negatively impact the City's vision for the Lazy Z Ranch, then the City can modify its disinfection operations to produce Class C wastewater to use wetlands and ponds/streams for disposal of the City's recycled water.

TM/sg

ATTACHMENT A
Oregon Department of Environmental Quality
Groundwater Quality Tables

State of Oregon Department of Environmental Quality

OAR 340-040-0020 Numerical Groundwater Quality Reference Levels

11/14/97

Table 1 – Inorganic Contaminants Numerical Groundwater Quality Reference Level[1]	
Contaminants	**Reference Level (mg/L)**
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Fluoride	4.0
Lead	0.05
Mercury	0.002
Nitrate-N	10.0
Selenium	0.01
Silver	0.05

[1]All reference levels are for total (unfiltered) concentrations unless otherwise specified by the Department.

Table 2 – Organic Contaminants Numerical Groundwater Quality Reference Level[1]	
Contaminants	**Reference Level (mg/L)**
Benzene	0.005
Carbon Tetrachloride	0.005
p-Dichlorobenzene	0.075
1,2-Dichloroethane	0.005
1,1-Dichloroethylene	0.007
1,1,1-Trichloroethane	0.200
Trichloroethylene	0.005
Total Trihalomethanes (the sum of concentrations bromodichloromethane, dibromochloromethane, tribromomethane (bromoform), and trichloromethane (chloroform))	0.100
Vinyl Chloride	0.002
2,4-D	0.100
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.100
Toxaphene	0.005
2,4,5-TP Silvex	0.010

[1]All reference levels are for total (unfiltered) concentrations unless otherwise specified by the Department.

Table 3 – Miscellaneous Contaminants Numerical Groundwater Quality Guidance Levels[1]	
Contaminants	**Guidance Level (mg/L)[2]**
Chloride	250
Color	15 Color Units
Copper	1.0
Foaming agents	0.5
Iron	0.3
Manganese	0.05
Odor	3 Threshold odor number
pH	6.5 – 8.5
Sulfate	250
Total dissolved solids	500
Zinc	5.0

[1] All guidance levels except total dissolved solids are for total (unfiltered) concentrations unless the Department specifies otherwise.
[2] Unless otherwise specified, except pH.

APPENDIX D
Sisters Country Vision Action Plan

VISION ACTION PLAN

FINAL

Sisters Country Vision
City of Sisters, Oregon
June 2019

(Last Updated: 06.20.19)

Prepared by
Steven Ames & Ruth Williamson
NXT Consulting Group • Bend|Portland, Oregon

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INTRODUCTION & OVERVIEW

The **Vision Action Plan** presented in this report is the final outcome of the **Sisters Country Horizons** community visioning project of the **City of Sisters**, Oregon conducted in 2018. (Note: As of June 2019, the project has been rebranded as the **Sisters Country Vision** with a new logo and tagline: "Our Community • Our Future".)

The City sponsored this effort to engage the community in a comprehensive conversation about the future of Sisters Country, to renew and update the community's existing vision for the future, and to develop a community-based action plan to engage the City and its key partners in achieving that vision over time, focusing on the next five years.

Deschutes County and **Central Oregon Intergovernmental Council**, along with PSU's **Oregon's Kitchen Table** project and **Citizens4Community**, partnered with the City in this effort.

As its name implies, the Horizons project focused on the **Sisters Country** area of Deschutes County – loosely defined as the Sisters School District 006 and Camp Sherman, including the city of Sisters proper, along with outlying residential developments and unincorporated areas, ranches and farms. The project actively reached out to residents throughout Sisters Country to engage them in the conversation.

To accomplish this goal, the project incorporated an exhaustive outreach and engagement effort. Key activities included: **stakeholder interviews** with 81 community leaders; 13 local **community meetings** conducted across the area; additional **"kitchen table" meetings** run by residents themselves; two major **online surveys** along with additional web-based opportunities for public comment; four **community forums** focused on the vision's four respective focus areas; and a culminating **Vision Summit**.

Special outreach was also conducted for local service clubs, senior citizens, high school students, veterans, the Latino community, Millennials, and others.

All of these activities were promoted by a **project website** and **social media**, along with **press releases** for local and regional media. As a result, a number of articles were published by *The Nugget*, *Bend Bulletin* and *Bend Magazine*. The project also developed a bespoke brand identity, logo and tagline, designed to be useful beyond the visioning process itself.

By the end of the process, nearly 2,000 participants had been engaged in the conversation, accounting for tens of thousands of individual comments and suggestions. This input eventually culminated in an overarching long-range vision statement presented at the Summit in September and 20 top priority **Strategies** recommended by the public for implementation over time.

Following these activities, a 31-member **Vision Action Team (VAT)** was formed and charged with reviewing and refining the strategies, and developing a vision action plan to promote their implementation.

The VAT met six times in the fall of 2018 to develop this plan, totaling nearly 500 hours of citizen time. Five strategies were fully developed for each of four focus areas: **Prosperous Sisters**,

Livable Sisters, **Resilient Sisters** and **Connected Sisters**, along with detailed action steps, suggested lead partners for their implementation, timelines and milestones. The City of Sisters, the major plan partner, commenced an effort to secure the commitments of other partners.

The final **Vision Action Plan** is intended to be a "living plan" and a guide to future action by the Lead Partners who sign on to help implement it. At the same time, it is not a legally binding document, but rather a catalogue of ideas and possibilities with the ambition of making it happen to the best of the City and its partners' abilities. Sisters City Council, as well as the boards of other Lead Partner organizations, is anticipated to adopt the plan.

Some actions in the plan may take up to five years (or beyond) to fully implement, and not every action called out in the plan may be achieved. It is also expected that the final list of Lead Partners may change or evolve over time, as may the actions themselves that they commit to undertake.

That said, based on the thousands of comments received from residents across Sisters Country, it is clearly the community's expressed desire that most of what is called out in the Vision Action Plan will, in fact, be achieved. And the results will mean a more prosperous, livable, resilient and connected Sisters Country – better prepared for whatever the future may bring.

NXT Consulting Group, consultant to the Sisters Country Horizons project, would like to thank the many **elected officials, citizens, community members and volunteers** who helped make this visioning process an exceptional community effort.

This long list includes: the Mayor of Sisters, President of Sisters City Council, and Sisters City Councilors; City of Sisters City Manager, City staff and the Community Development Department; Project Partners Deschutes County, Central Oregon Intergovernmental Council, Oregon's Kitchen Table and Citizens4Community; the Horizons Project Management Team; the Horizons Vision Action Team (VAT); numerous planners at Deschutes County who assisted with community meetings and VAT planning sessions; community leaders who volunteered to be interviewed by the Horizons project; volunteers who were trained and helped facilitate community meetings and/or kitchen table sessions; volunteers who assisted with special outreach to youth, seniors, veterans and the Latino community; and the many contributors who created the Sisters Horizons Community Quilt, itself a catalogue of ideas and possibilities.

During the course of this project, it has been said many times that if there is one person smarter than any of us, it's all of us. The residents of Sisters Country have demonstrated many times over that they possess the intelligence, vision and courage to ensure a bright future for their community and all its residents – and a legacy for generations to come.

SISTERS COUNTRY – PROFILE OF A CHANGING COMMUNITY

Situated at the eastern base of Cascade Range, "Sisters Country" is the widely used name for a much loved, stunningly beautiful part of Deschutes County, Oregon. The majestic Three Sisters peaks – just miles from the city of Sisters and visible from almost every part of the region – lend the region its name and help define its lifestyles, identity and brand.

As the heart of Sisters Country, the city of Sisters lies where the Santiam and McKenzie highways converge at the west end of town to form Cascade Avenue and separate again on their way to Bend and Redmond to the east. Most Sisters Country residents frequent the city as part of their daily lives, for school and work, business and shopping, and government, professional and medical services – traveling to Bend or Redmond for those needs that cannot be met locally.

Population Growth and Change

During the latter half of the 20th century, the city of Sisters' population grew (and declined) in direct relation to its economic fortunes. In 1950 the population was 723 and 50 years later in the year 2000 it was still only 959. However, with the 21st century came a sustained period of growth as more people discovered Sisters. Despite the disruption of the Great Recession in 2008-09, the city's population in 2016 was estimated to be 2,537 – and growing.

The population of the city of Sisters is largely white (estimated at 94% in 2016), although there is a small but growing Latino population. The population is slightly older and more affluent than the state as a whole, while the median value of the city's housing is higher than that of the state.

Demographic information for the larger Sisters Country area is not easy to quantify, as most available data is not collected or aggregated by its informal boundaries. The best approximation can be found in examining combined data for Black Butte and Sisters school districts (which includes the city of Sisters). In 2016, the combined Census-estimated population of this area was 7,796, or a little more than three times that of the city of Sisters proper. This would indicate that two-thirds of the Sisters Country population lives outside the city – or roughly twice as many people as live within it.

The statistical differences with the rest of the state appear to be more pronounced for the part of Sisters Country that lies outside the city. Anecdotally, this area is considered older and more affluent. Population in the wider region has also grown during the last two decades.

History and a Changing Economy

Sisters Country has a rich and colorful history, shaped by its geographic location and spectacular geology, pre-history and native peoples, early pioneers and settlers, development of the town of Sisters (first incorporated in 1946), and the area's legacy economy, including logging, lumber and wood products, ranching and farming.

In latter decades of the 20th century, the economic profile of the area began to shift significantly, with the decline of logging and closure of the town's sawmills – and rise of destination resorts, tourism, arts and cultural amenities, and outdoor recreation. Catalyzed by the development of Black Butte Ranch resort, the downtown Sisters' 1880's building façades and Western-themed visitor

attractions grew from the 1970s onward, launching a new chapter in the community's economic development.

Today, the "Sisters County" brand is promoted by the Sisters Area Chamber of Commerce and bolstered by iconic Western events, including the Sisters Rodeo, Sisters Outdoor Quilt Show and Sisters Folk Festival. These, in turn, have fostered the spin-off of newer arts and craft, performance and visitor-related events and attractions.

While government (including the U.S. Forest Service), administration, education, accommodations and food, and professional/technical services are relatively large sectors of the Sisters compared to the state as a whole, the number of innovative new companies, telecommuting workers (i.e., "lone eagles"), and independent entrepreneurs has begun to grow, drawn by its location, amenities, and quality of life. An influx of retirees also has also brought a steady stream of former professionals, not to mention retirement incomes and accumulated wealth.

Middle- and lower-income families in Sisters Country have not fared so well in Sisters Country of late, as living wage jobs are not easy to find and rising housing costs have made it more difficult for Millennials, young families and minority residents to sink roots. There is also a small but significant population of homeless families living in the area, some of whom have encamped in nearby forests.

The lack of affordable housing and family wage jobs has also challenged local schools, which have faced declining enrollments in recent years. Sisters' schools are considered the heart of the community by many, with a history of strong financial support, community-based initiatives, and academic excellence. The School District offers innovative programming reflecting the area's evolving economy, including the Americana, arts and luthier programs, and the Interdisciplinary Environmental Expedition.

As to its future economy, Sisters Country recognizes that tourism and the arts and recreational economies will continue to be a major source of its future prosperity. Rural Sisters Country, which continues to support ranching and agricultural operations, also hosts other visitor amenities and attractions.

