City of Walla Walla

Watershed Master Resiliency Plan

January 2025

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Executive Summary

ES.1 Introduction

The City of Walla Walla (City) operates a drinking water system serving approximately 35,000 residents, primarily sourced from the Mill Creek Watershed, which provides 85 to 90 percent of annual supply. The watershed spans two states and four counties, with 90 percent federally owned. Water is treated at the City's unfiltered Water Treatment Plant (WTP) rated for 24 million gallons per day.

The water system faces significant risks from wildfire, flooding, landslides, drought, and weather volatility, which could temporarily eliminate access to surface water. For example, flooding in 2020 damaged infrastructure, forcing reliance on groundwater for three months. To address these vulnerabilities, the City secured Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure and Communities (BRIC) program funding to develop a Watershed Master Resiliency Plan (Watershed Master Plan) to ensure a safe, reliable, and high-quality drinking water supply for the City. This plan assesses risks and provides prioritized recommendations to strengthen water supply reliability.

ES.1.1 Scope of Work

The scope of this Watershed Master Plan includes hazard and risk assessment, resource and capability inventory, development of a watershed resiliency strategy, implementation and funding mechanisms, and a recovery framework. It integrates technical analysis, stakeholder engagement, and prioritization of mitigation actions to reduce risks and improve long-term sustainability.

ES.1.2 Organization of the Report

This report is organized into chapters, as described in **Table ES-1**. **Table ES-1** also indicates the relevant chapters for different audience members.

Table ES-1 | Walla Walla Watershed Master Resiliency Plan Organization and Audience

Chapter	Description	Audience
1. Introduction and Project Overview	Provides an introduction and project overview and discusses the establishment of a project scoping team and Stakeholder Technical Committee.	City leadership, technical staff, stakeholders, community members
2. Vision, Goals, and Objectives	Defines the City's vision for watershed resiliency and outlines strategic goals and objectives that guided the Watershed Master Plan development.	City leadership, planning staff, stakeholders
3. Watershed Data Summary	Compiles and reviews existing watershed and water system information, including planning documents, technical studies, and hazard mitigation plans. It also summarizes completed mitigation projects and provides context for risk assessment and resiliency strategies.	Planning staff
4. Hazard and Risk Assessment	Presents a comprehensive hazard and risk assessment for the Mill Creek Watershed and water system, including wildfire, flooding, drought, and climate impacts.	Emergency management, technical staff, planning staff
5. Resource & Capabilities Inventory	Documents available resources and capabilities among City departments and partner agencies, identifying gaps and opportunities for collaboration.	City leadership, emergency management, stakeholders

Chapter	Description	Audience
6. Watershed Resiliency Strategy	Defines mitigation actions based on SWOT analysis and hazard-informed planning, including feasibility and prioritization.	City leadership, technical staff, funding partners, community members
7. Implementation & Funding Strategy	Outlines funding strategies, including federal, state, and local programs, and provides a framework for prioritizing projects and aligning them with funding opportunities.	City leadership, finance staff, grant writers
8. Recovery Plan	Provides a post-event recovery framework, including pre-event actions, response protocols, and coordination strategies to restore water system functionality after a hazard event.	Emergency management, operations staff, City leadership

ES.2 Introduction & Project Overview

The planning process for the Watershed Master Plan was guided by a project scoping team and a stakeholder workgroup, ensuring alignment with regional water resource initiatives and incorporating technical expertise and community perspectives. A comprehensive outreach strategy engaged watershed partners, tribal representatives, and local residents through regular workgroup meetings and two public events, including an open house to review the draft plan. Input from stakeholders and community members was instrumental in shaping the plan's priorities and strategies, ensuring it is a practical and beneficial tool for protecting the City's water supply. These collaborative efforts established clear objectives, communication protocols, and decision-making processes that form the foundation for resiliency strategies and prioritized actions.

ES.3 Vision, Goals, Objectives

The Watershed Master Plan establishes a clear vision, strategic goals, and actionable objectives to guide long-term management of the Mill Creek Watershed. This framework ensures a coordinated approach to protecting the City's municipal drinking water supply while promoting sustainability and resilience in the face of weather volatility and natural hazards.

ES.3.1 Vision Statement

The vision for the Mill Creek Watershed is to support and provide the City with a plentiful, reliable, and high-quality drinking water supply, while maintaining a healthy balance with the watershed's natural ecosystem.

ES.3.2 Strategic Goals

Building on this vision, the Watershed Master Plan defines five strategic goals.

1. Enhance Water Supply Resiliency: Protect and maintain water quality and quantity through integrated management strategies.

2. Mitigate Wildfire and Natural Hazard Risks: Reduce risks and strengthen infrastructure against natural hazards.

3. Promote Sustainable Watershed Management: Support land and forest practices that reduce risk and align with regional planning efforts.

4. Strengthen Community Partnerships: Engage stakeholders, tribal partners, and residents in watershed stewardship.

5. Funding and Implementation: Position the City to secure federal, state, and nonprofit funding for resiliency actions.

ES.3.3 Primary Objective

The primary objective of the Watershed Master Plan is to establish a comprehensive framework that strengthens long-term watershed resiliency through prioritized investments and actionable strategies. Informed by hazard analysis and stakeholder collaboration, this framework integrates directly into the City's Capital Improvement Program (CIP) and recovery planning. By translating strategic goals into targeted mitigation projects and funding opportunities, the plan ensures each focus area is addressed through coordinated, on-the-ground improvements that support a sustainable and climate-adaptive approach to managing the Mill Creek Watershed.

ES.4 Watershed Data Summary

Existing information was compiled to guide planning and avoid duplication. Key resources included record drawings, the Water System and Well Master Plans, treatment process reports, wildfire impact studies, and regional hazard mitigation and emergency response plans. This review established the baseline for risk assessment and resiliency strategies.

ES.5 Watershed and Water System Hazard and Risk Assessment

A comprehensive hazard and risk assessment was conducted to evaluate threats to the City's municipal drinking water supply system and the Mill Creek Watershed. The analysis focused on critical infrastructure including the intake diversion structure, raw water transmission main, and WTP, and considered environmental, operational, social, and economic factors. The assessment integrated historical data, stakeholder input, and geospatial review to identify vulnerabilities and prioritize mitigation actions. Key steps included:

- Identifying hazards and reviewing historical events
- Conducting a vulnerability assessment of critical assets
- Applying a qualitative risk framework using likelihood, impact, and severity ratings
- Developing a risk summary table to guide mitigation planning

ES.5.1 Hazards Evaluated

Multiple hazard categories were analyzed.

- Wildfire: Increasing frequency and severity pose significant risks to water quality and infrastructure.

- Flooding: Historical floods in 1931, 1964, 1996, and 2020 caused major infrastructure damage, including washouts of the raw water transmission main and inundation of the intake facility.

- Earthquake: Seismic activity along regional fault lines could damage pipelines, reservoirs, and treatment facilities.

- Drought: Recurring droughts (2001, 2015, 2021) have stressed water resources and increased reliance on groundwater.

- Weather Volatility: Rising temperatures and variable precipitation patterns are expected to intensify wildfire risk, alter runoff timing, and increase flooding and drought frequency.

- Political, Social, and Economic Hazards: Funding constraints, regulatory changes, and loss of institutional knowledge may hinder implementation of resiliency measures.

ES.5.2 Water System Assets

The assessment cataloged key assets, including:

- Raw water intake - diversion system and surrounding area
- 14.5-mile raw water transmission main
- WTP facilities (sedimentation basins, roughing filters, ultraviolet disinfection, chlorine building, reservoirs, and finished water storage)

Condition assessments were performed through document review and site visits, focusing on structural integrity, operational reliability, and vulnerability to hazards. Detailed findings are provided in supporting appendices.

ES.5.3 Risk Assessment Framework

Risks were rated based on likelihood and impact, producing a severity score that guided prioritization. Interdependencies among hazards, such as wildfire increasing flood risk, were considered. A comprehensive risk matrix was developed to consolidate all identified risks, their hazard category, and status for mitigation planning. Projects specific to the WTP are detailed in Appendix I.

ES.6 Resource and Capabilities Inventory

The resource and capabilities inventory assessed the City's internal resources and those of partner agencies to support hazard mitigation and emergency response. It identified strengths in communication systems, technical expertise, and stakeholder engagement, as well as gaps in equipment availability and coordination protocols. Key findings include:

- Existing emergency communication systems and protocols, with opportunities to standardize messaging and integrate warning systems.

- Strong technical expertise among partners for hazard mitigation, ecological restoration, and emergency response.

- Limited availability of critical equipment such as backup generators and heavy machinery, highlighting the need for resource-sharing agreements.

- Opportunities to expand public education and outreach programs to strengthen community preparedness.

These findings inform the resiliency strategy and recovery framework by clarifying capabilities that can be mobilized during emergencies and identifying areas for improvement.

ES.7 Watershed Resiliency Strategy

The watershed resiliency strategy translates risk assessment and stakeholder input into actionable mitigation measures to reduce risks and enhance long-term water system reliability. It combines:

- Strengths, weaknesses, opportunities, and threats (SWOT)-derived strategies to leverage strengths, address weaknesses, and capitalize on opportunities for collaboration and funding.
- Hazard-informed actions targeting vulnerabilities identified in the risk assessment. Mitigation actions are grouped into categories such as infrastructure improvements, burn severity mitigation, watershed and stream restoration, and land management.

Each action includes feasibility, cost, and timeline considerations, forming the basis for integration into the City's CIP. **Table ES-2** and **Table ES-3** summarize all mitigation actions generated as part of the watershed resiliency strategy, including their general purpose, effort level, estimated cost, and implementation timeframe.

Table ES-2 | Summary of Mitigation Actions – SWOT Derived

Project ID Project Name	Description / Focus	Effort Level	Estimated Cost	Implementation Schedule
WS6 Water Resiliency & Outreach Program (WROP)	Consolidated initiatives to improve education, funding awareness, partnerships, and institutional capacity.	Low–Moderate	\$100 k – \$250 k (total)	Initiate 1–2 yrs: Individual Initiatives are ongoing
Strength-Opportunity Community Outreach & Education	Formalize and expand City's outreach on water conservation and resiliency with partners and schools.	Low	Included in WROP	
Strength-Opportunity Watershed Collaboration & Partnerships	Leverage Walla Walla 2050 and partnerships to coordinate watershed-resiliency initiatives.	Moderate	Included in WROP	
Weakness-Opportunity Public Funding Awareness	Increase community understanding and support for water-system funding and rate structures.	Low	Included in WROP	
Weakness-Threat Institutional Knowledge Capture & Succession	Document operational procedures and lessons learned; cross-train key roles.	Low	Included in WROP	
WS7 Emergency Preparedness & Continuity Plan	Maintain and update Recovery Plan; align with COOP and ERP to keep emergency preparedness consolidated and current.	Low	\$10 k – \$25 k	5-yr updates
WS8 ASR Optimization & Expansion	Study and expand ASR operations to improve drought resiliency and supply reliability.	Moderate	TBD (study + phased work)	0-5 yrs/ongoing

Table ES-3 | Summary of Mitigation Actions – Hazard Derived

Project ID Project Name	Description / Focus	Effort Level	Estimated Cost	Implementation Schedule
Infrastructure Improvements				
IN1 Pedestrian Bridge Anchor Replacement	Upgrade bridge anchors for safe access to gaging station.	Low	$20 k	0–5 yrs
IN2 Bridge Replacement and Wildland Fire Response Support Site at Barn/Corral Access	Replace bridge for emergency access and convert barn/corral into fire-response support site with equipment storage and water fill capability.	High	$750 k	5–10 yrs
IN3 Intake Control Building Replacement	Construct new fire/flood-resistant control building at intake.	High	$1.5 M	10+ yrs
IN4 Standby Power System Replacement at Intake	Replace aging generator and ATS to maintain backup power at intake site.	Moderate	$120 k	0–5 yrs
IN5 Telemetry Replacement between Intake and WTP	Upgrade to cellular and/or satellite-based communication system (e.g., Starlink).	Moderate	$150 k	0-5 yrs
IN6 Electrical System Replacement at Intake Structure	Replace and relocate electrical feeders and controls underground for reliability.	Moderate	$150 k	0–5 yrs
Burn Severity Mitigation				
WS1 Watershed Intake Defensible Space Enhancement	Maintain defensible space and reduce fuel load around intake infrastructure.	Low	$40 k	Recurring (5-yr cycle)
WS2 Watershed-Extensive Hazardous Fuels Assessment and Prescription Project	Implement targeted thinning and reduce fuel on City-owned land within the watershed.	High	$1 M	0-5 yrs
Watershed & Stream Restoration				
WS3 Mill Creek Channel Resiliency Study	Study channel response and debris flow risks upstream of diversion dam.	Moderate	$100 k	+10 yrs
WS4 Mill Creek Channel Restoration Implementation	Implement restoration measures identified in WS4 study.	Moderate	TBD (post-design)	Beyond planning horizon
Land Management & Acquisition				
WS5 Private Parcel Ownership Transition	Acquire private parcels within watershed to enable proactive fire and access management.	High	$3 k – $13 k per acre	+ 10 yrs

ES.8 Funding Plan

The Funding Plan provides a roadmap for financing and prioritizing mitigation actions. It includes:

- Federal programs (e.g., FEMA BRIC), Hazard Mitigation Grant Program, United States Army Corps of Engineers Continuing Authorities Program).
- State programs (e.g., Floodplains by Design, Drinking Water State Revolving Fund).
- Local options (municipal bonds, utility fees).

The chapter introduces a funding alignment matrix for near-term projects and summarizes historical grants received by the City, offering practical guidance for future applications. While a summary version of the matrix is included in **Appendix L**, the full matrix with live links will be maintained by the City as a dynamic document to support ongoing funding research and application efforts. Due to formatting constraints, the PDF appendix does not include all details from the spreadsheet, as printing the full version would reduce readability.

ES.9 Recovery Plan

The Recovery Plan establishes a framework for restoring water system functionality following hazard events. It includes pre-event actions such as emergency response coordination and equipment inventory, as well as response and recovery protocols for wildfire, flooding, drought, and infrastructure failures. The plan integrates with the City's Emergency Response Plan and Continuity of Operations Plan to ensure consistency and efficiency. It also emphasizes coordination with partner agencies for long-term watershed restoration and infrastructure repair, providing a clear roadmap for both immediate and sustained recovery efforts.

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CHAPTER 1

Introduction and Project Overview

1.1 Introduction and Purpose

The City of Walla Walla (City) is located at the base of the Blue Mountains in Walla Walla County, in the southeast corner of Washington State and is less than 10 miles from the Oregon State border. The City owns and operates a drinking water system that serves a population of about 35,000 people and uses surface water as the primary supply supplemented by seven deep basalt groundwater wells. The surface water source originates in the protected 36-square-mile Mill Creek Watershed with the intake located 14.5 miles east of the City. The Mill Creek Watershed straddles two states and four counties, two in each state, and 90 percent of the watershed is owned by the United States Forest Service (USFS), as shown in **Figure 1-1**. The ratio of surface water and groundwater supply to the City's water system varies each year but typically the City relies on the Mill Creek Watershed for approximately 85 to 90 percent of its annual water supply. Surface water is treated at the City's Water Treatment Plant (WTP) which is an unfiltered WTP which utilizes an upflow roughing filter for turbidity reduction and ultraviolet (UV) light for primary disinfection and chlorination to maintain distribution system residual disinfection. The WTP is rated to treat up to 24 million gallons a day (MGD).

The City's surface water supply system is vulnerable to threats from wildland fires, floods, landslides, drought, and weather volatility that could impact the quality and quantity of water supply and, in extreme cases, could prevent the City from using the surface water supply source for a significant period of time. For example, excessive flooding in 2020 washed out portions of the City's raw water transmission main which put the surface water supply out of service for three months. During that time, the City had to transition fully to their groundwater supply. A severe wildfire in the Mill Creek Watershed is a major concern which would significantly affect water quality and, because the existing WTP is unfiltered, likely prevent the City from using surface water until water quality is restored in Mill Creek.

The City received Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure and Communities (BRIC) Fiscal Year 2021 funds under Grant Number D24-024 to develop a comprehensive Watershed Master Resiliency Plan (Watershed Master Plan) with the objective of improving the resiliency of the municipal drinking water supply from the Mill Creek Watershed. The project focused on addressing water quality and quantity degradation proactively and comprehensively, anticipating weather extremes induced impacts to the Mill Creek Watershed that could negatively affect water quality and impact the City's water supply infrastructure. It provides an assessment, analysis, resiliency strategy, and recovery plan to aid the City in prioritizing its improvement investments.

WALLA WALLA WATERSHED MASTER RESILIENCY PLAN

Figure 1.1
Mill Creek Watershed

Map Printed December 2025

Project No. W219901WA.200

A project scoping team was established, comprised of City and Consultant team members (discussed in **Section 1.3.1**) as well as a stakeholder partner committee that consisted of watershed stakeholders, tribal partners, and city residents (discussed in **Section 1.3.3**). Both groups were essential in guiding the project from planning through successful completion, ensuring that it aligned with other regional initiatives around water resource management and sustainability and delivered meaningful benefits to the resilience and sustainability of the City's surface water supply. This approach ensured that the project was thorough and impactful, fostering active engagement and collaboration to effectively address the City's long-term goals for a resilient and sustainable water system.

1.2 Project Scope Overview

The Watershed Master Plan was developed to strengthen the City's ability to protect its municipal drinking water supply from the Mill Creek Watershed against hazards such as wildfire, flooding, drought, and weather volatility. The plan provides a roadmap for reducing risks, improving infrastructure resiliency, and ensuring a safe and reliable water supply for the community. The scope of work included five core elements.

- Hazard and Risk Assessment
- Resource and Capability Inventory
- Development of a Watershed Resiliency Strategy
- Implementation and Funding Framework
- Recovery Planning

These elements were completed through a structured process that combined technical analysis, stakeholder engagement, and public input. Each major task in the scope corresponds to a chapter in this plan, ensuring transparency and alignment between planning activities and the final document.

1.2.1 Major Project Tasks and Associated Chapters in the Plan

- <u>Chartering the Project Scoping Team and Establishing the Stakeholder Partner Committee</u>: These foundational steps set objectives, roles, and communication protocols, and brought together agencies, tribal representatives, and community partners to guide the planning process. **Chapter 1**, Introduction and Project Overview

- <u>Vision, Goals, and Objectives Development</u>: Defined the long-term vision and strategic goals for watershed resiliency, informed by stakeholders and public input. **Chapter 2**, Vision, Goals, and Objectives

- <u>Data Collection and Review</u>: Compiled existing watershed and water system information, including environmental studies, infrastructure records, and hazard mitigation plans, to build a strong technical foundation. **Chapter 3**, Watershed Data Summary

- <u>Hazard Identification and Risk Assessment</u>: Evaluated vulnerabilities to wildfire, flooding, drought, and seismic events, assessed potential impacts on critical water infrastructure, and developed a risk matrix to guide mitigation planning. **Chapter 4**, Watershed and Water Treatment Plan Hazard and Risk Assessment

- <u>Resource and Capability Inventory</u>: Assessed available resources among City departments and stakeholders to support mitigation and recovery actions. **Chapter 5**, Capabilities Inventory

- Resiliency Strategy and Mitigation Actions: Developed actionable strategies to reduce risks and improve watershed health, based on hazard analysis and stakeholder priorities. **Chapter 6**, Watershed Resiliency Strategy

- Implementation and Funding Plan: Identified funding sources and developed a framework for prioritizing projects and aligning them with grant opportunities. **Chapter 7**, Funding Plan

- Recovery Framework: Established a post-event recovery plan to guide restoration and ensure continuity of water service after a hazard event. **Chapter 8**, Recovery Plan

1.3 Planning Process

1.3.1 Project Scoping Team

The Watershed Master Plan was initiated by the City, with Consor contracted to conduct and facilitate the planning process. The project team included Consor's internal staff as well as key consulting firms Fluent Freshwater Insights (Fluent), Cascadia Consulting Group (Cascadia), and Northwest Management, Inc (NMI), forming a collaborative and multidisciplinary team to execute the project.

Early in the planning process, a project scoping team was initially assembled to confirm project objectives, establish team roles, outline responsibilities, and guide the project from inception through completion. This team, comprised of key members from both the consultant team and the City, held its first meeting in July 2024 to officially launch the project, setting key objectives, communication protocols, project scope, schedule, and defining roles and responsibilities. Regular meetings were held throughout the project to ensure adherence to the established scope. The key team members and associated project responsibilities are listed in **Table 1-1**.

Table 1-1 | Project Scoping Team

Individual	Company & Role	Responsibilities
Ki Bealey	City of Walla Walla: City Public Works Director	Offer strategic guidance and approve key project decisions to ensure alignment with City priorities.
Adam Klein	City of Walla Walla: City Project Manager	Lead City direction for the project, coordinate with City administration on strategic guidance and decision-making. Coordinate City review of deliverables and final acceptance.
Adrian Sutor	City of Walla Walla: Water Operations Manager	Water treatment and distribution facility operations and conditions input.
Heather Pina	Consor: Consultant Project Manager	Lead consultant team and coordinate communication with City. Lead/coordinate the completion of tasks, development of deliverables and reviews.
Amanda Cronin	Fluent: Public Water Resource/ Watershed Management Lead	Coordinate public outreach, lead Stakeholder interface.
Adam Herrenbruck	NMI: Forestry Management Lead	Provide technical input and review on forestry management, specific to forestry management, wildlife impacts, fire mitigation.
Ryan Billen	Consor: Water Treatment Technical Lead	Provide technical input and review on water treatment resiliency improvements

1.3.2 Public Outreach

A critical element of the planning effort is collaborative input from watershed stakeholders, tribal partners, and city residents. An outreach strategy was prepared at the start of the project that provided a framework and roadmap for the City and the Consor project team to engage community members and key partners in the Watershed Master Plan. Through outreach and engagement, the following objectives were met for the Watershed Master Plan.

- Assess community understanding of the municipal watershed's risk.
- Raise awareness and build community support for future mitigation actions and implementation.
- Create meaningful opportunities for stakeholders and partners to provide guidance and technical support throughout the project.
- Involve stakeholders and partners in the assessment and review of possible mitigation actions.
- Understand partner capabilities to support future mitigation actions and response and recovery efforts.
- Integration with the Walla Walla Water Basin 2050 Strategic Plan (Walla Walla 2050) group strategies.

Target audiences to engage throughout the project lifecycle and at project milestones were identified including city residents, tribal partners, federal government, local government and organizations, and state agencies. Of these key audiences, there are two broader categories: watershed partners and stakeholders, and local community members. Different outreach tactics to engage each audience category were utilized and are discussed further in **Sections 1.3.3** and **1.3.4**.

1.3.3 Watershed Partners and Stakeholders

An effective, implementable Watershed Master Plan requires collaboration with watershed stakeholders, tribal partners, and city residents. The project scoping team assembled a stakeholder partner committee, herein referred to as the Workgroup, which operated as an advisory committee, guiding the planning effort throughout the development of the Watershed Master Plan. Emphasis was placed on effective communication to ensure that the planning process would lead to a resiliency strategy that had the input and support from appropriate watershed partners and stakeholders. User-friendly engagement opportunities were employed to make the collaborative process accessible, foster long-term involvement, and encourage community participation to garner public support for the Watershed Master Plan.

The Workgroup included representatives of the following watershed partners and stakeholders.

- Local Government and Organizations
  - City of Walla Walla Public Works
  - Walla Walla County Emergency Management
  - Walla Walla Fire District No. 4
  - City of Walla Walla Fire Department
  - Walla Walla Basin Watershed Council
  - Kooskooskie Commons
  - Walla Walla Conservation District
  - Walla Walla Watershed Council
  - City of Milton–Freewater

   - Blue Mountain Land Trust
- Tribal Government: The Confederated Tribes of the Umatilla Indian Reservation
- Federal Government
   - United States Army Corps of Engineers
   - United States Forest Service
- State Agencies
   - Washington Department of Natural Resources
   - Washington Department of Fish and Wildlife
   - Washington Department of Health
   - Washington State Department of Emergency Management
   - Oregon Department of Foresty
- Walla Walla Community Members
- Engineering Consultants: Confluence West & Perteet Inc

Members of this Workgroup were actively engaged to guide work conducted throughout the project, so that the Watershed Master Plan could benefit from their technical expertise and local and institutional knowledge. The Workgroup member list is shown in **Appendix A**.

1.3.3.1 Workgroup Project Meetings

Regular workgroup meetings were essential throughout the project, creating a consistent forum for input, project updates, and collaborative discussions. The Workgroup met multiple times over the course of the project, providing valuable feedback on specific chapter development, resource and risk assessments, capabilities to support the resiliency strategy, mitigation and recovery planning, and community outreach activities. To maximize attendance and accessibility, meetings were held in a hybrid format, offering both in-person and virtual participation options. The timing and objective of each Workgroup meeting are detailed in **Table 1-2**. Workgroup agendas and meeting notes are provided in **Appendix B**.

Table 1-2 | Workgroup Meeting Schedule and Objectives

Meeting Number	Meeting Date	Meeting Agenda/Objective
1	10/24/2024	➢ Project Overview: Objectives, Scope of Work, and Schedule ➢ Workgroup Objectives and Goals ➢ Mill Creek Watershed – Water Supply Overview ➢ Public Outreach Plan ➢ Capabilities Overview
2	03/12/2025	➢ Forest Health & Mitigation Alternatives ➢ Resources and Capabilities Inventory Results
3	05/29/2025	➢ Watershed Resiliency and Mitigation Actions ➢ Northern Blues Restoration Partnership ➢ Public Outreach Update
4	07/22/2025	➢ SWOT Analysis Exercise ➢ Funding Strategy Update ➢ City of Flagstaff Bond Program ➢ Public Outreach Update

Meeting Number	Meeting Date	Meeting Agenda/Objective
5	10/23/2025	➢ Recovery Plan Overview ➢ SWOT Analysis Results and Next Steps ➢ Public Outreach Update and Fall Workshop Discussion
6	2/25/2025	➢ Project Updates and November Open House Highlights ➢ Full Watershed Master Plan Discussion

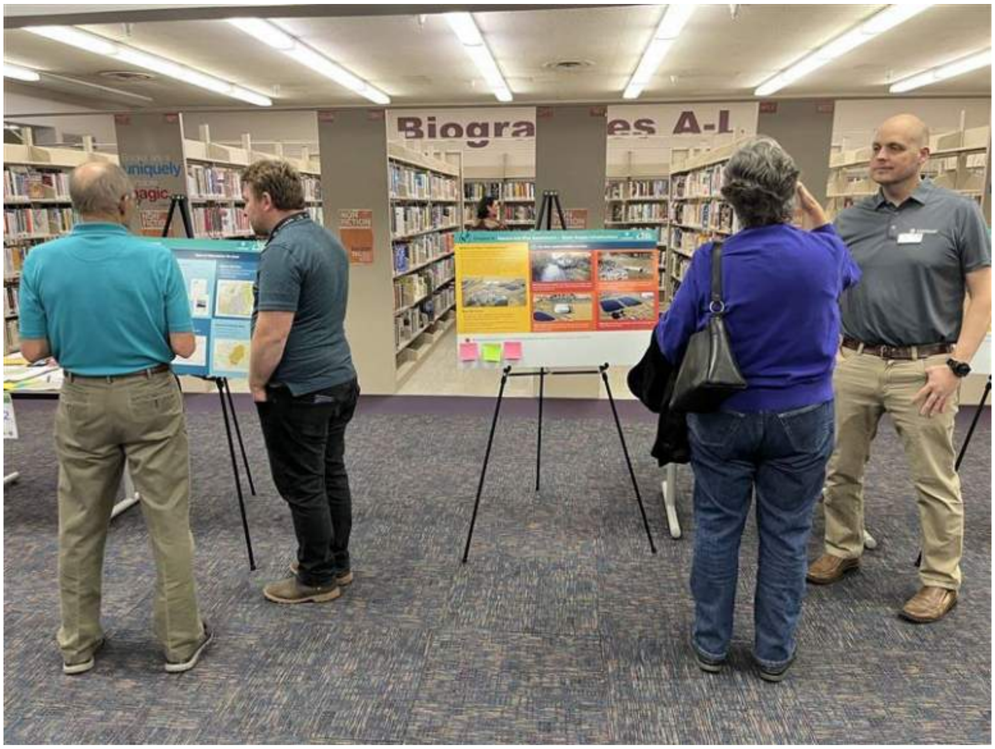
1.3.4 Local Community Members

The planning process also involved engaging the local community with the understanding that garnering public support for the Watershed Master Plan is crucial for successful implementation. A webpage was created for the project on the City's website and a public outreach insert was developed and distributed in the City's conservation newsletter in the spring of 2025. Both the website and insert included an overview of the City's surface water supply system, potential impacts to the water supply, the project objectives, listed contact information for project leads, and contained an announcement for an open house where the public could learn more about the project.

Two in-person public meetings were held as part of the project. The first public meeting was held on October 10, 2024, in collaboration with the Walla Walla Basin Advisory Committee and Watershed Strategy Open House and included a presentation and a table set up about the Watershed Master Plan to introduce community members to the project.

The second public meeting, an open house, was held on November 18, 2025, and was intended to share the draft Watershed Master Plan with the community and gather input from community members prior to finalizing the plan. The open house was held at the City's public library and featured an interactive gallery poster session. Each chapter of the plan was discussed on a poster board that highlighted main takeaways from and provided opportunities for community members to give feedback. The poster boards are included in **Appendix C**. A Public Input Summary, provided in **Appendix D**, compiles community comments from the open house and explains how feedback was incorporated into the final Watershed Master Plan. **Figure 1-2** shows City and Consor staff engaging with attendees during the event.

Figure 1-2 | Public Providing Feedback on the Draft Watershed Resiliency Plan During Open House Held November 18, 2025



CHAPTER 2

Vision, Goals, and Objectives

As one of the first stages of the project, this chapter defines the City's vision, goals, and objectives for the Watershed Master Plan to ensure a cohesive and strategic approach. The plan builds upon existing and ongoing Federal, State, local, and regional planning efforts, avoiding redundancy while aligning with the priorities of the City and stakeholders.

As introduced in **Chapter 1**, the primary objective is to improve the resiliency of the City's municipal drinking water supply from the Mill Creek Watershed by developing a comprehensive plan. The Watershed Master Plan employs a proactive and comprehensive strategy to address water quality and quantity challenges by anticipating threats to the water supply and evaluating their impacts on water resources and infrastructure. Through assessment, analysis, and recommendations, this plan provides a framework for prioritizing investment, integrating both surface and groundwater sources.

2.1 Vision Statement

A vision statement provides direction and purpose to the plan, guiding decision-making and inspiring stakeholders. It helps prioritize and guide work plans to establish sustainability and resilience.

The vision for the Mill Creek Watershed is to support and provide the City with a plentiful, reliable, and high-quality drinking water supply, while maintaining a healthy balance with the watershed's natural ecosystem.

A successful watershed resiliency plan will:

- Maintain and protect high-quality municipal drinking water resources from the Mill Creek Watershed and support water quantity for current and future municipal needs.
- Strengthen the watershed's ability to withstand and recover from natural disasters, particularly wildfires and floods.
- Protect and enhance critical water supply infrastructure and improve system reliability.
- Promote sustainable land and water use practices that balance environmental, economic, and community needs.
- Foster collaboration among regional partners, stakeholders, and the public to support long-term watershed resilience.
- Provide a framework that positions the City to leverage funding opportunities from Federal, State, and nonprofit sources.

This vision serves as the foundation for the goals and objectives outlined in the following sections, ensuring alignment with the City's broader water management and resilience efforts.

2.2 Strategic Goals and Objectives

To effectively achieve the vision for the watershed, a set of clearly defined, high-level goals and objectives were developed to address key focus areas, including:

- Goal 1: Enhance Water Supply Resiliency
  - Protect and maintain high-quality water resources and ensure adequate water quantity to meet municipal needs.
- Goal 2: Mitigate Wildfire and Natural Hazard Risks
  - Mitigate impacts from natural hazards and the risk of occurrence.
- Goal 3: Promote Sustainable Watershed Management
  - Promote sustainable land use and watershed management to enhance resilience.
- Goal 4: Community Partnerships
  - Strengthen community engagement in water and watershed stewardship.
- Goal 5: Funding & Implementation
  - Position the City to leverage federal, state, and nonprofit funding to implement mitigation and resiliency actions.

The following strategic goals provide a structured approach to achieving the vision and ensuring the long-term sustainability and resilience of the Mill Creek Watershed.

2.2.1 Goal 1: Enhance Water Supply Resiliency

Protect and maintain the quality and quantity of the municipal drinking water supply by integrating surface and groundwater management strategies that improve water system reliability and climate resiliency.

- Maintain and protect the high quality of the municipal drinking water supply from the Mill Creek Watershed.
- Sustain reliable water quantity to meet municipal demand through integrated water management.
- Integrate surface and groundwater management strategies, including aquifer storage and recovery (ASR), to optimize long-term water resource use.

2.2.2 Goal 2: Mitigate Wildfire and Natural Hazard Risks

Reduce wildfire and natural hazard risks through resiliency planning that strengthens and safeguards critical water supply infrastructure and minimizes secondary impacts across the Mill Creek Watershed.

Conduct a comprehensive vulnerability assessment of the watershed, intake facility, transmission line, and WTP to identify and prioritize mitigation strategies. These strategies will focus on reducing risk to City-managed infrastructure and addressing potential impacts from erosion, sedimentation, and debris flow, ultimately enhancing the reliability of the water system against natural hazards.

2.2.3 Goal 3: Promote Sustainable Watershed Management

Support long-term watershed function through sustainable land and forest management practices that reduce risk and align with ongoing Federal, State, local, and regional planning efforts to ensure a cohesive, collaborative, and effective watershed management strategy.

- Protect existing habitat and water quality conditions that contribute to watershed function.
- Support land and forest management actions that reduce the risk of catastrophic wildfire and protect water supply infrastructure.

2.2.4 Goal 4: Strength and Maintain Outreach

Maintain partnerships with watershed stakeholders, tribal partners, and area residents to support watershed implementation and long-term stewardship.

- Collaborate on a public outreach strategy to educate the community, provide transparency, and foster public involvement in watershed stewardship.
- Support Walla Walla 2050 and other relevant initiatives.

2.2.5 Objectives

The primary objective of the Watershed Master Plan is to establish a comprehensive framework that strengthens long-term resiliency through prioritized investments and actionable strategies. This framework is informed by hazard analysis and stakeholder collaboration and will integrate directly into the City's Capital Improvement Program (CIP), and recovery planning. By translating strategic goals into targeted mitigation projects and funding opportunities, the plan ensures that each focus area is addressed through coordinated, on-the-ground improvements. As the plan evolves, these objectives will continue to guide all elements, supporting a sustainable and climate-adaptive approach to managing the Mill Creek Watershed.

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CHAPTER 3

Watershed Data Summary

3.1 Introduction

An initial step in developing the Watershed Master Plan was to compile and review available drawings, reports, and other relevant information to build on previous planning efforts rather than duplicate them. The project team reviewed a wide range of documentation provided by the City and stakeholders, including planning studies, technical memoranda, and hazard mitigation and emergency response plans (ERPs). These resources informed the risk assessment, resiliency strategies, and recovery framework presented in later chapters. This chapter summarizes the major categories of information reviewed and identifies key reference documents, including those related to hazard mitigation and emergency response.

3.2 Record Drawing & Photos

Record drawings and photos were collected to document existing conditions across the intake, raw water transmission main, and treatment facilities. These resources provided critical information for understanding infrastructure layout and conditions. They also supported field verification during site visits. Photos were especially important for components that are buried or otherwise out of sight.

3.3 Planning Documentation

Planning documentation reviewed for this plan includes the City's March 2020 Water System Plan (WSP) and August 2021 Well Master Plan (WMP). Both documents outline key improvement strategies for the City's water supply system. Many of these strategies are re-evaluated in this Watershed Master Plan, based on discussions with City operations staff and consideration of completed improvements. These planning documents were essential for understanding the condition, age, and overall context of the water supply system.

3.4 Treatment Specific Documents

Treatment-related documentation collected for this plan includes a research article related to controlling disinfection byproducts, a City algae bloom notification, a pilot report for a hydrogen peroxide (H_2O_2) injection system, and an optimization assessment for minimizing trihalomethanes (THMs). These documents provide a basis of evidence for potential treatment improvements. Throughout the project, the City also provided documentation on current WTP processes including detailed water quality information.

3.5 Documentation Related to Wildfires

Wildfire-related documentation reviewed for this plan focused on understanding historical and recent fire activity in and around the Mill Creek Municipal Watershed. The review included the Tiger-Mill Project Environmental Assessment, which details current forest conditions, fuels profiles, and planned risk-reduction treatments within the Umatilla National Forest. We also reviewed the Tiger Creek Prescribed Fire Project documentation and subsequent Declared Wildfire Review, as this 2024 event provides recent, site-specific insight into potential fire spread, suppression challenges, and implications for watershed protection.

To contextualize long-term wildfire risks, we also examined regional fire history summaries, watershed-scale burn severity analyses, and peer-reviewed literature on post-fire erosion, sediment transport, and impacts to source-water quality. This included studies addressing how high-severity wildfire increases debris flows, turbidity, nutrient loading, and infrastructure vulnerability in municipal source-water areas

Additionally, documentation related to the 2005 School Fire was reviewed, including emergency response assessments and long-term watershed monitoring studies. These reports provide important analogs for how large wildfires in the Blue Mountains have historically affected hydrology, soil stability, sedimentation, and water treatment operations. Together, these resources offer a data-driven understanding of wildfire behavior, watershed sensitivity, and potential impacts to the City's water system, helping to inform planning, mitigation strategies, and risk communication.

3.6 Hazard Mitigation and Emergency Response References

In addition to planning and technical documents, this Watershed Master Plan incorporates findings from regional hazard mitigation and ERPs to ensure consistency and alignment with broader resiliency efforts. Key references include:

- Walla Walla County Multi-Jurisdictional Hazard Mitigation Plan (2024): Provides hazard profiles, risk assessments, and mitigation strategies for wildfire, flooding, drought, and seismic events.
- City of Walla Walla Emergency Response Plan (2021): Outlines protocols for maintaining safe drinking water during emergencies.
- City of Walla Walla Continuity of Operations Plan (2019): Establishes procedures for sustaining essential services during disruptions.
- Community Wildfire Protection Plan (2025): Identifies strategies to reduce wildfire risk and protect critical infrastructure.
- Water Shortage Response Program Resolution (2005): Defines curtailment stages and conservation measures during drought or supply interruptions.

CHAPTER 4

Watershed and Water Treatment Plant Hazard and Risk Assessment

4.1 Scope and Approach

The City's drinking water system has faced hazards that threaten its ability to consistently and reliably supply water to the community. To address this, the project team conducted a qualitative hazard and risk assessment to identify hazards and analyze their potential impacts on the system. The results informed the development of a watershed resiliency strategy, outlined in **Chapter 6**, which proposes mitigation actions to reduce the risks identified in this chapter.

This assessment focuses on the portion of the Mill Creek watershed that is owned by the City, located near its headwaters, a critical role in the City's water system. The assessment adopts an interdisciplinary approach, integrating environmental, political, social, economic, and operational factors to assess the vulnerabilities of both the built infrastructure (e.g., diversion structures, pipelines, treatment plants) and natural features (e.g., forested areas). It accounts for watershed-specific risks such as wildfires, earthquakes, severe weather events, flooding, drought, and weather volatility. The analysis focuses on the intake diversion structure and surrounding infrastructure, the 14-mile raw water pipeline, as well as the WTP and surrounding infrastructure, with a goal of ensuring the resiliency and long-term sustainability of the City's water system.

4.2 Structure of the Chapter

This chapter presents a comprehensive hazard and risk assessment for the City's water system, structured as follows.

- **Section 4.3**, Previous Planning Documentation: includes a discussion on previous planning documentation that provides insights into hazards, risks, or previously identified mitigation actions to the City's water system.
- **Section 4.4**, Hazard Description: outlines the potential hazards that could impact the City's water system.
- **Section 4.5**, Vulnerability Assessment: outlines the identification of City water system assets and summarizes the condition assessment of each asset.
- **Section 4.6**, Risk Assessment: details the methodology for assessing and evaluating risks and lists the most critical risks to the system.

4.3 Previous Planning Documentation

Several prior planning documents have been developed, addressing hazards, risks, and proposed mitigation strategies related to the City's water system. To avoid duplicating efforts, leverage existing work, and ensure alignment of goals and objectives, elements of these documents were reviewed and incorporated into this plan. The existing plans provide valuable insights and foundational information that support the identification and analysis of hazards, risks, and mitigation measures in subsequent sections and chapters.

The following narratives summarize key resources and their relevance to the current planning effort. This overview is not exhaustive of all plans, ordinances, or guidance documents but focuses on those most pertinent to this effort.

4.3.1 Walla Walla County: Multi-Jurisdictional Hazard Mitigation Plan

The 2024 Walla Walla County Multi-jurisdictional Hazard Mitigation Plan (MHMP) is a comprehensive framework, updated every five years, designed to identify and address potential hazards that could impact the county, including its municipalities and critical infrastructure such as the City's water system. The plan covers a variety of natural hazards, including wildfires, earthquakes, and severe weather events including flooding, droughts, and weather volatility, all of which pose risks to water infrastructure. The following summary contains details on the hazards and risks specifically associated with the City's water system as pertinent to this plan which, along with the proposed mitigation actions identified in the MHMP, are aimed at reducing vulnerabilities and enhancing the resilience of the City's water system.

- Wildfire Hazard
  - Background and Historical Data: The City faces an increasing regional wildfire threat, consistent with trends across the Blue Mountains. Recent events— including a 2024 prescribed burn outside the watershed that was later declared a wildfire and required a significant suppression response—underscore the ongoing hazard and the potential implications for the City's drinking water supply.
  - Risk: Wildfires pose a direct risk to the City's water system by contaminating water sources with ash, debris, and other contaminants. In addition, wildfires can damage pipelines, treatment facilities, and reservoirs, compromising water supply and quality.
  - Potential Mitigation Actions Identified in MHMP
    - Develop and integrate wildfire-specific response plans to protect water infrastructure, focusing on damage prevention and contamination control.
    - Implement vegetation management around critical infrastructure to prevent fire spread.
    - Install backup power systems for critical water infrastructure, such as wells and pump stations, to ensure continued water delivery during fire-related disruptions.
    - Expand water storage capacities to provide backup during wildfire events and drought conditions.

- Earthquake Hazard
  - Background and Historical Data: Walla Walla County is located within a seismically active region. While major earthquakes have not directly impacted the City's water infrastructure in recent years, minor seismic activity in the area has highlighted the potential for damage. Previous earthquakes in the region, such as those in 1936 and 1969, caused localized damage to infrastructure, including pipelines and buildings, indicating the vulnerability of critical systems like the City's WTP and distribution networks.
  - Risk: Earthquakes can cause significant damage to the City's WTP facilities, pipelines, and reservoirs. Seismic activity could result in water main breaks, disruptions to WTP operations, and contamination, posing a public health risk and affecting the availability of safe drinking water.
  - Potential Mitigation Actions Identified in MHMP
    - Retrofit pipelines and reservoirs to meet modern seismic standards to enhance infrastructure resilience during an earthquake.
    - Conduct regular inspections and maintenance of critical infrastructure to identify vulnerabilities and address any issues.
    - Develop and implement Emergency Response Plans (ERPs) to ensure water delivery during and after a seismic event.
- Severe Weather Natural Hazards – Flooding
  - Background and Historical Data: The City has a history of flooding, most notably during the 1996 and 2020 floods, which caused considerable damage to water infrastructure, including the watershed intake, pipelines, and water treatment facilities. The risk of flooding is exacerbated by intense rain events, snowmelt, and changes in land use patterns that increase runoff. In the spring, a Pineapple Express brings warm, moisture-laden air from the tropics to the Pacific Northwest, causing heavy rain and rising temperatures. This warm air raises snow levels and often results in rain falling directly on the snowpack. The combination of rain and rapid snowmelt dramatically increases runoff into rivers and streams, overwhelming their capacity and leading to significant flooding. The risk is especially high in areas with steep terrain or already saturated soil. These conditions led to the 1996 and 2020 floods.
  - Risk: Flooding can damage the surface water intake facility, water pipelines, the WTP, and reservoirs, leading to contamination of the water supply and service disruptions. Floodwater can also cause erosion and landslides, which may further damage infrastructure located in floodplains or near riverbanks.
  - Potential Mitigation Actions Identified in MHMP
    - Implement flood protection measures, such as levees, barriers, or floodplain restoration, to safeguard water infrastructure from flood damage.
    - Elevate critical components of the WTP above predicted flood levels.

        - Reinforce and relocate pipelines away from flood-prone areas to minimize risk of damage during high-water events.
        - Install a large sluice gate at the City's intake dam to allow floodwaters and associated bedload to bypass the intake screens, preventing flooding of the intake building.

- Severe Weather Natural Hazards – Drought
    - Background and Historical Data: Drought conditions have been a recurring issue for the City, with significant dry periods occurring in 2001, 2015, and 2021. The 2015 drought led to increased water conservation measures and reduced water availability, stressing the City's water supply system. The region's dependence on groundwater and surface water sources, combined with increasing temperatures and reduced snowpack in the mountains, exacerbates the risk of prolonged dry periods.
    - Risk: Drought can reduce water availability, putting pressure on the City's water supply system, especially during periods of high demand. It may result in lower reservoir levels, reduced groundwater recharge, and higher treatment costs due to changes in water quality.
    - Potential Mitigation Actions Identified in MHMP
        - Expand the City's ASR program. This program utilizes city wells to store water in the deep basalt aquifer during the winter for use during droughts and emergencies. The City is actively working towards constructing ASR facilities at Well 5 and will evaluate developing and rebuilding Well 7 for production and ASR injection.
        - Implement water-saving technologies and infrastructure that promote water conservation, such as drought-tolerant landscaping and efficient irrigation systems.
        - Increase public outreach and education programs on water conservation during dry periods.
        - Install solar panels and a battery system at the WTP to run the plant during power outages.
- Disruption to Water Supply – Fall within Multiple Hazard Categories
    - Risk: Disruptions to water supply due to multiple hazards that lead to power outages or other emergencies. These disruptions can affect the availability of safe drinking water, which poses a threat to public health and community functionality.
    - Potential Mitigation Actions Identified in MHMP
        - Implement water conservation measures and contingency plans to reduce demand during supply shortages.
        - Install backup power systems for critical infrastructure, including wells and pump stations, to maintain operations during power outages.

These items are included in the MHMP to support the resilience and continued functioning of the water supply system, ensuring that risks are addressed through mitigation strategies aimed at reducing vulnerabilities and enhancing the system's ability to withstand hazards. Many of the mitigation actions identified in the MHMP align closely with strategies detailed in **Chapter 6**, where they are expanded upon with more specific implementation details and prioritization.

4.3.2 Well Master Plan

The City's WMP, completed in 2021, outlines a prioritized strategy for investments aimed at enhancing the reliability and resiliency of the overall water supply system, with a focus on improvements to their groundwater supply system. While some improvements identified in the WMP fall outside the current project study area, their prioritization will be reassessed and updated as part of this Watershed Master Plan.

4.4 Hazard Description

This section provides a detailed overview of hazard categories including environmental, political, social, economic, and operational, and the associated hazards that threaten the City's water system assets. Historical data are included for each hazard to illustrate their frequency within the project area, providing valuable context for determining risk ratings in subsequent sections.

4.4.1 Environmental Hazards

This section examines the natural features and ecosystems that support the water system, focusing on how environmental hazards such as wildfires, earthquakes, and severe weather events including flooding, droughts, and weather volatility, can impact water availability and quality. The following sections discuss the context of each hazard and the potential impact on the watershed and water supply systems.

4.4.1.1 Wildfires

Wildfires are the uncontrolled destruction of forests, brush, field crops, and grasslands caused by nature or humans. The probability of a wildfire in any one location on a particular day depends on many factors: fuel conditions, topography, time of year, wind direction and speed, past and present weather conditions, and the activity that is or will be taking place (debris burning, land clearing, etc.). **Table 4-1** summarizes the fires for the past 25 years burning over 500 acres within 10 miles of the project area.

Table 4-1 | History of Wildfires

Incident Name	Fire Discovery Date	Fire Cause	Incident Size (Acre)
Grizzly Complex	8/13/2015	Nature – Lightning Strike	82,659
School Complex	8/5/2005	Human – Tree falling on Powerline	52,000
Columbia Complex	8/23/2006	Unknown	34,000
Eureka	9/6/2010	Human	21,760
Dry Creek	8/21/2016	Unknown	>10,000
Hair Road	6/21/2021	Unknown	>7,000
Blue Creek	7/20/2015	Human	6,004
North Coppei	9/18/2001	Human – Uncontrolled field burn	4,810
Oasis	6/19/2023	Unknown	4,250
Port Kelley	7/28/2001	Human	3,500
Wallula Gap Fire	7/30/2010	Nature – Lightning Strike	3,500
Touchet North	6/28/2022	Unknown	3,000

Incident Name	Fire Discovery Date	Fire Cause	Incident Size (Acre)
Neff Road	6/15/2024	Unknown	1,435
Van Ausdle	7/29/2022	Human	1,100
Joe Barker Rd	6/19/2017	Unknown	518
Harvey Shaw	8/16/2023	Human	500
Tiger Creek	10/01/2024	Human - Prescribed Fire Escape	600

Figure 4-1 shows a map of the historical fires and fuels reduction activities in the watershed which was provided by the City. Wildfire hazards, along with their history and probability of occurrence, are discussed further in the MHMP.

Controlled burns, also known as prescribed burns, are considered a best practice by foresters and ecologists for reducing hazardous fuels and improving forest health. In October 2024, the U.S. Forest Service conducted the Tiger Creek prescribed burn just outside the Mill Creek Municipal Watershed. The burn escaped containment and was declared a wildfire, ultimately growing to 534 acres and requiring a regional Incident Management Team along with aerial support, with total suppression costs reaching approximately $10 million. While this incident underscores the inherent risks associated with prescribed fire, it also highlights the importance of proactive forest management to reduce the likelihood of larger, high-severity wildfires that could directly impact the City's drinking water supply.

To support long-term resiliency, the Project Team has developed recommendations for water quality monitoring to address potential impacts from disturbances such as fire, logging operations, or other activities that may increase soil runoff and compromise drinking water quality. These recommendations, including suggested parameters, thresholds, and response protocols, are provided in **Appendix N**.

Following the Tiger Creek prescribed burn incident, the City collected water-quality samples and reviewed treatment-plant supervisory control and data acquisition (SCADA) data to assess potential impacts on source water. Laboratory analysis of samples collected on November 14, 2024, showed total organic carbon (TOC) levels of 0.75–0.80 milligrams per liter (mg/L) in the Mill Creek main stem and elevated concentrations of 1.86–3.12 mg/L in the tributary affected by the burn area which is an increase of roughly 305 percent relative to main stem conditions.

The impact of the 2024 Tiger Creek fire on source-water quality is not fully known. The City has been monitoring water quality within Mill Creek and two stream branches, Low Creek and Broken Creek and preliminary data indicated increased TOC in the City's surface water source proceeding the Tiger Creek fire. These increased TOC levels could increase the impact to ASR compliance as it relates to TTHMs. SCADA data confirmed that TOC in the WTP's raw water rose in the weeks following the fire. While concentrations generally remained near baseline (0.7–1.0 mg/L), this upward trend raised operational concerns. The City used H_2O_2 to manage TOC levels and anticipated remaining within Safe Drinking Water Act limits through the winter; however, if TOC had exceeded 1.0 mg/L, the City would have been unable to restart its ASR program.

Loss of ASR operations limits the City's ability to offset groundwater declines and to augment Mill Creek flows for summer streamflow restoration, which supported the Confederated Tribes of the Umatilla Indian Reservation's (CTUIR's) salmon recovery program. This event highlighted the sensitivity of unfiltered treatment systems to even small wildfire disturbances and underscores the importance of watershed protection, source monitoring, and treatment resiliency planning.

Landscape Fire and Resource Management Planning Tools (LANDFIRE) is a program that is collaboratively produced by the US Department of the Interior, the USFS, and other partners that provides geospatial data, maps, and tools designed to support fire and land management activities. Consor's teaming partner, NMI, used LANDFIRE data to analyze the 13 fire behavior fuel models present in the area as defined by the USFS April 1982 General Technical Report INT-122, Aid to Determining Fuel Models for Estimating Fire Behavior. There are 11 fire behavior fuel models identified and **Table 4-2** presents those considered most applicable to the City. The models can indicate the kind of fire behavior expected for that type of fuel.

Table 4-2 | Fire Behavior Fuel Model

Fire Behavior Fuel Model	Description of Fire Behavior
1. Short grass	Surface fires that burn fine herbaceous fuels, cured and curing fuels, little shrub or timber present, primarily grasslands and savanna
2. Timber (grass and understory)	Burns fine, herbaceous fuels, stand is curing or dead, may produce fire brands on oak or pine stands
5. Brush (2 feet)	Low intensity fires, young, green shrubs with little dead material, fuels consist of litter from understory
8. Closed timber litter	Slow, ground burning fires, closed canopy stands with short needle conifers or hardwoods, litter consist of needles and leaves, with little undergrowth, occasional flares with concentrated fuels
9. Hardwood litter	Longer flames, quicker surface fires, closed canopy stands of long-needles or hardwoods, rolling leaves in fall can cause spotting, dead-down material can cause occasional crowning
10. Timber (litter and understory)	Surface and ground fire more intense, dead-down fuels more abundant, frequent crowning and spotting causing fire control to be more difficult
11. Light logging slash	Fairly active fire, fuels consist of slash and herbaceous materials, slash originates from light partial cuts or thinning projects, fire is limited by spacing of fuel load and shade from overstory

Wildfires can damage watersheds and forests, leading to increased soil erosion, sedimentation, debris flow, and water contamination. They have become more frequent and severe in the Pacific Northwest due to weather extremes. Loss of vegetative cover can degrade water quality and increase treatment costs at the WTP, if it is even able to remain online during an event, given its unfiltered nature.

Mill Creek Watershed Fires and Fire Fuels Reduction History

0 0.5 1 2 Miles

0 2,500 5,000 10,000 Feet

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4.4.1.2 Earthquake

An earthquake occurs when stress builds up along a fault line due to the movement of tectonic plates within the Earth's crust. When the stress exceeds the strength of the rocks holding the fault together, a sudden release of energy occurs, causing the ground to shake. This release of energy travels in waves through the Earth, creating seismic activity that can be felt at the surface. Faults, which are fractures or zones of fractures in the Earth's crust, are the sites where this movement takes place. The movement along a fault can happen suddenly during an earthquake or gradually over time through a process known as creep. These natural processes are fundamental to the dynamic nature of Earth's geology.

Three fault-related features are located in Walla Walla County, Umatilla County, and Wallowa County which extend within or near the project area.

- Hite Fault System, located along the foothills of the Blue Mountains, stretching generally north to south.
- Olympic-Wallowa Lineament (OWL), stretches from the Olympic Mountains to the Wallowa Mountains through Walla Walla County. The OWL is a series of geological features that indicate a history of earthquake activity. It includes the Wallula Fault Zone which extends from the Wallula Gap on the Columbia River toward Touchet. The Wallula Fault Zone is comprised of several localized faults near Walla Walla.
- Mill Creek Fault is a localized fault structure potentially present within the Mill Creek Watershed area, though its extent and activity may require further study.

In the past 40 years, 14 recorded earthquakes with a magnitude greater than 2.5 have been recorded in Walla Walla County, with the most significant being a 3.4 magnitude event. Most epicenters were documented just outside the County boundaries. Since 2018, no earthquakes have been recorded inside Walla Walla County.

Looking back 100 years, there was one significant earthquake. The 1936 Milton-Freewater earthquake had an estimated magnitude of 6.1 with an epicenter near the Oregon and Washington border, northwest of Milton-Freewater, Oregon. Earthquake hazards and the history and probability of occurrence are discussed further in the MHMP.

Seismic activity along the identified faults poses a significant threat to the City’s water supply infrastructure and watershed. Earthquakes can cause structural damage to facilities and pipelines leading to service disruptions and costly repairs. In the Mill Creek Watershed, seismic events could trigger landslides, destabilizing slopes and increasing sedimentation in water sources.

4.4.1.3 Severe Weather Events

Severe weather can be defined as hazardous weather-related events which are caused by several factors, including temperature, moisture, and instability in the atmosphere. Severe weather events can be organized into various subcategories, and the following sections discuss events that have or could impact the City’s water supply system including flooding, droughts, and weather volatility.

4.4.1.3.1 Flooding

Flooding occurs when an overflow of water submerges land that was previously dry and typically results when the volume within a water body exceeds its capacity. Walla Walla County is susceptible to riverine and flash flooding which is more likely to occur in winter and spring when localized rainstorms, snowmelt and rain-on-snow events can overwhelm channels with rapid runoff. Frozen soil conditions are often present during these periods and increase the volume and rate of runoff by preventing infiltration.

Mill Creek has experienced significant flood events, notably in 1931, 1964, 1996, and 2020, with peak flows exceeding channel capacity. The following provides a summary of these major flooding events.

- March 1931: Flood occurred after heavy rains saturated the soil, followed by a cold spell that brought approximately 12 inches of snowfall. When temperatures warmed, the snow rapidly melted. Combined with additional rainfall, the snowmelt generated excessive runoff that overwhelmed local streams and rivers resulting in significant flooding.

- December 1964: Flood was caused by a combination of freezing temperatures that froze the soil followed by a heavy snowfall of 3 to 4 feet. The snowfall was followed by a tropical storm where warm air brought torrential rain, causing the snow to melt rapidly. The combination of snowmelt and rainfall led to excessive runoff, overwhelming local streams and rivers, and resulted in widespread flooding.

- February 1996: Flood occurred following a rain-on-snow event where warming temperatures and rain following a late season snowfall rapidly melted snow over frozen ground. In some areas, as soils began to thaw, saturated conditions led to landslides. The flood impacted many areas throughout the County with some of the most severe impacts being realized in the upper Mill Creek area. The City's raw water transmission pipe was impacted as part of this flooding, including multiple locations of washouts.

- February 2020: Flood occurred due to heavy rain-on-snow event. As a result of the Mill Creek flooding, the City's raw water pipeline was washed out in three separate locations, which disrupted the City's water supply system and required emergency repairs as well as a full transition to the City's ground water supply for over six months.

Flooding can damage critical infrastructure in the watershed, including the transmission main and the raw water intake facilities.

4.4.1.3.2 Drought

A drought is a deficiency of precipitation over an extended period resulting in a water shortage. According to the FEMA National Risk Index, drought is the most frequent severe weather event in Walla Walla County, however, not all drought events cause measurable losses. Droughts are cyclic in nature but are intensifying due to climate variability. Historic droughts have reduced streamflow in Mill Creek, impacting water availability. Prolonged drought conditions can strain the City's water supply system, requiring reliance on groundwater. In addition, reduced streamflow limits hydropower generation at the City's facility, which can result in a loss of revenue needed to support water system operations.

4.4.1.3.3 Long Term Weather Volatility

Weather volatility is expected to alter precipitation patterns, increase temperatures, and intensify extreme weather events. Daytime and nighttime annual average air temperatures have risen significantly over the last several decades. Maximum daily air temperatures have also risen during this period and projections show that this trend is expected to continue through at least the mid-century or through the end of the century. Warmer air temperatures are expected to create changes in runoff timing, as well as changes in water usage within the Walla Walla region. Increases in the air temperatures during extremely hot days or heat waves will put an added stress on wildfire potential in the upper basin, particularly during the late summer/early fall months when this basin sees periods of surface flow from the east (offshore winds).

These findings, when combined with the observed and projected trends associated with precipitation, point to a future where water management will become a greater challenge due to an increase in the year-to-year variability of precipitation. Periods of drought coupled with intense heat/air temperatures in one year could be followed by copious rainfall and flooding potential in the next.

Water supply resilience will be extremely important to the successful future operation of water agencies throughout the country and especially in the western US. System flexibility and the ability to adapt to the anticipated challenges that weather extremes presents are the keys to resilience.

4.4.1.4 Endangered Species Act Habitat Status and Restoration Activities in Mill Creek

The Mill Creek Watershed provides critical habitat for ESA-listed species, including summer steelhead and bull trout. It supports migration, spawning, and rearing for these species including the reintroduced spring Chinook. These fish depend on cold, clean water and complex stream habitats, yet Mill Creek faces challenges such as insufficient streamflow and elevated temperatures, limiting access to quality habitat.

The CTUIR are actively restoring habitat and reintroducing spring Chinook to the headwaters, addressing conditions that have persisted since the species' extirpation in the 1950s. These efforts align with the City's watershed resiliency goals by improving ecological function, reducing sedimentation risks, and supporting long-term water quality. Integrating ESA considerations and CTUIR restoration activities into the Watershed Master Plan ensures that hazard mitigation strategies also advance regulatory compliance and ecosystem health.

4.4.2 Political, Social and Economic Hazards

Political, social, and economic hazards collectively influence the resilience and sustainability of the City's water system by impacting governance, societal dynamics, and funding considerations.

4.4.2.1 Political Hazards

Political hazards examine the political landscape and governance structures that influence the water system, focusing on how political decisions and policies can impact water resource management, infrastructure investment, and regulatory enforcement. For example, changes in water laws, funding practices, or political instability can disrupt water system operations or delay necessary infrastructure projects. Understanding political factors is essential to assessing the risks they pose to the long-term sustainability and resilience of the water system.

Water infrastructure projects rely on public funding, grants, and ratepayer revenue. Financial shortfalls can delay system improvements. Insufficient funding can exacerbate risks, particularly in aging infrastructure, where repairs or upgrades are deferred by the city to future years. Regulatory changes or lack of funding for water infrastructure can hinder necessary upgrades and maintenance. Delays associated with permitting or restrictive environmental regulations may delay critical projects and increase vulnerabilities to the system.

4.4.2.2 Social Hazards

Social hazards consider the social dynamics and human factors that can impact the water system, focusing on how population growth, public health concerns, stakeholder interests, and social behaviors pose risks to water availability, distribution, and quality. These factors highlight the importance of community resilience and public trust in effective management and sustainability of the water system. Population growth and migration patterns can increase demand on the water system and growing demands may outpace infrastructure capacity, leading to shortages or system strain. Public health issues (contamination events) may raise concerns about water quality and public trust in the water supply can be negatively impacted during contamination events.

4.4.2.3 Economic Hazards

Economic hazards address the financial aspects of water system operations, including the costs associated with maintenance, infrastructure upgrades and risk mitigation. Economic disruptions or insufficient funding can exacerbate vulnerabilities, while the economic impacts of system failures (such as repair costs or service interruptions) pose risks to the City's water supply infrastructure and operations. Infrastructure damage or service disruptions can have economic consequences for residents and businesses.

4.4.3 Operational Hazards

Operational hazards may pose risks that compromise the functionality, efficiency, and reliability of physical infrastructure. These hazards stem from aging components, system interdependencies, and maintenance and planning. They include infrastructure failures, power outages, and water supply disruptions. Most of the City's water supply system is over 50 years old with some components such as the twin reservoir embankments being over 100 years old. Aging infrastructure threatens water supply functionality and safety, leading to potential failures and costly maintenance.

The City has experienced multiple power outages at their WTP, averaging about two and a half outages per year over the past five years. Each outage typically lasts around two hours, with the longest recorded outage lasting five and a half hours.

Because the City's facilities are highly interconnected, a failure in one component can disrupt the entire system. To reduce this risk, the City is installing a solar farm and backup battery at the WTP. In the event of a power outage, the battery energy storage system (BESS) will maintain plant operations. If the outage extends beyond two hours, an emergency generator will automatically take over to ensure uninterrupted service.

4.5 Vulnerability Assessment

This section outlines the approach to vulnerability assessment, which included identifying the City's water system assets and conducting an initial condition assessment. The results of this assessment, combined with the historical events discussed in **Section 4.4**, are used in **Section 4.6** to complete the Risk Assessment.

4.5.1 Water System Assets

To identify the City's water system assets with potential risks, both built and natural assets were assessed by the project team. "Built assets" refers to physical facilities, infrastructure, and equipment directly associated with the City's water system. "Natural assets" includes adjacent environmental features, such as wilderness and forested regions, which support or interact with the water system. They are collectively referred to as system assets, reflecting the integrated nature of the water system and its surrounding environment. Where applicable, facility assets were grouped based on their proximity (e.g., location on the same site) and **Table 4-3** summarizes the City's water system assets that were evaluated. Subsequent sections present the condition assessment of the City's water system assets which includes an evaluation of their current physical state, functionality, and maintenance history based on provided documentation and limited onsite observations. The consultant team conducted a WTP and a watershed and diversion facilities tour on September 19th, 2024, to visually assess existing conditions of the structural, mechanical, and electrical systems. The site observation notes for components of the WTP and the watershed facilities observed during the site visit can be found in **Appendix E**.

Table 4-3 | City's Water System Assets

City Asset	Facilities Included
Raw Water Intake Surrounding Environment	City-owned property surrounding the intake area
Raw Water Intake – Diversion System	Mill Creek diversion, raw water intake, fish screens and equipment, fish ladder, control building, screening/sorting building, stand-by generator,
Caretaker Facilities	Caretaker home, barn, and access road
USGS Gauging Station	USGS gauging station and pedestrian bridge
Barn/Corral Area	Abandoned barn/corral area to the south of Mill Creek and bridge
Raw Water Transmission Main	10.5 miles of 30" welded steel pipe and 3.6 miles of 30" C301 Prestressed Concrete Cylinder Pipe
Water Treatment Plant	Raw water hydropower plant
	Twin 7.5 million gallon sedimentation basins and valve house
	Outlet control structure
	Roughing Filters building
	UV disinfection system building and backup SCADA server
	Chlorine building
	Treated water pump station
	Finished Water Reservoirs
	Maintenance Building
	Administration and SCADA building

4.5.2 Raw Water Intake: Surrounding Environment

The Mill Creek Watershed is located within a complex area in the Blue Mountains, consisting of rugged terrain of undulating ridges separated by deep U-shaped canyons. It is a uniquely pristine and roadless forest with White fir, Douglas fir, Larch, and Ponderosa pine. For over 100 years, it has been closed to entry, except by special permit during hunting season. According to the data, and confirmed by visual observation, the primary fuel types adjacent to the area consist of fire behavior fuel models 5 – brush, 8 – closed timber litter, and 9 – hardwood litter. Higher up the slopes to the north of Mill Creek, there is a presence of fire behavior fuel models 1 and 2 which are grass fuel groups. To a lesser extent, Model 10 – timber (litter and understory) is also present near the road and facilities. Model 10 is more common south of Mill Creek. Model 11 – light logging slash, does occur but very sparingly.

Significant fire behavior in this area is based on the fuel models that are present. Fuel model 9 includes the Ponderosa pine and Douglas fir stands in the area and has potential for more intense fire activity. Fires that start in nearby brush fuels can carry quickly into these fuels and generate a rapid rate that carries into the canopy, resulting in crowning and spotting.

The structures within the area noted below are moderately at risk of damage from wildfire and from subsequent secondary hazard events, such as landslide or debris flow, resulting from a large wildfire event. The narrow canyon with steep incline on either side of the main road and buildings pose challenges in two significant ways. The topography makes wildfire mitigation practices more difficult, specifically road construction and vegetation removal, and increases potential for extreme fire behavior such as rapid rate of spread. Building materials used in construction of the facilities are highly flammable and the buildings themselves have construction defects that make them more receptive to embers. Heavy vegetation is immediately adjacent to the structures, increasing exposure.

The vegetation conditions at the site indicate a high wildfire risk due to a combination of dense understory and compromised overstory health. The understory consists of heavy brush and small hardwood components, including fine live fuels like ninebark and grasses, alongside significant amounts of dead fuels such as timber litter, branches, and logs. The overstory is heavily impacted by disease and pests, potentially including root rot and defoliators, resulting in dead and dying standing timber, particularly along canyon sides and near facilities. These factors are further exacerbated by the site's topography, where steep slopes can accelerate fire spread. The proximity of hazardous vegetation to infrastructure increases the risk to facilities and underscores the need for immediate mitigation efforts, such as fuel reduction treatments, creation of defensible space, and vegetation health monitoring to prevent further decline. Boulders, rocks, and large fallen logs exist on steep slopes above the facilities, creating the opportunity for rolling debris to impact the facilities during a wildfire event.

Further north of the intake site, vegetation is mixed conifer overstory with a heavy brush component or low-growing understory plants higher up the slopes. Grand fir ninebark/Douglas fir ninebark and Ponderosa pine are more prevalent higher up the slopes. Brush is heavy in the understory, along with overstocked and diseased overstory trees in places. Where spacing of the overstory is healthy, trees are in better condition and the brush component is minimal. Some thinning has occurred to reduce the overstory trees per acre. Smaller diameter trees were thinned and larger diameter overstory trees were pruned above six feet.

A two-track road runs from the northeast corner of the home site to the east/northeast and is currently used only when the City dredges above the dam. Equipment typically used for dredging activities includes an excavator and bulldozer. The two-track road will require maintenance for more regular use. Where the track ends, just north of the intake, a foot trail continues and parallels Mill Creek running northeast. The Site Assessment Report for Wildfire Resiliency of Watershed Intake Site, generated by NMI, discusses these features and is provided in Appendix F.

During Workgroup discussions, it was noted that extending the road would be difficult due to its location within critical fish habitat; improving trail access for foot traffic would be more feasible. Enhancing creek crossings along these access points could also provide significant benefits by reducing flood impacts and restoring stream capacity. These streams flow through City property and represent key locations where improvements could help manage large flows and mitigate flood-related risks.

An additional vulnerability within the Mill Creek Watershed stems from the presence of privately owned parcels located partially within the watershed boundary, as shown in Figure 1 of Appendix F. These lands introduce management challenges because they are outside City control, limiting the ability to implement consistent wildfire mitigation practices such as vegetation thinning, fuel reduction, and access restrictions. Unmanaged or incompatible land uses on these parcels can increase fuel loads and create ignition sources, elevating wildfire risk to City infrastructure and overall watershed health. This fragmented ownership pattern complicates coordinated risk reduction and underscores the need for long-term strategies, such as land acquisition or conservation agreements, to reduce exposure and improve resilience.

4.5.3 Raw Water Intake – Diversion System

This is a grouped asset that consists of the Mill Creek diversion, raw water intake, fish ladder, control building, screening building, and standby generator.

4.5.3.1 Mill Creek Diversion, Raw Water Intake, and Fish Ladder

The Mill Creek diversion structure was originally built in 1922/1923 with improvements made at various points over its lifetime and is comprised of a 10-foot-high concrete water intake control structure situated across Mill Creek with a fish ladder on the south side and a fish screen on the north side of the creek. The raw water intake structure serves as a concrete fixed crest weir control structure and maintains the pool upstream during low flows to allow water from Mill Creek to travel through the raw water transmission main to the WTP. There are five sluice gates at the Mill Creek diversion structure: one at the intake, one at the entrance of the fish ladder, two for low-flow passage upstream, and one downstream.

The two upstream sluice gates that pass low flow through the structure sustained damage during the recent diversion cleaning in 2023 and are no longer fully operational. The downstream sluice gate was further impacted by rocky debris and is also inoperable. The inability to operate the sluice gate valves during low flows could lead to issues keeping Mill Creek from running dry and maintaining the creek ecosystem.

The reservoir upstream of the diversion structure frequently fills with sediment following flood events. Currently, maintenance activities to remove the sediment are manual and include a complex operation utilizing excavators, conveyor belts, and dump trucks to clear the accumulated material and maintain the facility. The removal of sediment also requires extensive permitting with the Oregon authorities and the United States Army Corps of Engineers (USACE), which took 18 months during the last cycle. In addition to these maintenance challenges, heavy sediment flow during flood events poses a hazard by potentially blocking the raw water intake, which could disrupt water supply to the WTP.

The City has an ongoing separate contracting effort for design of modifications to the diversion structure to reduce sediment accumulation, minimize manual dredging, and protect the intake building from flooding. The project includes installation of a new 10-foot wide by 13-foot-tall vertical lift bypass gate in the weir structure to allow regular flushing of the sediment through the bypass gate and past the existing dam embankment and water supply intake screens. The new gate should also reduce flooding impacts on the intake building by allowing accumulated material to pass through during high water events, reducing the recurring maintenance burden of manual clearing. The project is currently in design, and this risk assessment includes considerations for future risks related to the new bypass gate system.

Although the new gate has not yet been constructed, a previous demolition effort at the diversion structure provided an opportunity to observe the internal condition of the concrete. Based on the section that was cut out, the concrete appeared to be in relatively good condition considering its age, despite assumptions that it was cracked and below modern strength standards. No major defects were noted during this observation. However, the exact construction specifications and internal properties remain unknown, and further evaluation through concrete core sampling could provide valuable data on compressive strength, consolidation, and potential deterioration. The design team recommended that any future dewatering events be used as opportunities for additional visual inspections, as access will be limited once the new gate is operational. The diversion structure overall is considered in fair condition, with moderate surface deterioration and localized spalls. While past performance suggests no underlying structural issues, internal flaws such as poor consolidation or low compressive strength could affect long-term reliability. The planned demolition for the new bypass gate will provide an excellent opportunity to collect core samples for testing, including petrographic analysis and strength evaluation.

The fish ladder has been visually inspected by the United States Fish and Wildlife Service and was determined to function appropriately, with recent modifications in 2022 made to improve fish passage.

4.5.3.2 Control Building

The control building consists of a 30-foot by 8-foot composite building built in 1922 and an adjoining screen structure platform which was built by the City in 2001. The building houses the mechanical and electrical equipment that operates the diversion and spillway, including actuators for four sluice gates, four compressor air tanks, telemetry equipment, building lighting, and other electrical-mechanical equipment associated with the building operation. These gates regulate flow through the diversion structure and intake system. The screen in front of the intake prevents debris from entering. Debris collects on the screen over time which is periodically flushed out by the air compressors located on the platform. The control building structure is in poor condition, with severely deteriorated wood panel walls, windows, and doors that were damaged during prior flooding events. The electrical and telemetry systems are in poor condition. During high water flow conditions, the building is prone to inundation and is vulnerable to damage from large woody debris, which could damage the building's platform or machinery/structural components stored on the platform, including compressed air tanks and sluice gates. Flooding has already caused significant damage to the control building structure, and future flood events could exacerbate existing vulnerabilities. During the 2020, flood the control building structure was inundated with up to three feet of surge water, causing substantial damage. The 2020 flood was a record flood event and was the first recorded flooding of the intake building. The sluice gates, machinery, and the critical and supplementary mechanical-electrical equipment avoided damage due to being elevated above the surge water inside of the building. The City completed siding upgrades of the building in the summer of 2025 and some minor work inside of the building but overall, the control building is in poor condition.

The existing telemetry system communicates from the control building to the WTP control system via a hardwired (leased line telephone) connection using dial-up modems (Data-Link DLM-4500). The connection has been problematic and fails periodically, generally due to problems with the leased telephone line. The existing telephone leased lines are old and have been broken and spliced many times over the years.

4.5.3.3 Screening/Sorting Building

The screening building, constructed in 1986, contains upstream and downstream intake piping, large screens, and vertical lift gates that regulate flow between the intake and the screens. The screens serve two primary purposes: managing debris downstream of the intake and protecting fish by preventing their entry into the water supply system. Ancillary mechanical and electrical equipment for lighting and operation is also housed within the building.

The building is in overall good condition, with no significant deficiencies observed. Recent improvements include roof replacement, and the internal electrical system is in good condition. However, the electrical service to the building is rated fair because the above-grade powerlines show signs of deterioration and are located near trees, increasing vulnerability.

The City collects turbidity and temperature data at this building and transmits it to the WTP via a hardwired phone line. This line is exposed to environmental elements, which can impact connectivity. Transitioning to a more reliable communication system, such as wireless or satellite, would improve operational resilience.

4.5.3.4 Standby Generator

The standby power system provides power to the screening/sorting building and raw water intake structure in the event of a loss of utility power. The existing generator is an 80-kilowatt Kohler generator in a weatherproof outdoor enclosure with an external diesel fuel tank located under a shed roof. The facility is rated as being in fair condition, as it is over 35 years old and exhibits signs of corrosion and aging. The transfer switch located in the screening building is also over 35 years old, showing signs of corrosion and age. Since all electrical power is routed through the transfer switch, its failure would result in a complete loss of power to the facilities.

4.5.3.5 Caretaker Facilities

The caretaker facilities are located just downstream of the raw water intake and screening/sorting building and include a residence that is occupied full-time by the caretaker, a cabin, and a few sheds/garages. The residence has heating and cooling issues and needs drywall repairs in the interior. The electrical service to the building is rated fair, as the existing powerlines show signs of deterioration, are installed overhead, and are located in close proximity to trees; these powerlines also serve the screening building. There is no standby power system for these facilities.

Building materials used in construction of the facilities are highly flammable and the buildings themselves have construction defects that make them more receptive to embers. Overstock vegetation is present adjacent to the structures, including fine and heavy fuels.

At the Washington and Oregon state boundary, Mill Creek Road remains paved and continues as a paved access roadway maintained by Umatilla County. The County recently completed paving the road up to the intake property in coordination with the USFS, improving year-round access to the site.

Mill Creek Road is the only access road to the critical facilities at the intake. It is narrow and winding in places, and runs along the north side of Mill Creek, where vegetation is in closer proximity to the facilities, increasing the potential for impact from direct flame contact or falling trees. This area offers better access to the vegetation, creating more opportunities for treatment. However, the north side also features a hard-south slope, which tends to have drier fuels and a more fire-prone forest composition. Additionally, the narrow road and limited parking area around the facilities pose challenges for fire suppression vehicles, further complicating mitigation and emergency response efforts. There is sufficient room around the home site to allow for wildfire suppression vehicles to maneuver and access the property, safely fight the fire, and evacuate easily.

During flood events, access to the raw water intake can be cut off. Response and recovery planning is necessary to allow for key personnel to be on site for operations, maintenance, and facility monitoring during a high-water event. In past flood events, it was reported by the caretaker that flood waters came within a few feet of the residence foundation.

4.5.3.6 United States Geological Survey Gauging Station

The United States Geological Survey (USGS) gauging station is located on the south side of Mill Creek and is only accessible via a 2-foot-wide pedestrian bridge which spans the creek. The pedestrian bridge was built on-site by City staff, and no construction documentation was provided as part of this assessment. It is a lightweight, steel, welded single-span structure, and is unpainted with surface corrosion noted during the site visit. The bridge has four 1/2-inch diameter anchor bolts attaching it to the concrete abutments. Assuming that the bridge is not designed for loading from flood waters and debris, there is potential for the small anchor bolts to be inadequate in shear/tension, which could result in the bridge superstructure being separated from the abutments. This may result in a temporary loss of access to the USGS gauging station which is a critical component of WTP operations.

4.5.3.7 Barn/Corral Area

Up until about 10 years ago, the USFS patrolled the watershed by horseback, and the barn/corral area was located on the south side of Mill Creek, opposite the caretaker facility. This practice ended due to an injury and the site is now vacant. The City is exploring alternate uses of this site and wishes to maintain access. A bridge which spans over Mill Creek provides the single point of access to the barn/corral area and is in poor condition. The bridge consists of a steel truss; single span connected with lateral steel beams. The steel beams support wooden girders, which support the wooden deck. The abutments are reinforced concrete, with gabion baskets used for erosion protection. The wooden girders and deck are deteriorated beyond repair; the bridge is currently not passable to vehicular traffic and is only suitable for pedestrian access. If deemed appropriate by a review from a bridge engineer, the steel components may be salvaged during a retrofit but the wood components should be replaced. Due to the poor condition of the bridge, it is possible that a significant flood event could damage the structure and dislodge/displace the compromised wooden decking.

The flat, treeless area has potential for some uses, but lack of vehicular access keeps this potential limited. Several snags are observable from the barn area, including many tall, old trees that appear to have died in the last few years. Young conifers have begun to encroach on this area, otherwise the main fuel here is tall grass which is kept mowed by the caretaker.

The barn/corral area and bridge accessing it are unutilized areas downstream of the intake that currently have no impact on the intake or WTP operations and therefore have no risks expected related to the operation or safety of the intake or WTP. One potential improvement to the site is to use the area to increase firefighting opportunities by converting the barn/corral area into a heliport, safety zone, fire break, access point, or other feature, as further discussed in **Chapter 6**.

4.5.4 Raw Water Transmission Main

The raw water transmission main was installed by the City in 1988 and is 14.5 miles in length, traveling along Mill Creek Road from the raw water intake to the WTP. The transmission main was installed under two separate contracts. Contract No. 1 (Reach A) included installation of 3.6 miles of 30-inch C301 prestressed concrete cylinder pipe spanning from the raw water intake to the state border. Contract No. 2 (Reach B) included installation of 10.5 miles of 30-inch welded steel pipe with cathodic protection spanning from the state border to the WTP. There is 1,200 feet of elevation difference from the raw water intake and the WTP which translates to over 500 pounds of pressure supplied by the transmission main at the WTP.

Multiple repairs on the transmission main have been required since installation, due to washouts that occurred because of flooding within Mill Creek. Three separate sections were washed out during the February 2020 flood event, which is reported to have observed peak flows in excess of 7,000 cubic feet per second and sections of the transmission main were also damaged and repaired during a flood event in February 1996. The washouts are further discussed in the following sections.

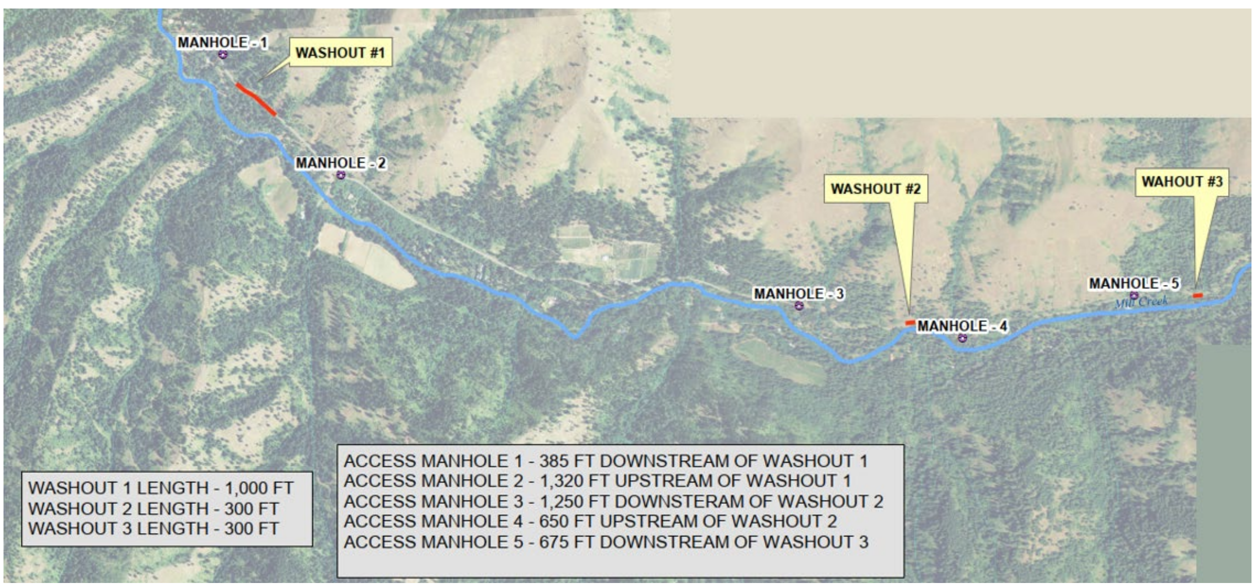
4.5.4.1 2020 Emergency Repairs

During the 2020 service outage due to the washouts from flooding, the City switched to groundwater sources to maintain supply. However, the transmission main serves as a critical water source during peak demand times and is also used to recharge the local groundwater aquifer which serves as a large storage reservoir for the water supply system. The 2020 damages occurred in Umatilla County, OR, and the transmission main was buried within the subgrade of Mill Creek Road and relied on the bearing capacity and erosion protection provided by the roadway prism. Shallow bedrock was observed at one washout location. USACE provided technical assistance to the City on February 14th, 2020, following the washouts and their recommendations are contained in a memorandum located in **Appendix G** and summarized as follows:

- Use of grouted rock anchors with cabling to secure the pipe at the location where shallow bedrock was observed.
- Redundant erosion protection, including a hardened bench with gabions and/or riprap, at each of the washout sites.
- Various channel improvements at each site, including channel modifications (clearing, grading) and flow redirection (training structures, swales).

Design of emergency repairs following the 2020 transmission main washouts was developed by Murraysmith (now Consor) on February 27th, 2020. The plans from that effort are included in **Appendix H** and can be used as a reference in the case of another washout. Locations and dimensions of the 2020 washouts, as well as access manholes in the vicinity, are shown in **Figure 4-2**. Repairs for each of the three washout locations were prescribed and conducted in the field.

Figure 4-2 | 2020 Transmission Main Washout Locations and Dimensions



4.5.4.2 Future Transmission Main Improvements

The City and CTUIR have noted a ¼-mile section of Mill Creek where floodwaters historically exceed channel capacity and inundate Mill Creek Road, causing erosion and temporary loss of access for residents and City staff. While this location presents ongoing challenges, the City has indicated that long-term improvements to Mill Creek Road and the transmission main are outside the scope of this Watershed Master Plan. The City's current approach is to maintain the existing infrastructure as-is and perform emergency repairs as needed following high-water events. CTUIR has expressed interest in future habitat enhancement opportunities, such as bank stabilization, floodplain reconnection, and placement of large woody debris, to improve channel complexity and fish passage for ESA listed salmonids. These habitat-focused actions should be considered in future collaborative projects but are not addressed in this report.

4.5.5 Water Treatment Plant

The WTP is a grouped asset that consists of the raw water hydropower plant, twin 7.5 million gallons (MG) reservoirs and valve house, outlet control structure, roughing filters building, UV disinfection system building, chlorine building, treated water pump station, finished water tanks, maintenance building, administration and SCADA building, backup power and SCADA systems, and water supply wells.

The site visit and condition assessment conducted for the WTP provided insights into the existing operational and infrastructure vulnerabilities. These vulnerabilities could pose risks to the WTP's continued operation, especially in the context of extreme events, such as wildfires, flooding, or significant infrastructure failure. A Water Supply and Treatment Facilities Condition and Risk Assessment Technical Memorandum (WTP TM) focused on the WTP condition and risk assessment and is included as **Appendix I**. The following sections provide a high-level overview of the WTP TM but for additional details the Appendix should be referenced.

4.5.5.1 Water Treatment Plant Overview

The City obtains approximately 85 percent of its drinking water from Mill Creek with the remainder being provided by the City's groundwater system. The WTP relies on high-quality water provided by Mill Creek at the surface water intake to meet drinking water standards and has been able to effectively implement this strategy for decades. However, the reliance on high-quality surface water that is low in turbidity and other undesirable constituents at the source means that the WTP is vulnerable to changes in water quality that may occur suddenly due to a wildfire or landslide in the watershed, or changes that may occur over time from weather extremes. The lack of a filtration facility to manage changes in the quality of the source water, which is a common practice, constitutes a significant risk for this facility.

The WTP has a treatment capacity of 24 MGD and is located on a 51-acre parcel. It was originally constructed in 1923 as a sedimentation-only treatment facility but has undergone several modifications over the years, including the most recent upgrade in 2019. It faces challenges related to aging infrastructure, operational inefficiencies, and environmental hazards. Several original components, including the twin reservoirs and valve house, are still in operation after over 100 years. While upgrades have been made over time, the original infrastructure remains vulnerable to further wear and potential failure.

4.5.5.2 Backup Power

The WTP relies on a stable power supply, which can be disrupted by severe weather events. Power loss could halt operations and distribution, creating significant risk to public health and safety. The backup power system, which includes a 750 kilowatt generator, is over 25 years old. Additional generators located throughout the WTP for dedicated treatment processes are also old, such as the chlorine building backup generator which is over 35 years old. While the utility provider's responsiveness to outages has been reliable, the aging generator system could present challenges during extended power interruptions. In the past, an 18-hour outage has occurred and been managed by the City. Prolonged outage events pose risks to the water supply if the generator fails to function. As noted in **Section 4.4.3**, a solar farm is currently being constructed at the WTP site to help alleviate vulnerabilities associated with power outages.

4.5.5.3 Twin Reservoirs

The twin open-air reservoirs, each 7.5 MG and constructed in 1923, are over 100 years old and in poor condition. Originally used for finished water storage, they now provide system storage, limited settling, and a point for diverting excess water to Mill Creek. Routine system losses have been attributed to seepage through the embankments, confirmed during a 2024 inspection when the north reservoir lost approximately two feet of water within 24 to 36 hours, equating to about 0.5 MGD. Cracking near the valve house was observed, and while pressure grouting was performed in the south reservoir in 2016, long-term integrity remains uncertain. The reservoirs are vulnerable to contamination because they are open-air basins exposed to wildlife and air particles. Geese activity and recurring algae blooms introduce organic material into the reservoirs, which reacts with chlorine added during treatment and creates chemical byproducts that affect water quality and impacted ASR operations. Structural deterioration, differential settlement, and potential voids beneath the concrete lining pose seismic vulnerability, and aging valves in the valve house are corroded and difficult to operate despite routine maintenance. Poor drainage on the intermediate embankment complicates cleaning and maintenance. Additional details, including inspection findings and historical repairs, are provided in **Appendix I**.