At the same time, clean, light industry and smaller specialty companies compatible with the local culture are seen as critical to a more sustainable and equitable economy that can support working families. Currently, existing and potential relocating traded-sector employers (i.e., companies that produce goods and services sold outside the region) estimate 450 new year-round non-seasonal jobs, which will significantly impact the local and regional economy. Not only would this represent a significant number of new jobs, but also a shift in the economic base toward greater diversification.

Economic Development for Central Oregon's (EDCO) Sisters staff is working with the City, other government agencies, Sisters Area Chamber of Commerce, local businesses, investors and developers, and the community-at-large to strategically assist in diversifying the future economy of Sisters.

Planning for Future Growth and Development

The City of Sisters, Deschutes County and Central Oregon Intergovernmental Council (COIC) are actively involved in planning for the future growth and development of Sisters and Sisters Country. The City of Sisters has purview over plans, policies and ordinances affecting the city proper, while

Deschutes County provides traditional county services for the entire area, administers building codes for the City of Sisters, and oversees planning and policy for all unincorporated areas outside the City. COIC offers a range of regional planning and governmental services that includes Sisters Country, focusing on community economic development, education and training, transportation and more.

The City of Sisters has active public works, planning and community development departments, and a full slate of plans and policies guiding the town's growth and development. These include the Sisters Comprehensive Plan (last updated in 2014), Transportation System Plan Refinement (June 2018), Natural Hazards Mitigation Plan (prepared in collaboration with Deschutes County) (2015), Greater Sisters Country Community Wildfire Protection Plan (2014), Sisters Housing Plan (2010), and Downtown Urban Renewal Plan (2003).

Among the City's active planning projects in 2018 were the Community Planning Assistance for Wildfire project (CPAW), Whychus Creek Riparian Restoration and Fish Passage Project, and the Sisters Country Horizons visioning project. A complete update of the City's Comprehensive Plan is expected to be undertaken in the next couple years.

Sisters Country Horizons Visioning Project

The Sisters Country Horizons project is intended to provide a larger context for more detailed plans and initiatives of the City, County and COIC, and to do so in a way that engages the diverse perspectives and input of the wider public across the region.

The Sisters City Council has expressed a desire for the project to develop a better understanding and what local residents, both inside and outside city limits, aspire to for the future of their community – and what types of projects they are willing to support. The visioning project also has been seen by some as part of a response to a recent difficult period in community relations – and the expressed desire for more inclusive, civil conversations about the area's future.

Not surprisingly, the Horizons project is not the first time Sisters Country has set its sights on the future. The most recent vision plan for Sisters Country was undertaken more than a decade ago. Sponsored by the Community Action Team of Sisters, COIC and Rural Development Initiatives, Inc., this effort resulted in the *Community Vision and Strategic Plan* (2007). The plan included seven focus areas, a long list of action projects, and identified project "champions." Many of the recommended projects were achieved over time, although the Great Recession put a damper on local initiatives and the plan was never formally updated.

The Horizons project is built in part on the foundation of the 2007 plan. At the same time, it has involved local governments as project sponsors, reframed the vision's focus areas into a shorter list, and addressed a number of trends that have accelerated since 2007 (see below). It has also been designed to encourage ongoing involvement of the City of Sisters, its partner agencies and the wider community to help ensure the implementation of its vision action plan over time. (See "Implementing the Vision Action Plan," page 24.)

Emerging State and Local Trends & Strategic Issues

While the Sisters Country Horizons project was launched during a relatively stable and prosperous time in the state and local economies, the future could be seen as more challenging. Below are

some of the trends projected to have major impacts Oregon's local communities going forward, including observations on how they may affect Deschutes County and Sisters Country. This information was gathered from a variety of government, educational and independent research organizations, and online data sources.

- Oregon's population is growing. Oregon's statewide population is forecast to increase by nearly a million people, from 3.97 million in 2014 to 4.8 million in 2030, with most population growth occurring in urban centers. This is due in part to increased levels of in-migration from others states; over the last decade, Oregon has had one of the highest levels of in-migration from other states in the entire nation. **Deschutes County** is one of the fastest growing counties in Oregon; current forecasts show County population increasing from nearly 188,000 in 2018 to 244,000 in 2040. Similarly, the **City of Sisters** population is forecast to nearly double from 2,691 in 2018 to 5,169 in 2043. Forecasts for future growth in *rural* parts of Deschutes County while significant are somewhat lower than its urbanized areas.

- Oregon's population is aging. Oregon's percentage of citizens over 65 is growing faster than the nation as a whole (an 18% increase from 2010 to 2014 compared to 14% for the nation as a whole). This increase is happening across the state and in every county, and is due to the aging Baby Boomers as well as an influx of retirees from other places. **Sisters Country** has become a significant destination for more affluent retirees.

- Oregon's population continues to diversify. Oregon will continue to become more racially and culturally diverse, especially with a burgeoning Hispanic population dominating younger cohorts. Oregon's Hispanic population grew five times faster than the rest of the population between 2000 and 2014, increasing by 65%. **Sisters Country** has attracted a small but growing number of Latinos; Hispanics accounted for an estimated 4% of the area's population in 2016.

- Oregon's economy is restructuring and diversifying. Oregon's economy has largely recovered from the Great Recession, and continues its long-term trend away from resource-based and extractive industries to a more diversified economy. Rural areas of Oregon continue to lag behind its larger cities economically, but the State of Oregon is working to link natural resources with innovation to create new jobs in rural areas. With its quality of life, natural amenities, and arts and tourism industries, the **city of Sisters** could be considered a prime example of the economic potential of Oregon's smaller communities.

- Oregonians continue to earn less than the nation with a few exceptions. In 2014 median household income in Oregon was slightly above $51,000, or more than $2,500 less than the nation as a whole. At the same time, Oregon currently has one of the higher minimum wages in the nation. Oregon's highest household incomes are in the Portland metro area and Deschutes County, and yet there are significant numbers of households in the county that struggle with the area's high living costs, especially housing. This problem is very evident in **Sisters Country** and a focus of local government and community-based organizations.

- Oregon's cities have relatively stronger controls over new development. As Oregon grows, the State's comprehensive land-use planning system will provide Oregon cities a relatively greater degree of control over new development than other states – and potentially higher levels of community livability. The **city of Sisters** continues to grow, but faces long-term constraints on land for both housing and industrial development due to adjacent public lands and exclusive farm use lands. Vacant and buildable land within City limits is highly constrained. The City projects a need for 922 new housing units by 2038 – but not enough land to accommodate 20 years of residential growth. The largest and most significant parcel of potentially developable land in the city is the 81-acre Forest Service property.

- Homelessness is becoming a bigger issue in Oregon. For the foreseeable future the number of people affected by homelessness in Oregon is projected to grow, placing increased stresses on schools and local social services, housing, drug treatment and mental health providers, and the criminal justice system. With known encampments in its vast expanse of adjacent public lands, the homeless situation in **Sisters Country** is not as visible as other Deschutes County communities, but significant nonetheless. The community and schools have responded to this challenge with a number of programs and initiatives.

- Oregonians are stepping up preparations for climate change and natural disasters. Oregon faces the threats of climate change in the form of increasing average temperatures, ongoing serious droughts, and the threat of large-scale wildfires, as well as the predicted Cascadia Subduction Zone earthquake. At the same time, "climate refugees" are also expected to increase in their numbers in Oregon, including migrants from more severely climate-impacted areas of California, the Southwest and beyond.

  Sisters Country faces the possibility of larger, catastrophic wildfires and affiliated impacts in the future. Research shows that the largest fires in Deschutes Country over the last century have occurred since the year 2000, and that most of them have occurred in the vicinity of Sisters Country. The Milli Fire of 2017 burned 24,000 acres in the Deschutes National Forest and Three Sisters Wilderness, came within several miles of the City of Sisters, and caused the cancellation of key summer activities and the Sisters Folk Festival. In 2018, the City of Sisters was a participant in the Community Planning Assistance for Wildfire project.

  There is a predicted 37% chance of a Cascadia earthquake occurring between now and 2065. Impacts will be severe on the Oregon coast and serious in the western valleys, while more moderate in Central Oregon. However, after the quake **Central Oregon** will become the center for Federal emergency response (FEMA), possibly the temporary seat of state government, and the state's transportation and distribution hub for two years or more. Large population migrations to Central Oregon from Western valleys in the short term are anticipated with major impacts on housing, traffic, cost of living and day-to-day life.

  State and local governments are increasingly focused on building greater resiliency in local communities in Oregon. The State of Oregon has a State Resiliency Plan and localities are working to increase public awareness and readiness. In addition to wildfires and earthquakes, Central Oregon and Sisters Country face a number of other potential natural hazards. **Deschutes County** and the **City of Sisters** are working aggressively to anticipate and prepare for a range of potential natural disasters, including fire and volcanic events.

- Use of public lands, parks and recreational amenities continues to increase in Oregon. With its exceptional natural attractions and large amount of public lands, Oregon will continue to focus on both economic utilization and public enjoyment of its natural amenities. More and more people will be using national, state, regional and local parks and recreational facilities, bringing more potential visitors, tourists and new residents to **Sisters Country**. While offering potential large economic benefits to the region, these activities may have associated impacts such as traffic congestion, demand for vacation rentals, and potential overuse of local parks and other recreational facilities.

Community Perceptions on Change

Beyond the data and forecasts, local community residents often have very accurate insights into the impact of change on their communities, informed by their daily experiences and personal observations. Such insights were on full display during the Horizons visioning process. (See "Sisters Country Horizons – A Comprehensive Community Conversation," page 12.) In the first of two online community surveys, hundreds of respondents voiced their opinions on the biggest challenges facing the future of the region.

Among the top challenges cited by respondents:

- **Planning for and managing future growth**
- **Meeting the need for more affordable housing**
- **Ensuring sufficient living wage jobs**
- **Addressing traffic congestion**
- **Undertaking key transportation improvements**

Also mentioned were a number of distinctly more social challenges, including:

- **Maintaining the small-town character of Sisters Country**
- **Building greater community trust**
- **Meeting the needs of the region's young adults and families**

Finally, respondents cited **adapting and responding to change itself** as among the greatest of challenges facing the future of Sisters Country. These challenges directly informed the Sisters Country Horizons visioning process and its resulting Vision and Action Plan. (See "Sisters Country Horizons Strategies & Actions," page 18.)

SISTERS COUNTRY HORIZONS – A COMPREHENSIVE COMMUNITY CONVERSATION

From the beginning, the **Sisters Country Horizons** visioning project was intended to be a conversation as broad and comprehensive as the landscape of the Central Oregon Cascades.

The project's overarching goal was a 'whole of community' vision, reflecting the breadth, depth and diversity of the Sisters Country region. For this reason, the visioning process was inclusive of many voices as possible – rural and urban, young and old, newcomers and old-timers – reflecting their shared values, perceived challenges, and aspirations for the future of the area.

For the better part of a year, community leader interviews, on-line surveys, meetings and forums offered multiple opportunities for citizens of all backgrounds and perspectives to contribute their ideas and feedback. Toward the end of the process, guided by a task force of 31 community leaders, the focus shifted to developing a concrete plan of action to achieve the vision.

As a result, the resulting vision and plan feel both 'right-sized' yet full of the possibility and promise of the wider Sisters Country community. Here's how we got there...

Project Organization & Structure

Sponsored by the **City of Sisters**, the Sisters Country Horizons visioning process was undertaken in partnership with **Deschutes County** and the **Central Oregon Intergovernmental Council** (COIC). **Oregon's Kitchen Table**, a program of Portland State University affiliated with COIC and **Citizens4 Community** also partnered with the project. These groups formed a **Project Management Team** that met 20 times over the course of the project. **NXT Consulting Group** of Bend and Portland led the planning process.

The area of study for the project – **Sisters Country** – was defined as the part of Deschutes County served by the Sisters School District 006, including the city of Sisters itself, surrounding unincorporated communities and residential areas, local ranches and farms, as well as a small area outside the District. Even though it lies within Jefferson County, Camp Sherman is typically considered part of Sisters Country and was a part of this assessment.

As a comprehensive community visioning process, the Horizons project was based on a planning approach known as the **Oregon Model**. This approach, employed by scores of communities across the state, is driven by a series of questions, tapping into the inherent wisdom of the community about its future. The process was delivered over the span of 2018, with framing of the process in the late winter, setting the context in the early spring, conducting visioning activities late spring through early fall, and developing the plan in the fall and early winter.

The content of all Horizons project conversations was organized around four **focus areas** providing the structure of the vision and action plan – **Prosperous Sisters**, **Livable Sisters**, **Resilient Sisters**, and **Connected Sisters**. These themes became the "mantra" of project organizers, facilitators and participants alike – organizing and adding specificity to the higher-level discussions.

Stakeholder Interviews (February-April 2018)

As the first step of engagement for its visioning process, Sisters Country Horizons conducted a series of stakeholder interviews between February and April 2018.

Interviewees were identified as community leaders and opinion shapers for the Sisters Country community. Building on an initial list recommended by the City, the number of interviews grew significantly. Additional referrals were added to reflect the broader diversity of the community, with attention paid to emerging business and cultural leaders, Millennials, and representatives of underserved or under-represented residents, including rural areas. Fully 81 individuals participated in the interviews – an exceptional number for a community of this size.

Conducted by Ruth Williamson of NXT Consulting Group, most interviews lasted over an hour and were organized by five major questions:

- **Values:** What do you most value about living in Sisters Country?
- **Challenges:** What is the biggest challenge facing the future of Sisters Country?
- **Vision:** What is your vision for the future of Sisters Country?
- **Action:** What actions would help achieve your vision?
- **Results:** How would you know your vision has been achieved?

Capturing major themes that surfaced during these conversations, a 76-page interview report was produced, concealing the identity of individual interviewees. The full report, along with a shorter executive summary, was released in May 2018 and can be found at the project website: ***www.sistershorizons.com/learn-more/***

General Community Input (March-May 2018)

The project applied these same themes to the general public through two major on-line community surveys and printed questionnaires, a series of small town hall-style community meetings facilitated by Oregon's Kitchen Table, Deschutes County planners and community volunteers, and DIY 'Kitchen Table' conversations hosted by community members themselves.

These activities were supplemented by presentations to various local groups, including C4C's Age-Friendly Community Event, Sisters High School Leadership class, local service clubs, and others, using the print or online survey to gather additional input.

On-Line Community Survey I. Findings from the first online community survey, in particular, served as the foundational research in developing a long-range vision and action plan for Sisters Country and its residents. The total number of online and print survey respondents –

approaching 500 people in a community with a population of some 8,000 residents – added validity to these findings.
Four core questions were worded exactly the same in both the on-line and print versions of the survey, and corresponded to the same questions asked during the community leader interviews. With the on-line survey, several more questions were added to mine community perceptions on the future more deeply, get a better sense of who was taking the survey, and to test differences in attitudes between different communities within Sisters Country, such urban and rural residents. While a few significant differences were noted, more significant was the high degree of alignment.

By far, the on-line survey proved to be the most effective method in reaching community members. The short print survey featured key questions used in the online version and provided a more traditional form of input for individuals not inclined to go online.

Community Meetings. A series of 13 community meetings, augmented by Kitchen Table conversations, were held at various locations in Sisters Country, both inside the city and in several rural locations. During these group discussions, meeting facilitators, drawn from the community-at-large and the Deschutes County Community Development Department, took notes of what residents said, including what they value most about the community, what they see as its biggest challenges, and finally what vision ideas they have for the future of the community. Again, these topics closely mirrored three of the main questions asked in Online Community Survey I. These notes were added to the online database and separated from the survey results.

C4C's Values and Visioning Quilt. Adding an artistic (and highly local) touch to the visioning process, the Citizens4Community organization collected ideas of residents and visitors about what they value about Sisters Country and their aspirations for its future. These aspirations were literally quilted into an "interactive piece of community art" known as the Sisters Horizons Community Quilt. These short but inspiring sentiments were added to the Sisters Country Horizons online database and separated from the results of the two surveys and from the results of the community meetings.

Factoring in the stakeholder interviews, presentations to Citizens4Community's (C4C) Age-Friendly Community event, and Sisters High School's Leadership Class, and creative forms of input including C4C's Values and Visioning Quilt, the total number of data points from all sources climbed to nearly 1,000 submissions by the end of May.

Working with all of these sources, the Sisters Country Horizons project utilized "qualitative data analysis" (QDA) software to analyze all compiled community input, identifying major themes and enabling the generation of graphical "word clouds" to capture the community's core values, perceived challenges, and high-level aspirations.

All of these methods of community input reflected Sisters Country Horizons' strong commitment to engaging as many people as possible in order to firmly and clearly articulate their aspirations for the future of Sisters Country. Based upon this input, the Community Input Report was released in report was released in June 2018 and can be found at the project website: ***www.sistershorizons.com/learn-more/***

Community Forums (June 2018)

With clear themes emerging from the Stakeholder Interviews and Community Input Report, the project began to drill down from high-level aspirations to more specific strategies for the future of Sisters Country. Four community forums were staged, each forum dedicated to one of the four Horizons focus areas: Prosperous Sisters, Livable Sisters, Resilient Sisters, and Connected Sisters. At each forum, local and regional experts presented base line data and trends for that focus area. Forum participants, working with ideas gleaned from the general public, developed a draft list of strategies. Slide presentations for each of the four forums can be found at the project website: ***www.sistershorizons.com/learn-more/***

Online Community Survey II (July-August 2018)

Working with the results of the four community forums, a second online community survey tested 54 potential strategies with the general public between late July and late August. Between 13 and 14 strategies were presented for each focus area, and respondents were asked to select their top five ideas for each area. Based on total numbers of votes, a short list of the top five strategies for each area was determined.

A total of 565 participants took the second survey. Their top overall strategies were: **Oregon's Artisanal Capital** (Prosperous Sisters), **Walkable Downtown** (Livable Sisters), **Urgent Care Facility** (Resilient Sisters), and **Small Town Atmosphere** (Connected Sisters).

These top scoring strategies were presented at the Vision Summit in September, and handed over to the project's Vision Action Team for further refinement. The Community Survey Report II was released in September and can be found at the project website: ***www.sistershorizons.com/learn-more/***

Vision Summit (October 2018)

After a late summer hiatus, the Sisters Country Horizons visioning process was reintroduced to the community in early October with a Vision Summit hosted at Five Pines Lodge Conference Center.

Close to 100 citizens gathered for an initial reading of the draft Sisters Country Horizons Vision Statement, shaped from the data collected through the aforementioned engagements earlier in the vision process, and the revealing of the top-scoring vision strategies. Both the vision and strategies were simultaneously posted to the Horizons website for general public comment.

The Summit also set the stage for the final phase of the project – planning the actions that would help make the vision for Sisters Country a reality. The newly formed Vision Action Team was introduced to the community at this time.

Finally, the Summit was highlighted with storytelling from community leaders from across Sisters Country, describing their diverse experiences of the 'Sisters Way,' a cultural standard often referred to in interviews and community meetings during the project.

Vision Action Team (September-November 2018)

The Sisters Country Horizons Vision Action Team – or "VAT" – was appointed and oriented in early September and went to work immediately following the Vision Summit. The VAT was comprised of 31 community members representing leaders from across Sisters Country. Their mission was to develop a Vision Action Plan to guide achievement of the Sisters Country Horizons vision with implementable action steps over the next 3-5 years.

During the months of October and November the Vision Action Team met four times to

- **finalize top priority strategies;**
- **brainstorm actions for each strategy;**
- **finalize actions and identify Lead Partner contacts; and**
- **affirm suggested Lead Partners and finalize the draft Vision Action Plan.**

The VAT worked in small teams organized by the four vision focus areas and guided by Team Leaders from the City of Sisters, Deschutes Country, COIC and EDCO. The open-ended dialogue in small group format coalesced the VAT membership and created a collective sense of ownership of the community vision, establishing a robust foundation for implementation of the adopted strategies and actions pending approval by the Sisters City Council.

Early in the week of Thanksgiving, the VAT elected to meet one more time to review and finalize the draft action plan, preparing it for posting to the Horizons website for public comment and presentation to Sisters City Council. The draft plan was previewed with Sisters City Council on November 28. A final draft was planned for Council consideration on January 9, 2019 with formal adoption of the final plan scheduled for February 13, 2019.

A summary version of the plan is presented in this report (See "Sisters Country Horizons Strategies & Actions," page 18) and the Vision Action Plan Implementation Guide presented in the Appendix.

OUR VISION FOR SISTERS COUNTRY – A LEGACY FOR GENERATIONS TO COME

Our Vision for Sisters Country – first revealed at the Vision Summit in October 2018 – is the overarching vision statement developed by the Sisters Country Horizons visioning process. The result of input from participants across Sisters Country, including community interviews, meetings, online surveys and forums, it reflects the ideas and words of Sisters Country residents themselves – and their aspirations for a more prosperous, livable, resilient and connected community.

SISTERS COUNTRY proudly stands at a pivotal moment in its history – with a past we choose to honor, a present we seek to improve, and a future we aspire to create that is uniquely and positively our own.

WE HONOR AND STRIVE TO MAINTAIN our spectacular natural environment, our small town feel, the experience of caring and belonging, our outstanding schools, and our Western identity.

WE ACTIVELY SEEK TO IMPROVE our community's quality of life, economic opportunity and affordability for all residents, and the facilities, programs and services that enrich and sustain our lives.

WE ASPIRE TO CREATE a prosperous economy rooted in arts and craft, recreation, entrepreneurship and innovation, a livable city and region that remain welcoming even as we grow, resilient people better prepared for a challenging world, and a connected community that works together for the common good.

OUR VISION is to seize this moment, choose our preferred future, and create an enduring legacy for generations to come.

SISTERS COUNTRY HORIZONS STRATEGIES & ACTIONS

The following **Strategies and Actions** – summarized here from the **Sisters Country Horizons Vision Action Plan** – are intended to help achieve the community's vision over time. (A complete version of the Vision Action Plan Implementation Guide can be found in the Appendix of this document.)