4.5.5.4 Chlorine Building

The chlorine building has the potential for gas leaks and the risk of chlorine cylinder damage in the event of an earthquake. Recent mitigation efforts, including installation of a scrubbing system, have been implemented to address these issues. Securing the chlorine cylinders and exploring bulk hypochlorite options may be warranted to address health hazards and supply issues associated with chlorine gas.

4.5.5.5 UV Disinfection System Building

The UV disinfection system building was constructed by the City as part of the 2019 WTP upgrades and provides disinfection downstream of the roughing filter. This facility consists of three UV reactor trains with 24-inch diameter piping and valves with a capacity of 12 MGD per train. The City has had issues with leakage though the 24-inch plug valves during low flow conditions which has inhibited the ability to fully isolate individual UV trains. In addition, the facility lacks a crane or portable hoist to move large equipment such as the 24-inch plug valves.

4.5.5.6 Finished Water Storage Tanks

The dual finished water storage tanks were built in 1998 and are 7.0 MG, each, at 4.5 MGD at minimum operating depth. During a recent interior inspection, it was reported by the City that there is concern about the potential for corrosion at the bottom of the vertical interior supports. The location, between the tank floor and the column support plate makes it impossible to paint them. It has been suggested that this location could be protected by cathodic protection or by seal welding the column support plates to the floor. The extent of the corrosion and section loss is not known at this time, but section loss that results in loss of structural support could result in the loss of a tank and its contents into the WTP facility and surrounding area. The tanks also lack flexible or earthquake valves on the outlet pipes to provide resilience against seismic activity.

4.6 Risk Assessment

This section provides the details on the risk assessment process.

4.6.1 Risk Framework Methodology

A brainstorming exercise was conducted by the project team to develop a comprehensive list of risks to the City's waters supply facilities. WTP-specific risks outside of some political, social, and economic hazards are not included in this overall risk framework as those were identified through the work done on the WTP TM (**Appendix I**). Each risk was analyzed by the project team by developing an understanding of the hazard description, risk description, risk owner, likelihood rating and description, impact rating and description, and severity rating.

Following the development of a comprehensive list of risks, the team conducted a screening process based on the risk rating, feasibility of implementation, and removing potential duplication of mitigation actions.

4.6.2 Risk Rating Criteria

The risk rating framework utilizes a system based on likelihood and impact ratings, each categorized as low, medium, or high. The likelihood rating assesses the probability of an event occurring, while the impact rating evaluates the potential effect of the event on the City's water supply system. These two ratings are then combined to derive a severity rating, which is also classified as low, medium, or high. The resulting severity rating provides a comparative measure of risk associated with each asset. Using these methods, the higher the rating, the more risk associated with a particular asset.

For example, an asset that has a high likelihood of frequent occurrence of a particular risk that will negatively impact the City's water supply system to provide potable water will have a higher severity rating than an asset with a low likelihood of risk occurrence and minimal impact to the City's water supply system. To reduce the overall level of risk to the City's water supply system, mitigation actions to the assets with the highest scores should be prioritized over lower-severity components.

4.6.2.1 Likelihood Ratings

The likelihood ratings are classified as either low, medium, or high based on the descriptions below.

- Low Likelihood Rating: Unlikely or rare event, only a few instances of similar risks happening in similar situations.
- Medium Likelihood Rating: Moderate, either because it has been observed in similar contexts or may materialize under foreseeable conditions.
- High Likelihood Rating: Likely, either because it has happened frequently in the past or there is strong indication of an impending occurrence.

4.6.2.2 Impact Ratings

The impact ratings are classified as either low, medium, or high based on the descriptions below.

- Low Impact Rating: Minor disruption with negligible long-term effects.
- Medium Impact Rating: Moderate impact requiring significant repair/recovery or operational adjustment.

- High Impact Rating: Severe impact resulting in system failure or long-term impact. Unacceptable outcome.

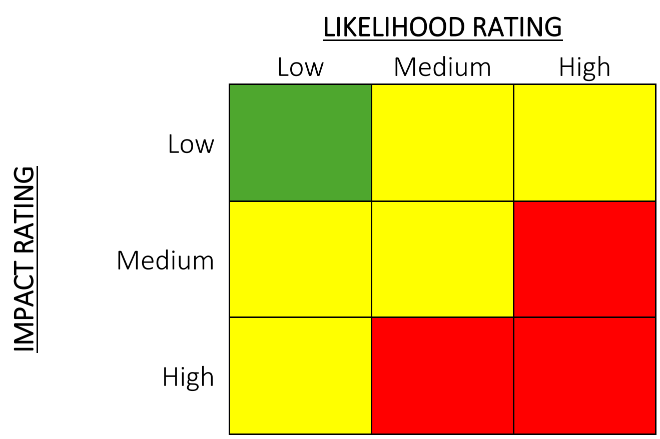
4.6.2.3 Severity Rating Matrix

The severity rating is based on a matrix that combines likelihood and impact ratings. Each rating: low, medium, or high for both likelihood and impact is cross-referenced within the matrix to produce a corresponding severity rating. The matrix works as follows.

- Low likelihood, low impact results in a low severity rating
- Low likelihood, high impact results in a medium severity rating
- High likelihood, low impact results in a medium severity rating
- High likelihood, high impact results in heigh severity ratings

Figure 4-3 illustrates the severity rating matrix.

Figure 4-3 | Severity Rating Matrix



4.6.3 Interdependencies

The risks identified in the City's watershed are deeply interdependent, with most hazards having compounding effects that cascade throughout the system. A primary example is the interplay between wildfire, flooding, and infrastructure damage. Wildfires within the Mill Creek Watershed can significantly alter soil properties, reducing permeability and increasing runoff during rainfall. This heightened runoff can exacerbate the risk of flooding, which in turn can damage the raw water intake and/or transmission main. The increased sediment loads from post-wildfire runoff can also have significant impacts on water turbidity, complicating water treatment processes and increasing operational costs. These disruptions are not isolated, as they ripple through the system, impacting water supply reliability and WTP operations.

Similarly, weather extremes intensifies these vulnerabilities by altering precipitation patterns and increasing the frequency of extreme weather events. For example, higher temperatures and prolonged droughts can reduce stream flows, straining water supply during critical periods. These conditions also create an environment conducive to wildfires, further compounding the risks of flooding and sedimentation. Additionally, the impact of weather extremes on water quality, such as increased TOC and algae growth, places further strain on treatment processes, leading to potential non-compliance with water quality standards. The convergence of these factors results in a feedback loop where each hazard exacerbates the others, challenging the resilience of the entire water system.

Infrastructure failures also have overlapping and amplifying effects. For instance, embankment performance issues at the twin reservoirs during a seismic event could lead to uncontrolled flow releases, which could damage WTP facilities. Flooding from such an event could impact operations and/or impede access for City staff. Additionally, the loss of storage capacity due to seepage or structural damage further limits the system's ability to mitigate and respond to natural hazards.

Economic and political constraints, such as reductions in grant funding or public and tribal support, further hinder the implementation of critical CIP projects, delaying necessary mitigations against operational risks.

Together, these factors create a complex web of risks where individual vulnerabilities cannot be addressed in isolation without considering their broader implications on the system.

4.6.4 Risk Assessment Summary

Table 4-4 provides a comprehensive overview of the risks associated with the City's water supply system, as discussed in previous sections, and provides the following details.

1. System/Component: Identifies the specific water system asset where the risk is present as identified in Section 4.5.1.
2. Risk ID: A unique identifier for each risk, referencing its entry in the project's risk register.
3. Hazard Category: Classifies the risk into broad hazard categories as discussed in Section 4.4 to help readers quickly understand is nature.
4. Risk Description: Provides a brief explanation of the potential hazard and risk, including its cause and impact on the water system's operations or safety. Also provides a discussion on the severity rating matrix.
5. Status: Indicates whether the risk is being carried forward for mitigation planning ("Pushing Forward") or has been excluded from further consideration ("Screened").
6. Reason for Screening: For risks that are screened, the table explains the rationale, often due to overlaps with other risks, because they are adequately addressed by existing strategies or practices, or they were noted as low severity.

Mitigation actions are identified to reduce the overall risks as part of the watershed resiliency strategy identified in Chapter 6 and the WTP TM Appendix I.

Table 4-4 | Risk Assessment Summary

System/Component	Risk ID	Hazard Category	Risk Description and Rating	Likelihood Rating	Impact Rating	Severity Rating	Status	Reason for Screening
Raw Water Intake – Diversion System & Surrounding Environment	1	Environmental - Wildfire	Wildfire damage to raw water intake disrupting water supply to WTP.	Medium	High	High	Pushing Forward	N/A
	13	Operational	Structural failure of the control building due to existing deteriorated state, rendering intake inoperable and disrupting water supply to WTP.	Medium	High	High	Pushing Forward	N/A
	14	Environmental - Wildfire	Flooding causes mechanical or electrical failure at control building, rendering intake inoperable and disrupting water supply to WTP.	Medium	High	High	Screened	Addressed under Risk ID #13 with overlapping mitigation strategies, screened to avoid duplication
	26	Environmental – Severe Weather	Flooding causes structural failure of pedestrian bridge leading to gauging station renders the location inaccessible.	Low	Medium	Medium	Pushing Forward	N/A
	29	Environmental – Severe Weather	Flooding overtops diversion abutment, breaching earthen abutment and disrupting water supply to WTP due to loss of pool.	Low	High	Medium	Pushing Forward	N/A
	30	Environmental – Earthquake	Cracking of the diversion structure could occur due to seismic activity, potentially leading to a structural breach and loss of the pool, thereby disrupting water supply to the WTP.	Medium	Medium	Medium	Screened – O&M	Monitoring for cracking should be included as part of routine O&M to ensure early detection and response. These practices are considered routine and should be addressed through typical O&M planning, rather than through this resiliency study, which focuses on identifying actions beyond standard procedural updates.
	31	Environmental – Earthquake	Earthquake damages control building, rendering intake inoperable and disrupting water supply to WTP.	Medium	High	High	Screened	Addressed under Risk ID #13 with overlapping mitigation strategies, screened to avoid duplication
	32	Operational	Control structure slides on interface with bedrock foundation leading to failure.	Low	High	Medium	Screened	This risk should be evaluated as part of vertical lift bypass gate design currently ongoing.
	33	Operational	Aging infrastructure and the unknown condition of diversion structure may lead to deterioration of control structure, resulting in reduced shear strength and sliding stability, leading to breach and loss of pool disrupting water supply to WTP.	Low	High	Medium	Pushing Forward	N/A
	34	Environmental – Severe Weather	Scour undermines abutment, causing breach of diversion structure and loss of pool disrupting water supply to WTP.	Low	High	Medium	Screened	Addressed under Risk ID #29 with overlapping mitigation strategies, screened to avoid duplication
	35	Environmental – Severe Weather	Access Road floods restrict Caretaker access to and from the site, hindering intake system operations and posing a safety hazard.	Medium	Medium	Medium	Pushing Forward	N/A
	36	Environmental – Severe Weather	Flooding damages air compressors, preventing flushing until system is restored or would require manual operations to clear screens resulting in reduced flows to the WTP.	Medium	Low	Medium	Screened	Addressed under Risk ID #13 with overlapping mitigation strategies, screened to avoid duplication
	37	Operational	Future conditions for new bypass gate: bypass gate leakage from gaps between new gate tower pier and weir.	Low	Low	Low	Screened	This was identified as low risk and should be addressed in the vertical lift bypass gate design currently ongoing.
	38	Operational	Future conditions may result in mechanical or electrical failure of the new bypass gate, causing it to become inoperable in the open position. This could lead to a loss of the pool and disrupt water supply to the Water Treatment Plant (WTP).	Low	High	Medium	Screened – O&M	Regular inspection, testing, and maintenance of gate components should be included in routine O&M to ensure reliable operation and early identification of potential issues. These practices are considered routine and should be addressed through typical O&M planning, rather than through this resiliency study, which focuses on identifying actions beyond standard procedural updates.
	39	Operational	Future conditions for new bypass gate: Mechanical/electrical failure leads to inoperable gates in closed position leading to inability to flush debris and causing clogs in the system or require manual operations to remove sediment.	Low	Medium	Medium	Screened	Addressed under Risk ID #38 with overlapping mitigation strategies, screened to avoid duplication
	40	Operational	Future conditions for new bypass gate: Ice prevents bypass gate from opening leading to inability to flush debris and causing clogs in the system or require manual operations to remove sediment.	Medium	Low	Medium	Screened – O&M Pushing Forward	As part of the O&M, gate is normally in the closed position and limit flushing operations during freezing conditions. These practices are considered routine and should be addressed through typical O&M planning, rather than through this resiliency study, which focuses on identifying actions beyond standard procedural updates.

System/Component	Risk ID	Hazard Category	Risk Description and Rating	Likelihood Rating	Impact Rating	Severity Rating	Status	Reason for Screening
	41	Operational	Future conditions for new bypass gate: Ice prevents bypass gate from closing leading to loss of pool, disrupting water supply to WTP.	Medium	High	High	Screened	Addressed under Risk ID #40 with overlapping mitigation strategies, screened to avoid duplication
	42	Operational	Future conditions for new bypass gate: Floating bog or debris jam leads to gate inoperability leading to inability to flush debris and causing clogs in the system or require manual operations to remove sediment.	Medium	Low	Medium	Screened	This was identified as low risk and should be included as part of the City's Operations and maintenance plan.
	43	Operational	Future conditions for new bypass gate: Wire rope failure of bypass gate leading to inability to flush debris and causing clogs in the system or require manual operations to remove sediment.	Low	Low	Low	Screened	Identified as low risk and should be addressed in the vertical lift bypass gate design currently ongoing by designing wire rope attachments for easy repair and limit possibility of fraying the wire rope.
	46	Environmental – Wildfire	Wildfire leads to access road being cut off due to trees falling, hindering intake system operations and posing a safety hazard.	High	High	High	Screened	Addressed under Risk ID#1 with overlapping mitigation strategies, screened to avoid duplication.
	47	Environmental – Wildfire	Wildfire leads to landslides and damages access road, hindering intake system operations and posing a safety hazard.	High	High	High	Screened	Addressed under Risk ID#1 with overlapping mitigation strategies, screened to avoid duplication.
	48	Environmental – Wildfire	Wildfire in watershed disrupts water supply to WTP.	Low	High	Medium	Screened	Addressed under Risk ID #1 with overlapping mitigation strategies, screened to avoid duplication
	49	Environmental – Wildfire	Wildfire impacts trail access to watershed and leads to limitations for firefighting activities.	Low	Medium	Medium	Screened	Addressed under Risk ID#1 with overlapping mitigation strategies, screened to avoid duplication
	50	Environmental – Wildfire	Limited access for fire fighting operations.	Low	Medium	Medium	Pushing Forward	N/A
	51	Operational	Aged overhead powerline near trees may be damaged by falling branches during a storm, potentially disrupting power supply to screening building and caretake facility.	Medium	Medium	Medium	Pushing Forward	N/A
	52	Operational	Failure of generator or transfer switch leads to power outage at intake facility.	Low	High	Medium	Pushing Forward	N/A
	53	Operational	Failure of telemetry system resulting in disruption to WTP operations.	Low	High	Medium	Pushing Forward	N/A
	54	Operational	Personnel responsible for monitoring and maintaining the intake structure does not have backup power. In the event of a wildfire, flood, or other hazard that causes a power outage, critical operations and communications could be disrupted, limiting the ability to respond effectively to intake-related emergencies and potentially impacting the city's water supply.	Low	Medium	Medium	Screened	Addressed under Risk ID #52 with overlapping mitigation strategies, screened to avoid duplication.
	55	Political, Social, Economic	Privately owned parcels within watershed limit City's ability to implement wildfire mitigation and land management practices, increasing risk to water supply infrastructure.	Low	Low	Low	Pushing Forward	N/A
Raw Water Transmission Main	2	Environmental – Wildfire	Wildfire causing slope instability and leading to a landslide causing damage to the transmission main disrupting supply to the WTP.	Medium	High	High	Screened	This risk was screened because the City has indicated that the transmission main will remain as-is and is outside the scope of this Watershed Master Plan. While slope instability remains a concern, mitigation actions for the transmission main itself are not included in this plan. The City's current approach is to maintain the existing facility and perform emergency repairs as needed following hazard events.
	3	Environmental – Severe Weather	Increased variability in precipitation patterns impacting steam flows and reducing supply to the WTP.	Medium	Medium	Medium	Screened	This risk is being screened out because there are limited direct mitigation actions the City can take to influence regional precipitation variability. However, the City maintains a dual water supply system that includes both surface water and groundwater sources. Planned improvements to well facilities will strengthen the reliability of the groundwater system and ensure continued supply during periods of reduced surface water availability, effectively mitigating this risk.

System/Component	Risk ID	Hazard Category	Risk Description and Rating	Likelihood Rating	Impact Rating	Severity Rating	Status	Reason for Screening
	16	Environmental – Severe Weather	Flooding washes out section(s) of the transmission main disrupting supply to the WTP.	Medium	Medium	Medium	Pushing Forward	N/A
Water Treatment Plant	4	Political, Social, Economic	Economic downturn reduces development	Low	Medium	Medium	Screened	Identified as a low risk. City has adequate water supply between dual sources and has multiple approved plans for infrastructure upgrades.
	5	Operational	Twin reservoir embankment failure results in uncontrolled release of flows impacting WTP operations and poses a safety risk.	Medium	High	High	Screened	Addressed under Risk ID #8 with overlapping mitigation strategies, screened to avoid duplication
	6	Operational	Twin reservoir water contamination from air particulates, wildlife activity, and/or biofouling	High	Medium	High	Pushing Forward	N/A
	7	Operational	Twin reservoir seepage losses result in loss of system storage capacity	High	Medium	High	Pushing Forward	N/A
	8	Operational	Lack of a current facilities plan resulting in insufficient funding/budgeting for needed capital projects, and misallocation of site usage on the WTP property.	High	High	High	Pushing Forward	N/A
	9	Environmental – Severe Weather	Water quality impacts related to weather extremes and volatility (temperature increase, TOC, algae growth) resulting in reduced water quality and limiting WTP supply.	High	High	High	Pushing Forward	N/A
	10	Environmental – Earthquake	An earthquake or other natural disaster causes a failure in the system rending the WTP inoperable.	Medium	High	High	Screened	Addressed under Risk ID #11 with overlapping mitigation strategies, screened to avoid duplication. In addition, the City's current planning documentations have indicated vulnerabilities to the water supply via an earthquake and will be provided as part of the combined CIP.
	11	Environmental – Earthquake	An earthquake causes a failure in the chlorine building and uncontrolled release of hazardous gas creating a safety concern.	Medium	High	High	Pushing Forward	N/A
	12	Operational	A failure in the twin finished water tank shell and/or interior structural support of the tanks due to corrosion resulting in loss of stored water releasing into WTP and surrounding area causing damage and loss of supply for City's potable water system.	Medium	High	High	Pushing Forward	N/A
	15	Political, Social, Economic	Delays with regulatory authorization of system improvements leading to inability or delay in implementing infrastructure improvements	Medium	Medium	Medium	Screened	Addressed through ongoing efforts to inform stakeholders on the benefits of CIP
	17	Political, Social, Economic	Lack of political support for system improvements and impacts CIP implementation.	Low	High	Medium	Screened	Addressed through ongoing efforts to inform stakeholders on the benefits of CIP
	18	Political, Social, Economic	Decrease in federal grants due to budget constraints.	Low	High	Medium	Screened	Managed through ongoing engagement with state officials to inform them of the need for continued funding support for a safe and reliable water supply. This is a standard practice conducted by the City.
	19	Political, Social, Economic	Decrease in state grants due to budget constraints.	Low	High	Medium	Screened	Managed through ongoing engagement with state officials to inform them of the need for continued funding support for a safe and reliable water supply. This is a standard practice conducted by the City.
	20	Political, Social, Economic	Lack of public support for system improvements	Low	Medium	Medium	Screened	Addressed by conducting updates on the need to protect critical water supply infrastructure. This is a standard practice conducted by the City.
	21	Political, Social, Economic	Lack of tribal support for stream restoration and/or system improvements	Low	Medium	Medium	Screened	Addressed through active engagement with Sovereign Nations to seek opportunities to collaborate on restoration practices. This is a standard practice conducted by the City.
	22	Operational	The aging valves at the twin reservoirs valve house become inoperable and staff lose the ability to manage reservoir capacity.	Medium	Low	Medium	Pushing Forward	N/A
	23	Political, Social, Economic	The State Dam Safety Office enforces actions to bring the Twin Reservoir embankments up to compliance with state code.	Medium	Medium	Medium	Screened	Addressed under Risk ID #8 with overlapping mitigation strategies, screened to avoid duplication

System/Component	Risk ID	Hazard Category	Risk Description and Rating	Likelihood Rating	Impact Rating	Severity Rating	Status	Reason for Screening
	24	Operational	Improper drainage on the Twin Reservoir embankment crowns leading to excessive maintenance responsibility.	High	Low	Medium	Screened	Addressed under Risk ID #8 with overlapping mitigation strategies, screened to avoid duplication
	25	Operational	Infrastructure becomes less efficient or fails, causing an operational disruption	Medium	Medium	Medium	Screened	Addressed under Risk ID #8 with overlapping mitigation strategies, screened to avoid duplication
	27	Political, Social, Economic	Regulatory changes stemming from new standards developed and implemented	Low	Medium	Medium	Screened	Addressed through the review of communications from agencies to determine if new standards are in development. This study addresses the current and forecasted regulatory setting, making additional recommendations unnecessary.
	28	Operational	Electrical system failure, could include primary power system or existing backup power system leading to inoperability of WTP.	Medium	Medium	Medium	Pushing Forward	N/A
	44	Operational	Damaged or failed control valves in the UV building leading to supply disruptions from the WTP.	Medium	Low	Medium	Pushing Forward	N/A
	45	Operational	Increased levels of disinfectant byproducts halts aquifer storage and recovery wells.	Low	Low	Low	Pushing Forward	N/A

CHAPTER 5

Resource and Capabilities Inventory

5.1 Introduction and Structure of the Chapter

As part of the City's Watershed Master Plan, a resource and capabilities inventory was conducted to assess the capacity of agencies and organizations involved in managing the Mill Creek Watershed and water supply, essentially the Workgroup members identified in Chapter 1. This inventory aimed to identify available resources including personnel, equipment, funding, technical expertise, communications, and organizational structures, both from local stakeholders and the City, to enhance emergency response planning and resilience-building for the City's water system.

The findings were used to inform the development of a Response Plan (Chapter 8) and contributed to the overall resiliency strategy (Chapter 6) by identifying gaps and opportunities for leveraging existing resources and partnerships.

This chapter outlines the methods and findings of the resources and capabilities inventory for the City's water system and includes discussions on the methods used to complete the inventory, summary of results, and summary of findings and opportunities for improvement.

5.2 Methods

The methods used to complete the inventory included drafting capability categories, developing an online questionnaire, and analyzing the responses.

The four capability categories that questions for stakeholders were developed around include:

- Public Communication: Refers to communication systems, public warning mechanisms, and response and recovery plans that guide the management of critical services during emergencies. Includes existing methods, protocols, and capacity to adapt, update, and improve these systems to enhance coordination, preparedness, and resilience over time.

- Administrative & Technical Knowledge: Refers to the roles, resources, and expertise of stakeholders not directly responsible for the water supply systems but capable of supporting the City in mitigation and restoration efforts. Includes their administrative capacity, technical skills, workforce (e.g., engineers, planners.), and collaborative potential to enhance resilience, as well as their ability to adapt and expand their contributions as needed.

- Equipment & Supplies: Refers to technical equipment and supplies that could be used for planning, prevention, mitigation, and response actions.

- Education & Outreach: Refers to programs and methods that increase and improve public awareness.

An online questionnaire was generated based on the capability categories and sent out to the stakeholders. The questionnaire contained 18 questions that are listed in **Appendix J**.

5.3 Summary of Results

In total, the questionnaire received 18 responses out of 21 from a range of stakeholders, resulting in an 86 percent response rate. A few of the identified stakeholders did not complete the survey with two citing that the survey was not relevant to them as they were individual landowners. A single entity did not provide any response to the survey or request to complete it. The following sections provide specific discussions on the four capability categories with a more detailed summary of results including specific graphs and charts for the different capability categories in **Appendix J**. **Table 5-1** includes the list of respondents.

Table 5-1 | Resource and Capabilities Inventory Respondents

Agency	Acronym
Federal	
US Army Corps of Engineers	USACE
USDA Forest Service – Umatilla National Forest	USFS
Tribal	
Confederated Tribes of the Umatilla Indian Reservation – Housing Department	CTUIR
State – Oregon	
Department of Forestry	OR DF
State – Washington	
Department of Ecology	WA DE
Department of Fish and Wildlife	WA DFW
Department of Health – Drinking Water	WA DH
Department of Natural Resources	WA DNR
Department of Natural Resources – Community Wildfire Preparedness & Resilience	WA DNR – CWPR
Walla Walla County Conservation District	WWCCD
County – Walla Walla	
Emergency Management	WWC – EM
City Representatives	
Milton-Freewater	City - MF
Walla Walla - Water Department	City - WW
Walla Walla	City - WWWD
Non-Governmental Organizations	
Confluence West	CW
Kooskooskie Commons	KC
Walla Walla Basin Watershed Council	WWBWC
Other	
Port of Walla Walla	PWW

5.3.1 Public Communication

The City needs to be able to disseminate relevant and timely information to the public in cases where safe drinking water supply is disrupted. Leveraging communications and warning systems already in use by local stakeholders, or increasing coordination with those stakeholders during emergencies, may enhance the City's ability to do so effectively. The results from the questionnaire provided insight into current practices for public communication during emergencies and how stakeholders are currently integrated with the City. The most commonly reported method was social media, followed closely by websites. A total of seven stakeholders indicated that it would be beneficial to have some form of coordination with the City to integrate warning systems and/or public communication during emergency response efforts. These coordination efforts include sharing warning systems, conducting joint trainings, and general collaboration through phone, email, or information sharing. More than half of the stakeholders (56 percent or 11 stakeholders) indicated that they do not currently coordinate with the City on emergency communications.

Stakeholders were asked to identify potential opportunities for increased collaboration with the City to enhance emergency preparedness. The top two suggested approaches were to standardize messaging and share communication.

5.3.2 Administrative & Technical Knowledge

The City plans to implement actions that reduce risks to its water supply system and establish a recovery plan to maintain or restore safe drinking water following a natural or manmade hazard event. Leveraging the administrative and technical knowledge of stakeholders, including potential in-kind service exchanges, can help accelerate and enhance the effectiveness of these efforts. The questionnaire provides insight into current local efforts to support the City's water supply resilience, including stakeholder involvement in mitigation actions, emergency response, and resource sharing.

Nearly all stakeholders indicated that they currently support or could potentially support the City during a natural hazard event that impacts critical water supply infrastructure. To present this information clearly, roles have been consolidated into broader categories, and descriptions of each role are provided in **Table 5-2** along with the stakeholders that currently provide support and those that could potentially assist in the future. This approach eliminates duplication and gives a quick reference to both the type of support and who can provide it. **Table 5-3** summarizes other initiatives and partnerships identified by stakeholders that could assist the City in building resilience for essential services like water supply.

Table 5-2 | Summary of Stakeholder Support Roles and Participation in Hazard Response and Recovery

Support Role	Stakeholders – Current*	Stakeholders – Potential*
Emergency response: Direct hazard response, firefighting, and coordination through emergency operations centers.	OR DF, USACE, USFS, WA DH, WA DNR, WWC – EM	WA DE, WA DNR, WWCCD
Timber/forest/fuels management: Vegetation thinning, fuels reduction, and prescribed burning to reduce wildfire risk.	OR DF, USFS, WA DNR	KC, WA DNR, WWCCD
Ecological restoration: Post-fire recovery and habitat restoration activities.	USACE, USFS	KC, WA DE, WA DFW, WA DNR, WWCCD
Data collection, monitoring, & early warning: GIS mapping, hazard modeling, and water quality monitoring.	USACE, USFS, WA DH	KC, WA DFW, WA DNR, WWBWC, WWCCD
Access road maintenance/improvement: Maintaining or improving access routes for emergency and operational needs.	USFS	None
Planning/policy/program support: Assistance with hazard mitigation planning, CWPP development, and strategic coordination.	WWC – EM, CW	None

Support Role	Stakeholders – Current*	Stakeholders – Potential*
Operational logistics & supply: Provision of equipment, backup power, heavy machinery, and transport resources.	None	City – MF, PWW
Public communication & outreach support: Disseminating information, mobilizing volunteers, and supporting public messaging.	WWC - EM	KC

Note:
*See Table 5-1 for Acronym List

Table 5-3 | Potential Initiatives to Build Resilient Water Supply Responses from Capabilities and Resource Inventory Questionnaire

Initiative Type	Description	Stakeholder*
Funding & Grants	Grants through the Hazard Mitigation Plan and Community Wildfire Protection Plan and partnership engagements.	WWC-EM, WWCCD
Post-Fire Recovery & Restoration	The post-fire recovery program aims to assist communities like Walla Walla to recover from wildfire. This includes efforts to ready communities for recovery efforts.	WA DNR
Community Resilience Program	Post fire Program, Community Resilience Program	WA DNR
Federal Water Supply & Flood Mitigation studies	Mill Creek 205, USBR Water Supply Study	USACE
Regional Water Planning (Water 2050) Federal Water Supply & Flood Mitigation Studies	Walla Walla Water 2050	KC, WA De
Northern Blues Restoration Partnership	Treatments in and around the watershed implemented by Umatilla National Forest and other partner members of the NBRP. The NBRP also supports watershed restoration efforts (across NE Oregon and SE Washington) and would like to coordinate with other local partners on efforts in the future.	USFS
Other Strategic Partnerships & Programs	Working closely with western water utilities and municipalities; includes strategic planning and coordination.	CW, WA HD, PWW

Note:
*See Table 5-1 for Acronym List

Stakeholders reported technical capabilities that can support the City in hazard mitigation and water system restoration. The most common tools include geographic information system (GIS) mapping and risk assessment/mitigation planning, which are essential for both pre-disaster planning and post-disaster recovery. Additional capabilities such as hazard modeling, emergency response training, and permitting further strengthen preparedness.

Many stakeholders also employ professionals who can assist with emergency operations, including engineers, environmental scientists, emergency responders, and grant writers. This combination of technical tools and expertise provides the City with a valuable network to enhance resilience and safeguard water supply systems. **Appendix J** summarizes these stakeholders and the resources they can provide.

5.3.3 Equipment & Supplies

Assessing the equipment and supplies available from stakeholders and exploring opportunities for collaboration or in-kind resource sharing can help the City to implement actions that improve water supply resiliency quickly and effectively. The questionnaire provides insight into the availability of these resources, and potential partnerships to support the City's ability to restore safe drinking water during emergencies.

While many stakeholders reported limited capacity to provide or loan physical resources, several indicated they can contribute critical equipment and supplies to the City's emergency response efforts. The most frequently reported resources include backup power generators and fuel.

Table 5-4 summarizes stakeholders and the equipment, supplies, and personnel they can provide to support emergency operations and delivery of essential supplies to impacted areas during a natural hazard event.

Table 5-4 | Potential Available Equipment and Supplies Responses from Capabilities and Resource Inventory Questionnaire

Equipment/Supplies/Personnel	Stakeholders
Early warning rain and stream gauges	WA DNR
Emergency Kit	WA DNR
Erosion control materials	USACE
Backup generators and/or fuel	USACE, City – MF,
Heavy Equipment	City – MF
Replacement Pipe	City – MF
Funding	WA DE
Water storage tanks	PWW
Water supply (through Airport intertie w/ City)	PWW
Delivery of essential supplies to impacted areas – Personnel	OR DF, WWC – EM, City – MF, WWBWC, WA DH, USFS, WA DFW, PWW
Delivery of essential supplies to impacted areas – logistical support	WWC – EM, WWCCD, City – MF, WWBWC, USFS, PWW
Delivery of essential supplies to impacted areas – transport/transportation vehicles	WA DFW, City – MF, PWW
Emergency workers	WWC – EM

5.3.4 Education & Outreach

The City would like to increase education and outreach primarily around emergency preparedness and water conservation activities. Leveraging the capabilities of local partners and/or trading in-kind services could help the City achieve this goal. The questionnaire results provide insight into the existing outreach efforts of stakeholders, potential areas for collaboration, and opportunities to expand public education on these critical topics. Sixteen stakeholders reported that they currently conduct public outreach or education programs within the local area, many addressing topics directly relevant to the City's emergency preparedness and resilience goals. More importantly, many stakeholders stated that if a topic of interest was not currently part of their outreach programming, it could potentially be added. Topics like risk reduction, emergency, and water conservation are already covered by a substantial share of stakeholders. However, there is strong potential for expanded outreach. For example, while only 19 percent currently address volunteerism to support ecological resiliency in the Mill Creek Watershed, an additional 56 percent indicated they could incorporate this topic in the future. Four stakeholders noted additional outreach topics not explicitly listed in the questionnaire.

Stakeholders reported using a variety of methods to conduct public outreach, with the average utilizing five different approaches. The most frequently used methods include websites, in-person presentations or workshops, and social media.

5.4 Summary of Findings and Opportunities for Improvement

The questionnaire provided valuable insights into the resources and capabilities amongst stakeholders to improve emergency preparedness and resilience for the City's water supply system. The findings highlight existing capabilities, gaps, and potential areas for collaboration to enhance mitigation actions and response planning. The following subsections provide the key findings and opportunities for improvement.

5.4.1 Public Communication & Coordination

5.4.1.1 Key Findings

- Stakeholders use a variety of communication methods during emergencies, with social media being the most common, alongside Walla Walla County Emergency Operations Center, Walla Walla Emergency Notification System, and Everbridge phone alerts.

- While some stakeholders coordinate with the City through joint training exercises, shared warning systems, and information-sharing, more than half do not currently integrate their emergency communication efforts with the City.

5.4.1.2 Opportunities for Improvement

- Standardize messaging, expand collaboration on public alerts using multiple platforms to ensure widespread and timely information dissemination, mobilize volunteers, utilize the Emergency Operations Center, and integrate ERPs.

- Strengthen partnerships with stakeholders to integrate emergency warning systems and standardize messaging.

- Increase training and joint exercises to improve coordination during emergency situations.

5.4.2 Administrative & Technical Knowledge

5.4.2.1 Key Findings

- Many stakeholders already contribute to planning, management, and ecological restoration efforts in the Mill Creek Watershed. Some also support the City through hazard mitigation planning, policy advocacy, and emergency response efforts.

- Nearly all stakeholders indicated they either currently support or could potentially support the City during natural hazard events affecting critical infrastructure. Key areas of support include emergency operations, flood mitigation, forest management, technical assistance, and fundraising.

5.4.2.2 Opportunities for Improvement

- Utilize stakeholder expertise in hazard mitigation, emergency response, and ecological restoration to strengthen resilience strategies.

- Formalize partnerships for post-disaster recovery, funding opportunities, and technical support in infrastructure restoration.

5.4.3 Equipment & Supplies

5.4.3.1 Key Findings

- Most stakeholders do not have the capacity to provide or loan equipment to support water supply resilience. However, those that do primarily offer backup power generators, early warning rain and stream gauges, and potential funding assistance.

- Some stakeholders can support emergency response by providing personnel, logistical support, and transportation for delivering essential supplies. Additional support may include volunteers, emergency workers, and public information dissemination.

5.4.3.2 Opportunities for Improvement

- Identify ways to acquire or borrow critical equipment such as backup generators and emergency filtration systems.

- Develop agreements for rapid deployment of personnel and transportation support during crisis events.

5.4.4 Education & Outreach

5.4.4.1 Key Findings

- Many stakeholders conduct public outreach and education programs, with a strong focus on emergency preparedness and water conservation. However, several stakeholders indicated a willingness to expand their programs to cover additional topics relevant to the City's needs.

- Outreach efforts rely on multiple communication channels, including websites, social media, workshops, and direct engagement at community events.

5.4.4.2 Opportunities for Improvement

- Expand outreach through new initiatives such as Wildfire Ready Neighbors mailers.

- Work with stakeholders to broaden public engagement on water conservation, emergency preparedness, and community resilience.

- Leverage existing outreach programs and communication channels to increase participation in mitigation efforts.

5.4.5 Conclusion

By improving these categories, the City can better utilize stakeholder resources, strengthen its emergency response framework, and build a more resilient water supply system. These findings will inform next steps in mitigation action planning and ensure effective collaboration moving forward.

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CHAPTER 6

Watershed Resiliency Strategy

6.1 Introduction and Structure of the Chapter

This chapter presents the City's strategy for enhancing the resiliency of its municipal drinking water supply system located within the Mill Creek Watershed. It builds upon the hazard and risk assessment presented in **Chapter 4** and the stakeholder engagement framework established in **Chapter 1** to define mitigation actions that strengthen water system resiliency and infrastructure reliability as well as the resiliency of the Mill Creek Watershed.

In addition to the hazard and risk assessment completed for the City's water supply system, the foundation of this chapter is a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, conducted collaboratively with the project scoping team and Workgroup. The SWOT analysis provided a structured framework to evaluate the City's existing capabilities, identify internal and external factors influencing water system and watershed resiliency, and explore opportunities to enhance the City's ability to prepare for, withstand, and recover from future water system disruptions. Input gathered during the facilitated Workgroup meeting specific to this analysis served as the primary forum for developing and validating the analysis, ensuring that mitigation actions were informed by both technical understanding and local knowledge.

Mitigation actions in this chapter were developed through two primary efforts.

- SWOT-Derived: Specific mitigation actions developed directly from the SWOT analysis findings and subsequent strategy pairings (for example, strength-opportunity, weakness-threat). These represent proactive, actionable approaches that leverage existing strengths and address identified weaknesses to improve the City's water supply system and watershed resiliency.

- Hazard-Informed: Actions developed based on the hazards and risk analysis conducted in **Chapter 4**, excluding WTP-specific recommendations that are identified in the WTP TM (**Appendix I**). While **Chapter 4** focused on characterizing risks, this chapter translates those findings into specific, actionable strategies for mitigation of identified risks.

Together, these mitigation actions form a comprehensive list of resiliency measures that the City can implement to address vulnerabilities affecting its municipal drinking water supply system and associated infrastructure as well as to improve conditions within the Mill Creek Watershed.

This chapter serves as the central location where all mitigation actions for the Watershed Master Plan are first defined and organized, excluding the recommendations presented in the WTP TM (**Appendix I**) and recovery actions identified in **Chapter 8**. Other chapters and planning documents may reference these actions, but this chapter represents the foundational catalog of resiliency strategies for the City's water system and Mill Creek Watershed. Mitigation actions are detailed below to the extent possible at this planning level, including estimated effort, cost, and timeline considerations. This information aims to help the City prioritize future investments and guide the integration of resiliency considerations into planning, operations, and capital improvement programming as well as watershed management.

The chapter is structured as follows:

- **Section 6.2**, Strengths, Weaknesses, Opportunities, and Threats Analysis: This section summarizes the SWOT analysis methodology, organization and analytical approach, and results.
- **Section 6.3**, SWOT Mitigation Strategy Development: This section presents the development of mitigation strategies derived from the SWOT findings.
- **Section 6.4**, Hazard-Related Mitigation Strategy Development: This section presents the development of mitigation strategies derived from the hazard-informed narrative.
- **Section 6.5**, Summary: This section compiles all recommended mitigation actions, including both SWOT-derived and hazard-informed measures, to establish a cohesive framework for improving the City's water system resiliency.

6.2 Strengths, Weaknesses, Opportunities, and Threats Analysis

6.2.1 Methodology

The SWOT analysis is a strategic planning tool used to identify a system's internal strengths and weaknesses, as well as external opportunities and threats. Strengths are defined as internal attributes that contribute positively towards the desired goal, while weaknesses are internal attributes that may limit the ability to achieve the desired goal. Opportunities are external factors that contribute positively or help address weaknesses, and threats are external factors that may endanger stability or limit the ability to achieve the desired goal. If an attribute is well-developed and functions effectively, it is considered a strength. However, if the same attribute is underdeveloped or contributing to a problem, it may be classified as a weakness.

The analysis used a structured, participatory approach designed to capture a range of perspectives related to watershed management, infrastructure, operations, and community engagement. The process began with the development of a discussion guide that introduced the SWOT framework and definitions and outlined how input would be gathered. Workgroup participants contributed through a facilitated group exercise that focused on capturing and categorizing internal and external factors influencing water system and watershed resiliency. Feedback was documented and compiled by the project team for further organization and evaluation.

Following completion of the facilitated exercise, the information collected was reviewed, categorized, and analyzed to identify common themes and relationships among internal and external factors, as described in the following section.

6.2.2 Summary of Stakeholder Engagement

The project scoping team, as defined in **Chapter 1**, facilitated the SWOT discussion during the July 22, 2025, Workgroup meeting. The meeting served as the primary forum for conducting the SWOT exercise described above. A PowerPoint presentation provided visual framing of the SWOT categories and helped guide the Workgroup participants through a structured exercise. Participants were encouraged to reflect on internal factors including but not limited to infrastructure, staffing, governance, and partnerships; and external factors including but not limited to climate impacts, regulatory changes, and funding.

Input gathered through this exercise, along with ongoing feedback throughout the project, formed the foundation for the SWOT analysis and subsequent development of mitigation strategies. All comments and meeting notes from Workgroup meetings were documented and carried forward into the planning process to ensure alignment between stakeholder input and the technical recommendations described in this chapter. Workgroup meeting notes are located in **Appendix B**.

6.2.3 SWOT Organization and Analysis Approach

Following the July Workgroup meeting, all input collected through this process was consolidated and reviewed by the Project Scoping Team to ensure consistency and completeness. The identified SWOT were organized into six overarching categories: environment (ENV), internal management (IM), external management (EM), infrastructure (INF), community (COM) and funding (FUND). These categories provided a consistent framework for analyzing relationships and patterns across the factors influencing watershed and system resiliency.

Once categorized, the SWOT components were used to identify relationships between internal and external factors and to develop strategic pairings. This step involved determining how existing strengths could be leveraged to capitalize on opportunities or mitigate threats, and how weaknesses could be addressed through available opportunities or influenced by external threats. This process resulted in four common strategy pairings used to guide development of mitigation strategies in subsequent sections.

- Strength–opportunity strategies: use existing strengths to take advantage of opportunities.
- Strength–threat strategies: apply strengths to reduce or manage external risks.
- Weakness–opportunity strategies: leverage opportunities to address internal limitations.
- Weakness–threat strategies: minimize vulnerabilities and avoid potential risks.

Stakeholder input was central to the SWOT process and participants evaluated system attributes based on their relevance to watershed resiliency and the City's ability to protect its water supply system. The evaluation emphasized both current performance and future adaptability, including factors such as infrastructure condition, emergency preparedness, interagency coordination, and community support. The discussion guide provided prompts to help stakeholders consider how internal strengths could be leveraged to address external threats, and how opportunities could be used to overcome weaknesses.

The collaborative nature of the SWOT process ensured that the analysis reflected both technical expertise and local knowledge, transforming qualitative input into a structured framework that forms the foundation for the targeted mitigation strategies presented in the following sections.

6.2.4 SWOT Results

This section summarizes the results of the SWOT analysis, outlining key internal and external factors that influence watershed resiliency and protection of the City's water supply system. The summary includes the overarching category as well.

6.2.4.1 Strengths

Identified strengths related to internal and helpful attributes that will contribute positively towards the City's desired goals of protecting the City's water supply system and achieving watershed resiliency include the following.

- <u>Water Source (ENV)</u>: The City benefits from a protected, stable, and healthy watershed that provides high-quality water.

- Source Redundancy (IM): In addition to surface water from the watershed, the City benefits from multiple groundwater sources. While it is not typical for cities to have two distinct water sources, this availability provides valuable backup and redundancy that greatly enhances system reliability.
- City Staff (IM): The City's Public Works department is staffed with skilled and dedicated professionals who have a deep understanding of local water issues and the capacity to fundraise.
- City Planning (IM): Recently updated Water System and Capital Improvement Plans guide infrastructure upgrades.
- Partnerships (COM): The USFS owns and maintains a majority of the Mill Creek Watershed. A century-long cooperative relationship with the USFS under the 1918 agreement has successfully protected the Mill Creek Watershed and ensured high-quality drinking water for over 107 years, making it a cornerstone of watershed management. In addition, strong partnerships with local and federal agencies, the CTUIR, and an engaged community support the City's objectives.
- Facilities (INF): The City owns land for its WTP and maintains adequate treatment capacity under current conditions.
- Technology (IM): The City uses smart meters and leak-detection technology that allows customers to monitor and manage water use effectively.

6.2.4.2 Weaknesses

Identified weaknesses relate to internal and harmful attributes that may limit the City's ability to achieve the desired goals of protecting its water supply system and achieving watershed resiliency include the following.

- Land Ownership (EM): Some parcels of the watershed are privately owned which reduces the City's overall ability to protect it since they cannot control how the private lands are managed or maintained.
- Facilities (INF): The City's WTP is unfiltered and is therefore not equipped to manage increased sediment loads that can occur from natural hazards such as flooding following wildfires. Also, the City's water supply system includes aging infrastructure that will require replacement to maintain reliable operation.
- Funding Sources (FUND): The City primarily funds water system operations, maintenance, and capital improvements through water rates that are reviewed and set on five-to-six-year intervals. This structured planning process prioritizes the most critical and essential needs, ensuring responsible management of the water system. While external funding is available, it is increasingly challenging to secure. Historically, external funding has supported enhancements such as ASR, water-use efficiency, or clean energy projects, not core infrastructure improvements. Internally, the existing water rate structure may not fully support future improvements or resilience initiatives. Customers routinely express concerns about utility bills, which may limit elected officials' willingness to approve rate increases. Some city residents that have been engaged in the development of this plan (both at stakeholder workgroups and the November 2025 Open House) have expressed support for a rate structure that rewards water conservation. This dynamic is important to acknowledge in the context of securing additional revenue for future improvements or resilience initiatives.
- Watershed Control Program (IM): The City does not have a formal Watershed Control Program (WCP), which is referenced in Washington State Department of Health (DOH) watershed inspection reports for

unfiltered surface water systems. While the City has relied on the 1918 agreement and other documents to demonstrate watershed protection, the absence of a dedicated WCP creates a compliance gap and limits clarity in management responsibilities.

6.2.4.3 Opportunities

Several external factors offer the City valuable opportunities to strengthen water supply system protection and resiliency within the Mill Creek Watershed. These include:

- Collaboration (COM): A "big tent" collaborative approach could be established within the watershed by engaging local communities, state, federal, and tribal agencies, and colleges with research programs. These partnerships would enhance research efforts, promote resource sharing, and support coordinated mitigation actions.
- Community Outreach (COM): Strong project partnerships provide opportunities for community outreach and education on water conservation. For example, the heritage gardens project led by the Walla Walla County Conservation District provides a platform for public education on water conservation and sustainable landscaping practices.
- Residential Water Consumption (COM/IM): While the City has implemented a number of actions that have successfully improved water conservation across the system as a whole, Workgroup members expressed a desire to see additional policies and incentives (perhaps via the City's rate structure) to motivate additional water conservation by residential water users.
- Land Acquisition (IM): The City has an opportunity to strengthen watershed protection by exploring land swaps and purchasing privately owned parcels within the watershed. These actions would enhance both the City's and USFS's ability to safeguard this critical resource.
- Planning (IM): The City's adopted WSP and WMP provide a clear roadmap for improving resiliency through prioritized capital projects. Both plans identify infrastructure upgrades such as WTP improvements, well rehabilitation, electrical improvements, and ASR expansion to enhance supply redundancy and system reliability. Leveraging these plans ensures that resiliency improvements are strategically sequenced and supported by long-term financial planning.
- Supply Augmentation (IM): ASR mitigates groundwater table decline in the region, ensuring the long-term viability of the groundwater supply and preserving groundwater as an alternative water supply.
- Regulatory Alignment (IM): Developing a formal WCP offers an opportunity to close a compliance gap, supplement the USFS 1918 agreement, and align with DOH expectations for watershed protection. This action would strengthen regulatory compliance, formalize management practices, and reinforce the City's leadership role in watershed stewardship.

6.2.4.4 Threats

The City faces several external and harmful factors that could negatively impact its water supply and limit its ability to achieve long-term watershed resilience.

- Natural Hazards (ENV): There is an increased likelihood of more extreme events such as wildfires, floods, earthquakes, and landslides, all of which could affect water quality and damage water supply system infrastructure.

- Weather Volatility (ENV): Changing climatic conditions are likely to intensify these natural hazards by contributing to decreased snowpack, reduced summer streamflow, increased summer temperatures, increased pressure on groundwater resources, and diminished ecosystem function.

- Funding (FUN): Current state and federal funding opportunities are limited for system improvements, watershed management, and natural hazard response initiatives. Funding for research is reduced as well. In addition, it is unclear whether the community would support raising rates or taxes to fund infrastructure upgrades and watershed resilience initiatives.

- Federal Actions (EM): Recent funding cuts at the federal level affect watershed management, and/or limit opportunities to increase watershed resiliency. For example, reduced staffing, shifting agency priorities, changes in land use policies/actions (e.g. potential rescission to the 2001 Roadless Area Conservation Rule), reduction of regulatory safeguards (e.g., National Environmental Policy Act), and/or reduction of research activities.

- Regulations (EM): Evolving water and water management regulations may introduce new compliance requirements.

- Institutional Knowledge (IM): The potential loss of institutional knowledge due to staff retirements or departures could further disrupt operations and hinder effective decision-making.

Building on these findings, **Section 6.3** outlines how identified SWOTs were used to develop targeted mitigation strategies.

6.3 SWOT Mitigation Strategy Development

The results of the SWOT analysis discussed in **Section 6.2.4** and the results of the capabilities inventory in **Chapter 5** provide a foundation for developing mitigation strategies that address key internal and external factors influencing the City's ability to protect its water supply system and achieve watershed resiliency. The findings highlight where the City can leverage its strengths, address internal weaknesses, and respond to external opportunities and threats to enhance long-term water supply system reliability through system improvements and watershed resilience.

The City's strong foundation of high-quality water sources, redundancy, capable staff, effective planning, and partnerships, creates opportunities to strengthen system and watershed resiliency. Challenges such as aging infrastructure, watershed health, and funding constraints must be overcome.

By aligning these insights, the SWOT framework supports the development of strength-opportunity, strength-threat, weakness-opportunity, and weakness-threat strategies that prioritize actionable mitigation measures and have been organized into three primary CIP groupings, described below. This structure allows related efforts to be tracked and implemented together while maintaining flexibility for future expansion.

- Water Resiliency and Outreach Program (WROP): Consolidates education, funding awareness, and institutional knowledge initiatives.

- Emergency Preparedness & Continuity Planning Project: Strengthens operational readiness, coordination, and response procedures during system disruptions.

- ASR Optimization & Expansion: Enhances drought resilience and long-term water-supply reliability through technical and infrastructure improvements.

The following sections describe the SWOT strategy mitigation actions and include a description of each mitigation action, potential implementation cost and timeframe for implementation. These strategies were discussed at the October 2025 Workgroup meeting, documented in **Appendix B**.

While the mitigation strategies in this section are primarily based on the SWOT analysis and capabilities inventory, several actions also address risks identified in the hazard and risk assessment (**Chapter 4**), including political, social, and economic risks. To ensure full traceability, each mitigation action in this section now references the applicable Risk ID(s) from the risk register. Additional mitigation actions developed through the hazard analysis are presented in **Section 6.4**, which focuses on risks that extend beyond the scope of the SWOT framework.

6.3.1 Water Resiliency and Outreach Program

Corresponding Risk ID Number(s): Risk ID #4, 15, 18, 19, 20, 21, and 27. Note: These risks were screened in **Chapter 4** for various reasons; however, implementing this mitigation action will help further reduce their potential impact.

The WROP consolidates several SWOT mitigation strategies that strengthen the City's long-term water supply system resiliency through education, partnership coordination, and internal capacity building.

These initiatives are primarily administrative and outreach-focused rather than capital-intensive, but they are essential, ensuring organizational continuity, increasing community awareness, and maintaining watershed protection.

The following initiatives are implemented under this program:

- Strength-Opportunity #1: Community Outreach and Education
- Strength-Opportunity #2: Watershed Collaboration and Partnerships
- Weakness-Opportunity #2: Public Funding Awareness
- Weakness-Threat #1: Institutional Knowledge Capture and Staff Succession

6.3.1.1 Actionable Next Step (CIP Integration)

Implementation of WROP will require coordination across multiple City departments and external partners, but represents a relatively low-cost, high-impact investment. The program is intended as a single CIP line item to facilitate unified tracking, reporting, and funding allocation for related education, coordination, and organizational resiliency activities. Each of the elements is detailed in its respective strategy section below and together create a coordinated framework for advancing water and watershed resiliency objectives.

Effort: Low-Moderate
Estimated Cost Range: \$100,000 – \$250,000 (total combined for all sub-initiatives)
Implementation Schedule: Near-Term (Initiate within 1-2 years, with ongoing activities such as annual outreach events, partnership coordination meetings, and biennial updates to educational materials and internal documentation)

6.3.1.2 Strength-Opportunity Strategy #1: Community Outreach and Education

Findings from the capabilities inventory (**Chapter 5**) show that 16 local partners currently conduct public outreach or education programs, many of which relate directly to water resources and environmental stewardship. Several partners also expressed interest in expanding their programming to include topics such as hazard preparedness, water conservation, and volunteer engagement.

While the City participates in regional initiatives such as Walla Walla 2050 and provides conservation messaging through newsletters and utility billing articles, they do not yet have a fully coordinated outreach program focused specifically on drinking water, watershed protection, and resiliency. Expanding and formalizing these efforts would strengthen public awareness and engagement.

6.3.1.2.1 Mitigation Approach

A low-cost, low-effort strategy for the City would be to formalize and expand its role in community water education by leveraging resources already developed by partner organizations or other municipalities. For example, the Washington Department of Ecology (Ecology) provides educational materials on water conservation methods such as repairing household leaks, efficient irrigation, and outdoor water use reduction that could be adapted for City communications.

The City could also collaborate with partners such as the Walla Walla Community College Water & Environmental Center, Walla Walla 2050, and the Walla Walla County Conservation District to:

- Design and implement a coordinated public outreach campaign, like Denver Water's "Use Only What You Need" program, which effectively raised awareness through consistent messaging and community visibility.
- Develop a community-specific fact sheet on water conservation and watershed protection, modeled after Spokane County's "Water Wise Spokane" outreach materials.
- Create a dedicated webpage highlighting local conservation programs and participation opportunities, such as what the City of Bend developed for its "Every Drop Counts" campaign.
- Partner with schools to provide in-classroom education on water conservation and watershed health, following examples like the Portland Water Bureau's "Water Education Program" that integrates classroom activities and field trips.
- Host public events such as waterwise garden tours, watershed tours, or volunteer days focused on water conservation and protection activities, like the City of Santa Fe's "Xeriscape Demonstration Garden" tours.

6.3.1.2.2 Actionable Next Step (CIP Integration)

Include this initiative under the WROP as a Community Outreach and Education Initiative. This effort would:

- Develop unified educational materials and messaging with regional partners.
- Fund staff time for outreach coordination and program evaluation.
- Sponsor one annual community event and one school-based initiative.
- Track engagement metrics to inform future resiliency planning.

6.3.1.3 Strength-Opportunity Strategy #2: Watershed Collaboration and Partnerships

The City has already demonstrated strong public engagement through this project's outreach and workgroup process, revealing significant community interest in how the water supply is protected and managed. The City can capitalize on this engagement to strengthen existing collaborative partnerships, particularly with USFS, which manages the majority of the Mill Creek Watershed.

One framework that could provide immediate structure for collaboration is the Walla Walla 2050 Watershed Strategy, which outlines 60 strategies across three tiers based on priority for regional implementation. The following is a Tier 2 strategy that directly aligns with the City's resiliency objectives: Walla Walla 2050 Strategy 2.01 – Manage the forested portion of the Walla Walla watershed to maximize snow and water retention to support sustained flows and recharge. As a medium-priority action, it focuses on building resilience and addressing longer-term needs. Aligning with this strategy reinforces the City's approach to integrate regional priorities with local resiliency objectives, ensuring that forest and watershed management actions complement broader hazard mitigation and water supply reliability goals.

6.3.1.3.1 Mitigation Approach

The City could build on existing partnerships and the Walla Walla 2050 framework by:

- Identifying and mapping springs and wetlands in the upper watershed in coordination with the Walla Walla Basin Watershed Council. This work is underway through the Mill Creek Baseflow Assessment and Springs Inventory for Sustainable Drinking Water Supply project. The City can incorporate findings when available and coordinate with private landowners to establish or maintain appropriate buffers.
    - Purpose: Locate, map, and describe surface flow paths and groundwater resources that provide summertime base flows in Mill Creek.
    - Status: LIDAR flight completed in 2022; field inventory of springs completed during summers of 2023-2025; mapping and data review currently underway with reporting anticipated in quarter one of 2026.
- Participating in ongoing Walla Walla 2050 stakeholder discussions to coordinate City actions with regional forest-health and water-supply goals.
- Develop a formal WCP: Create a WCP to document watershed protection measures, supplement the 1918 agreement, and align with DOH expectations. This program should outline monitoring protocols and collaborative management practices with USFS and other partners.

The Walla Walla 2050 framework offers a ready-made stakeholder network and partner forum that the City can leverage to pursue joint watershed-resiliency initiatives. Participation in this collaborative structure would allow the City to influence regional watershed management and restoration while sharing responsibilities, data, and resources with other agencies and landowners.

6.3.1.3.2 Actionable Next Step (CIP Integration)

Implement this initiative under the WROP as a Watershed Collaboration and Resiliency sub-initiative. This effort would fund staff coordination, partner engagement, and targeted technical studies to formalize partnerships, pursue joint grant opportunities, and develop a formal WCP. The WCP will document watershed protection measures, supplement the 1918 agreement, and align with DOH expectations. Estimated cost should include consultant support for WCP development and integration of findings from the Mill Creek Baseflow Assessment and Springs Inventory project upon completion in early 2026.

6.3.1.4 Weakness-Opportunity Strategy #2: Public Funding Awareness

A key weakness identified through the SWOT process was that state and federal funding opportunities, which the City has relied on in the past, are becoming more limited for system improvements, watershed management, and natural hazard response initiatives. In addition, it is unclear whether or not the City government would be willing to make this a budgetary and policy focus; and/or the community would support raising water utility rates or taxes to fund infrastructure upgrades and watershed resilience initiatives. Declining state and federal funding opportunities combined with a current lack of local funding poses a barrier to implementing large-scale infrastructure improvements or proactive watershed-resiliency measures.

Increasing public understanding of the connection between watershed health, infrastructure reliability, and overall community resilience can help build local and political support for sustained investment in the City's water supply system. Targeted outreach efforts that clearly communicate the benefits of proactive maintenance and long-term capital planning, particularly in the face of weather Volatility and resource uncertainty, will be key to shifting public priorities and ensuring financial sustainability.

6.3.1.4.1 Mitigation Approach

The City can strengthen local support for funding initiatives by:

- Developing clear, visual communication tools, such as infographics, project dashboards, and short videos, that illustrate how water-system investments reduce long-term costs and risks.
- Highlighting rate comparisons and success stories from other communities that demonstrate the benefits of early, sustained investment in infrastructure and watershed protection.
- Incorporating funding and rate education into broader community outreach activities under strength-opportunity Strategy #1 (Community Outreach and Education).
- Coordinating with the City's Finance and Public Works departments to align communication on funding needs with future rate studies or CIP updates.

6.3.1.4.2 Actionable Next Step (CIP Integration)

Incorporate this initiative into the WROP as a Public Funding Awareness component. This effort would fund staff and consultant time to prepare educational materials, host informational events, and evaluate changes in community understanding over time.

6.3.1.5 Weakness-Threat Strategy #1: Institutional Knowledge Capture and Staff Succession

Institutional knowledge is a critical resource for maintaining continuity and effectiveness within the City's Water Division. As long-tenured employees retire or transition, the loss of operational and project-specific expertise presents a growing risk to water system management, planning, and emergency response. Developing a structured process to document internal procedures, project history, and technical standards will ensure that this knowledge is preserved and accessible to current and future staff.

6.3.1.5.1 Mitigation Approach

To maintain institutional memory, the City could:

- Develop an institutional knowledge guide summarizing operational procedures, system configurations, design standards, and lessons learned from past projects.
- Create standardized templates for documenting key decisions, maintenance practices, and permitting conditions.

- Establish a centralized digital filling system accessible to authorized staff for technical references, project data, and contact information.

- Implement cross-training plans for critical roles and incorporate knowledge-transfer checkpoints into staff transitions or project close-outs.

6.3.1.5.2 Actionable Next Step (CIP Integration)

Include this initiative under WROP as a Knowledge Capture and Staff Succession component. The project would fund limited staff or consultant support to develop documentation tools, organize legacy materials, and provide internal training sessions.

6.3.2 Strength-Threat Strategy #1: Emergency Preparedness and Continuity Planning Project

Corresponding Risk ID Number(s): Risk ID #15, 17, 20, 21, 27, and 35. Note: Some of these risks were screened in **Chapter 4** for various reasons; however, implementing this mitigation action will help further reduce their potential impact.

The City is already part of the Walla Walla County Comprehensive Emergency Management Plan, which provides an overarching framework for coordinated emergency response across County agencies. This plan establishes a solid foundation for interagency coordination and disaster response. However, as identified through the capabilities inventory, there are additional opportunities to expand emergency preparedness that are specific to the City's water supply and delivery systems.

The Recovery Plan (**Chapter 8**) developed through this project directly supports this objective by identifying hazards, establishing response and recovery strategies, and referencing the City's existing ERP. Building on this existing foundation, the City could strengthen preparedness by formalizing coordination procedures and communication systems specific to the Water Division's operations.

This strategy also directly addresses coordination gaps identified in the capabilities inventory, where more than half of partner agencies indicated that opportunities exist for improved communication and information sharing during water-related emergencies.

Partners that expressed interest in increased coordination and standardized communication include: City of Milton-Freewater, Walla Walla Basin Watershed Council, Ecology, DOH - Drinking Water, and USACE. Several partners also indicated a willingness to assist in public notification and volunteer mobilization during emergencies affecting water quality or supply. This collaboration presents an opportunity to align emergency messaging and response actions across jurisdictions.

6.3.2.1 Mitigation Approach

To enhance emergency preparedness, the City has developed a comprehensive Recovery Plan (see **Chapter 8**) that consolidates water system-specific response and recovery actions with existing emergency protocols, including the Continuity of Operations Plan (COOP) and the Emergency Response Plan (ERP). This integrated approach ensures that all critical information is maintained in one location and updated regularly to reflect operational changes, provides clarification on when to use other resource documents, lessons learned, and infrastructure improvements.

- Maintain and update communication and coordination protocols within the Recovery Plan to align with COOP and ERP.

- Continue to refine standard messaging templates and public-notification methods for water-supply disruptions.
- Cross-reference staffing roles and resource needs across all plans to eliminate gaps.
- Periodically test the integrated framework through tabletop or functional exercises with County emergency management.

6.3.2.2 Actionable Next Step (CIP Integration)

Develop a CIP to maintain and update the Recovery Plan developed under this project, ensuring alignment with the City's COOP and ERP. This effort will support ongoing coordination, partner engagement, and technical studies to keep emergency preparedness and recovery information consolidated and current.

Effort: Low
Estimated Cost Range: $10,000 to $25,000
Implementation Schedule: Mid-Term (Recurring 5-year updates coordinated with County emergency management)

6.3.3 Weakness-Opportunity Strategy #3: ASR Optimization and Expansion Project

Corresponding Risk ID Number(s): Risk ID #3, 4, 15, 16, 20, 27, and 35. Note: Some of these risks were screened in **Chapter 4** for various reasons; however, implementing this mitigation action will help further reduce their potential impact.

The City currently operates two (2) ASR wells that stabilize groundwater levels and improve long-term aquifer sustainability. These facilities help diversify the City's supply sources and enhance resiliency during drought conditions. Expansion of ASR capacity offers an opportunity to further improve system resiliency and drought response.

Recent ASR operations have encountered water-quality challenges and evolving monitoring requirements, highlighting the need for continued coordination with Ecology and the DOH to ensure ongoing compliance and program optimization. Following a temporary pause in 2024 and 2025, the City has resumed ASR operations while pursuing a revised ASR reservoir permit to expand operations to additional wells in the future. The City currently conducts ASR at Wells 1 and 6 under reservoir permit No. R3-30526 with Well 5 next on the list for implementing ASR. Well 7 is the City's long term potential ASR location but a feasibility analysis needs to be conducted.

6.3.3.1 Mitigation Approach

The City can strengthen its ASR program by:

- Conducting additional hydrogeologic studies and pilot testing to evaluate recharge and recovery efficiency under varying hydrologic conditions.
- Coordinating closely with Ecology and DOH to refine monitoring protocols and ensure continued compliance with reservoir permitting requirements.
- Identifying funding opportunities through federal and state programs such as the Bureau of Reclamation's WaterSMART Program and the State Revolving Fund (SRF).

- Developing a phased infrastructure plan to expand ASR capacity across additional wells as regulatory and technical milestones are met.

6.3.3.2 Actionable Next Step (CIP Integration)

Establish an ASR optimization and expansion program as a stand-alone CIP project. This program would fund continued study, permitting, and design efforts, as well as phased construction of infrastructure upgrades.

Effort: Moderate
Estimated Cost Range: TBD (Study plus phased work)
Implementation Schedule: Near-term/Ongoing and Past-Planning Horizon (for Well 7 upgrades)

6.3.4 Additional Discussion on SWOT Strategies

In addition to the mitigation strategies described above, several items identified through the SWOT process are being addressed through related planning efforts or concurrent policy updates. These items are summarized below to ensure alignment between this Watershed Master Plan and other ongoing City initiatives.

6.3.4.1 Water Shortage and Drought Policy Update

The need to review and update the City's 2002 Water Shortage Emergency Response Plan (Resolution 2002-37) was identified as a weakness–threat strategy. However, this action is already being implemented through the City's ongoing Water Shortage Response Plan update, which will align directly with the Recovery Plan. The updated policy will incorporate curtailment stages, communication protocols, and coordination procedures developed through this project. Accordingly, this item is not included as a separate mitigation strategy here.

6.3.4.2 Emergency Equipment and Resource Inventory

The capabilities assessment and partner feedback identified a strength–threat opportunity to enhance emergency preparedness through improved access to shared equipment and materials (for example, backup generators, portable pumps, and transport vehicles). This recommendation is being incorporated into the Recovery Plan (**Chapter 8**), which calls for development of a comprehensive emergency equipment and resource inventory that includes City and partner-owned resources. Maintaining this inventory will improve response coordination and reduce redundancy during water-related emergencies.

6.3.4.3 Post-Fire Recovery Coordination Framework

Several partners, including the USFS, Washington Department of Natural Resources, and Walla Walla County Conservation District, are actively engaged in post-fire watershed recovery and fuels management. This topic aligns with both strength–threat and weakness–opportunity strategies, as it leverages partnerships while addressing limited local post-fire recovery capacity. Rather than creating a separate mitigation strategy, this topic is addressed through the City's Recovery Plan (**Chapter 8**), which identifies actions that can be taken to facilitate recovery efforts within the watershed following wildfires or other large-scale watershed disturbances. Information provided for each action includes implementation considerations, potential funding support sources, and the agency expected to lead the action. The Recovery Plan also discusses coordination considerations for stakeholders internal and external to the City, along with an inventory of equipment and material supplies that are available between partner agencies to support recovery efforts.

6.4 Hazard-Related Mitigation Strategy Development

The results of the hazard analysis discussed in **Chapter 4** provide a foundation for developing mitigation strategies that may reduce risks associated with the City's water supply system infrastructure.

To streamline coordination, these strategies have been organized into four primary CIP groupings, described below.

- Infrastructure Improvements: This grouping includes mitigation actions focused on upgrading or replacing aging infrastructure critical to the City's water supply system. Projects address structural vulnerabilities, electrical and communication system failures, and access limitations that could disrupt operations or emergency response capabilities.

- Burn Severity Mitigation and Fire Prevention: These actions aim to reduce the frequency, intensity, and impact of wildfires within and around the watershed. Strategies include vegetation thinning, prescribed burning, and defensible space creation to protect critical facilities and maintain long-term fire resiliency.

- Watershed and Stream Restoration: Mitigation actions in this category focus on restoring natural watershed functions and improving stream channel stability. These efforts help reduce sediment and debris flow risks, particularly following wildfire events, and support the protection of water intake infrastructure.

- Land Acquisition and Management: This grouping includes strategies to reduce wildfire risk and improve land stewardship through the acquisition and management of privately owned parcels within the watershed. Bringing these lands under public ownership enables proactive vegetation management, access control, and long-term protection of water supply system assets.

The following sections describe the hazard mitigation actions and include the associated risk ID from **Chapter 4**, the description of the mitigation action, potential implementation cost and timeframe.

6.4.1 Infrastructure Improvements

6.4.1.1 Hazard Mitigation Action 1: IN1 - Pedestrian Bridge Anchor Replacement

Corresponding Risk ID Number(s): Risk ID #26

6.4.1.1.1 Mitigation Approach & Actionable Next Step (CIP Integration)

Enhance the structural integrity of the pedestrian bridge leading to the USGS gauge station by upgrading the bridge anchors. This will involve:

- A structural engineer conducting an anchor sizing analysis.

- Installation of upgraded anchors by a qualified contractor to ensure long-term stability and safe access to the gaging station.

Effort: Low
Estimated Cost: $20,000
Implementation Schedule: Near-Term (0-5 Years)

6.4.1.2 Hazard Mitigation Action 2: IN2 - Bridge Replacement and Wildland Fire Response Support Site Conversion at Barn/Corral Area

Corresponding Risk ID Number(s): Risk ID #1, #48, and #50

6.4.1.2.1 Mitigation Approach & Actionable Next Step (CIP Integration)

Replace the existing vehicle bridge that provides access to the barn/corral area to ensure safe and reliable passage for wildfire response infrastructure upgrades. The current structure cannot support equipment transport or emergency operations, and its replacement is a critical prerequisite for planned improvements at the barn/corral site.

Following bridge replacement, convert the barn and corral area into a multi-functional fire response support site, including:

- Equipment storage for rapid deployment.
- Water fill site with a planning-level concept that includes a 25-foot diameter tank with 10 feet of usable water depth and associated pumping equipment to support aerial and ground firefighting operations. Based on coordination with the Umatilla National Forest, the site could potentially accommodate a Type 2 or 3 helicopter for bucket dipping operations.
- Helistop for wildland fire response, improving access and response time.

This effort will enhance operational readiness and provide critical infrastructure for wildfire suppression near the City's watershed and intake areas. Coordination with other watershed stakeholders during planning and design phases is essential to confirm the viability and effectiveness of all proposed upgrades. Given its strategic location, the site is expected to play a key role in the initial attack phase of wildfire incidents within the watershed.

Effort: High
Estimated Cost: $750,000 (Bridge: $250,000 + Site Conversion: $500,000)
Implementation Schedule: Mid-Term (5-10 Years)

6.4.1.3 Hazard Mitigation Action 3: IN3 - Intake Control Building Replacement

Corresponding Risk ID Number(s): Risk ID #1 and #13

6.4.1.3.1 Mitigation Approach & Actionable Next Step (CIP Integration):

Replace the existing control building with a new, hardened structure designed for wildfire resiliency and elevated above the high-water elevation to reduce vulnerability to both fire and flood hazards. The new facility will ensure continued operation of the intake and protection of critical water infrastructure.

Effort: High
Estimated Cost: $1.5M
Implementation Schedule: Long-Term (10+ Years)

6.4.1.4 Hazard Mitigation Action 4: IN4 – Standby Power System Replacement at Intake

Corresponding Risk ID Number(s): Risk ID #52

6.4.1.4.1 Mitigation Approach & Actionable Next Step (CIP Integration)

Replace the aging generator and automatic transfer switch at the intake site to ensure reliable backup power for the screening building and raw water intake structure. The upgraded system will also extend emergency power support to caretaker facilities, enhancing community resilience during power outages and wildfire events.

Effort: Moderate
Estimated Cost: $120,000
Implementation Schedule: Near-Term (0-5 Years)

6.4.1.5 Hazard Mitigation Action 5: IN5 - Telemetry System Replacement between Intake and WTP

Corresponding Risk ID Number(s): Risk ID #53

6.4.1.5.1 Mitigation Approach & Actionable Next Step (CIP Integration)

Replace the outdated telemetry connection between the WTP and the intake control system, which currently relies on a hardwired leased telephone line and dial-up modems (Data-Link DLM-4500). The new system will utilize a cellular and/or satellite-based internet solution (e.g., Starlink) paired with VPN routers to ensure secure and reliable data transmission.

This upgrade will eliminate recurring communication failures, improve operational continuity, and enhance system resilience during emergencies.

Effort: Moderate
Estimated Cost: $30,000
Implementation Schedule: Near-Term (0-5 Years)

6.4.1.6 Hazard Mitigation Action 6: IN6 - Electrical System Replacement at Intake

Corresponding Risk ID Number(s): Risk ID #51

6.4.1.6.1 Mitigation Approach & Actionable Next Step (CIP Integration)

Replace the entire electrical system at the intake facilities to ensure reliable operations and reduce vulnerability to system failure. The scope of work includes:

- Replacement of the feeder from the screening building.
- Installation of a new main disconnect.
- Upgrades to panelboards, lighting, and receptacles.
- Replacement of the control system and telemetry system.

All components have reached the end of their useful life and require modernization to maintain operational continuity and support future hazard mitigation efforts. All powerlines should be moved underground to avoid damage during hazardous weather conditions.

Effort: Moderate
Estimated Cost: $150,000

Implementation Schedule: Near-Term (0-5 Years)

6.4.2 Burn Severity Mitigation and Fire Prevention

6.4.2.1 Hazard Mitigation Action 7: WS1 – Watershed Intake Defensible Space Enhancement

Corresponding Risk ID Number(s): Risk ID #1 and #48

6.4.2.1.1 Mitigation Approach & Actionable Next Step (CIP Integration)

Conduct vegetation thinning near the City's intake infrastructure to:

- Reduce potential for extreme fire behavior.
- Create defensible space around critical facilities.
- Maintain fire protection along the access trail.
- Include a long-term maintenance plan for fire resiliency.
- Ensure active collaboration with City staff.

Note: Similar mitigation efforts were completed previously, most recently in Summer 2025.

Effort: Low
Estimated Cost: $40,000
Implementation Schedule: Continued maintenance, recommendation to complete on a 5-year reoccurring schedule.

6.4.2.2 Hazard Mitigation Action 8: WS2 – Watershed-Extensive Hazardous Fuels Assessment and Prescription Project

Corresponding Risk ID Number(s): Risk ID #1 and #48

6.4.2.2.1 Mitigation Approach & Actionable Next Step (CIP Integration)

Implement strategic vegetation thinning and prescribed burning across the City-owned watershed property to reduce the potential for extreme fire behavior, establish a defensible zone around the City's water supply system infrastructure, and enhance long-term fire resiliency and watershed health.

Effort: High
Estimated Cost: $1M
Implementation Schedule: Mid-Term (5-10 years)

6.4.3 Watershed and Stream Restoration

6.4.3.1 Hazard Mitigation Action 8: WS3 - Mill Creek Channel Resiliency Study

Corresponding Risk ID Number(s): Risk ID #48

6.4.3.1.1 Mitigation Approach & Actionable Next Step (CIP Integration)

Conduct a targeted study of the Mill Creek channel upstream of the City's diversion dam (within City-owned property) to assess risks associated with sediment and debris flow during post-wildfire flood events and to address 100 years of gravel and sediment accumulation. The study will evaluate channel response and hazard potential, reduce downstream risk, and identify restoration strategies eligible for environmental funding.

The study will explore opportunities for the strategic placement of large woody debris to enhance channel complexity, slow water flows, and trap debris before reaching the intake infrastructure.

Findings will guide future implementation of large woody debris placement and potential improvements to natural flow paths, with a focus on increasing watershed resiliency and protecting critical water supply system infrastructure. Given the protected nature of the watershed, the study will carefully consider ecological sensitivity and avoid unnecessary disturbance, including the assumption that no formal creek crossings currently exist. The study will include field assessments, geomorphic analysis, hydrologic modeling, and preliminary design work

Effort: Moderate
Estimated Cost: $100,000
Implementation Schedule: Long Term (+10 years)

6.4.3.2 Hazard Mitigation Action 9: WS4 - Mill Creek Channel Restoration Implementation

Corresponding Risk ID Number(s): Risk ID #48

6.4.3.2.1 Mitigation Approach & Actionable Next Step (CIP Integration)

This mitigation action focuses on implementing restoration measures identified in the targeted study of the Mill Creek channel (Project ID WS4) to protect critical water infrastructure which has not been completed. Restoration efforts will be designed to reduce sediment and debris flow risks, enhance channel stability, and improve watershed resiliency in the event of post-wildfire conditions.

The project will require obtaining necessary permits, including Hydraulic Project Approval from Washington Department of Fish and Wildlife, and potentially a Joint Aquatic Resources Permit Application depending on the scope of in-stream work.

Installation work is expected to be challenging due to limited access within the protected watershed, which is a key consideration for financial planning and logistical coordination.

Effort: Moderate
Estimated Cost: To be determined based on final design and access solutions
Implementation Schedule: Past-Planning Horizon

6.4.4 Land Management & Acquisition

6.4.4.1 Hazard Mitigation Action 10: WS5 – Private Parcel Ownership Transition

Corresponding Risk ID Number(s): Risk ID #55

6.4.4.1.1 Mitigation Approach & Actionable Next Step (CIP Integration)

Acquire privately owned land within the Mill Creek Watershed to bring it under City or public ownership, enabling improved land management practices such as vegetation thinning, fuel reduction, and access control. These actions will reduce wildfire risks originating from unmanaged or incompatible land uses and protect City water supply system infrastructure and overall watershed health.

A preliminary analysis was conducted to support this mitigation strategy, evaluating 13 private parcels identified by the City as partially within the watershed. These parcels total approximately 690 acres, with an estimated 200 acres intersecting the watershed boundary. Land types include timber (49 percent) and mountain (42 percent), with six parcels containing cabin-like improvements and several designated as "sites," which may increase market and taxable value. This information is intended to support cost-benefit comparisons with other mitigation actions and does not represent a formal appraisal or indicate property owner willingness to sell. Reference **Appendix K** for additional information.

> **Effort:** High
> **Estimated Cost:** Based on recent sales and comparable property analysis, the estimated market value ranges from $3,000 to $13,000 per acre, with a median value of $5,200 per acre, depending on parcel attributes such as land type and presence of improvements.
> **Implementation Schedule**: Long -Term (+10 Years)

6.4.5 Additional Discussion on Hazard Mitigation Strategies

In addition to the mitigation strategies described above, several items identified through the hazard analysis are being addressed through related planning efforts. These items are summarized below to ensure alignment between this Watershed Master Plan and other ongoing City initiatives and include the associated risk identified in **Chapter 4**.

6.4.5.1 Emergency Preparedness

- Associated with Risk ID #1: Risks associated with wildfires near the intake facility infrastructure can cause severe damage to infrastructure that has a high impact on the City's water supply system. A recovery plan has been developed as part of this project (**Chapter 8**) that provides pre-actions and post recovery actions that the City can implement to protect its water supply infrastructure. Accordingly, development of a recovery plan is not included as a separate mitigation strategy here.

Associated with Risk ID #35: Flooding of the access road to the intake facility poses a safety hazard and may strand the on-site caretaker, disrupting operations. While no standalone mitigation action is proposed in this Watershed Master Plan, this risk is addressed in the Recovery Plan (**Chapter 8**), which includes protocols for emergency access, warning systems, and caretaker evacuation procedures. Future updates to the Recovery Plan may incorporate additional mitigation measures such as early warning systems or infrastructure improvements to reduce flood-related access issues.

6.4.5.2 Diversion Structure Evaluation During Bypass Gate Installation

Associated with Risk ID #29 and #33:

An assessment of the existing diversion dam should be performed during the planned 2026 dredging work, when the structure will be dewatered and accessible. This evaluation will address concerns related to aging infrastructure and potential deterioration of the concrete.

The review should include:

- Visual inspection of exposed concrete surfaces for cracking, spalling, or other signs of distress.
- Verification of assumptions used in QRS Consulting design work for the ongoing bypass sediment gate project, which treated the concrete as cracked and not up to modern standards.
- Assessment of global stability for the ogee sections and adjacent structures, including the ladder, which were not fully evaluated during the sediment bypass gate design phase.

Findings from this assessment will inform future monitoring, maintenance, or rehabilitation needs to ensure long-term structural integrity and operational reliability.

6.5 Summary

The City, with the input of partners and stakeholders, has developed a comprehensive list of mitigation actions to enhance the resiliency of its municipal drinking water supply system within the Mill Creek Watershed. These actions were derived through two primary lenses, SWOT-based strategies and hazard-informed mitigation measures and collectively form the foundation for the City's long-term resiliency strategy.

The SWOT-based strategies focus on strengthening the City's institutional capacity, emergency preparedness, and partnership coordination to ensure reliable operation of its water supply infrastructure under changing conditions and support watershed resiliency. The hazard-informed mitigation measures translate risk findings from **Chapter 4** into actionable projects that reduce vulnerabilities at critical facilities and improve the City's ability to maintain safe, reliable water delivery following hazard events.

Together, these actions offer a balanced set of administrative, operational, and capital investments that strengthen the resiliency of the City's municipal drinking water supply system within the Mill Creek Watershed. The WTP TM (**Appendix I**) should be referenced for additional mitigation actions specific to treatment-facility vulnerabilities and upgrades, which complement the broader watershed strategies summarized here.

Table 6-1 and **Table 6-2** summarize all mitigation actions presented in this chapter, including their general purpose, effort level, estimated cost, and implementation timeframe. These projects serve as the foundation for **Chapter 7**, Funding Plan, which identifies potential federal, state, and local funding programs to support and accelerate implementation.

Table 6-1 | Summary of Mitigation Actions – SWOT Derived

Project ID Project Name	Description / Focus	Effort	Estimated Cost	Implementation Schedule
WS6 Water Resiliency & Outreach Program (WROP)	Consolidated initiatives to improve education, funding awareness, partnerships, and institutional capacity.	Low–Moderate	$100 k – $250 k (total)	Initiate 1–2 yrs: Individual Initiatives are ongoing
Strength-Opportunity Community Outreach & Education	Formalize and expand City's outreach on water conservation and resiliency with partners and schools.	Low	Included in WROP	
Strength-Opportunity Watershed Collaboration & Partnerships	Leverage Walla Walla 2050 and partnerships to coordinate watershed-resiliency initiatives.	Moderate	Included in WROP	

Weakness-Opportunity Public Funding Awareness	Increase community understanding and support for water-system funding and rate structures.	Low	Included in WROP	
Weakness-Threat Institutional Knowledge Capture & Succession	Document operational procedures and lessons learned; cross-train key roles.	Low	Included in WROP	
WS7 Emergency Preparedness & Continuity Plan	Maintain and update Recovery Plan; align with COOP and ERP to keep emergency preparedness consolidated and current.	Low	$10 k – $25 k	5-yr updates
WS8 ASR Optimization & Expansion	Study and expand ASR operations to improve drought resiliency and supply reliability.	Moderate	TBD (study + phased work)	0-5 yrs/ongoing

Table 6-2 | Summary of Mitigation Actions – Hazard Derived

Project ID Project Name	Description / Focus	Effort	Estimated Cost	Implementation Schedule
Infrastructure Improvements				
IN1 Pedestrian Bridge Anchor Replacement	Upgrade bridge anchors for safe access to gaging station.	Low	$20 k	0–5 yrs
IN2 Bridge Replacement and Wildland Fire Response Support Site Conversion at Barn/Corral Access	Replace bridge for emergency access and convert barn/corral into fire-response support site with equipment storage and water fill capability.	High	$750 k	5–10 yrs
IN3 Intake Control Building Replacement	Construct new fire/flood-resistant control building at intake.	High	$1.5 M	10+ yrs
IN4 Standby Power System Replacement at Intake	Replace aging generator and ATS to maintain backup power at intake site.	Moderate	$120 k	0–5 yrs
IN5 Telemetry Replacement between Intake and WTP	Upgrade to satellite-based communication system (e.g., Starlink).	Moderate	$150 k	0-5 yrs
IN6 Electrical System Replacement at Intake Structure	Replace and relocate electrical feeders and controls underground for reliability.	Moderate	$150 k	0–5 yrs
Burn Severity Mitigation				
WS1 Watershed Intake Defensible Space Enhancement	Maintain defensible space and reduce fuel load around intake infrastructure.	Low	$40 k	Recurring (5-yr cycle)
WS2 Watershed-Extensive Hazardous Fuels Assessment and Prescription Project	Implement targeted thinning and reduce fuel on City-owned land within the watershed.	High	$1 M	0-5 yrs
Watershed & Stream Restoration				

Project ID Project Name	Description / Focus	Effort	Estimated Cost	Implementation Schedule
WS3 Mill Creek Channel Resiliency Study	Study channel response and debris flow risks upstream of diversion dam.	Moderate	$100 k	+10 yrs
WS4 Mill Creek Channel Restoration Implementation	Implement restoration measures identified in WS4 study.	Moderate	TBD (post-design)	Beyond planning horizon
Land Management & Acquisition				
WS5 Private Parcel Ownership Transition	Acquire private parcels within watershed to enable proactive fire and access management.	High	$3 k – $13 k per acre	+ 10 yrs

CHAPTER 7

Funding Plan

7.1 Purpose and Scope

The intent of this chapter is to outline external funding opportunities, including federal, state, and local, programs, that could help finance projects identified through this plan. This chapter focuses on grant opportunities, loan programs, and other funding tools that can advance the City's resiliency, recovery, and infrastructure improvement goals.

This chapter also includes a strategic overview of prioritized near-term projects and their alignment with specific funding opportunities (**Section 7.5**). This section introduces a "funding cheat sheet" matrix summarizing relevant grant programs, historical funding trends, eligibility requirements, and considerations for competitiveness, along with potential next steps for deeper grant preparation.

In addition to long-term infrastructure and planning programs, this chapter identifies emergency response and recovery funding sources that may be leveraged in the event of a disaster. These programs are included to ensure that the Recovery Plan (**Chapter 8**) can reference back to the same comprehensive set of funding programs that support both near-term recovery and long-range mitigation.

This chapter does not evaluate rate structures, utility fee adjustments, or long-term financing strategies. Instead, it focuses on external funding mechanisms that complement the City's capital improvement planning and hazard mitigation efforts.

It is important to note that the City can't secure all needed funding alone and will require collaboration with partners, agencies, and local organizations that complement the City's capacity, knowledge, and relationships. Partnerships are critical to improving competitiveness for grants, leveraging technical resources, and aligning the City's objectives with basin-wide resilience priorities. In many cases, these partnerships can also serve as direct funders or cost-share contributors through investment of their received funds into City projects. This is particularly relevant when project outcomes support shared goals such as fish habitat enhancement, water quality improvement, and watershed resilience. Key partners for the City include:

- CTUIR: Collaboration with CTUIR can strengthen funding applications to agencies such as FEMA, the Natural Resources Conservation Service (NRCS), and the National Oceanic and Atmospheric Administration (NOAA). CTUIR may also directly contribute funding or in-kind services for projects that improve streamflow, fish passage, and water quality consistent with tribal resource management goals.

- Walla Walla Water 2050 Initiative: A collaborative effort of CTUIR, the states of Oregon and Washington, and local entities like the Walla Walla County Conservation District that is addressing streamflow, floodplain connectivity, passage, and water supply. Aligning City projects with this basin-wide initiative demonstrates regional coordination, builds local support, and can open access to shared implementation funding. In the capabilities inventory, WWCCD could potentially aid the City in applying for funding at the state and federal level.

- Non-Governmental Organizations: Groups such as Kooskooskie Commons, Walla Walla Basin Watershed Council, and Washington Water Trust bring technical expertise, advocacy, and potential match contributions that enhance the competitiveness of state and federal grant applications.

Further, program funding at any level, federal, state, or local, is not guaranteed. The current national political climate indicates an increasing shift of funding responsibility from federal to state and local governments, and while none of the programs described below have been deauthorized, some have seen reduced appropriations or temporarily suspended funding cycles. As a result, the City should anticipate relying more heavily on state and regional programs in future years.

Because funding priorities and availability change frequently, this chapter should be periodically updated to reflect new opportunities, program realignments, and evolving agency priorities.

7.2 Federal Funding Programs

Federal programs remain an important funding source for hazard mitigation, watershed restoration, and water infrastructure improvements. However, appropriations and program stability vary year by year, so the City should monitor solicitations closely and position projects early to align with eligibility and timeline. The following sections provide a high-level description of each federal agency and summarize the funding programs that are most relevant for the City's Water Department, with additional details on match requirements and application cycles summarized in **Table 7-1**.

7.2.1 Federal Emergency Management Agency

The federal agency responsible for disaster preparedness, response, and long-term hazard mitigation is FEMA. Funding opportunities are most relevant for projects that reduce wildfire, flood, and other hazard risks to community infrastructure or respond to the impacts of a natural disaster.