The **Strategies** are the result of an extensive community conversation, including stakeholder interviews, community meetings, community forums, and two online community surveys. Through this process hundreds of potential ideas were whittled down to a list of 54 draft strategies, tested again with the public, and then reduced to a list of 20 top priority strategies. From there, the project's 31-member **Vision Action Team** further refined the list and developed a series of recommended actions to implement each strategy over the next five years.

The resulting strategies and actions are organized into four "focus areas," each area representing a key aspect of the future of Sisters Country: **Prosperous Sisters**, **Livable Sisters**, **Resilient Sisters**, and **Connected Sisters**.

Each action includes one or more **Suggested Lead Partners**, who are being asked to lead its implementation. The plan also identifies **Potential Supporting Partners**, **Milestones**, and **Timelines** for each action.

As a community-based initiative, the actions in the **Vision Action Plan** will involve multiple partners from the public, private and nonprofit sectors in its implementation. While a good deal of the actions will be led by the City of Sisters, other Lead Partners are anticipated to include **Deschutes County**, **Central Oregon Intergovernmental Council** (COIC), **Sisters Ranger District/U.S. Forest Service**, **Sisters-Camp Sherman Fire District**, **Sisters School District**, **Sisters Park & Recreation District**, **Economic Development for Central Oregon** (EDCO), **Sisters Chamber of Commerce**, **Sisters Arts Association**, **Sisters Trail Alliance**, **Citizens4Community**, and others.

PROSPEROUS SISTERS

Our Vision: a prosperous economy rooted in arts and craft, recreation, entrepreneurship and innovation.

This focus area is about creating a Sisters Country that is prosperous for all its residents. It covers such topics as jobs, small business, economic development, and entrepreneurial activities that generate income for Sisters: tourism, arts and craft, recreation, and more. More detailed information can be found in the Vision Action Plan Implementation Guide in the Appendix.

Strategy 1: Four-Season Tourism & Visitor Destination. Strategically develop Sisters Country's tourism and destination economy, increasing the number of shoulder season and winter events and attractions, such as performances, festivals, retreats, educational speaker series, trainings, and outdoors sports tournaments.

Actions:

1.1 Sisters Event Committee & Coordinator
1.2 Permanent Multi-Use Events Center
1.3 Four-Season Competitive Tournaments
1.4 Sisters Country Winter Festival
1.5 Regional Events Partnerships
1.6 Ice Rink & Fly-Fishing Pond

Strategy 2: Oregon's Artisanal Capital. Develop and promote Sisters Country as the "Artisanal Capital of Oregon," building on its strategic location and spectacular environment, expanding the artisanal economy including visual artists, trades and crafts people, musicians, performance artists, writers, brewers, distillers, and farm-to-table chefs.

Actions:

2.1 Public Art Installations
2.2 Artisanal Capital Marketing Plan & Programming
2.3 'Made in Sisters' Annual Festival

Strategy 3: Sisters Makers District. Develop and promote a Sisters Makers District, where wood, metal, and glass crafts, woven crafts, pottery, and arts studios mix with local food and craft beverages, creating a pedestrian friendly zone that compliments, diversifies, and expands the local economy and supports entrepreneurialism and innovation.

Actions:

3.1 Sisters Makers District Designation
3.2 Makers District Marketing Plan
3.3 Sisters Makers Event
3.4 Makers District Pedestrian Zone

Strategy 4: Vibrant & Diverse Local Economy. Facilitate local entrepreneurial infrastructure and the development of Sisters-compatible light Industrial land and building inventory, as well as support vocational education and workforce development.

Actions:

4.1 Local Entrepreneur & Start-Up Infrastructure
4.2 Light Industrial Space & Lands

4.3 Emerging Workforce Development
4.4 Baseline Economic Data

Strategy 5: Forest Service Property Development. Facilitate the development of a masterplan on the U.S. Forest Service property that is compatible with the community's character and identity, combining mixed-used commercial, residential and recreational facilities that anchor and define the community, create new jobs, and provide housing options.

Actions:
5.1 Interested Parties Meeting
5.2 USFS Property City Advisory Committee
5.3 Data Collection & Feasibility Analysis
5.4 Design Competition & Symposium

LIVABLE SISTERS

Our Vision: a livable city and region that remain welcoming even as they grow.

This focus area is about creating a Sisters Country that is livable for all its residents. It covers such topics as growth and planning, housing, transportation, parks and recreation, environmental quality, biking and walking, and other factors that combine to make Sisters Country such a great place to live. More detailed information can be found in the Vision Action Plan Implementation Guide in the Appendix.

Strategy 1: Walkable Downtown. Expand pedestrian-friendly amenities in Downtown Sisters, encouraging residents and visitors to get out of their cars and walk, including during the evening hours.

Actions:
1.1 Pedestrian Flag Program
1.2 'Hey, Let's Walk There!' Initiative
1.3 Improved Downtown Lighting

Strategy 2: Affordable Housing. Increase the availability of affordable housing in Sisters Country, including a comprehensive review of the 2010 Sisters Housing Plan, promotion of a diverse mix of housing types, and support for private and volunteer programs that address the issue of housing affordability.

Actions:
2.1 Sisters Housing Plan Update
2.2 Workforce Housing
2.3 Long-Term Rental Housing

Strategy 3: Integrated Transportation System. Implement the updated Sisters Transportation System Plan that addresses changes in local and regional growth and new state transportation policies. Determine a preferred alternative to address congestion on Highway 20 in Downtown Sisters, exploring alternate routes and roadway designs, traffic management strategies, bicycle and pedestrian options, signage, and centralized public parking.

Actions:

3.1 Intra-Sisters Country Transit
3.2 Activity Bus Route
3.3 Grant Funding for Transportation
3.4 Washington Avenue Bike Boulevard
3.5 Alternative Regional Transportation Options

Strategy 4: Expanded Trail System. Support Sisters Trails Alliance and the U.S. Forest Service in expanding and integrating equestrian, bicycle and hiking trails throughout Sisters Country and beyond, connecting unincorporated rural communities with Downtown, linking Sisters to Redmond and Bend, and facilitating appropriate access to recreational areas.

Actions:

4.1 Trail Expansion Outreach
4.2 Trail Expansion Funding
4.3 Regional Trails System
4.4 Separated Bike and Equestrian Trails on Sisters Tie Trail

Strategy 5: Parks, Recreation & Greenspace. Identify potential new parks, greenspaces and recreation sites and facilities in Sisters Country to meet the needs of a growing resident population and create new public amenities and visitor attractions. Recognize and honor the City of Sisters' status as a Tree City, and develop Dark Skies program.

Actions:

5.1 Greenspace and View Corridor Assets Inventory
5.2 Greenspace and View Corridor Standards
5.3 New City Park on East Portal Property
5.4 Tree-Planting/Replanting
5.5 New Community Recreational Facilities

RESILIENT SISTERS

Our Vision: resilient people better prepared for a challenging world.

This focus area is about creating a Sisters Country that is resilient for all its residents. It covers such topics as public safety, health and wellness, social services, fire safety and disaster preparedness, and other initiatives that will help our community to be prepared for unanticipated events or a less certain future. More detailed information can be found in the Vision Action Plan Implementation Guide in the Appendix.

Strategy 1: Urgent Care Facility. Pursue establishment of a comprehensive urgent care facility in Sisters, providing walk-in and related ambulatory care and medical services for a rapidly growing population and increasing numbers of tourists.

Actions:

1.1 Needs Analysis
1.2 Gaps/Barriers Analysis
1.3 Close Gaps and Eliminate Barriers

Strategy 2: Communications Connectivity. Improve communications connectivity and infrastructure (telecommunications, broadband, mobile and Internet services) in Sisters Country with special attention paid to underserved areas.

Actions:
2.1 FirstNet Communications Tower
2.2 Underserved Areas
2.3 Remediation in Underserved Areas

Strategy 3: Age-Friendly Community. Support an 'age-friendly' community in Sisters Country, encouraging key organizations to share resources and to advocate for issues relevant to all ages and abilities.

Actions:
3.1 Inventory of Age Specific Facilities and Programs
3.2 Community Calendar
3.3 Access to Healthy Outdoor Activities – On Unincorporated Lands
3.4 Access to Healthy Outdoor Activities – Within City Limits

Strategy 4: Fire/Drought Resistant Building & Development Codes. Review and update City of Sisters and Deschutes County building and development codes to improve and enhance the fire and drought resistance of homes, communities and landscapes in Sisters Country.

Actions:
4.1 State Regulatory Framework
4.2 Sisters-Specific Regulatory Framework
4.3 Retrofits to Critical Infrastructure, Other Structures and Landscaping

Strategy 5: Disaster Preparedness & Response. Promote enhanced coordination of disaster preparedness and response efforts in Sisters Country within the statewide network. Improve and enhance natural disaster preparedness and socioeconomic resilience training and education programs.

Actions:
5.1 Active Forest Management
5.2 Models for Active Forest Management
5.3 Economic Uses of Forest Management By-Products
5.4 Community Outreach Activities
5.5 Comprehensive Natural Hazards Planning and Preparation

CONNECTED SISTERS

Our Vision: a connected community working together for the common good.

This focus area is about creating a Sisters Country that is more connected, making all its residents feel welcome and involved. It covers such topics as governance and leadership, education and learning, civic engagement and dialogue, volunteerism, and other things that bind us together as a community. More detailed information can be found in the Vision Action Plan Implementation Guide in the Appendix.

Strategy 1: Small Town Atmosphere. Promote the small-town atmosphere and friendly vibe of Sisters Country as the city and region grow, increasing outreach and opportunities for face-to-face contacts, neighbor-to-neighbor cooperation, and visitors-to-locals connections and commerce.

Actions:
1.1 Values-Based Marketing Campaign
1.2 Strengthened Business Community Connections
1.3 New Celebrations
1.4 Community Hub Activities

Strategy 2: Innovation & Distinctive Programming in Schools. Support the innovative curriculum, distinctive programming, community-based initiatives, and year-round use of existing Sisters School District facilities, bolstering the district as the "hub of the community" and connecting its students to the community and beyond.

Actions:
2.1 Schools Marketing Campaign
2.2 New Schools Partners and Leaders
2.3 Community HR Database
2.4 Annual School Pitch Event
2.5 Crowdfunding for New Programs

Strategy 3: Multi-Purpose Community Center. Plan, finance and develop a multi-purpose community center in Sisters, featuring year-round programming and opportunities for community members of all ages and abilities to gather and connect, take part in healthy recreation and exercise, and participate in classes, arts, lectures, and community events.

Actions:
3.1 Existing Elementary School Conversion
3.2 Community Center Task Force
3.3 New Funding for Sisters Park & Recreation District

Strategy 4: Diversity & Inclusion. Bring Sisters Country's less frequently heard voices into a more diverse, welcoming and inclusive community conversation, fostering greater tolerance in the community helping newcomers as well as long-time residents to feel valued and supported.

Actions:
4.1 Community Demographics Assessment
4.2 Barriers to Diversity
4.3 Mental Health Support Systems

Strategy 5: Leadership Training & Development Emphasizing Youth. Develop a deeper pool of leadership through mentorship, education and training, opportunities for civic participation, and community involvement across the generational spectrum with a particular emphasis on youth and young adults.

Actions:
5.1 Community-wide Leadership Training Model
5.2 Existing Leadership Barriers
5.3 Mentorship Program
5.4 Key Community Leadership Partners

5.5 Sisters Foundation

IMPLEMENTING THE VISION ACTION PLAN

The **Sisters Country Horizons Vision Action Plan** has been designed and developed to help Sisters Country achieve its vision for the future. Each of its 20 strategies includes a number of action steps intended to be implemented over the next five years, suggested "Lead Partner" organizations who are being asked to take on those activities, and timelines and milestones for their achievement. (A complete version of the Vision Action Plan Implementation Guide with supporting information can be found in the Appendix of this document.)

For many communities that have developed vision action plans, seeing their plans through to completion can be more daunting than creating them in the first place. It involves commitment, resolve and persistence. However, those communities that have succeeded in implementing their plans have achieved significant, even impressive results.

The **City of Sisters** has been called upon to implement a number of the actions in the Vision Action Plan, but as primary sponsor and "owner" of the visioning process it is also identified to lead another important charge: to ensure that the overall plan is effectively implemented over time, as well as renewed and updated at an appropriate point in the future.

As Sisters Country looks forward to achieving its plan for the future, **NXT Consulting Group**, consultant to the Sisters Country Horizons visioning process, offers the follow **implementation recommendations** to the help the City and its partners achieve the most successful outcomes:

- Formal Commitment. Signal the City's formal commitment to implementation through plan adoption. Support Deschutes Country and other government agencies and organizations in signaling their commitment to the plan as well. Use the action plan to guide annual Council goal setting sessions and link the plan to the City's own internal strategic planning efforts. Refer back to the public input compiled through the visioning process interviews, meetings, surveys and forums to help inform new City plans and policies on a continuing basis.

- Dedicated Staff Time. Dedicate a portion of City staff time to promote implementation of City-led actions and track overall plan implementation. For a variety of reasons, it makes good sense to lead such activities from the City Manager's desk.

- Vision Implementation Team (VIT). Form a City advisory team to monitor, track and support plan implementation. A Vision Implementation Team (VIT) reflecting key Lead Partners in the plan should meet periodically to support plan partners in implementing the plan and to monitor and report on implementation progress back to the City and community.

- Easy Wins and Game Changers. Immediately implement some plan actions in order to get "easy wins" on the board and communicate the success of these achievements to the public. These small successes will help demonstrate the power of the plan to affect change and build motivation and resolve to take on the bigger, bolder actions – such as developing a masterplan for development of the USFS property or a multi-purpose community center.

- Horizons Brand. Use the brand, logo, website that have been developed for the visioning process to sell the vision and plan to the community and beyond. Publish a polished,

graphical version of the vision statement and strategies, that can be used by the City, Chamber, Schools and other organizations to develop support for their own activities, promote the community, and attract grants and other investments in the community.

- Ongoing Engagement. Continue to engage the wider community in the achievement of the Vision Action Plan over time. Along with the VIT, an annual Vision Town Hall meeting is a good way to keep people engaged, report on progress and accomplishments, honor citizens and organizations who have done the most to promote the vision, and generate new ideas that keep the plan alive.

- Measuring Progress. Develop a set of community "indicators" and corresponding metrics to measure the community's general progress in the direction of its vision over time. Having measurable indicators of the plan's general effectiveness is a critical part of ensuring the long-term success and relevance of a community's vision. The Sisters Vision Action Plan has been designed and structured to promote this additional activity.

Next Steps for Plan Implementation

The process to successfully implement each of the Vision Acton Plan strategies going forward will entail highly coordinated and committed efforts among several organizations and committees. Given the above recommendations, below is a suggested path forward for the City and its partners.

Lead Partner Engagement. First and foremost, the City must engage the suggested Lead Partner for each strategy, respecting the fact that each partner must confirm their readiness and capacity to implement specific actions. These leads are critical to the success of the plan and have been chosen based on their expertise in that particular strategy. Fortunately, most of the major partners were involved with the Vision Action Team and have had a hand in developing specific strategies and actions.

The effort to engage Lead Partners is already underway and being led by the City Manager with assistance as needed from the Mayor. Once all Lead Partners have been engaged, it will be their responsibility to begin the process of implementing identified actions necessary for successful strategy implementation. In some cases partners may suggest refinements to specific actions or timelines to better fit their ability to implement them.

For some actions, this also means engaging several supporting partners and/or possibly forming separate committees to supplement the lead partner's activities. It will be necessary for the Lead Partner to work with their key players to communicate and coordinate progress; update milestones and responsible parties; and monitor remaining action item plans.

Vision Implementation Team (VIT) Formation. Another key step in plan implementation will be forming the Vision Implementation Team (VIT). This team should be established over the next few months and will serve as an overall advisory board to the City (Staff and Council) and to the general public. Ideally, the VIT will include members of the Vision Action Team (VAT), a number of whom have already indicated their interest in continuing with the process.

The VIT role will be to monitor and track accomplishment progress across all strategies, using tools such as key performance indicators (KPI's). This team will also need to meet regularly to keep an active pulse on progress and to identify "gaps" where we may need to increase focus and attention. Selected City Staff should be active members of the VIT and regular reporting including the KPI's will be necessary.

Council & Board Engagement. Another key step will be to engage Sisters City Council and the Deschutes County Board of Commissioners in this process on an ongoing basis. The Council and Board can help by potentially identifying liaison members to some of the key lead partner organizations and/or the VIT. This will be particularly valuable when an action may potentially need some type of future decision by the Council or the Board (e.g.: funding mechanisms; policy resolutions; etc.).

It will be necessary to have regular workshop agenda items on the Council calendar focused on updates to the Visioning process including reviewing VIT KPI's, etc. Finally, the Council and Board will make the Visioning project part of their annual goal setting sessions so there is greater coordination and momentum between the two areas.

Another potential is to engage the various existing City and County Committees (e.g.: planning; parks; HPAB; etc.) in the process by potentially identifying member(s) to serve on either lead partner committees or the VIT.

It goes without saying that adequate resources, overall engagement and commitment, and communication will be critical for overall success of the Horizons Vision Action Plan. That said, potential selected consulting support and/or incremental staff assistance may be necessary for successful implementation. These decisions will be led by the City Manager and will be part of the upcoming annual budgeting process.

Finally, ongoing engagement of the entire community will be necessary to keep communication lines open on progress and feedback including an annual Vision town meeting. At the end of the day, the community's continued engagement will ensure the success of this plan for the future of Sisters Country.

APPENDIX

VISION ACTION PLAN

Implementation Guide

Sisters Country Vision

City of Sisters, Oregon
February 2019

(Last Updated: 06.20.19)

Prepared by
Sisters Country Horizons Vision Action Team

Focus Area Team Leaders:
Caprielle Foote-Lewis, EDCO – Prosperous Sisters
Nicole Mardell, Deschutes County – Livable Sisters
Patrick Davenport, City of Sisters – Resilient Sisters
Janel Ruehl, COIC – Connected Sisters

INTRODUCTION & OVERVIEW

The **Vision Action Plan** presented in this document is the final outcome of the **Sisters Country Horizons** community visioning project of the **City of Sisters**, Oregon conducted in 2018. (Note: As of June 2019, the project has been rebranded as the **Sisters Country Vision** with a new logo and tagline: "Our Community • Our Future".)

The preceding report contains a *summary* version of the plan including focus area visions, strategies and corresponding actions.

The following ("Implementation Guide") is the *full* version of the plan, containing all supplementary information developed by the Sisters County Horizons Vision Action Team (VAT), 31 appointed community and agency leaders who articulated the actions recommended herein.

Following public input via the Horizons website in December 2018, a few subsequent minor revisions and one new action (Prosperous 4.4, "Baseline Economic Data") were approved by the Horizons Project Management Team, advised by the VAT's Focus Area Team Leaders.

In addition to **Strategies** and corresponding **Actions**, for each action this version of the plan includes the following information:

- **Suggested Lead Partners**, the government agencies or nonprofit organizations who have been recommended for implementing respective actions;
- **Potential Supporting Partners,** other government agencies or nonprofit organizations that may be able to assist in or support the implementation of those actions;
- **Suggested Milestones** for measuring progress in implementation of actions;
- **Suggested Timeline** for action implementation.

It should be noted that not all Suggested Lead Partners may have been confirmed as of publication of this final Vision Action Plan. The City of Sisters will continue to work on those confirmations with the respective agencies or organizations, as necessary.

It is quite possible that agencies or organizations recommended by the VAT as "Suggested Lead Partners" for specific actions may change at the request of those entities, and may not necessarily be the entities that end up implementing those actions.

Finally, this plan represents a well-informed road map forward. It is not intended, however, to be a prescriptive document. Adoption assumes further development and refinement of the plan's recommended actions by their respective Suggested Lead Partners.

APPENDIX F
Oregon Department of Environmental Quality Approval *(Forthcoming)*

RESOLUTION NO. 2023-07

A RESOLUTION DECLARING THE CITY'S ELECTION TO RECEIVE STATE REVENUES

The City of Sisters resolves as follows:

Section 1. Pursuant to ORS 221.770, the City of Sisters hereby elects to receive state revenues for fiscal year 2023/24.

Adopted by the Common Council and approved by the Mayor this 14th day of June 2023.

_____
Michael Preedin, Mayor

ATTEST:

_____
Kerry Prosser, City Recorder

I certify that a public hearing before the Budget Committee was held on May 23, 2023, and a public hearing before the City Council was held on June 14, 2023 giving citizens an opportunity to comment on use of State Revenue Sharing.

_____
Kerry Prosser, City Recorder

CITY COUNCIL

Agenda Item Summary

Meeting Date: June 14, 2023 **Staff:** Joseph O'Neill

Type: Regular Meeting **Dept:** Finance

Subject: FY 2023/24 Budget Adoption & Levying Taxes

Action Requested: Conduct a public hearing and consider the approval of Resolution No. 2023-08: A RESOLUTION ADOPTING THE FISCAL YEAR 2023/24 BUDGET, APPROPRIATING FUNDS, APPROVING A TAX LEVY AND DIRECTING STAFF TO FILE THE BUDGET WITH THE COUNTY CLERK.

Background:

On May 23, 2023, the Sisters Budget Committee held meetings to review the City's fiscal year 2023/24 budget. The Budget Committee approved the proposed budget with changes consisting of the addition of a $20,000 Housing Reserve and the full funding of the Economic Development for Central Oregon proposed agreement of $118,369.

The resolution includes adopting the City of Sisters tax rate for FY 2023/24. As approved by the Budget Committee, the elected rate is $2.6417 per $1,000 of assessed value.

Financial Impact:

Authorize appropriations of $30,716,478 for fiscal year 2023/24.

Attachment(s):

Resolution No. 2023-08

RESOLUTION 2024-08

A RESOLUTION ADOPTING THE FISCAL YEAR 2023/24 BUDGET, APPROPRIATING FUNDS, APPROVING A TAX LEVY AND DIRECTING STAFF TO FILE THE BUDGET WITH THE COUNTY CLERK.

ADOPTING THE BUDGET

BE IT RESOLVED that the City Council of the City of Sisters hereby adopts the budget for fiscal year 2023/24 in the total amount of $30,716,478*. This budget is now on file at 520 E. Cascade Ave., in Sisters, Oregon.