7.2.1.1 Relevant US Army Corps of Engineers Programs

- BRIC: Competitive grants for infrastructure resilience, water system hardening, and wildfire mitigation. The program has historically supported communities as they build capability and capacity to reduce hazard risk, while also encouraging and aiding innovation.

- Hazard Mitigation Grant Program (HMGP): Post-disaster funding for hazard mitigation projects after a presidentially declared disaster. Applicants must have an adopted Hazard Mitigation Plan.

- Hazard Mitigation Grant Program (HMGP Post-Fire): Provides mitigation funding in areas affected by large wildfire events.

- Safeguarding Tomorrow Revolving Loan Fund (RLF): Provides capitalization grants to states for low-interest loans supporting local hazard mitigation projects. The Safeguarding Tomorrow RLF program complements and supplements FEMA's Hazard Mitigation Assistance grant portfolio to support mitigation projects at the local government level and increase the nation's resilience to natural hazards. Funds flow through state-managed loan programs, not directly from FEMA.

7.2.2 US Army Corps of Engineers

The USACE develops and implements flood control, ecosystem restoration, and shoreline protection projects nationwide. The most relevant opportunities for the City are under the Continuing Authorities Program, which funds small to medium projects without requiring separate Congressional authorization.

Projects include a feasibility phase (federally supported up to a defined amount, with additional costs shared with the local sponsor) and an implementation phase (cost-shared between USACE and the sponsor). The maximum federal contribution is capped, and local sponsors must provide land/easements and commit to long-term operation and maintenance (O&M).

7.2.2.1 Relevant Programs

- Section 14, Emergency Streambank & Shoreline Protection: Funds stabilization of banks and shorelines to protect critical public facilities; eligible only if bank failure is caused by natural erosion, not human activities.
- Section 205, Small Flood Risk Management Projects: Supports stand-alone flood reduction measures such as levees, floodwalls, or non-structural solutions.
- Section 206, Aquatic Ecosystem Restoration: Funds aquatic habitat restoration projects but cannot be used to meet mitigation or remediation requirements.
- Section 208, Clearing and Snagging Program: Provides support for channel clearing and excavation, with limited embankment construction using materials from the clearing operation. Intended to reduce nuisance flood damages caused by debris and minor shoaling of rivers.
- Floodplain Management Services (FPMS): Provides technical and planning assistance for floodplain management but does not fund design or construction.
- Planning Assistance to States (PAS): Funds cost-shared planning studies related to water supply, watershed management, and hazard mitigation (planning only, no construction).

7.2.3 US Department of Agriculture

The United States Department of Agriculture (USDA) programs that address watershed protection, disaster recovery, and forest health are primarily concentrated in two branches.

- NRCS: Supports post-disaster recovery and long-term watershed protection.
- USFS: Supports wildfire risk reduction and forest landscape restoration.

7.2.3.1 Relevant Programs

- Emergency Watershed Protection (NRCS - EWP): Funds debris removal, streambank stabilization, levee repair, and other measures following disasters. Does not require a federal disaster declaration, as NRCS can declare a local watershed emergency.
- Watershed Protection & Flood Prevention Operations (NRC - WFPO): Helps plan and implement long-term municipal drinking water supply system improvements within the Mill Creek Watershed. Requires a capable local sponsor.
- Collaborative Forest Landscape Restoration Program (USFS - CFLRP): Encourages collaborative, science-based ecosystem restoration of priority forest landscapes, including reducing the risk of uncharacteristic wildfire. Program authorization expired September 30, 2025 and the Administration's proposed fiscal year 2026 budget does not include CFLRP funding. However, bipartisan legislation has been introduced to reauthorize the program for 10 additional years. If continued and funded by Congress, CFLRP could provide a strong source of support for forest resilience projects.

- Community Wildfire Defense Grant Program (USFS - CWDG): Helps communities and Tribes plan for and reduce wildfire risk and implement the National Cohesive Wildland Fire Management Strategy. It was launched in 2022 as a 5-year, $1 billion program. Approximately $200 million was awarded to 58 projects in September 2025.

7.2.4 Council of Western State Foresters: Wildland Urban Interface Grant Program

The Wildland Urban Interface (WUI) Grant Program, administered by the Council of Western State Foresters (CWSF) through the USFS State and Private Forestry Branch, provides competitive funding to reduce wildfire risk and enhance community resilience on non-federal lands.

Typical projects include:

- Hazardous fuel reduction near communities and critical infrastructure.
- Development or updates of Community Wildfire Protection Plans (CWPPs).
- Wildfire prevention education, outreach, and training programs.
- Cross-boundary mitigation projects in partnership with local fire districts and community groups.

Projects demonstrating collaboration among local governments, tribes, and community organizations are prioritized for funding, particularly those that address high-risk WUI areas and align with existing CWPPs.

7.2.5 Centers for Disease Control and Prevention: Emergency Preparedness Funding

The Emergency Preparedness Funding (EPF) program, administered by the Centers for Disease Control and Prevention (CDC) Office of Readiness and Response, provides annual cooperative agreements to state, territorial, and local public-health agencies to strengthen preparedness and response capacity for all-hazards emergencies. EPF investments help ensure communities can sustain critical public-health functions during disasters and recover more quickly from environmental or infrastructure disruptions.

Typical projects include:

- Development and testing of public health and emergency response plans

- Cross-sector coordination between public health, water utilities, and emergency management

- Training and exercises related to wildfire smoke events, water contamination, or extreme heat impacts

- Maintaining staff and systems that ensure rapid communication and response during declared emergencies

7.2.6 United States Environmental Protection Agency

The United States Environmental Protection Agency (EPA) supports water and wastewater infrastructure resilience through financing programs.

7.2.6.1 Relevant Programs

- Water Infrastructure Finance and Innovation Act (WIFIA): Provides low-cost, long-term financing for large-scale projects such as drinking water treatment, distribution, wastewater systems, stormwater management, and drought resilience. Can be paired with state revolving fund loans administered at the state level.

- Community Grants: Provides congressionally directed funding for local governments, tribes, utilities, and nonprofits to implement water and wastewater infrastructure improvements, including construction, planning, and environmental protection projects.

- Water Research Grants: Supports development and application of scientific research and technologies addressing emerging water resource challenges such as contaminants of concern, water reuse, treatment advancements, and harmful algal bloom mitigation.

7.2.7 Bureau of Reclamation

The Bureau of Reclamation (Reclamation) provides funding and technical assistance for projects that enhance water management, conservation, and drought resilience across the western United States. Programs are generally implemented through Reclamation's regional and area offices and support partnerships with state and local water providers to improve long-term water resource sustainability.

7.2.7.1 Relevant Programs

- WaterSMART Program: Umbrella for a wide range of initiatives that provide financial assistance for water and energy efficiency projects, drought contingency planning, watershed management and restoration to increase resilience, and other water-related activities. One potentially relevant example is Reclamation's Drought Response Program which supports drought contingency planning and implementation of projects that build long-term drought resilience.

- Water Conservation Field Services Program (WCFSP): Offers cost-shared financial and technical assistance through Reclamation's regional and area offices to support water conservation planning, system optimization reviews, design of water management improvements, and demonstration of new conservation technologies. Applicants should coordinate with their local Reclamation office before applying.

7.2.8 National Oceanic and Atmospheric Administration

The NOAA administers grant programs that support habitat restoration, watershed resilience, and climate adaptation, particularly relevant to salmon and steelhead recovery efforts in the Walla Walla Basin. These programs could support ongoing regional restoration initiatives led by partner agencies and create opportunities for coordinated funding applications.

7.2.8.1 Relevant Programs

- Transformational Habitat Restoration Grants: Supports large-scale river and floodplain reconnection projects that restore habitat and reduce flood risk.

- Coastal Habitat Restoration and Resilience Grants (for underserved communities): Targets underserved communities with projects that combine habitat restoration, climate resilience, and socioeconomic benefits.

- National Forest Foundation: https://www.nationalforests.org/grant-programs

Table 7-1 | Federal Funding Programs

Program	Eligible Projects	Match Requirement	Application Cycle	Notes / Considerations
FEMA – BRIC	Infrastructure resilience, wildfire mitigation, water system hardening	~25%	Annual, competitive	Align with FEMA hazard-mitigation priorities.
FEMA – HMGP	Hazard mitigation after presidential disaster	~25%	Post-disaster (state-managed)	Requires adopted Hazard Mitigation Plan.
FEMA – HMGP Post-Fire	Wildfire-related mitigation after FMAG events	~25%	Post-fire; window typically through 6 months after state FY end	State-managed timeline.
FEMA – Safeguarding Tomorrow RLF	Local hazard mitigation via state revolving loan	Loan financing (no grant match)	State-dependent	Low-interest loans; complements grants.
USACE – Section 14	Streambank/shoreline protection for public facilities	~35% local (can be higher with LERRDs); feasibility beyond first $100k is 50/50	Rolling, funding-dependent	Eligible only if erosion is natural, not human-caused.
USACE – Section 205	Small flood-risk management projects	~35% local; feasibility beyond first $100k is 50/50	Rolling	Stand-alone projects not previously authorized by Congress.
USACE – Section 206	Aquatic ecosystem restoration	~35% local; feasibility beyond first $100k is 50/50	Rolling	Not for required mitigation/remediation.
USACE – Section 208	Channel clearing/excavation; limited embankment from cleared material	Varies by scope (generally CAP-like shares)	Rolling	Reduces nuisance flood damages from debris/minor shoaling.
USACE – FPMS	Floodplain management planning/technical services	0% (100% federally funded)	Rolling	No final design or construction funding.
USACE – PAS	Planning studies (watershed, water supply, hazard mgmt)	50%	Rolling	Planning only; no construction.
USDA – NRCS EWP	Post-disaster debris removal, streambank stabilization, levee repair	~25%	Rolling; disaster-driven	NRCS can declare local watershed emergencies (no federal disaster declaration required).
USDA – NRCS WFPO	Watershed protection, flood prevention, ag/municipal supply	50%	Rolling	Requires capable local sponsor.
USFS – CFLRP	Forest restoration & wildfire risk reduction	Varies	When authorized	Program set to expire Sept 2025 unless reauthorized.
USDA – USFS CWDG	Plan for and reduce wildlife risk, protect homes, businesses and infrastructure	None	When authorized	Program set to expire in 2027
CWSF – WUI Grant Program	Hazardous fuel reduction, CWPP development, wildfire prevention education	50% non-federal (cash or in-kind)	Annual, through state forestry agencies	Focused on cross-boundary wildfire mitigation on non-federal lands
CDC – EPF	Public health emergency preparedness, training, coordination with utilities and emergency management	None	Annual cooperative agreements	Supports state and local public health readiness for natural and environmental hazards
EPA – WIFIA	Drinking water, wastewater, stormwater, drought resilience	Financing up to ~49% of eligible costs	Annual NOFA	Can pair with SRF loans/bonds.
EPA – Community Grants (Congressionally Directed Spending)	Water and wastewater infrastructure construction, planning, and environmental protection projects	None (Congressional earmark)	Annual appropriations process	Funding directed by Congress and administered by EPA regional offices
EPA – Water Research Grants	Research on emerging contaminants, water reuse, treatment technologies, and watershed resilience	Varies (typically none)	Competitive solicitations as issued by EPA ORD	Supports applied research to address national and regional water-quality challenges
Reclamation – WaterSMART Program	Water and energy efficiency projects, drought planning, and watershed management	Typically 50%	Annual competitive solicitations	Cost-shared program supporting water supply reliability and climate resilience
Reclamation – WCFSP	Water conservation planning, System Optimization Reviews, design and demonstration of water management improvements	Typically 50%	Competitive; varies by Reclamation regional or area office	Provides cost-shared funding and technical assistance; applicants should coordinate with local Reclamation office
NOAA – Transformational Habitat Restoration Grant	Floodplain reconnection, habitat restoration	Varies (cost-share often encouraged)	Last closed Apr 2025	Large awards; future rounds uncertain.
NOAA – Coastal Habitat Resilience	Habitat restoration + climate resilience (underserved communities)	Varies (cost-share often encouraged)	Last closed May 2025	$75k–$2M; future rounds uncertain.

7.3 State Funding Programs

State-level funding can provide both standalone project support and local matches to federal programs. Like federal funding, state program availability and requirements can shift every couple of years. The City should monitor solicitations closely and coordinate with Washington State agencies early in the planning process. Some Oregon programs may also be applicable if projects demonstrate cross-boundary watershed benefits. The following are potentially viable state funded programs from Washington and Oregon with additional details on match requirements and application cycles summarized in **Table 7-2**.

7.3.1 Washington State Programs

- Floodplains by Design (Ecology & Bonneville Environmental Foundation): Supports multi-benefit projects that reduce flood hazards while restoring floodplain function and providing habitat benefits. Competitive two-year funding cycle.

- Streamflow Restoration Grant (Ecology): Funds projects that improve streamflow and aquatic habitat, including water rights acquisition, water storage, watershed restoration, and feasibility studies. Highly competitive with limited funding statewide.

- Drinking Water State Revolving Fund (DWSRF): Provides low-interest loans (sometimes with partial forgiveness) for drinking water infrastructure improvements. Eligible for both public health and regulatory compliance projects.

- Office of Columbia River (OCR) Grants: Supports planning and development of new storage, conservation projects, pump exchanges, and other strategies to increase access to water supplies across Eastern Washington.

- Salmon Recovery and Puget Sound Acquisition and Restoration Grants (Recreation and Conservation Office (RCO)): Funds habitat restoration and protection projects that support salmon recovery and watershed resilience. Eligible applicants include local governments, Tribes, state agencies, non-profits, and private landowners.

- Source Water Protection Grant Program (DOH): Provides grants to protect public drinking water sources serving Group A water systems. Projects may address water quality, quantity, or both, and often involve land acquisition, risk mitigation, or implementation of protection plans.

- Water Quality Grants and Loans (Ecology): Funding for wastewater, stormwater, nonpoint-source pollution, and on-site sewage system projects. Funding sources include the Centennial Clean Water Program, Clean Water State Revolving Fund, Section 319 Nonpoint Source Grants, and the Stormwater Financial Assistance Program.

- Financial Assistance for Wildfire Resilience and Forest Health (mentioned in working group meeting notes): https://dnr.wa.gov/forest-resilience-division/financial-assistance-wildfire-resilience-and-forest-health

- Washington Public Works Board (PWB) Traditional Financing: The PWB provides low-interest loans and some grants for planning, pre-construction, construction, and emergency projects across several infrastructure systems, including drinking water, wastewater, roads, and bridges. It is designed as a flexible state tool that can pair with federal grants and SRF to complete funding packages.

7.3.2 Oregon State Programs

- Landscape Resiliency Program (Department of Forestry): Provides funding for projects that reduce wildfire risk near critical infrastructure. Limited to Oregon but could be explored for collaborative projects in the Mill Creek watershed.

- Restoration Grants (Oregon Watershed Enhancement Board (OWEB)): Broad program supporting watershed and habitat restoration, including floodplain reconnection. Typically offered on biennial cycles.

- Oregon HMGP (Department of Emergency Management (OEM)): Provides funding to implement long-term hazard mitigation measures following a Presidential Major Disaster Declaration. Eligible projects include infrastructure hardening, flood and wildfire risk reduction, and other actions that reduce future disaster impacts. The program also supports hazard mitigation planning to help communities identify vulnerabilities and prioritize investments.

Table 7-2 | State Programs

Program	Eligible Projects	Match Requirement	Application Cycle	Notes / Considerations
WA – Floodplains by Design (Ecology & BEF)	Flood hazard reduction + floodplain/habitat restoration	Varies (local match often expected)	Biennial	Strong alignment with Mill Creek flood/fish habitat projects.
WA – Streamflow Restoration Grants (Ecology)	Projects that improve streamflow and aquatic habitat, including water rights acquisition, water storage, altered water management or infrastructure, watershed function, riparian and fish habitat improvements, environmental monitoring, planning, and feasibility studies	None (no matching funds required)	Biennial	Highly competitive; priority for projects benefiting streamflows, ESA-listed species, and those in adopted Streamflow Restoration plans (RCW 90.94). Operation and maintenance costs are not eligible.
WA – DWSRF	Drinking water infrastructure (treatment, transmission, consolidation)	Loan; forgiveness possible	Annual	Covers public health and regulatory compliance.
WA – OCR Grants	Storage, conservation, pump exchanges, water supply projects	Varies	Biennial	Targeted to Eastern Washington; good fit for Walla Walla.
WA - RCO	Habitat restoration and protection for salmon recovery and watershed resilience	Typically 15%–25% (varies)	Annual competitive cycle	Administered by RCO through regional recovery organizations; eligible to local governments, tribes, and non-profits.
WA - DOH Source Water Protection Grant Program	Protection of Group A public drinking water sources (quality and quantity)	Varies; often 10%–25%	Annual; administered by DOH	Supports implementation of source water protection measures and risk mitigation for public systems.
WA Ecology – Water Quality Grants and Loans	Wastewater, stormwater, nonpoint pollution, and on-site sewage projects	Typically 25% or as defined per fund	Annual combined funding cycle	Combines multiple state and federal funding sources under one application; supports compliance and watershed restoration.
WA PWB - Traditional Financing	Eligible infrastructure systems include domestic water; roads/streets; bridges; sanitary sewer; solid waste /recycling/organics; stormwater	Low-interest loans (1–2%); some grants.	Quarterly pre-construction; annual construction window (spring–summer).	Addresses high-impact infrastructure needs, resilience, and modernization.
OR – ODF	Wildfire risk reduction near critical infrastructure	Varies	Biennial	May require justification for WA applicant participation.
OR – OWEB Restoration Grants	Watershed and floodplain restoration	Varies	Biennial	Next solicitation expected in 2026.
OR – OEM HMGP	Post-disaster hazard mitigation projects (e.g., wildfire risk reduction, flood mitigation, seismic retrofits), mitigation planning, and certain initiatives like early warning systems	25% non-federal match (can include in-kind contributions)	Post-disaster; timeline tied to FEMA disaster declarations	Requires FEMA-approved Natural Hazard Mitigation Plan (NHMP) for applicants; private nonprofits may apply under certain conditions; projects must be cost-effective and comply with federal environmental laws

7.4 Local Funding Options

Local funding mechanisms provide the City with the greatest control and require political support and public buy-in. They can also serve as local match sources to strengthen competitive applications for federal and state programs. The following are relevant options, which also are summarized in **Table 7-3**.

7.4.1 Municipal Bonding

With reductions in federal appropriations and uncertainty around state pass-through funding, cities may need to rely more heavily on self-financing tools to implement critical infrastructure projects. Municipal bonds are one of the most common mechanisms available to local governments to fund capital improvements, including water and wastewater infrastructure.

Municipal bonds are debt obligations that allow governments to borrow upfront and repay over time, usually with interest. They provide predictable long-term financing but require political approval and repayment capacity.

7.4.1.1 Types of Bonds

- General Obligation Bonds: Backed by the "full faith and credit" of the City, with repayment guaranteed by its taxing authority. These are typically used for essential public projects.
- Revenue Bonds: Repaid from revenues generated by a specific project (e.g., water or sewer utility charges). These can be structured to match project beneficiaries with repayment.
- Private Activity Bonds: Issued by a public entity on behalf of a private borrower (e.g., healthcare, housing, education). The public entity serves as a conduit issuer but is not responsible for repayment.
- Variable Rate Demand Obligations: Less common, long-term bonds with short-term interest rates that reset periodically, often purchased by institutional investor.

Municipal bonding may become increasingly important as a match source for grants or as a primary funding mechanism when federal and state programs are unavailable.

7.4.2 Utility Fees

In addition to bonding, local governments can generate revenue through utility fees tied to water, sewer, and stormwater services. While these fees are typically set to cover O&M, they can also be structured to support capital improvements.

In the current political climate, with federal funding uncertain and state pass-through programs constrained, utility fees may become an increasingly important self-financing tool and a way to demonstrate local commitment when applying for competitive grants. Agencies often view a community's ability to generate local match as a sign of project readiness and financial sustainability.

To pursue this option, the City would likely need to conduct a comprehensive rate study that incorporates upcoming capital needs, including those identified in this Watershed Resiliency Plan. Ultimately, any adjustments to rates are a policy decision made by the City Council, balancing affordability for ratepayers with the need to invest in resilient infrastructure.

Table 7-3 | Local Funding

Program	Eligible Projects	Match Requirement	Application Cycle	Notes / Considerations
General Obligation Bonds	Essential public projects (e.g., water, wastewater, other municipal infrastructure)	Repaid via taxing authority	As authorized	Requires voter or Council approval; backed by City's full faith and credit
Revenue Bonds	Projects with revenue streams (e.g., water/sewer utilities)	Repaid from project revenues	As authorized	Ties repayment to project beneficiaries; may require rate adjustments
Private Activity Bonds	Projects on behalf of private entities (e.g., housing, education, healthcare)	Borrower repays (not the City)	As authorized	City acts as conduit; not responsible for repayment
Variable Rate Demand Obligations	Large-scale, long-term projects	Institutional investor driven	As authorized	Less common; interest rates reset periodically
Utility Fees	Water, sewer, stormwater infrastructure; O&M and capital improvements	Paid by ratepayers	Ongoing	Can be structured to fund capital projects or provide grant match; requires rate study and Council approval

7.5 Prioritized Projects and Grant Alignment

As part of this effort, a comprehensive funding alignment matrix was developed to help the City identify funding strategies tailored to a selected group of near-term, high-priority projects. This matrix provides detailed, actionable information for each project, including:

- Key relevant funding sources
- Historical funding trends, such as previously funded projects and typical award amounts
- Application timing and cycles
- Eligibility and match requirements
- Competitiveness factors and scoring considerations
- Recommended next steps to prepare for application

The funding alignment matrix summarized in **Appendix L** provides an overview of near-term projects and associated funding opportunities. While the appendix includes a condensed version for reference, the full matrix, with live links to program guidance and application portals, will be maintained by the City as a dynamic document. This approach ensures staff can quickly access current requirements and deadlines in a practical, user-friendly format. The live version is intended as a strategic resource to guide decision-making and prioritize projects with the highest potential for external funding support.

The set of near-term projects selected for this deeper funding analysis were prioritized based on readiness, alignment with City goals, overall cost, and compatibility with known grant criteria. These projects represent major capital investments to strengthen the reliability, safety, and long-term resilience of the City's water system.

- Clarification Facility Project: Defined in **Appendix I**, Project ID: NT10b

- Filtration Facility Project: Defined in **Appendix I**, Project ID: LT3

- Intake Control Building Replacement Project: Defined in **Chapter 6**, Project ID: IN3

- On-Site Sodium Hypochlorite Generation Project: Defined in **Appendix I**, Project ID: TP9

- Bridge Replacement and Wildland Fire Response Support Site Conversion at Barn/Corral Area: Defined in **Chapter 6**, Project ID: IN2

Together, these projects represent major capital investments to strengthen the reliability, safety, and long-term resilience of the City's water system. A range of federal and state programs can support planning, design, and construction across these project types. Many funding programs identified for one project also apply to others due to overlapping goals related to water quality, safety, hazard mitigation, and infrastructure resilience. **Appendix L** provides a summary of the funding matrix, while the full interactive version will remain available to the City for ongoing use. The matrix also includes transportation-focused programs that were not discussed earlier in this report but are relevant to the Wildland Fire Response Access and Support Infrastructure Project and the Intake Control Building Replacement Project.

7.5.1 Next Steps for Competitive Positioning

While the funding matrix provides a high-level overview of grant alignment, a more in-depth analysis could be warranted for certain projects. This could include:

- Reviewing detailed eligibility and scoring criteria

- Attending grant-specific webinars and Q&A sessions
- Drafting preliminary narratives and cost-benefit analyses
- Engaging with grant administrators for feedback
- Confirming readiness elements such as inclusion in hazard mitigation plans, environmental review status, and engineering design milestones

This level of analysis represents the early stages of preparing a full grant application and could be pursued by a dedicated committee or working group. It would require a longer-term commitment but could significantly increase the City's success rate for securing external funding.

7.5.2 Historical Funding Reference

To support the funding strategy and matrix development, a summary of previously awarded grants and loans that the City has received was compiled. **Table 7-4** highlights successful funding sources, award amounts, and key program characteristics. It provides a reference for identifying which programs have historically supported City projects and may be strong candidates for future applications.

Table 7-4 | Historical Loans & Grants Received

Grant/Loan ID & Name	Administrator	Project	Award Amount (Match Amount, if applicable)	Award Notification Date
WRSRP-2020-WalWal-00031 Streamflow Restoration Grant	Department of Ecology	Well 5 Rehab & ASR Feasibility Study	$0.92M	2021
WROCR-2325-WalWal-00038 OCR Grant	Department of Ecology	Well 5 ASR Design Phase	$0.25M	2023
R23AP00158-00 WaterSMART Drought Response	Reclamation	Well 5 ASR Construction Phase	$1.6M ($1.5M)	2023
PC23-96103-128 Pubic Works Board Loan	DOC (Department of Commerce)	WTP Hydro Electric Upgrade	$1.5M	2022
24-92601-137 State Energy Grant	WA State Department of Enterprise Servies & DOC	Solar Battery Energy Storage System	$2.5M	2024
D25-041 BRIC Grant	FEMA	FEMA Wells Emergency Generator #1 & #6	$0.48M ($0.02M)	2024
EMS-2021-BR-044-0006 BRIC Grant	FEMA	Mill Creek Watershed Hazard Mitigation Plan	$0.76M ($0.25M)	2023

7.6 Summary

Section 7.5 offers a focused look at priority projects and funding alignment, providing a practical tool for decision-making and future grant strategy. At present, the funding landscape for municipal drinking water supply system improvements within the Mill Creek Watershed is highly dynamic. At the same time, project costs continue to rise due to inflation and global supply chain challenges. Partnerships with CTUIR, regional initiatives such as Walla Walla Water 2050, and non-governmental agencies can enhance funding opportunities and alignment with basin-wide goals in this challenging environment.

Federal appropriations and program stability remain uncertain, with some long-standing programs (e.g., FEMA mitigation grants, CFLRP) facing reduced or uncertain funding given the national political climate.

As a result, state-level programs and local mechanisms such as municipal bonds and utility fees are becoming increasingly important funding sources. These local tools not only provide direct financing but also strengthen competitiveness for federal and state grants by demonstrating local match and long-term financial commitment.

Given these uncertainties, it is recommended that this chapter and its associated funding matrices be reviewed and updated at least semi-annually. This will allow the City to identify new or restarted programs, track potential reauthorizations, and remove programs that have been discontinued.

CHAPTER 8

Recovery Plan

8.1 Introduction and Purpose

This Recovery Plan is an actionable guide that the City can take in response to natural hazards that impact the City's surface water supply in the Mill Creek Watershed. It supplements the City's 2021 ERP, 2019 COOP, and other planning documents by providing specific response and recovery recommendations.

This Recovery Plan should be considered a living document and should be updated as new information is identified, policies and recovery procedures are updated, and infrastructure improvements are completed. The intent is for it to receive regular revisions concurrent with planned updates to the 2019 COOP, 2021 ERP, and other reference materials. At a minimum, this chapter should be reviewed and updated every five years, or more frequently if significant changes occur to the City's water system, emergency response structure, or watershed conditions. Additional opportunities for revisions should be considered when the City's ERP, COOP, WMP, and WSP are updated.

Because the Recovery Plan may be used as a standalone document, this chapter has been structured to help City staff and stakeholders quickly locate the guidance they need. The chapter is organized as follows.

- Section 8.2, Reference Materials: Summarizes City planning documents that directly informed this Recovery Plan, as well as supplemental County and regional resources that may be useful for the City's reference.
- Section 8.3, City of Walla Walla Water System Overview: Provides a high-level overview of the City's drinking water system, including its primary and supplemental sources, key hazards identified in the Resiliency Plan, and existing partner resources. This section establishes the overall system context that informs the response and recovery framework and associated actions presented throughout this chapter.
- Section 8.4, Response and Recovery Strategy: Presents the City's operational framework for response and recovery, including planning and pre-event actions, communication and coordination, equipment and supply inventory, damage assessment, and system-specific response and recovery strategies.
- Section 8.4.6, Response and Recovery Plan Descriptions: Provides detailed descriptions for each recommended action, including implementation considerations, potential funding and partnership opportunities, and references to supporting guidance documents and resources.

The intent is to provide both a roadmap for long-term recovery planning and a practical quick-reference tool that City staff can use prior to, during, and after an emergency.

8.2 Reference Materials

This Recovery Plan is supported by several primary references that directly informed its development. Additional supplemental resources are listed; while not used to generate recommendations, they may be useful for the City's reference and future coordination. For additional context within the overall Watershed Master Plan, readers may also consult **Chapter 4** (Watershed and Water Treatment Plan Hazard and Risk

Assessment), **Chapter 5** (Capabilities Inventory), **Chapter 6** (Watershed Resiliency Strategy Chapter) and **Chapter 7** (Funding and Implementation Strategy), which provide supporting background and expanded detail that complement this chapter.

Table 8-1 describes the reference materials used to provide background, supplementary information, emergency response procedures, and context for the Recovery Plan. All documents are owned and maintained by the City.

Table 8-1 | Primary Reference Material Used in Development of Recovery Plan

Document Title	Description	Update Status
2019 COOP	This plan provides a framework for maintaining essential municipal services during emergencies, including water supply interruptions. It identifies Mission Essential Functions (MEFs) and activates the City's Incident Management Team (IMT) during emergencies to ensure continuity of operations across departments.	Unknown
2021 ERP	The City's ERP aims to ensure a continuous supply of safe, potable water through rapid deployment of personnel and resources during emergencies. Its goals align with the City's COOP by prioritizing essential functions, public safety, swift emergency response, effective communication, and collaboration with external agencies.	Update anticipated for 2026
2021 WMP	This plan outlines a prioritized strategy for investments aimed at enhancing the reliability and resiliency of the overall water supply system, with a focus on improvements to their groundwater.	Unknown
2020 WSP	This plan documents key water system information and provides analysis and recommendations that inform infrastructure development and operational decisions by City staff. It serves as a guidance document for future water system improvements and is required to be updated at least every ten years by the State of Washington.	Update under development
2005 Water Shortage Response Program Resolution	The resolution establishes a formal water shortage response program for the City to protect public health, drinking water supply, and essential municipal needs during emergencies. It outlines procedures for declaring shortages, public notification, and four response stages ranging from monitoring to critical restrictions, including voluntary and mandatory conservation measures. The program replaces a previous resolution and requires ongoing evaluation and adjustment during shortage events.	Update under development

Table 8-2 further lists and describes supplemental reference material the City can use during recovery operations. All documents listed in the table are owned and maintained by Walla Walla County.

Table 8-2 | Supplemental References for City Use

Document Title	Description
Comprehensive Emergency Management Plan	This plan establishes responsibilities for agencies and organizations within Walla Walla County for preparation for, response to, recovery from, and mitigation the effects of emergencies and disasters.
(DRAFT) Multi-Jurisdictional Hazard Mitigation Plan	The plan is a comprehensive framework designed to identify and address potential hazards that could impact the county, including its municipalities and critical infrastructure such as the City's water system. The plan covers a variety of natural hazards, including wildfires, earthquakes, and severe weather events including flooding, droughts, and weather volatility.
2025 CWPP	The intent of the plan is to reduce the potential of catastrophic wildfire in Walla Walla County, WA. It demonstrates the County's effort in working together to improve preparedness for wildfire and reduce community risk factors.

8.3 City of Walla Walla's Water System Overview

This section provides a high-level overview of the City's current water supply system, including a system summary, key hazards, and supporting partner resources, to set the context for the response and recovery strategies presented in this Recovery Plan.

8.3.1 Water System Summary

The City's drinking water system receives direct unfiltered surface water from the approximately 36-square-mile Mill Creek Watershed as its primary supply. The watershed is majority owned by the USFS, and is a protected, closed area with dense forests and steep terrain and no public access or road infrastructure beyond the existing raw water intake – diversion system. **Table 8-3** summarizes the Mill Creek Watershed ownership. The City relies on Mill Creek for approximately 85 to 90 percent of its source supply. The remainder is supplemented by seven deep basalt groundwater wells, two of which act as ASR wells that are used to recharge the groundwater supply.

Table 8-3 | Mill Creek Watershed Ownership

Landowner	Area (sq acres)	Percent of Watershed
Private	171	1%
City of Walla Walla	1,946	9%
Federal (USFS)	19,322	90%

A minimum stream flow must be maintained within Mill Creek as identified in the City's Federal Energy Regulatory Commission Permit. **Table 8-4** summarizes the key features of the existing water system.

Table 8-4 | Key Features of Existing City Water System

Feature	Value	Reference Documents
Mill Creek Surface Water Rights, Instantaneous	18.1 MGD	2021 WMP (Table 2-2)
Groundwater Water Rights, Instantaneous	26.46 MGD	2021 WMP
Hydro Operation Permit Limits	16.48 MGD	2021 WMP
Water Treatment Plant (WTP) Design Capacity	24.0 MGD	2021 WMP (Table 2-2)
2028 Projected Maximum Day Demand (MDD)	18.4 MGD	2020 WSP

Feature	Value	Reference Documents
Average Daily Flow at WTP	9.79 MGD	2024 Recorded Data
Maximum Monthly Flow at WTP	16.4 MGD	2024 Recorded Data
Well Production Capacity[2]	23.95 MGD	WTP TM
Raw Water Storage	15 MG	WTP TM
Treated Water Storage	24 MG	2020 WSP

Notes:
1. MGD = Million Gallons Per Day
2. TM = Technical Memorandum
3. Total well capacity with all City wells fully operational

A detailed explanation of the City's water system, including transmission and distribution mains, the WTP, and groundwater wells can be found in earlier chapters of this document and in the reference materials listed in **Section 8.2**.

8.3.2 Water System Hazards

Potential hazards to the watershed and drinking water system were identified and evaluated in detail in **Chapter 4**. A risk matrix was developed that provides a comprehensive review of the potential risks to the City's water supply facilities. In addition, **Chapter 6** outlines practical proactive mitigation measures to reduce risks associated with the hazards that may impact the City's water supply and infrastructure.

This Recovery Plan provides situational specific response and recovery strategies to address the following hazards that were identified in **Chapter 4**.

- Wildfires
- Earthquakes
- Flooding
- Drought
- Other disruptions to the water supply

8.3.3 Existing Resources and Supporting Partners

A successful recovery effort requires collaboration among local, state, and federal stakeholders as well as Tribes and non-government agencies that have a vested responsibility and understanding of the watershed. This Recovery Plan leverages the findings from **Chapter 5**, which assessed the resources and capabilities of key watershed partners that are able to share and contribute resources including personnel, equipment, funding, technical expertise, and organizational structures, both from local stakeholders and the City, to strengthen emergency response and recovery planning and enhance resiliency of the City's water system. The assessment identified strengths, gaps, and opportunities for collaboration in five categories that inform the actions and coordination framework of this Recovery Plan.

- Public communication
- Administrative
- Technical knowledge
- Equipment and supplies
- Education and outreach

Sections 8.4.2 and **8.4.3** further elaborate on communication with partner agencies and coordinating supply inventories to facilitate recovery efforts.

8.4 Response and Recovery Strategy

The City's established 2019 COOP outlines the roles, responsibilities, chain of command, and lines of authority used to respond to emergencies. When the emergency response operations transition to a more long-term response and recovery focus, so will the City's responsibilities, communication strategy, and actions.

To assist with this transition, the following response and recovery topics have been provided.

- Pre-event actions
- Communication and coordination framework
- Equipment and supply inventory
- Damage assessment and documentation
- Response and recovery actions
- Response and recovery plan response descriptions

This structure provides a logical progression, from preparedness and communication through system assessment, response, and long-term recovery. Each section includes tables or summaries that identify potential hazards, system impacts, and associated actions the City may consider.

The response and recovery plan descriptions (**Section 8.4.6**) further expand on these actions by describing implementation considerations and potential funding or partnership opportunities. While program-specific options are identified where relevant, **Chapter 7** should be referenced for a comprehensive discussion of potential state and federal funding sources that may support emergency response, recovery, and system-resiliency improvements.

8.4.1 Pre-Event Actions

Targeted pre-event actions can help reduce the City's vulnerability to natural hazards, preserve water supply reliability, and support recovery operations following an event. These actions are intended to be completed in advance of an emergency to strengthen system resilience and position the City to assess external funding or technical assistance.

Table 8-5 summarizes recommended pre-event actions, organized by hazard and facility or area type, along with reference documents. Each action represents a practical step the City can take to decrease risk, lessen long-term impacts and improve recovery outcomes.

Table 8-5 | Pre-Event Actions

Event	Water Facility or Area	Pre-Event Actions	Reference Documents
General	Citywide	Update the 2021 ERP and establish coordinated emergency response with area stakeholders to improve emergency response preparedness. Also, coordinate with partner agencies to increase community outreach and education activities around water conservation and emergency preparedness.	Watershed Master Plan, **Chapter 5** Public Communications and Coordination, 2021 ERP
		Develop public communication resources (e.g., public notification templates, boil water orders, and contact lists).	2021 ERP FMEA - Disaster Response Social Media Toolkit[3]
		Develop an emergency response equipment and supply inventory to document resources available to support emergency response and recovery efforts	Example inventory form included in **Appendix M**
	Watershed	Land acquisition of privately owned parcels within and directly adjacent to the Mill Creek Watershed	City of WW WMP, **Chapter 6**, project WS5
Wildfire	Watershed	Collect current aerial and geospatial data to establish a baseline of existing conditions Review existing drone operator capabilities. Establish contracts with outside operators or train City staff	USGS – National Map Data and Delivery website provides GIS data[1] USDA – LANDFIRE provides GIS Database and Landscape Assessment Resources[2]
		Land management activities (i.e.: hazardous fuel assessment, brush and forest thinning)	City of WW WMP, **Chapter 6**, project WS2
		Determine correct native plant seeding mix identification and native plantings for future restoration operations	Walla Walla County Noxious Weed Control Board or Conservation District
		Evaluate enhanced watershed security measures, trespasser deterrent, and patrols (e.g., No trespassing signs, visible security camera, drone patrols). Areas for security enhancements should be determined based on reported incidents of trespassing and vandalism.	
		Coordinate with USFS to identify possible staging areas to support response or recovery operations. Barn and former corral area on City property could be used once bridge is repaired.	City of WW WMP, **Chapter 6**, project IN2
		Evaluate area near the Mill Creek intake structure to create defensible space options and long-term maintenance requirements.	City of WW WMP, **Chapter 6**, project WS1
Surface Water Supply Disruptions	Wells	Upgrade groundwater wells and support systems as planned in the City's water capital improvement plan.	City of WW Water CIP projects GW1, GW2, GW3, and GW4
Earthquake	Water System Infrastructure	Retrofit existing system components such as reservoirs to meet current seismic standards	City of WW Water CIP project TP16. Continue distribution system upgrades with IRRP projects
Flooding	Raw Water Transmission Main to WTP	Implement recommendations for conducting a Mill Creek Channel resiliency study and implement washout mitigation measures. Prioritize implementation based on the evaluation study.	City of WW WMP, **Chapter 6**, project WS3 and WS4
	RW Intake – Diversion System	Construct sediment bypass gate	City of WWW design of the bypass gate is ongoing with expected construction to begin in 2027.

Notes:
1. https://www.usgs.gov/the-national-map-data-delivery/gis-data-download
2. https://www.landfire.gov/about-landfire
3. https://agents.floodsmart.gov/resource-library/toolkits/general-flooding-disaster-response-social-media-toolkit?utm_medium=email&utm_source=govdelivery

8.4.2 Communication and Coordination Framework

Clear, consistent communication is essential before, during, and after an emergency. This includes timely information for staff, stakeholders, and the public regarding water system status, health advisories, restrictions, and recovery progress.

8.4.2.1 Internal Coordination

The City's communication framework builds on the 2021 ERP, Section 9, Effective Communication, and the 2019 COOP, which provide established notification procedures and message templates. As the event transitions from emergency response into recovery operations, communication must adapt to reflect recovery needs while maintaining transparency and public trust.

The City's Public Information Officer (PIO) is solely responsible for developing and releasing information to news media, incident personnel, and other agencies and organizations. The PIO will coordinate with the Public Works Director and/or Deputy Public Works Director to issue guidance to the public, including health advisories, water restrictions, and public access restrictions to limit additional land and water disturbance. City staff can coordinate with Walla Walla County to use the County's Emergency Management's Citizens Alert system to rapidly alert residences about an emergency across multiple platforms.

Findings from the Capabilities Inventory in **Chapter 5** highlighted opportunities to improve communication coordination, including standardizing messaging, sharing communication systems, and mobilizing volunteers.

Once the emergency situation stabilizes, the City should transition communication back to standard public outreach protocols such as press releases, social media updates, and community meetings, ensuring ongoing transparency and updates on recovery timelines, infrastructure repairs, and public safety recommendations. The PIO will work closely with City staff and key stakeholders to provide these updates. **Table 8-6** summarizes the communication and coordination framework.

Table 8-6 | Communication and Coordination Framework

Stage	Audience	Lead Role	Communication Tools/Methods
Pre-Event	Internal staff, Stakeholders	PIO + Public Works Director	ERP templates, coordination meetings, preparedness messaging
During Emergency	Customers, public, media	PIO (with Public Works Director Support)	COOP notifications, Citizens Alert system, press releases, social media
Recovery	Customers, stakeholders, community	PIO + City Staff	Community meetings, social media updates, recovery status reports, public advisories

8.4.2.2 External Coordination

Coordination between the City and external stakeholders is critical as the situation transitions from emergency response to recovery operations. The level of communication will vary with the complexity of the hazard situation and the number of external stakeholders involved. For example, if a wildfire were to occur within the Mill Creek Watershed, significant coordination with the USFS, other property owners, and regulatory agencies providing wildfire response support would be essential. Coordination efforts related to this scenario are anticipated to include:

- Firefighting response efforts, including personnel, equipment, and materials used for fire suppression

- Establishing access for staging, response, and long-term recovery
- Leveraging and supplementing damage assessment operations
- Coordination of priority areas for erosion control and slope stabilization measures along Mill Creek, including monitoring locations
- Long-term recovery, revegetation operations, and surface water monitoring and testing

While coordination during firefighting efforts would primarily be an emergency response activity rather than a recovery action, the City's use of the watershed as a drinking water supply source means that any fire-retardant chemicals or foams used during these operations that contain harmful compounds would likely have long term consequences and complicate recovery efforts. According to Umatilla Forest Plan 4-196, chemical retardants and foams are not allowed to be used in the suppression of wildland fires managed by the USFS within the Municipal Watershed. Therefore, if retardant is needed, only water will be used. However, to ensure the integrity of the watershed, continued coordination efforts with external stakeholders should be prioritized. A contact list of key agencies is provided in **Table 8-7** below:

Table 8-7 | Contact List of Key Agencies

Agency	Role	Contact Information
WA DNR – Wildland Fire Division	Wildfire suppression	Main: 360-902-1300 Dispatch SE Region: 509-884-3473 Fire Info: Thomas Kyle-Milward 360-529-7184
Northwest Interagency Coordination Center	Regional resource coordination	Portland, OR; Website: NWCC
Walla Walla County Emergency Management	Local coordination	Phone: (509) 524-2900
USFS – Umatilla National Forest	Federal lands	Pendleton Office: (541) 278-3716
Washington State (DOH)	Drinking water regulator	Regional Engineer: (360) 236-3100
Washington State Patrol – Fire Protection Bureau	State Fire Marshal oversight	Interim State Fire Marshal Chad Cross: (360) 596-3901 Email: Chad.Cross@wsp.wa.gov
CTUIR	Tribal coordination	Phone: (541) 276-3165
Washington State Department of Ecology	National Flood Insurance Program	Statewide Coordinator Amanda Richardson: (509) 385-3076

Other types of hazard coordination and efforts focused on funding and technical support are included in **Section 8.4.6**, Response and Recovery Plan Descriptions.

8.4.3 Equipment and Resource Inventory

The City does not currently maintain a dedicated inventory of emergency response equipment and resources. This section will support and guide future updates once an inventory has been created.

An example inventory form has been developed and is included in **Appendix M**. In addition, the capabilities assessment and partner feedback identified in **Chapter 5** provides a starting point that can be leveraged and incorporated into the inventory system. The intent is that the inventory will:

- Identify critical equipment and supplies needed during response and recovery.

- Document ownership, storage locations, and points of contact.
- Highlight gaps where additional procurement or mutual aid agreements may be necessary.
- Identify potential in-kind exchanges that can provide services or access to equipment and materials.
- Be incorporated into updates to the 2021 ERP
- Support future Washington State Water and Wastewater Agency Response Networks operations.

8.4.4 Damage Assessment & Documentation

Initial damage assessments may begin during emergency response operations, depending on the type and extent of the event. These assessments will often need to continue or be repeated throughout recovery and restoration operations to capture a full picture of system impacts.

City staff will take on the initial responsibility to assess and document impacts and damaged infrastructure. As the response and recovery operation progresses, additional outside support and expertise should be enlisted. **Table 8-8** provides suggested resources and approaches.

Immediately following an emergency, technical experts may be unavailable or assigned elsewhere; therefore, a Damage Survey Report or similar Preliminary Damage Assessment (PDA) should be completed to ensure critical information is collected. Accurate and timely damage assessments are essential for supporting emergency response, recovery planning, and securing state and federal funding. Additional details on funding processes are provided in **Chapter 7**.

Table 8-8 summarizes recommended damage assessment actions and associated reference documents for specific hazards and facilities.

Table 8-8 | Damage Assessment Activities

Event	Facility/area	Action	Reference Documents
General (flooding, earthquake, fire, etc)	Citywide Water System - Damage Assessment / Funding Support	Coordinate damage assessment and documentation with Walla Walla County Emergency Management to ensure water system damages are documented and integrated into countywide damage assessments.	Walla Walla County Comprehensive Emergency Management Plan[1]
		Damage assessment documentation coordination through Walla Walla County Emergency Management to the Washington State Military Department, Emergency Management Division to support statewide disaster reporting and funding eligibility.	WA State Initial Damage Assessment (IDA) and joint PDA Resources[2]
		Participate in FEMA PDA by submitting water system damage data to verify disaster impacts and support federal assistance requests. PDAs are conducted to enable FEMA, as well as state, local, tribal, and territorial partners, to determine the magnitude of damage and impact of disasters.	FEMA PDA Resources[3] FEMA Using data to support disaster declaration request (video)[4]

Event	Facility/area	Action	Reference Documents
Wildfire	Citywide Water System	Conduct aerial assessment of burned watershed area to document fire extent and identify potential risks to water quality, infrastructure, and access (e.g., aerial imagery, video, or lidar survey).	USGS GIS data; City contracts for drone operations
		Coordinate with Burned Area Emergency Response (BAER) teams to evaluate post-fire impacts on vegetation, soils, and watershed hydrology that may affect water supply reliability.	BAER Team Resources[5]
	Watershed/RW Intake – Diversion System	Develop a post-fire water quality monitoring plan using BAER assessment as baseline data, to track turbidity, sediment, and contaminants that may affect supply reliability.	BAER Burn Severity Reports; EPA Wildfire Water Quality Guidance

Notes:
1. https://www.wwcowa.gov/government/emergency_management/comprehensive_emergency_management_plan.php
2. https://mil.wa.gov/preliminary-damage-assessment
3. https://www.fema.gov/disaster/how-declared/preliminary-damage-assessments
4. https://www.youtube.com/watch?v=AHH0fmlBq8Y
5. https://burnseverity.cr.usgs.gov/products/baer

8.4.5 Response and Recovery Actions

This section provides a high-level framework for response and recovery following hazard events. It builds on the hazard evaluation in **Chapter 4**, the water system summary in **Section 8.3.1**, and the preparedness measures in **Section 8.4.1**, but focuses here on the operational actions the City may need to take to maintain service and restore system functionality.

Response and recovery efforts for the City's water system are grouped into two primary focus areas:

- Surface Water Supply and Watershed Impacts: hazards that reduce or eliminate Mill Creek supply through watershed damage, intake failure, drought, or sedimentation.
- Treatment, Storage, and Distribution System Impacts: hazards that reduce or eliminate the City's ability to treat, store, or deliver water.

Table 8-9 and **Table 8-10** summarize anticipated hazards, associated impacts, and the key response and recovery actions.

Table 8-9 | Surface Water Supply and Watershed Impacts – Response and Recovery Actions

Event	Damage/Impacts	Effects to System	Response/Recovery
Wildfire	Burned landscape; destabilized slopes; erosion; degraded water quality	Sedimentation and turbidity; possible intake damage	➢ Conduct aerial/geospatial assessments of burned areas ➢ Implement erosion control and slope stabilization ➢ Re-vegetate/restore burned areas ➢ Increase/adjust water quality testing ➢ Transition to groundwater supply as needed

Event	Damage/Impacts	Effects to System	Response/Recovery
Earthquake	Landslides; raw water intake – diversion system damage; slope failure	Raw water intake – diversion system failure; sediment loads entering system	➢ Transition to groundwater supply ➢ Repair/replace damaged raw water intake – diversion system or transmission infrastructure ➢ Remove sediment/debris
Flooding	Washouts, raw water intake – diversion system damage, erosion along stream channels	raw water intake – diversion system failure; increased sediment in raw water	➢ Transition to groundwater supply ➢ Repair/replace damaged raw water intake and stream crossings ➢ Implement washout mitigation and stream improvements
Drought	Reduced surface water availability	Decreased supply for drinking water, agriculture, environment	➢ Implement emergency conservation measures ➢ Transition to groundwater supply ➢ Explore long-term drought resiliency projects (e.g., ASR optimization, storage expansion)

Table 8-10 | Treatment, Storage, and Distribution System Impacts – Response and Recovery Actions

Event	Damage/Impacts	Effects to System	Response/Recovery Actions
Degraded Source Water	Surface water supply degraded beyond WTP capability	Inability to meet regulatory standards	➢ Transition to or supplement with groundwater supply ➢ Use emergency treatment (portable units, chemical adjustments) ➢ Filtration improvements
Earthquake/ Flooding	WTP process equipment, storage tanks, or transmission mains damaged	Loss of treatment or storage capacity; inability to deliver water	➢ Transition to groundwater supply ➢ Distribute emergency water (tankers, bottled water) ➢ Isolate damaged sections of system ➢ Repair/replace damaged infrastructure
Power Outage	Long-term power outage	WTP or wells offline	➢ Supply emergency generator fuel ➢ Explore portable generation options ➢ Transition to alternate sources where available
Wildfire/ Earthquake	Distribution piping and service lines damaged	Localized or system-wide service loss	➢ Isolate impacted distribution zones ➢ Distribute emergency water to affected areas ➢ Repair/replace damaged piping

8.4.6 Response and Recovery Plan Descriptions

This section provides additional detail for the response and recovery actions summarized in **Section 8.4.5**. Each action outlines its purpose, key implementation considerations, potential funding or partnership mechanisms. Actions are organized into five primary categories aligned with the City's overall recovery strategy.

Funding Context: **Chapter 7** of this Watershed Master Plan summarizes a range of potential federal, state, and local funding programs that may support these actions. Unless otherwise noted, the City should reference **Chapter 7** for detailed eligibility, match requirements, timelines, as well as status of available programs.

Commonly applicable programs include FEMA's Hazard Mitigation Assistance portfolio, USDA NRCS EWP, USACE Section 14 and 205 Programs, the EPA's WIFIA Program, Reclamation's WaterSMART Grants, and Washington State's Floodplains by Design and DWSRF Programs.

8.4.6.1 Watershed and Intake Protection

Wildfire, flooding, and earthquakes can damage infrastructure, destabilize slopes and degrade water quality in the Mill Creek Watershed, leading to erosion, sedimentation, and reduced raw water availability. These actions focus on assessing, stabilizing, and restoring the watershed and intake areas. In addition to the below actions, other pre-event fire prevention and mitigation projects have been identified and are listed in **Section 8.4.1 and Chapter 6**.

8.4.6.1.1 Aerial and Geospatial Assessments

Collect post-event aerial imagery, LiDAR, and GIS data to evaluate burned or damaged areas and coordinate erosion control and revegetation efforts.

- Implementation Notes: Utilize city drone resources, agencies supporting the response efforts, or contract with aerial assessment companies to complete surveys of the burned area. Aerial assessments will likely be repeated to support the response and longer-term recovery operations. Steps should be made to ensure the city has adequate systems in place to store, analyze, and share geospatial information.
- Potential Funding Support: NRCS EWP; FEMA HMGP Post Fire; Reclamation WaterSMART Grants; NOAA Habitat Resilience Grants
- References/Technical Support: USGS GIS Data; City drone patrol initiative (in development). USGS BAER Teams
- Lead Agency/City Department: USDA (Forest Service), City of Walla Walla Technology Services, and Public Works Department

8.4.6.1.2 Erosion Control and Stabilization Measures

Apply targeted erosion control measures, such as mulch application or slope barriers, in high-risk areas to reduce sediment transport into Mill Creek.

- Implementation Notes: Prioritize burned riparian zones, tributaries, steep slopes, and fire lines created during response operations. Avoid creating further disturbance whenever possible, and introducing invasive species, when installing erosion control measures such as straw bales, wattles, silt fencing, or aerial application of mulch. Use aerial imagery to identify and focus recovery efforts.
- Potential Funding Support: FEMA HMGP Post Fire; NRCS EWP; USACE Section 14 (Emergency Streambank Protection); USFS CWDG; OR ODF Landscape Resiliency (if eligible). OR OEM HMGP
- References/Technical Support: USGS BAER Teams, WoodStraw.com (local provider example)
- Lead Agency/City Department: USDA (Forest Service) and City of Walla Walla Public Works Department

8.4.6.1.3 Revegetation Operations

Restore riparian and upland areas using native plantings to reduce erosion and support long-term watershed recovery. Revegetation may be completed manually or via drone or other aerial application.

- Implementation Notes: Coordinate with the USFS to develop an understanding how revegetation operation would likely occur, as well as the availability and lead time to acquire native plantings (seed packets, seedlings, etc.). Evaluate available manpower and equipment necessary for traditional hand plating and consider establishing communication with aerial/drone application companies such as Mast Reforestation.
- Potential Funding Support: FEMA HMGP Post Fire; USACE Section 206 (Aquatic Ecosystem Restoration); NRCS Emergency Watershed Program (requires a cooperation agreement to be established before support can be provided)(; NRCS WFPO; USFS Collaborative Forest Landscape Restoration Program (if eligible); Reclamation WaterSMART Grants; NOAA Transformational Habitat Restoration Grants; NOAA Habitat Resilience Grants; WA Floodplains by Design Program; WA RCO Salmon; OR OWEB Restoration Grants (if eligible)
- References/Technical Support: Walla Walla County Noxious Weed Control Board (technical assistance); Mastre Forest Seed Services
- Lead Agency/City Department: USDA (Forest Service) and City of Walla Walla Public Works Department

8.4.6.1.4 Sediment Removal at the Raw Water Intake / Diversion System

Remove accumulated sediment or operate the planned sediment-bypass gate to restore diversion capacity and water flow.

- Implementation Notes: Continue to pursue construction of a sediment bypass gate at the Mill Creek intake. Design of the bypass gate is ongoing with expected construction to begin in 2027.
- Potential Funding Support: FEMA HMGP; FEMA HMGP Post Fire; FEMA Safeguarding Tomorrow RLF; USACE Section 205 (Small Flood Risk Projects); USACE Section 208 (Clearing for Flood Control); NRCS EWP; USFS CWDG; City CIP (2026 project)
- References/Technical Support: **Chapter 4** - Hazard Assessment; Draft 2025 Water CIP Plan
- Lead Agency/City Department: City of Walla Walla Public Works Department

8.4.6.2 Source and Treatment Adaptations

These actions ensure the City can maintain potable water quality and supply when surface water quality or treatment capacity is compromised. Note that if *the water system can't deliver water that meets established standards or if the City is experiencing significant operational impacts that could lead to a health advisory, there would be a role for DOH to assess and a*ssist the City with emergency operations and a recovery strategy. Capital projects that involve new treatment systems will likewise require involvement and coordination with DOH.

8.4.6.2.1 Increased or Adjusted Water Quality Testing

Expand or modify water quality testing following wildfire, flooding, or other events that may introduce new contaminants.

- Implementation Notes: Add temporary sampling stations, acquire mobile testing kits, or contract with local laboratories if City capacity is exceeded. Emergency efforts would supplement (not replace) the City's existing testing process. Additional testing considerations and water quality parameters to evaluate for this action item are discussed in **Appendix N** of this report.

- Potential Funding Support: Cost sharing with partner agencies such as USFS

- References/Technical Support: 2021 ERP Section 8.1, Water Quality Emergency

- Lead Agency/City Department: City of Walla Walla Public Works Department

8.4.6.2.2 Water Filtration Improvements

Construct a filtration system at the WTP to remove contaminants that enter the water supply.

- Implementation Notes: The City's WTP currently has an upflow roughing filter that provides some turbidity reduction, but it does not meet the criteria required for a filtered system as defined by the EPA. Adding filtration to the treatment process will improve resiliency during hazard events and source water quality fluctuations that may occur more gradually over time. Early coordination with DWSRF and DOH engineer for Walla Walla County should be considered.

- Potential Funding Support: EPA WIFIA (large projects); WA DWSRF (emergency loans)

- References/Technical Support: See WTP Resiliency memo in **Appendix I** for filtration alternatives discussion and for filtration CIP projects at the WTP.

- Lead Agency/City Department: City of Walla Walla Public Works Department.

8.4.6.2.3 Transition to Groundwater Supply

Use groundwater wells as the primary or sole supply source when surface water supply is limited, not available, or cannot be treated to meet water quality standards.

- Implementation Notes: Confirm well readiness and pumping capacities for the City's seven existing well sites to serve as the primary supply source. Wells currently operate as supplementary sources. An extended duration of groundwater-only operations may require upgrades to meet summer peak demand and may trigger adjustments to the distribution system interconnections. Recommended well upgrades are listed in the City's current CIP. Additional water quality testing should be considered for wells that do not see regular use before they incorporated into the emergency response efforts. Use of groundwater wells as the primary or sole supply source will temporally impact the ASR program as well as reduce hydroelectric power production and revenues at the WTP and impact (Federal Energy Regulatory Commission) Permit.

- Potential Funding Support: Reclamation WaterSMART Grants; Reclamation WCFSP; WA DWSRF (for well improvements); USDA WFPO (for storage or recharge projects)

- References/Technical Support: 2021 ERP Section 12, Alternative Water Sources; 2020 WSP; 2021 WMP; 2025 CIP groundwater projects

- Lead Agency/City Department: City of Walla Walla Public Works Department

8.4.6.2.4 Emergency Water Treatment

Deploy portable filtration or temporary treatment systems when source water conditions exceed WTP treatment capability. This response is anticipated as a secondary option after transitioning to groundwater supply.

- Implementation Notes: Secure portable membrane filter units; adjust chemical treatment; transition to groundwater supply as needed. This response action involves mobilizing trailer mounted portable units to filter surface water on a temporary basis. Important considerations related to implementation of this response action include:
  - Size and Treatment Capacity: The footprint of single trailer is 56 feet by 15 feet with an operational capacity of approximately 1.5 MGD.
  - Electrical needs & hookup point
  - Integration into Existing Treatment Process: potentially withdraw water from the open reservoirs and discharge at the valve house or setup equipment to pump between open reservoirs.
  - Lead time: depending on the quantity of trailers needed this could be several weeks to several months.
  - Duration: Extended use of portable filters would likely be cost prohibitive. Cost for a single trailer would likely run above $50,000 per month, with a minimum rental period specified by the supplier.
  - Identify an onsite flushing and disposal stream location.
  - Coordinate with DOH for treatment system approval. Significant changes to treatment systems may require monitoring for lead and copper.
- Potential Funding Support: EPA WIFIA (large projects); WA DWSRF (emergency loans); Reclamation WaterSMART Grants
- References/Technical Support: Aria FAST™ Mobile Water Treatment Solutions | Aria Filtra. See WTP memo for additional discussion related to this response alternative.
- Lead Agency/City Department: City of Walla Walla Public Works Department.

8.4.6.3 Demand Management and Distribution Measures

Hazard events can reduce system capacity or isolate parts of the distribution network. These actions help manage demand and sustain delivery to customers during recovery.

8.4.6.3.1 Emergency Water Conservation Measures

Implement public outreach and operational controls to reduce demand during shortages.

- Implementation Notes: Issue irrigation restrictions and public advisories; prioritize repair of high-leak areas; enact Water Shortage Emergency under Municipal Code § 13.04.090.
- Potential Funding Support: Reclamation WaterSMART Grants

- References/Technical Support: 2025 Draft Water Shortage Policy; Resolution No. 2005-58; 2021 ERP Section 13
- Lead Agency/City Department: City of Walla Walla Public Works Department.

8.4.6.3.2 Emergency Water Distribution

Provide potable water through mobile or alternate means when system delivery is compromised.

- Implementation Notes: Truck and container distribution; establish public fill-up points; provide sanitary fill-up kits for residents. This response would be supplemented by a boil water order for affected areas of the main distribution system. Boil water advisories require coordination with DOH and assume no contaminants will be concentrated by boiling.
- Potential Funding Support: EMA HMGP (Post-Disaster Cost Share)
- References/Technical Support: 2021 ERP Section 12.2, Hauling Water During Emergency; Appendix A
- Lead Agency/City Department: City of Walla Walla Public Works Department

8.4.6.3.3 Isolate Impacted Distribution Areas

Identify and isolate damaged system segments to maintain service elsewhere and prevent contamination.

- Implementation Notes: Use existing valving plans and GIS mapping to expedite isolation and rerouting of flows. Once proper pressure is reestablished, chlorine residual testing needs to be completed before notifying customers they can drink the water without boiling it. I*f pressure is lost in distribution, DOH must be contacted and repeated sets of clean coliform results required prior to lifting advisories.*
- Potential Funding Support: WA DWSRF; FEMA HMGP (Post-Disaster Mitigation)
- References/Technical Support: 2020 Water System Plan – Distribution System Mapping
- Lead Agency/City Department: City of Walla Walla Public Works Department

8.4.6.4 Power and Operational Continuity

Sustained operations during and after emergencies rely on backup power and logistical support to critical facilities.

8.4.6.4.1 Supplement Emergency Generator Fuel and Capacity

Ensure extended power supply for wells, WTP, and pump stations during long-term outages.

- Implementation Notes: Maintain fuel contracts and portable generator inventory; evaluate dual-fuel options.
- Potential Funding Support: FEMA BRIC; FEMA HMGP (for generator hardening); WA Emergency Management Grants (if available)
- References/Technical Support: City of Walla Walla O&M Procedures; 2021 ERP Section 10, Power Failure Response

- Lead Agency/City Department: City of Walla Walla Public Works Department

8.4.6.5 Infrastructure Restoration and Replacement

Infrastructure damaged by hazard events must be prioritized for repair or replacement to restore normal service levels.

8.4.6.5.1 Replace Damaged Infrastructure

Repair or replace damaged pipelines, tanks, or treatment components following hazard impacts.

- Implementation Notes: Coordinate damage documentation with Walla Walla County Emergency Management and funding agencies for FEMA or state reimbursement. Prioritization of projects would vary and depend on impacts to the system; however, the generalized approach for a worst-case scenario where the water system was rendered inoperable and customers were receiving emergency water distributions would involve:
    - Identify and implement projects necessary to bring one supply source online that is compliant with treatment standards and has capacity to serve customer base.
    - Distribution system projects that restore water service to all customers.
    - Projects necessary to bring second supply source online.
    - Miscellaneous infrastructure projects needed to replace/upgrade impacted system component.
    - Long term projects that improve resiliency/harden the system.
- Potential Funding Support: FEMA Public Assistance, NFIP and HMGP; EPA WIFIA (loans for major rebuilds); WA DWSRF (state loan support)
- References/Technical Support: **Chapter 4** – Watershed and Water Treatment Plant Hazard Assessment
- Lead Agency/City Department: City of Walla Walla Public Works Department and DOH

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APPENDIX A
WORKGROUP MEMBER LIST

Walla Wall Watershed Master and Resiliency Plan
Workgroup Members

Members		Organization
First Name	Last Name	
Linda	Herbert	Blue Mountain Land Trust
Amanda	Martino	Blue Mountain Land Trust
Steven	Patten	City of Milton-Freewater
Lisa	Wasson-Seilo	City of Walla Walla - Planning
John	Knowles	City of Walla Walla Fire Department
Adam	Klein	City of Walla Walla Public Works
Mike	Laughery	City of Walla Walla Public Works
Frank	Nicholson	City of Walla Walla Public Works
Adrian	Sutor	City of Walla Walla Public Works
Joe	West	City of Walla Walla Public Works
Dan	Mack	City of Walla Walla Public Works
Kimery	Wiltshire	Confluence West
Judith	Johnson	Kooskooskie Commons
Justin	Lauer	Oregon Department of Forestry
Lindsay	Olivera	Oregon Department of Forestry
Kirk	Holmes	Perteet
Randal	Son	Private Landowner
Anton	Chiono	The Confederated Tribes of the Umatilla Reservation
Travis	Ball	US Army Corps of Engineers
Cindy	Boen	US Army Corps of Engineers
Shawn	Nelson	US Army Corps of Engineers
Amber	Ingoglia	US Forest Service
Joseph (Joby)	Sciarrino	US Forest Service
Melissa	Downes	WA Department of Ecology
Tim	Poppleton	WA Department of Ecology
Scott	Tarbutton	WA Department of Ecology
Jeff	Dengel	WA Department of Fish and Wildlife
Jackie	McCool	WA Department of Fish and Wildlife
Mark	Wachtel	WA Department of Fish and Wildlife
Scott	Mallery	WA Department of Health
Rose	Beaton	WA Department of Natural Resources
Collin	Haffey	WA Department of Natural Resources
Charlie	Landsman	WA Department of Natural Resources
Kate	Mickelson	WA Department of Natural Resources
Annie	Byerley	Walla Walla County Conservation District
T. Chris	Lee	Walla Walla County Emergency Management
Rockey	Eastman	Walla Walla Fire District No. 4
Stuart	Crane	Yakama Nation
Emily	Tilden	WA Department of Ecology

Walla Wall Watershed Master and Resiliency Plan
Workgroup Members

Members		Organization
First Name	Last Name	
Troy	Baker	Walla Walla Basin Watershed Council
Harlan	Gough	Washington Water Trust
Holly	Myers	DOH
Stan	Hoffman	DOH
Paul	Lynn	Community member
Tom	Fellows	Community member
Mike	Wohr	Community member
Susan	Wickham	Community member

APPENDIX B
WORKGROUP AGENDAS AND MEETING NOTES

WALLA WALLA BASIN
MUNICIPAL WATERSHED RESILIENCY WORKGROUP
MEETING SUMMARY

Wednesday, October 24, 2024

10:00-11:30 a.m.

Walla Walla Service Center Conference Room| 55 E Moore St, Walla Walla, WA 99362

Hybrid Meeting

Time*	Agenda Item (Action items are marked with "!")	Reference Materials	Presenter(s)
10:00 *(5 min)*	**Welcome, Introductions, Review Agenda** • Welcome • Introductions (name, affiliation) • Review agenda	Agenda	• Amanda Cronin, AMP Insights
10:05 *(5 min)*	**Project Overview** • Project Objectives • Scope of Work • Project Schedule		• Frank Nicholson, City of Walla Walla • Heather Pina, Consor Engineers
10:10 *(10 min)*	**Working Group Objective & Goals** • Structure of this workgroup within WW2050 process • Schedule for the workgroup • Role of the group • **WG Discussion Question:** What is something you bring to this working group and what's something you hope to take away?		• Amanda Cronin
10:20 *(45 min)*	**Mill Creek Watershed - Water Supply Overview** • Overview • Management Goals and Strategies • Current Conditions • Key Challenges, Vulnerabilities, and Risks		• David Johnson, Sam Smith, Erin Krug, and Ryan Billen, Consor Engineers • Amanda Cronin
11:05 *(10 min)*	**Public Outreach** • Overview on public outreach for Watershed Resiliency Plan • **WG Discussion & Feedback**		• Alle Brown-Law, Cascadia Consulting Group
11:15 *(10 min)*	**Capabilities Survey** • Overview of Capabilities Survey • **WG Feedback on Capabilities Survey**		• Amanda Cronin
11:25 *(5 min)*	**Updates and Closing** • October Open House • Next steps • Closing comments		• Amanda Cronin

*All times are approximate and may change

Welcome & Introductions

Amanda Cronin, AMP Insights, called the meeting to order, provided overview of the agenda, and lead introductions. Attendees are listed in Appendix A.

Project Overview

Presentation by Heather Pina, Consor Engineers

- Project is funded by FEMA Building Resilient Infrastructure and Communities (BRIC) FY2021, which provides funding for hazard mitigation planning and resilience investment.
- The City of Walla Walla is developing a Comprehensive Watershed Master/Resiliency Plan. The City has hired a consultant team led by Consor Engineers, along with AMP Insights and Cascadia Consulting Group, to develop the Plan. The Plan will be informed and implemented by the partners in this working group.
- The project has nine different tasks to improve the resiliency of the municipal water supply from Mill Creek Watershed.
- Currently, we have begun a Risk Assessment, Identifying Mitigation Actions, and Identifying Capabilities. The consultant team will work on all three of these tasks from November - February 2025. The SWOT Analysis will begin in March 2025 and end in April. Implementation and Funding Plan will begin in May and go through August 2025.
- The Recovery Plan and Final Plan assembly will start next fall, and the final document will be complete in the new year (2026).

Working Group Objectives & Goals

Presentation by Amanda Cronin, AMP Insights

- Amanda gave an update on the connection to the Walla Walla Basin Advisory Committee (BAC) and the overarching Walla Walla Basin Watershed Strategy ("Walla Walla 2050") project. This working group is under the umbrella of the Walla Walla Basin Watershed Strategy.
    - At the 2024 Fall Walla Walla Basin Watershed Strategy Open House, Frank Nicholson gave a presentation on the overview of this project to key partners and the community.
- The goal of this working group is to bring together a group of key partners, stakeholders, and community members to provide feedback and support mitigation actions related to impacts on the municipal water supply, as well as ecological and cultural resources. The working group will: contribute to the capabilities survey, review preferred mitigation actions, and review the draft Resiliency Plan.
- There will be 5-7 meetings in total, scheduled for October 2024, February/March 2025, May 2025, July 2025, and October 2025. The group will meet when we have content, there is some flexibility in meeting timing. We can meet more if needed but will be driven by content.

Discussion Question

What's something you bring to this working group and what's something you hope to take away?

- Annie Byerley, *Walla Walla County Conservation District:* The Conservation District is developing a Drought Preparedness Plan, which will complement the Resiliency Plan well. Excited about the connections between both.
- Justin Lauer, *OR Department of Forestry:* Bring Oregon perspective on forests and fire protection.
- Randal Son, *Landowner in Mill Creek Watershed:* Bring local knowledge and a regeneration mindset. Would like to generate a robust plan for the City.
- Steven Patten, *City of Milton-Freewater, Oregon:* Bring a different public works perspective to the table. Milton-Freewater is looking at reactivating its surface water; interested in the findings of Walla Walla's work.

- Joe West, *City of Walla Walla:* Strong interest in maintaining high treatment standards at the treatment plant to deliver high quality water. Bring treatment plant information to support consultants and partners, and desire to operate the facilities we do have while also planning for possible hazards or disasters.
- Lisa Wasson-Seilo, *City of Walla Walla:* Also working on a separate project with Cascadia Consulting Group to develop a climate resilience sub-element for the City of Walla Walla's Comprehensive Plan. Apply learnings and progress from both projects to support each other.
- John Knowles, *City of Walla Walla Fire Chief:* Interested in access, recovery for SA 6, partnering with the Forest Service, and resiliency in the water system.
- Adrian Sutor, *City of Walla Walla:* Bring the operations perspective. How can operations support both proactive solutions and reactive approach if emergencies happen?
- Linda Herbert, *Blue Mountain Land Trust:* Bring connections to Blue Mountain Land Trust, with emphasis on land conservation and stewardship; Walla Walla 2020, which focuses on building the community we desire; and Walla Walla BAC. Bring penchant for public outreach and education, can inform other community members of this work.
- Judith Johnson, *Kooskooskie Commons:* Bring a long history and involvement in conservation work, including forest conservation, community wildfire protection planning, and am a BAC member. Very interested in the results and recommendations of this work.
- Kirk Holmes, *Perteet:* Bring previous expertise as a water treatment plant operator, planning and preparing for emergencies. Bring connections to state partners and organizations, can help bring them into this conversation.
- Kimery Wiltshire, *Confluence West:* Interested in how this process can inform smaller communities, particularly those where water comes from public forests, and would like to learn from other communities in similar situations.
- Troy Baker, *Walla Walla Basin Watershed Council:* The Watershed Council has been working in the upper watershed; currently inventorying springs within the municipal watershed. Bring an understanding of where the valuable source water is coming from.
- Jackie McCool, *WA Department of Fish and Wildlife:* New WDFW Habitat Biologist for Walla Walla, looking forward to contributing to the Resiliency Plan.
- Jeff Dengel, *WA Department of Fish and Wildlife:* Also looking forward to contributing to this discussion.
- Collin Haffey, *WA Department of Natural Resources:* Very exciting to see communities planning for response and recovery after a significant fire. DNR works across public and private forests and land. Want to see how DNR can best bring resources to complement work on the Oregon side.
- Andrew Purkey, *AMP Insights:* Bring lessons from other communities and watersheds, as there is a lot to be learned from what other communities are doing.
- Joseph (Joby) Sciarrino, *US Forest Service:* Manage prescribed fire and fuels for the Umatilla Forest, and serves as project manager for Tiger Mill Project. Bring information on the 90% of wild land that the Forest Service manages.

Mill Creek Watershed – Water Supply Overview

Presentation by Consor Project Team

Identify Hazards and Conduct Risk Assessment

David Johnson and Heather Pina, Consor Engineers

- This task will identify the various hazards and risks affecting the area and explore potential mitigation actions to address these challenges. This will involve assessing both the immediate and long-term impacts on the community, infrastructure, and natural resources.
- Consider both surface water and groundwater as integral components of the local water system, ensuring that mitigation strategies account for the interconnectedness of these resources and their role in the overall water supply.
- Focus on the Mill Creek watershed, examining its unique characteristics, vulnerabilities, and the importance of this area for local water supply, ecology, and infrastructure resilience.
- Include a detailed evaluation of the intake diversion structure and the associated 14 miles of piping leading to the hydroelectric plant, and the Water treatment plant including tanks and reservoirs.

- Frank Nicolson, City of Walla Walla, stated that, when thinking about resiliency and defining a common understanding, it's crucial to recognize the current state of the watershed. At some point, we will face a significant challenge. The real question is: how quickly can we recover and get back on our feet? Our focus must be on ensuring people's safety, minimizing recovery and response costs, and reducing disruptions to essential services. Resiliency is about preparedness, swift recovery, and reducing long-term impacts.
- Management goals and strategies include:
  - Establish and sustain a secure water supply that addresses both current and future demands.
  - Build a resilient water supply system to withstand future challenges.
  - Identify both short-term and long-term Capital Improvement Plan (CIP) projects.
  - Create a resiliency plan that capitalizes on future grant and funding opportunities.
- Frank added the current water system has significant vulnerabilities, and securing this FEMA grant highlights the urgency; state priorities are submitted to FEMA, and federal funding, along with other resources, is necessary to address these issues.
- Developing a Watershed Resiliency Plan will enable public and private partners to maximize capabilities, services, and grants, ensuring a safe and clean water supply for the future.
- There is significant opportunity to improve the resiliency of the watershed by reducing wildfire risk, as vegetation extends right up to the buildings. This includes developing plans to manage timber, brush, buildings, and fish habitats, as well as considering the implementation of a heliport.
- The watershed is 90% Forest Service-owned and 10% City-owned.
- The U.S. Forest Service will be a key partner in improving access to the watershed, including upgrading roads to allow fire professionals easier entry and exit. This will enable larger vehicles to safely make turn around.
- The recommendation for wildfire mitigation is to manage vegetation in response to climate change. A study indicates that precipitation will remain similar, but with hotter days, shorter seasons, and more extreme precipitation events in the short term, leading to increased erosion, which could impact Mill Creek. If City decides to replant for more climate resilient plants, work needs to start soon.

Intake Structures and Properties

Erin Krug, Consor Engineers

- Intake Diversion Structure:
  - Structure was built in the 1920s and is facing recurring challenges, including regular gravel buildup in the reservoir every time it floods.
  - The control building is in poor condition. The building has been flooded up to 3 feet, causing doors to be blown open, deterioration of the building structural components/exterior, and cutting off access. This creates safety risks, damages equipment, and threatens the building’s structural integrity.
- Intake Caretaker Facilities:
  - The building faces heating and cooling issues and requires drywall repairs.
  - There is only one narrow access road, which is a gravel road from WA/OR border.
  - Previously, flood water has gotten close to the house, cutting off access and posing a danger to the caretaker.
- Intake USGS Gauging Station:
  - The USGS gauging station is essential to the operations of the Water Treatment Plant, as it provides critical data on water flow and levels necessary for effective water management.
  - Access to the station is via a small bridge, but the design/construction details are unclear, and its performance under flooding conditions is unknown.
  - If the bridge was not designed for floodwater loading, there is a potential for the anchor bolts to be inadequate in shear/tension and the result would be the bridge superstructure becoming separated from the abutments and be taken by the flood waters downstream.
- Intake Surrounding Area:
  - To utilize the horse barn, field, and paddock area, the bridge, which is currently unusable by vehicles, would need to be repaired or replaced.

Transmission Main

Sam Smith, Consor Engineers

The single transmission main, constructed in the 1980s under two contracts, includes a 30-inch main which provides 1,200 feet of head and over 500 psi at the Water Treatment Plant (WTP). The main has experienced washouts, and in February 1996, three sections were washed out, requiring the water system to rely fully on their groundwater supply until the sections were restored. The City intends to maintain the current pipeline as-is despite these challenges, and focus on identifying channel improvement strategies.

Twin Reservoirs

Sam Smith, Consor Engineers

- Reservoirs have a capacity of 7.5 million gallons each, with concrete-lined open-air reservoirs, and removed baffles.
- The embankment is highest along the south end, with a central embankment dividing the north and south reservoirs. The north reservoir lost two vertical feet of storage in September while isolated, partially attributed to a large crack observed in the concrete lining, and remedial measures such as embankment grouting have been implemented in the past.
- Routine seepage through the concrete lining, embankments and foundation results in a loss of 0.5 million gallons per day. Differential settlement, voids, and concrete cracking have been observed throughout the reservoir embankments.
- The reservoirs are vulnerable to contamination from wildlife, vegetation growth, and airborne particulates, and are exceeding their typical design life.
- Natural hazards such as earthquakes and wildfires present operational risks, and comprehensive, long-term remediation options are being considered.

Water Treatment Plant

Ryan Billen, Consor Engineers

- Consor is assessing the risk and resilience of the plant, including its current treatment capabilities.
- Table (Slide 27) identifies risks, improvements, and the plant's current capabilities.
  - Red does not indicate that the water is bad; but rather highlights the areas where the plant has limited capabilities to respond to risks or changes in water quality levels. The water treatment plant is currently unfiltered because the surface water from the Mill Creek watershed is already very clean.
- High turbidity can occur when a large volume of water enters the water supply, often due to higher rainfall, or because of wildfires and landslides.
- Another risk is elevated dissolved organics, which can enter the water from sources such as fires, algae, and landslides. Algae can affect both water safety and cause unpleasant odors.
- Another risk includes contaminants such as PFAS, but PFAS is very unlikely to be present in this watershed.
- Adding pretreatment could involve coagulant dosing. Adding pretreatment along with filtration would provide resiliency against many of the risks highlighted on the slide. Additional treatment would be required to address specialty contaminants such as PFAS.
- The City has some built-in resiliency measures, including the ability to pump groundwater to offset or replace the surface water supply.
- We will be exploring both short-term and long-term solutions as part of the study.

WG Questions

- A WG member said the City of Medical Lake gave a presentation on wildfire preparedness and the potential risks of being unprepared.
- A WG member asked about the plan for treating wildfire ash and how it interacts with the infrastructure.
  - Ryan noted that wildfire ash is included in the Turbidity and Elevated Dissolved Organics categories. A long-term solution is a filter facility.
- A WG member said the federal government offers resources for watershed restoration following a fire. We should make sure all relevant resources are identified, as there is a process to assess whether the fire has impacted the water supply.

- A WG member asked if there a response framework for the City to use when addressing events impacting the watershed.
- Amanda responded yes, the consultant team will develop a recovery plan as part of the Resiliency Plan.

Public Outreach

Presentation by Alle Brown-Law, Cascadia Consulting Group

- Alle discussed the plan for public, partner, and stakeholder engagement, outlining how we are engaging with both community members and stakeholders. The consultant team is currently developing an outreach strategy.
- Draft outreach objectives include assessing community understanding of the municipal watershed's risks, raising awareness and building support for future mitigation actions and the implementation of the Watershed Master/Resiliency Plan, creating meaningful opportunities for stakeholders and partners to provide guidance and technical support throughout the project, and involving stakeholders in assessing potential environmental impacts and reviewing possible mitigation actions.
- Target audiences include the local community and watershed partners and stakeholders.
- There will be several different outreach activities to engage the target audiences:
    - Main outreach will occur through working group meetings, with regular updates provided to the BAC.
    - The team will present twice to the City of Walla Walla Water and Wastewater Advisory Council.
    - Outreach to the local community will include two in-person events and ongoing engagement through the website and social media throughout the entire process.

Capabilities Survey

Presentation by Amanda Cronin, AMP Insights

- The goal of the capabilities survey is to assess the current capacity and resources available pre- and post-hazard and identify what is available and what is still needed. An extensive list of agencies, partners, and stakeholders may have valuable capabilities and resources. The consultant team will survey these groups to gather insights and evaluate whether the selected mitigation actions can be successfully implemented.
- Draft list of desired/needed capabilities for planning, prevention, mitigation, and response actions:
    - **Research:** Existing datasets, assessments, analyses, and other relevant studies.
    - **Institutional Knowledge:** Staff expertise and the ability to effectively access and coordinate resources.
    - **Equipment & Supplies:** Technical equipment and necessary supplies.
    - **Funding:** Available fiscal resources and potential funding sources.
    - **Education & Outreach:** Programs and methods aimed at increasing public awareness.
- The next steps involve working with the workgroup to gather feedback on the online questionnaire and presenting the findings to the group. If anyone has thoughts on the survey from the categories listed, please reach out to Amanda.
- A WG member has a suggestion for a mitigation topic to add; when and how should it be submitted?
    - Amanda replied that the project team is working to get those solidified in a couple months and would like to get that feedback early in the process rather than later.
- A WG member asked if NW management available to help a working group member review the initial findings report?
    - Amanda said their findings will be incorporated, and can try to present the chapters early.
    - David added that we can share materials as we go along, but we need to distinguish between "draft" and "final" versions.

Updates and Closing

- View Kimery's newsletter at [here]() and sign up to receive updates at the [end of any blogpost]().
- Next working group meeting: Late February or March 2025.

Appendix A. Attendees

Name	Affiliation
Adrian Sutor	City of Walla Walla Public Works
Alle Brown-Law	Cascadia Consulting Group
Amanda Cronin	AMP Insights
Andrew Purkey	AMP Insights
Annie Byerley	Walla Walla County Conservation District (WWCCD)
Carson Brock	Cascadia Consulting Group
Charlie Landsman	WA Department of Natural Resources (WA DNR)
Collin Haffey	WA Department of Natural Resources (WA DNR)
David Johnson	Consor Engineers
Erin Krug	Consor Engineers
Frank Nicholson	City of Walla Walla Public Works
Heather Pina	Consor Engineers
Jackie McCool	WA Department of Fish and Wildlife (WDFW)
Jeff Dengel	WA Department of Fish and Wildlife (WDFW)
Joe West	City of Walla Walla Public Works
Judith Johnson	Kooskooskie Commons
Justin Lauer	Oregon Department of Forestry
Kimery Wiltshire	Confluence West
Kirk Homes	Perteet Inc
Lillian Lowery	
Linda Herbert	Blue Mountain Land Trust
Lisa Wasson-Seilo	City of Walla Walla Planning
Melissa Downes	WA Department of Ecology (Ecology)
Mike Moore	
Randall Son	Community Member
Ryan Billen	Consor Engineers
Sam Smith	Consor Engineers
Steven Patten	City of Milton-Freewater
Tess Gardner	AMP Insights
Tim Poppleton	WA Department of Ecology (Ecology)
Troy Baker	Walla Walla Basin Watershed Council (WWBWC)
15093017478	

WALLA WALLA BASIN
MUNICIPAL WATERSHED RESILIENCY WORKGROUP
MEETING SUMMARY

Wednesday, March 12, 2025, 10:00 a.m. – 12:00 p.m.

Water and Environment Center Room | 2023-2024 | 640 Water Center Dr, Walla Walla, WA 99362

Hybrid Meeting (Zoom Instructions on Page 2)

Time*	Agenda Item	Reference Materials	Presenter(s)
10:00 *(10 min)*	**Welcome, Introductions, Review Agenda** • Welcome • Introductions (name, affiliation) • Agenda	• Agenda	• Amanda Cronin, AMP Insights
10:10 *(10 min)*	**Project Recap & Meeting Objectives** • Project objectives reminder • What we've accomplished • Today's meeting goals • Draft Watershed Hazard & Risk Assessment Chapter Recap • **WG Feedback on Draft Chapter**	• Draft Watershed Hazard & Risk Assessment Chapter	• Heather Pina, Consor Engineers
10:20 *(1 hour)*	**Forest Health & Mitigation Alternatives** • NMI expertise & project contribution • Key facilities investigated • Mitigation actions: reducing fire now & in the future • Collaborative mitigation actions: planning for long-term fire resilience • **WG Discussion Questions:** See presentation slides		• Adam Herrenbruck, Northwest Forest Management, Inc
11:20 *(30 min)*	**Resources and Capabilities Inventory Results** • Presentation on results of Resource and Capabilities Inventory • **WG Discussion Question:** ○ Any questions or feedback about the capabilities inventory?		• Amanda Cronin, AMP Insights • Sarah Kruse, AMP Insights • David Johnson, Consor
11:50 *(10 min)*	**Updates and Closing** • Upcoming work • Next meetings: May and July 2025 • Engagement moving forward • Closing comments		• Amanda Cronin, AMP Insights

*All times are approximate and may change

Welcome & Introductions

- Amanda welcomed everyone, reviewed the agenda, and led roll call. Attendees listed in Appendix A. Attendees.

Project Recap & Meeting Objective

Heather Pina, Consor

- The project objective is to develop a comprehensive Watershed Master and Resiliency Plan, to enable City of Walla Walla to improve the resiliency and sustainability of the Mill Creek Watershed. Our goal is to protect water quality and quantity from Mill Creek watershed.
- Consor has worked on several draft chapters since the last workgroup meeting (in October 2024), and shared the draft Chapter 4 (Watershed and Water Treatment Plant Hazard and Risk Assessment) with the Working Group via email.

Discussion and Questions

- A WG member confirmed that the scope is limited to City-owned assets, not any contingent risks. Is that right?
  - Heather affirmed yes, this is focused on what mitigation the City of Walla Walla can do to reduce those risks associated with their own property.
- WG members shared that they had learned a lot through reviewing draft Chapter 4.
- WG members asked the number of chapters in the plan and what the schedule for review was.
  - Heather reviewed the general structure of the plan. All chapter drafts should be done before the end of Summer/Fall 2025.
  - **Action Item:** Send out a schedule for working group chapter review. See Appendix B. Chapter Review Schedule.

Forest Health and Mitigation Alternatives

Presentation by Adam Herrenbruck, Northwest Management

- NW Management works on forest hazard management and mitigation planning. They are working on several local fire protection plans in Walla Walla region.
- For the City of Walla Walla, they assessed the facilities at the water intake site, plus the potential strategies and actions that the City could take to mitigate wildfire risk for those facilities. They also investigated what's happening in the watershed to identify opportunities to partner. Their final memo is in Appendix C. Northwest Management Technical Memo.
- They assessed the following sites/facilities: intake facility, caretaker facilities, barn and corral area, forested area. They assessed the wildfire fuels and hazards in these areas, looking at how best to mitigate for wildfire and create more resiliency.
- They recommend that the City implement vegetation management around the sites using a combination of machine, hand thinning, and cutting down hazard trees in the near term. This would reduce fire risk and prevent slope destabilization due to falling trees. The forest is unhealthy due to pests and overstocking, and treatment of live ladder fuels would improve its condition.

Questions from Working Group

- A WG member noted that through a grant from the community wildfire protection plan, Walla Walla County has hired a crew from the Corrections Facility that will do hand-thinning. Do you recommend any hand-thinning?
  - Typically machines are less expensive than hand crews, but there are areas in this site that are not accessible by machine. If the Correctional Facility crew is less expensive, then that would be a good avenue to explore.
  - Other WG members have used the correctional facility crew and it's been very affordable.
- A WG member asked how this will interact with the US Forest Services' plans.