MAKING APPROPRIATIONS

BE IT RESOLVED that the amounts shown below are hereby appropriated for the fiscal year beginning July 1, 2023, for the following purposes:

General Fund		
Council-Manager	$	1,019,317
Finance & Administration		263,386
Maintenance		190,192
Tourism		375,000
Parks		435,197
Police		942,369
Community Development		887,706
Economic Development		125,869
Capital Outlay		66,000
Operating Contingency		706,506
Transfers		302,600
Total	**$**	**5,314,142**
Water Fund		
Personnel Services	$	412,974
Materials & Services		404,875
Capital Outlay		360,000
Transfers		8,600
Operating Contingency		136,308
Total	**$**	**1,322,757**
Street Fund		
Personnel Services	$	484,922
Materials & Services		524,900
Capital Outlay		405,000
Transfers		7,000
Operating Contingency		168,304
Total	**$**	**1,590,126**

Sewer Fund

Personnel Services	$	404,562
Materials & Services		439,375
Capital Outlay		235,000
Debt Service		331,920
Transfers		12,100
Operating Contingency		140,656
Total	**$**	**1,563,613**

Street SDC Fund

Materials & Services	$	110,000
Capital Outlay		30,000
Total	**$**	**140,000**

Sewer SDC Fund

Materials & Services	$	25,000
Capital Outlay		200,000
Debt Service		76,060
Total	**$**	**301,060**

Water SDC Fund

Materials & Services	$	25,000
Total	**$**	**25,000**

Park SDC Fund

Capital Outlay	$	15,000
Total	**$**	**15,000**

City Hall Debt Service Fund

Debt Service	$	50,320
Total	**$**	**50,320**

Total Appropriations, All Funds	**$10,322,018**
Total Unappropriated Reserve amounts, All Funds	**20,394,460**
TOTAL ADOPTED BUDGET	**$ 30,716,478***

*(*amounts with asterisks must match)*

IMPOSING THE TAX

BE IT RESOLVED that the following ad valorem property taxes are hereby imposed upon the assessed value of all taxable property within City limits for tax year 2023/24:

At the rate of $2.6417 per $1,000 of assessed value for permanent rate tax.

CATEGORIZING THE TAX

BE IT RESOLVED that the taxes imposed are hereby categorized for purposes of Article XI section 11b as:

Subject to the General Government Limitation
Permanent Rate Tax $2.6417 per $1,000

FILING THE BUDGET

BE IT RESOLVED that the City Council of the City of Sisters hereby directs staff to file the fiscal year 2023/24 budget with the Deschutes County Clerk.

The above resolution statements were approved and declared adopted on this 14th day of June 2023.

_____
Michael Preedin, Mayor

_____
Andrea Blum, Council President

_____
Jennifer Letz, Councilor

_____
Gary Ross, Councilor

_____
Susan Cobb, Councilor

ATTEST:

_____
Kerry Prosser, City Recorder

CITY COUNCIL

Agenda Item Summary

Meeting Date: June 14, 2023 **Staff:** Paul Bertagna
Type: Regular Meeting **Dept:** Public Works
Subject: Community Wildfire Risk Reduction Grant Program Grant Funds

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Action Requested: Discussion and Consideration of a Motion to Approve Resolution 2023-09. A Resolution of City of Sisters Accepting Community Wildfire Risk Reduction Grant Funds and Authorize the Mayor to Execute the Grant Agreement.

Summary Points:

- The office of the State Fire Marshal (OSFM) administers the Community Wildfire Risk Reduction Grant program on behalf of the State of Oregon.
- The City applied for a Wildfire Risk Reduction Grant in January 2023 to provide thinning and ladder fuel removal treatments on approximately 30 acres at the Wastewater Treatment Plant and 10 acres of the Edgington Road property.
- The City was awarded a $72,000 grant for the fuel reduction work and the project was completed on May 26, 2023. The grant funds will pay for the cost of the original contract as well as some additional fuel reduction work on the Treatment Plant site within the original project boundaries.
- Agreement number 2023-CWRR-021 requires that the recipients governing body authorized the agreement by an Ordinance, Order or Resolution.
- The City will process it's first grant reimbursement request in June 2023 and submit it with the required June 2023 progress report.

Financial Impact: Reimbursement to the Sewer fund in an amount not to exceed $72,000.

Attachments: Agreement Number 2023-CWRR-021

RESOLUTION NO. 2023-09

A RESOLUTION OF CITY OF SISTERS ACCEPTING COMMUNITY WILDFIRE RISK REDUCTION PROGRAM GRANT FUNDS; AUTHORIZING EXECUTION OF GRANT AGREEMENT.

WHEREAS, the Office of State Fire Marshal ("OSFM") administers the Community Wildfire Risk Reduction Program ("CWRR") on behalf of the State of Oregon; and

WHEREAS, OSFM desires to award City of Sisters ("City") a CWRR grant in the amount of $72,000.00; and

WHEREAS, a precondition to award of the grant is that the Sisters City Council ("Council"), as the governing body of City, must authorize the execution of a grant agreement with OSFM; and

WHEREAS, the Council desires to authorize the CWRR grant agreement with OSFM.

NOW, THEREFORE, BE IT RESOLVED that City of Sisters resolves as follows:

1. Findings. The above-stated findings are hereby adopted.

2. Authorization. The Council hereby approves of the grant agreement attached hereto as Exhibit A and authorizes City's mayor to execute such grant agreement and take such further actions as may be necessary to further the purposes of this Resolution 2023-09 (this "Resolution").

3. Miscellaneous. All pronouns contained in this Resolution and any variations thereof will be deemed to refer to the masculine, feminine, or neutral, singular or plural, as the identity of the parties may require. The singular includes the plural and the plural includes the singular. The word "or" is not exclusive. The words "include," "includes," and "including" are not limiting. The provisions of this Resolution are hereby declared severable. If any section, subsection, sentence, clause, and/or portion of this Resolution is for any reason held invalid, unenforceable, and/or unconstitutional, such invalid, unenforceable, and/or unconstitutional section, subsection, sentence, clause, and/or portion will (a) yield to a construction permitting enforcement to the maximum extent permitted by applicable law, and (b) not affect the validity, enforceability, and/or constitutionality of the remaining portion of this Resolution. This Resolution may be corrected by order of the Council to cure editorial and/or clerical errors.

ADOPTED by the City Council of City of Sisters and signed by the mayor this 14th day of June 2023.

_____
Michael Preedin, Mayor

ATTEST:

_____
Kerry Prosser, City Recorder

EXHIBIT A
GRANT AGREEMENT

[attached]

GRANT AGREEMENT

Title: 2023 Community Wildfire Risk Reduction Program ("CWRR") Grant

Agreement Number: 2023-CWRR-021

This grant agreement ("Agreement"), dated as of the date the Agreement is fully executed, is made by the State of Oregon, acting by and through its Department of State Police, for the benefit of its Office of State Fire Marshal ("OSFM"), and City of Sisters ("Recipient"). This Agreement becomes effective only when fully signed and approved as required by applicable law (the "Effective Date") and, unless earlier terminated, expires on May 31, 2026 (the "Expiration Date"). The period from the Effective Date through the Expiration Date is hereinafter referred to as the "Grant Term."

Pursuant to Section 9 of Oregon Laws 2021, chapter 592 (SB 762) (the "Act"), the Oregon Legislature established the Community Risk Reduction Fund for the purpose of carrying out community risk reduction and the local government financial assistance described in Section 8a of the Act. Section 8a of the Act, in turn, directs OSFM to administer a community risk reduction program that emphasizes education and methods of prevention with respect to wildfire risk, enforcement of defensible space requirements, response planning and community preparedness for wildfires. Section 8 of the Act defines "defensible space" as "a natural or human-made area in which material capable of supporting the spread of fire has been treated, cleared or modified to slow the rate and intensity of advancing wildfire and allow space for fire suppression operations to occur."

This Agreement sets forth the terms and conditions of Recipient's receipt of a CWRR Grant and includes the following exhibits:

Exhibit A: Project Description and Reporting Requirements
Exhibit B: Subcontract Insurance Requirements

SECTION 1 – GRANT

OSFM shall provide Recipient, and Recipient shall accept from OSFM, a grant in the amount of $72,000.00 (the "Grant").

Conditions Precedent. OSFM's obligations are subject to the receipt of the following items, in form and substance satisfactory to OSFM and its counsel:

(1) This Agreement duly signed by an authorized officer of Recipient; and

(2) Such other certificates, documents, opinions, and information as OSFM may reasonably require.

SECTION 2 - DISBURSEMENT

A. Full Disbursement. Upon satisfaction of all condition's precedent, OSFM shall disburse the full Grant to Recipient.

B. Condition to Disbursement. OSFM has no obligation to disburse funds unless, in the reasonable exercise of its administrative discretion, it has sufficient funding, appropriations, limitations, allotments and other expenditure authority to make the disbursement.

SECTION 3 - USE OF GRANT

A. Use of Grant Moneys.

Recipient shall use the Grant only for the activities described in **Exhibit A**.

B. RESERVED.

SECTION 4 - REPRESENTATIONS AND WARRANTIES OF RECIPIENT

Recipient represents and warrants to OSFM:

A. Organization and Authority.

(1) Recipient is a public body validly organized and existing under the laws of the State of Oregon.

(2) Recipient has all necessary right, power and authority under its organizational documents and under Oregon law to (a) execute and deliver this Agreement, (b) incur and perform its obligations under this Agreement, and (c) receive the Grant funds.

(3) This Agreement has been authorized by an ordinance, order or resolution of Recipient's governing body.

(4) This Agreement has been duly executed by Recipient, and when executed by OSFM, is legal, valid and binding, and enforceable in accordance with their terms.

B. Full Disclosure. Recipient has disclosed in writing to OSFM all facts that materially adversely affect its ability to perform all obligations required by this Agreement. Recipient has made no false statements of fact, nor has it omitted information necessary to prevent any statements from being misleading. The information contained in this Agreement is true and accurate in all respects.

C. Pending Litigation. Recipient has disclosed in writing to OSFM all proceedings pending (or to the knowledge of Recipient, threatened) against or affecting Recipient, in any court or before any governmental authority or arbitration board or tribunal, that, if adversely determined, would materially adversely affect the ability of Recipient to perform all obligations required by this Agreement.

D. No Defaults. No Defaults or Events of Default exist or occur upon authorization, execution or delivery of this Agreement.

E. Compliance with Existing Agreements and Applicable Law. The authorization and execution of, and the performance of all obligations required by, this Agreement will not: (i) cause a breach of any agreement or instrument to which Recipient is a party; (ii) violate any provision of the charter or other document pursuant to which Recipient was organized or established; or (iii) violate any laws, regulations, ordinances, resolutions, or court orders related to Recipient or its properties or operations.

SECTION 5 - COVENANTS OF RECIPIENT

Recipient covenants as follows:

A. Notice of Adverse Change. Recipient shall promptly notify OSFM of any adverse change in the activities, prospects or condition (financial or otherwise) of Recipient related to the ability of Recipient to perform all obligations required by this Agreement.

B. Compliance with Laws. Recipient shall comply with all applicable laws, rules, regulations and orders of any court or governmental authority that relate to this Agreement.

C. Grant Report. Recipient must submit to OSFM reports as outlined in Exhibit A. Recipient shall further provide any related reports and information as OSFM may reasonably request.

D. Insurance. RESERVED.

E. Books and Records. Recipient shall keep accurate books and records of the uses of the Grant and maintain them according to generally accepted accounting principles.

F. Inspections; Information. Recipient shall permit OSFM and any party designated by OSFM to inspect and make copies, at any reasonable time, of any accounts, books and records, including, without limitation, its records regarding receipts, disbursements, contracts, investments and any other related matters. Recipient shall supply any related reports and information as OSFM may reasonably require.

G. Records Maintenance. Recipient shall retain and keep accessible all books, documents, papers, and records that are directly related to this Agreement for a minimum of six years beyond the later of the final and total expenditure or disposition of the Grant. If there are unresolved issues at the end of such period, Recipient shall retain the books, documents, papers and records until the issues are resolved.

H. Notice of Default. Recipient shall give OSFM prompt written notice of any Event of Default as soon as any senior administrative or financial officer of Recipient becomes aware of its existence or reasonably believes an Event of Default is likely.

I. Contribution and Recipient Subcontracts.

1) Contribution.

i. If any third party makes any claim or brings any action, suit or proceeding alleging a tort as now or hereafter defined in ORS 30.260 ("Third Party Claim") against a party (the "Notified Party") with respect to which the other party ("Other Party") may have liability, the Notified Party must promptly notify the Other Party in writing of the Third Party Claim and deliver to the Other Party a copy of the claim, process, and all legal pleadings with respect to the Third Party Claim. Either party is entitled to participate in the defense of a Third Party Claim, and to defend a Third Party Claim with counsel of its own choosing. Receipt by the Other Party of the notice and copies required in this paragraph and meaningful opportunity for the Other Party to participate in the investigation, defense and settlement of the Third Party Claim with counsel of its own choosing are conditions precedent to the Other Party's liability with respect to the Third Party Claim.

ii. With respect to a Third Party Claim for which the State is jointly liable with Recipient (or would be if joined in the Third Party Claim), the State shall contribute to the amount of expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred and paid or payable by Recipient in such proportion as is appropriate to reflect the relative fault of the State on the one hand and of Recipient on the other hand in connection with the events which resulted in such expenses, judgments, fines or settlement amounts, as well as any other relevant equitable considerations. The relative fault of the State on the one hand and of Recipient on the other hand shall be determined by reference to, among other things, the parties' relative intent, knowledge, access to information and opportunity to correct or prevent the circumstances resulting in such expenses, judgments, fines or settlement amounts. The State's contribution amount in any instance is capped to the same extent it would have been capped under Oregon law if the State had sole liability in the proceeding.

iii. With respect to a Third Party Claim for which Recipient is jointly liable with the State (or would be if joined in the Third Party Claim), Recipient shall contribute to the amount of expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred and paid or payable by the State in such proportion as is appropriate to reflect the relative fault of Recipient on the one hand and of the State on the other hand in connection with the events which resulted in such expenses, judgments, fines or settlement amounts, as well as any other relevant equitable considerations. The relative fault of Recipient on the one hand and of the

State on the other hand shall be determined by reference to, among other things, the parties' relative intent, knowledge, access to information and opportunity to correct or prevent the circumstances resulting in such expenses, judgments, fines or settlement amounts. Recipient's contribution amount in any instance is capped to the same extent it would have been capped under Oregon law if it had sole liability in the proceeding.

2) Recipient Subcontracts. Recipient may enter into agreements with contractors or subcontractors (collectively, "Subcontracts") for performance of the Project.

   i. Recipient shall take all reasonable steps to cause its contractor(s) that are not units of local government as defined in ORS 190.003, if any, to indemnify, defend, save and hold harmless the State of Oregon and its officers, employees and agents ("Indemnitee") from and against any and all claims, actions, liabilities, damages, losses, or expenses (including attorneys' fees) arising from a tort (as now or hereafter defined in ORS 30.260) caused, or alleged to be caused, in whole or in part, by the negligent or willful acts or omissions of Recipient's contractor or any of the officers, agents, employees or subcontractors of the contractor ("Claims"). It is the specific intention of the parties that the Indemnitee shall, in all instances, except for Claims arising solely from the negligent or willful acts or omissions of the Indemnitee, be indemnified by the contractor from and against any and all Claims.

   ii. Recipient shall require its first-tier contractor(s) that are not units of local government as defined in ORS 190.003, if any, to: i) obtain insurance of the types and in the amounts specified in Exhibit B and meeting the requirements under ADDITIONAL INSURED, NOTICE OF CANCELLATION OR CHANGE, and CERTIFICATES OF INSURANCE before the contractors perform under its Subcontracts, and ii) maintain the insurance in full force throughout the duration of the Subcontracts. The insurance must be provided by insurance companies or entities that are authorized to transact the business of insurance and issue coverage in the State of Oregon and that are acceptable to OSFM. Recipient shall not authorize contractors to begin work under the Subcontracts until the insurance is in full force. Thereafter, Recipient shall monitor continued compliance with the insurance requirements on an annual or more frequent basis. Recipient shall incorporate appropriate provisions in the Subcontracts permitting it to enforce contractor compliance with the insurance requirements and shall take all reasonable steps to enforce such compliance. Examples of "reasonable steps" include issuing stop work orders (or the equivalent) until the insurance is in full force or terminating the Subcontracts as permitted by the Subcontracts or pursuing legal action to enforce the insurance requirements. In no event shall Recipient permit a contractor to work under a Subcontract when Recipient is aware that the contractor is not in compliance with the insurance requirements. As used in this section, a "first tier" contractor is a contractor with which Recipient directly enters into a contract. It does not include a subcontractor with which the contractor enters into a contract.

I. Return of Unexpended Grant Funds. No later than April 30, 2026, Recipient shall return to OSFM all Grant funds not expended by the Expiration Date.

SECTION 6 - DEFAULTS

Any of the following constitutes an "Event of Default":

A. Any false or misleading representation is made by or on behalf of Recipient, in this Agreement or in any document provided by Recipient related to this Grant.

B. Recipient fails to perform any obligation required under this Agreement, other than those referred to in subsection A of this section 6, and that failure continues for a period of 10 business days after written notice specifying such failure is given to Recipient by OSFM. OSFM may agree in writing to an extension of time if it determines Recipient instituted and has diligently pursued corrective action.

SECTION 7 - REMEDIES

A. Remedies. Upon any Event of Default, OSFM may pursue any or all remedies in this Agreement and any other remedies available at law or in equity to enforce the performance of any obligation of Recipient. Remedies may include, but are not limited to any one or more of the following:

(1) Terminating OSFM's commitment and obligation to make the Grant.

(2) Barring Recipient from applying for future awards.

(3) Withholding amounts otherwise due to Recipient for application to the payment of amounts due under this Agreement.

(4) Requiring repayment of the Grant and all interest earned by Recipient on those Grant funds.

B. Application of Moneys. Any moneys collected by OSFM pursuant to section 7.A will be applied first, to pay any attorneys' fees and other fees and expenses incurred by OSFM; then, as applicable, to repay any Grant proceeds owed; then, to pay other amounts due and payable under this Agreement, if any.

C. No Remedy Exclusive; Waiver; Notice. No remedy available to OSFM is intended to be exclusive, and every remedy will be in addition to every other remedy. No delay or omission to exercise any right or remedy will impair or is to be construed as a waiver of such right or remedy. No single or partial exercise of any right power or privilege under this Agreement will preclude any other or further exercise thereof or the exercise of any other such right, power or privilege. OSFM is not required to provide any notice in order to exercise any right or remedy, other than notice required in section 7 of this Agreement.

SECTION 8 - MISCELLANEOUS

A. Time is of the Essence. Recipient agrees that time is of the essence under this Agreement.

B. Relationship of Parties; Successors and Assigns; No Third-Party Beneficiaries.

(1) The parties agree that their relationship is that of independent contracting parties and that Recipient is not an officer, employee, or agent of the State of Oregon as those terms are used in ORS 30.265.

(2) Nothing in this Agreement gives, or is to be construed to give, directly or indirectly, to any third persons any rights and benefits greater than those enjoyed by the general public.

(3) This Agreement will be binding upon and inure to the benefit of OSFM, Recipient, and their respective successors and permitted assigns.

(4) Recipient may not assign or transfer any of its rights or obligations or any interest in this Agreement without the prior written consent of OSFM. OSFM may grant, withhold or impose conditions on such consent in its sole discretion. In the event of an assignment, Recipient shall pay, or cause to be paid to OSFM, any fees or costs incurred because of such assignment,

including but not limited to attorneys' fees of OSFM's counsel. Any approved assignment is not to be construed as creating any obligation of OSFM beyond those in this Agreement, nor does assignment relieve Recipient of any of its duties or obligations under this Agreement.

C. Disclaimer of Warranties; Limitation of Liability. Recipient agrees that:

(1) OSFM makes no warranty or representation.

(2) In no event are OSFM or its agents liable or responsible for any direct, indirect, incidental, special, consequential or punitive damages in connection with or arising out of this Agreement.

D. Notices and Communication. Except as otherwise expressly provided in this Agreement, any communication between the parties or notices required or permitted must be given in writing by personal delivery, email, or by mailing the same, postage prepaid, to Recipient or OSFM at the addresses set forth below, or to such other persons or addresses that either party may subsequently indicate pursuant to this Section.

Any communication or notice by personal delivery will be deemed effective when actually delivered to the addressee. Any communication or notice so addressed and mailed will be deemed to be received and effective five (5) days after mailing. Any communication or notice given by email becomes effective 1) upon the sender's receipt of confirmation generated by the recipient's email system that the notice has been received by the recipient's email system or 2) the recipient's confirmation of receipt, whichever is earlier. Notwithstanding this provision, the following notices may not be given by email: notice of default or notice of termination.

If to OSFM:
Grant Manager
Office of State Fire Marshal
3565 Trelstad Ave. SE
Salem, OR 97317
Ph: 503-779-8364
Email: osfm.grants@osp.oregon.gov

If to Recipient:
Jackson Dumanch
Public Works Project Coordinator
City of Sisters
P.O. Box 39
Sisters, OR. 97759
(541) 323-5220
jdumanch@ci.sisters.or.us

E. No Construction against Drafter. This Agreement is to be construed as if the parties drafted it jointly.

F. Severability. If any term or condition of this Agreement is declared by a court of competent jurisdiction as illegal, invalid or unenforceable, that holding will not invalidate or otherwise affect any other provision.

G. Amendments, Waivers. This Agreement may not be amended without the prior written consent of OSFM (and when required, the Department of Justice) and Recipient. This Agreement may not be amended in a manner that is not in compliance with the Authorization. No waiver or consent is effective unless in writing and signed by the party against whom such waiver or consent is sought to be enforced. Such waiver or consent will be effective only in the specific instance and for the specific purpose given.

H. Attorneys' Fees and Other Expenses. To the extent permitted by the Oregon Constitution and the Oregon Tort Claims Act, the prevailing party in any dispute arising from this Agreement is entitled to recover its reasonable attorneys' fees and costs at trial and on appeal. Reasonable attorneys' fees cannot exceed the rate charged to OSFM by its attorneys.