- Joby (US Forest Service) noted that they have a signed decision on the Tiger Mill Project, currently.
  - The forested areas owned by the City near the intake facilities would need a inventory completed to confirm the required thinning needed to make the area more resilient. NMI noted this as an additional task outside of what they are scoped to do for this project.
- A WG member asked for a ballpark cost estimate on this forest management work.
  - Adam (NW Management) answered that there are two different types of work – short-term and long term. The short-term work estimate is $30k (for about a week's worth of work with a hand crew and then a maintenance program). For the long-term partnership with the Forest Service, that would be a much larger funding ask.
- The working group discussed Good Neighbor Authority funding for cross-boundary actions.
  - Joby (USFS) noted that it would require another agreement with the City to add area into the USFS prescribed burn. We have had previous agreements with the City to burn on their land.
  - Tucker (NW Management) noted that we need to facilitate as much cross-boundary work as possible. Maintaining prescribed burn across boundaries brings per acre costs down.
- Amber (USFS) shared that the Forest Service has thought through some funding options and how to pay for some of the Forest Service work. They had identified potentially $20 million worth of work. Helicopter logging would be a big part of that work, which would be very expensive. There's work we can do that's less expensive. Helicopter logging would be used where there is no reliable road access or place to move logs safely. We'd look at the Joint Chiefs proposal process that could support cross-boundary work. It's complicated by the fact that this project crosses two states, and NRCS is more of a state and county-based agency. On the Oregon side, they could support a Joint Chief Proposal, but Washington hasn't been accepting proposals. Northern Blues group also helps with cross-boundary work and looking for funding as well.
  - Tucker (NW Management) asked if they've considered NFF, NRCA, or NRCS.
    - Yes, the Forest Service has considered these options. The Tiger Mill project is on their radar.
  - Amber (USFS) shared that they had made a job offer to a candidate to assist with contract management and fundraising, particularly for Tiger Mill fuel reduction work. However, the funding for this position was frozen.
  - Lindsay (Oregon Dept. of Forestry) noted that ODF is going to put grants out that the City of Walla Walla would be eligible for.
  - City of Walla Walla staff asked for these funding sources and grants to be included in the final Watershed Resiliency/Master Plan so they can track them.
    - Consor can create an annual grants calendar that shows state, federal, special district grants on an annual calendar, with live hyperlinks to those grant program websites.
    - **Action Item:** Consor add a grants calendar to the Watershed Master/Resiliency Plan.
- Tucker (NW Management) shared that the Community Wildfire Defense Grant is an option, but it can be very competitive. It has a 5 year timeframe for implementation and a cap of $10M. Northwest Management can include funding and grants in their recommendations.
- A WG member noted that NW Management is doing a lot of work in the larger region, so it'd be useful to identify where other work is happening and what others are doing.

Presentation by Adam Herrenbruck, Northwest Management (Cont.)

- One of the recommendations from NW Management is trail and road improvements, particularly to the two-track road, which is essentially a maintenance road for work in the watershed. They recommend maintaining and improving that road, and possibly preparing the road for future fire suppression needs. The City could pre-treat it to the status of the containment line. The hiking trail could also be expanded, making it so that when the fire crews show up to do suppression, they don't need to spend time creating those containment lines, and instead direct their energy to actual fire suppression.
- Joby (USFS) noted that it would be a hard sell to extend the road, because it's critical habitat for fish. But it would be easier to extend trail access for people to access on foot. It would also help to improve creek crossings against flooding. Those streams come through City property, and those are the access points. Trying to restore capacity and stop big flows from coming would be a major benefit.

- Consor is working on stream management and identifying potential areas of washout downstream of the intake but indicated they would provide further discussions in the Watershed planning for potential improvements to the stream upstream of the intake.
    - USFS and City of Walla Walla staff both agreed that it would be helpful to stabilize Mill Creek from flooding. USFS has had trouble winning funding for these kinds of projects but they are interested in pursuing this with partners. They'd like to see these projects be implemented in the watershed.
    - A WG member recommended partnering with the Tribe about this, both with the fisheries and the Tribe's forestry department.
    - Other WG members suggested partnerships with the Conservation District and Nature Conservancy.
- Another recommendation from NW Management was to pave Mill Creek Road from the WA/OR boundary. It was noted by a WG member that Umatilla County is going to pave Mill Creek Road all the way to the watershed intake site this year.
- The final recommendation from NW Management was to convert the corral/barn area into a potential equipment storage, water fill site, helispot, and/or command center for wildland fire response. The City has had recent conversations with the Forest Service and will bring Consor and team in on the conversations so that a mitigation project can be identified as part of the Watershed Plan. NW Forest Management added that the existing bridge would need to be replaced/repaired in order to utilize the corral and barn area as it is currently only used for pedestrians and would not be able to hold vehicular weight.
    - Consor will include a proposal on what the City needs to do to improve the bridge.
    - The City of Walla Walla did a site visit with the Forest Service to look at feasibility of pulling water from Mill Creek with a helicopter. This could be a FEMA grant opportunity, but it's unlikely, so the City would need more local funding.
    - The City also wants better access to do weekly sampling in the watershed.
    - **Action Item:** Consor and NW Management to meet with City of Walla Walla to discuss the helicopter site project idea and incorporate project into the Watershed Plan.

Capabilities Survey and Inventory

Presentation by Amanda Cronin, AMP Insights

- The purpose of the capabilities and equipment inventory is first, to assess stakeholders' current capacity and resources that can be used for planning, prevention, mitigation and response actions with a focus on municipal water supply from Mill Creek Watershed. Second, findings from the inventory will assist in preparing for the implementation of preferred mitigation actions (pre- and post-hazard) and evaluating whether the selected actions can be successfully implemented and/or identifying capabilities necessary to achieve implementation.
- AMP prepared a targeted survey for agencies, partners, and stakeholders who operate in the study area. The survey included questions on public communication, administrative and technical knowledge, equipment and supplies, and outreach and education. All of these are within the context of emergency response.
- 17 of 20 project stakeholders completed the survey. The full results will be included in the Master/Resiliency Plan.
- Respondents used a variety of public communication methods, and seven respondents already coordinate with the City during an emergency event.
- Eight respondents currently support the City during natural hazard events, or could potentially support in the future.
- Only six respondents have potential capacity to provide equipment or supplies to the City in a natural hazard event. However, the majority could provide some support delivering essential supplies during a hazard.
- In terms of education and outreach, all but one respondent conduct public outreach or educational programs in the local area.

Discussion and Questions from Working Group

- USFS worked with staff from multiple agencies to develop talking points and a communication plan around wildfire. They can share those talking points with the City and/or the working group.
    - **Action Item**: USFS to share talking points and communication plan.

- Consor screened based on likelihood and impact of mitigation actions. They plan to build implementation tables, starting with high likelihood hazards and high impact actions, and then matching up the capabilities and resources of community partners with those. Who will do what, when, and how much will it cost? What grants could support that?
- A WG member asked if the City of Walla Walla has bonding capacity. The City of Flagstaff, AZ, is a great example to draw from.
  - The City has used bonds in the past, including the Public Works Trust Fund, and they've evaluated what the best interest rate sources are, or low-interest grants and loans. However, they prefer grants.
- A WG member asked if Consor can include a chart that shows the multiple outcomes from a particular improvement, such as improving the bridge over Mill Creek?
  - Consor answered yes, there will be a column in the Implementation tables that show what the proposed action is, and then the multiple outcomes that are achieved. The risk assessment chapter assigned "risk IDs," which will be included in these tables.

Upcoming Work and Next Steps

- The upcoming work includes:
  - Identifying mitigation actions and developing the resiliency strategy.
  - Completing a SWOT analysis.
  - Creating an implementation and funding plan.
  - Developing the recovery plan.
- Consor will prepare a schedule of chapter drafts for workgroup review.
- The consultant team are creating outreach materials, including a new webpage, social media, and an insert in the City's newsletter. Soon, they will start planning for a fall 2025 outreach event.
  - WG members suggested, for future outreach, offering public tours of the intake facility, or combining an in take tour with the smolt release by CTUIR. They also suggested participating in a Water and Wine Event.
- **Upcoming Workgroup Meetings:**
  - Meeting #3 - May 29, 2025, in the morning (10 am – 12 pm)
    - Hybrid meeting: in-person + virtual
  - Meeting #4 – July 2025
    - Poll for the WG: Virtual or In-Person?
    - Majority of WG members voted for hybrid meeting option in July.

Appendix A. Attendees

Name	Affiliation
Adam Herrenbruck	Northwest Management, Inc
Adrian Sutor	City of Walla Walla Public Works
Alle Brown-Law	Cascadia Consulting Group
Amanda Cronin	AMP Insights
Amber Ingoglia	US Forest Service – Umatilla National Forest
Amy Schwab	Port of Walla Walla
Andrew Purkey	AMP Insights
Annie Byerley	Walla Walla County Conservation District (WWCCD)
Brook Beeler	Ecology
Carson Brock	Cascadia Consulting Group
Charlie Landsman	WA Department of Natural Resources (WA DNR)
Collin Haffey	WA Department of Natural Resources (WA DNR)
David Johnson	Consor Engineers
Frank Nicholson	City of Walla Walla Public Works
Heather Pina	Consor Engineers
Jaime Short	Ecology
Jeff Dengel	WA Department of Fish and Wildlife (WDFW)
Joby Sciarrino	US Forest Service – Umatilla National Forest
Judith Johnson	Kooskooskie Commons
Ki Bealey	City of Walla Walla
Kimery Wiltshire	Confluence West
Linda Herbert	Blue Mountain Land Trust
Lindsay Olivera	Oregon Department of Forestry
Lisa Wasson-Seilo	City of Walla Walla Planning
Randall Son	Community Member
Renee Hadley	Walla Walla County Conservation District (WWCCD)
Ryan Billen	Consor Engineers
Sarah Dymecki	Ecology
Steven Patten	City of Milton-Freewater
Todd Kimball	Walla Walla County
Troy Baker	Walla Walla Basin Watershed Council (WWBWC)
Tucker Flaten	Northwest Management, Inc

Appendix B. Chapter Review Schedule

Chapter/Memo Title	Date to be Delivered	Who Needs to Review
Chapter 1 – Introduction and Project Overview	**Delivered**	City - **Completed**
Chapter 2 – Vision, Goals, Objectives	April 4	City & Workgroup
Chapter 3 – Data Summary	Fall: Still receiving data and reviewing similar planning effort documents so plan is to submit closer to end of project	
Chapter 4 – Watershed and Water Treatment Plant Hazard and Risk Assessment	**Delivered**	City – **Completed** Workgroup – **Completed**
Chapter 5 – Resource and Capabilities Inventory	April 11	City & Workgroup
Chapter 6 – Watershed Resiliency Strategy	June 12	City & Workgroup
Chapter 7 – Implementation and Funding Plan	September 15	City & Workgroup
Chapter 8 – Recovery Plan	October 24	City & Workgroup
Water Treatment Plant Facilities Condition and Risk Assessment Technical Memorandum	April 18	City
Outreach Strategy Memorandum	**Delivered**	City – **Completed**
Full Watershed Mater Plan – Draft	December 1	City
Full Watershed Master Plan Final	January 9, 2026	NA

WALLA WALLA BASIN
MUNICIPAL WATERSHED RESILIENCY WORKGROUP
MEETING SUMMARY

Thursday, May 29, 2025, 10:00 a.m. – 12:00 p.m.

Water and Environment Center Room | 2023-2024 | 640 Water Center Dr, Walla Walla, WA 99362

Hybrid Meeting (Zoom Instructions on Page 2)

Time*	Agenda Item	Reference Materials	Presenter(s)
10:00 *(10 min)*	**Welcome, Introductions, Review Agenda** • Welcome • Introductions (name, affiliation) • Agenda • Recap last workgroup meeting	• Agenda	• Amanda Cronin, AMP Insights
10:10 *(5 min)*	**Project Update & Meeting Objectives** • Project objectives reminder & meeting goals		• David Johnson, Consor Engineers

10:15
(45 min)
	Watershed Resiliency & Mitigation Actions
	• Review and discuss watershed resiliency actions:
	  ○ Proactive Wildfire Mitigation on City Lands
	  ○ Mill Creek Post-Fire Sediment Control Study
	  ○ Creek Road Resiliency Study
	  ○ Barn Conversion for Fire Response Support
	  ○ Acquire Privately-Owned Watershed Property
	• **WG Discussion & Feedback**
			• David Johnson, Consor Engineers
			• WG Members

11:00	**5 Minute Break**		
11:05 *(35 min)*	**Northern Blues Restoration Partnership** • Overview of the Northern Blues Restoration Partnership: entities, work & mission, funding • **WG Questions**	www.northernblues.org	• Amber Ingoglia, US Forest Service
11:40 *(10 min)*	**Outreach Update** • Update on outreach materials: webpage, social media, and newsletter • Fall 2025 Event - **WG Feedback**	• Website: bit.ly/watershed-resiliency • Newsletter • Social media	• Alexandra Doty, Cascadia Consulting Group
11:50 *(10 min)*	**Updates and Closing** • Upcoming work • Next meeting: July 22, 2025, from 10a – 12p (Hybrid) • Closing comments		• Amanda Cronin, AMP Insights

*All times are approximate and may change

Welcome & Introductions

- Amanda Cronin, AMP Insights, welcomed everyone, reviewed the agenda, and led roll call. Attendees listed in Appendix A. Attendees.

Project Update & Meeting Objectives

David Johnson, Consor Engineers

- Today's meeting objectives are to continue gathering input from all interested parties by collecting feedback on what works and what might be missing, while thinking about potential challenges and barriers.
- Mitigation strategies have been identified, so this meeting will focus on presenting and discussing some of these while starting to identify funding and collaboration opportunities.

Watershed Resiliency & Mitigation Actions

Presentation by David Johnson, Consor Engineers

- Today's focus is on strategies related to the watershed itself, but there will be an opportunity for the working group to provide feedback on all strategies through written feedback.
- Keep in mind that the city only controls 10% of where the water comes from, so it is very dependent on partnerships, collaboration, and producing a plan to manage the watershed from a resiliency standpoint.
- Several of the mitigation strategies are tied to City-owned infrastructure and will be implemented as needed and as budget allows.
- The following actions are more dynamic and expected to benefit most from input and discussion at today's meeting.

WS3 - Proactive Wildfire Mitigation on City Lands

- This action focuses on mitigating the risk of wildfire damage to the raw water intake that could also disrupt water supply to the Water Treatment Plant through thinning and prescribed burning on the City-owned Watershed Property. There is a building on this property with trees right next to it and no fire boundary.

Discussion and Working Group Questions

- WG members expressed that they had no objections to this action and that if the City needs to do this, they should.
- A WG member asked if the scope of study includes looking at the disposition of wood material and what the City might do with large-diameter material. They also noted that there has been discussion about amending tributary areas with woody debris in case some of the materials removed for this action could be repurposed for this.
    - Another WG member responded, noting that the scale of projects differs and that this project is smaller in comparison, involving mostly pruning and burning. Based on what they saw on the site, the materials removed would mostly be of small diameter, but another site visit may be needed to confirm this assessment. Moving up the creek from the road and where the structures are located, there aren't many options for the kind of work that can be done, and this is where we would want to assess what to use the wood for.
        - It was also noted that the biomass could be used for stream restoration, but removing large-diameter trees from the area is more challenging and would require a more extensive plan.
    - David also noted that this is another point the WG will discuss and asked if the logging revenue from this work could be reinvested in the project.

        - The WG member responded that they would have to examine volumes, hauling fees, markets, and other cost considerations, as it is a possibility but may not be cost-effective.
        - A WG member commented that this should be identified as a goal because it is a priority for the U.S. Forest Service.
    - A WG member commented that this action offers good cost-benefits to the City's ability to mitigate risks at the facility and that materials harvested that offer environmental benefits could improve the action's cost-benefit analysis. However, there are also risks associated with this approach that require analysis.
    - Another WG member added that for the Tiger Mill work, they have not found value in repurposing materials due to the high cost of helicopter logging. However, if the work can be done simultaneously and benefits other city projects, it may work.
        - David responded to this, saying that this will be part of the discussion, especially when identifying partnerships. Additionally, this point on mobilization and maximizing its use for cost-effectiveness makes a lot of sense.
- A WG member asked to confirm that consulting fisheries and other wildlife organizations will be consulted about this work, and David confirmed that this is a part of the plan.
- A WG member commented that the Tiger Mill project requires City permission for certain work, but that there has been a lot of public opposition to the project, so they would really encourage looking at what the City can act on, like this action. They also noted that they are working on vegetation that will grow back, so this needs systematic consideration, and partnerships can help.

WS4 – Mill Creek Post-Fire Sediment Control Study

- This action focuses on mitigating the risk of wildfire damage to the raw water intake that could also disrupt water supply to the Water Treatment Plant by conducting a post-fire sediment control study. This study should help the City identify opportunities for large wood debris placement and creek crossing improvements to reduce sediment and flooding, and protect the City's water supply infrastructure post-wildfire.

Discussion and Working Group Questions

- A WG member, with USACE, inquired whether the project team was exploring funding sources for this initiative. David responded affirmatively, noting that it would be beneficial to connect with USACE on this matter, as it could present a great opportunity to expand the work by collaborating.
- One of the WG members asked whether putting structures in, based on the study, might improve fish habitat and if this could be an angle to use in grant requests.
    - A WG member responded to this, stating that they need to determine whether it's feasible to do large-scale restoration and that a similar issue to WS3 with getting trees down the stream and into the right place, while limiting disturbance of the watershed.
    - David added that this is something that could be planned for.
- The same WG member added to the previous question asking if that action would improve habitat?
    - A WG member responded that they believe everything in the watershed is in an optimum condition, but they aren't aware of any recent assessments.
    - David concluded this point by noting that the watershed is good from a fishery standpoint, but that they may need someone to walk and assess it.
- Another WG member asked if the project team has access to the sediment studies that were conducted following fires in the Umatilla National Forest, and David responded, stating that good partnerships are forming around this.
- A WG member added that it is good timing to think about this work since there has been bipartisan support for the Water Resource Development Act, and that this bill will come up again in 2026.
- Another WG member mentioned that the Walla Walla Basin Advisory Committee could improve this and their work, or align what they are doing with this initiative, since they are also doing a baseline assessment.

WS7 – Mill Creek Road Resiliency Study

- This action focuses on mitigating the risk of wildfire damage to the access to intake by evaluating the slope stability, drainage, and vegetation along Mill Creek Road and identifying wildfire, flood, and landslide risks.
- David elaborated, adding that if the slope stability changes, sediment will move into the creek, and that a previous flood impacted the pipeline, exemplifying the need to evaluate these potential risks and changes.

Discussion and Working Group Questions

- A WG member commented that this action should look at hot spots for this action—areas that are prone, where triage might be needed, roads, waterways.
  - Daved responded that they would build them into the budget and action plan.
- Another WG member commented that one spot has washed out twice and that they have discussed with CTUIR the idea of making the spot more fish-friendly post-event. They also noted that a local university has completed slope studies using satellites to improve fish friendliness, and that this could be a potential partnership opportunity. However, it seems unlikely that the City would do a full slope analysis down to the creek.
- A WG member noted that WS4 and WS7 could be connected by considering adding a slope stability element to WD4 or at least adding a note to each of these actions.

WS13 – Barn Conversion for Fire Response Support

- This action focuses on mitigating the risk that limited access for firefighting operations poses to the watershed by converting the existing structure on the City's property into storage for equipment, a water fill site, or a helicopter landing spot. This action also includes replacing the existing bridge so that it is safe for vehicles and other equipment to cross.
- David elaborated that this action was identified after the team noted limited access during a site visit and that vehicles can't currently cross the bridge. The City may also want to consider floodproofing for the existing structures and other uses to support risk mitigation in the watershed.

Discussion and Working Group Questions

- One WG member mentioned that they have discussed this previously and are continuing to have conversations with the City, but that they are wondering if there is more to look at, such as partnerships or other opportunities for this property.
- Another WG member asked if there is any historical significance for the property's structures, and it was agreed that consulting Cultural Resources would need to happen, especially if any federal funding is involved.

WS17 – Acquire Privately-Owned Watershed Property

- This action focuses on mitigating the risk of wildfire starting on unmanaged private land within the watershed, which threatens City water infrastructure and watershed health, by purchasing privately owned land located within the watershed.

Discussion and Working Group Questions

- Adrian, with the City of Walla Walla, elaborated on this action, noting that there is a mix of natural habitat and cabins on these properties and that this is more of a long-term plan. The City is also not particularly interested in owning these properties, so it is considering giving them to the U.S. Forest Service or other government agencies. However, he also noted that they have heard that land swaps with the federal government would likely be challenging, and they would want to partner with tribes on this. Property taxes are also a consideration for wanting the federal government to take the land.
- A WG member asked if there are issues or risks associated with these properties.
  - Adrian with the City responded that there are minimal issues due to the existing terrain.

- Another WG member mentioned Ecology's Floodplains by Design grant, which includes property acquisition and could support this action.
- One of the WG members asked if this action is intended to increase access for emergencies or reduce access to the watershed by the public.
  - Adrian responded to this, stating that it's a very fine line of wanting better access for firefighting while limiting public access, so the development and control of roads need to be intentional.
- Another WG member asked what the cost of acquisition would be.
  - Adrian commented that this varies greatly by property but is likely not very high due to the steep terrain on many of the properties.
  - David added that the project team can add cost to the plan.

General Discussion

- David wrapped up the discussion, adding that he could speak to other actions that were not included in the meeting. Actions for this meeting were chosen by the project team based on identifying actions that would require more points of discussion.
  - Examples of these from Heather included, fixing an old bridge and replacing a building control panel.
- Amanda and David concluded the discussion, stating that the project team will be sharing all draft actions for written feedback, tracking all comments, and how comments are responded to.

Northern Blues Restoration Partnership

Presentation by Amber Ingoglia, U.S. Forest Service and Northern Blues Restoration Partnership

- Amber opened the presentation by sharing that she wanted to join the meeting to discuss the bigger picture of the work she is doing and where there is overlap with the WG's work.
- The Northern Blues Restoration Partnership (NBRP) was formed as a result of the Umatilla and Wallowa-Whitman National Forests applying for collaboration funding from the federal government. This grant involved a substantial amount of cross-boundary work, necessitating the development of a formal partnership.
- NBRP's primary focus is wildfire risk reduction, but the nature of this work makes it broader since fire doesn't recognize boundaries.
- NBRP focuses on bringing projects and opportunities together from across approximately ten million acres of land in northeast Oregon and southwest Washington, which includes both national forests, some private land, and some tribal lands.
- For wildfire prevention, NBRP's primary strategy is to apply thinning practices and then prescribe burns across forests. This combination reduces fire risk while preserving the ecological benefits that habitats receive from burning.
  - An example from Oregon was shown, illustrating how fire impacts areas that received both treatments and just one of the two.
- NBRP also focuses on education, community wildfire protection plans, and fire-adapted communities, as well as leveraging funds as effectively and efficiently as possible. This includes supporting socio-economic initiatives (e.g., job creation), addressing invasive species, and studying the impact through monitoring.
- NBRP has similar projects to the WG, including the Baker City Watershed, the Meadow Creek, and the Central Grande Ronde projects.
- The partnership hosts a variety of events, and examples include a Sheep Creek Riparian Restoration Tour and a Prescribed Fire Skill Training that is open to anyone and serves as an opportunity for private landowners to learn about this technique.

Questions and General Discussion

- Amber opened the discussion by stating that she would love the opportunity to work with this group, specifically on fundraising.
- A WG member stated that the strategy for protecting the City of Walla Walla Watershed has been extreme vigilance and suppression, but that this is not free. After seeing the effects of prescription on the landscape in the Oregon photo, they wonder if Amber has seen the effects of suppression on policies and if the cost of suppression decreases after using thinning and prescribed burn methods.
    - Amber responded, saying that yes, they have absolutely seen these effects, and the photo example shows this because the flame length goes down and there are more areas where firefighters can be safe during a wildfire event, making firefighting more effective overall, which leads to cost savings.
- Another WG member asked Amber where her future expectations are for federal funding in relation to the partnership and its programs.
    - Amber responded, saying that their work is part of the Fix Our Forests Act, which has strong bipartisan support, but the funding does get diluted by the time it reaches the local level and is set to run out in 2031. Additionally, helicopter logging is needed and could be $10 million alone.
    - The WG member added that California voters are voting for large investments in wildfire protection and prevention, and that Oregon is considering similar programs, and Washington might be as well. They wondered if Oregon kicker funding would be a possibility.
    - Amber added that the Washington Department of Natural Resources has been supportive for the last five years, especially in the Tiger Mill area, but that Washington and Oregon are both in the midst of budget crunches, so the next few years are less clear.
    - The WG shared this article from Oregon Public Broadcasting.
- Amber added that the new federal administration's approach is focused on suppressing all fires, but NBRP's approach is to allow some fires to burn for ecological benefits, but this may not be a tool in the toolbox for the next several years. She is also unsure of wildfire budgets—with the larger suppression approach, you would think there would be more funding, but it's still unclear if firefighters will be rehired.
- To start wrapping up the discussion, Amber let the WG know that NBRP is exploring potential grants, including the Joint Chiefs Project, an annual program announced in June with applications due soon after. They are also looking into the Nature Conservancy's Nature for Water Program, but aren't sure how easy it is to receive funding from, since it is a global initiative. If anyone has the capacity to support these applications, they should reach out to Amber.

Outreach Update

Presentation by Alexandra Doty, Cascadia Consulting Group

- The Watershed Resiliency project website is officially live: Watershed Resiliency Plan | City of Walla Walla
    - A blurb about this was also included in the City's May e-newsletter.
- Social Media posts are available on Facebook, Instagram, and X.
    - **Action Item:** The WG was unsure if these had been posted yet, so City staff will follow up with Dillon.
    - **Action Item:** A WG member asked if these would be on Bluesky too—the project team will ask Dillon at the City about this.
- The Return to River 2025 event was a success despite the rain!
- Fall Outreach Event: The project team is starting to plan ahead for this event, as the draft resiliency plan will be ready for review. Alexandra asked the WG how they would like to gather input from the public. Ideas from the Cascadia team include hosting a booth at the 2050 event, organizing a separate meeting or workshop, or attending another event or partner meeting scheduled for the fall.
    - A WG member inquired about the set date for the 2050 open house and noted that any steps that can be taken to expedite plan development should be taken for council review and given the federal fiscal year ending September 30.

- The date has not been set yet.
  - A WG member added that an event could be done before the plan is ready.
  - Another WG shared that the resiliency plan feels different from the 2050 work and would encourage the WG to have a separate session. Others in the group seconded this and added that they could do both a booth at the 2050 event and host a separate event.
  - A WG member recommended having a conversation with Dylan at the City to see what has been most effective for community engagement in the past.
  - WG members also began discussing the issue of daytime versus evening, as well as how to make it more accessible. They asked, "Who is the audience we are trying to reach?"
  - **Action Item:** Team to connect with the Columbia Basin Sustainable Water Coalition to find out more about their work, funding their effort, and scope.
  - The WG decided to have a more robust discussion on this topic at the next meeting.

Updates and Closing

- Reminder: The project team is still accepting feedback on Chapters 2, 4, and 5.
- The next meeting is July 22, 2025 from 10 am – 12 pm.

Appendix A. Attendees

Name	Affiliation
Adam Herrenbruck	Northwest Management, Inc
Adam Klein	City of Walla Walla Public Works
Adrian Sutor	City of Walla Walla Public Works
Alexandra Doty	Cascadia Consulting Group
Amanda Cronin	AMP Insights
Amber Ingoglia	US Forest Service – Umatilla National Forest
Amy Schwab	Port of Walla Walla
Andrew Purkey	AMP Insights
Annie Byerley	Walla Walla County Conservation District (WWCCD)
Caroline Dickey	Cascadia Consulting Group
Chris Kowitz	Oregon Water Resources Department
David Johnson	Consor Engineers
Emily Tilden	Washington State Department of Ecology
Frank Nicholson	City of Walla Walla Public Works
Hailey Boileau	Consor Engineers
Heather Pina	Consor Engineers
Jackie McCool	Washington Department of Fish & Wildlife
Joe West	City of Walla Walla Public Works
Judith Johnson	Kooskooskie Commons
Ki Bealey	City of Walla Walla
Kirk Holmes	Perteet
Lindsay Olivera	Oregon Department of Forestry
Mark Wachtel	Washington Department of Fish & Wildlife

Name	Affiliation
Nina Lottsfeldt	Washington Water Trust
Randall Son	Community Member
Ryan Billen	Consor Engineers
Sarah Dymecki	Washington State Department of Ecology
Scott Mallery	Washington Department of Health
Shawn Nelson	United States Army Corps of Engineers
Steven Patten	City of Milton-Freewater
Stuart Crane	Yakama Nation
Todd Kimball	Walla Walla County

WALLA WALLA BASIN
MUNICIPAL WATERSHED RESILIENCY WORKGROUP
MEETING SUMMARY

Tuesday, July 22, 2025, 10:00 a.m. – 12:00 p.m.

Water and Environment Center Room | 2023-2024 | 640 Water Center Dr, Walla Walla, WA 99362

Hybrid Meeting (Zoom Instructions on Page 2)

Time*	Agenda Item	Reference Materials	Presenter(s)
10:00am *(5 min)*	**Welcome, Introductions, Review Agenda** • Welcome • Introductions (name, affiliation) • Agenda • Recap last workgroup meeting	• Agenda	• Amanda Cronin, AMP Insights
10:05am *(45 mins)*	**SWOT Analysis Exercise** • Introduce the SWOT analysis approach and intended outcomes • Complete the SWOT analysis as a group	• Discussion guide	• Amanda Cronin, AMP Insights
10:50am *(15 min)*	**Funding Update** • Overview of funding landscape & notable changes • Summary of Major Funding Categories • Next steps to support the City o Funding Matrix o Shortlist of fundable projects o Feasibility-Level Project Development		• Andrew Purkey, AMP Insights • David Johnson, Consor Engineers
11:05am	**5 Minute Break**		
11:10am *(30 min)*	**City of Flagstaff Bond Program** • Presentation on how that bond program was created, how funds are used, and lessons learned from the process	Three Drop Thursday article	• Kimery Wiltshire, Confluence West
11:40am *(15 min)*	**Outreach Updates and Fall Event Discussion** • Fall outreach event planning discussion • Update on outreach materials: webpage, social media, and newsletter	• Website: bit.ly/watershed-resiliency • Newsletter • Social media	• Alexandra Doty, Cascadia Consulting Group
11:55am *(5 min)*	**Updates and Closing** • Upcoming work • Next meeting: September 24, 2025, from 9:30am – 11:30am (Hybrid) • Closing comments		• Amanda Cronin, AMP Insights

*All times are approximate and may change

Welcome, Introductions, Review Agenda

- Amanda Cronin welcomed attendees and provided an overview of the meeting agenda. A full list of participants is included in Attendees.

Introduction to the SWOT Analysis and Feasibility

- Amanda Cronin provided an overview of the SWOT Analysis and Feasibility activity.
- The purpose and framework of the SWOT analysis being used to evaluate watershed resiliency for municipal water supply. The analysis aims to identify internal strengths and weaknesses, as well as external opportunities and threats, that may influence the feasibility and success of future mitigation actions. Internal factors include infrastructure, staffing, governance, and partnerships, while external factors consider climate impacts, regulatory changes, and funding. Findings from this analysis will undergo additional vetting and eventually inform strategies to enhance long-term resilience.

Strengths

- A WG member mentioned that the system has built-in redundancy with access to both surface water and groundwater sources, ensuring a more resilient and reliable water supply.
- A WG member stated the skill and dedication of Public Works staff.
  - A WG member added and the depth of their understanding of the issues.
- A WG member highlighted the value of holding robust, senior water rights with strong priority dates and adequate allocations, which contribute to long-term supply reliability.
- A WG member mentioned the ecological stability of headwaters and forests.
- A WG member highlighted the multiple benefits of the watershed and its ability to support endangered fish spawning.
- A WG member noted that groundwater redundancy is being developed as part of their Aquifer Storage and Recovery (ASR) program to enhance long-term storage and supply resilience.
- A WG member highlighted the adequate capacity of the treatment plant.
- A WG member noted that a capital improvement plan is in place to support the replacement of aging infrastructure and maintain system reliability.
- A WG member mentioned the city’s updated water system plan.
- A WG member mentioned the good partnership with local and federal agencies.
- A WG member highlighted the community’s strong engagement and commitment to the sustainability of its drinking water supply as a key strength an uncommon but valuable asset that can help drive future resilience efforts.
- A WG member noted the city's strong track record in securing grants and fundraising.
- A WG member highlighted the high quality of both surface water and groundwater sources as a key strength supporting water system reliability and public health.
- A WG member noted that city-owned land around and downstream of the water treatment plant provides an advantage for protecting water quality and managing operations.

Weaknesses

- Andrew noted that some current strengths such as healthy watershed function could become weaknesses if conditions shift, emphasizing the importance of acknowledging potential vulnerabilities tied to existing assets.
- A WG member raised a concern about the water treatment plant’s ability to handle large sediment loads following a major upstream wildfire.
  - A City staff person responded that the system is unfiltered and relies heavily on the high quality of its source water.
- A WG member noted that portions of the treatment facility infrastructure are over 100 years old, despite some recent upgrades.
  - A WG member noted the transmission line running from the intake to the treatment plant and emphasized the need to address long-term solutions related to privately owned land within the watershed.
- A WG member mentioned the age of the intake infrastructure.

- A WG member noted that while the city has a water conservation policy, it lacks an effective program to implement it, limiting its impact.
- A WG member highlighted a lack of public awareness about water scarcity and the connection between the watershed and the community's water supply, posing a challenge for engagement and stewardship.
- A WG member raised concerns about the lack of active watershed management over the past 20 years, noting that while protections exist, delayed implementation of management plans may now represent a weakness.
- A WG member noted that the cooperative management agreement between the city and the Forest Service is outdated, dating back to 1918, and highlighted the need for a more modern and comprehensive approach to watershed protection.
- A WG member noted the potential loss of institutional knowledge as key personnel retire, which could impact the continuity and momentum of water system operations.
- A WG member highlighted the significant reduction in streamflow during summer months, increasing reliance on groundwater. While ASR provides some relief, ongoing trends and climate pressures may intensify this vulnerability.
- A WG member raised concerns about whether the current water rates and rate structure are sufficient to support future system improvements.
- A WG member noted that limited funding remains a barrier to completing necessary work.
  - Andrew added that this can be a threat as well.
- A WG member expressed concern that, despite past investments in planning and data collection, the city has hesitated to act due to cost concerns. A continued reluctance to raise rates could limit progress on necessary water system improvements.
  - A WG member emphasized that community advocacy is also critical, as City leadership needs to hear strong, consistent public support for funding watershed protection and system upgrades.
- A WG member noted a disconnect between focusing on watershed protection and investing in water infrastructure, urging the community to recognize the importance of maintaining and upgrading local systems, which are within its control.

Opportunities

- A WG member noted that Walla Walla is ahead of many communities in adopting a locally driven approach to upstream watershed protection. Investing in upstream areas to safeguard downstream drinking water is becoming a widely accepted strategy, and the inclusive collaboration beyond just federal agencies.
- A WG member noted an opportunity to explore innovative land management strategies in partnership with the Forest Service to improve water flow and timing, particularly in response to climate impacts. Tools like advanced monitoring and modeling, along with strong partnerships, could support forward-thinking solutions.
- A WG member highlighted the potential of emerging technologies such as smart meters and leak detection systems to enhance water management and community engagement. Expanding these tools could support conservation and empower residents to monitor and reduce water use.
- A WG member mentioned partnering with the local colleges, potentially could help with research.
- A WG member noted that with many stakeholders involved, there is strong potential for a broader community education effort to build awareness and support for ongoing water resilience work.
- A WG member highlighted new planning support for the Conservation District's Heritage Gardens through the Walla Walla Water 2050 effort, noting this as an opportunity to expand outreach on water conservation practices. They also supported the idea of interactive tools to help residents engage with their own water use.
- A WG member added maintaining and expanding ASR.
- A WG member emphasized the importance of ensuring the facility plan is actionable and not just created for compliance implementation should be a central focus.
- A WG member noted strong stakeholder involvement and suggested that a broader community education effort could help build awareness and support for water resilience work.
- A WG member highlighted the need for continued coordination with the Forest Service and basin partners on land management efforts.

Threats

- A WG member noted that expanding water quality regulations driven by environmental and public health concerns can pose challenges for treatment systems that must adapt to meet evolving standards.
- A WG member expressed concern about efforts to weaken regulatory safeguards, including reduced federal staffing, which could impact watershed management and the agencies that support water protections.
- A WG member emphasized broader concerns about the erosion of the Forest Service's capacity and role, beyond just funding cuts.
- A WG member noted the community's limited tax base as a key vulnerability, creating reliance on external funding to support major projects. While grants and partnerships have been successful, this model is not guaranteed and may be unsustainable amid shifting economic conditions.
- A WG member highlighted the risk posed by pauses in key federal funding programs, such as FEMA's BRIC and Stafford Act assistance.
- A WG member suggested that threats beyond wildfire such as extreme flooding, earthquakes, and infrastructure damage should be elevated in priority.
- A WG member emphasized that land use decisions, more than global climate change, are the primary drivers of watershed threats. They raised concerns about current forest management practices, such as timber sales, which may increase risks like flooding and habitat loss.
- A WG member noted that the upper watershed contains critical salmon habitat and emphasized the need to manage land use and climate risks with this ecological value in mind. They suggested incorporating additional protections or redundancies.
- A WG member noted that the city owns land around and downstream of the water treatment plant.

Funding Update

Andrew Purkey, AMP-Insights, and David Johnson, Consor Engineers, provided funding updates.

- Army Corps Section 206: Continues to support aquatic restoration with partial federal funding, though FY2026 funding remains uncertain.
- FEMA BRIC: Program ended in April 2025. Previously provided wildfire mitigation support with a 25% match. Legal challenges to the termination are ongoing.
- Collaborative Forest Landscape Restoration Program (CFLRP): Authorized through September 2025 but not included in the proposed FY2026 federal budget. A bill for reauthorization has been introduced.
- Reclamation's WaterSMART Program: Has invested over $3 billion in watershed restoration since 2010, but no funding is proposed for FY2026.
    - A WG member added that this program has historically received strong bipartisan support, which offers some hope for future funding despite broader challenges
- Oregon: Programs continue to support wildfire risk reduction and watershed restoration, though funding for FY2025–2027 remains uncertain.
- Washington: The Floodplains by Design program funds multi-benefit floodplain projects; FY2025–2027 funding levels are still under review.
    - A WG member noted that Ecology's Water Quality Combined Funding Program allows applicants to address multiple categories such as nonpoint source pollution and wastewater within a single application.
    - Andrew asked whether the program could support projects related to stability and erosion, especially if they can be connected to risks facing the City's infrastructure (destabilized stream channels or banks).
    - A WG member clarified that while she is more familiar with the nonpoint source category, the program appears to cover a sliding scale of project types, and they should explore further to assess alignment with their needs.
- A WG member highlighted the USFS/WA DNR Community Wildfire Defense Grant and Forest Resilience Program, which supports small forest landowners with funding for forest health and wildfire resilience. Administered locally through WA DNR, funding availability is still uncertain early in the fiscal year.

- A WG member encouraged incorporating response and recovery strategies into the plan, not just mitigation. They emphasized the importance of preparing for short-term watershed impacts especially during fire season including identifying funding for restoring surface water supply.
    - Andrew acknowledged WG members point, noting that while the current focus has been on prevention, it's important to also plan for response actions if an event occurs. He invited further input from David, who has more experience with recovery programs.
    - David highlighted that, similar to Texas's current focus on flooding, disasters often drive action and funding in the U.S. He noted that if a wildfire occurs, priorities quickly shift to fire response, recovery, and securing matching funds, emphasizing the reactive nature of disaster management.

Flagstaff Bond Program

Kimery Wiltshire provided a presentation on Flagstaff Bond Program

- Flagstaff had a proactive approach to watershed and wildfire resilience following the 2010 Schultz Fire, which caused significant damage to the city's water supply. In response, strong public support driven by visible leadership and direct community outreach led to the passage of a $10 million bond in 2012 with 74% voter approval. This local investment leveraged over $50 million in additional funding from state, tribal, and philanthropic sources.
- Key accomplishments include treatment of approximately 54,000 acres and the establishment of a water resource fee generating $1.3 million annually. Challenges remain, including the need for costly re-treatment and work in steep terrain. Flagstaff continues to explore nature-based solutions with tribal partners and remains engaged in the Four Forest Restoration Initiative (4FRI) to expand forest and watershed resilience across the region.
- A WG member asked for more detail on which entities were involved in the decision to underwrite the Flagstaff bond measure.
    - Kimery responded that Flagstaff's success in securing bond funding was partly due to recently retiring a previous $10 million bond, creating capacity for a new one. They also highlighted that the Arizona Water Infrastructure Authority had to be persuaded to support forest-based water infrastructure, which is not typically within its funding scope.
- A WG member asked whether Flagstaff's bond effort was led solely by the city or included the county and other entities, noting that in Walla Walla, multiple jurisdictions rely on the watershed.
    - Kimery: responded that the City of Flagstaff primarily led the bond effort, with additional funding contributions from local tribes and some involvement from the county, though the extent of the county's role is unclear.
- Amanda asked if it is common for a small city that there is a wildland fire chief.
    - Kimery replied that she was surprised too. It's an equivalent city position, given its position as a city surrounded by national forests and with significant development in the wildland-urban interface (WUI).
- A WG member asked if the whole watershed US Forest Service?
    - Kimery clarified that the area affected by the fire was primarily national forest land, with some potential BLM land included as well.
- Amanda asked the City of Walla Walla any reactions to this? Does it seem relevant at all?
- A WG member emphasized the importance of incorporating funding strategies such as bonds or insurance for post-wildfire restoration into the watershed plan. They noted the relevance of Flagstaff's approach and highlighted the initial challenge of getting the watershed recognized as critical infrastructure.
- A WG member added that, based on current conditions, there's a high likelihood the watershed could experience a major fire within the next decade, citing recent severe fires in California as a warning.
- Kimerly invited discussion from the group on two questions: how vulnerable they believe the watershed is, and whether the city has ever considered a bonding approach.
    - A WG member noted that much of the system's vulnerability lies in the water treatment process, as it operates an unfiltered plant.
    - A WG member added that other regions, such as Forest Service Region 2 and Marin Water, have invested in protecting critical water infrastructure located in forested areas, highlighting this as a potential strategy.

- A WG member questioned the assumption that a high-severity wildfire is imminent in the watershed, citing insufficient scientific evidence and a lack of independent risk assessments for the Mill Creek Municipal Watershed. They urged for an independent, science-based analysis of risks including wildfire, land use, flooding, and water quality expressed caution around forest treatments that could elevate short-term flood risk, and advocated for more deliberate, informed planning over reactive decision-making.
    - Andrew asked to what extent the City of Flagstaff conducted independent assessments to inform its watershed risk mitigation plan, in relation to earlier concerns about the need for science-based planning.
    - Kimery noted that while the City of Flagstaff has detailed plans and clear priorities for risk mitigation, it did not conduct a formal risk assessment prior to implementation.
- A WG member noted that some risk assessment work for the watershed was included in the County's Hazard Mitigation Plan at the City's request. While more detailed analysis may be useful, they emphasized the need for a practical plan the City can act on if a fire occurs.
- A WG member emphasized that the Mill Creek watershed is ecologically distinct and may not respond well to standard forest treatments. They supported science-based assessments and highlighted the importance of coordinated outreach and funding efforts, especially with private landowners.
- A WG member reinforced that the watershed's unique mix of wet canyons and dry slopes makes it ecologically different from other areas where prescribed fire is common. They noted the long-term stability of the ecosystem and supported thoughtful consideration of any treatments.
- A WG member highlighted the update of the 1918 cooperative agreement with the Forest Service as a key opportunity to incorporate more planning and risk assessment especially regarding downstream water supply impacts.
- A WG member noted that while updating the cooperative agreement is a valuable opportunity, the Forest Service may be reluctant to engage in more detailed planning or risk assessment due to limited staffing and capacity.

Outreach Updates and Fall Event Discussion

Alexandra Doty provided an update on Outreach and Fall Open House Event.

- A community outreach event is planned for November 18, tentatively from 6–8 p.m., at the Walla Walla Library.
- The event will share the full draft Watershed Resiliency Plan with the public and stakeholders using a gallery walk format with posters and guided input questions.
- Attendees will have the opportunity to drop in, engage with project staff, and provide feedback in an informal setting
- Additional details and feedback opportunities will be shared at the September working group meeting.
- A WG member suggested pairing the fall outreach event with something more engaging like a presentation, speaker, or performance, to help attract a larger audience. They emphasized that many residents may be interested but aren't yet aware of the relevance, and noted that adding something exciting (like free pizza) could help boost turnout and community engagement.
    - Amanda added in addition to the fall outreach event, a larger open house is planned at Whitman College as part of the Walla Walla 2050 effort. The two events are being held separately to ensure the drinking water resiliency conversation is included. Due to time constraints, attendees were encouraged to follow up with her or Alexandra for coordination and next steps.

Updates and Closing

- Amanda Cronin provided the group with updates and closing remarks.
- The next work group meeting will occur on September 24, from 9:30am – 11:30am.

Attendees

Name	Affiliation
Adam Klein	City of Walla Walla Public Works
Adrian Sutor	City of Walla Walla Public Works

Name	Affiliation
Alexandra Doty	Cascadia Consulting Group
Amanda Cronin	AMP Insights
Andrew Purkey	AMP Insights
Annie Byerley	Walla Walla County Conservation District
Charlie Landsman	Department of Natural Resources
Carson Brock	Cascadia Consulting Group
Chris Lee	Walla Walla County Emergency Management
David Johnson	Consor Engineers
Emily Beebe	Washington State Department of Ecology
Harlan Gough	Washington Water Trust
Heather Pina	Consor Engineers
Jeff Dengel	WA Department of Fish and Wildlife
Joe West	City of Walla Walla Public Works
Judith Johnson	Kooskooskie Commons
Kirk Holmes	Perteet
Linda Herbert	Blue Mountain Land Trust
Nina Lottsfeldt	Washington Water Trust
Paul Lynn	
Randal Son	Community Member
Sarah Dymecki	Washington State Department of Ecology
Steven Patten	City of Milton-Freewater
Unidentified number	

WALLA WALLA BASIN
MUNICIPAL WATERSHED RESILIENCY WORKGROUP
MEETING SUMMARY

Thursday, October 23, 2025, 9:00 a.m. – 11:00 a.m.

Fulton Room | City of Walla Walla Police Department | 54 E. Moore St., Walla Walla 99362

Hybrid Meeting

Time*	Agenda Item	Reference Materials	Presenter(s)
9:00am *(5 min)*	**Welcome, Introductions, Review Agenda** • Welcome • Introductions (name, affiliation) • Agenda • Recap last workgroup meeting	Agenda	• Amanda Cronin, Fluent Freshwater Insights
9:05am *(60 mins)*	**Response and Recovery Plan Overview** • Share the Response and Recovery Plan (Chapter 8) and discuss resources available • Additional input from WG members • **Work group questions and discussion**		• Nathan Bemis and Ryan Billen, Consor
10:05am	**5 Minute Break**		
10:10 *(25 mins)*	**SWOT Analysis Results and Next Steps** • Summary of the results from the SWOT analysis and how it is informing the Watershed Resiliency Plan • **Work group questions and discussion**		• Amanda Cronin, Fluent Freshwater Insights
10:35am *(20 min)*	**Outreach Updates and Fall Workshop Discussion** • Update on the fall workshop planning process • Share out promotional materials and discuss pathways for promotion **Work group questions and discussion**	Website: bit.ly/watershed-resiliency Promotional materials	• Alexandra Doty, Cascadia Consulting Group
10:55am *(5 min)*	**Updates and Closing** • Upcoming work and possible additional work group meeting • Closing comments		• Amanda Cronin, Fluent Freshwater Insights

*All times are approximate and may change

Welcome, Introductions, Review Agenda

- Amanda Cronin, Fluent Freshwater Insights (Fluent), welcomed attendees and provided an overview of the meeting agenda. A complete list of participants is included in Attendees.

Response and Recovery Plan Overview

Ryan Billen and Nathan Bemis, Consor Engineers (Consor), presented draft Chapter 8 of the Watershed Resiliency Plan to the Working Group (WG), which outlines the City's approach to response and recovery following watershed-related hazards.

- They described that the chapter is designed to be used as a standalone, actionable guide that integrates existing plans and resources while remaining adaptable to changing conditions and funding availability.
- They also shared the following key components of the chapter:
    - City and county emergency plans, water system master plans, and operations plans are referenced throughout the chapter to minimize repetition of content throughout the plan and to build on and support existing plans.
    - Watershed hazards, including wildfire, drought, and flooding, are highlighted and used to structure the chapter, with references to Chapter 4 for more in-depth information.
    - The chapter includes a section on response and recovery strategies that is intended to guide actions from pre-event preparation through long-term recovery.
    - The chapter also discusses the need for pre-event actions, communications strategies, and geospatial information, as well as the potentially necessary assessment and documentation after an event has occurred.
    - Tables help readers identify response and recovery plans, potential effects on systems, and other resources that may be useful while moving through an event.

Work group questions and discussion

WG members asked and discussed the following points during and following the presentation:

- A working group member emphasized the importance of monitoring and data reliability, asking whether additional monitoring is needed.
    - Nathan agreed and noted the importance of understanding data locations, how events impact them, and what stakeholders have.
    - Another WG member added that having data available and gaining support from stakeholders on this is critical before and during an event to help understand how long it will take to get back to normal.
    - Heather Pina, Consor Engineers, commented that she was unsure if the City could answer about monitoring raw water.
    - The WG member followed up, asking if the City does continuous monitoring of raw water at the intake before and after events.
    - The other WG member asked about turbidity and streamflow monitoring at the intake, noting that there is an important relationship between the two for knowing what is normal versus a disturbance.
    - Another WG member responded, saying that the City is currently looking to expand its turbidity monitoring so that they can get samples during high flow events, which has not been done previously.
- A working group member asked whether thinning operations are watershed-wide or focused near the intake.
    - Heather clarified that thinning is focused at the intake facility, with separate recommendations for other areas within the city boundary, which comprises only 10% of the watershed. She added that the City has done some thinning in the past couple of years.
- A working group member asked about funding responsibilities for post-event actions.
    - Nathan pointed to Chapter 7, which details funding sources and how to access them, adding that they are trying to lean more forward here by providing information on what to think about for grant paperwork during an emergency, so that it's generally less burdensome and easier to access funds.
- A working group member raised the importance of knowing how to request emergency resources and who to go to for these.

- Nathan responded in agreement and added that they would take this under consideration when developing the plan.
  - The WG member replied, saying thank you and adding that they were speaking from experience and learning how to ask the right way to get help quickly enough.
  - Ryan followed up with the WG member, asking if they could elaborate on their experience.
  - The WG member shared their experience that occurred during a wildfire event where they couldn't access data and information that was needed for a quick and more precise response to mitigate risk to the water supply system. After the event, they were able to add their learnings to planning for future fires. The WG member also offered to provide tips and language for the plan on this, especially regarding the proper way to make requests.
- A WG member asked if there is a place in the chapter (or in a different chapter) that clarifies the responsibilities and authorities of the Public Works department.
  - Ryan responded and confirmed that this is addressed in the next part of the chapter, which identifies lead parties for each response action.
- Amanda asked for clarification on a WG member's question about whether actions in the chapter refer to the watershed as a whole or just within the city.
  - Ryan responded that this may be something to clarify within the plan and added that this question often depends on where the event occurred, which is inherent in the plan, but this is a point that could be expanded upon and clarified.
- A WG member asked whether water filtration improvements are included in pre-event planning and recommendations.
  - Ryan confirmed they are addressed both as proactive and reactive strategies, noting that retrofitting existing infrastructure often depends on costs, available funding, and prioritization since this could be done pre-event or as a recovery strategy later on.
  - The working group member asked about cost comparisons for pre-treatment infrastructure upgrades versus post-event upgrades.
  - Ryan responded that they do not have a cost comparison specific to this and explained that direct costs can be similar, but indirect and associated costs, such as lost hydroelectric revenue during an event, complicate the analysis and can make it hard to quantify.
- A WG member asked whether the city has met its recharge targets.
  - A WG member noted that the system had been shut down for the past year and a half, and another WG member added that efforts continue within allowable limits.
- A WG member asked about the emergency water conservation plan and what triggers its use.
  - Ryan responded that specific triggers aren't outlined for this plan, so we are establishing the importance that when there is an impact, the City knows how to reach out to the public about limiting usage and that this is an issue of giving public notice.
  - A WG member added that while the plan doesn't have specific triggers, the City is working on updating it. They added that the City has steps to take for conservation (e.g., specifics on landscaping, stopping water parks, etc.) and that there is a water shortage plan that they could share with the Working Group.
  - Ryan commented that Consor can add reference to the water shortage plan.
- A WG member brought up drought as a concern and emphasized the need to include water shortage in the plan and link it to groundwater improvements to create a loop.
  - Amanda noted that the City has a water shortage response program.
  - Adam agreed and noted that these are two different things.
  - Ryan followed up, saying that Consor is creating a structure for the City to grab specific plans and resources when needed to ensure they all grow together.
- A WG member asked about the status of Chapter 4, sharing that they would like to help add comments.
  - Heather clarified that WG members reviewed this chapter previously and confirmed that comments are currently being incorporated. She added that Consor will send the full draft in December, so that will be the next opportunity for WG members to provide comments on Chapter 4. This structure allows Consor to refine the plan as everything evolves.

- Ryan asked for clarification, and Amanda responded that the project team will send Chapter 8 to the WG after this meeting and then the full draft plan in December.
- Heather agreed and added that Consor will make some changes to the draft Chapter 8 based on the meeting's discussion before sending it to WG members.
- Amanda commented that this plan sounded great and added that the WG can discuss how comments and questions were addressed at the next meeting in January.

SWOT Analysis Results and Next Steps

Amanda summarized the results of the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis that was conducted in July and explained how the findings are being used to develop actionable strategies and inform Chapter 6 of the Watershed Resiliency Plan.

- After the initial SWOT analysis, Fluent collated and summarized input from the working group and then categorized and thematically grouped the various SWOT elements:
  - Strengths:
    - Water source: Protected, secure, and high-quality watershed.
    - Source redundancy: Access to both surface and groundwater.
    - Partnerships: Strong relationships with federal, state, tribal, and local partners.
    - Facilities: City-owned land for the treatment plant and adequate capacity under current conditions.
    - Technology: Leak detection systems and others
    - City staff and planning were also identified as strengths.
  - Weaknesses:
    - Land ownership: The City doesn't own the entire watershed, and the cooperative agreement is outdated.
    - Facilities may be unable to handle events.
    - Water consumption: Some water conservation has happened on the consumption side, but the City could update policies and programs to increase conservation programs.
    - Funding sources are also a potential area of need, and changes to rate structures could support this.
  - Opportunities:
    - Collaboration: Potential for a "big tent" approach involving colleges, community groups, and agencies.
    - Community outreach: Existing partnerships can support expanded outreach efforts (e.g., Heritage Gardens).
    - Planning: The City has a master plan that will have a real impact.
    - Supply augmentation was also identified as an opportunity.
  - Threats:
    - Natural hazards: Increased risk of wildfire, flooding, etc.
    - Funding: There is currently limited federal funding and additional pressure on state budgets.
    - Federal actions: NEPA and the expansion of potential water quality regulation at the state level.
    - Regulations: These change over time and may bring modified requirements for the City.
    - Climate change was also identified as a threat.
  - Categories developed for the SWOT analysis included community, environment, external management, funding, infrastructure, and internal management.
- The categories were used to match internal (strengths and weaknesses) and external (opportunities and threats) elements to develop targeted strategies; four types of strategies were developed through this process:
  - Strength–Opportunity (SO):
    - Leverage existing partnerships to expand community outreach and education.
    - Build on existing partner relationships to develop a "big tent" approach to watershed management.
  - Strength–Threat (ST):
    - Expand planning with partners to improve emergency preparedness.
      - Weakness–Opportunity (WO):

        - Modernize and update the 1918 cooperative agreement with the USFS.
        - Strengthen local support through targeted outreach.
        - Expand and maintain ASR projects to diversify water supply sources.
    - Weakness–Threat (WT):
        - Document institutional knowledge and implement transition planning to reduce vulnerability from staff turnover.
        - Update the City's emergency water response plan to improve readiness.

Work group questions and discussion

- No questions or comments.

Outreach Updates and Fall Workshop Discussion

Alexandra provided updates on the upcoming Fall Workshop, scheduled for November 18, 2025, from 5–7 p.m. at the Walla Walla Public Library.

Work group questions and discussion

- A WG member asked whether promotional materials similar to the Walla Walla Watershed Strategy Open House would be shared with the group.
    - Alexandra confirmed that a save-the-date would be sent the next day and that Cascadia would also send some of the materials to WG members. She asked if the project team should use a similar promotion strategy to the Open House.
    - The WG member responded that social media tiles are great, especially for Facebook. They also suggested leveraging the contact lists from the Open House, as many local groups only meet once a month, which could make it more challenging to spread the word.
    - Amanda agreed that sharing with anyone would be great and that the Policy, Funding, and Outreach team for Walla Walla Basin Watershed Strategy meetings next week.
    - Alexandra added that incentivizing attendance with pizza is good and that the project team planned to get to work on promotion right away, with materials already developed and ready to go.
- A WG member asked to confirm whether people from the City and Consor would be at the event to answer questions about the posters.
    - Alexandra clarified that yes, they will be in attendance, but there will not be a formal presentation, so the project team has talking points to share with people. She added that this will be a more interactive and one-on-one event.
    - The WG member responded that that's good, and they want to ensure attendees understand the big picture.
    - Amanda agreed, saying that the project team should think about how to make that really clear.
    - Alexandra added that she agreed and that the project team will ensure people stop at the welcome poster.
- A working group member proposed having a mini water table at the event.
    - Alexandra noted that OWRD has a tabletop version that could be used.
- A WG member commented that they attended the comprehensive plan update event at the library and shared concern that it was a small space, but that this was also great because it was packed. They asked if the passport activity would be worthwhile for this.
    - Alexandra responded that the project team had been considering bingo and not using the same passport strategy, but invited input from WG members on this.
    - A WG member responded that they weren't sure about this.
    - Another WG member added that they like the passport and bingo idea after seeing similar activities encourage more people to talk to others at events. They added that a drawing they did for another event included a tour of the intake.
- A WG member commented that the project team should reach out more directly to schools, including the high schools and colleges.

- Alexandra notes that we have contacts at Whitman College and the community college, but not at the high schools.
- A WG member shared that they had a student interested in becoming a civil engineer, and it was good for her to have exposure to the public and private sectors.

- Amanda added that the event isn't geared towards kids, but anyone is welcome.
- A WG member shared that Public Works would be happy to support contacting high schools.

Updates and Closing

- Amanda Cronin provided the group with updates and closing remarks.
- The next working group meeting will occur in early 2026, but the date is currently tentative, and the project team noted they will follow up in an email to ask for WG members' availability.

Attendees

Name	Affiliation
Adam Klein	City of Walla Walla Public Works
Adrian Sutor	City of Walla Walla Public Works
Alexandra Doty	Cascadia Consulting Group
Amanda Cronin	Fluent Freshwater Insights
Andrew Purkey	Fluent Freshwater Insights
Charlie Landsman	Department of Natural Resources
Caroline Dickey	Cascadia Consulting Group
Emily Beebe	Washington State Department of Ecology
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Linda Herbert	Community Member
Nathan Bemis	Consor Engineers
Nina Lottsfeldt	Washington Water Trust
Randal Son	Community Member
Ryan Billen	Consor Engineers
Sarah Dymecki	Washington State Department of Ecology
Stan Hoffman	Washington State Department of Health

PLACEHOLDER PAGE - LAST WORKGROUP MEETING SUMMARY

APPENDIX C
WATERSHED RESILIENCY
PLAN OPEN HOUSE
PRESENTATION POSTERS

City of Walla Walla Watershed Resiliency Plan Workshop

Welcome!

This workshop is an opportunity to learn about the City of Walla Walla's first-ever Watershed Resiliency Plan and share your input to help protect our community's drinking water supply for current and future generations.

This is a drop-in style event with interactive stations designed to help you explore the City of Walla Walla's drinking water story. As you walk through, you'll learn how the Mill Creek Watershed supports our community and discover some of the challenges it faces and strategies to help keep a resilient water system.

We invite you to explore each station, participate in activities, and share your thoughts.

Project Team Representatives Here Today

City staff and project team members are available to answer questions, discuss ideas, and gather feedback.

Did You Get Your Feedback Form?

Pick up your Watershed Resiliency Feedback Form at **Station 1 Welcome Station**—visit all five stations and let us know what you learn! Return your completed Watershed Resiliency Feedback Form to the Welcome table to **receive a prize**.

Workshop Stations

Stations are organized around chapters of the Watershed Resiliency Plan, so we suggest visiting workshop stations in the following order:

Station 1 *You Are Here!*

Welcome & Overview Station is an opportunity to meet the project team and gather an understanding of how to participate in the event.

Station 2

Chapter 1: Introduction and Project Overview

Chapter 2: Vision, Goals, and Objectives

Chapter 3: Background Research

Station 3

Chapter 4: Water System Hazard and Risk Assessment

Station 4

Chapter 5: Resource and Capabilities Inventory

Chapter 6: Watershed Resiliency Strategy

Station 5

Chapter 7: Implementation and Funding Plan

Chapter 8: Response and Recovery Plan

Why are you here today? Share what brought you to this workshop on a sticky note and leave it below.

Chapter 1: Introduction and Project Overview

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City of Walla Walla

WHAT Is The Watershed Resiliency Plan?

The primary objective of the Watershed Resiliency Plan is to provide an assessment, analysis, and recommendations to improve the reliability and resiliency of the City's water supply.

The plan takes a proactive and comprehensive approach to addressing several potential threats and challenges:

- poor water quality
- climate change impacts
- insufficient water quantity
- natural hazards (droughts, floods, wildfires)

To address these, the plan identifies long-term strategies that will make the Mill Creek Watershed more resilient and protect our drinking water supply. Many of these strategies have co-benefits like maintaining healthy forests, streams, and ecosystems that protect key species, provide clean water, and support a thriving community.

WHO Is Involved?

Together, the Watershed Resiliency Working Group has helped shape the vision and recommendations of this plan by identifying challenges and developing strategies to protect the Mill Creek Watershed from drought, wildfire, flooding, and other climate impacts.

The Watershed Resiliency Working Group

- City of Walla Walla
- Confederated Tribes of the Umatilla Indian Reservation
- Local & Regional Partners
- State & Federal Partners
- Community Members
- Project Team

WHY Is A Resiliency Plan For Mill Creek Watershed Important?

The Resiliency Plan seeks to provide plentiful, reliable, and high-quality drinking water supply for current and future generations.

- **Primary Water Source:** The watershed supplies **85–90%** of the City's drinking water each year.
- **Many Jurisdictions:** The watershed is within **two states and four counties**.
- **Risks and Vulnerabilities:** Past floods, fires, and droughts have shown how vulnerable our water system can be.
- **Proactive Leadership:** This plan helps the City **prepare for, withstand, and recover from** future hazards to keep clean water flowing.

HOW Was the Plan Developed?

Watershed Resiliency Plan

- Reviewed existing studies, reports, and data to identify potential hazards and risks affecting the watershed and related water supply infrastructure.
- Collaborated through five Watershed Resiliency Workgroup meetings.
- Collected community input through newsletters, Workgroup review of Plan content, and this workshop.
- Evaluated strategies to enhance water quality, protect water supply infrastructure, and strengthen emergency preparedness.

What are your top concerns for City drinking water supply? Place a sticker or sticky note under:

Water Quality	Water Quantity	Reliability	Availability for Future Generations	Emergency Preparedness

Chapter 2: Vision, Goals, and Objectives

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Our Vision

Provide the City with plentiful, reliable, and high-quality drinking water and protect the watershed's natural ecosystem.

Our Goals

1. **Ensure Reliable Water Supply**
   Protect and maintain the City's abundant and high-quality drinking water supply.
2. **Mitigate Natural Hazard Risks**
   Reduce impacts of natural hazards to the City's water supply facilities.
3. **Promote Sustainable Watershed Management**
   Support sustainable land and forest practices that protect and enhance long-term watershed health.
4. **Strengthen Watershed Partnerships**
   Maintain ongoing partnerships to ensure coordinated watershed implementation and long-term stewardship.
5. **Secure Funding & Advance Implementation**
   Position the City to leverage federal, state, and nonprofit funding to implement mitigation and resilience strategies.

From Vision to Action

The Watershed Resiliency Plan builds on the vision by identifying risks and opportunities through a detailed hazard analysis and stakeholder collaboration. These efforts informed the development of a resiliency strategy that outlines targeted mitigation projects and actions. Together, these projects form a framework the City can use to prioritize investments, strengthen long-term watershed resilience, and integrate directly into the City's Capital Improvement Program (CIP).

Resilient Drinking Water Supply

Which of these goals is most important to you?

Place a sticker or star next to the goal(s) that matter most.

Or add your own idea on a sticky note below.

Chapter 3: Background Research

Where We Started

Before developing strategies and solutions, the Project Team gathered and reviewed existing information. This ensures the plan builds on **existing knowledge**, avoids duplicating past work, and reflects the **best available science and local expertise**.

What We Learned and Why It Matters

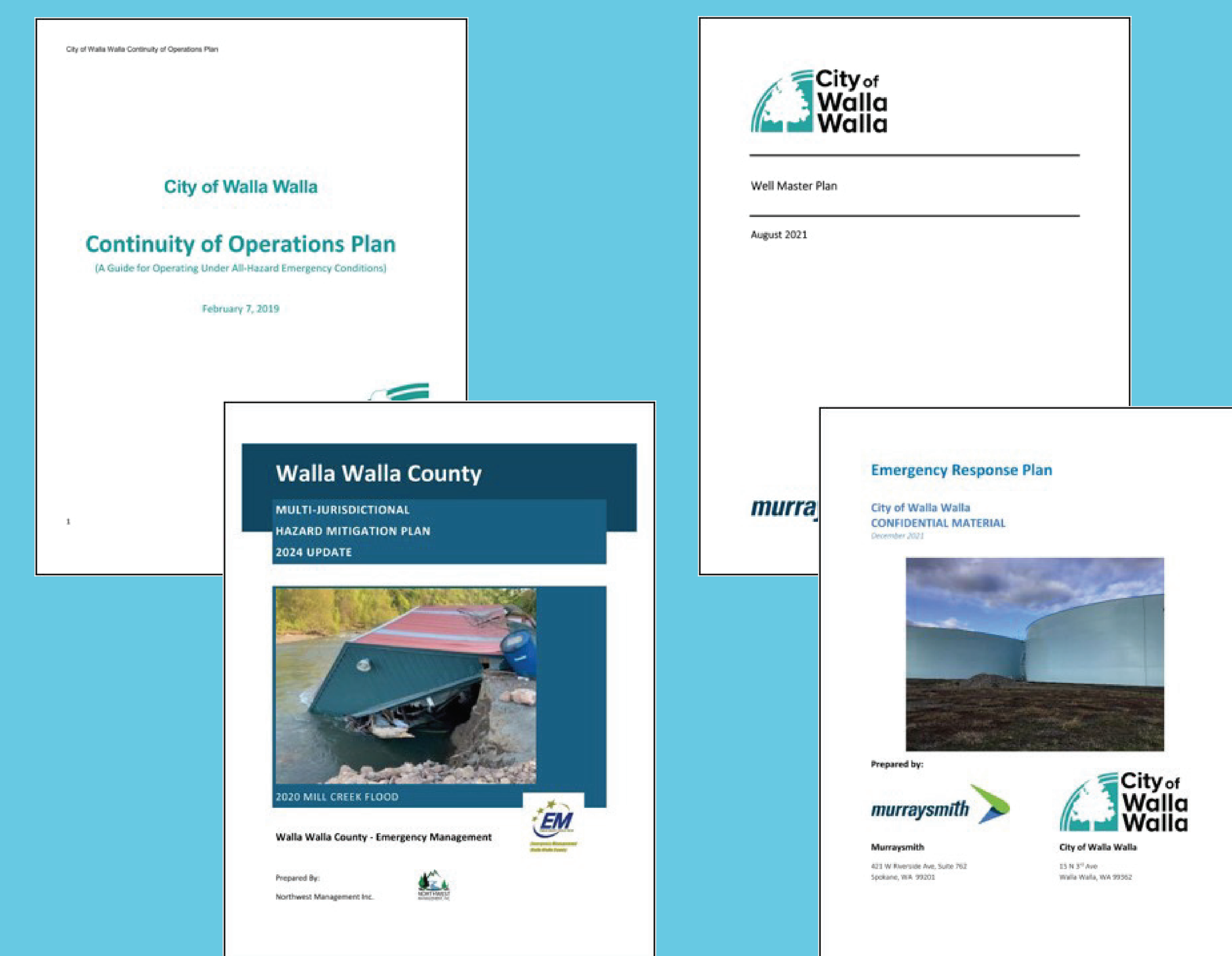
By pulling this information together, the City and project team were able to:

- Understand current risks to Mill Creek Watershed and City water supplies
- Identify gaps where new analysis was needed
- Build a plan grounded in both science and community input

Types of Information We Used

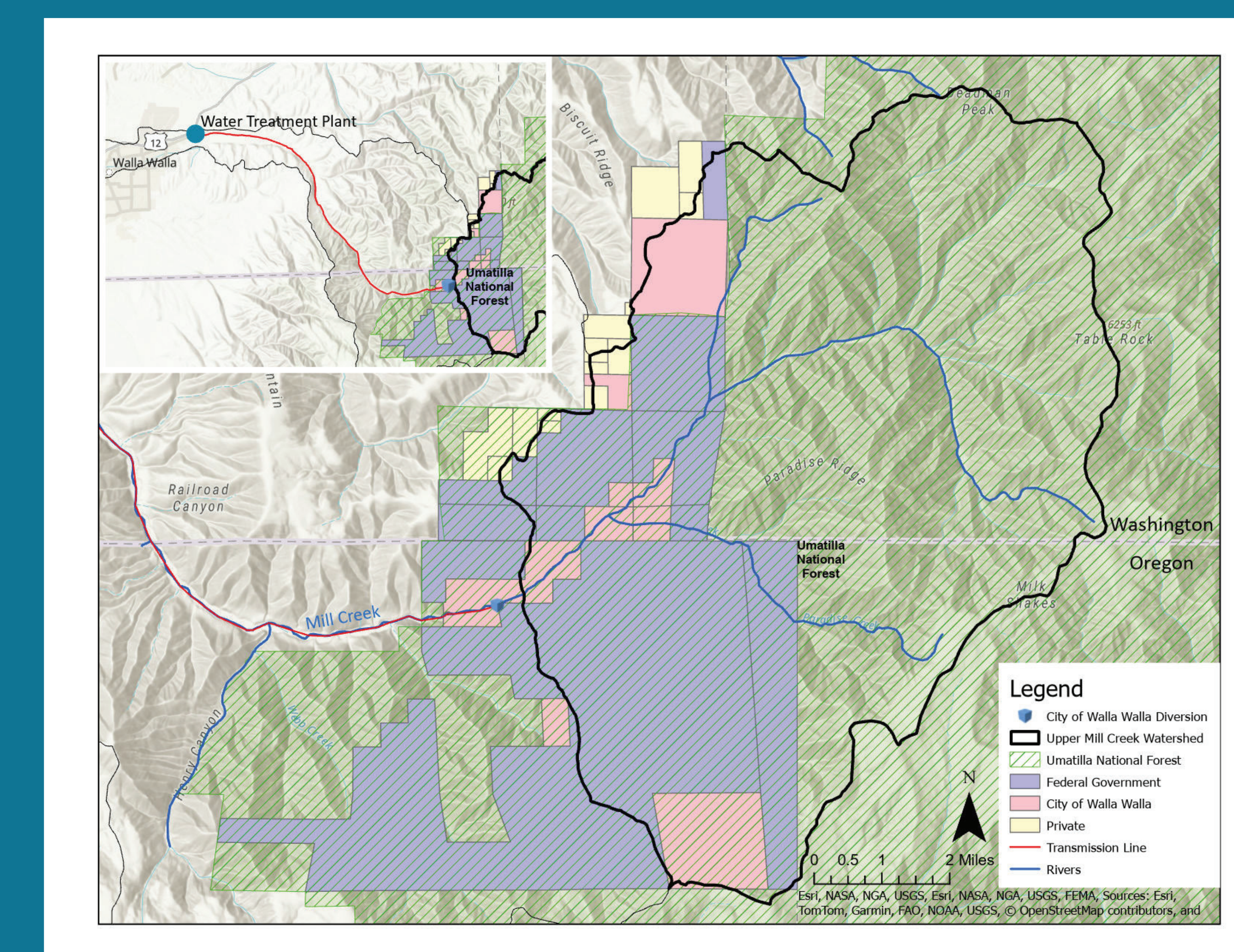
Reports & Studies

- Past watershed and wildfire protection plans
- Water supply and treatment studies



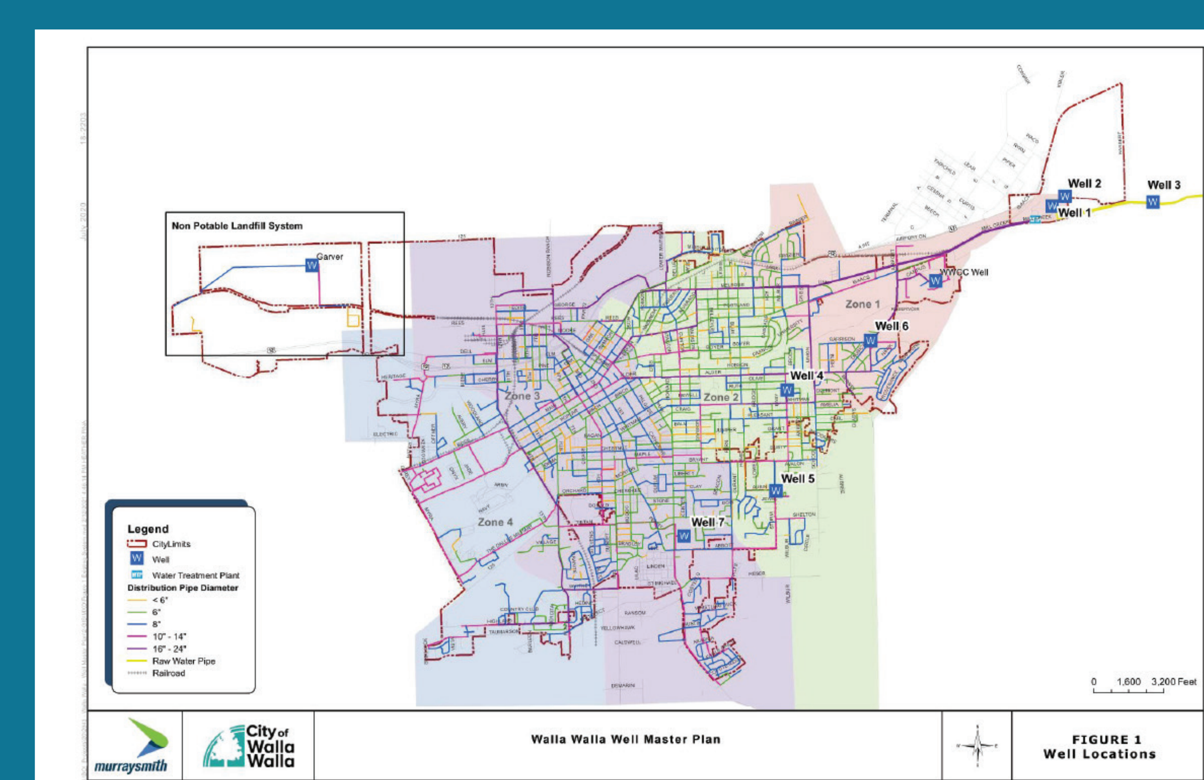
Maps & GIS Data

- Watershed boundaries and land ownership
- Forest health and habitat conditions
- Infrastructure maps



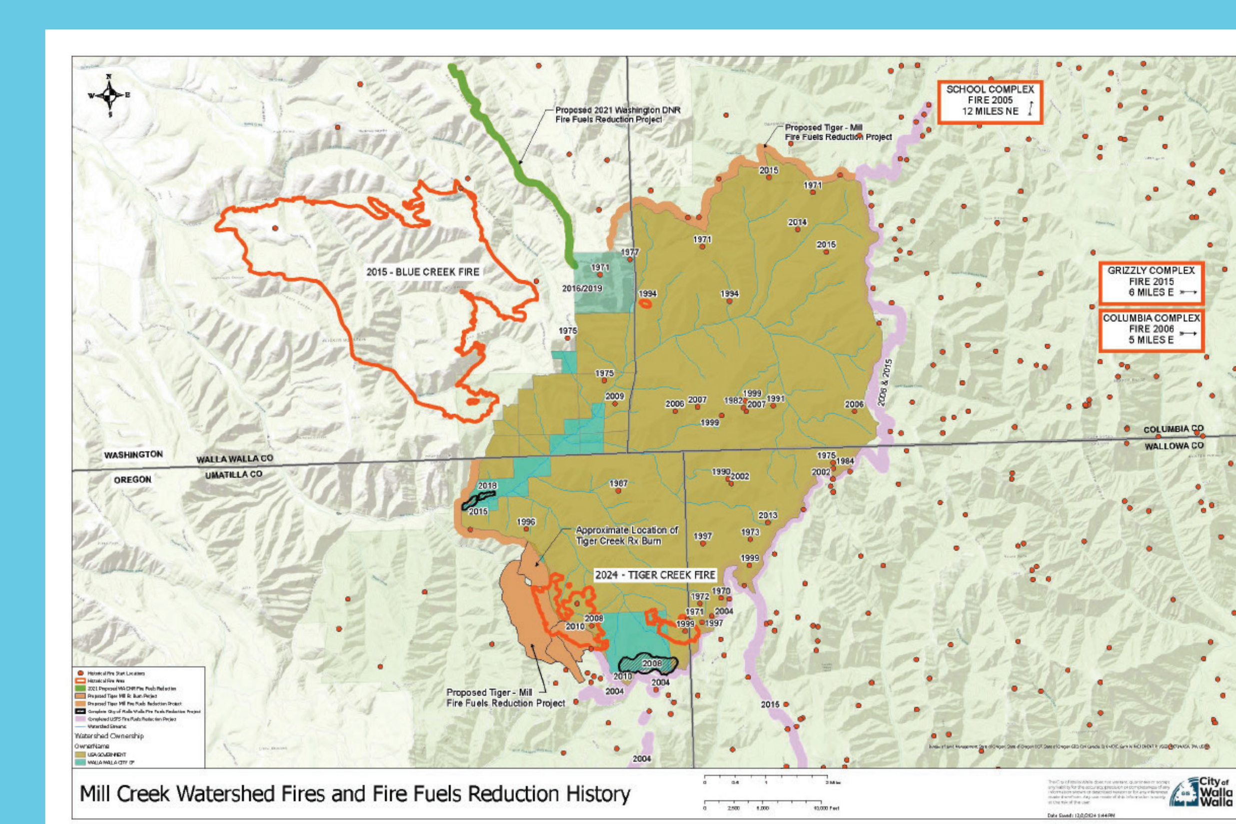
Water System Data

- Water quality and quantity records
- Operations and treatment plant information



Hazard & Climate Data

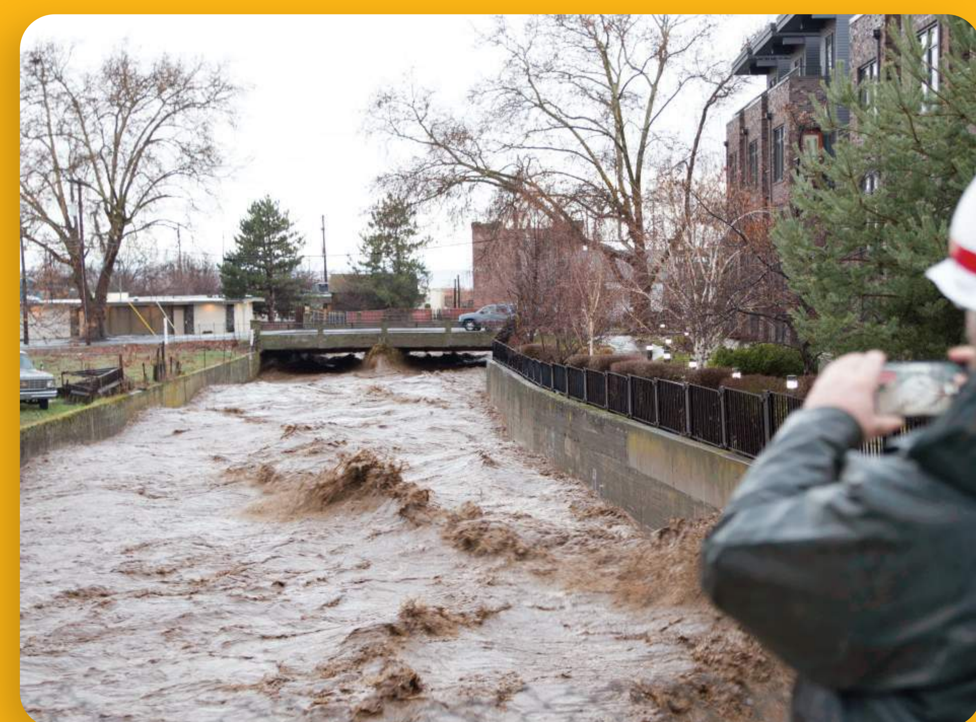
- Wildfire risk assessments
- Flood history and projections
- Climate change impacts



Chapter 4: Hazard and Risk Assessment – Water System Hazards

Understanding the Risks to the City of Walla Walla's System Infrastructure

The Mill Creek Watershed and the City's water system face **many hazards**. Some are natural, like wildfire, floods, and drought. Others come from aging infrastructure or power outages. This assessment helped us understand which risks are most serious and what solutions will protect the City's water system in the future.



Wildfire

Contaminates water with ash/debris and damage pipelines and facilities.

Flooding

Damages infrastructure, for example the 2020 flood damaged the raw water pipeline.

Drought

Reduces water available in Mill Creek during hot, dry summers.

Climate Change

Increases year-to-year extremes in precipitation, heat, and wildfire risk.

Earthquakes

Damages pipelines, reservoirs, and treatment plant facilities.

Operational Risks

Aging facilities, power outages, and equipment failures.

Which of these hazards concern you most about our water infrastructure and supply? Place a sticker under the hazards above that most concern you.

What other concerns or thoughts do you have about hazards and related risks to our water system? Write your thoughts down on a sticky note and place it below.

What is the Water Treatment Plant?

The Water Treatment Plant provides clean, safe drinking water for the City. Located at the base of the Mill Creek Watershed, it can produce up to 24 million gallons per day that meet or exceed all drinking water standards.

Before water flows through the water treatment plant, it also powers a hydroelectric generator that produces about 13,500 megawatt-hours of electricity each year — enough to power roughly 1,500 homes and help to offset system costs. The Treatment Plant is part of a larger water delivery system that carries water from the watershed to homes and businesses across the City. Each piece of that system faces unique risks from both natural hazards and operational vulnerabilities.

What We Found

- Many risks are interconnected (example: wildfire can lead to flooding/erosion, which can lead to sediment in Mill Creek resulting in higher water treatment costs).
- Some facilities are aging and in poor condition, which increases both operational and safety risks.
- The City is prioritizing the highest-severity risks in the Watershed Resiliency Plan.

Key Water System Facilities and Risks

Mill Creek Diversion & Intake: Vulnerable to floods and wildfire, which can damage infrastructure, and cause sediment buildup. Infrastructure is also over 100 years old.

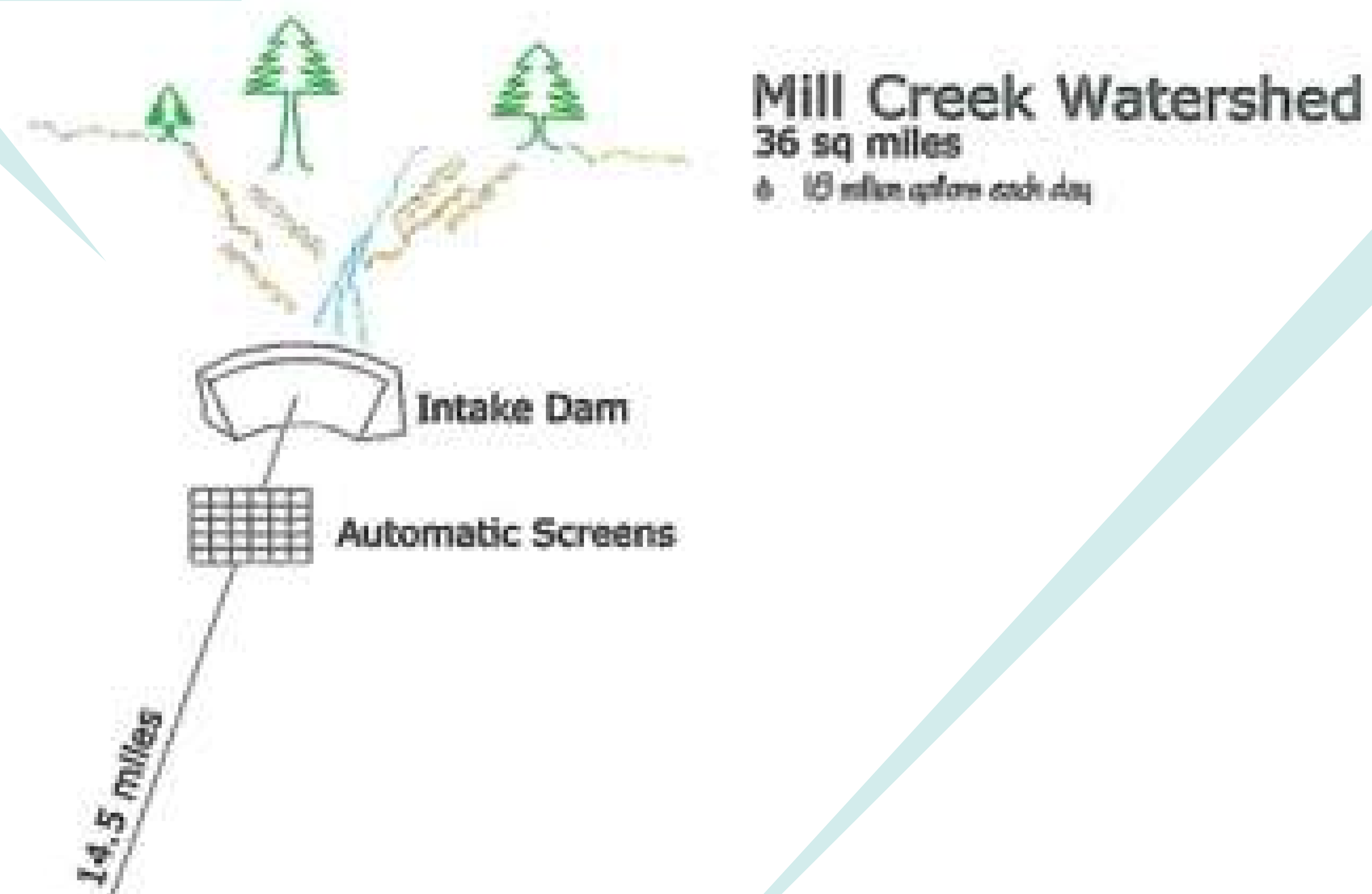
Raw Water Transmission Pipeline (14 miles): Vulnerable to floods, which can damage infrastructure. This happened during both the 1996 and 2020 floods.

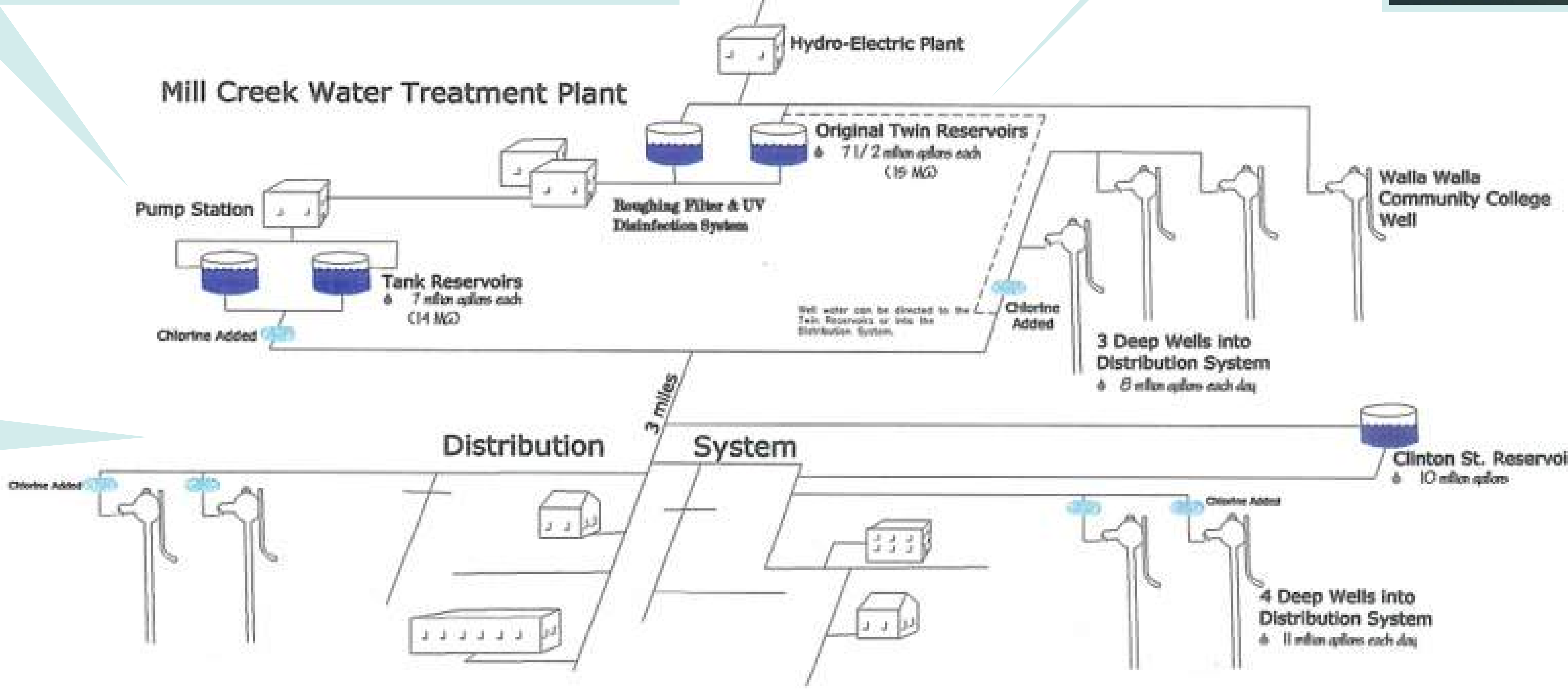
Water Treatment Plant: Vulnerable to power loss from any natural hazard as well as water quality changes. Infrastructure is also over 100 years old in parts.