I. Choice of Law; Designation of Forum; Federal Forum. The laws of the State of Oregon (without giving effect to its conflicts of law principles) govern all matters arising out of or relating to this Agreement, including, without limitation, its validity, interpretation, construction, performance, and enforcement.

Any party bringing a legal action or proceeding against any other party arising out of or relating to this Agreement shall bring the legal action or proceeding in the Circuit Court of the State of Oregon for Marion County (unless Oregon law requires that it be brought and conducted in another county). Each party hereby consents to the exclusive jurisdiction of such court, waives any objection to venue, and waives any claim that such forum is an inconvenient forum.

Notwithstanding the prior paragraph, if a claim must be brought in a federal forum, then it must be brought and adjudicated solely and exclusively within the United States District Court for the District of Oregon. This paragraph applies to a claim brought against the State of Oregon only to the extent Congress has appropriately abrogated the State of Oregon's sovereign immunity and is not consent by the State of Oregon to be sued in federal court. This paragraph is also not a waiver by the State of Oregon of any form of defense or immunity, including but not limited to sovereign immunity and immunity based on the Eleventh Amendment to the Constitution of the United States.

J. Integration. This Agreement (including all exhibits, schedules or attachments) constitutes the entire agreement between the parties on the subject matter. There are no unspecified understandings, agreements or representations, oral or written, regarding this Agreement.

K. Survival. The following provisions, including this one, survive expiration or termination of this Agreement: Sections 5.E., 5.F., 5.G., 5.I., 5.J., 7 and 8.

L. Execution in Counterparts. This Agreement may be signed in several counterparts, each of which is an original and all of which constitute one and the same instrument.

Recipient, by its signature below, acknowledges that it has read this Agreement, understands it, and agrees to be bound by its terms and conditions.

STATE OF OREGON acting by and through its Oregon State Police on behalf of Oregon State Fire Marshal's Office	**CITY OF SISTERS**
By: _____	By: _____
Date: _____	Date: _____

APPROVED AS TO LEGAL SUFFICIENCY IN ACCORDANCE WITH ORS 291.047:

Approved via email by Samuel Zeigler on 1/18/2023

Senior Assistant Attorney General

I. Purpose and Scope

The purpose of this Grant is to award dollars for defensible space available to protect people, property, and communities from wildfire through community risk reduction programs and projects. See the 2022 CWRR Grant Application and Manual for more information. The defensible space work needs to match OSFM's standards described at this link: https://www.oregon.gov/osp/programs/sfm/pages/oregon-defensible-space-code.aspx

Recipient shall implement the following projects.

A. Project 1: ($53,500.00) This project location is the forested area around the City's wastewater treatment facility. A portion of forested area is used for the disposal of treated effluent and as a result experiences substantial vegetative growth that requires annual mowing. The forested area accounts for about 100 acres of the property. The northern 30 acres of the 100-acre forested area would be part of this project due to unhealthy stand densities and accumulated ladder fuels. The remaining unforested area of about 55 acres is where the wastewater treatment facility, public works headquarters, maintenance shop, and vehicle and materials storage are located. The site is bordered to the north by residential and commercial developments, to the east by privately-owned open fields and to the south and west by US Forest Service property. The City maintains the area by performing annual maintenance of the forest including mowing to keep weeds and brush down and removing hazardous trees that pose a threat to staff, infrastructure, and the public when the tree is along the property boundary. The forest health has been deemed poor in the City's Wildfire Risk Assessment and Mitigation Plan (2022) likely due to the high density of trees and has been determined capable of supporting a crown fire. Much of the forest floor contains large woody debris, pine needles and cones, and dead brush. The 30 acres considered in this project are immediately north of the Public Works Headquarters facility. The area is particularly dense with trees and poses risk to the facility and the immediately adjacent properties to the north containing residential and commercial developments. Tree density is so high that it prevents City Public Works staff from accessing areas for mowing of weeds and brush that grow rapidly and abundantly due to the irrigation. Recipient shall use grant funds to implement recommendations made in the City's Wildfire Risk Assessment and Mitigation Plan with the treatment specifications that have been developed such as removing all Juniper trees, thin Ponderosa Pines to increase crown spacing between single and groups of trees and remove slash. The site is shovel ready and the project would proceed immediately.

B. Project 2: ($18,500.00) This proposed project location is heavily stocked with surface fuels, ladder fuels and Ponderosa Pines. Recipient shall use grant funds to implement recommendations made in the City's Wildfire Risk Assessment and Mitigation Plan by removing all Juniper trees, thin Ponderosa Pines to increase crown spacing between single and groups of trees and remove slash.

II. Reporting Requirements

1. Recipient shall provide OSFM with a progress report in each of the following months: June 2023; December 2023; June 2024; December 2024; June 2025; and December 2025. Recipient shall provide a final progress report no later than April 15, 2026. Each progress report shall include Recipient's updated work plan.
2. Before each reporting month, OSFM will email Recipient a link to the electronic report due for that month.
3. If Recipient completes the Project and expends all Grant funds before March 31, 2026, it may close out the program upon submission of a final report to OSFM.
4. Recipient shall attend a kick-off meeting either in-person or virtual and notification will be sent to Recipient via email with details.

EXHIBIT B – SUBCONTRACT INSURANCE REQUIREMENTS

Recipient shall require each of its first-tier contractors that are not units of local government as defined in ORS 190.003 (each a "Contractor") to obtain, at the Contractor's expense, the insurance specified in this Exhibit B before performing under this Contract and to maintain it in full force and at the Contractor's own expense throughout the duration of this Contract, as required by any extended reporting period or continuous claims made coverage requirements, and all warranty periods that apply. Contractors shall obtain the following insurance from insurance companies or entities that are authorized to transact the business of insurance and issue coverage in the State of Oregon and that are acceptable to OSFM. Coverage shall be primary and non-contributory with any other insurance and self-insurance, with the exception of Professional Liability and Workers' Compensation. Contractors shall pay for all deductibles, self-insured retention and self-insurance, if any. Recipient shall require and ensure that each of its Contractors complies with these requirements and maintains insurance policies with responsible insurers, insuring against liability, in the coverages and amounts identified below.

WORKERS' COMPENSATION & EMPLOYERS' LIABILITY
All employers, including Contractors, that employ subject workers, as defined in ORS 656.027, shall comply with ORS 656.017 and provide workers' compensation insurance coverage for those workers, unless they meet the requirement for an exemption under ORS 656.126(2). Recipient shall require and ensure that each of its Contractors complies with these requirements. If a Contractor is a subject employer, as defined in ORS 656.023, the Contractor shall also obtain employers' liability insurance coverage with limits not less than $500,000 each accident. If the Contractor is an employer subject to any other state's workers' compensation law, Contactor shall provide workers' compensation insurance coverage for its employees as required by applicable workers' compensation laws including employers' liability insurance coverage with limits not less than $500,000 and shall require and ensure that each of its out-of-state subcontractors complies with these requirements.

As applicable, each Contractor shall obtain coverage to discharge all responsibilities and liabilities that arise out of or relate to the Jones Act with limits of no less than $5,000,000 and/or the Longshoremen's and Harbor Workers' Compensation Act.

COMMERCIAL GENERAL LIABILITY:
☒ **Required** ☐ **Not required**
Commercial General Liability Insurance covering bodily injury and property damage in a form and with coverage that are satisfactory to the State. This insurance shall include personal and advertising injury liability, products and completed operations, contractual liability coverage for the indemnity provided under this contract, and have no limitation of coverage to designated premises, project or operation. Coverage shall be written on an occurrence basis in an amount of not less than $1,000,000 per occurrence. Annual aggregate limit shall not be less than $2,000,000.

AUTOMOBILE LIABILITY INSURANCE:
☒ **Required** ☐ **Not required**
Automobile Liability Insurance covering each Contractor's business use including coverage for all owned, non-owned, or hired vehicles with a combined single limit of not less than $1,000,000 for bodily injury and property damage. This coverage may be written in combination with the Commercial General Liability Insurance (with separate limits for Commercial General Liability and Automobile Liability). Use of personal automobile liability insurance coverage may be acceptable if evidence that the policy includes a business use endorsement is provided.

EXCESS/UMBRELLA INSURANCE
Umbrella insurance coverage in the sum of $2,000,000 shall be provided and will apply over all liability policies, without exception, including but not limited to Commercial General Liability, Automobile Liability, and Employers' Liability coverage. The amounts of insurance for the insurance required under this Contract, including this Excess/Umbrella insurance requirement, may be met by the Contractor obtaining coverage for the limits specified under each type of required insurance or by any combination of underlying, excess and umbrella limits so long as the total amount of insurance is not less than the limits specified for each type of required insurance added to the limit for this excess/umbrella insurance requirement.

ADDITIONAL INSURED:
All liability insurance, except for Workers' Compensation, Professional Liability, and Network Security and Privacy Liability (if applicable), required under this Contract must include an additional insured endorsement specifying the State of Oregon, its officers, employees and agents as Additional Insureds, including additional insured status with respect to liability arising out of ongoing operations and completed operations, but only with respect to a Contractor's activities to be performed under this Contract. Coverage shall be primary and non-contributory with any other insurance and self-insurance. The Additional Insured endorsement with respect to liability arising out of your ongoing operations must be on ISO Form CG 20 10 07 04 or equivalent and the Additional Insured endorsement with respect to completed operations must be on ISO form CG 20 37 07 04 or equivalent.

WAIVER OF SUBROGATION:
Each Contractor shall waive rights of subrogation which the Contractor or any insurer of the Contractor may acquire against the OSFM or State of Oregon by virtue of the payment of any loss. Each Contractor will obtain any endorsement that may be necessary to affect this waiver of subrogation, but this provision applies regardless of whether or not the OSFM has received a waiver of subrogation endorsement from the Contractor or the Contractor's insurer(s).

CERTIFICATE(S) AND PROOF OF INSURANCE:
Upon request, each Contractor shall provide to OSFM Certificate(s) of Insurance for all required insurance before delivering any Goods and performing any Services required under this Contract. The Certificate(s) shall list the State of Oregon, its officers, employees and agents as a Certificate holder and as an endorsed Additional Insured. The Certificate(s) shall also include all required endorsements or copies of the applicable policy language effecting coverage required by this Contract. If excess/umbrella insurance is used to meet the minimum insurance requirement, the Certificate of Insurance must include a list of all policies that fall under the excess/umbrella insurance. As proof of insurance OSFM has the right to request copies of insurance policies and endorsements relating to the insurance requirements in this Contract.

NOTICE OF CHANGE OR CANCELLATION:
Each Contractor or its insurer must provide at least 30 days' written notice to OSFM before cancellation of, material change to, potential exhaustion of aggregate limits of, or non-renewal of the required insurance coverage(s).

INSURANCE REQUIREMENT REVIEW:
Recipient agrees to periodic review of insurance requirements by OSFM under this Contract and to provide updated requirements as mutually agreed upon by Recipient and OSFM.

STATE ACCEPTANCE:
All insurance providers are subject to OSFM acceptance. If requested by OSFM, Recipient shall provide complete copies of insurance policies, endorsements, self-insurance documents and related insurance documents to OSFM's representatives responsible for verification of the insurance coverages required under this Exhibit B.