Reservoirs: Vulnerable to earthquakes, which could cause leaks, and contamination from wildlife.

What surprises you most about how the City of Walla Walla's drinking water system works? Write down your thoughts on sticky note below.

Existing System





Chapter 5: Resource and Capabilities Inventory

Local Resources and Capabilities

The City can't prepare for every emergency alone — strong partnerships are essential to protect our water system and build resilience.

This project identifies the people, tools, and partnerships that keep our drinking water safe and help the City prepare for and recover from emergencies.

Opportunities to Improve

From the capabilities inventory and Watershed Resiliency Work Group discussions, opportunities were identified to strengthen how the City prepares for and responds to water–related emergencies. These ideas focus on improved partner coordination and resource sharing and helping the community stay informed and prepared some areas to improve include:

- **Standardize** emergency messaging across agencies
- **Increase** training and joint exercises
- **Build** agreements for sharing equipment
- **Expand** education and outreach with new tools

How We Collected This Information

The Project Team created an online survey with 18 questions to gather input from local partners and agencies. Survey participants were asked about:

- **Communication methods** during emergencies
- **Technical expertise** and staffing they can provide
- **Equipment and supplies** they could loan or deploy
- **Outreach and education programs** they already run or could expand

What Resources Do We Currently Have?

Communication

- Most partners have established communication methods and many already coordinate with the City.
- Opportunities include sharing emergency messaging systems, standardizing messaging and mobilizing volunteers in an emergency.

Expertise

- Many partners support the City's work in Mill Creek Watershed by responding to emergencies, collecting data and conducting monitoring.
- Partners employ staff whose knowledge may be useful including engineers, scientists, emergency responders, planners, outreach coordinators, among others.

Equipment

- The majority of partners could provide support delivering essential supplies during a natural hazard.
- Some partners could provide equipment including backup generators, heavy equipment, pumps, storage tanks.

Outreach

- 94% of partners conduct public outreach or education on topics such as natural hazards, risk reduction, emergency preparedness, and water conservation.
- Many partners are open to including other topics in their outreach if useful.

Which of these types of support would help most before or during an emergency that affects drinking water? Place a sticker or sticky note under:

Communication	Equipment	Expertise	Outreach	Other
Share alerts and updates	Tools, pumps, and generators	Trained people and knowledge	Education and preparedness	Add your ideas!

Chapter 6: Watershed Resiliency Strategy

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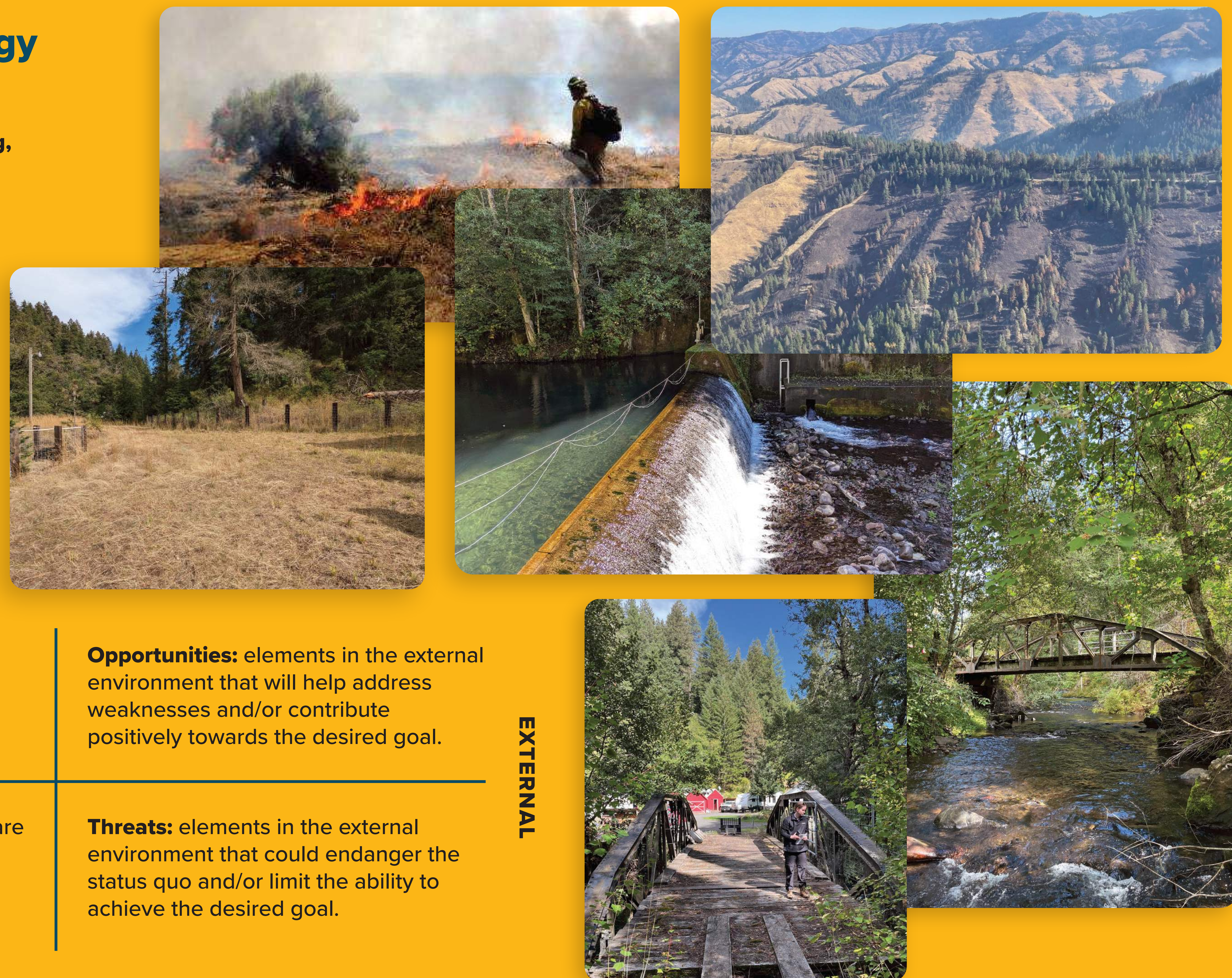
City of Walla Walla

How We Built the Strategy

- **Community and partner input and collaborative brainstorming, as we shared at Station 2.**
- **A hazard and risk assessment of the City's water system, as we shared at Station 3.**
- **A capabilities inventory of partner skills and resources, as shared at Station 4**
- **A SWOT analysis of the City's water system**

SWOT Analysis Components:

INTERNAL	**Strengths:** internal attributes that will contribute positively towards the desired goal.	**Opportunities:** elements in the external environment that will help address weaknesses and/or contribute positively towards the desired goal.	EXTERNAL
INTERNAL	**Weaknesses:** internal attributes that are lacking or may limit the ability to achieve the desired goal.	**Threats:** elements in the external environment that could endanger the status quo and/or limit the ability to achieve the desired goal.	EXTERNAL



Types of Actions We're Considering & Why:

Focus on developing actions that will make the Mill Creek Watershed more resilient and protect our drinking water supply such as

- **Infrastructure Upgrades:** Harden intake facilities, replace aging pipelines, improve power and telemetry systems
- **Emergency Preparedness:** Acquire backup power, repair access bridges, establish fire-fighting support sites
- **Land Management:** Vegetation removal around City infrastructure and acquire land for watershed protection
- **Watershed & Stream Restoration:** Enhance channel complexity, reduce sedimentation, and improve overall watershed resilience
- **Education & Outreach:** Promote and increase community awareness of the City's drinking water system, water conservation, risk reduction, and emergency preparedness

What Happens Next

Final strategies will feed into the City's Capital Improvement Program (CIP).

Which types of actions do you think the City of Walla Walla should prioritize first? Place a sticker or sticky note under:

Infrastructure	Watershed Restoration	Emergency Preparedness	Land Management	Education/Outreach

Chapter 7: Implementation and Funding Plan

Why Funding Matters

Even the best strategies require financial resources to put into action. The Implementation and Funding Plan looks at how identified mitigation actions could be financed—including opportunities for grants, loans, and other funding sources that can help reduce the local burden

Potential Sources of Support

Federal Programs

(Availability of these examples and other federal funds is uncertain):

- **Federal Emergency Management Agency (FEMA):** Disaster recovery & hazard mitigation (Building Resilient Infrastructure & Communities-BRIC, Hazard Mitigation Grant Program-HMGP)
- **United States Department of Agriculture (USDA) & United States Forest Service (USFS):** Wildfire recovery, watershed restoration
- **Bureau of Reclamation, WaterSMART:** water and energy efficiency projects, drought contingency planning, watershed management and restoration
- **Environmental Protection Agency EPA:** Drinking water financing (Water Infrastructure Finance and Innovation Act – WIFIA

Partnerships

(Critical to fundraising success):

- **Confederated Tribes of the Umatilla Indian Reservation (CTUIR)**
- **Regional initiatives** like Walla Walla Water 2050
- **Local organizations** like the Walla Walla County Conservation District and Walla Walla Basin Watershed Council
- **Nonprofits** like Kooskooskie Commons, the Washington Water Trust, and The Nature Conservancy

State Programs:

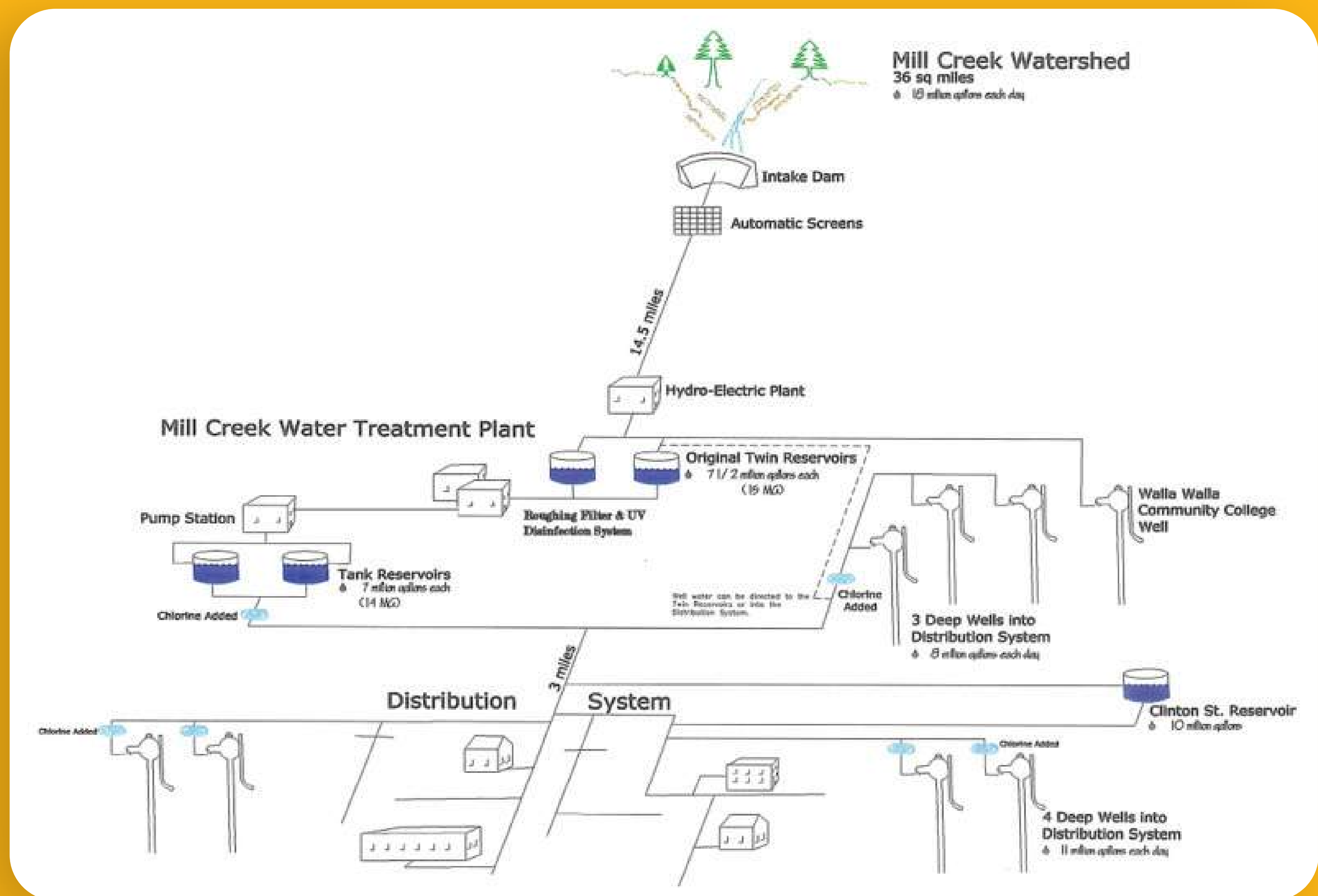
- **Washington Floodplains by Design:** multi-benefit floodplain & habitat projects
- **Washington Streamflow Restoration Grants:** boost streamflow, habitat, water storage
- **Washington Drinking Water State Revolving Fund:** low-interest loans with partial forgiveness
- **Oregon Watershed Enhancement Board Restoration Grants:** for watershed restoration projects with cross-boundary benefits
- **Public agencies** from Oregon, Washington, and Walla Walla County

Local Options:

- **Municipal bonds:** can be voter or Council approved
- **Utility fees:** ratepayer-funded projects, require Council policy decision

If the City of Walla Walla has to focus its funding efforts, where do you think the best opportunities lie?
Share your thoughts on a sticky note below and leave a sticker on the funding options that you think would be most effective.

Chapter 8: Response and Recovery Plan



If and when disaster strikes, the City is ready to keep safe drinking water flowing to the community. The City relies on the Mill Creek Watershed for most of its drinking water. This plan ensures that if a fire, flood, or earthquake disrupts the City's system, safe and reliable drinking water will still be available through other sources and emergency measures.

Alternative Water Sources

If water from Mill Creek cannot be used, the City can rely on its groundwater wells (including the City's Aquifer Storage and Recovery wells) to meet demand until surface water supply is reliably and safely restored.

What comes to mind when you think about future water needs and impacts to the water system? Any other ideas that should be considered?
Share your thoughts on a sticky note and leave it below.

How You Can Help: Stay informed and follow City updates through alerts and social media, and conserve water during emergencies.

Scan the QR Code or visit the link to subscribe to the City of Walla Walla Newsletter: bit.ly/WACOWW-Newsletter

1 Plan and Prepare

Key Proactive Steps Include:

- Strengthen emergency communication systems
- Implement new tools and technology to monitor the City's water system
- Complete identified mitigation actions to restore the system
- Develop emergency equipment and resource inventories to aid in efficient response and recovery actions

2 Respond

Damage Assessment & Response Planning:

When a hazard event occurs, accurate assessments help prioritize the response and recovery actions and secure resources.

- Conduct aerial imagery and field inspections (wildfire, flood, earthquake)
- Coordinate with County Emergency Management, Washington Emergency Management Division, and FEMA for damage documentation and funding

3 Recover

Recovery & Restoration Strategies:

Tailor strategies to address the specific issue or combination of issues.

To address hazards within the Mill Creek Watershed:

Wildfire	Flooding	Earthquake
Revegetate critical areas	Remove sediment at intake	Repair any damaged pipeline
Conduct water quality testing	Reinforce key areas of transmission main and access road	Remove sediment and debris
Stabilize slopes to reduce erosion		Stabilize slopes to reduce erosion

If there is loss of Surface Water Supply:

Implement emergency conservation measures	**Transition to groundwater wells as necessary**	**Repair infrastructure and restore surface water capacity**

If there is loss of Treatment System Capacity:

Switch to backup power generation	**Use portable and/or emergency treatment systems**	**Transition to groundwater wells as necessary**

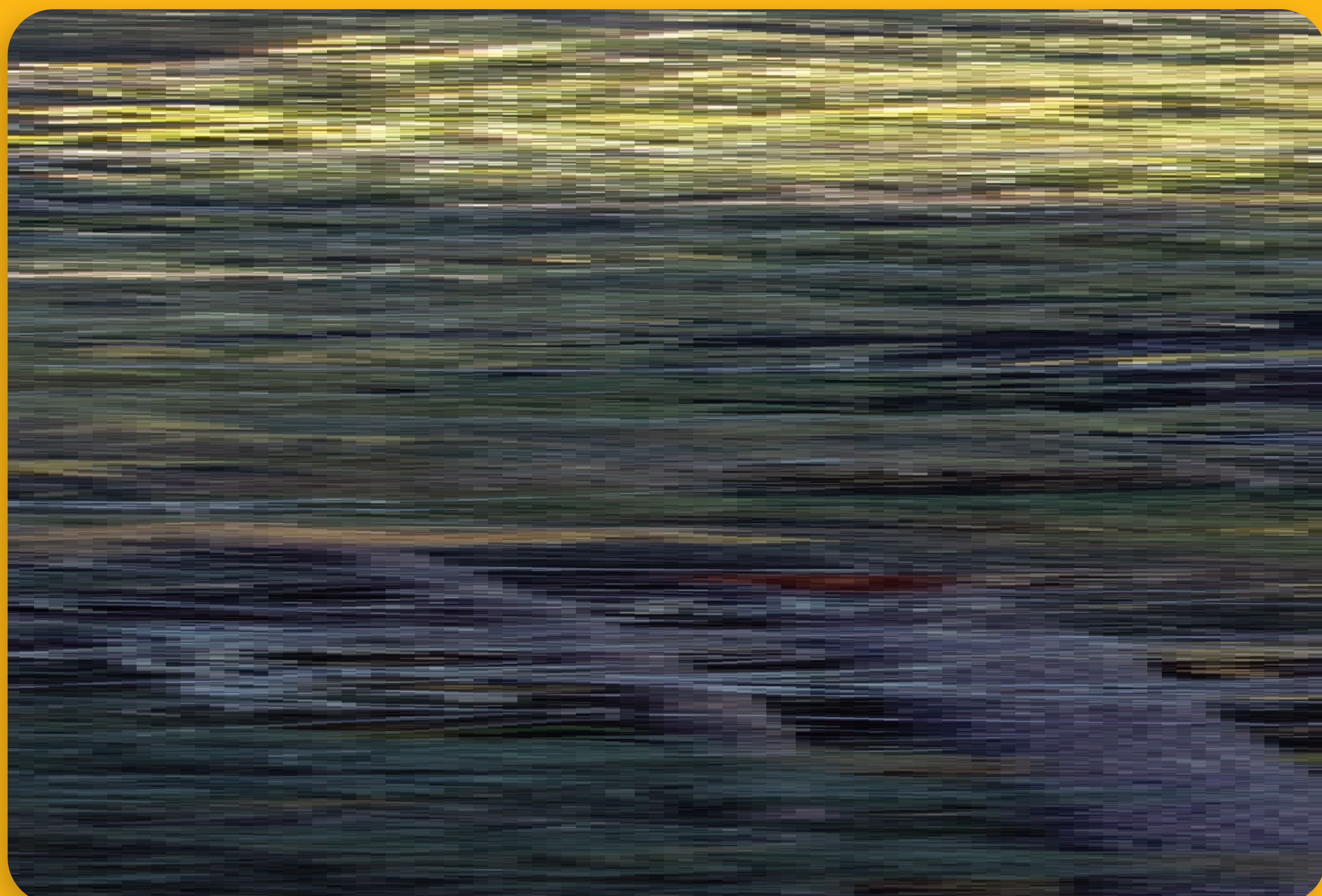
If there is loss of Distribution System:

Isolate damaged areas	**Establish emergency water hauling and fill-up stations**	**Complete reservoir repairs**

What's Next?

Thank you for joining the City of Walla Walla Watershed Resiliency Workshop!

Your input today will help shape the City's Watershed Resiliency Plan for Mill Creek Watershed. Together, we can improve resiliency in the watershed and strengthen the City's water supply for current and future generations.



Project Timeline

Understanding Our Risks
(Completed)

→

Exploring Watershed Solutions
(Completed)

→

Assessing Current Strengths & Resources
(Completed)

→

Analyzing Watershed Strengths, Weaknesses Opportunities & Threats (SWOT)
(Completed)

Developing an Action & Funding Plan
(Completed)

→

Planning for Long-Term Recovery
(Completed)

→

We Are Here!

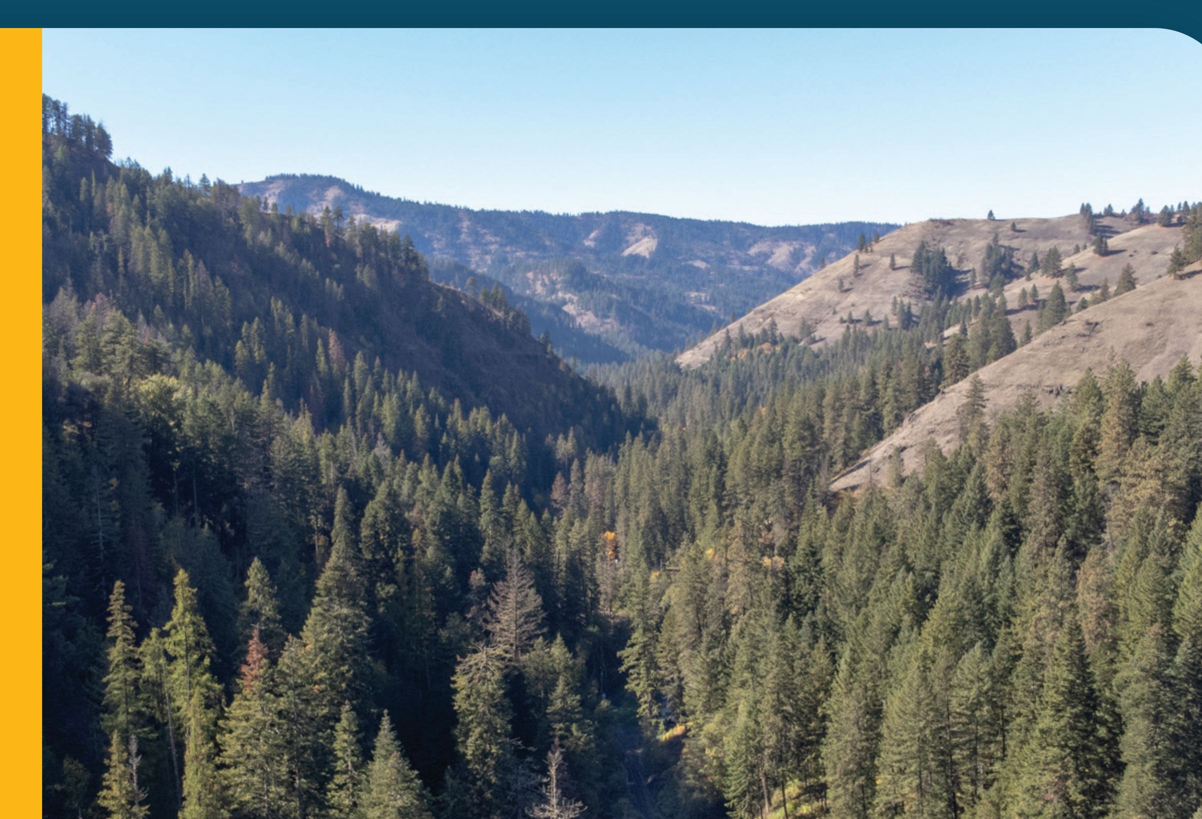
Finalizing the Plan
November 2025 - January 2026

Stay Connected

Visit for project timeline and information:
wallawallawa.gov/government/public-works/watershed-resiliency-plan

Questions? Ask staff or project team member today or email Adam Klein at aklein@wallawallawa.gov

Don't forget to turn in your feedback form to receive a prize!



consor

APPENDIX D
PUBLIC INPUT SUMMARY

DRAFT

Appendix C: Public Input Summary

To: Consor
From: Fluent Freshwater Insights
Date:
Subject: Summary of Community Comments from the November 2025 Public Workshop

1. OVERVIEW

In total, 65 individuals attended the City of Walla Walla (City) Watershed Resiliency Plan Workshop on November 18, 2025. Prompt questions at the various stations provided an opportunity for attendees to provide comments and feedback on specific aspects of the plan.

Because attendees were self-selecting, summary information presented here should not be interpreted as necessarily representative of the broader community. Instead, it offers an initial snapshot of perspectives from willing participants and provide a foundation for developing actionable strategies to improve resiliency of the Mill Creek Watershed and the City's water supply system.

1.1. Chapter 1 – Introduction & Project Overview

On this poster, attendees were asked what their top concerns for the City's drinking water supply were. Water quality (5) was most frequently cited as the top concern by those answering this question. Other choices included availability for future generations (2); water quantity (1); reliability (1); and emergency preparedness (0).

The majority of sticky note comments (six of ten) related to the perceived negative impacts of the Tiger Mill project on the watershed, City water supply, and City water infrastructure. Remaining comments focused on the need for water system resiliency; increased water conservation; impacts of adjoining private lands on water quality; and watershed management (i.e., local versus state versus federal control).

1.2. Chapter 2 – Vision, Goals and Objectives

This poster asked which planning goal was most important to attendees. Response to this question was low (n=7), with ensuring water supply reliability (3); promoting sustainable watershed management (2); and strengthening watershed partnerships (2) receiving votes. The choices "mitigate natural hazards" and "secure funding and advance implementation" did not receive any votes. In some ways, this result is not surprising given that mitigating natural hazards and securing funding/advancing implementation are both steps toward an end goal of ensuring water supply reliability.

1.3. Chapter 4 – Hazard and Risk Assessment

The first Chapter 4 poster (Water System Hazards) asked which hazard concerned attendees most as relates to the City's water infrastructure and supply. Ten individuals answered the question, with climate change (4) being the top concern. Other hazards of concern included drought (3); operational risks (3); wildfire (2); earthquakes (1); and flooding (0).

In addition, some attendees provided additional comments related to hazards and risks. While several commented again on the risks associated with the Tiger Mill project, three mentioned **overwatering of lawns and parks** as a risk to the system.

The second poster (Water Supply Infrastructure) asked attendees what surprised them most about how the City's drinking water system works. Two individuals mentioned not knowing about the hydroelectric component of the system.

1.4. Chapter 5 – Resource & Capabilities Inventory

This poster asked attendees to select which type of support would help most before or during an emergency that affects drinking water. Eleven individuals answered the question with communication (4) receiving the most responses. Other options included expertise (3); equipment (2); and outreach (2). Open-ended responses related to the desire for **text alerts when drinking water issues arise** (2), and ensuring availability of portable backup generators (2).

1.5. Chapter 6 – Watershed Resiliency Strategy

Attendees were asked which of a list of actions the City should prioritize first as part of its watershed resiliency strategy. While it is unclear if each response was unique, this question receive notably more answers than any other (n=35). Responses to each action choice are provided in Table 1, with education and outreach receiving the most votes.

Table 1. Most important action to prioritize

Choices	Responses
Education & outreach	10
Land management	8
Emergency preparedness	7
Watershed restoration	6
Infrastructure	4

In addition, ten open-ended comments were provided by attendees. Again, several noted concerns around the Tiger Mill project, but half (5) related to **education and outreach**:

- Is there a place where education and outreach info is described in a high-level or broad way?
- Is there detailed education and outreach info available?
- Provide links to educational resources.
- What are the emergency preparedness protocols in place?
- Suggest anyone purchasing a home or already owning a home be sent Guidelines for Caring for Your Creek, elucidating what can be done + what should not be done.

1.6. Chapter 7 – Implementation and Funding Plan

The question on this poster — if the City has to focus its funding efforts, where do you think the best opportunities lie — received the fewest responses (5) of any with answer options provided. Those choosing to respond voted for partnerships (3), federal programs (1) and local options (1). Notably, state programs did not receive any votes.

Open-ended responses that did not focus on options listed included donations and/or mitigation from corporations and developers.

1.7. Chapter 7 – Response & Recovery Plan

Attendees were asked what comes to find when thinking about future water needs and impacts to the City's water system and whether there were additional ideas (beyond those in the Plan) that should be considered. Responses included the following.

- S.A.R
- Put a link for emergency plans and this information meeting on WW's website!
- Characterize "surface water" in Mill Creek watershed to determine if springs are from the unconfined aquifer or from the basalt bedrock. CTUIR has claimed some water is pulled from the south-central aquifer.
- Clean drinking water forever is not guaranteed!
- Groundwater may not be available as backup in emergency.
- Proactively communicate aquifer drawdown risk to get support and familiarity with summer water use restrictions, lawn watering, etc.

1.8. Additional Feedback

Additional feedback provided by eight community members was generally positive and focused on appreciation for the informative meeting and the work the City does as relates to water supply. Other comments focused on **additional opportunities for education and outreach** (3), ensuring emergency response and water supply security (1) and reducing city water use (1). In terms of education and outreach, individuals asked for:

- information to be put on the City's website about how the plan works;
- more public meetings;
- texts in case of emergency; and
- signage around the City to help "socialize a consciousness of where our water comes from and how to protect it".

The raw data is provided in the following pages.

Public Input Summary - Open House November 18, 2025

Poster	Sticky Note Comment	Notes
Welcome	Learn about water infrastructure	
Welcome	Learn more about caring for our region	
Ch. 2: Vision, Goals, and Objectives	Protect Mature trees. Please be skeptical of controlled burns	
Ch. 2: Vision, Goals, and Objectives	#3	In support of goal 3 Promote Sustainable Watershed Management
Ch. 2: Vision, Goals, and Objectives	Disappointed #4 that the agreement with Forest Service wont be classified or discussed as suggested by Tom Scriber	
Ch. 2: Vision, Goals, and Objectives	Allow for plan flexibility so that unforeseen events can be accommodated	
Ch. 2: Vision, Goals, and Objectives	Think about herbicide/pesticide run of from both farms and neighbors	
Ch. 2: Vision, Goals, and Objectives	Year-round water needs. What are we / how are we going to improve the flood-to-dry, failing geology of the water headways / water ways / floodways? Time for change.	
Ch. 2: Vision, Goals, and Objectives	Monitoring group withdraws	
Ch. 2: Vision, Goals, and Objectives	Nano plastic in the water	
Ch. 2: Vision, Goals, and Objectives	Logging in the watershed is a big concern	
Ch. 2: Vision, Goals, and Objectives	Quality vs Quantity of flow from the Mill Creek watershed	
Ch. 2: Vision, Goals, and Objectives	Ownership Map need to sort of USFS hash lines on the private yellow parcels	
Ch. 2: Vision, Goals, and Objectives	The plan is based on current water use. Are there assurances that large water uses such as data centers will not be approved by Walla Walla County and imperil water supply?	
Ch. 1: Introduction and Project Overview	Concern that the Tiger Mill logging project will greatly increase flooding rash and slim water supply	
Ch. 1: Introduction and Project Overview	Cost of a filtration system if logging trucks increase run off in the supply	Top concern is Availability for Future Generations
Ch. 1: Introduction and Project Overview	The City should commit to improving the resiliency of the water infrastructure	Top concern is Reliability
Ch. 1: Introduction and Project Overview	I have very troubling concerns & motives of the Tiger Mill project. Removal of old-growth trees over 22” diameter triggering mudslides, silt into our pristine source of water. Honor the 1918 agreement to preserve this critical resource	Top concern is Availability for Future Generations
Ch. 1: Introduction and Project Overview	Commercial logging in the watershed	
Ch. 1: Introduction and Project Overview	Quality	Top concern is Water quality

Ch. 1: Introduction and Project Overview	How much control do we have over our watershed? How much do the feds and state have	Top concern is Water quality
Ch. 1: Introduction and Project Overview	Flood risks from logging in an arid watershed is greatly increased — so more emergencies will occur.	Top concern is Water quality
Ch. 1: Introduction and Project Overview	Private lands adjacent — NPS pollution, septic + fertilizers. Who monitors + enforces buffers?	Top concern is Water quality
Ch. 1: Introduction and Project Overview	Should be Planning should be planning ahead for water conservation due to climate change + loss of snowpack	Top concern is Water quantity
Ch. 1: Introduction and Project Overview	The City should exercise its authority to demand an EIS for the Tiger Mill project.	Top concern is Water quality
Ch. 4: Hazard and Risk Assessment - Water System Hazards	Year-round water needs. What are we/how are we going to improve the flood-to-dry, failing geology of the water headways/water ways/floodways? Time for change.	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	Cost of a filtration system if logging, trucks increase run-off in the supply.	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	I have very troubling concerns & motives of the Tiger Mill project. Removal of old-growth trees over 22" diameter triggering mudslides, silt into our pristine source of water. Honor the 1918 agreement to preserve this critical resource.	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	Flood risks from logging in an arid watershed is greatly increased — so more emergencies will occur.	
Ch. 4: Hazard and Risk Assessment - Water Supply Intrastructure	The City should exercise its authority to demand an EIS for the Tiger Mill project.	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	Private lands adjacent — NPS pollution, septic + fertilizers. Who monitors + enforces buffers?	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	What are potential adverse effects of logging in the watershed on H_2O quality, water supply, flooding & late-summer droughts?	
Ch. 4: Hazard and Risk Assessment - Water Supply Intrastructure	I didn't know about the hydro-electric plant. Also many wells to secure enough water supplies.	
Ch. 4: Hazard and Risk Assessment - Water Supply Intrastructure	Please don't do what California does w/ water recycling.	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	Parks dept not utilizing native plants, thereby using way less water.	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	I am surprised that the City does not have an adequate filtration plant.	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	I didn't know about electricity generation.	
Ch. 4: Hazard and Risk Assessment - Water Supply Intrastructure	Overwatering at parks	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	The document seems comprehensive and climate change seems the biggest unknown.	

Ch. 4: Hazard and Risk Assessment - Water System Hazards	Will Tiger Mill logging project increase flood risk? Shouldn't there be an EIS so we have the facts? Thanks.	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	People believe because we have "water, water" there's plenty of water to waste on lawns.	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	Top Hazard Concerns for Water Supply and Infrastructure Total Votes by Hazard Climate Change: 4 Operational Risks: 3 Drought: 2 Earthquakes: 1 Wildfire: 1 Flooding: 0	
Ch. 4: Hazard and Risk Assessment - Water System Hazards	Security risks @ WTP	
Ch. 5: Resource and Capabilities Inventory	Text alerts when water issues arise (Important and timely)	Vote under communication support
Ch. 5: Resource and Capabilities Inventory	Text alerts when water issues arise (Important and timely)	Vote under communication support
Ch. 5: Resource and Capabilities Inventory	Portable backup generators, manual transfer switches at switchgear	Vote under Equipment support
Ch. 5: Resource and Capabilities Inventory	Backup generator, portable and is there a way to plug it into the equipment	Vote under Equipment support
Ch. 5: Resource and Capabilities Inventory	Question:Which of these types of support would help most before or during an emergency that affects drinking water? Total Votes by Category Communication: 3 Equipment: 2 Expertise: 3 Outreach: 3	
Ch. 6: Watershed Resiliency Strategy	Is there a place where education and outreach info is described in a high-level or broad way?	
Ch. 6: Watershed Resiliency Strategy	Is there detailed education and outreach info available?	
Ch. 6: Watershed Resiliency Strategy	Suggest anyone purchasing a home or already owning a home be sent Guidelines for Caring for Your Creek, elucidating what can be done + what should not be done.	
Ch. 6: Watershed Resiliency Strategy	Provide links to educational resources.	
Ch. 6: Watershed Resiliency Strategy	The City should move their emergency services dept to a safer location.	

Ch. 6: Watershed Resiliency Strategy	Timing of any logging in the watershed, i.e., want to spread the work out over years, if possible!
Ch. 6: Watershed Resiliency Strategy	Concerns pursuant to 1918 agreement to protect watershed bringing logging in (Tiger Mill project) + the risks (flooding, landslides) this poses.
Ch. 6: Watershed Resiliency Strategy	What are the emergency preparedness protocols in place?
Ch. 6: Watershed Resiliency Strategy	Is the city prepared for increased flooding potential from the Tiger Mill project. We could have another 1996!
Ch. 6: Watershed Resiliency Strategy	Fix geology to reduce flooding we've got equipment now which was not possible before.
Ch. 6: Watershed Resiliency Strategy	Top Priorities Identified by Workshop Participants Total Votes by Category Watershed Restoration: 6 Education & Outreach: 6 Land Management: 5 Emergency Preparedness: 4 Infrastructure: 4
Ch. 7: Implementation and Funding Plan	Please apply for the grants for money federal or state.
Ch. 7: Implementation and Funding Plan	We can't keep paying more and more taxes!
Ch. 7: Implementation and Funding Plan	Corporate & developer donations/mitigation.
Ch. 7: Implementation and Funding Plan	Army Corps
Ch. 7: Implementation and Funding Plan	Vote for a different president this one cut FEMA funds that would have paid to improve the city's water infrastructure.
Ch. 7: Implementation and Funding Plan	Developers (Cottonwood to name one/several) should cough up lots of money for more residents using water — and wasting it on lawns.
Ch. 7: Implementation and Funding Plan	Funding & Partnerships Activity Question: Which funding pathways or partnership types should the City prioritize? Total Votes by Category Partnerships: 3 Local Options: 1 Federal Programs: 1

Ch. 8: Response and Recovery Plan	S.A.R
Ch. 8: Response and Recovery Plan	Put a link for emergency plans and this information meeting on WW's website!
Ch. 8: Response and Recovery Plan	Characterize "surface water" in Mill Creek watershed to determine if springs are from the unconfined aquifer or from the basalt bedrock. CTUIR has claimed some water is pulled from the south-central aquifer.
Ch. 8: Response and Recovery Plan	Clean drinking water forever is not guaranteed!
Ch. 8: Response and Recovery Plan	Groundwater may not be available as backup in emergency.
Ch. 8: Response and Recovery Plan	Proactively communicate aquifer drawdown risk to get support and familiarity with summer water use restrictions. Lawn watering, etc.
Feedback Card	Thanks for making this information availa ble to the community.
Feedback Card	I've learned a lot tonight. A dynamic document identifying risks and change is very important. Climate change may take us places we currently don't know about. We are blessed to have such amazing water. I applaud the city staff and the contractors for Walla Walla to be as prepared as possible. Support of Forest Service and Tiger-Mill is important — catastrophic wildfire is the highest probable risk
Feedback Card	Reduce City water usage
Feedback Card	Please put a link on the Walla Walla wbesite about how the plan works. More informitve meeting like this. Text in caise of emergency with water quality on any other emergency
Feedback Card	Text in case of emergency
Feedback Card	Very well done lots of info, clearley presnted thank you! Didn't know or rembe,ber about the hydorelective plant
Feedback Card	Thank you for holding the event. For me, healthy streams and forests and water conservation are key! Maybe some more educational signage around town would help socialize a consciousness of where our water comes from and how to protect it!
Feedback Card	Emergency response — timing may be a critical factor to mitigate damage use of aircraft and boots on the ground! Ensure resource availability. Security at water treatment plant — prevent terrorist activities.

APPENDIX E
WATER SYSTEM SITE VISIT OBSERVATION NOTES

APPENDIX E

Facilities Site Visit

On September 19, 2024, the Project Team consisting of Consor AEI Engineering (AEI), and Northwest Management, Inc (NMI) staff conducted a site visit with the City of Walla Walla (City) as part of the Walla Walla Watershed Master Resiliency Plan (Watershed Master Plan) project. The visit included two primary objectives.

- Water Treatment Plant (WTP) Tour – To review the existing facility layout, identify known issues and concerns, discuss upcoming projects, and understand operational priorities for future improvements.

- Mill Creek Watershed Visit – To assess the condition of the City's diversion facilities and gather input from the watershed caretaker regarding current challenges and operational considerations.

This memo summarizes the Project Team's observations and condition assessment for the WTP and watershed facilities. The information documented herein will inform the development of the WTP and Watershed Hazard and Risk Assessment (Chapter 4 of the Watershed Master Plan).

E.1 Condition Assessment

The following rating system was used for the condition assessment.

- 0 – Not inspected
- 1 – Excellent, like new condition
- 2 – Good, no observed signs of deterioration
- 3 – Fair, moderate signs of deterioration
- 4 – Poor, severe signs of deterioration
- 5 – Unserviceable, failure is imminent.

E.2 Water Treatment Plant

The Project Team assessed the general condition and functionality of the major treatment process units and equipment, including structure condition, concrete coating, equipment age and condition, obsolescence, performance, operation status, and accessibility, based on visual observations, record data, and anecdotal input from staff. Project Team leads for this component of the project included Ryan Billen & Lee Odell for treatment processes, Sam Smith for the twin open reservoirs, and Ray Wakins for all electrical infrastructure. The following tables and additional notes provide the condition assessment for different components/areas.

E.2.1 Overall WTP Site

Figure E-1 | Overall WTP Site Condition Assessment

Item	Condition	Notes
Civil and Site	Varies	Original plant constructed in 1920's, with original components such as the open reservoirs and valve house still in service. Additional upgrades have occurred over the years, with most recent major upgrade occurring in 2019.
Site Power	3	Backup power includes a 750-kw generator (Cummins/Onan, Serial No. D980721020, Deisel fuel) that is 25 years old. Worst outage in that period was 17or 18 hours. Have a good relationship with the utility provider to get the plant back up and running in the event of an outage. Generator appears to be in good working condition and has been regularly serviced. Generator enclosure and base show moderate corrosion.
Generator circuit breaker	5	The existing 2000A, Siemens Type RL draw-out breaker has failed to operate reliably.The plant has purchased a replacement circuit breaker (2000A, Siemens Type RLW), however, the controls are not a direct replacement match because of the original gear custom construction. The new circuit breaker will require integration to work with existing controls.
Service Entrance and Transfer Switchgear (20-01)	2	Switchgear ~26 years old, 2000A, 480V, 3 phase, 3 wire.
Switchgear automatic transfer controls	4	The automatic transfer control system is outdated and difficult to service. The PLC is a Siemens S5 series which the manufacture no longer supports, End of Life Cycle date of 9/30/2020. The other control devices and relays are at the end of their service life.
Piping and Valves	3	Some of the onsite valves around the site are leaking when closed, including the UV building and the open reservoirs (see respective write ups for these facilities).
Safety	2	

Additional Notes for the overall WTP Site:

- The WTP has a rated capacity of 24 million gallons per day (MGD). On the day of site visit, the WTP was operating at approximately 5 MGD. Overall water demand on the system has been reduced to approximately 3 billion gallons per year from approximately 4 billion gallons per year following closure of the local canaries, and further reductions with current utility replacement projects (IRRP program). A staff member indicated that the current demand is 1.7 billion gallons per year.

- Developers want to build a large mixed-use development on the east side of the WTP. This would require a new pressure zone to serve.

- Plant is not connected to the City's wastewater treatment (WWTP) collection system. Instead, there is a drain vault with aluminum stop logs for discharging excess water back into Mill Creek. A sump pump (approximately 400 gpm) in the drain vault allows water to be pumped into an on-site septic system.
- Current concerns at the plant include the following:
  - Having algae bloom problems this year in the open reservoirs. The City has been injecting hydrogen peroxide (installed with 2019 upgrades) to address this concern, but algae recently showed up again within the last week.
  - Having Total Trihalomethane (TTHM) problems in the treatment process. Aquifer recharge operations have been halted since spring due to Ecology concerns about TTHM levels (went over 40 at one point). The plant used to treat with ozone, but the ozone treatment facilities were removed due to concerns about effectiveness against cryptosporidium in cold water.
  - Upflow filter efficiency is not ideal. Would like to get this remedied.
  - Earthquake resiliency. The plant currently has no plan for delivering water in the event of a large earthquake. There are no flexible/earthquake valves onsite, and no current way to bypass storage tanks for delivering water to the system.
- The plant has several upgrade/design project underway, including the following:
  - Hydropower building upgrades
  - Admin building electrical upgrades
  - Study by HDR to evaluate upflow filter media and cleaning process, algae blooms, TTHM issues.

E.2.2 Administration Building

Administration building is the former ozone building – the SCADA room is now located where the ozone generators used to be. Ozone was removed from the treatment process due to concerns about effectiveness against cryptosporidium when the water is very cold (which is typical of Mill Creek).

Figure E-2 | Administration Building Condition Assessment

Item	Condition	Notes
Architecture	2	Building constructed in 1998/1999 and renovated in 2019 as part of the larger plant upgrades project.
Structural	3	No known issues, membrane roof is 35 years old
Building Electrical	0	Electrical upgrades project underway
I&C	2	
HVAC	3	Having some problems with freon leakage from evaporators in the HVAC system, impacting SCADA Room
Safety & Accessibility	2	

E.2.3 Maintenance Building

An outside inspection was completed for this building only. Ordinary wear signs for modular metal building were observed but not further comments for this building.

E.2.4 Chlorine Building (Building G)

The chlorine building is divided into 3 sections: generator & switch gear, process controls, and gas cylinders (largest section of building). Plant receives new chlorine deliveries every 2.5 months. There a 4 injections points within the treatment process. There is an overhead crane in the chlorine storage tank room used for moving equipment and chlorine tanks.

Figure E-3 | Chlorine Building (Building G) Condition Assessment

Item	Condition	Notes
Architecture	3	Built in mid 1980's, roof recently replaced
Structural	2	CMU building, City would like to remove chlorine equipment and construct a new chlorine building near the clearwell. This building could be used as storage or for backup power generation.
Standby Power	3	Generator is 35 years old, 750KW (Cummins/Onan, Serial No. D980721020) diesel fuel, but functions well. Fuel source includes a 500-gallon diesel fuel tank. Generator appears to be in good working condition and has been regularly serviced.
Transfer Switch	3	
Pumping Systems	2	Chlorine injection points
Piping and Valves	2	
I&C	2	
HVAC	2	

Process Control	2	
Safety & Accessibility	2	Previously used Scrubber (Port Angeles, WA) and alarm system recently installed
Permit and regulatory requirements		Requires annual Chlorine gas risk reporting, public information and other risk management requirements.

Potential Risks/Hazards:

- Gas leaks presents health hazards, although the 2019 scrubbing system improvements are in place to help mitigate this risk. Cylinders may explode in fire, but gas itself is non-flammable.
- City would like to evaluate options for bulk or onsite sodium hypochlorite generation to reduce safety hazards (included as part of our scope).
- Earthquake resiliency. During treatment operation, chlorine gas is released by control valves and the gas is stored in cylinders in the chlorine building. There are no flexible/earthquake valves onsite, and no back up system for automatically shutting off the release of chlorine gas if the valves become damaged. Additionally, the chlorine gas cylinders are not tied, strapped, or otherwise anchored to the ground in the chlorine building. In the event of a large earthquake, there is potential for the chlorine cylinders to become damaged during movement and cause an uncontrolled release of the poisonous gas.

E.2.5 Well 1 Facility (Building H)

The 2020 Well Master Plan did a full condition assessment of the Well 1 facility but the Project Team still did another high level look at the facility since it is in the fencing limits of the WTP. Well 1 is a combination ASR and production well that is 800 ft to 900 ft deep. The 200 hp pump is in standby mode for pumping water into the reservoir. Water can also be pumped into the ground at half speed by running the pump in reverse for aquifer recharge. The well is controlled by 3 valves to pump either to the reservoir or the ground. Currently not pumping into the ground due to high levels of total THM.

Figure E-4 | Well 1 Facility (Building H) Condition Assessment

Item	Condition	Notes
Architecture	3	CMU building
Structural	3	No known issues, older building with normal deterioration
Building Electrical	3	
Pumping Systems	0	See additional notes below

Potential Risks/Hazards: Ongoing high levels of TTHM may continue to prohibit aquifer recharge operations

E.2.6 Hydropower Building (Building I)

Figure E-5 | Hydropower Building (Building I) Condition Assessment

Item	Condition	Notes
Architecture	3	Damage to exterior surface from birds pecking holes in the stucco, which needs repair. City staff would like to see guard hawks installed on the building corners – these have been effectively used elsewhere on site.
Structural	2	No observed issues
Building Electrical	0	Interior renovation project underway – equipment has started to arrive and will be installed soon.
Pumping Systems	0	Interior renovation project underway – equipment has started to arrive and will be installed soon.
Piping and Valves	0	Interior renovation project underway – equipment has started to arrive and will be installed soon.
I&C	0	Interior renovation project underway – equipment has started to arrive and will be installed soon.
HVAC	0	Interior renovation project underway – equipment has started to arrive and will be installed soon.
Process Control	0	Interior renovation project underway – equipment has started to arrive and will be installed soon.
Safety & Accessibility	0	Interior renovation project underway – equipment has started to arrive and will be installed soon.

Additional Notes:

- Next time pipeline is shut down due to washout or otherwise, City would like to install isolation valve
- High pressure (approximately 500 psi) in pipeline from Mill Creek leading into the hydro building.
- With the renovation project addressing improvements on the buildings interior/equipment, the only concerns are related to interior ventilation and the exterior architecture of the building.
- There is a 3-ton overhead crane inside of the building used for moving equipment.

E.2.7 Twin Embankments for Open Basin Reservoirs and Valve House

Figure E-6 | Twin Embankments for Open Basin Reservoirs and Valve House Condition Assessment

Item	Condition	Notes
Seepage - Embankments	4	A routine loss of 0.5 mgd is assumed to be seepage through the twin reservoir embankments & foundation
Settlement - Embankments	3	Differential settlement was observed on the embankment crown and side slopes (typical condition)
Stability - Embankments	0	There is a potential and significant concern for voids within the embankment causing global stability issues. The City is concerned about differential head between the embankments when one reservoir is drawn down and the other remains filled.
Reservoir Concrete Lining	3	Cracking and differential settlement was observed on the reservoir concrete lining. It is assumed by the project team and City that one major crack in the north basin concrete sidewall is a significant contributor to the seepage outflows.
Embankment Foundation	0	There is a potential and significant concern for voids within the foundation causing global stability issues
Safety, Accessibility & Maintenance	3	Routine inspections of the embankments are not being conducted. The City manages embankment vegetation multiple times per year with support from local inmates.
Permit and regulatory requirements	4	The reservoir embankments appear to exceed criteria for classification as a dam in the State of WA. The dam is not registered and a hazard classification has not been assigned.
Valve House	4	Issues with valve opening and closure because of corrosion on valves and damage to the valve stems. The four valves are greased twice per year before they are exercised.

Potential Risks/Hazards:

- The twin reservoirs were constructed in 1922 and have been in operation since construction. The embankments have experienced significant deterioration which is impacting water treatment facility performance and poses both flood risk & operational hazard for the City. A comprehensive rehabilitation or reconstruction of the embankments would be necessary to address all known deficiencies with the existing embankments. A City staff member indicated that a Ground-Penetrating Radar investigation was conducted a few years ago.
- A routine loss of 0.5 mgd from the twin reservoirs is of primary concern with respect to embankment performance.

- A crack on the north basin concrete sidewall was observed during an inspection of the dewatered reservoirs on the week of September 23-27. The City staff and project team assume that the crack is a contributor to the seepage exit through the embankments and foundation.

- Ongoing seepage through the embankment material and foundation has a high likelihood of inducing soil particle movement and causing voids to form. The concrete walls provide a rigid surface to the waterside slope of the embankments, resulting in challenges with detection of voids and assessment of the underlying embankment condition. When the embankments are loaded with differential head (reservoirs filled, operational), a significant void could cause collapse of the embankment and concrete walls, leading to embankment breach, uncontrolled release of flows, and potential damage to surrounding infrastructure and/or present human safety risks. A sinkhole of unknown depth/size has formed on the western median between the two open reservoirs on the west side of the valve house. Material loss through the void has been observed for several months.

- The project team discussed a recommendation to decommission/demolish the twin reservoirs, and install a clarifier within the project footprint. The City does not need the 15MG storage which the reservoirs provide. A clarifier would meet the City's water treatment operation objectives while eliminating the hazard of the deteriorating embankments.

- Concrete lined basins and valve house were constructed in early 1920's with original plant. The sedimentation basins were originally used for finished water and included baffles to improve contact time. Baffles taken out of service once plant upgrades took place. Plant staff have observed a regular loss of 0.5 mgd through the plant when comparing inflow and outflow rates. Staff believe that this loss occurs in the sediment basins (see next bullet for additional discussion on this item).

- The City drained both basins during the week of September 23 – 27 for cleaning. City staff had noticed reduced clarity in both basins leading up to Consor's site visit on September 19th. Photos of the drained basins are located in the corresponding site visit folders. The north basin has a noticeable crack in the concrete sidewall near the valve house. Once the north basin was isolated, it lost approximately 2 feet of storage within a 24 hour to 36 hour period prior to actively draining it down. The rate of drawdown began to slow toward the end of the isolation period, perhaps due to the water surface dropping and having less contact with the cracked portion of the reservoir wall.

- Risks/Hazards: open air reservoirs vulnerable to blowing dust, contamination from birds/wildlife. Reservoirs are over 100 years old and are at/exceeded typical design life. Structural deficiencies include leaking valves, differential settlement under concrete lining. Of largest concern is the potential for large voids to have formed behind the concrete walls due to consistent exfiltration from the pond over many years. A high-pressure grouting project was performed several years ago added ~30 yards of grout in the area immediately west of the valve house.

- Many geese are observed in the open reservoirs on a regular basis. There is a lack of drainage on the walking surface in the median between the open reservoirs. It was requested during the site visit that the WTP would like more drainage in that location and ways to hose the surface to clean up after the geese with pressure washing.

E.2.8 Roughing Filters Building (Building D)

The roughing filters building consists of two parallel upflow filters installed with the 2019 plant upgrades. Filters have a rated capacity of 12MGD each @ 1.4 GPM/SF for a total firm capacity of 24 MGD.

Figure E-7 | Roughing Filters Building (Building D) Condition Assessment

Item	Condition	Notes
Architecture	2	Lots of gnats ending up on the water surface, which is the filtered side of the treatment process. There is no downstream removal process for the insects.. Explore options for tighter screen mesh, and reducing open areas.
Structural	2	
Building Electrical	2	
Pumping Systems	0	NA
Piping and Valves	2	Some actuators require significant maintenance.
I&C	1	
HVAC	1	
Process Control	1	The process control works as designed, but the effectiveness of the roughing filter for turbidity removal is extremely limited. If there were a high turbidity, or elevated organic water quality event from a fire or other condition in the watershed, the roughing filter would provide inadequate treatment.
Safety & Accessibility	2	City would like the catwalk to extend around the entire perimeter of the roughing filters
Performance	3	This facility is not achieving the expected 1-log turbidity reduction. Closer to 10% to 20% reduction. Each filter is typically cleaned twice a year. HDR is looking at options for improvements to media and cleaning process and will have a memo ready soon.

Potential Risks/Hazards:

- Upflow filter doesn't provide much resiliency against turbidity. Plant would be vulnerable in a situation where increased levels of turbidity showed up at the intake.
- The roughing filter room produces heat and the WTP has a need for better ventilation of the space.

E.2.9 UV Building (Building C)

The UV building has three parallel UV reactors installed with the 2019 plant upgrades, with additional work performed in 2022. Reactors have a rated capacity of 12MGD each for a total max capacity of 36 MGD. The

WTP has indicated the Rotork Actuators periodically have issues, and it would be very difficult and time consuming to replace portions of the system. Currently, the existing actuators and valves were installed with a forklift in a specific sequence, however, a replacement part would require rearranging the space to be able to replace the part. An overhead gantry crane would provide the ability to lift a part instead of rearranging the adjacent parts for access. It is unclear if the existing building has the structural adequacy to support an overhead gantry crane system, and a structural evaluation would need to be performed.

Figure E-8 | UV Building (Building C) Condition Assessment

Item	Condition	Notes
Architecture	1	
Structural	2	
Building Electrical	2	
Pumping Systems	0	NA
Piping and Valves	2	Having issues with the plug valves actuators. Valves not fully closing, some leakage through valves.
I&C	2	Having some data collection issues, Taurus is working on this. Also, would like to have better access for adjusting control bulbs.
HVAC	2	No HVAC for electrical room, so door is kept open, which works ok to cool the room.
Process Control	1	
Safety & Accessibility	2	City staff would like a gantry crane to move equipment within the building. Rolling or overhead crane could work.

Potential Risks/Hazards:

- The WTP has indicated the Rotork Actuators periodically have issues, and it would be very difficult and time consuming to replace portions of the system. Currently, the existing actuators and valves were installed with a forklift in a specific sequence, however, a replacement part would require rearranging the space to be able to replace the part. An overhead gantry crane would provide the ability to lift a part instead of rearranging the adjacent parts for access. It is unclear if the existing building has the structural adequacy to support an overhead gantry crane system, and a structural evaluation would need to be performed.

E.2.10 Treated Water Pump Station

The treated water p ump station has four parallel vertical turbine pumps that draw from clearwell and pump up to the reservoir. Each pump has a capacity of 8 MGD.

Figure E-9 | Treated Water Pump Station Condition Assessment

Item	Condition	Notes
Architecture	2	Facility constructed in 1998/1999
Structural	2	

Building Electrical	0	Needs new breaker/1 spare
Pumping Systems	2	4th pump added in 2019, each pump has a capacity of 8 MGD
Piping and Valves	2	
I&C	0	
HVAC	0	
Process Control	0	
Safety & Accessibility	0	

Additional Notes: City would like to make pumping operation more efficient for low flow conditions. City mentioned installation of flow meter to check pump efficiency.

E.2.11 Storage Tanks

The twin storage tanks each have a capacity of 4.5 million gallons at 25 FT storage depth which is the minimum operating depth.

Figure E-9 | Treated Water Pump Station Condition Assessment

Item	Condition	Notes
Architecture	2	External examination only. Tanks constructed in 1998/1999. 36' tall x 184' in diameter. Recently repainted on the exterior
Structural	0	Custom built tanks with internal column supports. Columns make repainting difficult. Note: roof deterioration is common in these tanks and internal inspection is recommended.
Piping and Valves	0	
Safety & Accessibility	0	

Potential Risks/Hazards:

- Cathodic protection system desired due to difficultly applying paint around internal columns.
- Earthquake susceptibility (no flexible valves).
- No system bypass around tanks.
- During the last interior inspection of the potable water storage tanks, it was reported that there is corrosion on the bottom few feet of the vertical interior supports of the tank. The extent of the corrosion is not known at this time, but section loss that results in loss of structural support could result in the loss of a tank and its contents into the WTP facility and surrounding area.

E.2.12 Raw Water Transmission Main

This project component was not inspected during the site visit at the discretion of City staff, and therefore a condition assessment chart was not developed for the transmission main. The pipeline spans from the

Diversion Facility to the WTP, resulting in 1200 ft of head and 500 lbs of pressure at the WTP. The pipeline was installed in 1988 and multiple repairs have been required since installation. The pipeline was originally wood stave pipe. The pipeline and hydropower building were constructed for $25M and have a current estimated value of $50-70M.

Additional Notes;

- The condition of the transmission main itself is not a concern to the City. A primary objective is to maintain operability of the current transmission main. The project team did not inspect the transmission main during the 9/19 site visit.

- From the dam/intake to the OR/WA state line, the transmission main consists of a reinforced concrete pipe (metal barrel, steel reinforcement, encased with concrete). From the OR/WA state line to the water treatment facility, the transmission main consists of welded steel with cathodic protection.

E.3 Watershed – Diversion Infrastructure & Surrounding Area

NMI conducted a site assessment focused on evaluating forest health within the watershed near the intake area, as well as wildfire resiliency. The review included an assessment of existing defensible space around critical infrastructure and its effectiveness in mitigating potential wildfire impacts. NMI's findings are documented in a standalone memo, provided as Appendix F of the Watershed Master Plan.

The following are observations conducted by Heather Pina, David Johnson, Sam Smith, Erin Krug, and Ray Watkins (AEI Engineering).

E.3.1 Raw Water Intake Infrastructure

Figure E-10 | Raw Water Intake Infrastructure Condition Assessment

Item	Condition	Notes
Architecture	0	
Structural	3 4	The dam structure is in fair condition. Moderate signs of concrete deterioration and localized spalls exist throughout the structure. The control building is in poor condition with deteriorated wood panel walls, windows, and doors that were blown open under flow during the last flood event.
Building Electrical	4	Building electrical was noted to be in poor condition. Electrical feeder from the screen building was also noted as poor condition.
Pumping Systems	NA	
Piping and Valves	2	
Telemetry System	4	
HVAC	1	

Potential Risks/Hazards:

- The control building is in poor condition with deteriorated wood panel walls, windows, and doors that were blown open under flow during the last flood event. The dam cannot be operated during high flow conditions or when the control building is inundated with water. Not being able to access or operate the dam is a dam safety concern.
- Large woody debris regularly flows into the dam. There is potential for woody debris damaging the control building platform, control building structure, machinery and compressed air tanks that are stored on the control building platform, and vertical lift gates and their stems. QRS Engineering (separate contract) is designing for installation of a new gate in which the City is in the process of obtaining environmental & regulatory permits to install this gate.
  - Every time it floods, the reservoir fills with gravel. The new 10 ft sluice gate within the fixed crest weir would open and run accumulated material through the gate, eliminating the need for routinely clearing accumulated debris and material above the structure. Currently, a complex operation utilizing excavators, conveyor belt, and dump trucks is required to clear the accumulated material and maintain the facility.
- The facility may not be considered a dam based on Oregon Dam Safety criteria. If a structure is 10 feet or more in height and has a storage capacity of at least 9.2 acre feet, it is classified as a dam under Oregon law. If this facility is not considered a dam, it does not need to adhere to dam modification authorization requirements. If it is considered a dam and not properly classified as such, there are risks related to regulatory compliance with the ongoing gate installation project (dam modification).
- The USFWS has conducted camera inspections of the fish ladder. The fish ladder is functioning appropriately with modifications made to the entry and exit.
- The separate building with mechanical controls is in an extremely deteriorated state and requires rehabilitation. The wood panel walls are deteriorated beyond repair. The building has been flooded up to three feet above the main floor elevation during recent Mill Creek high water events. The sluice gate on site is original (1922 construction) and failing in place. The City desires to upgrade the building but maintain its historical character.

E.3.2 Sorting Building

Figure E-11 | Sorting Building Condition Assessment

Item	Condition	Notes
Architecture		
Structural	2	The sorting building was built in 1986 and has had its roof replaced in the last few years.
Electrical Service to Sorting Building	3	Electrical service to building. The existing powerlines to the Screening building and Caregiver residence are overhead and are showing signs of deterioration and are in close proximity to trees. This last segment of the utility power could be placed underground for improved reliability.

Building Electrical	2	
I&C	1	
HVAC	2	
Process Control	1	
Safety	0	

Additional Notes:

- This building is in overall good shape, as stated by City staff. It is beneficial to have two screens upstream of the hydropower building.
- Turbidity and temperature data is collected at this facility and transmitted via phone line to the WTP. It would be preferrable to send a signal via SCADA or satellite. The physical phone line is exposed to more hazards which could impact connectivity.
- Fish that are caught in the screen building are separated and released back into the creek via a piping system on the west side of the building.

E.3.3 Standby Generator

The standby power system provides power to the Screening building and Raw Water Intake structure in the event of a loss of utility power and is noted in a fair condition. The generator, Kohler with external diesel fuel is 35+ years old and shows signs of corrosion and age.

The transfer switch is noted in a fair condition and is 35+ years old and shows signs of corrosion and age. All electrical power routes through the transfer switch, i.e. a failure of the transfer switch results in no power to the facility.

E.3.4 Bridge to Old Horse Barn

Historically, the U.S. Forest Service patrolled the watershed by horseback until about 10 years ago, when the practice ended following an injury. The City is exploring alternative uses for the Old Horse Barn site and intends to maintain access. The existing bridge over Mill Creek is a critical link to the site but is currently limited to pedestrian use due to its deteriorated condition. A major flood event could further damage the structure and dislodge the compromised timber decking.

The bridge consists of a steel truss span with lateral steel beams supporting wood girders and a timber deck. Reinforced concrete abutments with gabion baskets provide erosion protection. The wood components, including girders and decking, are severely deteriorated, with a hole on the west side posing a significant safety hazard. While the steel elements may be salvageable for retrofit, all wood components require replacement.

E.3.5 Bridge to Gauging Station

There is a small 2 ft wide pedestrian bridge spanning the creek to the gauging station. The bridge is unpainted and has surface corrosion. The bridge looks like it was made in a local shop without being designed. The bridge has four ½" diameter anchor bolts attaching the bridge to the concrete abutments. If the bridge was not designed for flow, there is a potential for the small anchor bolts to be inadequate in shear/tension and the result would be the bridge superstructure becoming separated from the abutments and be taken by the flood waters downstream. Bridge was manufactured by caregiver, who is skilled with welding. Access to the Gauging station is a critical component of WTP operations and needs to be maintained.

E.3.6 Caregiver Facilities

Overall, the house is in fair condition but has heating and cooling issues and needs drywall repairs. Additional, in past flood events, it was reported that flood water got within a few feet of the house.

Electrical system condition assessment is observed to be in a fair condition.

- The existing powerlines to the Screening building and Caregiver residence are overhead and are showing signs of deterioration and are in close proximity to trees. This last segment of the utility power could be placed underground for improved reliability.
- The interior of the residence was not reviewed during the site visit. There was mention of the residence needing some electrical upgrades.
- No standby power
- The electrical service to the Caregiver residence is currently has separate utility transformer and meter.
- Standby Power Options
  - The separate utility service could be replaced with a new feeder from the Screening building which would then provide standby power for the Caregiver residence. This would require a system study to ensure that the existing 225A Screening building service and generator are adequate for the addition of the Caregiver residence.
  - The Caregiver residence could have a transfer switch installed and a new feeder could be installed from the standby generator which would then provide standby power for the Caregiver residence. This would require a system study to ensure that the generator is adequate for the addition of the Caregiver residence.
  - A new generator with automatic transfer switch could be provided for the Caregiver residence.

consor

APPENDIX F
SITE ASSESSMENT REPORT FOR WILDFIRE RESILIENCY OF WATERSHED INTAKE SITE, NMI

Memorandum

Date: December 2024

Project: City of Walla Walla Watershed Master and Resiliency Plan

To: Frank Nicholson
City of Walla Walla

From: Adam Herrenbruck
Northwest Management, Inc.

Heather Pina (Project Manager)
Consor

Re: Site Assessment Report for Wildfire Resiliency of Watershed Intake Site

Introduction

Understanding watershed resiliency is crucial, as environmental hazards such as wildfires can significantly impact water quality and quantity. In the Pacific Northwest, wildfires have become more frequent and severe due to climate change and increased human activity. These fires can cause extensive damage to forested watershed, leading to higher erosion rates, debris flow, and sedimentation in water sources, ultimately affecting both water quality and quantity.

One of the City of Walla Walla's (City) primary water supply sources is Mill Creek River, located within the protected Mill Creek Watershed which spans two states and four counties. The United States Forest Service (USFS) owns 90 percent of the watershed, while the City owns the remaining 10 percent. Water from Mill Creek is diverted at the City's intake structure/diversion and treated at its Water Treatment Plant.

This memorandum presents the findings from Northwest Management, Inc. (NMI) regarding wildfire resiliency within the City-owned portion of the Mill Creek Watershed, adjacent to the City's surface water intake/diversion structure. This memorandum was developed as part of the City's Watershed Master and Resilience Plan. It is intended to document the observations made by NMI during the September 19, 2024 site visit and outline potential mitigation actions to reduce wildfire-related hazards and risks.

This memorandum is divided into four main components, which were assessed for wildfire resiliency through a field visit and desktop analysis. Each component represents a distinct physical area at and adjacent to the City's surface water intake/diversion structure, with unique characteristics and functions.

- Watershed intake/diversion facilities: Critical infrastructure for water supply management, consisting of diversion/intake, fish screens, fish ladder, control building, screening/sorting building, and standby generator.

- Caretaker facilities (home site): Consisting of a home, barn, and shop.
- Forested areas north of Mill Creek Road: Consisting of a vegetation-dense zone and access path.
- Corral and barn area: Consisting of an abandoned barn/corral area to the south of Mill Creek.

Figure 1 and Figure 2 depict the Mill Creek Watershed and associated areas of interest.

Figure 1 | Mill Creek Watershed & City of Walla Walla Intake

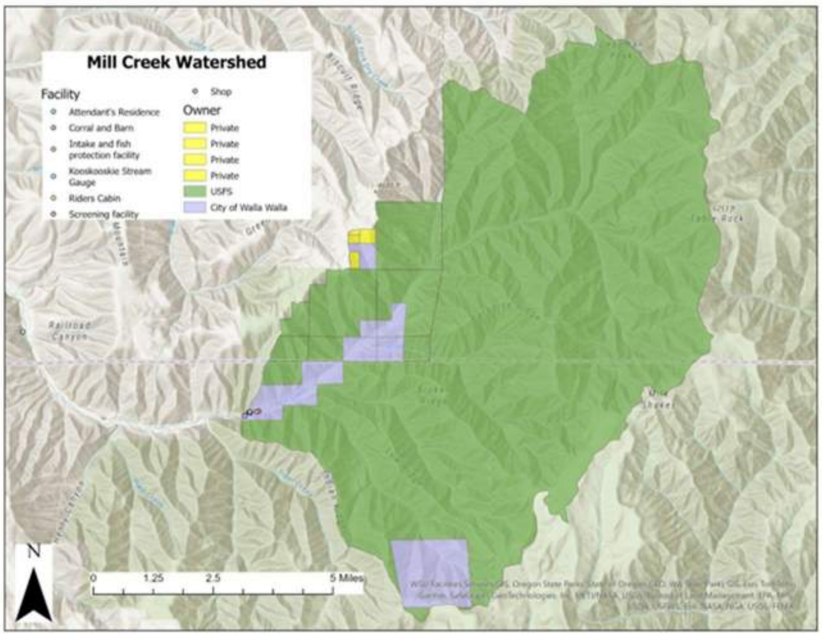
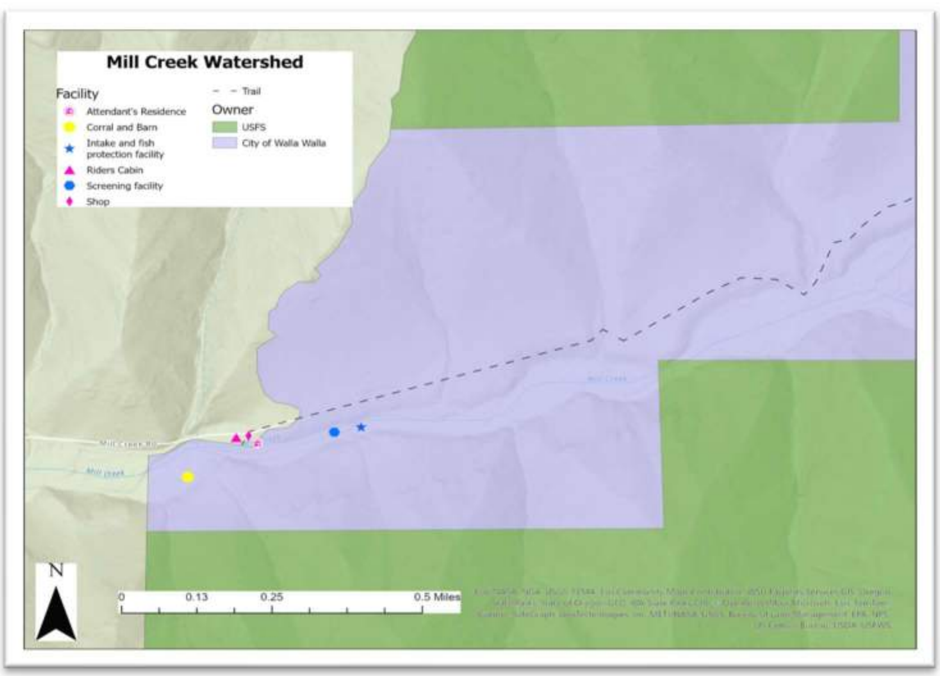


Figure 2 | Mill Creek Watershed – Zoomed In to City Owned Portion



Wildfire Risk Analysis Methodology

Wildfires are the uncontrolled destruction of forests, brush, field crops, and grasslands caused by nature or humans leading to soil erosion, sedimentation, and water contamination. The probability of a wildfire in any one location on a particular day depends on many factors: fuel conditions, topography, time of year, wind direction and speed, past and present weather conditions, and the activity that is or will be taking place (debris burning, land clearing, etc.).

Landscape Fire and Resource Management Planning Tools (LANDFIRE) is a program that is collaboratively produced by the US Department of the Interior, the USFS, and other partners that provides geospatial data, maps, and tools designed to support fire and land management activities. LANDFIRE data was used by NMI to analyze the 13 Fire Behavior Fuel Models[1] present in the area as defined by the USFS April 1982 General Technical Report INT-122, Aid to Determining Fuel Models for Estimating Fire Behavior. Those most applicable are presented in Table 1 below. The models can indicate the kind of fire behavior expected for that type of fuel.

According to the data, and confirmed by visual observation, the primary fuel types adjacent to this area consist of models 5-Brush, 8-Closed Timber Litter, and 9-Hardwood Litter. Higher up the slopes to the north of Mill Creek, there is a presence of models 1 and 2. These are grass fuel groups. To a lesser extent, Model 10-Timber (litter and understory) is also present near the road and facilities. Model 10 is more common south of Mill Creek. Model 11-Light Logging Slash, does occur but very sparingly. The models can indicate the kind of fire behavior expected for that type of fuel. The models' fire behavior characteristics are described in the table below.

Table 1 | Fire Behavior Fuel Model

Fire Behavior Fuel Model	Description of Fire Behavior[2]
1. Short grass	Surface fires that burn fine herbaceous fuels, cured and curing fuels, little shrub or timber present, primarily grasslands and savanna
2. Timber (grass and understory)	Burns fine, herbaceous fuels, stand is curing or dead, may produce fire brands on oak or pine stands
5. Brush (2 feet)	Low intensity fires, young, green shrubs with little dead material, fuels consist of litter from understory
8. Closed timber litter	Slow, ground burning fires, closed canopy stands with short needle conifers or hardwoods, litter consist mainly of needles and leaves, with little undergrowth, occasional flares with concentrated fuels
9. Hardwood litter	Longer flames, quicker surface fires, closed canopy stands of long-needles or hardwoods, rolling leaves in fall can cause spotting, dead-down material can cause occasional crowning
10. Timber (litter and understory)	Surface and ground fire more intense, dead-down fuels more abundant, frequent crowning and spotting causing fire control to be more difficult
11. Light logging slash	Fairly active fire, fuels consist of slash and herbaceous materials, slash originates from light partial cuts or thinning projects, fire is limited by spacing of fuel load and shade from overstory

[1] https://www.fs.usda.gov/rm/pubs_int/int_gtr122.pdf

[2] https://landfire.gov/fuel/fbfm13

Significant fire behavior in this area is likely based on the fuel models that are present. Fuel model 9 includes the ponderosa pine and Douglas-fir stands in the area and has potential for more intense fire activity. Fires that start in nearby brush fuels can carry quickly into these fuels and generate a rapid rate that carries into the canopy, resulting in crowning and spotting.

Wildfire Intensity

The United States Department of Agriculture's (USDA's) Wildfire Risk to Communities program[3] provides a tool called Conditional Flame Length (CFL), which estimates the most likely flame length at a given location if a wildfire occurs. CFL values for the City's water intake/diversion structure and surrounding area range from 0 feet to over 20 feet. In areas immediately adjacent to structures and roads, reported CFLs are between 8-12 feet and 12-20 feet. These values indicate a strong potential for extreme fire behavior in the City-owned portion of the Mill Creek Watershed near the diversion/intake facility.

Risk Reduction Zones

The USDA's Wildfire Risk to Communities program provides another tool that analyzes every pixel on the landscape to determine whether a structure is directly exposed to wildfire from adjacent wildland vegetation. It also assesses indirect exposure, such as from embers or home-to-home ignition. Structures classified as minimally exposed are set back a significant distance from both the direct and indirect wildfire sources.

According to this model, all structure at the watershed intake site fall within the Direct Exposure zone. This suggests that targeted mitigation efforts in this area could be highly effective in reducing wildfire risk.

Field Observations

While geospatial data and fire behavior models provide valuable insights into wildfire risk, on-the-ground assessments are essential for identifying site-specific conditions that may not be fully captured in the dataset. To supplement the wildfire risk analysis, a site visit was conducted to evaluate existing conditions, including vegetation density, potential fuel sources, and areas where mitigation efforts could be most effective. Observations focused on identifying overgrown vegetation near structures, assessing defensible space, and pinpointing key locations for risk reduction efforts. The following section outlines the key findings from this field assessment including observations and opportunities to enhance fire resiliency.

Watershed Intake/Diversion Facilities

There are two areas of multiple structures that make up the intake/diversion facilities.

1. The intake and fish protection facility consists of a diversion/intake, fish screens, fish ladder, and control building.
2. The screening facility consists of the screening/sorting building, a standby generator under a wood awning, and an adjacent diesel fuel tank.

The access road ends in front of the intake/diversion structure with a wide parking area situated between the two areas as shown in Figure 3.

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[3] https://wildfirerisk.org/download/

Figure 3 | Watershed Intake/Diversion Facilities

Observations

All structures in this area face moderate risk of wildfire damage, as well as secondary hazards such as landslide or debris flow following a large wildfire event. Key observations from the site assessment are listed below, followed by corresponding photos.

- Challenging Topography: The narrow canyon with steep inclines on either side of the main road and buildings present two significant challenges.
  - Mitigation Limitations: The steep terrain complicates wildfire mitigation efforts, particularly road construction and vegetation removal.
  - Increased Fire Behavior Risk: The topography can accelerate fire spread, increasing the potential for extreme fire behavior.
- Vegetation Conditions:
  - Heavy brush and small-sized hardwood component in the understory, including fine live fuels such as ninebark and grasses.
  - A significant component of fine and heavy dead fuels in the understory including timber litter, branches, and logs.
  - Major presence of disease or pests (potentially root rot and defoliators) in the overstory
  - Dead and dying, standing timber along the canyon sides, including near the facilities
  - The road runs along the north side of Mill Creek and the vegetation is in closer proximity to the facilities with more potential to impact them by either direct flame contact or from falling trees.
    - There is better access to the vegetation on this side of the creek with more opportunities for treatment.

- This is also a hard-south slope with a potential for dryer fuels and a more fire-prone forest composition.

➢ Building materials used in the construction of the facilities are highly flammable and the buildings themselves have construction defects that make them more receptive to embers.

➢ Heavy vegetation is immediately adjacent to a few of the structures, increasing exposure.

➢ Boulders, rocks, and large fallen logs exist on steep slopes above the facilities, creating the opportunity for rolling debris to impact the facilities during a wildfire event.

➢ The narrow road and parking area around the facilities provide limitations on fire suppression vehicles responding to a fire in the area.

Photo 1 | Intake/Diversion Control Building

Photo 2 | Screening Building & Generator

Photo 3 | Behind Generator Fuel Tank

Photo 4 | Generator and Cover

Photo 5 | Vegetation Near Structures

Opportunities to Enhance Wildfire Resiliency

- At a minimum, a 5-foot zone, free of combustible material, should be created around all structures and fuel tanks. This will likely involve initial vegetation removal as well as developing a maintenance plan to address new growth. Tactics that can be used would include mowing, spraying, and brush mastication. Very few large trees need to be removed to achieve this objective.

- Explore slope stabilization to achieve two objectives:

  - Reinforce steep and rocky soils where slide potential exists. Slides could not only damage buildings and equipment but could also block roads and endanger suppression crews during a wildfire.

  - During a wildfire, rolling debris could cause fire to spread rapidly and make fire behavior less predictable .

- Building materials and construction should be assessed to determine weaknesses in wildfire resiliency.

- Assess and remove hazard trees that have potential to fall and damage buildings or block access. Hazard trees are dead or dying trees that become weak and fall in windy conditions or during a wildfire. Hazard trees can all also be live trees with unstable root systems in shallow soil or on slopes. Taller trees have more potential to cause damage and disruption.

Caretaker Facilities (Home Site)

This area consists of three buildings: the caretaker's residence, a rider's cabin, and a shop. The gravel road providing access to the City property is widest at this point and serves as the main driveway for these buildings. There are multiple spots for vehicles to turn around and park within the area. To the west of the buildings, there is a parking area and a fenced pasture, approximately half an acre in size. On the east side of the residence, a two-track road exits the area and ascends the hill, running parallel to the creek.

Observations

Key observations from the site assessment are listed below, followed by corresponding photos.

- Overstocked vegetation is present close to current buildings, including fine and heavy fuels.
- Building materials used in construction of the structures at the home site are highly flammable and the buildings themselves have construction defects that make them receptive to embers.
- There is a lot of room around the home site to allow for wildfire suppression vehicles to maneuver and access the property, safely fight the fire, and evacuate easily.
- Mill Creek Road Discussion
    - Mill Creek Road is maintained from the state border to the City gate at the intake/diversion site by Umatilla County. The road is narrow and windy in places and is composed of gravel on the Oregon side.
    - Mill Creek river runs very close to the road in several places and could pose a flooding risk, possibly interrupting access to the site for both normal and emergency purposes. The safe condition of the road would also be critical in the event of a need to evacuate the site during a wildfire event in the watershed. This may include city staff evacuating the premises or it may include wildland fire response personnel hiking out of the watershed via the foot trail.
    - It was noted that the County will pave the road this summer, Summer 2025.

Photo 6 | Caretaker Facilities

Photo 7 | Caretaker Facilities – Looking Behind Barn

Opportunities to Enhance Wildfire Resiliency

- The slopes north of the home site are gradual enough for potential containment line construction to increase fire suppression options. This could be achieved by expanding the currently existing road corridor that runs northwest from the corner of the home site.

- Building materials and construction should be assessed to determine weaknesses in wildfire resiliency.

- Overstocked vegetation near the home site should be thinned and pruned up to a minimum height of 6 feet. Grass and brush inside the perimeter of the home site should be mowed and weeds should be sprayed or pulled.

- Wildfire resistant landscaping practices should be utilized to increase resiliency including decorative plant selection and fire-resistant landscaping materials.

Forested Areas North of Mill Creek Road

This section discusses the adjacent forestlands north of both the home site and the intake/diversion facilities.

Observations

Key observations from the site assessment are listed below, followed by corresponding photos.

- Vegetation: Mixed conifer overstory with heavy brush component or low-growing understory plants higher up the slopes.
  - Grand fir-ninebark/Douglas fir-ninebark
  - Ponderosa pine more prevalent higher up the slopes

- Forest health: Brush is heavy in the understory along with overstocked and diseased overstory trees in places. Where spacing of the overstory is healthy, trees are in better condition and brush component is minimal.
- Previous vegetation treatments: Some thinning has occurred to reduce the overstory trees per acre. Smaller diameter trees were thinned and larger diameter overstory trees were pruned up above six feet.
- Two-track Road: this road runs from the northeast corner of the home site to the east/northeast and can support some equipment. The road will require maintenance for more regular use.
- Trail: Where the track ends, just north of the intake, a foot trail continues on, and parallels Mill Creek running northeast.

Photo 8 | Upstream of Intake/Diversion

Photo 9 | Forested Area

Photo 10 | Forested Area and Trail

Photo 11 | Forested Area Slopes

Opportunities to Enhance Wildfire Resiliency

- Assessment: An assessment should be conducted that determines the level of overstocking that is present on this parcel and identifies appropriate stocking levels, species composition, and health factors that should be targeted.
    - Based on the forest habitat type, establish an appropriate number of trees per acre.
    - Determine the appropriate forest structure to establish for the area and develop the prescription based on uneven-age silviculture techniques.
    - Identify forest health concerns, such as disease, and establish guidelines for selecting leave-trees based on health and vigor.
- Thinning: Beginning in the area closest to the road, remove stems based on the factors established in the prescription. For steeper slopes closer to the road, hand thinning will likely be required. For the flatter areas, mechanical thinning equipment and mastication can be done.
- Pruning: Beginning in the area closest to the road and buildings, remaining trees should be pruned up to a minimum height of six feet.
- Slash Abatement: The slash can be reduced by chipping and spreading or by piling and burning. Machine thinned stands can also be piled mechanically. Hand thinning might be a good option for many of the areas at this site. The piles should be burned in late fall under the appropriate conditions. Piles should be monitored to ensure adequate consumption and checked in the spring to see if they are still hot prior to summer. Piles that maintain heat throughout the winter can be extinguished in the spring by utilizing a wildland fire engine and hose lay system.
- Trail Improvement: Access to this area is limited but possible due to the two-track road and the hiking trail beyond. Maintaining the road should be prioritized so that response and mitigation equipment can access as far as possible into the area. Maintenance of the trail system is key for access deeper into the watershed by wildland fire response personnel on foot.

Corral and Barn Area

This area is located south of Mill Creek and south/southwest of the home site. It is accessed by a decommissioned bridge that is unsafe for vehicular traffic of any kind. A short trail leads to a wide, grassy, flat area with corral remnants. A barn and stock feeding structure remain on the site. Power lines run across Mill Creek to a power pole located near the barn. A significant amount of fencing is still present in this area and the total flat area, including the corrals, is roughly one acre in size.

Observations

Key observations from the site assessment are listed below, followed by corresponding photos.

- The flat, treeless area has potential for some uses, but lack of vehicular access keeps this potential limited.
- Several snags are observable from the barn area, including many tall, old trees that appear to have died in the last few years.

- Some younger conifers have begun to encroach on this area, otherwise the main fuel here is tall grass. The grass is kept mowed by the attendant.

Photo 12 | Bridge to Corral and Barn Area

Photo 13 | Corral and Barn Area

Photo 14 | Corral and Barn Area

Opportunities to Enhance Wildfire Resiliency

- Snags and other hazard trees that are close to this area should be removed.
- If this site is to be maintained, a forest assessment, thinning, pruning, and slash abatement plan should be established for the forested area immediately adjacent to it.
- The barn should either be demolished and all materials removed, or its building materials and construction should be assessed to determine weaknesses in wildfire resiliency.
- Encroaching trees should be removed, and the grass should be kept mowed as widely as possible.
- The area should be assessed by wildfire response personnel for its potential usefulness as a helispot, safety zone, fire break, access point, or other feature and then a plan can be established to enhance the area for any of those uses.

Next Steps

The opportunities to enhance wildfire resiliency identified during the site assessment will be vetted and translated into specific mitigation actions. Engagement and collaboration with key watershed stakeholders will be a critical next step that will help assess the feasibility and viability of proposed mitigation measures, ensuring they align with broader watershed management goals and stakeholder priorities. Following stakeholder engagement, the finalized mitigation actions will be integrated into the Watershed Master and Resiliency Plan and incorporated into a comprehensive capital improvements project list. Additionally, potential funding opportunities will also be explored to support implementation efforts, strengthening the City's long-term wildfire resiliency strategy.

APPENDIX G
US ARMY CORPS OF ENGINEERS 2020 RECOMMENDATIONS FOR RAW WATER TRANSMISSION MAIN

consor

To: Michelle Frost. Catastrophic Disaster Response Program Manager. CENWW-RO
From: Steve Wyrembelski, CENWW-ECD-G & Mitch Price, CENWW-ECH.
RE: City of Walla Walla Tech Assistance – Upper Mill Creek Site Visit
Date: 14-Feb-2020

Background

The City of Walla Walla Public Works Department (City) has requested technical assistance via PL84-99 following the FY 2020 Mid-Winter Flood Event. More specifically, they are requesting technical assistance with approximately three (3) discrete sections of their 30-inch diameter water supply transmission line that was washed out during the recent February 2020 flood event on Mill Creek which is reported to have seen peak flows in excess of 7 kcfs. Anecdotally, sections of the original water transmission line was significantly damaged during the February 1996 flood and the line was abandoned and replaced with this 30-inch line. Evaluation of more specific details in USACE records may be prudent to provide a basis for comparison if they exist.

At noon on 13 February 2020, Steve Wyrembelski (USACE) and Mitch Price (USACE) met with Mori Struve and Michael Laughery of the City to assess the pipe damage locations as well as check on the status of the temporary road access which was currently underway by Umatilla County road crews. The team was able to travel to about 1000 feet downstream of Tiger Creek Road, which was the upstream most site of the damaged areas. Damage site locations and descriptions are provided below.

In the short term, the City has been able to switch to groundwater sources for the City of Walla Walla water supply. However, it is important to note that this transmission line serves as a critical water source in the system during peak demand times and also is used to recharge the local groundwater aquifer which serves as a large storage reservoir for the system. As such, the water supply transmission line is not considered a secondary or backup system and restoration of the transmission infrastructure is a very high priority for the City and ideally would be restored no later than this summer in order to adequately meet peak water demand.

From a jurisdictional perspective, one key detail to resolve in restoring the City's water transmission line is that the sections in need of repair are located in Umatilla County Oregon, and were buried within the subgrade of Mill Creek Road, which is also known as County Road 582 on the Oregon side. In general, being located within the road, the water transmission line relied upon the bearing capacity and erosion protection that was provided by the road prism. As previously noted, sections of this road were also damaged during the February 1996 flood event and were subsequently repaired. It is not known at this time if the repaired road sections were protected with revetment or to what hydrologic event they may have been designed to withstand.

From a technical perspective and to improve resiliency relative to the 1996 repair, there are a number of key design factors that should be considered including:

- Pipe alignment, bedding, and anchorage
- Road grade, elevation, material, and drainage.
- Road/Pipe erosion protection
- Hydrologic design magnitude (e.g. 100-year, 1% AEP)

- River flooding thresholds, channel conveyance capacity and overbank flow paths
- River hydraulics including effects of channel bed and grade transitions on current/future impingement points, lateral and vertical channel adjustment, and sediment transport capacity.

Site #1 – Lower

The lower erosion site (Site #1) is located upstream of the town of Kooskooskie, WA (approximately 45°59'41"N 118°06'34"W) as shown in Figure 1-1 below. This site is approximately located SE of where Reynolds Drive joined Mill Creek Road. Although Mill Creek Road in this area was not directly adjacent to the active Mill Creek Channel, during the flood, Mill Creek breached its right bank into the road alignment which subsequently unraveled. The total lineal feet of damaged pipe and road at Site#1 has not yet been quantified.

Figure 1-1. Approximate location of Site#1 – Lower.

Figure 1-2. Zoomed in view of ~Site#1 – Lower Location, and approximate breach area.

Figure 1-3. Random Stick of 30" Water Transmission Line in Site #1 that was installed in 1996. Note that the pipe in the Site#1 reach was steel with welded joints.

Figure 1-4. Site #1 looking upstream at damaged water transmission line.

Figure 1-5. Site #1 looking downstream at damaged water transmission line.

In Figures 1-4 & 1-5 above, note the presence of both new 30” pipe as well as older 24” pipe that was abandoned following the 1996 flood. Also note the temporary road prism that was recently repaired. As of 11-Feb-2020, this road was completely washed out and the active channel flow (which has now been diverted back to its original channel) was flowing against the hillside toe. The vertical grade in this area is reported to be bedrock controlled which may influence final invert grades for replacement pipe segments. The Site#1 segment also appears to be at an elevation that is lower than the main Mill Creek channel indicating a higher risk potential for future flooding and erosion.

Figure 1-6. Bedrock outcrop on Mill Creek left bank upstream of Site#1 which appears to have directed flows into the right bank.

Figure 1-7. Right bank breach location adjacent to bedrock outcrop shown in Figure 5 above.

In Figures 1-7 and 1-8, note temporary alluvium diversion constructed by Umatilla County ~12-Feb-2020 in order to facilitate reconstruction of the county road. This diversion is highly susceptible to erosion and is not expected to be sufficient to withstand spring freshet flows at bankfull or greater.

Provisional Recommendations for Site#1 – Lower:

- Restore the road and pipe alignment.

- Considering the shallow bedrock, use grouted rock anchors or equivalent with cabling to secure the water transmission pipe in critical areas.
- Consider constructing a hardened bench with road prism gabions and/or grouted angular rock to improve provide redundant erosion protection for the water transmission line.
- Address lateral adjustment and flow overtopping on the right bank across from bedrock outcrop
    - Considering the abrupt angle of change in the planform alignment, the installation of river training structures tied into a hardened revetment and levee is recommended to help keep the channel from breaching in this location in future floods.

Figure 8. Panoramic view of breach location on Mill Creek upstream of Site #1.

<u>Site #2 – Middle</u>

The middle erosion site (Site #2) is located upstream of Henry Canyon (approximately 45°59'14"N 118°04'55"W) near the Neotoma Lane junction as shown in Figure 2-1 below.

The Mill Creek channel in this location also breached its right bank and activated an isolated area of lower elevation floodplain upstream of a private bridge crossing. While much of the exposed transmission line in this area appeared to be intact, there is undermining and other pipe adjustments that have compromised the pressure integrity of the slip joints. The total lineal feet of damaged pipe and road at Site#2 has not yet been quantified.

Figure 2-1. Approximate location of Site #2 – Middle. Upstream of Henry Canyon.

Figure 2-2. Zoomed in view of ~Site#2 – Middle Location.

Figure 2-3. Looking Upstream at exposed pipe in Site #2.

In Figure 2-3 above, note the re-grading of the Mill Creek right overbank. The active channel flow was against the road prism, but has subsequently been isolated back to its original channel using some localized push-up berms.

Figure 2-4. Undermined section of exposed pipe in Site #2.

Figure 2-5. Site#2 looking downstream (SW) towards the private bridge crossing.

Provisional Recommendations for Site#2 – Middle:

- Restore the road and pipe alignment
- Restore the road prism, by grading from the top of road to the toe of floodplain using relatively flat slopes (5H+:1V) that are angled to steer large overbank back towards the main channel and add revetment.
- Consider constructing a hardened bench within road prism comprised of large angular rock and/or gabions to improve bearing capacity for the water transmission line as well as provide redundant erosion protection.
- Correct the flow route path in the right overbank by grading in a stable swale to steer frequent flood flows back towards the main channel. Include a hardened tie-in sill at the upstream end of the swale to mitigate avulsion risk.
- Elevate the North approach of the downstream bridge and provide conveyance using culverts or equivalent for right overbank return flows.
- Grade and shape Mill Creek channel to remove sediment lag deposits that could create future impingement points.

Figure 2-6. Site#2 looking downstream (SW) with Mill Creek channel to the left. Note the exposed pipe also shown in Figure 2-3.

Site #3 – Upper

The upper erosion site (Site #3) is located downstream of the junction of China Cany Place (approximately 45°59'17"N 118°04'08"W) as shown in Figure 3-1 below. The road (and buried pipe) in this location appears to be approximately 50-75 feet offset from the main active Mill Creek channel. Although there is not a direct flow impingement point evident, the channel does appear to slightly bend to the left, which likely allowed for overbank flows to access the right floodplain and subsequently erode the road prism. The total lineal feet of damaged pipe and road at Site#3 has not yet been quantified.

Figure 3-1. Approximate location of Site#3 – Upper.

Figure 3-2. Zoomed in view of approximate Site#3 – Upper.

Figure 3-3. Site#3 – Upper. Looking upstream at damaged & missing pipe segments.

Figure 3-4. Site #3 – Upper. Looking upstream.

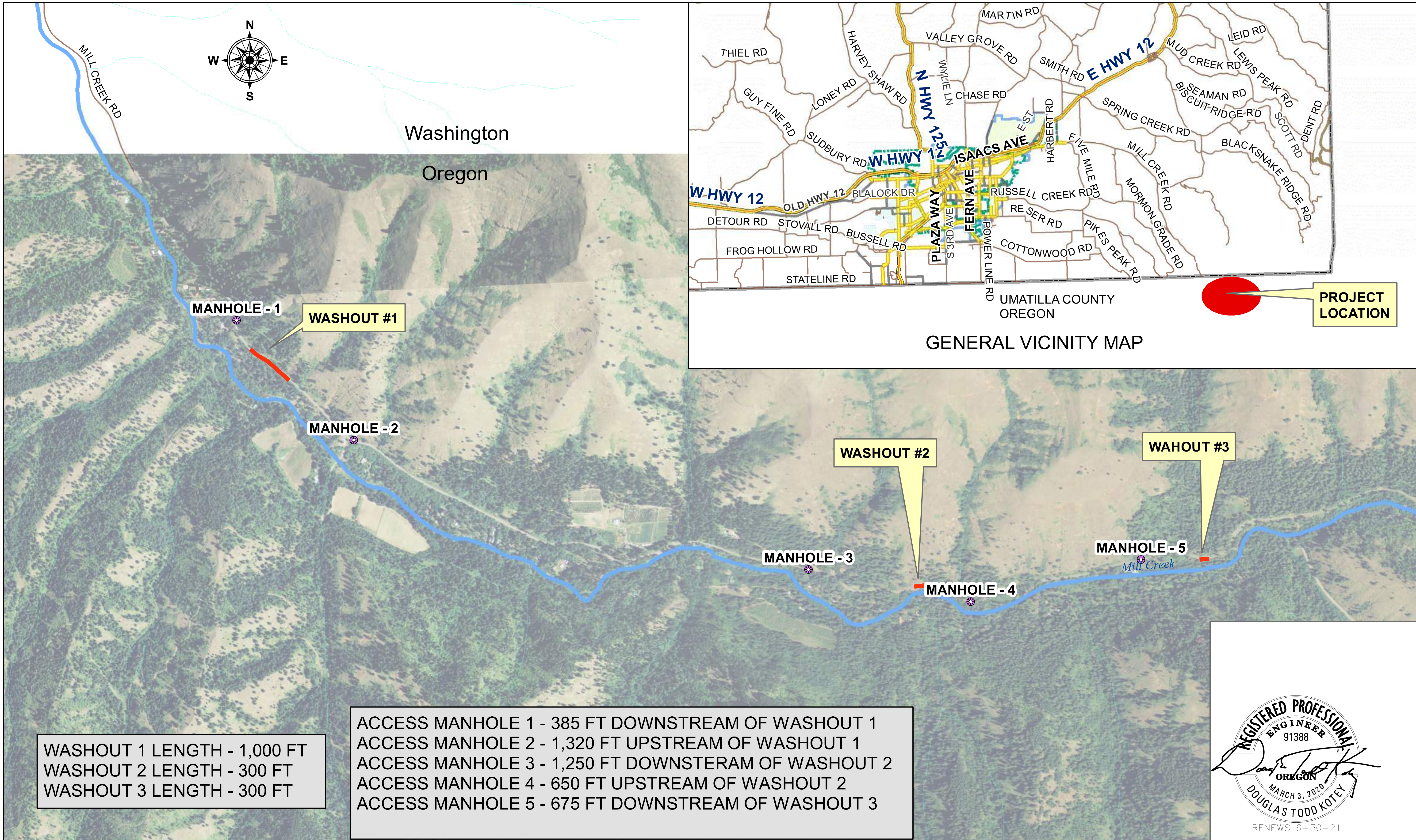
Figure 3-5. Site#3 – Upper. Panoramic view with upstream to the left side and downstream to the right side.

Provisional Recommendations for Site#3 - Upper:

- Restore the road and pipe alignment.
- Use slopes 3H:1V or flatter for reconstruction of the road prism.
- Provide revetment for road prism slope protection.
- Consider constructing a hardened bench within road prism comprised of large angular rock and/or gabions to improve bearing capacity for the water transmission line as well as provide redundant erosion protection.
- Grade and shape Mill Creek channel to remove sediment lag deposits that could create future impingement points.

APPENDIX H
2020 EMERGENCY REPAIRS OF
RAW WATER TRANSMISSION MAIN

MILL CREEK TRANSMISSION MAIN
EMERGENCY REPAIR - VICINITY MAP



Print Date: FEBRUARY 27, 2020

0 500 1,000 2,000 Feet

The City of Walla Walla does not warrant, guarantee or accept any liability for the accuracy, precision or completeness of any information shown or described hereon or for any inferences made therefrom. Any use made of this information is solely at the risk of the user.

1 inch = 1,000 feet

SHEET 1

CITY OF WALLA WALLA

PHOTOS ABOVE – MANHOLE 1 – NEAR 60974 MILL CREEK RD

PHOTOS ABOVE – MANHOLE 2 – LANE EAST OF REYNOLDS LN

PHOTOS ABOVE – MANHOLE 3 – NEAR 61471 MILL CREEK RD

PHOTOS ABOVE – MANHOLE 4 – EAST OF NEOTOMA LN

PHOTOS ABOVE – MANHOLE 5 – NEAR 62086 MILL CREEK RD

MILL CREEK TRANSMISSION MAIN
EMERGENCY REPAIR – WA20002

City of Walla Walla

SHEET 2

WASHOUT #3

PHOTO ABOVE – UPSTREAM END OF WASHOUT 3

WASHOUT 3 – SEQUENCE OF WORK

1. DIG AND VERIFY LIMITS OF PIPE SEGMENTS THAT WERE SEVERED.
2. EXCAVATE, EXPOSE, AND RETRIEVE ALL SIX SEGMENTS OF 30-INCH PCCP PIPE THAT WERE DISLODGED DURING FLOOD EVENT.
3. PERFORM EVALUATION OF PIPE SEGMENT CONDITION.
4. PERFORM PIPE REPAIRS AS NEEDED.
5. PHYSICALLY REMOVE DEBRIS FROM UPPER AND LOWER SECTIONS OF THE PIPELINE THAT IS STILL INTACT.
6. UTILIZE TELEVISION INSPECTION TO VERIFY ALL DEBRIS HAVE BEEN REMOVED FROM INTACT PIPELINE.
7. INSTALL BASE LAYER(S) OF GABION CRIBBING (CREEK SIDE) TO APPROXIMATELY ONE FOOT ABOVE VERTICAL PIPE ALIGNMENT.
8. STARTING AT DOWNSTREAM END, REINSTALL 30-INCH PCCP PER DETAILS.
9. PRIOR TO FINAL UPSTREAM END CONNECTION, GROUT INTERIOR OF ALL JOINTS.
10. MAKE FINAL CONNECTION AT UPSTREAM END PER DETAILS.
11. INSTALL CATHODIC PROTECTION CONNECTIONS PER DETAILS.
12. GROUT EXTERIOR PIPE JOINTS PER DETAILS.
13. INSTALL THRUST BLOCKS AT LOCATIONS IDENTIFIED BY ENGINEER.
14. INSTALL PIPE BEDDING TO TOP OF PIPE.
15. INSTALL FINAL LAYER(S) OF GABION CRIBBING.
16. DETERMINE LIMITS OF TELEMETRY FAILURE ACROSS THIS WASHOUT SECTION AND RECONSTRUCT. INSTALL TEMEMETRY TEST STATION APPROXIMATLY 80 FEET DOWNSTREAM OF WASHOUT AREA.
17. PERFORM TEMPORARY ROADWAY RESTORATION.
18. TELEVISE FROM THE NEAREST UPSTREAM/DOWNSTREAM ACCESS POINT TO DOCUMENT THE JOINT MORTARING.

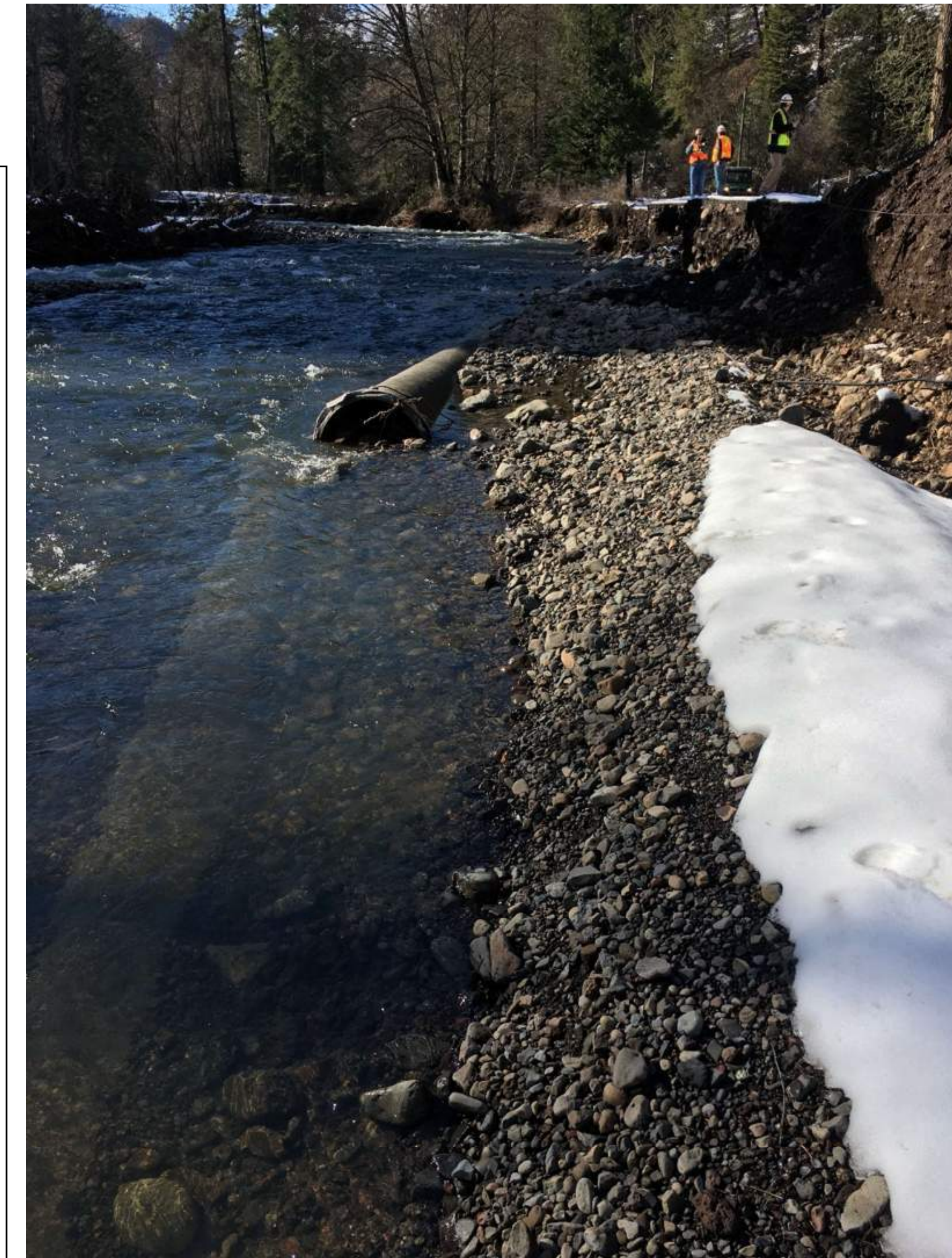


PHOTO ABOVE – DOWNSTREAM END OF WASHOUT 3

MILL CREEK TRANSMISSION MAIN
EMERGENCY REPAIR – WA20002

City of Walla Walla

WASHOUT #2

PHOTO ABOVE – UPSTREAM END OF WASHOUT 2

WASHOUT 2 – SEQUENCE OF WORK

1. EXCAVATE AND EXPOSE, ALL FOUR JOINTS AND PIPE SEGMENTS OF 30-INCH PCCP PIPE THAT WERE EXPOSED DURING FLOOD EVENT.
2. PERFORM EVALUATION OF PIPE DEFLECTION.
3. REDUCE PIPE DEFLECTION IF DETERMINED NECESSARY BY THE ENGINEER. MAX DEFLECTION IS 4%.
4. INSTALL BASE LAYER(S) OF GABION CRIBBING (CREEK SIDE) TO APPROXIMATELY ONE FOOT ABOVE VERTICAL PIPE ALIGNMENT.
5. INSTALL CATHODIC PROTECTION CONNECTIONS PER DETAILS.
6. GROUT EXTERIOR PIPE JOINTS PER DETAILS.
7. INSTALL THRUST BLOCKS AT LOCATIONS IDENTIFIED BY ENGINEER.
8. INSTALL PIPE BEDDING TO TOP OF PIPE.
9. INSTALL FINAL LAYER(S) OF GABION CRIBBING.
10. DETERMINE LIMITS OF TELEMETRY FAILURE ACROSS THIS WASHOUT SECTION AND RECONSTRUCT. INSTALL TELEMENTRY TEST STATION APPROX. 80 FEET DOWNSTREAM OF WASHOUT AREA.
11. PERFORM TEMPORARY ROADWAY RESTORATION.
12. TELEVISE FROM THE NEAREST UPSTREAM/DOWNSTREAM ACCESS POINT TO DOCUMENT THE INTERIOR JOINT MORTAR CONDITION.

PHOTO ABOVE – DOWNSTREAM END OF WASHOUT 2


PHOTO ABOVE – UPSTREAM END OF WASHOUT 1 SEVERED PIPE

WASHOUT #1

WASHOUT 1 – SEQUENCE OF WORK – UPSTREAM OF SEVERED PIPE LOCATION

1. EXCAVATE AND EXPOSE, ALL FOURTY JOINTS AND PIPE SEGMENTS OF THE 30-INCH PCCP PIPE THAT WERE EXPOSED DURING FLOOD EVENT UPSTREAM FROM SEVERED PIPE.
2. INSTALL BASE LAYER(S) OF GABION CRIBBING (CREEK SIDE) TO APPROX. ONE FOOT ABOVE VERTICAL PIPE ALIGNMENT.
3. INSTALL CATHODIC PROTECTION CONNECTIONS PER DETAILS.
4. GROUT EXTERIOR PIPE JOINTS PER DETAILS.
5. INSTALL THRUST BLOCKS AT LOCATIONS IDENTIFIED BY THE ENGINEER.
6. INSTALL PIPE BEDDING TO TOP OF PIPE.
7. INSTALL FINAL LAYER(S) OF GABION CRIBBING.
8. TELEVISE FROM THE NEAREST UPSTREAM/DOWNSTEAM ACCESS POINT TO DOCUMENT THE INTERIOR JOINT MORTAR CONDITION.

WASHOUT 1 – SEQUENCE OF WORK – SEVERED PIPE LOCATION

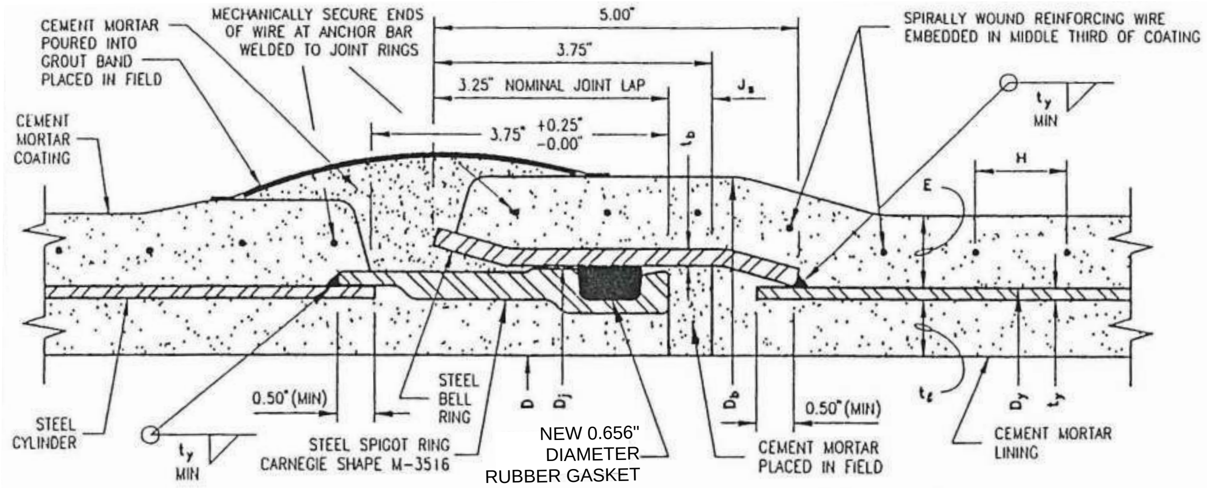
1. DIG AND VERIFY LIMITS OF PIPE SEGMENTS THAT WERE SEVERED.
2. EXCAVATE, EXPOSE, AND RETRIEVE ALL FOUR SEGMENTS OF 30-INCH PCCP PIPE THAT WERE DISLODGED DURING FLOOD EVENT.
3. PERFORM EVALUATION OF PIPE SEGMENT CONDITION.
4. PERFORM PIPE REPAIRS AS NEEDED.
5. PHYSICALL REMOVE DEBRIS FROM DOWNSTREAM SECTIONS OF THE PIPLINE THAT IS STILL INTACT. NO DEBRIS SHALL TRAVEL BEYOND THE PIPE ACCESS STRUCTURE BELOW WASHOUT 1. TELEVISE AS NECESSARY TO VERIFY ALL DOWNSTREAM DEBRIS HAVE BEEN REMOVED.
6. INSTALL BASE LAYER(S) OF GABION CRIBBING (CREEK SIDE AND HILL SIDE) TO APPROX. ONE FOOT ABOVE VERTICAL PIPE ALIGNMENT.
7. STARTING AT DOWNSTREAM END, REINSTALL 30-INCH PCCP PER DETAILS.
8. PRIOR TO FINAL UPSTREAM END CONNECTION, GROUT INTERIOR OF ALL PIPE JOINTS.
9. MAKE FINAL CONNECTION AT UPSTREAM END PER DETAILS.
10. INSTALL CATHODIC PROTECTION CONNECTIONS PER DETAILS AND PERFORM TESTING.
11. GROUT EXTERIOR PIPE JOINTS PER DETAILS.
12. INSTALL THRUST BLOCKS AT LOCATIONS IDENTIFIED BY ENGINEER.
13. INSTALL PIPE BEDDING TO TOP OF PIPE.
14. INSTALL FINAL LAYER(S) OF GABION CRIBBING.
15. DETERMINE LIMITS OF TELEMETRY FAILURE ACROSS THIS WASHOUT SECTION AND RECONSTRUCT. INSTALL TELEMETRY TEST STATION APPROX. 80 FEET DOWNSTREAM OF WASHOUT AREA.
16. PERFORM TEMPORARY ROADWAY RESTORATION.
17. TELEVISE FROM THE NEAREST UPSTREAM/DOWNSTREAM ACCESS POINT TO DOCUMENT THE INTERIOR JOINT MORTAR CONDITION. IF REQUIRED, REMORTAR INTERIOR JOINTS.
18. PERFORM PRESSURE TESTING PER SPECIFICATIONS. REMOVE TEMP. PRESSURE VALVE.

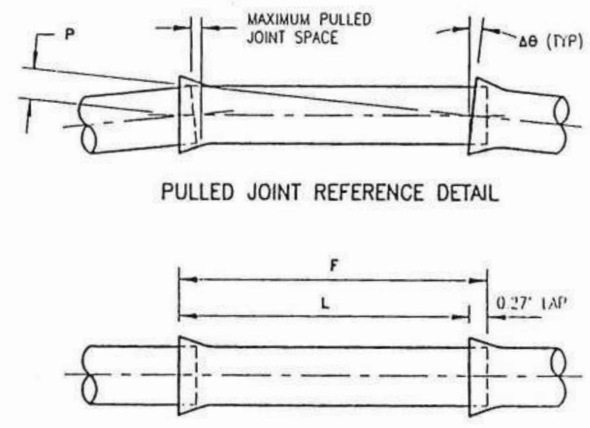

PHOTO ABOVE – UPSTREAM END OF WASHOUT 1 SEVERED PIPE
PHOTO BELOW – CURRENT CONDITIONS OF WASHOUT 1

MILL CREEK TRANSMISSION MAIN
EMERGENCY REPAIR – WA20002

City of Walla Walla

NOTE: THIS DETAIL IS FOR FIELD FITMENT PURPOSES. CMLC PIPE IS EXISTING OR SUPPLIED BY OTHERS





AWWA C200

CEMENT MORTAR LINED AND COATED STEEL PIPE

ASSEMBLED JOINT SECTION

FOR JOINT WELDING SEE SHEET 11.

MANUFACTURING DATA*

GENERAL: D — NOMINAL PIPE DIAMETER (IN)	SPECIFIED PIPE CLASS (PSI)	PIPELINE LAYOUT CLASS DESIGNATION	APPROXIMATE FOOTAGE (FT)	D_j — NOMINAL JOINT DIAMETER (IN)	t_b — BELL RING THICKNESS (IN)	SOCKET DEPTH (IN)	t_l — NOMINAL LINING THICKNESS (IN)	E — MINIMUM COATING THICKNESS (IN)	F — OVERALL LENGTH OF STANDARD PIPE (FT)
30	200	200	565	32.375	1/4	3.75	3/4	1	20.27

STEEL CYLINDER: CYLINDER STEEL AREA A_y/FT (IN²)	t_y — CYLINDER THICKNESS OR GAUGE NO. (IN OR NO.)	D_y — CYLINDER OUTSIDE DIAMETER (IN)	PLANT HYDROTEST PRESSURE (PSI)	WIRE REINFORCEMENT: WIRE DIAMETER (NO.)	WIRE COILS PER FT (NO.)	H — AVERAGE WIRE SPACING CTR-TO-CTR (IN)
2.510	5	31.875	300	14	9.60	1.25

INSTALLATION DATA

L — LAYING LENGTH OF STANDARD PIPE (FT)	D_b — MAXIMUM PIPE O.D. (AT JOINT) (IN)	TYPICAL PIPE O.D. (AT BARREL) (IN)	J_s — INTERIOR JOINT SPACE (IN)	Δθ — MAXIMUM PULL PER JOINT (D MIN)	MAXIMUM PULLED JOINT SPACE (IN)	MINIMUM CURVE RADIUS FOR L= 20 FT (FT)	P — OFFSET USING MAXIMUM PULL FOR L= 20 FT (FT)	SHIPPING WT OF PIPE ASSY PER LINEAR FT (LBS)	SHIPPING WT OF STANDARD PIPE SECTION L= 20 FT (LBS)
20.0	34.88	33.88	0.50	1°46'	1.25	649	0.62	268	5,360

NOTES: PREP & PAINT EXPOSED PORTIONS OF JOINT RINGS PER A/4.

* TO BE FIELD VERIFIED

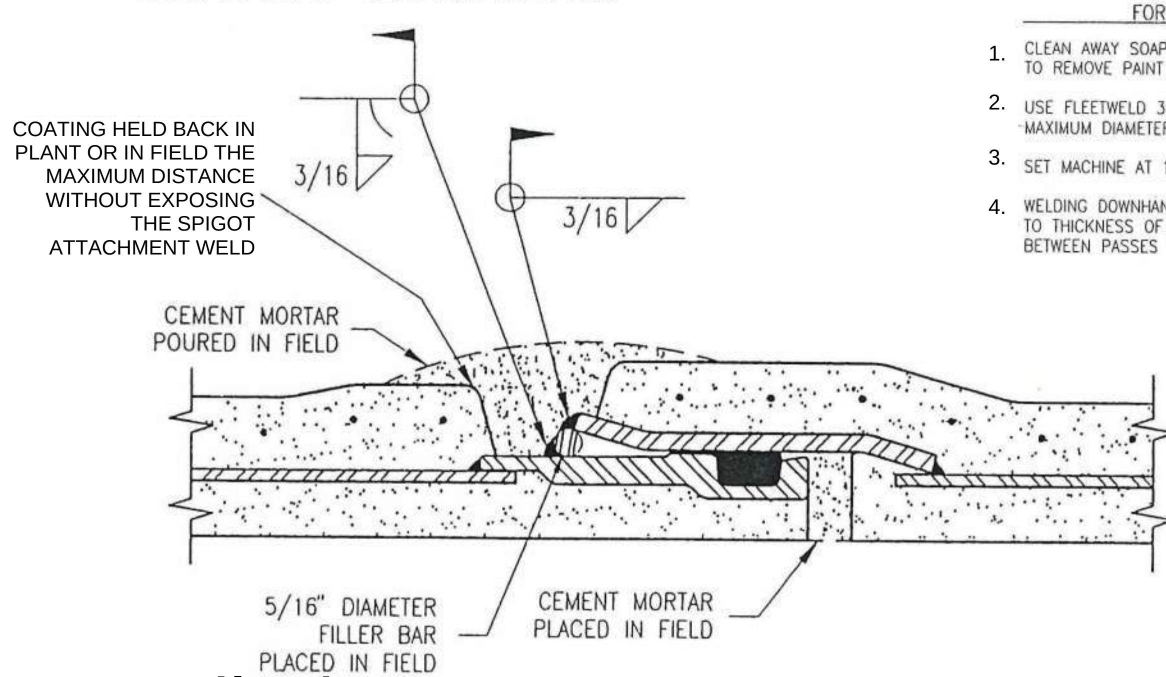
Detail 1/- CEMENT MORTAR LINED AND COATED STEEL PIPE

ASSEMBLED JOINT SECTION

NTS

FIELD WELDED MLCSP JOINT

EXTERIOR CONTINUOUS

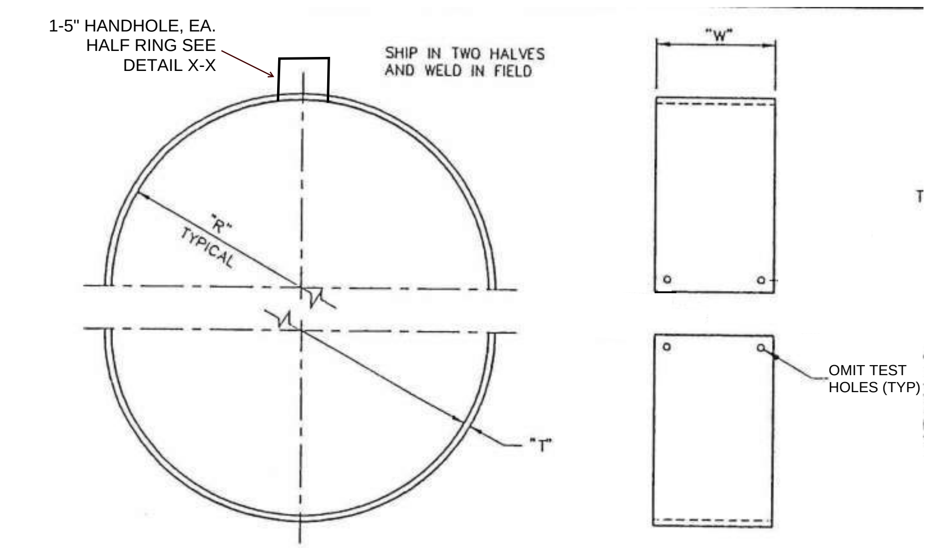


RECOMMENDED FIELD WELDING PROCEDURE FOR TENSION JOINTS

1. CLEAN AWAY SOAP RESIDUE, AND USE WIRE BRUSH TO REMOVE PAINT FROM SURFACES TO BE WELDED.
2. USE FLEETWELD 35 OR 5P ELECTRODE, 5/32" MAXIMUM DIAMETER.
3. SET MACHINE AT 125± AMPS.
4. WELDING DOWNHAND, BUILD UP STRINGER PASSES TO THICKNESS OF BELL. ALLOW COOLING TIME BETWEEN PASSES TO AVOID BURNING THE GASKET.

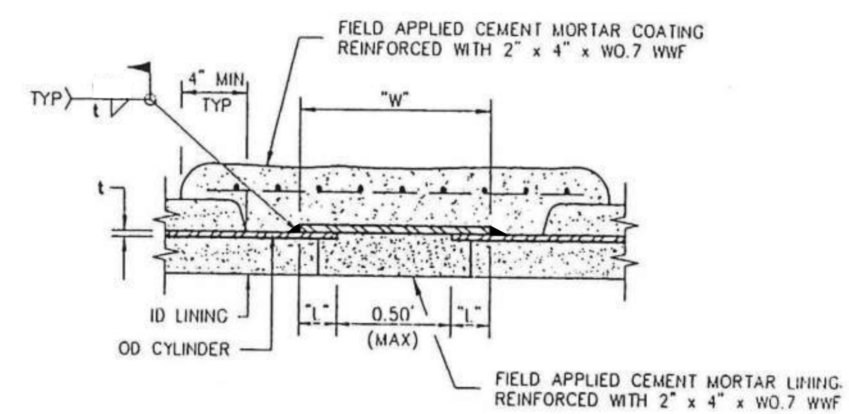
Detail 2/- FIELD WELDED MLCSP JOINT

NTS



NOTE: LOCATE HANDHOLES @ SPRINGLINE

PIPE SIZE	PART NO.	QTY HALF BUTTSTRAP	CUT LENGTH	"R"	"T"	"W"	"L"
30"	D10815-104	4	4.17'	15.81"	1/4"	0.83'	0.17'



CLOSING RING (WSP)

Detail 3/-

NTS

SHEET 6

DESIGNED:	HKP
DRAWN:	DRAWN
JOB #:	JOBNUM
HORIZONTAL:	HSCALE
VERTICAL:	VSCALE
DATE:	DATE
SHEET ID:	SHTID

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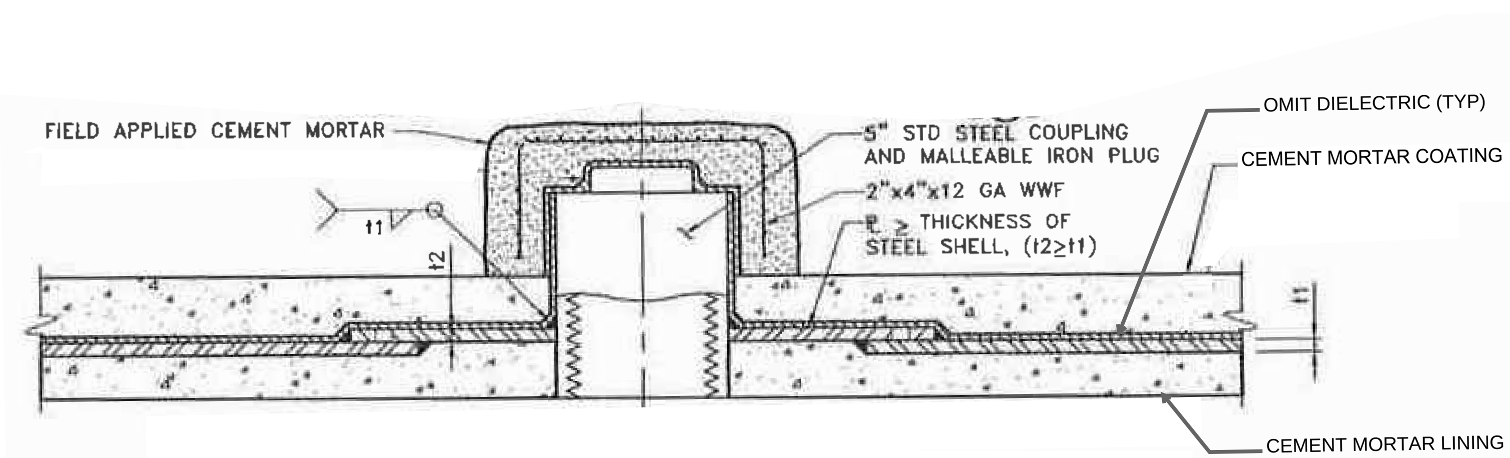
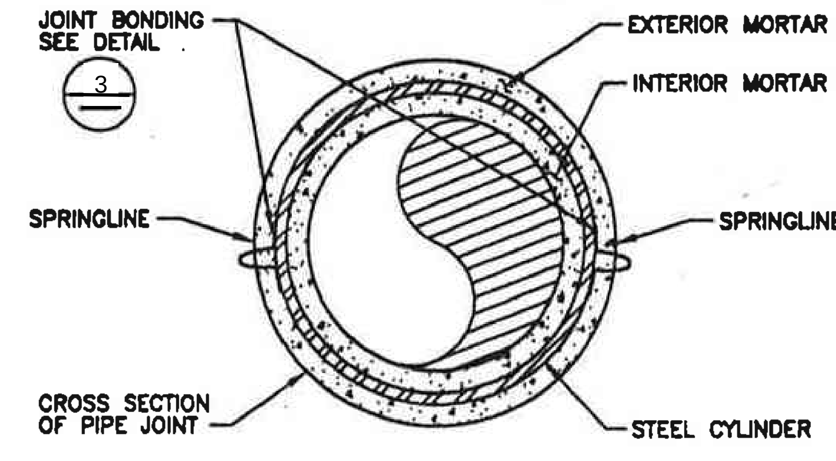


Detail 1/- HAND HOLE DETAIL

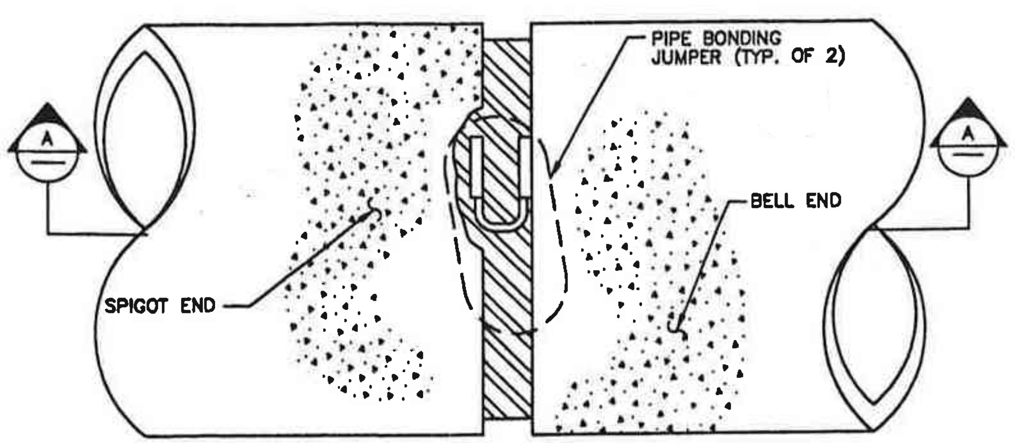
NTS



Detail 2/- JOINT BOND CABLE LOCATIONS

CEMENT MORTAR LINED AND COATED STEEL PIPE

NTS

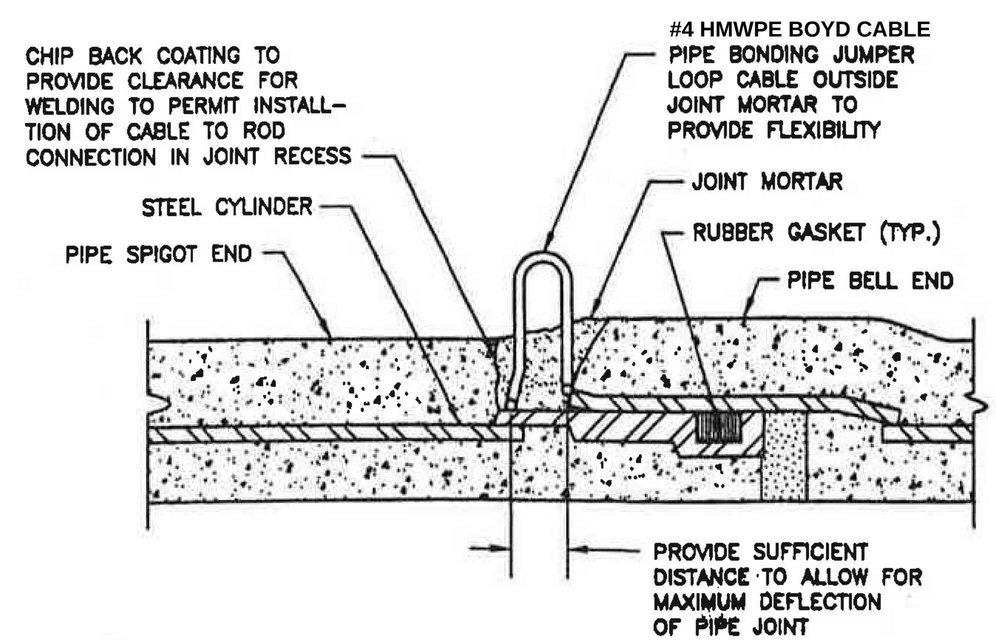


NOTE: ONE BONDING JUMPER SHALL BE INSTALLED AT EACH SPRINGLINE OF THE PIPE JOINT. SEE DETAIL 2, THIS SHEET

Detail 3/- JOINT BONDING

CEMENT MORTAR LINED AND COATED STEEL PIPE

NTS



SECTION A

NTS

SHEET 7

DESIGNED: HKP
DRAWN: DRAWN
JOB #: JOBNUM
HORIZONTAL: HSCALE
VERTICAL: VSCALE
DATE: DATE
SHEET ID: SHTID

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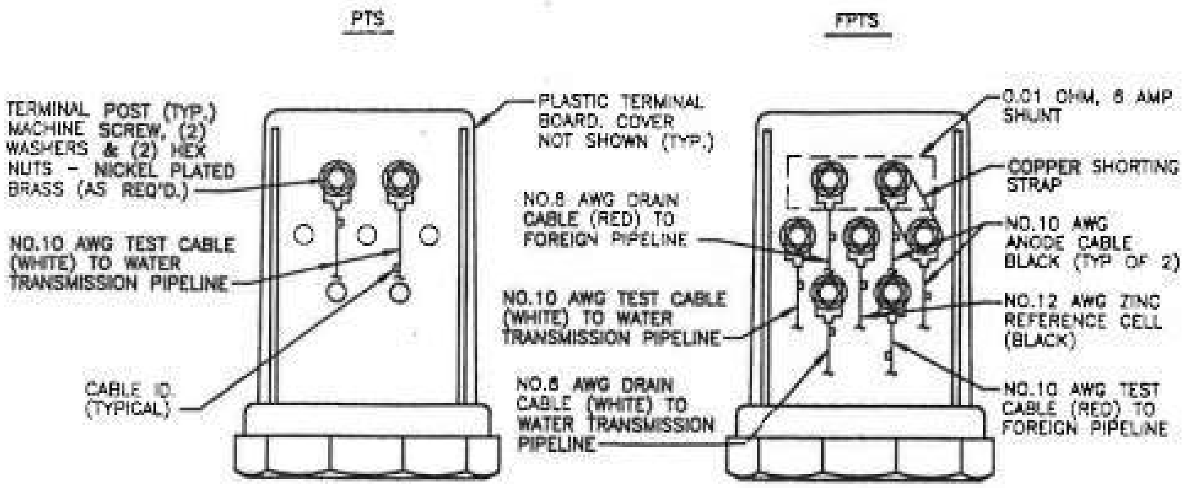
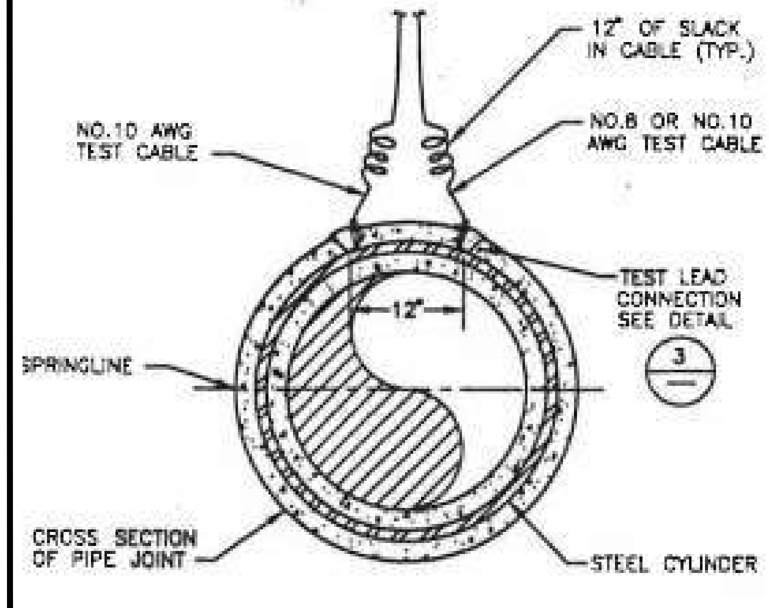


NOTES:
1. ALL CABLES SHALL BE STRANDED COPPER WITH THHN INSULATION UNLESS INDICATED OTHERWISE.
2. IDENTIFY ALL CABLES PER DETAIL 5, SHEET CP-3.

DETAIL 1/- TERMINAL BOXES

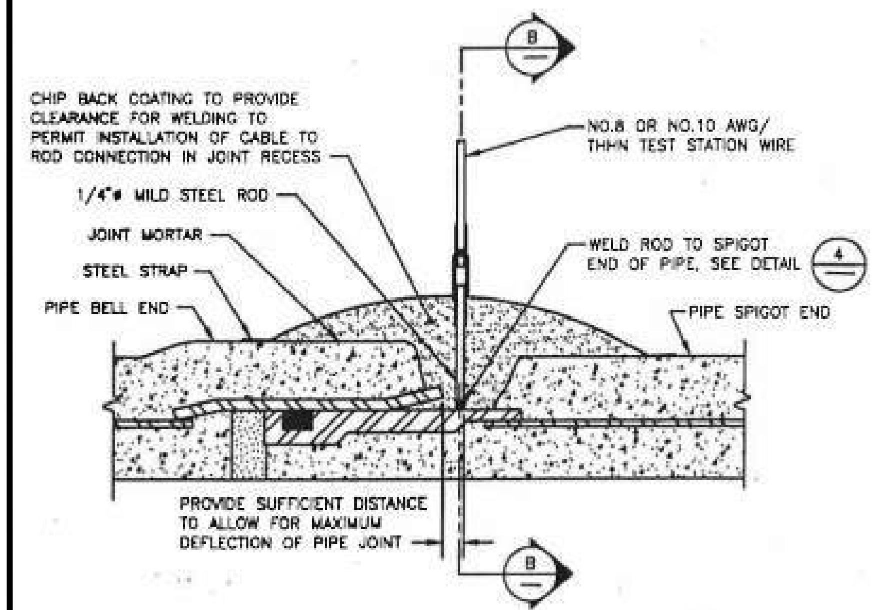
NTS



NOTE: JOINT BONDING CABLES NOT SHOWN FOR CLARITY.

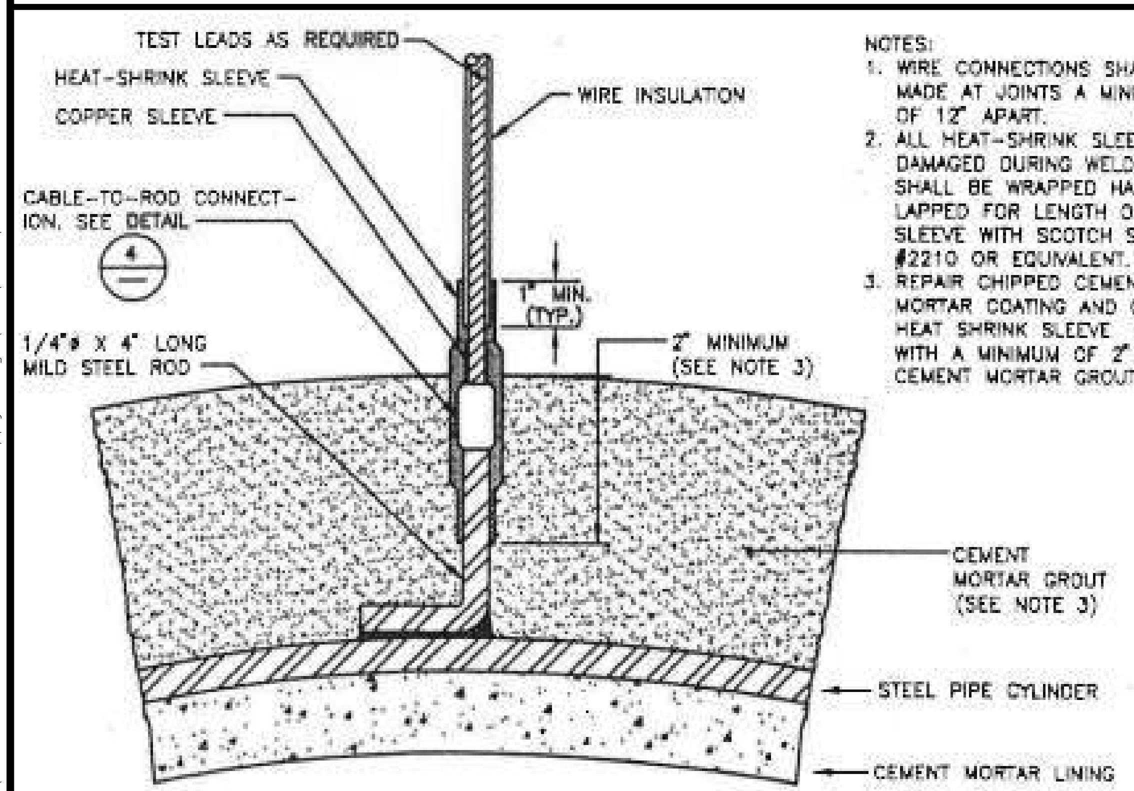
DETAIL 2/- CABLE TO PIPE CONNECTION

CEMENT MORTAR LINED AND
COATED STEEL PIPE
NTS



DETAIL 3/- TEST LEAD CONNECTION

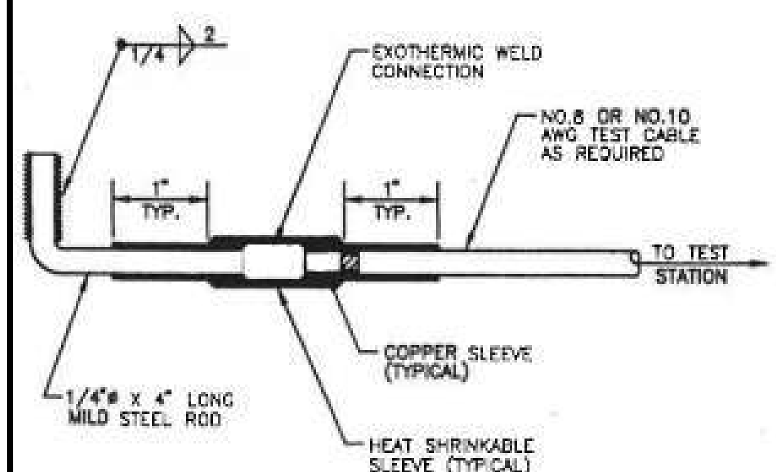
CEMENT MORTAR LINED AND
COATED STEEL PIPE
NTS



NOTES:
1. WIRE CONNECTIONS SHALL BE MADE AT JOINTS A MINIMUM OF 12" APART.
2. ALL HEAT-SHRINK SLEEVES DAMAGED DURING WELDING SHALL BE WRAPPED HALF-LAPPED FOR LENGTH OF SLEEVE WITH SCOTCH SEAL #2210 OR EQUIVALENT.
3. REPAIR CHIPPED CEMENT MORTAR COATING AND COVER HEAT SHRINK SLEEVE WITH A MINIMUM OF 2" CEMENT MORTAR GROUT.

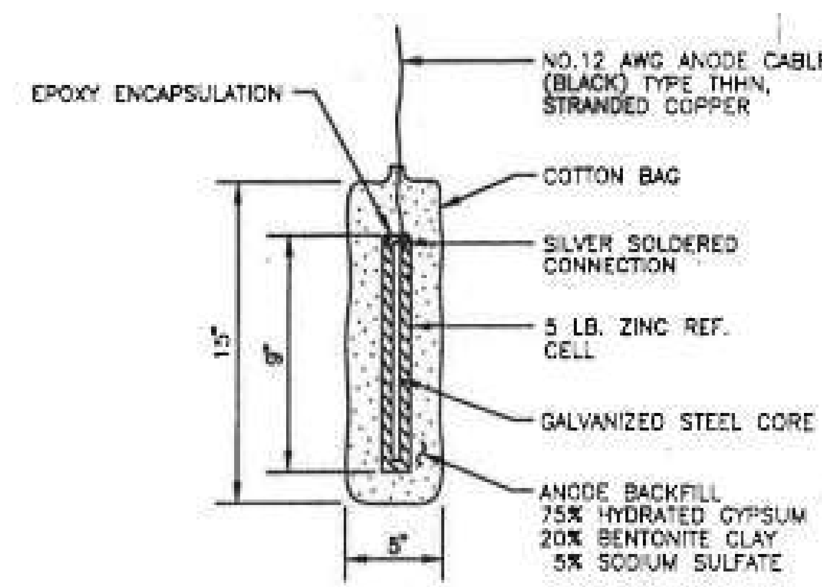
SECTION B/-

CEMENT MORTAR LINED AND
COATED STEEL PIPE
NTS



DETAIL 4/- CABLE TO ROD CONNECTION

CEMENT MORTAR LINED AND
COATED STEEL PIPE
NTS



DETAIL 5/- PREPACKAGED ZINC REFERECE CELL

NTS

SHEET 8

DESIGNED: HKP
DRAWN: DRAWN
JOB #: JOBNUM
HORIZONTAL: HSCALE
VERTICAL: VSCALE
DATE: DATE
SHEET ID: SHTID

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APPENDIX I
WATER SUPPLY AND TREATMENT CONDITION AND RISK ASSESSMENT TECHNICAL MEMORANDUM

City of Walla Walla

Water Treatment Plant Risk Assessment and Mitigation Strategies

December 2025

PREPARED BY:

Consor
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PREPARED FOR:

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Water Treatment Plant Risk Assessment and Mitigation Strategies

City of Walla Walla

December 2025

REVISED DRAFT

Consor

8202 W Quinault Ave
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Kennewick, WA 99336

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Tables

Figures

Appendices

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CHAPTER 1

Introduction

1.1 Objective

Consor North America, Inc and their subconsultants (Consultant Team) were contracted to complete a Technical Memorandum (TM) documenting the City of Walla Walla's (City) Water Treatment Plant (WTP) facilities condition and risk assessment. The objective of this TM is to document the vulnerabilities specific to the City's Water Treatment Plant (WTP), assess current and potential vulnerabilities and risks, and provide recommendations to enhance resiliency against identified vulnerabilities and risks.

This TM was developed as part of the City's Comprehensive Watershed Master Resiliency Plan (Watershed Master Plan), which aims to improve the resiliency of the City's overall surface water supply system and sustainability of the Mill Creek watershed. The Watershed Master Plan evaluates the City owned watershed, intake facility, raw water transmission main, and WTP, and identifies future projects and grant funding needs to protect and make these critical assets resilient to natural disasters such as wildland fires and earthquakes. The Watershed Master Plan will complement the City's 2020 Water System Plan and 2021 Well Master Plan to improve the resiliency of the City's drinking water system.

1.1.1 Objectives

This TM is focused on the City's WTP and includes the following objectives:

- Evaluation of the existing WTP infrastructure, processes, and vulnerabilities associated with them.
- Identify areas for improvement to enhance WTP performance, efficiency, and compliance with regulatory standards.
- Evaluation of available methods for plant filtration upgrades to enhance the resilience of the surface water treatment system against wildfire impacts.
- Evaluation of upgrade possibilities for the chlorine gas disinfection system, including onsite sodium hypochlorite generation, in response to existing safety concerns and potential supply chain disruptions.
- Strategies to improve resiliency to forest fires, natural disasters and other emergency events in addition to plant filtration upgrades.
- Recommending appropriate operation and maintenance (O&M) strategies for the WTP to improve flow management at the WTP.
- Description of improvement strategies and estimates of probable construction costs for near term, mid term, and long term capital improvement projects.

1.2 Background

1.2.1 System Overview

The City of Walla Walla (City) owns and operates a drinking water system that serves a population of about 35,000 people and uses surface water as the primary supply supplemented by seven deep basalt groundwater wells. The distribution system consists of over 180 miles of pipeline, delivering treated water through a four-zone pressure system. The City's primary source of water comes from Mill Creek which originates on the western slopes of the Blue Mountains in Washington, flows southward into Oregon, and then returns north into Washington, where it converges with the Walla Walla River. The City's watershed, covering approximately 36-square-miles, was designated as a drinking water source by the U.S. Department of Agriculture. The watershed is a protected, closed area with dense forests, steep terrain and has no public access or road infrastructure. The surface water supply from Mill Creek is occasionally blended with groundwater from City Wells No. 1, No. 2, and No. 3, and from the Walla Walla Community College (WWCC) Well. This typically occurs during summer months when system demand is high and flowrates in Mill Creek are low. Use of groundwater from the City wells into the water supply is often initiated following storms events in the watershed which can increase sediment loads in Mill Creek and turbidity in the surface water supply.

1.2.2 WTP Treatment Process Overview

Raw water from the Mill Creek intake travels 14.1 miles through a transmission main to the WTP. The transmission main provides a total head of 1,200 feet and delivers 500 pounds of pressure to the WTP. Upon arrival, the raw water first passes through a hydroelectric facility, where the excess pressure from the transmission main is harnessed to generate electricity. This water flows from the hydroelectric facility to a weir structure where flows are divided, with the majority of flow directed through the existing twin sediment basins and associated valve house, and any excess flow returning to Mill Creek via the weir overflow system. The twin sediment basins provide storage and limited turbidity reduction through sedimentation. From there, the water passes through the upflow roughing sand filters, which help further reduce turbidity before reaching the UV disinfection system. The UV disinfection inactivates pathogens, ensuring compliance with the EPA's LT2 Enhanced Surface Water Treatment rule. Following UV disinfection, chlorine is added via gas chlorination for secondary disinfection to maintain water quality throughout the distribution system. The plant also has a supply of hydrogen peroxide that can be injected into the sedimentation basins for algae growth or run through the UV disinfection for Advanced Oxidation Process that can destroy chemicals and control taste and odor. The chlorination facility feeds chlorine to both the inlets and outlets of the Mill Creek Tanks, where the treated water is stored to achieve disinfection contact time before being distributed through the city's four-zone pressure system. The plant's SCADA and telemetry system continuously monitors water quality and plant operations, ensuring regulatory compliance and operational efficiency.

1.2.3 Site Description

The WTP risk assessment focuses solely on the area within the boundary of the existing WTP located at 521 Mill Creek Road in Walla Walla, Washington. The site is approximately 51 acres in size and is located on one parcel, 360713230006. It is bounded by Mill Creek Road to the south, an on-ramp onto United States route 12 (US 12) to the northwest and agricultural lands to the east and west. Other than the WTP and hardscapes, the site consists principally of mowed grass, a few planted trees and has no environmentally sensitive areas. A Solar Battery Energy System (BESS) is scheduled for construction in the fall of 2025 on the west end of the WTP site.

The WTP has a treatment capacity of 24 million gallons per day (MGD). Key facilities on site include the hydroelectric building, weir diversion structure, twin sediment basins, roughing filters, ultraviolet (UV) disinfection system building, outlet control structure, chlorine system building, process wastewater disposal, administration building and hydrogen peroxide system, treated water pump station, two 7 MG finished water tanks (Mill Creek Tanks) and wells No. 1 and 2 and the Solar BESS See **Figure 1-1** for the WTP site layout.

Figure 1-1 | Walla Walla WTP Site Layout

1.2.4 Water Treatment Plant History

From its initial construction over 100 years ago, the City's WTP facility has undergone several renovations and upgrades over the years. Highlights include the following projects at and around the WTP:

- **1923** (original construction) - The WTP was originally constructed in 1923 as a sedimentation-only treatment facility, consisting of the concrete lined twin sediment basins used as open reservoirs and associated valve house.
- **1987 -** Installation of a hydroelectric facility
- **1999** - The City completed a 24 MGD ozonation facility in response to an Agreed Order with the Department of Health (DOH). This project involved converting the Twin Sediment Basins into raw water sediment basins, constructing two new 7 million gallon (MG) finished water tanks (14 MG

total) and creating a fourth pressure zone to supply the northeast end of the city. Additionally, Well No. 1 was upgraded for Aquifer Storage and Recovery (ASR), launching the city's ASR program.

- **2018** - the City upgraded the WTP to comply with the United States Environmental Protection Agency's (EPA) Long-Term 2 Enhanced Surface Water Treatment Rule (LT2). This included replacing ozone treatment with a UV disinfection system and installing an up flow roughing filter as pretreatment to reduce turbidity. A metal building was constructed over the filters to reduce algal growth. Additional upgrades included new piping, valves, and controls for the filters, decommissioning the ozone system, installing a hydrogen peroxide system and replacing the telemetry system at the WTP, the intake, all seven city wells, and the Clinton Street booster pump station. Other LT2 upgrades included a new high-service pump station backup pump, safety systems to prevent accidental chlorine gas releases, and the replacement of leaking isolation valves at the city's main reservoirs.

- **2025 –** the City installed a Solar Battery Energy Storage System (BESS) system. The BESS installed a solar array and battery, rated at 344kWh to support the facility's 314kW peak load and provide two hours of run time. The solar array, battery, and electrical equipment was installed on the southwest corner of the property, and connected to the clear well pump station and diesel generator. Construction of the BESS is ongoing and scheduled for completion in 2026.

CHAPTER 2

Site Evaluation and Risk Assessment

2.1 Site Evaluation

2.1.1 Methodology

The Consultant Team's evaluation of the City's WTP utilized several methods and sources to assess existing conditions and processes at the WTP, including:

- Site Visits
- Meetings with City staff and stakeholders
- Review of previous reports and construction drawings
- Review of ongoing studies

Each method is described in more detail in the following subsections. This chapter also discusses regulatory requirements applicable to the WTP.

2.1.2 Site Visit

The Consultant Team conducted a WTP and a watershed and diversion facilities tour on September 19th, 2024, to visually assess existing conditions of the structural, mechanical and electrical systems. The site investigation notes in the Watershed Master Plan document a detailed condition assessment for components of the WTP and the watershed facilities observed during the site visit. **Table 2-1** summarizes the existing conditions and vulnerability assessment of structures observed at the WTP.

Table 2-1 | Condition Assessment Summary

Structure	Key Features & Observations[1]	Notes on Vulnerabilities
Overall WTP Site	➢ The backup power system includes a 25-year-old 750 kW generator, fueled by diesel tank, with the longest outage noted as lasting 17-18 hours. The circuit breaker was noted to have failed to operate reliably. ➢ Service entrance and transfer switchgear noted in good condition. ➢ Switchgear automatic transfer control system is outdated and difficult to service. ➢ Obsolete security cameras	➢ Aging generators could fail during power outage, creating a significant risk to the water supply and public health and safety ➢ Switchgear being replaced as part of the BESS project.
Administration Building	➢ No known structural issues; electrical projects underway	➢ Freon leakage from evaporators in the HVAC system, impacting SCADA room

Structure	Key Features & Observations[1]	Notes on Vulnerabilities
Maintenance Building	➢ Ordinary wear signs for a modular metal building.	➢ None
Chlorine Building (Building G)	➢ The 35-year-old generator operates well, fueled by a 500-gallon diesel tank. ➢ Scrubber and alarm system recently installed. ➢ The chlorine gas cylinders are not anchored to the ground in the chlorine building.	➢ Aging generators could fail during power outage, rendering mechanical equipment (including air scrubber system) in operable. ➢ Vulnerable to supply chain limitations due to transport of hazardous materials to the WTP site (pressurized chlorine gas) ➢ Pressurized chlorine gas cylinders are vulnerable to damage and uncontrolled gas leaks in an earthquake event.
Hydroelectric Building (building I)	➢ Damage to exterior surface from birds pecking holes in the stucco. ➢ High pressure pipeline from Mill Creek leading into the building. ➢ Interior remodel project has been designed and is underway	
Twin Embankments for Sediment Basins & Valve House	➢ Stored water volume exceeds 10-acre feet and is impounded by a berm ➢ Aging valves in the valve house are deteriorating and in need of replacement ➢ Poor drainage on the walkway between the basins ➢ Cracking and differential settlement observed on the reservoir concrete lining causing seepage loss, including the SE corner of the north sediment basin. ➢ In 2016, pressure grouting was performed behind two settling panels in the south sediment basin.	➢ Original infrastructure is aging and vulnerable to wear and tear, and potential failure. ➢ Vulnerable to earthquakes. ➢ Potential for voids forming within embankment causing global stability issues ➢ Open aired basins are vulnerable to contamination from air particles and bird/wildlife activity. Re-occurring algal blooms and TTHM concerns have halted aquifer recharge ➢ Issues with valve opening and closure because of corrosion on valves and damage to the valve stems.
Roughing Filters Building (Building D)	➢ Gnats on water surface, no downstream removal process ➢ The up-flow roughing filter is not achieving the expected 1-log or 90% turbidity reduction and is only achieving closer to 30% turbidity reduction	➢ Provides limited resiliency against turbidity spikes
UV Building (Building C)	➢ The building consists of three parallel UV reactors with 12 MGD capacity each. ➢ Plug valve actuators not fully closing and leakage through 24-inch plug valves ➢ No HVAC for electrical room	➢ Leakage through the 24-inch plug valves during low flow conditions has inhibited the ability to fully isolate individual UV trains
Treated Water Pump Station	➢ Facility consists of four parallel vertical turbine pumps with capacity of 8 MGD each. ➢ Pumps are inefficient at winter low flows	➢ Inefficient operation of pumps at low flows can lead to increase wear on pumps and premature failure

Structure	Key Features & Observations[1]	Notes on Vulnerabilities
	➢ Electrical building needs new breaker	
Mill Creek Tanks	➢ Capacity of 7 MG each and 25-ft operating storage depth. They are 36-ft tall, 183-ft in diameter, and recently repainted on the exterior. ➢ No flexible or earthquake valves, nor a system bypass around tanks. ➢ Unable to coat under the vertical interior supports with paint so potential for corrosion.	➢ Vulnerable to seismic activity since there are no flexible or earthquake valves on the outlet pipes ➢ Interior support has potential for corrosion. Loss of structural support could result in the loss of a tank and its contents into the WTP facility and surrounding area.

Notes:
1. Most of the information regarding the operating history documented in the site visit notes was provided verbally through discussions with the operators present on-site.

2.1.3 Input from City Staff and Stakeholders

The Consultant received input about the WTP processes and existing conditions from the City staff and local stakeholders during site visits, workshops, phone calls, and email correspondence. A summary of relevant items that are not captured in other sections of this TM are listed below:

- ➢ ASR system has been offline since March 2024 when it was shut down by the Washington State Department of Ecology (Ecology) after a test on recovered water exceeded the ASR Permit regulatory threshold for total trihalomethanes (TTHMs), a disinfection byproduct.
- ➢ A controlled burn in the watershed performed during the fall of 2024 escaped containment and burned a portion of the forest in the watershed area. Ash deposition from this fire appears to have caused increased total organic carbon (TOC) concentrations coming into the WTP header originating at the intake structure although specific increases are unknown due to limited historical data.
- ➢ Algae blooms in the reservoirs were observed during the late summer of 2024 requiring adjustments to peroxide dosing and drawdown of both sediment basins for cleaning.
- ➢ Low plant flows during the winter months have been an ongoing problem at the WTP, leading to increased residence time and requiring adjustments to chemical dosing. The problem has been exacerbated by having the ASR system offline, which is normally used to move water through the plant and recharge the groundwater during low system demand periods. ASR also facilitates production of electricity through the hydroelectric facility.
- ➢ Upcoming projects at the WTP site include:
    - Installation of solar power panels and BESS will be completed in 2026.
    - Ongoing interior rehabilitation of the hydroelectric building, including installation of a 2nd TOC analyzer.

In addition to the items listed above, the operation and maintenance activities on the WTP site were discussed with City staff and an overview is presented in **Table 2-2**, along with frequency and a brief description of the maintenance activities performed. Maintenance checklist forms used for regular inspection activities onsite are included in **Appendix D**.

Table 2-2 | O&M Activities Overview at the WTP Site

O&M Activity Overview	Frequency	Description
Exercise generators	Monthly	Total of 2 generators onsite, run time of 20 minutes. Exercised monthly and load tested yearly.
Twin sediment basins drawdown	Semi annually	1 to 2 day activity, involves calling the Army Corp of Engineers in advance to provide notification of manual drawdown discharge into Mill Creek
Roughing Filter	Semi annually	Backwash filter beds to ensure 1 foot or less of headloss. Backwash water is routed to a lagoon for settlement of solids and infiltration of water.
Chlorine System	Monthly	Check automatic switchover, gas detectors and scrubber monthly.
Chlorine System -Hoist Testing	Monthly, Annual	Hoist testing monthly and hoist load annually
Chlorine System – Emergency Shut off Valves	Monthly	Test automatic emergency shutoff valves to canisters
Finished Water Pump station	Daily	Check oil levels, leaks, excessive heat and vibration Change fluid based on run time hours
Finished Water Pump station	Semi annually	Oil Analysis

2.1.4 Review of Previous Planning Documentation and Record Drawings

Several prior planning documents have been developed, addressing proposed improvements to the WTP and to avoid duplicating efforts, build upon existing work, and ensure alignment of goals and objectives, elements of these documents were reviewed and incorporated into this TM. The following narratives summarize key resources and their relevance to the current planning effort.

2.1.4.1 City of Walla Walla 2020 Water System Plan

The updated City Water System Plan (WSP), developed by Murraysmith (now Consor) in collaboration with City staff, provides a comprehensive framework to guide the City's water system improvements. Key objectives include developing a detailed overview of the water system, projecting population growth and water demand, and updating hydraulic models to evaluate system capacity and identify deficiencies over existing, 10-year, and 20-year planning horizons. The WSP establishes performance criteria, assesses compliance with water quality regulations, updates the source water protection plan, evaluates water use efficiency, and outlines typical operations and maintenance practices. It also develops project recommendations with cost estimates for a phased capital improvement program and analyzes the financial impacts of these projects on water rates. Future water demands for Walla Walla are projected to grow slowly over time. As shown in **Table 2-3** below, the projected system average daily demand (ADD) (including ASR) for 2038 is 12.9 MGD and for 2068 is 16.2 MGD, which constitutes 6.6% and 34% increase over the 2018 demand of 12.1 MGD. **Table 2-4** lists the City's water sources including facility name, capacity, and associated water rights (WR).

Table 2-3 | Historic and Projected Water Demand (ADD)

Demand Component (MGD)	2016	2018	2028	2038	2068
Intertie	0.1	0	0	0	0
Water Loss	1.9	1.6	0.9	0.9	1.3
Customer Demand	6.8	7.0	7.7	8.5	11.5
Total Before ASR	8.7	8.6	8.6	9.4	12.7
ASR	2.6	3.5	3.5	3.5	3.5
Total with ASR	11.3	12.1	12.1	12.9	16.2
ERUs	30,524	32,422	32,499	34,662	43,546

Table 2-4 | City of Walla Walla Water Sources

Supply Facility	Capacity, MGD	Instantaneous Water Rights, MGD 2
Well 1	3.60	3.60
Well 2	2.40	2.56
Well 3	4.10	5.76
Well 4	4.03	4.03
Well 5	1.90	2.45
Well 6	3.60	3.74
Well 7	4.32	4.32
Well Supply Total	23.95	26.46
Mill Creek WTP1	24.00	18.10

Notes:

1. The WTP has a physical capacity of 24 million gallons per day (MGD) with a surface water right of 18.1 MGD but overall supply limitations are associated with the hydro operation license that is limited to 16.48 MGD.
2. Long-term rate shown for Wells 2, 5, and 6. Instantaneous/pump capacity is 2.56 MGD, 2.16 MGD and 3.82 MGD for Well 2, 5 and 6 respectively.

Overall, the City's water system has adequate supply from their surface and groundwater supplies through the 2020 WSP identified planning horizons. Recommendations from the WSP include:

- Continuing efforts to reduce system water loss through the Water Loss Control Action Plan
- Regularly reviewing and updating City Standards
- Prioritizing pipe replacement through the Infrastructure Replacement and Repair Program (IRRP) throughout the City's water distribution system outside the WTP.
- Implementing Capital Improvement Projects (CIPs) specific to the WTP, which are listed in **Table 2-5**.

Table 2-5 | WTP CIP Projects from 2020 Water System Plan

Project ID	Description
M-3	Mill Creek Tank Painting
M-7	Hydro Controls Upgrade (Design)
M-8	Twin Sediment Basin Grouting (Design)

Project ID	Description
V-1	Hydro Valve Installation - Water Treatment Plant
V-2	WTP Valve House Restoration (Design)
M-7	Hydro Controls Upgrade (Construction)
M-8	Twin Sediment Basin Grouting (Construction)
M-11	Reroof of Hydroelectric and Chlorine Buildings
V-2	WTP Valve House Restoration (Construction)
M-13	Portable Emergency Generator
M-16	Hydroelectric and Chlorine Building Exterior Rehabilitation
M-18	Chlorine Room Motor Control Center and Generator Replacement (Design)
M-18	Chlorine Room Motor Control Center and Generator Replacement (Construction)

The City plans to update the WSP every 10-years and revise the financial plan every six years with 10-year projections to ensure alignment with evolving needs and to sustain financial and operational viability. These actions enable the City to meet future demands while maintaining the water system's reliability and efficiency. The WSP has limited focus on the WTP and does not include funding for major WTP projects.

2.1.4.2 City of Walla Walla 2021 Well Master Plan

The City's 2021 Well Master Plan (WMP) was developed by Murraysmith (now Consor) in 2021 as a plan to improve the reliability and resiliency of the City's water supply system through improvements to the groundwater supply system. Historically, the ground water system has served as a backup during emergencies, such as floods, fires, or when turbidity levels in the surface water supply are high, which typically occur several times per year during runoff events in the watershed. The recommendations for facility improvements identified in the WMP will be incorporated into the overall recommendations for the WTP as discussed further in Chapter 3.

2.1.4.3 Record Drawings

The WTP has undergone several design modifications over the past few decades, with various design drawings documenting these changes. The most recent set of record drawings, 2020 Mill Creek Water Treatment Plant Improvements (2020 WTP Improvements), was developed to ensure compliance with the USEPA's LT2 requirements. These drawings detail several key improvements, as summarized in Section 1.2.4 of this document.

Other record drawings were also evaluated, which include plans for construction of the 15 MG twin sediment basins from (1921), plans for the Twin Reservoir Hydroelectric Facility and Reservoir and Intake Improvements (1987), and various site improvement plans (1990s), reflecting the plant's ongoing enhancements over the years.

2.1.5 WTP Flow Data, Water Quality, and Ongoing Studies

2.1.5.1 Flow Data

Flowrate information for the years 2023 and 2024 are presented in **Figure 2-1**. As shown in this figure, the flowrate peaks during the summer months and substantially decreases during the winter months, which matches historical City demand trends. The low flows during winter months lead to long residence time at the WTP as discussed in Section 2.1.4. Average Day Demand (ADD) for 2023 and 2024 are presented in

Table 2-6 below. Note that average day demands and peak day demands for 2024 are less than the corresponding flows for 2023 due to the ASR system being offline for most of 2024 due to temporary shut down of ASR system as well as continued reduction of leakage.

Figure 2-1 | WTP Flow Rate Graph for 2023 and 2024

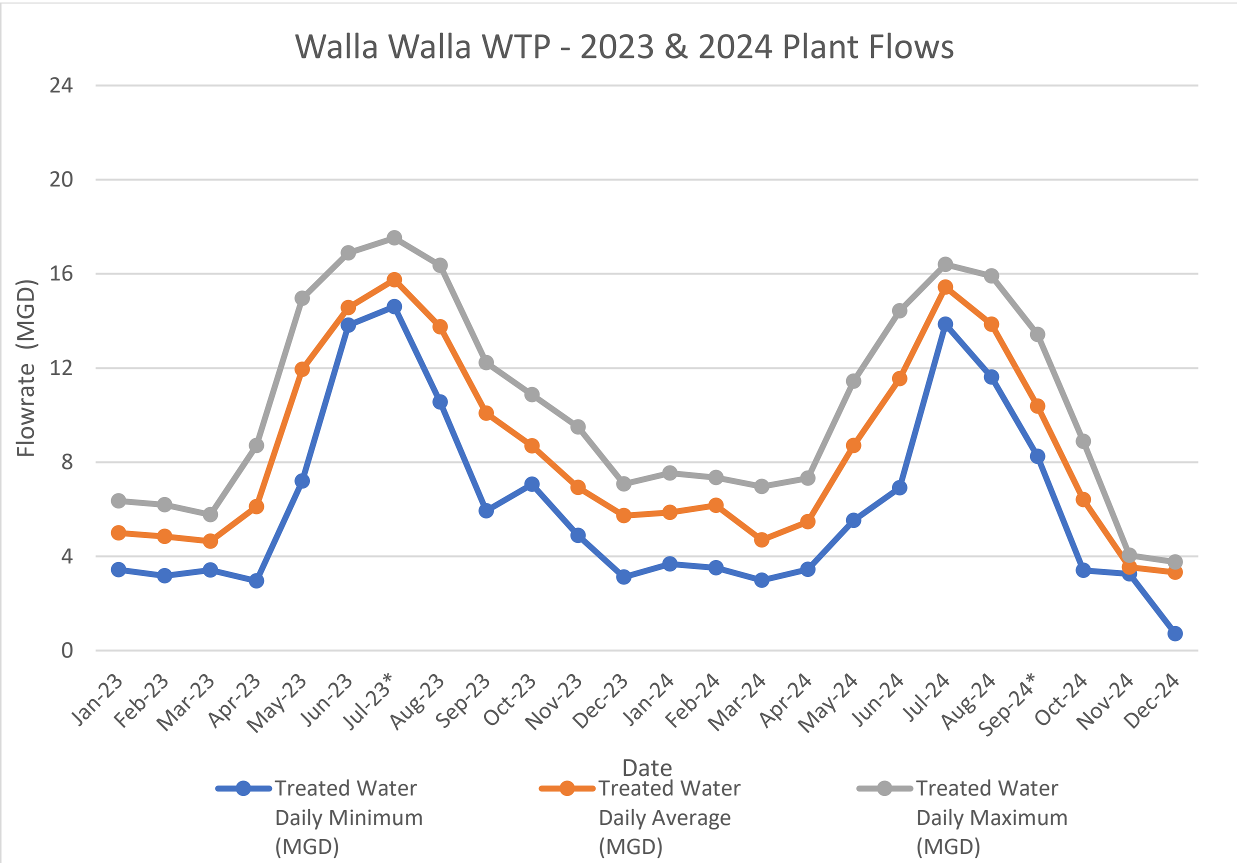


Table 2-6 | WTP Flow Rates for 2023 and 2024

Year	WTP Observed Average Day Demand (MGD)	WTP Observed Peak Day Demand (MGD)
2023	9.0	17.52 (July)
2024	7.95	16.40 (July)

The Water Plant is designed for a maximum flow of 24 MGD, however, at flows below 4 MGD the high-lift pumps and flow control valves experience operational issues. With the ASR program inactive from March 2024 through November 2025 and a reduction in water distribution leakage, water plant production has decreased water supply from the WTP to 3 MGD, creating significant operational challenges and potential water quality problems. Key challenges associated with low flow rates include:

- **Pump Issues**: The pumps struggle to handle low-flow conditions, leading to reliability problems.
- **Flow Control Valve Problems**: The downstream flow control valve cannot effectively modulate low flows, causing instability and inefficiency.

- **Revenue Loss**: Reduced hydroelectric power output decreases revenue and risks penalties under the Columbia REA contract.
- **Water Quality Concerns**: Prolonged water residence times in storage tanks contribute to disinfection by product (DBPs), impacting compliance with water quality standards.
- **Chlorine Residual Challenges**: Maintaining minimum chlorine residual levels throughout the system is difficult at low flows.
- **ASR Program Delays**: Regulatory restrictions related to DBPs have stalled progress in the ASR program.
- **Operational Constraints**: Frequent plant start-stop cycles increase mechanical wear and operational risks.

2.1.5.2 Water Quality Data

Water quality information is continuously monitored at the WTP using on-site analyzers for the following:

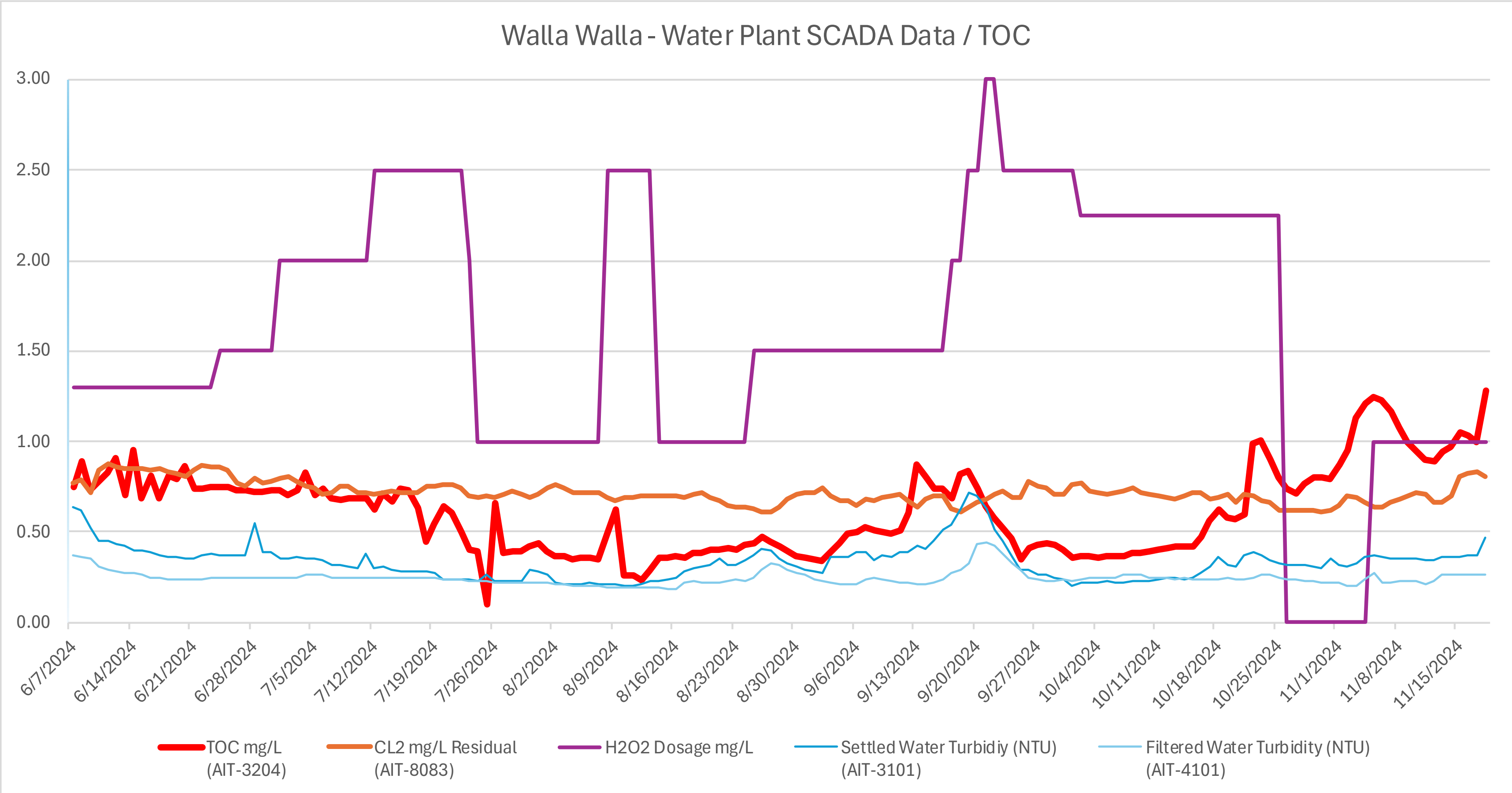
- Turbidity at two locations; Upstream and downstream of roughing filter
- Total Organic Carbon (TOC) - A TOC analyzer was installed during the spring/summer of 2024 on the downstream side of the roughing filter with a second analyzer brought online in 2025 at the hydroelectric building.
- Chlorine residual.
- Hydrogen peroxide dosing.

Data acquired by the onsite analyzers is graphed in **Figure 2-2** below for the period spanning June 2024 to mid-November 2024 to highlight recent conditions at the WTP. As shown in the figure, turbidity is consistently below 1 NTU for both the settled water entering the roughing filter (AIT-3101), and water exiting the roughing filter (AIT-4101). Chlorine residual is maintained at roughly 0.8 mg/L. Hydrogen peroxide dosing was increased during several periods of the year to combat algae growth in the twin sediment basins. TOC typically remained below 1 mg/L during the summer but exceeded this level during November 2024 which is being associated with post fire runoff from the uncontained Tiger Creek prescribed fire.

As an unfiltered system, the City's WTP relies upon low turbidity in the source water to comply with NTU thresholds set forth in Federal and State drinking water standards. The high-quality source water has enabled the onsite processes to focus on disinfection, which include UV disinfection and chlorination.

In addition to continuous monitoring of TOC, NTUs, and chlorine residual, the City collects samples on an intermittent basis as required by state and federal law. This includes quarterly samples at four locations to test for total trihalomethanes (TTHMs). A recent water quality issue that has appeared at the WTP includes an exceedance of Washington State Department of Ecology (Ecology) ASR permit requirements for TTHM at Well 1. In March 2022 there was a one-time occurrence of 42 µg/L which resulted in Ecology directing the City to halt ASR operations and to identify alternatives to reduce TTHM concentrations in the drinking water prior to injection. Note that the exceedance did not result in any action by DOH as the concentration was still well below drinking water limits of 80 µg/L.

Figure 2-2 | Water Quality Data at Walla Walla WTP



2.1.5.3 Ongoing Studies - Optimization Assessment for Minimizing TTHMs

To address TTHM concerns at the plant, the City recently contracted with HDR Engineering, Inc. – apart from this resiliency study – to identify strategies and associated projects that will reduce TTHM levels and allow ASR activities to resume. This study has resulted in an Alternatives Memorandum that provides several recommendations for addressing the TTHM issue, including:

- **Continue Injecting Hydrogen Peroxide**: Continue injecting hydrogen peroxide into the twin sediment basins for TOC control.
- **Sand Addition in Roughing Filters**: Add 3 inches of fine sand to one roughing filter, record water quality and backwash frequency. The final solution may involve adding 6 inches of fine sand to both filters.
- **Coagulation and Reservoir Improvements:** Implement a clarification system, including coagulation storage and injection, sedimentation improvements, and installing a vacuum cleaning system.
- **Install Sewer Connection:** Install a connection to the City sewer system for cleaning the coagulation tanks.
- **Chlorine Dosing and Air Mixing:** Explore boosting chlorine dosing at the Clinton tanks and conduct a small-scale pilot of air mixing at the water plant tanks. This potential project falls outside the limits of the treatment plant and is not considered with this memorandum.
- **Aeration in the Mill Creek Tanks:** Install an aeration system like the GridBee SN series to reduce total TTHMs in the Mill Creek Tanks by circulating and mixing water, spraying micron-sized mist to volatilize compounds such as chloroform, and ventilating the reservoir headspace. These systems can be retrofitted to existing reservoirs; however, the Mill Creek Tanks' large volume and high turnover would require approximately 26 units at an estimated cost of $1 million per tank.

Several of the recommendations from HDR's alternatives memorandum titled been incorporated into this WTP risk assessment and mitigation strategies memo. For a full characterization of the TTHM exceedance issue, as well as further discussion on the description of alternatives and recommendations, see HDR's memo titled "Water Treatment Plant Optimization Assessment for Minimizing TTHMs".

2.1.6 Regulatory Compliance

2.1.6.1 Primary Drinking Water Regulations

By State law, Washington Administrative Code (WAC) 246-290, the City is required to maintain an ongoing water quality testing and monitoring program. This program is administered by the DOH and is comprised of monitoring the water supply for specified chemical and physical contaminants. The DOH requires that the source water supply be monitored for the primary and secondary contaminants. Primary drinking water standards establish absolute concentration limits called Maximum Contaminant Levels (MCL) and Maximum Contaminant Goal Levels (MCGL). MCLs are enforceable standards, while MCLGs are non-enforceable public health goals.

This section summarizes regulatory compliance issues that apply to the City's groundwater supply and surface water sources. It includes a list of the applicable Safe Drinking Water Act (SDWA) regulations and subsequent amendments, and possible changes in the regulations that may impact the City's water system.

Several rules and regulations have been updated by the EPA for the purpose of implementing the SDWA and its Amendments. Those that apply to the City's water system are in **Table 2-7**, along with the City's compliance status with each rule. Compliance monitoring is performed by the City using various test methods. A full list of applicable standards, MCLs, and compliance monitoring methods can be found in the City's current Water System Plan.

Table 2-7 | Drinking Water Rules and City Compliance

Regulation	Type	Rule	Compliance Status
National Primary Drinking Water Regulations (NPDWR)	Chemical Contaminants	Arsenic	In Compliance
		Chemical Contaminant	In Compliance
		Lead and Copper	In Compliance
		Radionuclides	In Compliance
	Microbial Contaminants	Groundwater	In Compliance
		Disinfectant and Disinfection Byproducts	In Compliance
		Total Coliform & Revised Total Coliform	In Compliance
	Right-to-Know	Consumer Confidence Report	In Compliance
		Public Notification	In Compliance
National Secondary Drinking Water Regulations (NSDWR)	Aesthetic	Aluminum, Chloride, Color	In Compliance
		Copper, Foaming Agents, Iron, Manganese, pH, Sulfate, Threshold Odor Number, Total Dissolved Solids, Zinc	In Compliance
	Cosmetic	Fluoride, Silver	In Compliance
	Technical	Aluminum, Chloride, Copper	In Compliance
		Corrosivity, Iron, Manganese, pH, Total Dissolved, Solids, Zinc	In Compliance

2.1.6.2 Surface Water Treatment Rules

The Surface Water Treatment Rule (SWTR) was implemented in 1989 to reduce the potential for pathogenic contamination in drinking water. The rule has been updated multiple times with the last rule implemented in 2006. The SWTR applies to all public water systems that use surface water or groundwater under the direct influence of surface water (GWUDI). The SWTR addresses:

- Criteria under which filtration is required
- Performance criteria for filtration
- Disinfection requirements for both filtered and unfiltered systems
- Monitoring requirements for all surface water supplies

The SWTR started by requiring that source waters be treated to achieve a minimum 3-log (99.9 percent) removal and/or inactivation of Giardia cysts and a 4-log (99.99 percent) removal and/or inactivation of enteric viruses. A 2-log (99 percent) removal of cryptosporidium has also been added to the rule.

The City's recent LT2 upgrades included a UV disinfection system which facilitates compliance with the SWTR.

2.1.6.3 Source Water Protection

The Safe Drinking Water Act (Section 1428) established a Wellhead Protection Program (WHPP) to protect groundwater that contributes to public water systems. Likewise, the Surface Water Treatment Rule established source protection requirements for unfiltered surface waters that contribute to public water systems. DOH has expanded those Federal source protection regulations to include all Group A community and non-community water systems, including groundwater, groundwater under the influence of surface water, and filtered and non-filtered surface water sources. Accordingly, DOH has developed regulations that require all Group A water systems that maintain and operate their own sources to implement a WHPP (WAC 246-290-135(3)), or a Watershed Control Program (WCP) (WAC 246-290-135(4)), or any combination thereof, as deemed appropriate by the State. Source water protection programs are planning tools to be used by water utilities to identify potential sources of water contamination, and to protect existing and future drinking water supplies. The objective is to minimize the risk of accidental releases of contaminants in areas contributing water to the public water supply system. The three basic elements of a source water protection plan are:

- Definition of the area, either a Wellhead Protection Area (WHPA) or a watershed, that directly contributes to a water supply. A WHPA is defined as an area contributing to a source within a specified amount of time.
- Inventory of land uses and identify potential sources of contamination within the WHPA or watershed.
- Management strategies including emergency spill response and contingency plans to minimize or eliminate the possibility of potential contamination of the water supply.

The City's Source Water Protection Plan includes an updated source water protection plan which is presented in Chapter 5 in the 2020 water system plan.

2.1.6.4 New Regulations

On March 14, 2023, the EPA announced a regulation for six PFAS including perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA, commonly known as GenX Chemicals), perfluorohexane sulfonic acid (PFHxS), and perfluorobutane sulfonic acid (PFBS). The PFAS regulation was finalized on April 10, 2024. The regulation sets an MCL and MCL goal (health-based and non-enforceable) for the six PFAS in accordance with **Table 2-8**. As of March 2025, these regulations have been suspended.

Table 2-8 | Total PFAS Sampling Requirements

Compound	MCL Goal	MCL
PFOA	Zero	4.0 ppt
PFOS	Zero	4.0 ppt
PFNA	10 ppt	10 ppt
PFHxS	10 ppt	10 ppt
HFPO-DA	10 ppt	10 ppt
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1.0 Hazard Index	1.0 Hazard Index

The City has proactively tested for PFAS from the surface water source and several of its well sources. The results were non-detect for all tested locations, which is below the adopted MCL.

2.2 Risk Assessment

2.2.1 Risk and Hazard Categorization

Information gathered during the evaluation process was used to identify vulnerabilities at the WTP, alongside the risks and hazards that have historically been observed in the local area as well as common risks to water systems in general. Chapter 4 and 5 of the Watershed Master Plan provides in-depth discussion of the risks and vulnerabilities of the watershed, and outlines a risk matrix to identify threats, and recommends mitigation strategies to protect the City's water supply. The information presented in that chapter includes a discussion of risk analysis vocabulary, including the following terms and examples specific to the WTP:

- **Vulnerabilities** refer to the inherent weaknesses in the WTP infrastructure or operations which increase the WTP's susceptibility to disruptions but do not necessarily mean that an event will occur.
- **Hazards** constitute specific events or occurrences that could disrupt the normal/expected operation of the water system.
- **Risks** represent the probability of a hazard occurring and potential for negative impacts when hazards interact with vulnerabilities. The severity of risks is assessed based on the likelihood of an event occurring and the impact of that event.

The City's WTP faces multiple risks due to environmental hazards, aging infrastructure, and operational challenges including, but not limited to the following risks:

- Wildfires pose a major threat by increasing turbidity and contamination in Mill Creek, which could overwhelm the existing WTP treatment processes and disrupt surface water supply. Per the General Technical Report RMRS-GTR-240, Post-Fire Treatment Effectiveness for Hillslope Stabilization developed by Peter Robichaud et all, the recovery time, or return to the pre-fire erosion potential is estimated to be about three years. The water could become unusable after a major fire due to excessive turbidity (high suspended solids) from erosion.
- Flooding has historically damaged key infrastructure, including the raw water transmission main, leading to costly emergency repairs and extended surface water supply outages.
- Earthquakes could cause structural failures in critical components such as the twin sediment basins, pipelines, and chlorine storage, posing both operational and public health risks.
- Severe weather events, including high winds and heavy snowfall, increase the likelihood of power outages that could halt water treatment and distribution, especially given the WTP's aging backup power system.
- Regular drought conditions could strain water availability, forcing the City to rely more on groundwater supply sources, which may not be sufficient during prolonged dry periods in the future.

- Additional risks stem from aging infrastructure, such as the seepage losses in the twin sediment basins, deteriorating valves, and outdated control systems, all of which could lead to operational inefficiencies or failures.
- Political and economic factors also contribute to risks, such as delays in regulatory approvals or funding shortages.

Without proactive mitigation, these risks could lead to severe water supply disruptions, contamination events, and costly infrastructure failures, threatening the long-term resilience of the City's water system.

Through the site evaluation process, multiple vulnerabilities were identified at the WTP that could be improved. The risks associated with these vulnerabilities are presented in **Table 2-9** alongside the current risk mitigation strategies and supplementary mitigation needs.

Table 2-9 | WTP Risk Assessment and Mitigation Strategies

Risk ID#[1]	Hazard Category	Risk Description	Current Risk Mitigation Method	Additional Considerations	Supplementary Mitigation Needs	WTP Priority
1, 2, 3, 16	Environmental – Multiple	Natural disaster disrupts water supply to WTP.	Groundwater supply system is used for water supply and has capacity to meet system demand for the near term.	Disruption of surface supply will halt aquifer storage operations and hydroelectric production. Per the 2021 WMP, 2068 MDD cannot be meet with existing well supply.	Resiliency improvements in watershed (see Watershed Master Plan) and well facility improvements per 2021 WMP.	Low/Medium – Robust redundancy in place with groundwater system
6	Operational	Twin sediment basin water contamination from air particulates, wildlife activity, and/or biofouling.	Downstream roughing filter and disinfection processes provide some resiliency against contaminants.	Regular drawdown and cleaning of reservoirs performed. Large area/volume of reservoirs increases residence time	Reservoirs are 100+ years old and in poor condition, long term management plan for reservoirs needed.	High – multiple risks are tied to the twin sediment basins
7	Operational	Twin sediment basin seepage losses result in loss of system storage capacity.	Staff planning a capital project to grout reservoir wall.	Leakage results in significant water loss and could exacerbate potential embankment failure.	Reservoirs are 100+ years old and in poor condition, long term management plan for reservoirs needed.	High – multiple risks are tied to the twin sediment basins
8	Operational	Lack of a current facilities plan resulting in insufficient funding/budgeting for needed capital projects, and misallocation of site usage on the WTP property.	Planning efforts for WTP as part of other planning documents (2024 Multi-Jurisdictional Hazard Mitigation Plan, 2020 WSP) or projects on a case-by-case basis.	Significant investments and space allocation needs are anticipated for enhancing WTP resiliency.	Need a facility plan specific to the WTP that considers long term space allocation needs, financing needs, and addressing regulatory requirements.	High – significant level of risk tied to lack of planning/funding
9	Environmental – Severe Weather	Water quality impacts related to drought/prolonged periods of heat (temperature increase, TOC, algae growth) resulting in reduced water quality and limiting WTP supply.	Groundwater supply system is used for supplemental water supply and has capacity to meet system demand for the near term.	High risk of occurrence and high consequences.	Additional treatment processes to address contaminants associated with severe weather hazards.	High – Enhanced resiliency needed to address high risk of occurrence and high consequence
10	Environmental – Earthquake	An earthquake or other natural disaster causes a failure in the system, rendering the WTP inoperable.	Newer infrastructure has been designed in accordance with current seismic requirements.	Older infrastructure such as twin sediment basins and storage tanks may be more susceptible to earthquake failure.	Retrofits of systems that are more susceptible to seismic activity.	Medium – Lower probability of severe earthquake damage compared to other environmental hazards such as wildfire.
11	Environmental – Earthquake	An earthquake causes failure in the chlorine building and uncontrolled release of hazardous gas creating a safety concern.	Scrubber system recently constructed to address health hazard.	Delivery of chlorine gas cylinders susceptible to more restrictive supply chain limitations and delivery schedules compared to other chlorination methods	Explore opportunities for different chlorination methods such as on-site sodium hypochlorite generation.	Medium – Existing risks mitigated to an extent by recent scrubber system improvements. Supply chain risk only mitigated by utilizing different chlorination method.
10, 12	Operational	A failure in the Mill Creek Tanks shell and/or interior structural support of the tanks due to corrosion resulting in loss of stored water releasing into WTP and surrounding area causing damage and loss of supply for City's distribution system.	Two tanks ensure redundancy and mitigates the risk of failure due to low probability of simultaneous failure. Groundwater supply system also provides redundancy for supply into distribution system.	Connection point for cathodic protection system included on original storage tank design drawings.	Provide cathodic protection to address corrosion.	High – Severity and cost associated with mitigating corrosion will increase over time.
22	Operational	The aging valves at the twin reservoirs valve house become inoperable and staff lose the ability to manage reservoir capacity.	Exercise valves and apply lubricant. Groundwater supply system can bypass valve house and supply storage tanks.	Valve house is 100+ years old and minor leakage has been observed	Rehabilitation or replacement of valve house with new infrastructure	Medium – Twin reservoirs provide redundancy, along with well backup system.
28	Operational	Electrical system failure could include primary power system or existing backup power system leading to inoperability of WTP.	Exercise and maintain backup power generation systems.	Utility has been a good partner and has been able to restore power relatively quickly following outages which reduces demand on backup power system.	Replacement of aging infrastructure	Varies based on age of equipment. Some components are high priority and others low.
44	Operational	Damaged or failed control valves in the UV building leading to supply disruptions from the WTP.	Three treatment trains provide redundancy and mitigates risk of catastrophic failure due to low probability of simultaneous failure. Groundwater supply system also provides redundancy for supply into distribution system.	Valves and actuators are very large and difficult to move.	Rolling crane or overhead crane would facilitate maintenance of valves	Low – Low probability of significant risk to WTP
45	Operational	Increased levels of disinfectant byproducts halts ASR.	Peroxide system modifications underway to address DBP's	Cessation or ASR activities reduces hydroelectric production and groundwater recharge	Addition of pretreatment process to remove TOCs and reduce incidences of DBP production.	High – This had already occurred and resulted in several operation issues at the plant.
48	Environmental – Wildfire	Water quality impacts related Wildfire (increased turbidity/TOC) resulting in reduced water quality and limiting WTP supply.	Groundwater supply system is used for water supply and has capacity to meet system demand for several years.	High risk of occurrence and high consequences	Additional treatment process to address contaminants associated with wildfire hazards	High – Enhanced resiliency needed to address high risk of occurrence and high consequence

Notes:

1. Reference to Risk ID number in Chapter 4 of the Watershed Master Plan.

CHAPTER 3

Risk Mitigation and Improvement Strategies

3.1 Overview of Risk Mitigation Strategies

Several projects have been identified for the City's water supply system, which will be further defined in this section to address the risks presented in Chapter 2 of this TM . These projects are summarized in **Table 3-1** and are grouped into the following project types based on how they mitigate risk:

- **Safety and Health Improvements**: These projects mitigate risks and hazards related to operational safety at the WTP.
- **Maintenance improvements:** These projects help mitigate risks related to equipment failure at the WTP or provide enhanced efficiency or resiliency of existing systems compared to current operations.
- **Supply Improvements:** These projects increase the system's supply capacity and/or redundancy.
- **Treatment Process Improvements:** These projects help mitigate risks and hazards related to water quality degradation and ensure the continuous production of clean drinking water for residents via the City's surface supply.
- **Planning**: These projects help mitigate risks related to funding gaps or space allocation on the property
- **Groundwater Supply Improvements**: These projects have been identified in previous planning documents.

Several of the proposed projects fit several categories which are noted in the table. A site plan graphic showing the location of each project on the WTP property is included in **Appendix A**.

Table 3-1 | Risk Mitigation Strategies

Strategy	Project Type	Risks and Hazards Mitigated	Risk ID	Discussion Section & Project ID #
Installation of a Clarification System	Treatment Process Improvement	➢ Operational – DBP production ➢ Operational – Aging infrastructure ➢ Environmental – Hazards resulting in water quality degradation (increased turbidity, TOC)	9, 22, 24, 45	3.2 & FI2, FI3
Filtration Facilities	Treatment process improvement	➢ Operational – DBPs ➢ Environmental – Hazards resulting in water quality degradation (increased turbidity, TOC)	6, 9	3.3 & FI4

Strategy	Project Type	Risks and Hazards Mitigated	Risk ID	Discussion Section & Project ID #
Onsite Sodium Hypochlorite Generation	Maintenance Improvements, Safety	➢ Safety – Chlorine gas leak ➢ Environmental – Earthquake ➢ Operational – Aging Infrastructure	11	3.4 & TP9, TP10
Groundwater Supply System Improvements	Maintenance Improvements, Groundwater Supply Improvements	➢ Operational – Aging infrastructure ➢ Environmental – Hazards resulting in surface water quality degradation	9	3.5.1 & GW1, GW2, GW3, GW4
Earthquake resiliency at storage tanks	Maintenance Improvements, Safety	➢ Environmental – Earthquake ➢ Operational – Aging infrastructure	10	3.5.2 & TP16
Sedimentation Basin Rehabilitation	Maintenance Improvements, Safety	➢ Operational – Aging infrastructure	7	3.5.3 & TP1, TP12, TP15
Interior Water Tank Corrosion Protection	Maintenance	➢ Operational – Aging infrastructure	12	3.5.4 & TP7, TP19
Crane for UV Building	Maintenance	➢ Operational – Aging or inefficient infrastructure ➢ Safety – Equipment hazard	44	3.5.5 & TP14
Hydro Building Improvements	Maintenance	➢ Operational – Aging infrastructure		3.5.6 & TP4, TP8, TP13, TP18
Electrical Upgrades	Maintenance	➢ Operational – Aging infrastructure	28	3.5.7 & TP2, TP11, TP20
Facility Plan	Planning	➢ Planning – Project funding, Space allocation, operational protocols	8	3.5.8 & TP5
Intake Building Communication System Upgrades	Maintenance	➢ Operational – Aging infrastructure		3.5.9 & IN5, SC1, SC2
Roughing Filter Media Replacement	Treatment Process Improvement	➢ Operational – DBE production	45	3.5.10 & TP3
Upgrade Pumping Infrastructure	Maintenance	➢ Operational – Aging or inefficient infrastructure		3.5.11 & TP17
WTP Clarification and Filtration Pilot Testing	Treatment Process Improvements	➢ Planning – Project Direction		3.5.12 & FI1
Finished Water Tank Aeration	Treatment Process Improvements	➢ Operational – Inefficient Infrastructure		3.5.13 & TP6

In the following sub sections of Chapter 3, the risk mitigation projects are described.

3.2 Installation of a Clarification System

3.2.1 Introduction

Construction of a clarification system consisting of coagulant mixing, flocculation, and settling is a priority recommendation for upgrading the City's WTP due to the resilience it will provide against potential and anticipated degradation of the City's surface water supply from post-wildfire runoff. Wildfires significantly impact water quality, introducing high levels of suspended particles, ash, organic carbon, and other impurities into the source water. These contaminants can overwhelm existing treatment processes, leading to degraded water quality, regulatory compliance challenges, and operational inefficiencies. A properly designed clarification system addresses these challenges by effectively removing these contaminants at the initial stages of treatment. A media filtration system preceding clarification would optimize resiliency even further improving overall water treatment efficiency and reliability, especially during challenging water quality conditions such as those caused by storms, wildfires, or other disruptions.

The proposed upgrades will:

- Enable the WTP to handle high ash and carbon loads following wildfires or other events leading to increased particles in the surface water supply.
- Ensure the continuous production of clean drinking water for residents and critical facilities from the City's surface supply.
- Enhance community resilience to disruptions from natural hazards.
- Reduce risks and vulnerabilities associated with the aging open twin sediment basins.

This project represents a proactive approach to addressing wildfire risks and protecting the City's water supply, ensuring the long-term sustainability of this critical resource.

3.2.2 Clarification Process Background and Technology

Clarification of raw water is a fundamental process used in most surface water treatment plants to remove turbidity, DBP precursors, taste and odor causing compounds, and pathogens. The combination of rapid mix, flocculation, and sedimentation unit processes is often referred to as clarification, with the processes associated with each step highlighted below. Within each stage of the process there are a variety of technologies available for achieving the stated objective.

- The rapid mix process is designed to disperse chemical additions (coagulant) to destabilize both inorganic and organic colloidal material. Mixing can be achieved using inline mechanical mixing, hydraulic mixing, jet injection, or back-mix reactors.
- The flocculation process is designed to agglomerate destabilized colloids into settleable particles. Flocculation can be achieved using horizontal paddle wheel flocculators, vertical turbine flocculators, walking beam flocculators, hydraulic mixing, solids contact flocculation, sand-ballasted flocculation/clarification, or contact adsorption.
- The sedimentation process is designed to separate the resulting particles from the process water prior to further downstream treatment. Sedimentation can be achieved using lamella plates, tubes, conventional circular or rectangular basins, or dissolved air flotation.

Each of the technologies available for clarification have advantages and disadvantages, as well as cost implications. For conceptual design of the City's clarification system, a facility comprised of inline mechanical rapid mixing, horizontal paddle wheel flocculation, and lamella plate sedimentation has been identified as a viable option with a proven operational history.

Common coagulants available to support the clarification process include alum, polyaluminum chloride (PACl), aluminum chlorohydrate (ACH), and ferric chloride. Enhanced coagulation, consisting of decreasing the rapid mix pH and optimizing the coagulant dose to achieve the best removal possible, is recognized under the Stage 1 DBP Rule as a method to address TTHM compliance issues. PACl or ACH are less commonly used due to their lower effectiveness and higher costs relative to alum or ferric chloride. Water treatment plants that implement coagulant mixing, and flocculation with plate settlers typically see very effective removal of suspended solids and turbidity, with moderate removal of TOC depending on the coagulant used, and moderate to poor effectiveness at removing algae when compared to dissolved air flotation (DAF) style clarification facilities.

3.2.3 Overview of System Process

The proposed plan involves replacing the existing south twin sediment basin with a new clarification system and decant facility. Key features of these facilities include:

- **Clarification System**: A system consisting of two parallel open basin trains (12 MGD each), with each train comprised of a rapid mixer where coagulant and pH adjustment is added, a flocculation basin, and a sedimentation basin.
- **Chemical Storage Building**: A building near the mixing chambers to store coagulant, controls, and mechanical equipment.
- **Sludge Removal System**: A system located at the bottom of the sedimentation basin to remove settled coagulant sludge from each train and convey it to the decant facility using control valves. This would be routed to a gravity sewer connection that conveyed settled material to the City's wastewater treatment plant. A decant facility could be constructed to thicken the sludge and reduce the volume of water being sent to the sewer system by reintroducing it to the WTP.
- **Sewer Connection**: Sludge from the removal system will be routed to the City's wastewater collection system via a new sewer connection. Sludge concentrations and volumes will need to be estimated as part of preliminary design and system design/pilot testing to ensure that the Wastewater Treatment Plant can accept and manage the additional loads from this new connection.

A conceptual layout showing the key features of this system is provided in **Appendix A**. By constructing the clarification trains in the existing south twin sediment basin, the facility will be located at the beginning of the treatment process and will be able to operate under gravity flow conditions, receiving water from the hydro tailrace as well as onsite wells. The adjacent north sediment basin could either be abandoned or remain in service to provide storage/holding area as needed. The cost estimate for the clarification facility in **Appendix B** assumes that it will remain in service. With construction of the clarification trains, the existing twin sediment basins would not be required for the treatment process.

For each treatment train in the clarification facility, two in-line rapid mixers are anticipated to provide sufficient energy to effectively mix and disperse chemicals into the water. Upstream of the chemical feed points, a magnetic flow meter and modulating flow control valve are anticipated for each train to monitor and control flow through the clarification process. Backwash recycle flows from the decant facility would be introduced in a branched tee upstream of the rapid mix process.

For the flocculation basin, 30-minutes of flocculation time is assumed using three stages of flocculation. Each stage would be designed so flow will follow a serpentine flow path. In each stage flocculators will be installed, and at the 3rd stage flocculation basin, flow will pass through a channel and a series of window walls to the sedimentation process.

For conceptual design it is assumed that sedimentation will utilize lamella plate settlers. With plate settlers, flocculated water is directed through inclined, parallel plates where particles settle to the plate surface and then slide off the bottom of the plates to the basin floor where a solids collection system removes the accumulated solids. Clarified water leaving the system via a series of collection troughs at the top of the plates that discharge to the clarified effluent channel for conveyance to the roughing filter.

The solids that settle at the bottom of the sedimentation basins will be collected with hoseless sludge collectors. Collected solids will be conveyed via gravity sewer pipe to the decant facility using control valves. The decant facility will be located south of the sedimentation basin and will use a gravity thickener to extract water from the coagulant sludge that will be pumped back to the head of the clarification system. The thickened solids will be sent to the City's municipal wastewater conveyance system once a new trunkline is extended to the WTP.

3.2.4 Conceptual Design Criteria

Process design criteria for the rapid mix, flocculation and sedimentation systems are provided in **Table 3-2**. With a conceptual layout included in **Appendix A**.

Table 3-2 | Design Criteria for Walla Walla Clarification Facilities

Item	Values	Units
Rapid Mix		
Total Plant Flow	24	mgd
Number of Trains	2	#
Number of mixers per train	2	#
Flocculation		
Total Plant Flow	24	mgd
Total Plant Flow	16,667	gpm
Number of Trains	2.0	#
Flocculation Detention Time	30.0	min
Number of Flocculation Stages	3.0	#
Flocculation Basin Water Volume per Train	33,421	cf
Flocculation Basin Length	72	ft
Flocculation Basin Width	34	ft
Basin Freeboard	1.5	ft
Total Basin Depth	15.2	ft
Lamella Plate Clarification		
Total Plant Flow	24	mgd
Total Plant Flow	16,667	gpm
Number of Trains	2.0	#
Total Plate Length	10	ft
Plate Width	5	ft
Plate Angle	55	degrees
Effective Plate Area	95%	%
Projected Effective Plate Area	27.24	sf
Projected Plate Hydraulic Loading Rate	0.30	gpm/sf
Number of Plates per Train	1,020	#
Number of Rows per Train	4	#
Plate Spacing	2.5	in
Number of Plates per Row	255	#

Item	Values	Units
Plate Effluent Channel Width	1.5	ft
Internal Basin Width	34	ft
Sludge Collector Maintenance Access	15	ft
Basin Length	80	ft
Minimum Clearance Beneath Plate System	5	ft
Freeboard	1.5	ft
Total Basin Depth	15.2	ft

3.2.5 Benefits to Treatment Plant

The proposed clarification system will provide the following benefits to City's WTP:

- **Removal of Dissolved Organic Carbon (DOC)**: Post-wildfire runoff contains elevated levels of dissolved organic carbon, a precursor to disinfection byproducts (DBPs) like trihalomethanes (TTHMs), which are regulated under the SDWA and the City's ASR Permit. Membrane filtration systems cannot adequately remove DOC, but clarification is a proven method for significantly reducing these levels, minimizing DBP formation during subsequent disinfection processes.

- **Protection of Downstream Treatment Systems**: Without pre-treatment, ash, sediments, and organic debris can clog or damage the existing gravel roughing filter and in the future advanced treatment systems like membranes, leading to increased maintenance costs, reduced system efficiency, and premature equipment failure. Clarification provides critical protection by removing these materials before they reach sensitive downstream systems.

- **Enhanced Resilience to Wildfire Impacts**: With increases in the frequency and intensity of wildfires, the likelihood of extreme water quality degradation also rises. A clarification system ensures the plant is prepared to handle the high pollutant loads associated with wildfire events, safeguarding the community's water supply during and after such disasters.

- **Versatility and Adaptability**: This system can be tailored to handle varying water quality conditions, from routine operations to extreme events like wildfires. The ability to adjust coagulant dosages and process parameters ensures the plant can respond dynamically to changing conditions. Clarification using plate settlers can handle large variations in flows and water quality.

- **Regulatory Compliance and Public Health Protection**: The addition of a clarification system is a proactive measure to ensure compliance with stringent water quality regulations, particularly for DBPs. By maintaining high water quality standards, the plant protects public health and strengthens community confidence in the water supply.

- **Efficient Sludge Management**: The inclusion of sludge removal and management facilities ensures that settled coagulant sludge is effectively handled, preventing environmental impacts and ensuring smooth plant operations. Recycling water from the sludge management process further enhances efficiency.

- **Cost-Effective Long-Term Solution**: While this system requires an initial capital investment, it offers a cost-effective long-term solution by preventing costly repairs, regulatory fines, and operational disruptions associated with poor water quality and equipment damage.

- **Modernization of Aging Infrastructure**: The existing sediment basins were constructed over 100 years ago and require increased maintenance to address cracking and leakage. They also prolong residence time at the plant and constitute a large open surface area for contaminant entry. Replacing the south reservoir with a clarification system will modernize the existing sediment basins with a facility that will reduce the footprint and storage volume associated with the initial stage of the treatment process.

- Compatibility with Long Term Facility Planning: Replacement of the existing south reservoir with a clarification system will integrate with the existing treatment process and preserve space on the treatment plant site. It will also facilitate future planning efforts and projects such as granular media filtration or membrane filtration.

Given this wide array of benefits, the development and implementation of a clarification system is the primary component of the WTP's upgrade strategy. It not only addresses immediate water quality concerns but also ensures the facility's ability to provide safe, reliable, and resilient water treatment in the face of increasing environmental challenges.

3.2.6 Next Steps

Key next steps toward implementing this project include:

- Conducting additional pilot testing to determine if post-coagulant addition of caustic soda, lime, or soda ash is necessary to mitigate potential corrosion during operation.
- Development of a preliminary design report for the clarification system
- Final design of:
    - The clarification facility mixing, flocculation, and sedimentation basins, the sludge handling systems, electrical, instrumentation and control (E&IC), piping, and site improvements.
    - The chemical building to house storage tanks, feed pumps, and water quality monitoring equipment.
    - The decant facility to gravity thicken the settled sludge from the sedimentation basin and route the reclaimed water back to treatment plant.
    - The offsite wastewater conveyance system.
- Construction and startup

3.3 Filtration Facilities

3.3.1 Introduction

The EPA recognizes several filtration strategies for compliance with the SWTR, including the latest Long-LT2 Enhanced Surface Water Treatment Rule that sets out treatment requirements for Cryptosporidium removal and inactivation. These technologies include: Granular media filtration, Membrane filtration, Slow sand filtration, Cartridge and bag filtration, and Diatomaceous filtration. The membrane filter option was evaluated for the Mill Creek WTP in 2016 to prepare for any future conditions such as wildfire runoff, landslides and climate change that could affect water quality parameters such as water turbidity and TOC.

For the City's WTP, two filtration methods were considered for potential implementation to maximize the plant's resiliency against water quality changes: Granular Media Filtration and Membrane Filtration.

3.3.2 Granular Media Filtration

Granular media filtration is the most commonly used technology for large surface water plants in the U.S. There are two basic types of granular media filters in use for potable water treatment: rapid granular media filtration and biologically active filtration.

Rapid Granular Media Filtration is typically used for conventional surface water treatment plants after the clarification processes to filter water. It typically employs sand, anthracite, granular activated carbon (GAC), or combinations of media types. The dual media design is typically a shallow bed with 18 to 24 inches of anthracite or GAC followed by 12 inches of sand. The smaller sand media provides a barrier to particle breakthroughs, and more efficient filter runs.

Biologically Active Filtration provides additional removal of organics resulting in better disinfection DBP control and a biologically stable filter effluent. The filter design is similar to the rapid media filter and is usually preceded by ozonation. The large media and deep beds promote biofilm growth on anthracite or GAC.

Key considerations for implementing a granular medial filtration system at City's WTP include:

- A granular media filtration system would need to be preceded by clarification to maximize resiliency against a sustained turbidity event.
- This system or components of the system could be installed within the existing roughing filter building.

As part of the ongoing watershed resiliency study, Consor evaluated the possibility of retrofitting the roughing filter structure at the City's WTP into a media filtration system. This study was motivated by the possibility of substantial change in Mill Creek's raw water quality to require a process change to filtration where the current upflow roughing filter would not be effective in meeting regulatory requirements. This study, "Media Filtration Evaluation" is attached in **Appendix E.**

3.3.3 Membrane Filtration

Membrane filtration can be separated into four basic categories—reverse osmosis, nanofiltration, ultrafiltration, and microfiltration.

- Reverse osmosis (RO) and nanofiltration (NF) are used to remove dissolved inorganic compounds such as sodium, calcium, and magnesium ions, or dissolved organic compounds such as humic and fulvic acids that make up the primary source of DBPs. The NF membranes can remove particles, most DBP precursors and some dissolved salts; while the RO membranes remove everything the other membranes do, plus almost all dissolved salts. Some uses for RO and NF include desalination of seawater and membrane softening. The cost of installing and operating RO or NF systems makes this process cost-prohibitive for the City's WTP.
- Microfiltration (MF) cannot remove dissolved materials and are limited to removal of particles. MF membranes have a nominal pore size of between 0.05 and 0.5 µm, and this pore size makes them most effective at removal of turbidity, bacteria and oocysts such as Giardia and Cryptosporidium.
- Ultrafiltration (UF) membranes, similar to microfiltration, cannot remove dissolved materials. UF membranes have a nominal pore size of between 0.003 and 0.03 micrometer (µm); and have the

added feature of removing not only turbidity, bacteria, and Giardia and Cryptosporidium, but also viruses.

In 2016, a feasibility study was conducted by HDR for retrofitting the roughing filter structure at the City's WTP into a membrane filtration system. This study was motivated by the possibility of substantial change in Mill Creek's raw water quality to require a process change to filtration where the current upflow roughing filter would not be effective in meeting regulatory requirements. This study, 'Future Conversion of Roughing Filter' is attached in **Appendix C**.

The roughing filter has two large filter bays that are supplied and discharged to a common pipe gallery; each of these bays would be retrofitted to contain two parallel pressurized membrane treatment trains, for a total of four trains when fully installed, with a capacity ranging from 18+ MGD at 2°C to 30+ MGD at 15.4°C, depending on water temperature. The proposed retrofit would involve removing filter media and underdrain laterals, and installing pressurized membrane filtration trains, with their ancillary equipment including mechanical screens, feed pumps, air compressors, and break tanks. The conversion would occur in phases, temporarily reducing capacity before full implementation. Additional modifications include new ductile iron piping, chemical storage and feed systems, and backwash handling infrastructure. The study anticipates that the roughing filter can be used to house a new future membrane system if required and the retrofit would prevent it from becoming a stranded asset, ensuring flexibility for future filtration needs.

To aid this study, the Consultant Team reached out to two manufacturers to obtain preliminary equipment sizing and cost using the same design criteria outlined in the 2016 feasibility study, i.e. the temperature range of 2°C to 15.4°C and dimensions of roughing filter for area constraints. **Table 3-3** documents the manufacturer's suggested equipment models and cost. These costs are limited to the membrane filters and do not include feed tank, valves, motor control center, chemical storage equipment and supply, design of anchor bolts and pipe connections, handling, installation, instrumentation and control (I&C), design of civil infrastructure housing the filters, or any permits.

Table 3-3 | Manufacturers, Recommended Systems and Cost

Manufacturer	System Model	Membrane Model	Total Units	Membrane Modules per Unit	Equipment Cost*
Pall	Aria Filtra	-	12	66	$12,500,000
Westech	UFTXXA	Toray HFUG-2020AN	9 + 1 Redundancy	98	$11,480,000

Note:
*Estimated Cost of Filter Equipment Delivered to Site. See Appendix B for conceptual estimate of full filtration facility costs.

3.3.4 Comparison of Proposed Filtration Methods

The two filtration methods considered for this evaluation would provide considerable improvements to the City's WTP treatment capabilities and resilience against fluctuations in water quality. A comparison of the benefits associated with each filtration method is provided in **Table 3-4**. While both options would be compatible with prior implementation of a clarification system and provide similar levels of benefit for most criteria, granular media filtration with clarification offers enhanced TOC and algae removal compared to membrane filtration. For estimating the capital cost of a future filtration system, a granular media filtration system was assumed. Additional information regarding the potential to retrofit the existing roughing filter into a granular media filter system is presented in **Appendix E**.

Table 3-4 | Filtration Technology Benefit Comparison

Treatment Process Benefits	Granular Media Filtration			Membrane Filtration	
	Granular Media Filtration (Direct Filtration	Add clarification (Conventional filtration)	Biological granular media filtration	Membrane filtration	Add clarification
Provide pathogen removal for cryptosporidium, giardia, bacteria and viruses	++	++	++	++	++
Produce a biologically stable water	+	+	++	+	+
Reduce DBPs	+	+	++	+	+
Increase supply reliability	+	++	++	++	++
Reduce distribution system flushing, lower turbidity levels	++	++	++	++	++
Reduce iron and manganese	+	+	++	+	+
Improve WQ stability, lower lead and copper levels	++	++	++	++	++
Effectively treat an algae event	+	++	++	+	+
Reduce water quality impacts due to warmer weather	+	+	++	+	+
Reduce organic discoloration events	+	+ to ++	++	+	+ to ++
Improve ability to respond to changes in regulations	+	++	++	+	++
Increase ability to meet critical service levels	+	++	++	+	+
Treat a sustained elevated turbidity event	-	++	++	++	++

Ratings Key
++ = excellent, += good, - = poor

3.3.5 Portable Emergency Filtration

Another filtration option considered for this TM included a review of portable membrane filter units that could be deployed onsite in an emergency. This approach involves renting a trailer mounted filtration system such as the Aria FAST system from Aria Filtra. While not a long-term solution, this could be a viable strategy during periods of elevated turbidity following a wildfire event that the roughing filter is not capable of addressing. Considerations for this approach include the following:

- This system provides high turbidity removal
- This system provides limited removal of TOC
- High Cost ($30,000 per month per 1 MGD of treatment provided)

See Chapter 8 (Recovery Plan) of the Watershed Resiliency plan for additional information on this emergency measure.

3.3.6 Implementation Considerations

The implementation of a filtration facility is expected to be a long-term project due to the high cost associated with designing and constructing this type of facility; particularly if the City proceeds with a clarification project as the primary step toward addressing turbidity and TOC reduction.

3.4 Sodium Hypochlorite Onsite Generation Facility

3.4.1 Introduction

The existing gas chlorination building structure is aging, and transport of chlorine gas poses safety risks and potential health hazards. Additionally, the chlorine gas cylinders are not anchored to the ground in the chlorine building which poses a risk in an earthquake event. Replacing the gas chlorination system with a sodium hypochlorite on site generation (OSG) facility would enhance the system's safety and reliability. Also, converting to onsite generation would remove the city for the time-consuming Risk Management Program.

Currently, chlorine is injected at several locations throughout the plant using carrier water supplied by the Mill Creek Tanks. Chlorine gas is dissolved into the carrier water and the resulting hypochlorite solution is routed via underground piping to the WTP injection points. The chlorine injection points include the following locations:

- A common point for Well Nos. 1 and 2; prior to entering the distribution system or the sediment basins.
- Between the Treated Water Pump Station and the Mill Creek Tanks via the Treated Water Injection MH;
- Downstream of the Mill Creek Tanks, prior to the distribution system point of entry, at the Finished Water Injection Point.

The average chlorine dosage measured is 1.3 mg/L, maximum chlorine dosage is 1.6 mg/L and residual entering the distribution system is 0.7 to 0.8 mg/L which is in compliance with the SWTR requirements.

The most recent upgrades to the chlorination system were completed in 2016 and included replacing all chlorine feed piping gas and valves, installing new vacuum regulators with automatic emergency shut-off valves to comply with Article 80 of the IFC, and adding new chlorine gas detectors for improved safety. Additionally, the chlorinator between the Weir Diversion Structure and the twin sediment basins was converted into a spare gas chlorination system, sized to match the largest existing feeder, with modifications to the carrier water piping to allow the system to be a spare for any of the other systems.

3.4.2 Sodium Hypochlorite OSG Background and Technology

The process to generate sodium hypochlorite requires inputs of water, salt, and electricity. Both high and low-strength systems include usage of a water softener, following which the softened water and salt are combined in the brine storage tank to form a brine solution. The brine solution and softened water is then electrolyzed across the cells to produce sodium hypochlorite, which is stored in a product tank and metered out for disinfection. The power supply to the cells is converted to DC via a rectifier. The hydrogen gas byproduct is safely vented to the atmosphere and a cell cleaning system is included to maintain efficiency.

Although the high and low strength OSG share many of the same process steps, the high strength OSG is a more complex and hazardous process. The primary difference is that the high-strength OSG uses an electrolytic cell that has its anode and cathode separated by a membrane.

3.4.3 System Overview

The low strength system is recommended since it has slower product degradation rates at lower concentrations, and simpler system needs, one of which is food-grade salt. Low-strength OSG systems are common in the US with a wider selection of manufacturer and generator unit options, providing the City with more examples of previous installations. The low-strength OSG also has easier operation and maintenance and safer handling, as low-strength sodium hypochlorite is non-hazardous. This eliminates the risks associated with handling high-strength sodium hypochlorite or chlorine gas. While the low strength OSG requires larger product storage quantities than the high strength OSG, this is offset by the safety and operational efficiency of the low strength system.

A low strength centralized sodium hypochlorite OSG system was evaluated for the City's WTP. The chlorine demand for the WTP was calculated for the maximum plant capacity of 24 MGD and the required chlorine dose at each dosing point as reported in the 2016 HDR Preliminary Basis of Design Report to meet the chlorine residual target of 0.8mg/L entering the City's distribution system.

3.4.4 Conceptual Design Criteria

Using the design criteria summarized in **Table 3-5**, manufacturers for low-strength sodium hypochlorite OSG units were contacted, and the recommended units are listed in **Table 3-6**. The costs include units for redundancy and all ancillary equipment but doesn't include sales, permits, licenses, civil/structural work, electrical and piping installation, testing, painting, consumables, and equipment including hypochlorite tank, brine tanks, salt conveyor, brine tank, gravel, blower connector, and anchor bolts.

Table 3-5 | Design Criteria for 0.8% Sodium Hypochlorite OSG Mill Creek WTP

Design Parameter	Values	Units
Target Chlorine Dosage:		
Common point to Wells 1,2	1.2	mg-Cl_2/L
Treated Water Manhole	1.2	mg-Cl_2/L
Finished Water Manhole	0.4	mg-Cl_2/L
Total WTP Capacity	24	mgd
Total Maximum Design Dose	320	ppd
Annual Salt Required	184	ton/year

Table 3-6 | Manufacturers, Recommended Systems and Cost

Manufacturer	Models (1 duty, 1 standby)	Capacity	Total Cost (including unit for redundancy)
Clortec	Clortec-450	450 ppd each	$978,945
Klorigen	B-8	423 ppd each	$289,500
Microclor	MC-500	500 ppd each	Not provided

3.4.5 Implementation Considerations

Key next steps towards implementing this include:

- Additional Considerations

  - The existing chlorine building and emergency power generator are nearly 40 years old. If a new onsite sodium hypocholorite generation facility is not constructed in the near future, replacement of the generator, ATS, and building roof would be necessary.

- Preliminary Design:
  - Development of a preliminary design report evaluating the design criteria, required chlorine dosage and system selection for the OSG sodium hypochlorite system.
  - Determination of necessary storage space. The cost estimate included with this report assumes that a 60 ft x 50 ft building will be constructed for the generation facility in order to provide chemical storage with the facility. If this additional storage area is not required, a smaller footprint may be feasible for this facility at a lower cost.
  - Manufacturer equipment should be further considered as these systems are not necessarily designed equal and have various pros and cons that require evaluation prior to making a final selection.

- Final design of:
  - Sodium hypochlorite generation building layout
  - Selection and installation of the sodium hypochlorite generation system
  - Underground piping to chlorine injection points

3.5 Miscellaneous CIP Projects

3.5.1 Groundwater Supply System Improvements

Description: The City's 2021 Well Master Plan (WMP) includes recommendations to increase the City's water supply resiliency by providing dependable operation for all wells and reliably meeting demand conditions for the short-term time horizon and long-term time horizon. Short-term involves meeting the projected 2038 ADD by 2025 and long-term involves meeting the projected 2038 MDD by 2033.

- Short-Term: Based on existing and projected 2028 ADD of 8.6 million gallons per day (MGD) and the preferred operational order of well use, it is recommended that the City improve/upgrade and maintain Wells 1, 2, and 6 facilities, which will provide the City with the ability to supply 9.6 MGD to the system. If surface water quality was impacted enough to either limit or prevent use of the Mill Creek surface water source, Wells 1, 2, and 6 would be able to meet 2028 ADD. The total well supply of 9.6 MGD would also meet 2038 ADD.

- Long-Term: The long-term supply strategy intent is to improve/upgrade and maintain all wells to further increase supply resiliency enabling the City to meet its projected demands. Based on a 2038 MDD of 20.1 MGD and the preferred operational order of well use, it is recommended that the City focus well facility improvement efforts on Wells 5, 3, and 4 facilities. These wells in addition to Wells 1, 2, and 6 would provide the City with the ability to supply 19.8 MGD to the system from the well sources, which is 0.3 MGD less than 2038 MDD. With Well 7 online the City could provide 24.0 MGD from the groundwater supply which is 3.2 MGD less than the 2068 MDD. If the surface water quality is impacted enough to limit or prevent use of the Mill Creek surface water source the City would have to look at water restrictions. As part of the long term supply improvements, Well 2 and Well 5 are slated for conversion to an ASR system. Note that the conversion of Well 5 to an ASR system is not included on the project list within this memorandum as it is not located at the WTP site.

In addition to long term supply improvements, the City has identified multiple operation and maintenance projects associated with various well sites across the City. This memorandum includes those projects which are directly related to wells located at the WTP site. See the City's 2025 water CIP for a full list of all well projects.

Well Projects with Priority and Implementation Considerations:

- **Well Assessments: High Priority**
  - Well 1, 2, 3 & 4 – Perform condition assessment through a downhole well inspection and well casing plumbness. Potential work needed: perform rehabilitation including pump removal, cleaning, disinfection and removal of biomass through brushing and swabbing.
- **Well Site Physical Security, Electrical, & Lighting: High Priority**
  - Well 2, 3, 4 & 7 – Improve security by adding vandal-proof lighting, new perimeter fences with barbed wire, security cameras, and mesh screens over vents.
  - Well 2, 3, & 4 – Install manual transfer switches to connect portable generators during power outages.
- **Emergency Generator and Automatic Transfer Switch: High Priority**
  - Well 1 – Install diesel generators and transfer switch
  - Well 6 – Install diesel generator and transfer switch plus 700 ft of fencing around well site.
- **Well 2 ASR Conversion: Low Priority** – Upgrade Well 2 to increase ASR capacity at the WTP site.

3.5.2 Earthquake Resiliency for Storage Tanks

Description: The existing water storage tanks were constructed in 1999 and are not equipped with flexible valves or earthquake valve technology, which makes them vulnerable to uncontrolled discharges in the event of a downstream pipe break during an earthquake event. Several options exist for potential improvements, including:

- A motor activated valve installed on the reservoir outlet piping that is equipped with a sensor that will trigger automatic closure of the valve when a predetermined level of seismic activity is detected.
- A motor-actuated plug valve installed on the reservoir outlet piping that will allow operators to remotely operate the valve, providing the means to quickly close the valve and isolate the reservoirs.

Priority and Implementation Considerations: High Priority – The installation of earthquake valves at Walla Walla's reservoirs has been identified as a high prior project due to the benefit it will provide in terms of added resiliency to seismic events, as well as potential benefits related to insurance rates within the City's water service area. The installation of earthquake valves can be standalone project or coupled with other work in the tank area.

3.5.3 Sediment Basin Rehabilitation

Description: The existing sediment basins have been in operation for over 100 years and include several deficiencies ranging from drainage issues and waterfowl contamination to leakage. Currently, routine system loss has been attributed to seepage through the reservoir embankments. To confirm leakage, the basin water levels were drawn down and inspected in September 2024. A crack in the concrete sidewall near the valve house was noticeable in the north reservoir. Once the reservoir was isolated, it lost two feet of storage within a 24 to 36-hour period, accounting for a leakage of approximately 0.5 MGD. In January 2016, the City hired a contractor to pressure grout behind two settling panels in the south reservoir due to observed settlement and leakage at that time and is anticipating the same approach for the north reservoir. The 2016 project added about thirty cubic yards of grout to the embankments in the area immediately west of the valve house. In addition to the highest priority grouting in the north basin, there are additional crack and concrete seams throughout the sediment basins that need to be sealed. Also The valve house at the edge of the sediment basins is aging (at the end of design life) and in need of retrofit work, particularly the roof, which is failing.

Sediment Basin Projects with Priority and Implementation Considerations:

- **North Sediment Basin Grouting: High Priority** – Grouting the north basin of the sediment basins is proposed as a near-term project. This approach was used successfully at the south reservoir in 2016 and appears to be a reasonable short-term solution to reduce system loss and help mitigate the risk of a larger issue arising at this facility until a long-term solution is identified and implemented as part of facility planning efforts.

- **Sediment Basin Crack Sealing: Medium Priority** – Address overall concrete basin leakage and disintegration of concrete joint sealant.

- **Valve House Restoration: Medium Priority** – The valve house at the edge of the sediment basins is aging (at the end of design life) and in need of retrofit work, particularly the roof, which is leaking. This project also includes replacement of leaking valves that control flow into and out of the sediment basins.

3.5.4 Interior Water Tank Corrosion Protection

Description: Rust observed under the footings of the steel column footings would be addressed by providing cathodic protection to the tanks. Interior painting of the tanks is also required to maintain the facilities.

Priority and Implementation Considerations:

- **Mill Creek Tank Cathodic Protection: High Priority –** Mitigation of corrosion is time sensitive and should be quickly addressed as a standalone maintenance project or combined with other work onsite such as cathodic **protection of the raw water transmission main.**

- **Mill Creek Tank Repainting: Low Priority** – This is an ongoing maintenance activity required to prevent corrosion and maintain structural integrity of the steel tanks. This project is low priority because the tanks were recently repainted (spring 2025).

3.5.5 Crane for UV Building

Description: The recently constructed UV building contains 3 treatment trains, with only 1 or 2 trains typically active at any given time. The trains rely on 24-inch motor actuated plug valves to control flow rates in the system, which have experienced leakage issues during low flow conditions and required maintenance work. Currently there is no crane system in place at the UV building to move the equipment. Two types of crane system are available to address this deficiency, including a gantry style rolling crane, or an overhead crane system. The City has indicated that an overhead crane system is preferred which was used as the basis for the project cost estimate.

Priority and Implementation Considerations: Medium Priority – Overall risk associated with this deficiency is low.

3.5.6 Hydro Building Improvements

Description: The interior of the hydro building is being retrofitted as part of a previously designed project and construction will be complete in the Summer of 2025. Exterior improvements are not included with the interior redesign project and need to be addressed as a separate project. The exterior of the building includes a stucco finish that has been damaged by bird activity, including woodpeckers and starlings. The improvement project includes patching holes, repainting the exterior, and installing decoy owls or hawks at the corners of the building to deter future bird activity. In addition, the building roof is in need of replacement, and a new hydro valve is desired to improve isolation of the facility.

Hydro Building Projects with Priority and Implementation Considerations:

- **Exterior Improvements: High Priority –** This project is rated as high priority to maintain integrity of the structure and to ensure protection of the upcoming interior improvements.
- **Hydro Maintenance: Recurring** – Recurring 5 year task to maintain permit compliance
- **Roof Replacement: Medium Priority –** This project is rated as low as there are no known issues with the existing structure.
- **Hydro Facility Valve Installation: Medium Priority –** Full replacement of hydro valve and meter to isolate hydro facility when necessary.

3.5.7 Electrical Upgrades

Description: The existing standby power system at the WTP was assessed for general condition and functionality based on visual observations, record data, and anecdotal input from staff. The following improvement projects have been identified by the project team:

- **Solar Array & Switchgear Upgrades: High Priority** – Replace the PLC and Basler relays with a modern automatic transfer switch control system as part of the solar array project. Also install a new circuit breaker and integrate with the automatic transfer control system.
- **WTP Main Generator Replacement: Medium Priority** – The WTP has a single generator which is adequately sized for the operation of the WTP. The generator is a ~26 years old, 750KW, Cummins/Onan (Serial No. D980721020), diesel fueled generator with an in base fuel tank and weatherproof outdoor enclosure. The generator has communication issues causing it to shut down immediately after startup, but otherwise appears to be in good working condition and has been

regularly serviced, which has extended its useful life. The generator enclosure and base show moderate corrosion. The generator should be replaced in 5 to 10 years.

- **Service Entrance and Transfer Switchgear: Medium Priority –** The existing distribution switchgear is ~26 years old, 2000A, 480V, 3 phase, 3 wire Siemens draw out style switchboard with RL power circuit breakers. The switchgear should be replaced in 10 to 15 years. Continue regular maintenance and thermographic testing.

Priority and Implementation Considerations – High priority projects at the main electrical building will be addressed in conjunction with the City's ongoing solar array & BESS improvements. In addition, electrical improvements have been identified for the electrical building, including a new switchgear and generator as medium priority, however, this work would be superfluous if the City proceeds with the on-site sodium hypochlorite generation project, which would replace and relocate the existing chlorination building.

3.5.8 Facility Plan

Description: A facility plan is a document that outlines the needs and deficiencies of a large facility such as a WTP. This plan will also address considerations such as capacity needs, treatment improvement requirements regulatory standards in compliance as well as long-term funding and financing. This TM provides a basic starting point for a future facility plan, but it is not scoped to be a comprehensive analysis related to process improvements, updated cost estimates, and financing needs. A particular focus of the facility planning work should include long-term management of the sediment basin facilities.

Priority and Implementation Considerations – The development of a facility plan for the City's WTP has been identified as a high priority item to advance the improvement strategies and concepts presented in this TM to the next stage of planning and design. A high priority is warranted due to the number of projects that have been identified as part of this study, including the sediment basins. Developing a facility plan is anticipated as a near-term project in order for planning effort to track with or stay ahead of the various projects on this list.

3.5.9 Communication System Upgrades

Description: Several communication system upgrades have been identified for the WTP. The existing telemetry system communicates with the WTP control system via a hardwired (leased line telephone) connection using dial-up modems (Data-Link DLM-4500). The connection has been problematic and fails periodically generally due to problems with the leased telephone line. The existing telephone leased lines are old and have been broken and spliced many times over the years. The telemetry connection between the WTP and the Intake control system should be replaced with a satellite-based internet connection (Starlink for example) using VPN routers for a secure connection and data transmission. In addition, the SCADA system upgrade project needs to be completed and additional security upgrades are warranted at the WTP site.

Priority and Implementation Considerations:

- **Telemetry Replacement Between Intake and WTP: High Priority** – Improvements to the communication system should be coordinated with improvements at the raw water intake. Consider Starlink system at intake and plant, with separate systems for caretaker (satellite phone).

- **WTP SCADA System Replacements: High Priority** – This is a scheduled 5-year upgrade project to replace aging equipment and better integrate with other systems.

- **WTP & Well Security System Upgrad3.5.13es: High Priority** – Installation of cameras at WTP gates and other key locations.

3.5.10 Roughing Filter Media Replacement

Description: The HDR memo prepared for the WTP contained the following information regarding the roughing filter media replacement project:

- By incorporating a larger depth of finer media into the existing filter, it may be possible to increase the removal effectiveness for TOC and other fine particulates associated with post-fire runoff. This enhancement would leverage the existing infrastructure while improving water quality performance, making it a cost-effective solution for mitigating wildfire impacts.

- Further pilot testing and detailed design analysis are required to confirm the feasibility and expected performance improvements of this modification.

Specific recommendations within the HDR memo include:

- Add 3 inches of fine sand layers to one roughing filter as a pilot project. Monitor water quality and backwash frequency to evaluate performance. A final implementation may involve adding 6 inches of fine sand to both filters.

Priority and Implementation Considerations: High Priority – Project anticipated to improve treatment process, which would provide added resiliency, which is particularly important prior to clarification improvements coming online.

3.5.11 Upgrade Pumping Infrastructure

Description: The existing finished water pump station consists of four vertical turbine pumps rated at 8 MGD each (3 duty 1 standby). This project would involve installing a smaller high-lift pump designed for low-flow operations (3 MGD) and optimizing the existing pump control system for improved reliability and performance.

Priority and Implementation Considerations: High Priority – Improvements will provide better efficiency during low flow conditions.

3.5.12 WTP Clarification and Filtration Pilot Testing

Description: Conduct pilot testing to demonstrate and test effectiveness of clarification and filtration technologies proposed to mitigate against degraded water quality.

Priority and Implementation Considerations: High Priority – This work is a necessary step toward implementing a clarification system and a filter facility.

3.5.13 Finished Water Tank Aeration

Description: Install TTHM removal equipment on both finished water reservoir tanks at the WTP to enhance mitigation of TTHM production within the WTP. Cost sharing with partner groups is anticipated to help fund this project.

Priority and Implementation Considerations: High Priority – This project will help mitigate TTHM and thereby reduce the likelihood of future ASR shutdowns.

3.6 Operational Strategies

3.6.1 Peroxide Addition

Description: The City has been evaluating the effectiveness of dosing hydrogen peroxide upstream of the twin sediment basins to reduce the amount of chlorine added for residual disinfection. Reducing chlorine usage lowers the potential for DBP formation. Using doses ranging from 1-3 mg/L, testing showed:

- Chlorine residual leaving the plant was reduced from 0.83 mg/L to 0.69 mg/L (17% reduction).
- TOC leaving the plant dropped from a historic average of 2.89 mg/L to 0.55 mg/L (81% reduction).

This testing demonstrated the potential for hydrogen peroxide to control TTHM concentrations in the water. However, TOC levels after a wildfire would likely exceed manageable levels, indicating this approach should be considered primarily to address DBP concerns related to current ASR system issues and address DOE's concerns resulting in suspension of ASR operations.

Priority and Implementation Considerations: High Priority – Coordinating with DOE to get an approved peroxide dosing plan in place to bring the Well 1 ASR system back online will help address several concerns at the WTP.

3.6.2 Low Flow Management

Description: The City is considering several options to address the low flow issues described in section 2.1.5.1 of this TM. Developing a better operational strategy to address low flows at the plant is an important operational issue, with the goals for optimizing plant performance and hydroelectric revenue, as well as avoiding penalties from violation of the Columbia REA power production contract. Strategies for optimizing plant performance during low flow conditions include:

- Lower tank levels during low-flow periods to reduce water residence times while maintaining fire flow requirements.
- Evaluate water recycling to improve operational consistency.
- Restart the ASR Program, which will require collaboration with Ecology to meet requirements for restarting the ASR program. The City has conducted pilot testing to demonstrate the program's potential to reduce DBPs and stabilize system flows. Note: Ecology has authorized the City to restart the ASR program as of November 2025.
- Explore Wholesaling Water, which involves partnering with neighboring utilities or industrial users to increase plant demand and stabilize flow rates.
- Operate on a Modified Schedule. Which involves exploring a five-day plant operational schedule, turn off on weekends, supported by preventive maintenance and robust operational protocols to mitigate start-stop risks.

A summary of the benefits associated with each of these considerations is provided in **Table 3-7** below.

Table 3-7 | Low Flow Management Options and Potential Benefits

Potential Benefit	Low Flow Strategy				
	Lower Tank Levels	Recycle 1 MGD of Flow	Restart ASR	Wholesale Water	5-Day Schedule
Fix Plant Flow Control Valve	No benefit	X	X	X	X
Gain hydro Revenue	No benefit	No benefit	X	X	No benefit
Help with DBP Issues	X	No benefit	X	X	No benefit

CHAPTER 4

Implementation

4.1 Project Types and Prioritization

4.1.1 Project Types

This chapter summarizes the proposed CIPs that are specific to the City's WTP. A total of 31 projects are identified and grouped into the following categories for planning purposes.

- Treatment Plant (TP): These are general treatment plant projects needed to maintain or enhance current operations at the WTP site.
- Filtration (FI): These projects support the development of filtration capabilities at the WTP.
- Groundwater Wells (GW): These projects focus on groundwater well improvements for facilities located at the WTP site.
- Intake (IN): These projects focus on improvements to facilities at the intake and are typically covered in Chapter 6 of the Watershed Master Resiliency Plan, which the exception of the communication system between the WTP and the intake facilities.
- Security and Communication (SC): These projects focus on improving onsite communications and security at the WTP.

4.1.2 Prioritization

Prioritization of capital projects at the WTP site are based on the following time horizons:

- **Near-term** -- These projects are focused on the 0-to-5-year time horizon and typically coincide with high priority projects. These projects will show up on the City's water CIP list.
- **Mid-term** – These projects are focused on the 5-to-10-year time horizon and typically coincide with medium priority projects, or high priority projects that require more time to budget and implement.
- **Long-term** – These projects are focused on the 10-to-20-year time horizon and typically coincide with low to medium priority projects, or others that require more time to budget and implement.

4.2 Cost Estimates and Scheduling

As part of this technical memorandum, Consor was tasked with gathering or developing Association for the Advancement of Cost Engineering (AACE) Level 5 cost estimates (range -30% to + 100%) for the improvement projects. The projects and associated estimates have been grouped for implementation according to near-term (next 5 years), mid-term (next 10-years), and long-term (next 20-years) planning horizons as shown below in **Table 4-1**. See **Appendix B** for additional information regarding cost estimate sources and details.

Table 4-1 | Walla Walla WTP Capital Project List

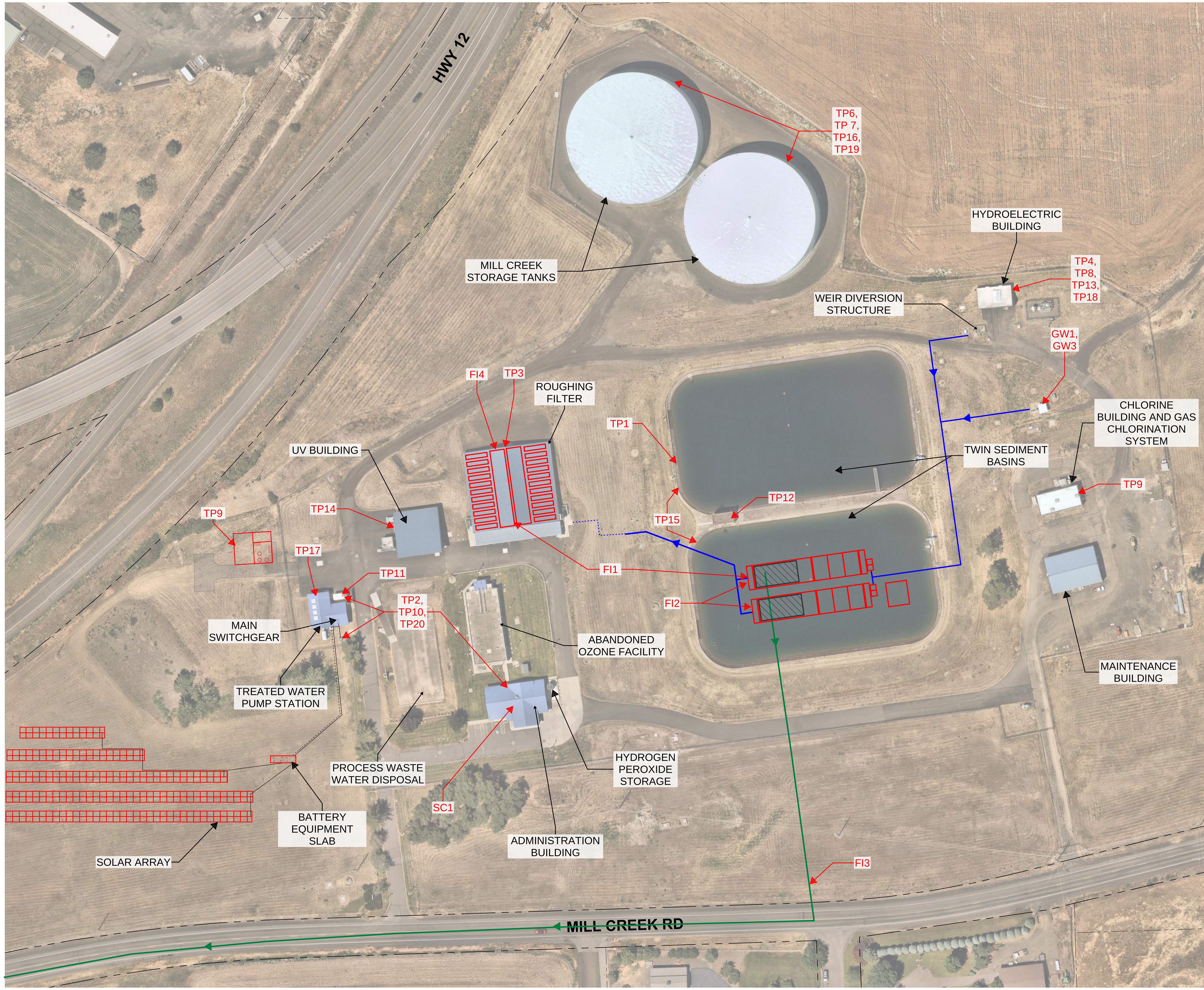
Period	Project ID#	Improvement	Purpose	Cost[1]
Near Term	TP1	North Sediment Basin Grouting	Address aging infrastructure	$100k
	TP2	Switchgear Upgrades	Backup power resiliency	$250k
	TP3	WTP Roughing Filter Media Replacement	Improve roughing filter performance	$250k
	TP4	Hydro Building Exterior Improvements	Address aging infrastructure	$25k
	TP5	Facility Planning	Space allocation, asset management, funding	$150k
	TP6	Finished Water Tank Aeration	Installation of TTHM removal equipment on both the water tanks at the WTP.	$2M
	TP7	Raw Water Transmission Main Cathodic Protection Ground Bed (Well) and the Mill Creek Tank Cathodic Protection	Address steel tank corrosion by installing a cathodic protection system	$750k
	TP8	Hydro Maintenance (Recurring)	Maintenance/permit compliance	$75k
	FI1	WTP Clarification and Filtration Pilot Testing	Conduct pilot testing to demonstrate and test effectiveness of clarification and filtration technologies proposed to mitigate against degraded water quality.	$100k
	GW1	Well Assessment 1,2,3, & 4	Address maintenance and improvements	$125k
	GW2	Well Site Physical Security, Electrical, & Lighting - Well 2,3,4, & 7	Enhance Security at well sites	$650k
	GW3	Emergency Generator and Automatic Transfer Switch at Well No 1 and Well No 6	Installation of a fixed generator and transfer switch at Well #1 and #6.	$750k
	IN5	Telemetry Replacement Between Intake and WTP	Resiliency improvement, address aging infrastructure	$125k
	SC1	Water Treatment SCADA System Replacement	Address aging infrastructure	$532k
	SC2	WTP & Well Security System Upgrades	Security Improvements	$300k
Mid Term	TP9	On-Site Sodium Hypochlorite Generation	Address aging infrastructure and improve safety	$6.8M
	TP10	Chlorine Building Upgrades (alternate project)	As an alternative to constructing an OSG facility, replace aging equipment and rehabilitate the building exterior & roof	$300k
	TP11	WTP Main Generator Replacement	Address aging Infrastructure	$984k
	TP12	WTP Valve House Restoration	Address aging infrastructure	$500k
	TP13	Hydro Facility Valve Installation	Operational Deficiency	$95k
	TP14	Crane for UV Building	Efficiency & Safety	$400k
Long Term	TP15	Sediment Basin Crack Sealing	Address concrete basin leakage by resealing all joints within the sediment basins	$1.1M
	TP16	Earthquake Resiliency at Storage Tanks	System resiliency	$250k
	TP17	Upgrade Clearwell Pumping Infrastructure	Add low flow pump for operational efficiency	$75k
	TP18	Reroof of Hydroelectric Buildings	Address aging infrastructure	$100k
	TP19	Repaint Finished Water Tanks	Address aging infrastructure – corrosion protection	$1.3M

Period	Project ID#	Improvement	Purpose	Cost[1]
	TP20	Service Entrance and Transfer Switchgear	Electrical Improvements	$250k
	GW4	Well 2 ASR Conversion	Convert Well #2 to facilitate aquifer storage	$3.8M
	FI2	Clarifier Facility	Enhance water treatment capabilities & resiliency	$24.1M
	FI3	Offsite Sewer Connection	Facilitate clarification and filtration projects	$1M
	FI4	Filtration Facility	Water reuse	$20 M

Note:

1. All costs shown are planning level estimates in current dollars that show approximate funding needs for improvements; all projects should undergo a full cost evaluation prior to design and implementation.

APPENDIX A
CONCEPTUAL LAYOUTS



PROJECT ID	DESCRIPTION
TP1	NORTH SEDIMENT BASIN GROUTING
TP2	SWITCHGEAR UPGRADES
TP3	WTP ROUGHING FILTER MEDIA REPLACEMENT
TP4	HYDRO BUILDING EXTERIOR IMPROVEMENTS
TP5	FACILITY PLANNING
TP6	FINISHED WATER TANK AERATION
TP7	RAW WATER TRANSMISSION MAIN CATHODIC PROTECTION GROUND BED (WELL) AND THE MILL CREEK TANK CATHODIC PROTECTION
TP8	HYDRO MAINTENANCE (RECURRING)
FI1	WTP CLARIFICATION AND FILTRATION PILOT TESTING
GW1	WELL ASSESMENT 1,2,3, & 4
GW2	WELL SITE PHYSICAL SECURITY, ELECTRICAL, & LIGHTING - WELL 2,3,4, & 7
GW3	EMERGENCY GENERATOR AND AUTOMATIC TRANSFER SWITCH AT WELL NO 1 AND WELL NO 6
IN 5	TELEMETRY REPLACEMENT BETWEEN INTAKE AND WTP (NOT SHOWN)
SC1	WATER TREATMENT SCADA SYSTEM REPLACEMENT
SC2	WTP & WELL SECURITY SYSTEM UPGRADES (NOT SHOWN)
TP9	ON-SITE SODIUM HYPOCHLORITE GENERATION
TP10	CHLORINE BUILDING UPGRADES (ALTERNATE PROJECT)
TP11	WTP MAIN GENERATOR REPLACEMENT
TP12	WTP VALVE HOUSE RESTORATION
TP13	HYDRO FACILITY VALVE INSTALLATION
TP14	CRANE FOR UV BUILDING
TP15	OPEN RESERVOIR CRACK SEALING
TP16	EARTHQUAKE RESILIENCY AT STORAGE TANKS
TP17	UPGRADE CLEARWELL PUMPING INFRASTRUCTURE
TP18	REROOF OF HYDROELECTRIC BUILDINGS
TP19	REPAINT FINISHED WATER TANKS
TP20	SERVICE ENTRANCE AND TRANSFER SWITCHGEAR
GW4	WELL 2 ASR CONVERSION
FI2	CLARIFIER FACILITY
FI3	OFFSITE SEWER CONNECTION
FI4	FILTRATION FACILITY

PLAN
SCALE: 1"=75'

Consultant:		Client:	Project Title:	Figure Title:	Figure No: FIGURE 1
consor	DRAFT	City of Walla Walla	CITY OF WALLA WALLA TREATMENT & WATERSHED PLAN	MILL CREEK WATER TREATMENT PLANT SITE IMPROVEMENTS	Date: DECEMBER 2025 Job No: W219901WA

PLAN

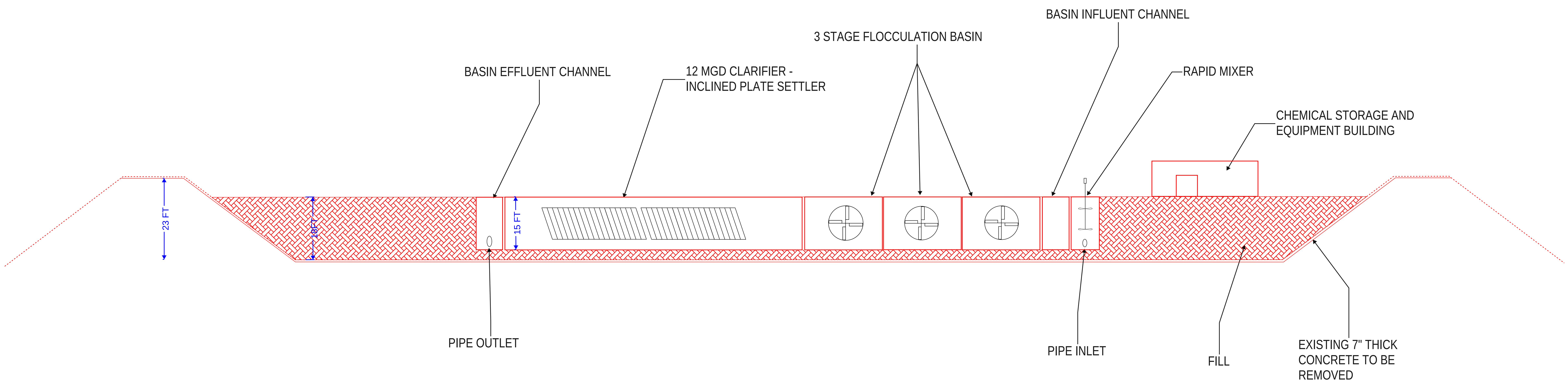
SCALE: 1"=50'

0 25 50 100

SCALE IN FEET

Consultant: consor	DRAFT	Client: City of Walla Walla	Project Title: CITY OF WALLA WALLA TREATMENT & WATERSHED PLAN	Figure Title: GRAVITY FED PRE-TREATMENT - PLAN	Figure No: FIGURE 2 Date: DECEMBER 2025 Job No: W219901WA

Drawing Path and Name: A:_V-W\Projects\WA\Walla Walla\2021\W219901WA.00\12 CADD\12-9 Figures\W219901WA_FIGURES.dwg, Plotted Date: January 14, 2025 11:20 AM By: Kent Harjala



SECTION
SCALE: 1"=15'

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SCALE IN FEET

Consultant:		Client:	Project Title:	Figure Title:	Figure No: FIGURE 3
consor	DRAFT	City of Walla Walla	CITY OF WALLA WALLA TREATMENT & WATERSHED PLAN	GRAVITY FED PRE-TREATMENT - PLAN	Date: DECEMBER 2025
					Job No: W219901WA

Drawing Path and Name: A:_V-W\Projects\WA\Walla Walla\2021\W219901WA.00\12 CADD\12-9 Figures\W219901WA_FIGURES.dwg, Plotted Date: January 14, 2025 11:20 AM By: Kent Harjala

PLAN
SCALE: 1"=20'

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SCALE IN FEET

Consultant:		Client:	Project Title:	Figure Title:	Figure No: FIGURE 4
consor	DRAFT	City of Walla Walla	CITY OF WALLA WALLA TREATMENT & WATERSHED PLAN	OSG LAYOUT - PLAN	Date: DECEMBER 2025
					Job No: W219901WA

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APPENDIX B
COST ESTIMATES

ESTIMATE SOURCES			
Project ID#	**Improvement**	**Amount**	**Sources**
TP1	North Sediment Basin Grouting	$ 100,000	Water CIP Spreadsheet
TP2	Switchgear Upgrades	$ 250,000	City Provided Estimate via Email
TP3	WTP Roughing Filter Media Replacement	$ 250,000	2025 City Water CIP
TP4	Hydro Building Exterior Improvements	$ 25,000	New Estimate - Minor Exterior Repair Work
TP5	Facility Planning	$ 150,000	Water CIP Spreadsheet
TP6	Finished Water Tank Aeration	$ 2,000,000	2025 City Water CIP & HDR Alternative Memo
TP7	Raw Water Transmission Main Cathodic Protection Ground Bed (Well) and the Mill Creek Tank Cathodic Protection	$ 750,000	2025 City Water CIP
TP8	Hydro Maintenance (Recurring)	$ 75,000	Water CIP Spreadsheet
FI1	WTP Clarification and Filtration Pilot Testing	$ 100,000	2025 City Water CIP
GW1	Well Assessment 1,2,3, & 4	$ 125,000	2025 City Water CIP
GW2	Well Site Physical Security, Electrical, & Lighting - Well 2,3,4, & 7	$ 650,000	2025 City Water CIP
GW3	Emergency Generator and Automatic Transfer Switch at Well No 1 and Well No 6	$ 750,000	2025 City Water CIP
IN5	Telemetry Replacement Between Intake and WTP	$ 125,000	2025 City Water CIP
SC1	Water Treatment SCADA System Replacement	$ 532,000	2025 City Water CIP
SC2	WTP & Well Security System Upgrades	$ 300,000	Water CIP Spreadsheet
TP9	On-Site Sodium Hypochlorite Generation	$ 6,800,000	New Estimate - See Appendix B
TP10	Chlorine Building Upgrades (alternate project)	$ 300,000	Water CIP Spreadsheet
TP11	WTP Main Generator Replacement	$ 984,000	New Estimate - See Appendix B
TP12	WTP Valve House Restoration	$ 500,000	2020 Water System Plan - Updated for additional Work
TP13	Hydro Facility Valve Installation	$ 95,000	2020 Water System Plan - Updated for Inflation
TP14	Crane for UV Building	$ 400,000	New Estimate - See Appendix B
TP15	Sediment Basin Crack Sealing	$ 1,100,000	Water CIP Spreadsheet
TP16	Earthquake Resiliency at Storage Tanks	$ 250,000	Water CIP Spreadsheet
TP17	Upgrade Clearwell Pumping Infrastructure	$ 75,000	Water CIP Spreadsheet
TP18	Reroof of Hydroelectric Buildings	$ 100,000	2020 Water System Plan - Updated for Inflation
TP19	Repaint Finished Water Tanks	$ 1,300,000	2020 Water System Plan - Updated for Inflation
TP20	Service Entrance and Transfer Switchgear	$ 250,000	Matched Project TP2
GW4	Well 2 ASR Conversion	$ 3,800,000	2021 Well Master Plan - Updated for Inflation
FI2	Clarifier Facility	$ 24,130,000	New Estimate - See Appendix B
FI3	Offsite Sewer Connection	$ 1,000,000	City Provided Estimate via Email
FI4	Filtration Facility	$20,000,000	New Estimate - See Appendix E

City of Walla Walla - Mill Creek Water Treatment Plant
12/30/2025
AACE Class 5 Estimate

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Estimated Construction and Material Costs for Clarification Facility (2 Trains)

ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	Demolition and Haul of Existing Concrete	1,600	CY	$ 35	$ 56,000
2	Earthwork (Fill and Compaction)	35,000	CY	$ 25	$ 875,000
3	Concrete Basins	2,300	CY	$ 1,200	$ 2,760,000
4	Shoring	1	LS	$ 15,000	$ 15,000
5	In-line Rapid Mixers (2 per train)	4	EA	$ 60,000	$ 240,000
6	Flocculators (per train)	2	EA	$ 325,000	$ 650,000
7	Lamella Plates (per train)	2	EA	$ 2,000,000	$ 4,000,000
8	Sludge Collectors (per train)	2	EA	$ 187,500	$ 375,000
9	Chemical Storage Building (Matching Site Aesthetic)	1,500	SF	$ 500	$ 750,000
10	E&IC (Flow meters, valves & SCADA system)	1	LS	$ 437,500	$ 437,500
11	Miscellaeous (Access platforms, coatings, railings)	1	LS	$ 250,000	$ 250,000
12	Yard Piping - 24-inch Waterline	220	LF	$ 250	$ 55,000
13	Yard Piping - 36-inch Waterline	740	LF	$ 400	$ 296,000
14	Yard Piping - 8-inch Sanitary Sewer	270	LF	$ 200	$ 54,000
15	Asphalt Access Road	1,280	SY	$ 77	$ 98,560
				Construction Subtotal (Rounded)	***$ 10,912,060***
				Sales Tax (8.9%)	$ 971,173
				Contractor Overhead and Profit (18%)	$ 1,964,171
				Construction Contingency (50%)	$ 5,456,030
				Construction Total	***$ 19,303,000***
				Engineering, Legal, and Adminsitration (25%)	$ 4,825,750
				Total Engineer's Opinion of Probable Construction Cost (Rounded)	**$ 24,130,000**
				TOTAL ESTIMATED COST (-25%)	***$ 18,097,500***
				TOTAL ESTIMATED COST (+75%)	***$ 42,227,500***

City of Walla Walla - Mill Creek Water Treatment Plant
12/30/2025
AACE Class 5 Estimate

Estimated Construction and Material Costs for UV Building Freestanding Crane

ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	Structural Evaluation	1	LS	$ 10,000	$ 10,000
2	Two Cell Overhead Bridge Crane with Hoist	1	LS	$ 150,000	$ 150,000
3	Electrical Modifications	1	LS	$ 10,000	$ 10,000
4	Misc Sitework	1	LS	$ 10,000	$ 10,000
				Construction Subtotal (Rounded)	***$ 180,000***
				Sales Tax (8.9%)	$ 16,020
				Contractor Overhead and Profit (18%)	$ 32,400
				Construction Contingency (50%)	$ 90,000
				Construction Total	***$ 318,000***
				Engineering, Legal, and Adminsitration (25%)	$ 79,500
				Total Engineer's Opinion of Probable Construction Cost (Rounded)	**$ 398,000**
				TOTAL ESTIMATED COST (-25%)	***$ 298,500***
				TOTAL ESTIMATED COST (+75%)	***$ 696,500***

City of Walla Walla - Mill Creek Water Treatment Plant
12/30/2025
AACE Class 5 Estimate

Estimated Construction and Material Costs for Replacement of Main WTP Generator

ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	Standby Generator with Sound Enclosure (750 kW)	1	LS	$ 290,000	$ 290,000
2	ATS	1	LS	$ 70,000	$ 70,000
3	Electrical Integration	1	LS	$ 55,000	$ 55,000
4	Site Preparation	1	LS	$ 30,000	$ 30,000
				Construction Subtotal (Rounded)	***$ 445,000***
				Sales Tax (8.9%)	$ 39,605
				Contractor Overhead and Profit (18%)	$ 80,100
				Construction Contingency (50%)	$ 222,500
				Construction Total	***$ 787,000***
				Engineering, Legal, and Adminsitration (25%)	$ 196,750
				Total Engineer's Opinion of Probable Construction Cost (Rounded)	**$ 984,000**
				TOTAL ESTIMATED COST (-25%)	***$ 738,000***
				TOTAL ESTIMATED COST (+75%)	***$ 1,722,000***

City of Walla Walla - Mill Creek Water Treatment Plant
12/30/2025
AACE Class 5 Estimate

Estimated Construction and Material Costs for On Site Sodium Hypochlorite Generation (ALT 2)

ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	Mobilization, Demobilization, Bonds, and Insurance	1	LS	$ 228,000	$ 228,000
2	Site Improvements	1	LS	$ 60,000	$ 60,000
3	Old Chlorine Building Demo	1	LS	$ 50,000	$ 50,000
4	Low-Strength Chlorine Generator(s), 480 ppd, three 160 PPD Units	3	EA	$ 300,000	$ 900,000
5	Brine Tank	1	1	$ 120,000	$ 120,000
6	Product Tanks	2	EA	$ 35,000	$ 70,000
7	Pumps and Piping	1	LS	$ 50,000	$ 50,000
8	Electrical/ I&C	1	LS	$ 100,000	$ 100,000
9	60' x 50' CMU Building (matching site aesthetic)	3000	SF	$ 500	$ 1,500,000
				Construction Subtotal (Rounded)	***$ 3,078,000***
				Sales Tax (8.9%)	$ 273,942
				Contractor Overhead and Profit (18%)	$ 554,040
				Construction Contingency (50%)	$ 1,539,000
				Construction Total	***$ 5,445,000***
				Engineering, Legal, and Adminsitration (25%)	$ 1,361,250
				Total Engineer's Opinion of Probable Construction Cost (Rounded)	**$ 6,807,000**
				TOTAL ESTIMATED COST (-25%)	***$ 5,105,250***
				TOTAL ESTIMATED COST (+75%)	***$ 11,912,250***

consor

APPENDIX C
ROUGHING FILTER FEASIBILITY STUDY

Memo

Date:	Thursday, February 11, 2016
Project:	Walla Walla Mill Creek Water Treatment Plant
To:	Nathan Black, Frank Nicholson, Tom Krebs – City of Walla Walla, WA
From:	Pierre Kwan, Kenny Packard – HDR
Subject:	**Future Conversion of Roughing Filter**

Introduction

The current conceptual design of the LT2 upgrades to the City of Walla Walla's Mill Creek Water Treatment Plant (WTP) includes an upflow roughing filter for turbidity reduction prior to ultraviolet disinfection reactors. The system will remain an unfiltered water supply. If the raw water quality in the Mill Creek ever changes substantially to require a process change to filtration, the upflow roughing filter will not provide any benefit for that future regulatory requirement. To avoid constructing a stranded asset, the City has requested HDR to analyze the feasibility of retrofitting the currently designed roughing filter structure to a membrane filtration system. The purpose of this memorandum is to summarize the overall approach for the retrofit and the potential membrane treatment capacity that could be placed in the roughing filter structure.

Retrofit Approach

The planned roughing filter has two large filter bays that are supplied and discharged to a common pipe gallery. In order to incorporate membrane filtration, the filter media and underdrain laterals would be removed from each filter bay. The membrane retrofit would occur in one bay at a time, so the initial media removal and membrane installation will reduce the roughing filter capacity down to 12 MGD, while the second stage will eliminate all roughing filter capacity.

Each of the roughing filter bays would be retrofitted to contain two parallel pressurized membrane treatment trains, for a total of four trains when fully installed. Revisions would be made to the roughing filter influent piping to feed the new membrane filtration trains and receive the filtered water. Each membrane filtration train requires a variety of ancillary equipment including mechanical screens, feed pumps, air compressors, and break tanks that would be placed in each filter bay along with the filtration membranes the equipment serves.

In addition to these mechanical systems, membranes require periodic chemical cleanings. Current practices by major membrane suppliers consist of daily/weekly chemically-enhanced backwashes and monthly/bimonthly chemical soakings. The chemicals typically now consist of hypochlorite and citric acid heated to 20 to 35 degC (68 to 95 degF). The hypochlorite would be supplied by the WTP's existing hypochlorite system whereas the citric acid system would be in a new building along with the chemical heating tank. The new chemical building will also house sodium bisulfite to quench remaining hypochlorite and sodium hydroxide to neutralize the citric acid.

Another ancillary system that would need to be considered is backwash management. This memorandum does not investigate what future backwash management strategies could be.

Membrane Filtration Capacity

HDR spoke with a representative of a local ultrafiltration membrane vendor in order to determine a high level capacity estimate for the retrofit. It is estimated that 20 ultrafiltration modules (two trains of 10 modules) and ancillary mechanical equipment (screens, pumps, compressors) could be fit into the planned roughing filter structure.

Attachment 1 is a markup of the 30% roughing filter mechanical plan that shows the approximate layout of the membrane modules and ancillary equipment. If the ancillary equipment were to be moved outside of the roughing filter structure, additional modules could be added to the roughing filter structure increasing the overall filtration capacity.

Membrane filtration capacity is influenced greatly by raw water temperature and therefore the cold weather capacity is less than that during warm weather. The table below contains the estimated filtration capacity delivered by the layout in Attachment 1 under the minimum and maximum raw water temperatures expected at the WTP.

Raw Water Temperature	Capacity
2 °C	18+ MGD
15.4 °C	30+MGD
DOH requires that capacities be confirmed with pilot testing.	

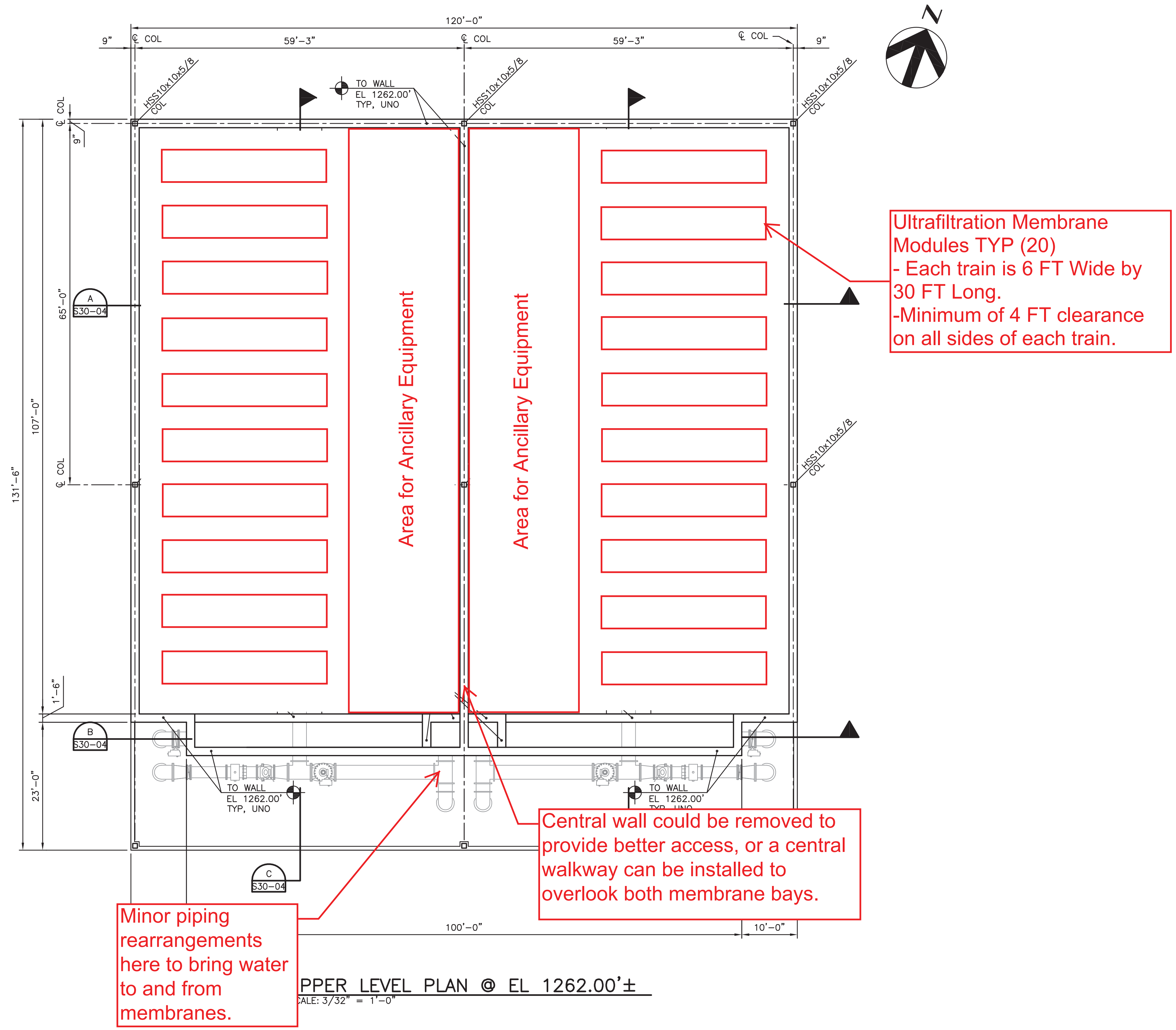
The capacity estimate for the retrofit of the upflow roughing filter was developed using a Toray HFU-2020 ultrafiltration module. This is a skid mounted pressurized membrane filtration system. The major features of these units are tabulated below.

Parameter	Value
Membrane Area	775 ft^2 per module
Membrane Flux	45 gfd
Membrane Footprint	6 ft wide by 10 ft long (per module)
Membrane Skid Clearance	4 ft on all sides

A pressurized system can be readily accommodated regardless of the ultimate basin depth. This system is the same one installed at the West Pasco and Bend WTPs. The alternative membrane system is submerged membranes, the system installed locally at Kennewick and Pendleton. Additional analysis would be required in the future to determine if the basin walls would need to be raised to provide the required submergence depth. The required submergence depth varies by vendor, whereas multiple pressurized membranes are fairly standardized in height. HDR can confirm that multiple pressurized membrane vendors could successfully retrofit their systems into the roughing filter.

Summary

This memorandum documents that the roughing filter can be used to house a new future membrane system if required and that the roughing filter structure would not be a stranded asset like the existing Ozone Contactor. The major changes/additions to the structure would be removal of the existing media and plastic piping and installation of new ductile iron piping, membranes, and new mechanical equipment. Additional equipment associated with chemical storage and feed, and backwash handling, would need to be installed a separate new structure to provide a complete operational membrane system.



30% DESIGN
NOT FOR CONSTRUCTION

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ISSUE	DATE	DESCRIPTION
	1–2016	30% DESIGN

PROJECT MANAGER:	P. KWAN
DESIGNED BY:	D. PRINDLE
CHECKED BY:	
CAD:	D. ELDREDGE
PROJECT NUMBER:	248106

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CITY OF WALLA WALLA

MILL CREEK
WATER TREATMENT PLANT
IMPROVEMENTS

ROUGHING FILTERS
UPPER LEVEL PLAN

FILENAME	S30–02.dwg	SHEET:	65 Of 189
SCALE	AS SHOWN		S30-02

APPENDIX D
MAINTENANCE CHECKLISTS

Weekly Critical Equipment Inspections

Item	Condition to Inspect	Result
Housekeeping		
Walls	Free of cobwebs, debris	
Ceiling	All lights functional, exit signs illuminate	
Regulators		
Relief valves	Leaks, evidence of release, corrosion	
Drip leg heater	Proper operation	
Piping and Relief Valves		
Labeling	Intact / Condition	
Cylinder Scales		
Oil Reservoir	Leaks / Level	
Chlorine Detectors		
Wiring and Enclosures	Damage, wear, corrosion	
Exhaust Fans		
Enclosures	Cages secure and sturdy, external flaps intact	
Cylinder Hoist		
Chain, Cords, Remote Control, Hook	Damage, Fraying, Corrosion, Wear	
1-Tons / 150# Cylinders		
All Tanks/Cylinders	Verify adequate supply on hand	
Injectors		
Check Valves	Damage, corrosion, leaks	

Monthly Critical Equipment Inspections

Item	Condition to Inspect	Result
Housekeeping		
Walls	Signage intact, no cracking or damage	
Ceiling	No cracks or sagging, vents clear of obstructions	
Regulators		
Check Supply	Gaskets, tools, inventory	
Chlorination Piping and Valves		
Structural Supports	Movement, damage, wear	
Cylinder Scales		
Reading Verification	Verify scales read additional weight added	
Chlorine Detector		
Alarm	Proper function	
Auto Shut-Offs	Test functionality, battery status	
Exhaust Fans		
Building	Air tightness, damage, corrosion	
Cylinder Hoist		
Use Hoist Inspection Checklist		
1-Tons / 150# Cylinders		
All Tanks/Cylinders	Inspect Viton seals in Emergency B-Kit	
Injectors		
No Monthly Checks		

Chlorination Process Inspection and Preventative Maintenance Checklist

Month: ______________ **Year:** __________

Mark "OK" if no defects exist, mark "X" if item needs attention. Provide comments (e.g. "Exhaust fan belt loose - work order prepared")

Daily PM Checklist

Date	Inspected By	House-keeping	Regulators	Piping and Relief Valves	Cylinder Scales	Chlorine Detectors	Exhaust Fans	Cylinder Hoist	1-Tons / 150# Cylinders	Injectors	Inspection Results / Actions Needed
1											
2											
3											
4											
5											
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Weekly PM Checklist

Date	Inspected By	House-keeping	Regulators	Piping and Relief Valves	Scales	Detectors	Exhaust Fans	Cylinder Hoist	1-Tons / 150# Cylinders	Injectors	Inspection Results / Actions Needed

Monthly PM Checklist

Date	Inspected By	House-keeping	Regulators	Piping and Relief Valves	Scales	Detectors	Exhaust Fans	Cylinder Hoist	1-Tons / 150# Cylinders	Injectors	Inspection Results / Actions Needed

APPENDIX E
MEDIA FILTRATION EVALUATION

Media Filtration Evaluation

Overview

This memorandum documents Consor's evaluation of potential media filtration system improvements at the City of Walla Walla's (City) water treatment plant (WTP), including retrofitting of the existing roughing filter. As an unfiltered system, the City's WTP relies upon low turbidity in the source water to comply with NTU thresholds set forth in Federal and State drinking water standards. The high-quality source water has enabled the onsite processes to focus on disinfection, which include UV disinfection and chlorination. However, it is anticipated that the source water turbidity could increase in response to wildfires, or other events and conditions that could occur in the watershed, or if upstream water treatment unit processes become compromised, and a higher performance and reliance upon the filtration system may be warranted.

Water quality information is continuously monitored at the WTP using on-site analyzers to measure turbidity upstream and downstream of the existing roughing filter, which reveals consistent removal resulting in a turbidity of less than 1.0 ntu, and below 0.5 ntu most of the time. However, it is understood that the existing roughing filter (Building D) experiences performance issues, where the expected 1-log or 90% turbidity reduction and is achieving closer to 30% turbidity reduction, and experience buildup of unwanted bugs on the water surface in the filter.

High removal performance, as measured by percent removal of a target parameter across a unit processes, can become difficult when the concentrations are low, or fluctuate widely seasonally, such as with surface waters. For example, to achieve 90% removal of turbidity with an influent concentration of 0.3 ntu, it would require an effluent concentration value of 0.03 ntu, which may not be easily or consistently achievable in a conventional or two-stage filtration configuration, but can be more readily achievable in a direct filtration or contact filtration configuration.

In addition to filtration improvements, the proposed clarification system presented in Consor's water treatment plant memo can help protect the performance of the existing downstream roughing filter and likewise whichever type or style of filtration is implemented.

Previous Efforts Related to Roughing Filter Modifications

To address TTHM issue at the plant, the City contracted with HDR Engineering, Inc. to identify strategies and associated projects that will reduce TTHM levels and allow ASR activities to resume. That study resulted in an Alternatives Memorandum that provides several recommendations for addressing the TTHM issue, including:

- Sand Addition in Roughing Filters: Add 3 inches of fine sand to one roughing filter, record water quality and backwash frequency. The final solution may involve adding 6 inches of fine sand to both filters. A final implementation may involve adding 6 inches of fine sand to both filters.
- Replacing the roughing filter media replacement and incorporating a larger depth of finer media into the existing filter, to increase the removal effectiveness for TOC and other fine particulates associated with post-fire runoff.
    - That enhancement would leverage the existing infrastructure while improving water quality performance, and being cost-effective for mitigating wildfire impacts.
    - However, further pilot testing and detailed design analysis are required to confirm the feasibility and expected performance improvements of these modifications.
    - ➢ Add 3 inches of fine sand layers to one roughing filter as a pilot project. Monitor water quality and backwash frequency to evaluate performance.

HDR also completed a membrane filtration alternatives analysis, that defined the footprint and potential capital costs to implement an ultra filtration membrane solution to achieve a similar desired outcome of adding resiliency, for both prior to and when the proposed clarification improvements are implemented.

Granular Media Bed Filtration Alternative

Rather than modifications to the existing roughing filter, or modifying the existing roughing filter structure/building to accommodate membrane filtration, the alternative of a single or multiple granular media bed filter was also considered as discussed and presented below.

Overview

Filtration processes are used primarily to remove particulate matter from water and it's one of the unit processes in some conventional water treatment plants. Filtration can both remove particulate matter, present in the raw water or those generated during other unit treatment processes such as bacteria, viruses and protozoa, clays and salts, and precipitated, humic substances, and other organic particles, metals.

There are many different filtration types used in drinking water treatment, each described by the scheme of treatment. Typical granular bed filters utilize granular material to trap and remove undesired particulate matter. Filters may be described by their scheme or the type of media use or maybe classified by their hydraulic arrangement and by their rate of filtration, or their depth of filtration.

- Granular bed filters utilize sand, and/or anthracite, coal or granular activated carbon, and/or a combination of to provide the desired treatment.
- Gravity media filters are some of the most common which utilize atmospheric pressure to facilitate the treatment process.
- Pressure media filters utilize a pressure tight vessel to both contain the media and the water conveyed for treatment.
- Many granular bed filters can be operated at various hydraulic rates, ranging from slow to rapid filtration and higher filtration rates favor surface removal of particulate matters at the top of the media bed

Another variable can classify a filter by depth, filtration where solids are removed within the granular material or cake filtration where the solids are removed on the entire face of the granular media. Often rapid granular filters are referred to as depth filtration, and those with a pre-coated or membrane filters may be considered cake filtration.

Each type of media filter operates based on a filter cycle, which is the duration, which the filter media becomes clogged due to the removal and capture a particulate matter.

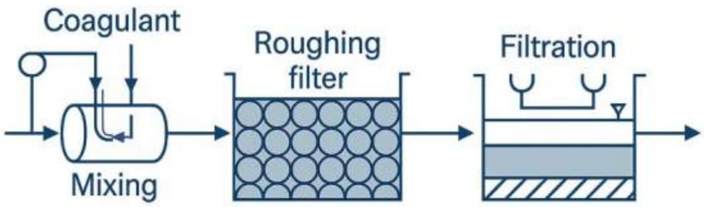
Typically, an upward, high-rate backwashing cycle are typical for rapid filters, where scraping of the dirt layer from the surface is common for slow sand filters.

A media filter must therefore be described by the choice of objectives such as a deep bed filter with two media operated at a high rate to encourage depth removal of particulate matter and operated by gravity flow.

Commonly used in support of conventional coagulation, filtration and sedimentation type treatment is a depth filter, which achieves removal particulate matter generally smaller than that of the interstate issues formed by the media. It is important to note that chemical pre-treatment is essential to removal in depth filtration where it helps calculate colloidal sized particles into larger flock, which enhance removal.

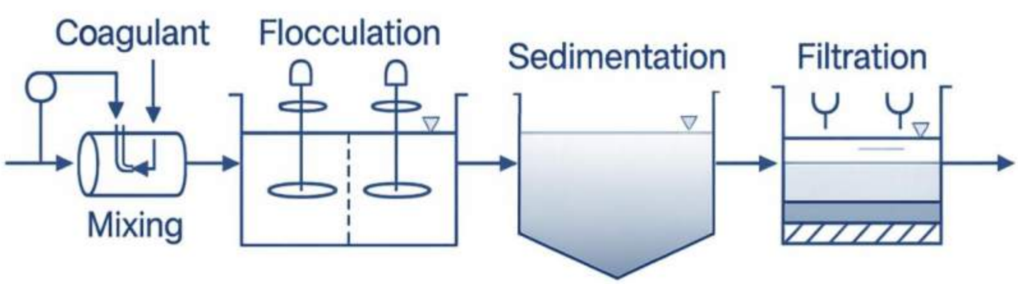
The existing configuration with the roughing filter is considered in part as a two-state filtration, but without the filtration beyond the roughing filter as depicted in the figure below.

Figure 1 – Two-stage Filtration



The proposed configuration with clarification (sedimentation) added to the surface water treatment process, and the roughing filter removed would achieve a "conventional filtration"" configuration as depicted in the figure below.

Figure 2 – Conventional Filtration



This configuration would consist of retrofitting the existing roughing filter to as a granular media filter bed, in either an upflow or downflow configuration. Such a system would consist of an underdrain, media, backwash appurtenances, and instrumentation to manage the process.

A conceptual design of such a gravity, granular media filter was evaluated for a design capacity of 24 MGD, to replace the existing roughing filter as described below.

Underdrain Types and Styles

General Description

Filter bottoms, or more specifically filter underdrains, are the structures underlying the gravity filter media. The underdrain both supports the filter media and provides a conduit for filtered water to leave the filter basin and proceed, generally to disinfection and then to distribution. The driving force for the water through the filters is the distance from the water level over the filter to the first air break which is usually the clearwell or a control weir.

As solids are accumulated within the filter media, the headloss or force required to maintain flow increases. A point is reached where either the flow cannot be maintained or solids are driven through the filter into the filtered water, adding turbidity and potentially becoming uncompliant. An upward flow of water or a combination of air and water (called a backwash) is used to scour and fluidize the media thereby removing the accumulated particles and restoring the driving force. The effectiveness of a backwash operation is measured by the resulting cleanliness of the media and the associated costs of power and water required to perform the backwash.

When the filter media becomes dirty, the underdrain is primarily responsible for the even distribution air and water to the used to flush out the accumulated particles. The backwash mode is where the underdrain is most critical. If the backwash water and air are not evenly distributed, dirt can accumulate within the filter media causing uneven forward and backwash flows. Over time as the dirt accumulates in the media, usually in the form of mudballs, the filter run-time and particle removal performance deteriorates. Uniform air/water backwash distribution is critical in maintaining the long-term performance of rapid-rate gravity filters.

Filter underdrains have a variety of configurations, styles, and materials of construction to accommodate the features and the functions of an effective and efficient system. Filter underdrains are built to established standards, based upon experience and good practice. The standards have been in place since well before the implementation of the Safe Drinking Water Act. In many instances, good practice of building and operating filters were known to protect public health and safety before it was understood that bacteria was a primary source of disease.

Classified by Flow Pattern

Filter underdrains are generally characterized by their flow patterns, and underdrains are designed in either one or the other configurations:

- Single-pass
- Dual-parallel pass

Filter underdrains are also differentiated by whether they incorporate water backwash alone, or air scour combined with water backwash. The air/water combination has been quantitatively found to produce a cleaner filter as a result of the scouring energy and resulting filter media particle collisions, while also reducing the total water of up to 40% compared to water used by conventional high flow rate water backwashing.

SINGLE PASS

Examples of single-pass underdrain systems are:

1. Folded Metal Plate Laterals
2. Clay Tile/Wheeler Bottom
3. Pipe Laterals
4. False Floor w/ Nozzles (not evaluated)

Note, the existing roughing filter is a single pass style configuration.

The flow distribution of these types of single pass underdrain systems is dependent upon a single series of orifices contained within the underdrain. In order to maintain an even distribution of flow, the lateral lengths must be kept to a length that does not create excessive head loss in the lateral. In the case of false floor nozzle systems, the plenum underneath the false floor must have clearance that results in lower velocities and resulting head loss.

The flow velocity is at its highest at the inlet to the lateral and the water tends to pass the first orifices in line. As flow proceeds the length of the lateral with velocity and quantity decreasing, more flow proceeds through the orifices at the end of the lateral. As the length increases and the flow travel increases, surges and maldistribution of backwash water results. It is primarily due to this inherent hydraulic characteristic that single pass lateral length be limited to 10-12 feet.

Single-Pass

Some types of single-pass underdrains are listed below, along with a summary of their characteristics and operation.

Folded Metal Laterals

The manufacturers of the folded metal plate underdrains have created a retrofit solution that is amenable to a variety of configurations, and filter geometries. The nature of the folded metal triangular-shaped lateral gives it a strength that allows it to span wide center gullets of 3’-0” without special support or reinforcement.

The lateral is also constructed in two chambers, with inside flow control orifices. While there is space between the inner passage and the outer shell, this space does not act as a pressure compensating lateral, there is insufficient space for compensating flow volume to equalize pressure and flow along the length.

The outer shell is slotted with slots smaller than the smallest media (sand) in the media profile. The triangular lateral is constructed of stainless steel, both inner and outer shells. There is a second central passage, one that is utilized for the conveyance of air for combined air/water backwash options.

One of the manufacturers pronounced claims is a low profile. The height and cross-sectional area of the underdrain laterals are much lower than the low-profile plastic block. Its cross-sectional area is much less as well, resulting in a higher head loss per foot of length. As a single-pass lateral, it is hydraulically not as amenable to high-rate backwashing without pressure surges and maldistribution of water and air across the area of the filter.

In addition, as a triangular shaped lateral, anchored to the floor of the filter basin with drilled-in anchors, the laterals must be spaced in order to place them. As a result, the air/water flow is applied to a column projected to from the bottom of the media to the surface. There is space between each of these higher energy columns, while the media between in between will mix laterally rather than fluidize upward. At the surface of the media, patterns of higher air and water flow can be observed.

Clay Tile/Wheeler Bottom Underdrains

Traditional filter bottoms relied upon heavier, and as a result, less buoyant underdrain system. These were typically constructed with clay tiles, which, due to their construction from clay, were heavier walled, and much higher profile than current composite material construction allows.

When place in grout levelled beds side-by-side, they formed very tightly fitted, monolithic floors, with small orifices in their top surface for backwash water distribution. The orifices in the clay tiles were much larger than the smaller media, and support gravel, placed in two to three well graded layers were spread over the tops of the clay tiles to support and prevent the migration of the smallest media into the orifices. The support gravel layers were not fluidized by the backwash flow, and their presence in the defined gradation of the layers, promoted an even distribution of high-rate backwash water flow to the bottom of the media profile.

Clay tiles were not amenable to the addition of air for scouring and combined air/water backwashing.

Wheeler bottoms are clay tiles with conical-shaped centers that are filled with ceramic balls of different sizes, arranged to minimize gravel penetration. The balls provided support structure for coarse gravel and are not fluidized. They do allow backwash water to flow through them at lower head loss than the orifices in the flat-top clay tiles

Clay tiles do degrade over time, and crumble with age, but the age is 40-60 years usually. Currently, replacement is generally not accomplished with clay tiles or Wheeler bottoms, they are now very expensive to obtain, and availability is a question.

Pipe Laterals

Underdrain systems comprised of pipe sections with drilled orifices are generally classified as pipe lateral style underdrains. This style of underdrain is very common as treated effluent collectors in ion exchange units, or other types of pressure filtration applications such as greensand filters and granular activated carbon adsorbers. In these applications, the pipe laterals are an appropriate selection.

For use as underdrains on a gravity filter, pipe laterals have limitations in evenly applying backwash water at the bottom of the media. In addition, the effect of the energy provided by the pipe lateral underdrain is limited to the column of media placed directly over the pipe lateral. Due to the spacing between the pipe laterals, sufficient energy to fluidize the media that resides above the empty space will be absent, resulting in incomplete cleaning and flow mal-distribution.

Pipe laterals are also unable to accommodate air for an air/water combined scour and backwash operation.

Dual-Parallel Pass

There are three main styles of dual-parallel pass underdrains that are common to gravity filter rehabilitation. Although constructed differently, they all have in common the feature of additional pass that compensates the pressure surges and provides a capacity to equalize the distribution of backwash water flow to the underside of the media bed. This favorable hydraulic feature is a clear advantage in underdrain construction and performance.

The dual-parallel pass lateral was developed specifically to solve the flow distribution anomalies associated with long single-pass. The dual-parallel pass lateral has the passages through its length. The center passage of the block is similar to a single-pass, a long conduit with flow-control orifices along the length. The same hydraulic profile develops within the center passage, and the discharge variances through the primary flow control orifices build up as in single-pass laterals.

The flow control orifices open from the primary pass in the lateral block to directly feed the secondary passages. The presence of the secondary laterals provides a compensating effect on the distribution of flow and the head loss buildup. Unbalanced flow from the primary lateral creates an opposing flow, forming a directly compensating velocity pressure gradient which puts the secondary lateral into a uniform hydraulic pressure condition throughout its length. The effect is to lower the head loss developed along the lateral block length, and also to minimize flow surges and mal distribution effects.

From hydraulic analysis, and neglecting friction, the amount of water that will flow from a lateral through a particular orifice is a function of the orifice coefficient and the hydraulic gradient feeding the orifice from the lateral. In a lateral having equal sized and shaped orifices along its length, the orifice furthest from the inlet to the lateral will deliver the most water. The same discharge variances exist in the central passage of the dual-parallel lateral underdrain, as in any single-pass underdrain. However, the secondary passage provides a compensating and automatic equalizing of pressure prior to discharging the backwash water from the underdrain, resulting in complete uniform discharge along the entire length of the lateral.

Dual-parallel pass laterals can be sized up to 30 feet in length in length with a backwash lateral maldistribution of less than 2%. This same advantage holds true with air introduced for air scour in combination with water.

For this study, Xylem Leopold underdrains were evaluated which included three types, with specific configuration and application length limitations as summarized in the table below.

Table 1 Dual Pass Undrain Types

Underdrain Type	Max Length (Center Feed)	Max. Length (End Feed)
Type S	96 feet	48 feet
Type XA	60 feet	32 feet
Type SL	40 feet	20 feet

The difference in feed type is depicted in the figures below.

Pertinent to the potential reconfiguration of the existing roughing filters, is the limitation of the required media area, and depth, to achieve the required capacity in correlation with the loading rate.

Figure 3 Gravity Media Filter and Underdrain General Configuration – End Feed

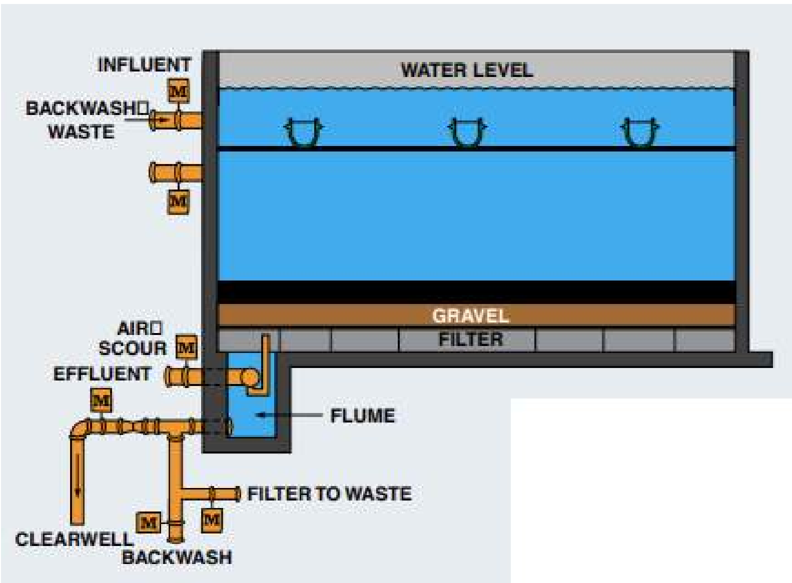
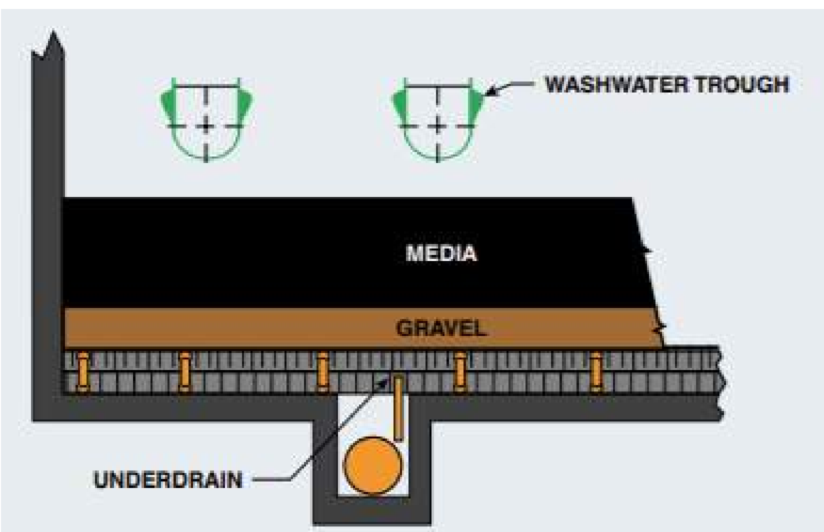


Figure 4 Gravity Media Filter and Underdrain General Configuration – Center Feed



Clay Block (High Profile)

The clay block underdrain has been around for decades, and was the predominant underdrain material utilized in gravity filter construction. The underdrain was favored due to its rugged construction and its characteristic weight. Laid side to side, with interlocking lips at each end, the clay tiles do not move or are affected by uplift forces in backwash.

The tiles were laid in levelling grout, in order that they were installed at measurable level and grade. The sides were lightly mortared, and the mortar's good adhesion to the clay further cemented its location. Demolishing a clay tile underdrain installation takes jackhammering to remove them.

Orifices in the top side require support gravel to avoid media migration. Clay tiles have a higher profile due to clay, precast construction and thicker walls

Underdrain Caps

Underdrain caps have historically been made of polyethylene beads sintered together. Bead pores may or may not be smaller than effective size of smallest media. Media migration is a possibility.

The latest generation of underdrain caps are extruded plastic fixtures anchored to the tops of the underdrain block and are provided with pore opening of micron size, retaining smallest media (sand, ES=0.4 mm). The Caps work well with dual-parallel pass underdrain blocks, providing the compensating head loss through them that results in even distribution of water and air.

This can eliminate the need for support gravel, and as an almost full area coverage, provide opportunity for most even distribution of air/water.

Failures associated with beaded caps made of polyethylene beads sintered together include:

- Associated with fouling – media penetration and inorganic
    - Silicates (sand)
    - CA, Mg, and Mn (raw water)
    - White precipitate (Ca2CO3) – formed by substantial pressure loss through cap
    - Air binding occurs as a result of high head loss
    - Al and Fe (coagulants)
    - Associated with fouling – biologicals in biologically active filters
- Bacteria
    - Biological secretions (biogrowth slime)
    - Occasional diatoms
- Associated with high head loss – mechanical anchors
    - Uplift forces under caps, and buoyant blocks
    - Air binding occurs as a result of high head loss
- Associated with poor installation workmanship – irregular setting and grout placement discrepancies
  Grout separation from plastic media blocks
  Voids in placed grout

New Style Media Retainers

Leopold has developed a new product, an IMS 200 media retainer that can be utilized with Leopold Type S, SL, and XA plastic filter underdrain blocks. All of Leopold's underdrain blocks feature the same bolt pattern on the top surface of the block. That means the new IMS 200 media retainer can be directly mounted to existing Type S filter blocks if desired.

The improved media retainer can be utilized in the same manner as the beaded caps, i.e., as a support for the smallest media (sand, E.S.=0.4), without support gravel. Improvements to the new IMS 200 include laser cut slots. The slot size is 200 micron and is sized and has a geometry (sharp-edged) that minimizes biological fouling in biologically active filters.

The 200-micron gap overcomes some of the shortcomings of the beaded caps, by preventing sand impregnation, and minimizing the formation of biofilms. Biofilms generally form in tighter pore sizes, with more rounded edges that shield them from shear forces of backwash flow.

When combined with Leopold's new low profile block underdrain (Type XA), a better result in backwashing effectiveness is anticipated, resulting in head loss at high-rate flows, and cleaner filters with reduced waste wash water volumes. The Type XA block has also been tested for a higher-pressure rating and features a bottom design that allows for better embedment in grout, resisting uplift more than previous designs.

Filter Underdrain and Media Guidelines

Regulatory Basis – Surface Water Treatment in Washington

Surface water sources (and groundwater under the direct influence of surface water) used by Group A public water systems must be treated to protect public health through filtration and disinfection in compliance with WAC Chapter 246-290, Part 6. These rules implement both state and federal requirements (e.g., Surface Water Treatment Rule and Long Term 1 & 2 Enhanced Surface Water Treatment Rules).

Designs must be prepared by a licensed professional engineer experienced in surface water treatment, and the DOH must review compliance with WAC requirements.

FILTER TECHNOLOGY ACCEPTABILITY AND DESIGN CRITERIA (WAC 246-290-676)

Filtration technology acceptable to the Department include:

- Conventional filtration
- Direct filtration (also termed in-line filtration)
- Slow sand filtration
- Diatomaceous earth filtration

Alternative filtration technologies may be accepted if it can be demonstrated to DOH that they achieve at minimum 2-log removal of Giardia and Cryptosporidium and meet applicable turbidity and treatment performance criteria. Pilot studies or other demonstration methods are often required for new technologies or configurations, showing consistent performance across operational conditions.

TURBIDITY PERFORMANCE REQUIREMENTS (WAC 246-290-660)

Filtered Effluent Requirements for conventional, direct, and in-line filtration:

- 95th percentile turbidity ≤ 0.30 NTU for combined filter effluent over a calendar month.
- Maximum turbidity must not exceed 1.0 NTU at any time.
- These are minimum performance requirements to qualify as "effective treatment."

Systems must continuously monitor turbidity and meet these performance outcomes to justify pathogen removal credits and regulatory acceptance.

LOG REMOVAL CREDIT (WAC 246-290-660)

The department assigns log removal credits based on filtration type when effective treatment is demonstrated by the following:

Table 2 Log Removal Requirements

Filtration Type	Giardia Removal	Virus Removal	Cryptosporidium Removal
Conventional	2.5-log	2.0-log	2.0-log
Direct/In-line	2.0-log	1.0-log	2.0-log

The filtration system must demonstrate both turbidity performance and proper operation to receive those credits.

OPERATIONAL CRITERIA FOR FILTER PERFORMANCE (WAC 246-290-654)

Filter loading rates for conventional, direct, and in-line filtration, the maximum design or operational filtration rates must not exceed the following:

- Gravity filters, single media: 3 gpm/ft^2
- Gravity filters, deep bed/dual or mixed media: 6 gpm/ft^2
- Pressure filters, single media: 2 gpm/ft^2
- Pressure filters, deep bed/dual or mixed media: 3 gpm/ft^2

Slower rates apply to slow sand and diatomaceous earth filters.

COAGULATION AND TREATMENT EFFECTIVENESS

Effective coagulation must be in use whenever water is produced for public supply and it must be demonstrated that the treatment is effective for Giardia/Cryptosporidium using the following:

- Turbidity reduction method (meeting turbidity performance and ≥80 % source turbidity reduction), or
- Log removal method (at least 2.5-log Giardia/2-log Crypto for conventional; 2.0-log Giardia/Crypto for direct/in-line), or
- Other DOH-approved methods.

MONITORING AND REPORTING REQUIREMENTS (WAC 246-290-664)

Turbidity monitoring for conventional, direct, and in-line systems must:

- Continuously monitor and record turbidity on each individual filter unit.
- Record combined filter effluent turbidity at intervals (e.g., every 4 hours) approved by DOH.
- For large systems (≥10 k people), record individual filter turbidity at least every 15 minutes.

Source water monitoring is also required for turbidity, which must be measured at least once per day upstream of disinfection and coagulation.

BACKWASH AND RECYCLING REQUIREMENTS

Operators must report whether filter backwash water or other recycle streams are returned to the treatment process and ensure that such recycling occurs prior to or concurrent with the primary coagulant addition. Capital modifications may be required to meet these requirements.

Disinfection Byproduct Precursors

Conventional systems using sedimentation must meet federal requirements for enhanced coagulation or softening per 40 C.F.R. 141.135 when applicable to control disinfection byproduct precursors.

KEY DESIGN METRICS

The following are the key design criteria to be included with the conceptual filtration design:

- Turbidity
  - ≤0.30 NTU (95th percentile)
  - ≤1.0 NTU instantaneous
- Filtration Rates
  - Up to 6 gpm/ft^2 for deep bed gravity media (conventional/direct/in-line)
  - Up to 3 gpm/ft^2 for gravity media (conventional)
  - Media selection and depth tailored to rates and organic removal

- Treatment Objectives
    - ≥2.5-log Giardia removal (conventional)
    - ≥2.0-log Giardia/Crypto (direct/in-line)
- Monitoring
    - Continuous turbidity on individual units and combined effluent
    - Daily source turbidity checks

- Operational Requirements
    - Effective coagulation control
    - Continuous disinfection
    - Backwash recycling managed upstream of coagulant

GLUMRB – Recommended Standards for Water Works, 2018 ed.

Also known as the 10-State Standards, these guidelines are updated on an irregular schedule every few years and represent the most complete set of guidelines and standards that reflect current knowledge and experience gained across the drinking water spectrum. While not the defining standards for the State of Washington, nor the standards used by the local regulatory agencies to review and approve plans for either new or modified water works facilities, these standards are recognized for their completeness and applicability as a reference for water works administrators, operators and consultants.

FILTER MEDIA

The 10-State Standards provide guidance for the specification of media that performs well. Performing well means that meeting compliance with filtered effluent quality is achieved and is reliable. Performing well also means that media cleans repeatedly and with expected behaviors related to fluidization and bed expansion with consistent backwashing rates and application of air and water mixtures that are within standard and comparable values.

The guidance provided by the standards is based on many years of experience and best practices employed at many water treatment plants across decades. Some of the uniform criteria that have evolved over time that show benefits in gravity deep-bed filters are the following:

- Total Media Bed Depth – not < 24-inches, not > 30-inches
- Uniformity Coefficient (UC) of the smallest media material not greater than 1.65
- Minimum of 12-inch depth of media with Effective Size (ES) </= 0.45-0.55 mm
- Media shall be installed in accordance with AWWA B100

These general guidelines apply for gravity filter media in general. More specific criteria for individual media placed in mono- or multi-media beds are also provided. These guidelines are summarized below.

FILTER SAND

Specific criteria for filter media utilized in drinking water filtration applications focuses on the physical characteristic of the granular aggregate. Filter sand is especially important in filtration as the sand layers in filters typically are the barrier for particle sizes associated with turbidity, the measurement associated with filter performance.

Head loss development is primarily at the top of sand layer. Filter sand is described by the guidelines as being in accordance with the following:

- Effective Size (ES) 0.45 mm – 0.55 mm
- Uniformity Coefficient </= 1.65
- Specific Gravity (s.g.) > 2.5
- Acid Solubility </= 5%

ANTHRACITE

Anthracite coal is mined and processed through milling and screening to produce anthracite filter media. Crushed anthracite makes excellent medium density filtration medium. As a coal, when milled and crushed, it displays an angular shape. As a result of this shape, some sediment penetrates deeper into the bed. When compared to sand, longer filter runs can be achieved due to its more gradual head loss buildup.

Anthracite filter media is described by the guidelines as being in accordance with the following:

- Effective Size (ES) 0.8 mm – 1.2 mm
- Uniformity Coefficient </= 1.7
- Specific Gravity (s.g.) > 1.4
- Acid Solubility </= 5%
- Mohs Scale (Hardness) > 2.7

GRANULAR ACTIVATED CARBON (GAC)

Granular Activated Carbon is charcoal that has been “activated” through a thermal process that cracks the charcoal and exposes the interior. The primary raw material used in the production of activated carbons is bituminous coal that is crushed, sized and processed in low temperature bakers followed by high-temperature activation furnaces. Activation develops the pore structure of the carbon. Through adjustments in the activation process, differentiated pores for a particular purification application are developed.

It is the increased surface area associated with the interior of the cracked surface of the carbon that provides its capacity for adsorption. Adsorption takes place on the internal surface of active carbon, termed the adsorbent. GAC is defined as the activated carbon remaining on the 50-mesh sieve.

GAC filter media is described by the guidelines as being in accordance with the following:

- Basic requirements for filter media given above in 3.1.1
- Provisions for free chlorine residual and adequate contact time following filters and prior to distribution
- Means for periodic treatment of filter material for control of bacterial and other growth
- Provisions for frequent replacement or regeneration

GAC specifications must be reviewed and considered in order to match the application to the filter and to check backwash hydraulics for efficient cleaning without washout of media.

FILTER BOTTOMS AND STRAINER SYSTEMS

The 10-State Standards present the requirements for filter bottoms and straining systems (which include underdrains). The important features of filter bottom structures are presented in both guidelines as follows:

- Minimize loss of head in the manifold (header) and laterals
- Ensure even distribution of the wash water and even rate of filtration over the entire area of the filter
- Provide the ratio of the area of the final openings of the strainer (collection) systems to the area of the filter at about 0.003
- Provide the total cross-sectional area of the laterals at about twice the total area of the final openings
- Provide the cross-sectional area of the manifold at 1.5 to 2 times the total area of the final openings
- Lateral perforation without strainers shall be directed downward (10-States only)

The guidelines are not prescriptive regarding configuration or construction of underdrain systems. This is reflective of the many types and styles of underdrain systems, and in recognition that they can be effective with certain requirements related to geometry and general statements related to flow distribution and head loss.

Underdrain Performance

Head Loss

BACKWASH WATER

The guidance provided by the standards is based on many years of experience and best practices employed at many water treatment plants across decades. Some of the uniform criteria that have evolved over time that show benefits in gravity deep-bed filters are the following:

- Total Media Bed Depth – not < 24-inches, not > 30-inches
- Uniformity Coefficient (UC) of the smallest media material not greater than 1.65
- Minimum of 12-inch depth of media with Effective Size (ES) </= 0.45-0.55 mm

These general guidelines. These guidelines are summarized below.

AIR SCOUR

Specific criteria for filter media utilized in drinking water filtration applications focuses on the filter sand as described by the guidelines as being in accordance with the following:

UNDERDRAIN DESIGN – MATERIAL AND MEDIA SUPPORT

Disperses air across entire surface area into media

The guidance provided by the standards is based on many years of experience and best practices employed at many water treatment plants across decades. Some of the uniform criteria that have evolved over time that show benefits in gravity deep-bed filters are the following:

- Total Media Bed Depth – not < 24-inches, not > 30-inches
- Uniformity Coefficient (UC) of the smallest media material not greater than 1.65
- Minimum of 12-inch depth of media with Effective Size (ES) </= 0.45-0.55 mm

These general guidelines apply for gravity filter media in general. More specific criteria for individual media placed in mono- or multi-media beds are also provided. These guidelines are summarized below.

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Conceptual Design

Overview

Consor prepared a conceptual design to quantify the media filtration unit process requirements for consideration of modification of the existing roughing filters. As based on the criteria and approach as outlines above, two scenarios were developed included:

- Scenario 1 – Current Flow Conditions at WTP (Q = 17.55 MGD)
- Scenario 2 – Design Capacity Condition (Q = 24 MGD)
    - Scenario 2A – Center Feed
    - Scenario 2B – End Feed

The result of each scenario defines the minimum volume and area required to accommodate the desired capacity. Separately, each scenario will be applied the feasibility for incorporation with the existing roughing filter basins and including additional redundancy, and support appurtenances.

Dual Media Filter Design Summary

SCENARIO 1 – CURRENT FLOW CONDITIONS (Q = 17.55 MGD)

The following outlines the design scenario conditions, assumptions and results of the dual media filter design for this scenario.

Table 3 Dual Media Scenario 1 Design Results

Parameter	Value	Units	AWWA / Textbook Basis
Average Day Flow	9.0	MGD	Project input
Peak Flow Factor	1.95	-	Greater than the AWWA M37 typical value
Peak Design Flow	17.55	MGD	
Filtration Rate	3	gpm/ft²	AWWA 2–5 gpm/ft²
Peak Flow (gpm)	25,272	gpm	MGD × 1440
Required Filter Area	**8,424**	ft²	Q / loading rate
Anthracite Depth	24.0	in	AWWA dual-media
Sand Depth	14.0	in	AWWA dual-media
Gravel Depth	8.0	in	Support layer
Total Media Depth	3.83	ft	
Backwash Rate	12.0	gpm/ft²	AWWA typical
Backwash Flow Required	101,088	gpm	Area × rate

The analysis for scenario 1 determined that the area required for a filter to meet the current peak flow demand is available within the existing roughing filter footprint of 57.78 feet x 102 feet (5,893 sf) for each basin (11,786 sf total).

SCENARIO 2 – DESIGN CAPACITY CONDITION (Q = 24 MGD)

The following outlines the design scenario conditions, assumptions and results of the dual media filter design for this scenario.

Table 4 Dual Media Scenario 2 Design Results

Parameter	Value	Units	AWWA / Textbook Basis
Peak Design Flow	24.0	MGD	Project input
Filtration Rate	3	gpm/ft²	AWWA 2–5 gpm/ft²
Peak Flow (gpm)	34,560	gpm	Avg. MGD × 1440
Required Filter Area	**11,520**	ft²	Q / loading rate
Equivalent Filter Diameter	121.1	ft	Circular filter
Anthracite Depth	24.0	in	AWWA dual-media
Sand Depth	14.0	in	AWWA dual-media
Gravel Depth	8.0	in	Support layer
Total Media Depth	3.83	ft	
Backwash Rate	12.0	gpm/ft²	AWWA typical
Backwash Flow Required	138,240	gpm	Area × rate

Note that the volume of media required and filter area is greater for the greater flow condition. However, the proposed dual media profiles are similar.

Underdrain Evaluation

Consor evaluated the following makes and manufacturers for filter underdrains as listed in Table 5 below.

Table 5 Underdrain Comparisons

Style	Description	Manufacturer	Model
Block	High Profile (HDPE)	Leopold	Type S, SL + IMS 200
Folded Metal	Lowest Profile (304 SS)	AWI	Phoenix
Block	Low Profile	Roberts	Infinity
Block	Low Profile (HDPE)	Leopold	Type XA + IMS 200

Conceptual Layout and Configurations

Conceptual layouts showing the configuration of Scenarios 2A and 2B are provided in Figure 5 and Figure 6.

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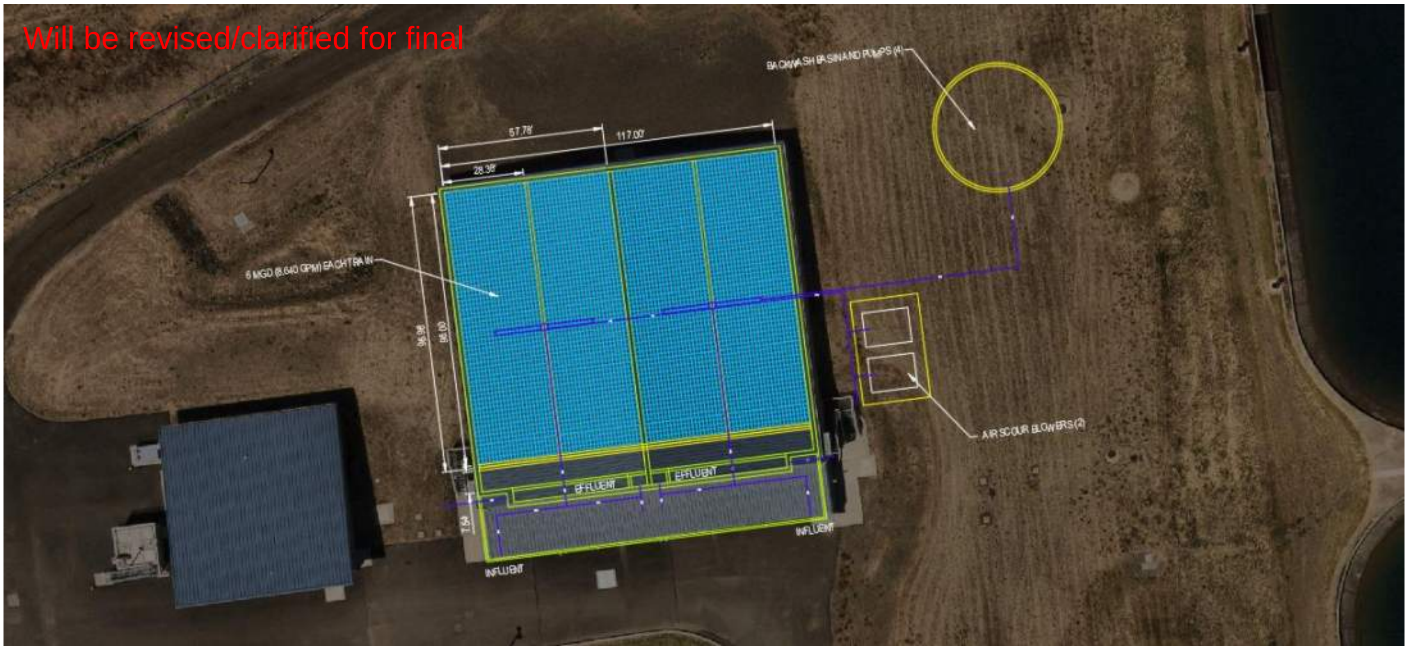
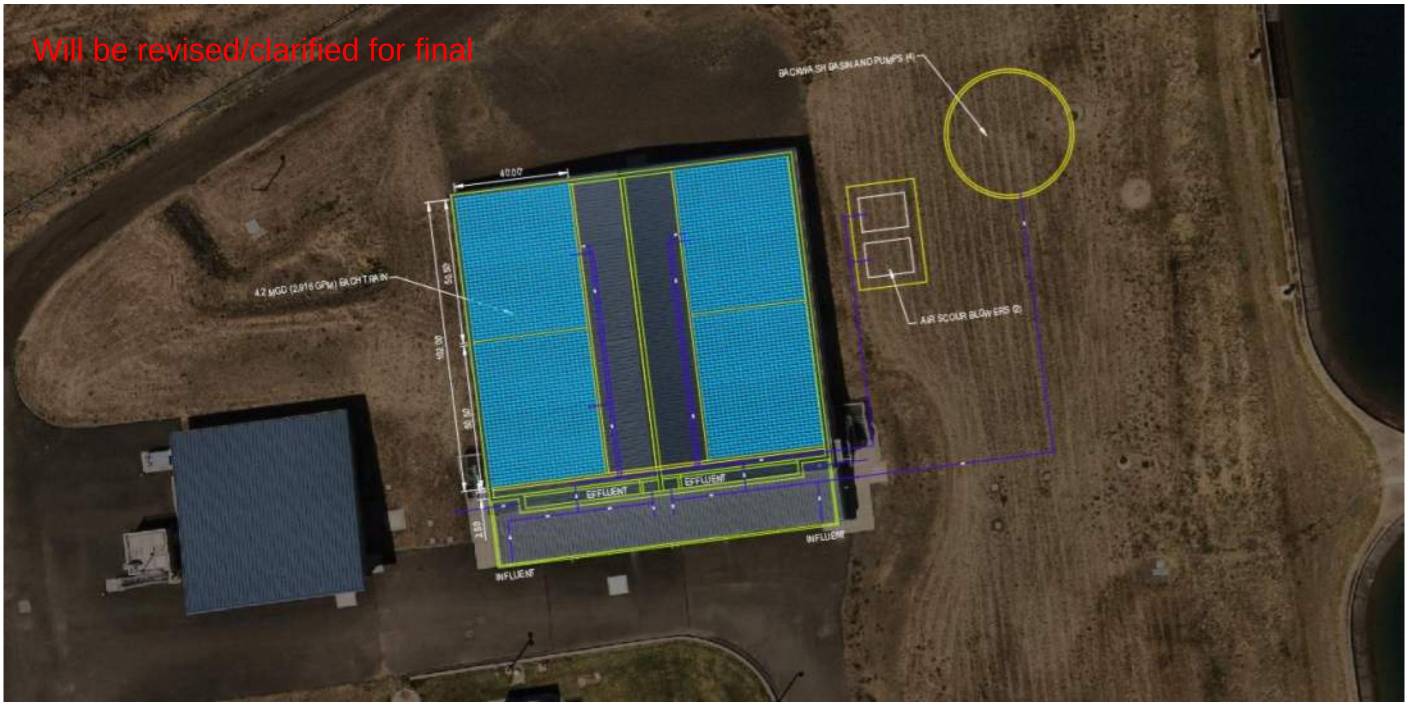
Figure 5 Scenario 2A – Center Feed Conceptual Layout



This configuration can meet the media area and loading rate requirements and provide 24 MGD of capacity. However, this configuration requires significant structural changes to accommodate a center feed of the influent to, and effluent and backwash supply from the center of the proposed underdrains.

Figure 6 Scenario 2B – End Feed Conceptual Layout



This configuration can only provide up to 16.8 MGD of capacity. However, this configuration requires significant less structural changes, and cost, to accommodate the end feed of the influent to, and effluent and backwash supply to the center of the proposed underdrains.

A preliminary comparison of feasible underdrain systems is summarized in the table below. Portions of the criteria are still in progress and being developed; however, based on the current evaluation of the alternatives, Consor would recommend the Leopold, low-profile, block style underdrain, Type XA with the IMS 200 media retainer cap.

Table 7 Underdrain System Decision Matrix

Rank	Underdrain	CAPEX	OPEX	Performance	O&M	Availability and lead time	Performance warranty
1	Leopold Type XA w/ IMS 200 media retainer	Medium	Medium	Dual-parallel pass, pressure and flow compensating, even distribution of air scour and backwash water	Less frequent preventative maintenance due to new style cap and less potential for fouling	12-16 weeks	Tested to 50 psi, warranty for 30 psi
2	Leopold High-profile w/ IMS 200 media retainer	Highest	Medium	Dual-parallel pass, pressure and flow compensating, even distribution of air scour and backwash water	More frequent preventative maintenance due to higher uplift potential and increased fouling	12-16 weeks	Warranty for 10 psi
3	AWI – Phoenix Folded Metal Underdrain	Lowest	Highest	Single-pass system, higher head loss development, may not be suited for >24-foot lateral length	More frequent preventative maintenance due to higher uplift potential, and mal-distribution	16-20 weeks	Site specific

Conclusions and Recommendations

Conclusions

The exiting roughing filter basin footprint available is 57.78 feet x 102 feet (5,893 sf) for each basin (11,786 sf total).

Scenario 1 configuration requires less area, but does not provide the full design capacity of 24 MGD.

Scenario 2 is appropriate and reveals a total media depth of 46 inches, on top of the underdrain, and does not require a gravel support.

Scenario 2A configuration can meet the media area and loading rate requirements and provide 24 MGD of capacity.

Scenario 2B configuration can only provide up to 16.8 MGD of capacity.

Scenario 2B would be an ideal configuration, with minimum structural change to the floor and walls of the roughing filter would be an end feed configuration. However, that would result in additional interior basin walls to limit the filter gallery basins to a length of 40 feet.

Additional improvements would consist of modifying the inlet piping in the gallery to direct influent up, and over the existing walls for a top feed configuration. The existing outfall would require minimal modification, consisting of raising the wall at the existing weir and would use the existing effluent channel and piping. A structural analysis would also be recommended to confirm that a higher water bearing on the exterior and interior center wall is acceptable.

New blowers and air purging system and piping would also be required and a backwash storage basin and pump station.

Recommendations

Each alternative was evaluated based on the project goals, current plant operational strategies, and the six criteria listed in the table columns below. The results of the analysis are presented in matrix format. Numerical scores are on a scale from 1 to 5, where 5 is the higher rating. Financial amounts were converted to a numerical score from high to low, following the similar scale of 1 to 5, where 5 is the lowest cost. No weighting was applied to any category but can be adjusted based on Owner's preferences.

Table 8 Comparison of Scenarios

Technology	Scenario	Performance	Capacity	Ease of Operation	Resiliency	Capital Expenditure	Operational Expenditure	Total Score
Center Feed	2A	4	5	4	4	$20M (3)	$0.6M (3)	23
End Feed	2B	4	3	5	4	$15M (4)	$0.5M (4)	24

Based on the comparison summarized above—and without weighting of the criteria—Scenario 2B provides a higher total score, due to lower capital and operational costs, as well as ease of operation. However, the filtration capacity associated with Scenario 2B is below the rated capacity of the treatment plant. Both alternatives to modify the existing roughing filter and implement dual media gravity filtration appear feasible based on this preliminary evaluation.

APPENDIX J
RESOURCE AND
CAPABILITIES INVENTORY

APPENDIX J

Resource and Capabilities Inventory

This appendix supplements Chapter 5: Resource and Capabilities Inventory of the Walla Walla Watershed Master Resiliency Plan (Watershed Master Plan) by providing detailed questionnaire content and expanded results that were too extensive for inclusion in the main report. It includes the survey questions organized by capability category and a summary of stakeholder responses to highlight available resources, technical expertise, and opportunities for collaboration. Hereafter, "stakeholders" refers exclusively to those who completed the inventory survey.

J.1 Methods

The methods used to complete the inventory focused on developing and administering an online questionnaire designed to capture stakeholder capabilities across different categories. This appendix provides the full set of questions used in the survey and additional detail on response patterns that were too extensive for inclusion in the main report.

J.1.1 Online Questionnaire

An online questionnaire was developed and distributed to stakeholders identified in Section 5.2.1 of the main Watershed Master Plan. The survey included 18 questions organized into four categories: Public Communication, Administrative & Technical Knowledge, Equipment & Supplies, and Education & Outreach. Respondents were given two weeks to complete the questionnaire, with reminders sent midway and additional follow-ups two days before closing. The full set of questions is provided below, grouped by category.

- Public Communication
    - What methods or channels does your agency/organization currently use to communicate with the public during emergencies (e.g., wildfire, flooding, landslides)? *Choices: social media, texts, automated phone calls, mailing, website, radio, national weather service radio or texts.*
    - In what ways does your agency/organization currently coordinate with the City of Walla Walla to integrate warning systems and/or public communication around emergency response? *Choices: No current coordination, Share/leverage each other's warning system, Conduct joint training exercise, Other.*
    - Which of the following opportunities exist for the City of Walla Walla to collaborate with your agency/organization to improve emergency preparedness? *Choices: Standardized messaging, Share warning systems or public communication methods, Help mobilize volunteers and resources to increase public awareness during a natural hazard or public water emergency, Other.*

- Administrative & Technical Knowledge
  - What role, if any, does your agency/organization currently play in supporting the City of Walla Walla with planning, management, and/or ecological restoration actions in the Mill Creek Watershed? *Choices: Timber management/thinning, Response to emergencies in the Watershed, Ecological restoration, Data collection and/or monitoring, Access road maintenance/improvements, None, Other.*
  - Does or could your agency/organization play a role in supporting the City of Walla Walla during natural hazard events that impact critical infrastructure like water supply systems? *Choices: No, Not currently, but it potentially could, Yes, it currently does.*
  - Briefly describe the role your agency/organization plays or could play.
  - Are you aware of any initiatives at your agency/organization or external partnerships that could assist the City of Walla Walla in building resilience for essential services like water supply? *Choices: No, Yes.*
  - Could you briefly describe these initiatives/partnerships and how they could help the City of Walla Walla?
  - Does your agency/organization have capacity with any of the following technical expertise or tools that could potentially be used to assist with drinking water supply system restoration? *Choices: GIS mapping, Hazard mapping and/or modeling, Damage assessment, Emergency response training, Permitting, Risk assessment and/or mitigation planning, Grant writing, Other.*
  - Which of the following types of professionals does your agency/organization employ? *Choices: Civil engineers, Mechanical engineers, Electrical engineers, Structural engineers, Planners, Geotechnical experts, Environmental scientists, Outreach coordinators, Grant writers, Emergency response personnel.*
- Equipment & Supplies
  - Which of the following could your agency/organization potentially provide/loan to the City to plan and respond to hazards that impact the drinking water supply system and ensure safe drinking water access during emergencies? *Choices: Erosion control materials (e.g., rip rap, gabions, erosion control mats), Flood barriers, Advanced filtration systems, Temporary filtration systems, Backup power generators and/or fuel, Pumps, Water storage tanks, Mobile drinking water treatment plants, Emergency kits, Heavy equipment, Replacement pipe, other.*
  - Which of the following could your agency/organization potentially provide to help deliver essential supplies to impacted areas? Choices: *Logistical support, Personnel, Transport/transportation vehicles, Other.*
  - How quickly can your equipment typically be deployed in the event of a disruption to water services? *Choices: Within a few hours, Within 24 hours, Within 2 to 4 days, More than 4 days*

- Education & Outreach
  - Does your agency/organization currently conduct public outreach or education programs within the local area? *Choices: No, Yes.*
  - Do or could your outreach/education programs cover any of the following topics? *Choices: Natural hazard risks, Risk reduction, Emergency preparedness, Water conservation, Volunteerism to support ecological resiliency in the Mill Creek Municipal Watershed, Other.*
  - What platforms/venues does your agency/organization use for outreach activities? *Choices: Website, Social media, In-person presentations/ workshops, etc., Local schools, Local community groups, Local media, Local NGOs, Community leaders, Other.*
  - Are you aware of any new or additional outreach efforts that could help with more public participation and support for mitigation actions/risk reduction – with a particular focus on the Mill Creek Municipal Watershed and public drinking water supply?

J.2 Summary of Results

The questionnaire results are summarized below.

J.2.1 Public Communication

Figure J-1 summarizes the communication methods used by stakeholders during emergency situations. The most commonly reported public communication method was social media, followed closely by websites. Other frequently mentioned tools included text alerts, radio, and mailing. The "Other" category captured systems such as the Walla Walla County Emergency Operations Center, Walla Walla Emergency Notification System, the Everbridge phone notification system, public meetings, and email notices. A couple of the stakeholders stated that public communication during emergencies was not part of their work.

Figure J-1 | Stakeholder-Reported Emergency Communication Methods Results from Capabilities and Resources Inventory Questionnaire

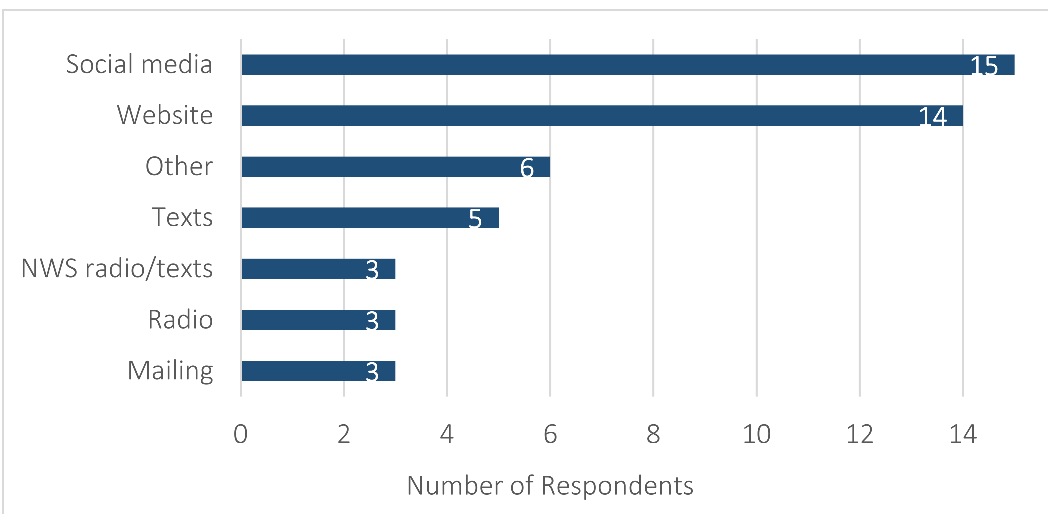
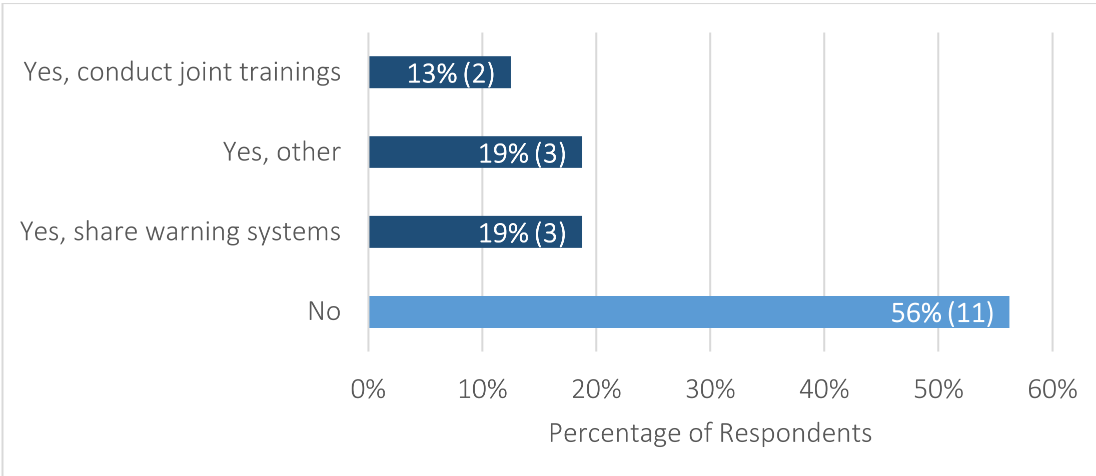


Figure J-2 provides a breakdown of how stakeholders reported their current level of coordination, showing both the percentage and number of stakeholders for each type of coordination. The figure can be interpreted independently to understand where communication partnerships currently exist and where there may be gaps. Since the stakeholders could select more than one coordination method, the totals shown in the figure exceed the number of stakeholders who coordinate with the City.

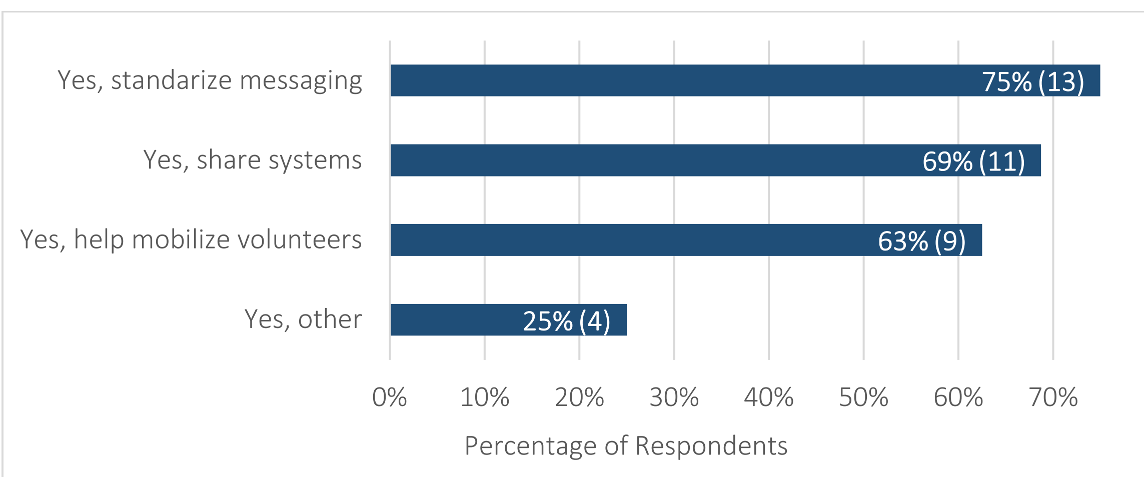
Figure J-2 | Coordination Between Stakeholders and the City on Emergency Communication Results from Capabilities and Resource Inventory Questionnaire



As shown in **Figure J-3**, stakeholders identified significant opportunities for improvement, highlighting various approaches such as standardizing messaging (75 percent), sharing communication systems (69 percent), and help mobilizing volunteers (63 percent). A small portion (25 percent) suggested other types of support, such as coordinating through phone and email, providing training for local residents, utilizing the Emergency Operations Center, and integrating response plans.

Because stakeholders could select more than one opportunity, the percentages shown in the figure reflect the proportion of stakeholders who selected each category, not mutually exclusive responses.

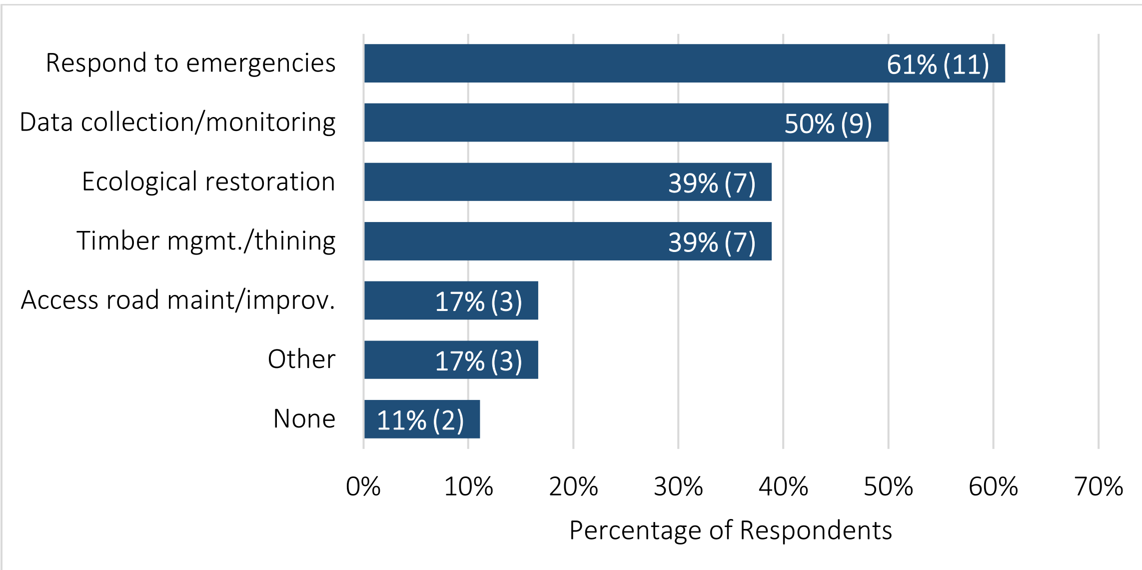
Figure J-3 | Potential Opportunities for Increased Coordination with the City Responses from Capabilities and Resource Inventory Questionnaire



J.2.2 Administrative & Technical Knowledge

The majority of stakeholders already support the City with planning, management, and/or ecological restoration actions in the Mill Creek Watershed; many in more than one way, as shown in **Figure J-4**. Additionally, one stakeholder indicated that they provide planning support through development of a Hazard Mitigation Plan, Community Wildfire Protection Plan, and Comprehensive Emergency Management Plan. A second stakeholder indicated that they supported the City through policy and financial advocacy. Two stakeholders indicated that they currently don't support the City in this area. Because stakeholders were allowed to select multiple activities, totals exceeded the number of individual stakeholders.

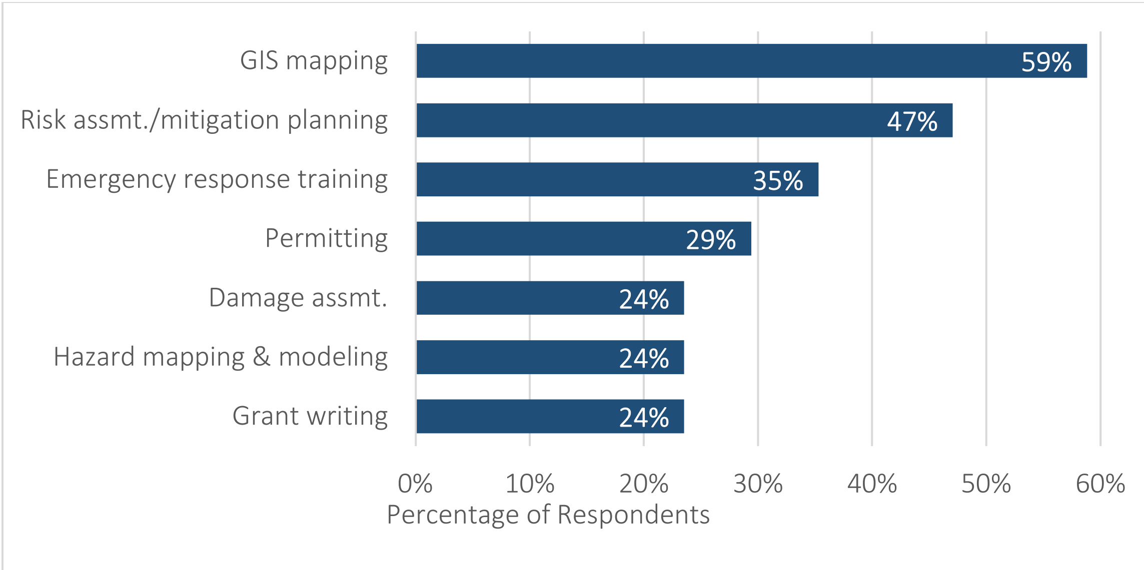
Figure J-4 | Stakeholder Involvement in Mill Creek Watershed Support Activities Responses from Capabilities and Resource Inventory Questionnaire



All but one stakeholder (94 percent) stated that they currently or could potentially play a role in supporting the City during natural hazard events that impact critical water supply infrastructure. Stakeholders that currently support the City during natural hazard events (44 percent) were asked to briefly describe the role they play.

The percentages in **Figure J-5** reflect the share of stakeholders indicating each area of expertise or available tool. Note that multiple selections were allowed in response to these questions.

Figure J-5 | Tools and Technical Capabilities Available Among Stakeholders from Capabilities and Resources Inventory Questionnaire



In addition to technical tools, many stakeholder organizations employ professionals with relevant expertise that could support the City's emergency preparedness, response, and recovery efforts. As illustrated in Figure J-6 the percentages indicate the proportion of stakeholders reporting each type of staff within their organization. Multiple selections were allowed.

Figure J-6 | Professional Expertise Available Among Stakeholder Organizations from Capabilities and Resources Inventory Questionnaire

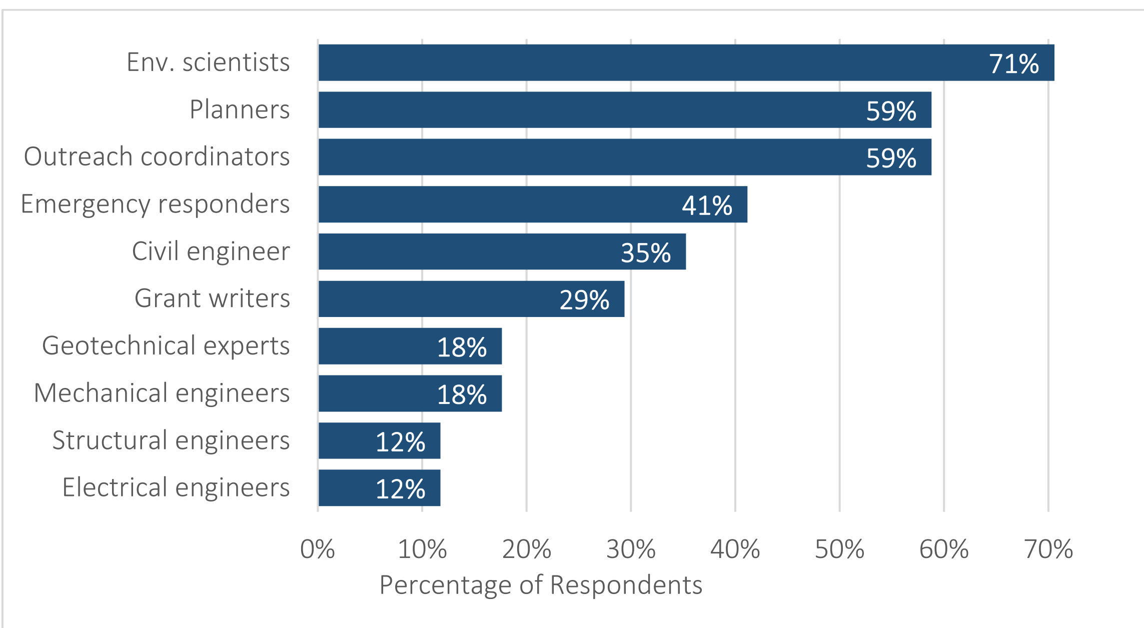


Table J-1 and Table J-2 summarizes stakeholders and the technical tools and professional expertise they can provide to support the City's hazard mitigation and water system restoration efforts.

Table J-1 | Stakeholder Capabilities Available to Support the City of Walla Walla

	Mapping & Modeling	Preparedness & Training	Permitting	Grant Support
Oregon Department of Forestry		✓		
Walla Walla County Emergency Management	✓	✓		
WA Dept of Natural Resources	✓			
WWCCD	✓		✓	✓
WA DNR		✓		
Confluence West		✓	✓	
USACE	✓	✓	✓	
City of Milton-Freewater	✓	✓		✓
Walla Walla Basin Watershed Council	✓			✓
City of Walla Walla	✓	✓		
Ecology			✓	
WA Deptment of Health Drinking Water	✓	✓		
Kooskooskie Commons				
Confederated Tribes of the Umatilla Indian Reservation Housing Department	✓			
USDA Forest Service- Umatilla National Forest	✓	✓		
WDFW			✓	
Port of Walla Walla				✓

Table J-2 | Stakeholder Expertise Available to Support the City of Walla Walla

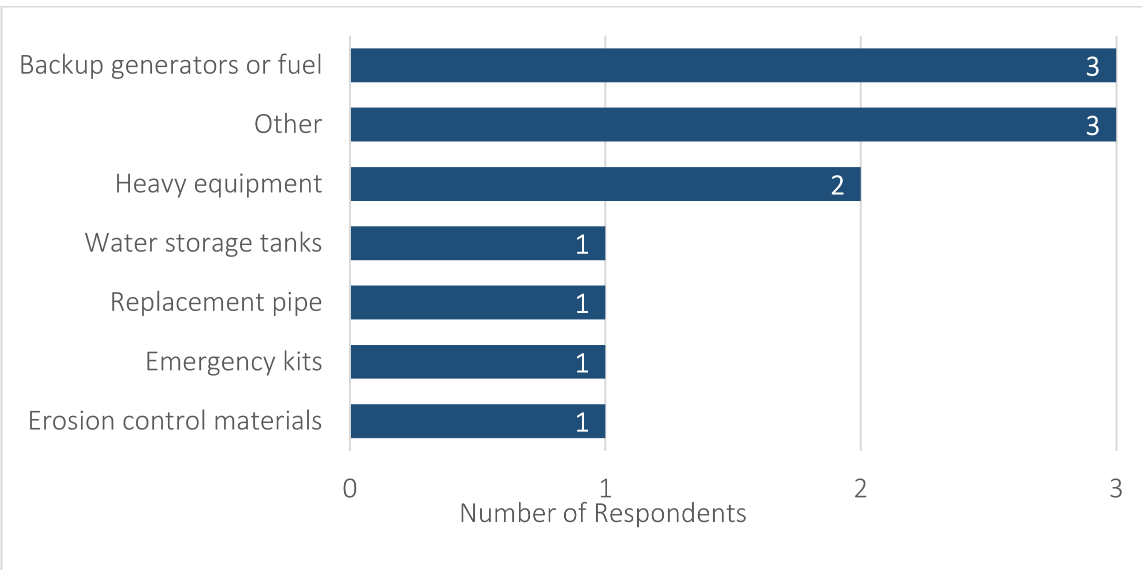
	Engineering	Planning	Environmental Science	Emergency Response	Outreach	Grant Writing
Oregon Department of Forestry				✓		
Walla Walla County Emergency Management		✓			✓	
WA Dept of Natural Resources		✓	✓	✓	✓	
WWCCD			✓		✓	✓
WA DNR						
Confluence West		✓	✓			✓
USACE	✓	✓	✓	✓	✓	
City of Milton-Freewater			✓			✓
Walla Walla Basin Watershed Council		✓	✓		✓	✓
City of Walla Walla	✓	✓		✓	✓	
Ecology	✓	✓	✓		✓	
WA Department of Health Drinking Water	✓	✓	✓	✓		
Kooskooskie Commons			✓			
Confederated Tribes of the Umatilla Indian Reservation Housing Department	✓	✓	✓	✓		

	Engineering	Planning	Environmental Science	Emergency Response	Outreach	Grant Writing
USDA Forest Service- Umatilla National Forest			✓	✓	✓	
WDFW			✓		✓	
Port of Walla Walla					✓	✓

J.2.3 Equipment & Supplies

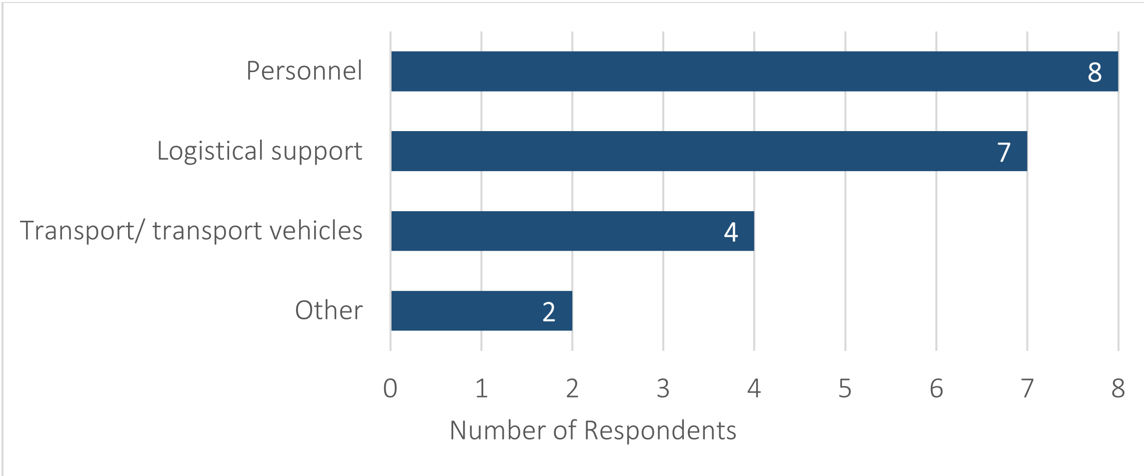
As shown in **Figure J-7**, the most commonly reported available resources include backup power generators and fuel as well as heavy equipment, followed by individual mentions of replacement pipe, erosion control materials, emergency kits, early warning rain and stream gauges, water storage tanks, and access to water supply through the airport intertie. Additionally, a few stakeholders noted that they may be able to provide funding support to assist with preparedness and response efforts. Numbers shown in **Figure J-7** indicate how many stakeholders reported having access to or the ability to provide each listed resource. Multiple selections were allowed.

Figure J-7 | Stakeholder-Reported Resources Available to Support Emergency Response from Capabilities and Resources Inventory Questionnaire



Stakeholders indicated they could provide some form of operational support to help deliver essential supplies to impacted areas during a natural hazard event. As shown in **Figure J-8**, the most frequently cited forms of assistance included personal and logistical support, followed by access to transport vehicles. Two stakeholders identified other support types, such as providing emergency workers, volunteers, and informational resources. Numbers represent how many stakeholders indicated they could provide each form of support. Multiple responses were allowed.

Figure J-8 | Operational Support Available to Aid Emergency Supply Delivery from Capabilities and Resources Inventory Questionnaire



J.2.4 Education & Outreach

Figure J-9 provides a summary of the education and outreach support reported by stakeholders. The percentage reflect stakeholders who currently include each topic in outreach programming, and those who indicated they could include it in the future.

Figure J-9 | Topics Covered in Stakeholder Outreach and Education Programs from Capabilities and Resource Inventory Questionnaire

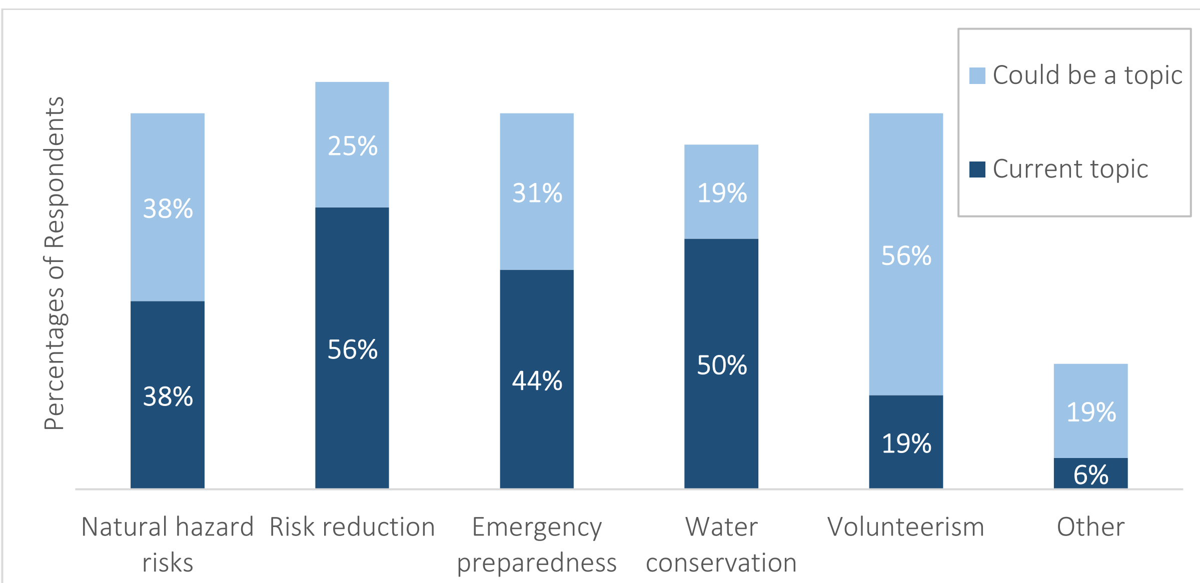
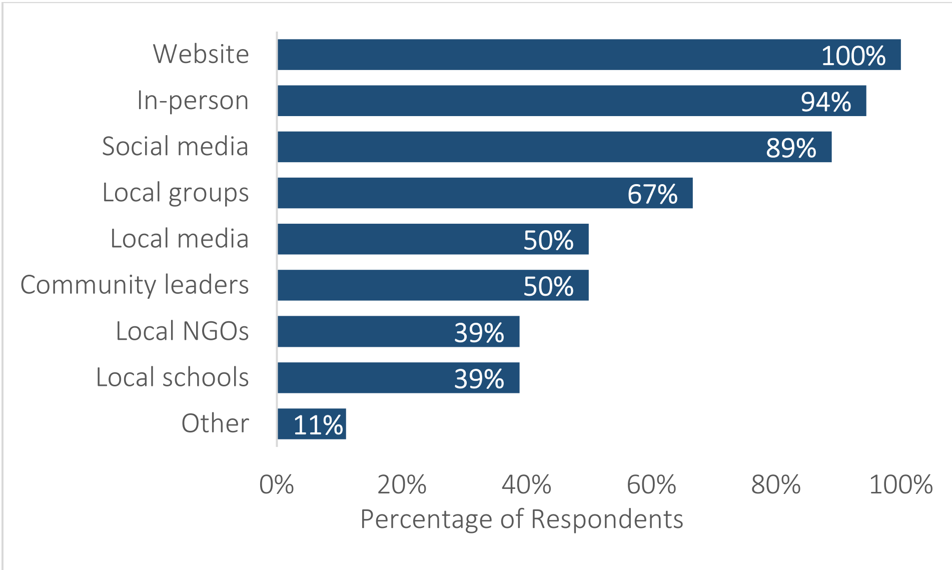


Figure J-10 show the variety of methods stakeholders reported to conduct public outreach, with the average utilizing five different approaches. Many stakeholders also engage with local groups, community leaders, and media outlets to expand their reach. Less frequently used methods include collaboration with local schools, NGOs, and other information or event-based outreach. Additional outreach strategies mentioned include engaging State and Federal emergency management technical specialists, participation in the county fair, and distributing Wildfire Ready Neighbors mailers; the latter noted as a promising way to enhance community participation in mitigation and risk reduction efforts. Percentages in Figure J-10 represent the share of stakeholders using each communication method in their outreach programs. Multiple responses were allowed.

Figure J-10 | Outreach Methods Used by Stakeholders to Engage the Public from Capabilities and Resource Inventory Questionnaire



consor

APPENDIX K
PRIVATE PARCEL REVIEW

Memorandum

Date:	November 2025
Project:	City of Walla Walla Watershed Master and Resiliency Plan
To:	Heather Pina, PE, Consor
From:	Fluent Freshwater Insights
Re:	Private Parcel Analysis

One mitigation action the City of Walla Walla (City) is considering is acquiring privately-owned land within the Mill Creek Watershed (watershed). This memorandum provides additional information on the potential current market value of 13 private parcels identified by the City as being partially in the watershed. This memo is intended to be used only as a point of reference (e.g., for comparing cost and benefits of potentially acquiring private parcels with other mitigation actions being considered) and is not an appraisal or formal valuation of the current market value of these properties nor the actual willingness to accept of current property owners. Parcel information was obtained from the Walla Walla County Assessor’s Office website.

Private Parcels

Key findings on the private parcels of interest include the following:

- All parcels are in Walla Walla County.
- Parcels range in size from 5 to 160 acres and cover 690 acres in total — only a portion of which, however, are in the watershed. A GIS analysis would be needed to estimate the exact number of acres located within the watershed, but based on a review of the map, which contains the watershed boundary intersecting with each parcel, it is unlikely that more than 200 acres total fall within the watershed.
- By land type, the majority of acres are categorized as timber (49%) or mountain (42%).
- Six of the thirteen parcels have improvements — generally small cabin-like structures. These parcels, along with three others, have one-acre “sites” included under land type. While a definition specific to Walla Walla County was not located, this designation generally refers land with potential for or current use of as a location for improvements. This is noteworthy in that the inclusion of a “site” on a parcel increases both the land market value and taxable value of a parcel substantially. For example, the 2024 market value used by the assessor for various timber and mountain land types range from $600/acre to $3,000/acre, whereas “sites” are valued at $35,000-$40,000/acre.
- Only two of the parcels have been sold in the last ten years:

- A 20.06-acre parcel, the majority of which is timber, but also includes a “site” with a cabin, was sold in 2020 for $165,000. Adjusting for inflation in the real estate market in this area since 2020, the value of this property in 2025 is an estimated $243,000 or $12,300/acre.[1]

- An 80-acre timber land parcel was sold in 2024 for $160,000. In 2025, this property would be worth an estimated $164,000 or $2,050/acre.

Comparable Sales

Given the limited number of sales in the last ten years on parcels of interest, an analysis of comparable sales also was conducted. Zillow was used to identify properties sold in the general area of interest (i.e., the southeast corner of Walla Walla County below US Route 12) over the last five years. The search was limited to sales of parcels of 20 acres or more and parcels with higher-value residential type homes (as opposed to cabins) were excluded. Eleven properties were identified, of which five contained similar land types (i.e., timber, mountain, site). Adjusting for inflation in the real estate market, the estimated current value of these parcels ranges from $3,000 to $13,000/acre, with a median value of $5,200/acre. Only one of these properties had no improvements, but it did contain a site for improvements. The sale of this parcel was the second-lowest on a per-acre basis (i.e., $3,100/acre). The other six properties identified are all considered “residential” land, which has a substantially higher per-acre sale value —a median value of $8,500/acre.

Conclusions

This analysis provides several data points that may be useful when considering acquisition of private parcels in the watershed:

- Considering all parcels (i.e., with and without improvements), $5,200/acre is likely a reasonable average estimate of current market value, with a range of $3,000 to $13,000 per acre depending on the attributes of a specific parcel.

- The presence of improvements (i.e., a cabin-like structure) appears to increases the market value of a parcel, which six of the thirteen parcels have.

- It is unclear whether parcels with only a “site”, but no improvements, have a higher market value. If the City were to retain ownership of acquired parcels, however, those would “sites” would have a higher taxable land value (at least as currently designated).

[1] Adjusted using data from the All-Transactions House Price Index for Walla Walla, WA (MSA) (https://fred.stlouisfed.org/series/ATNHPIUS47460Q).

APPENDIX L
FUNDING MATRIX

Project	Program Name	Administering Agency	Purpose / Eligible Activities	Match & Cost Share	Competitiveness Factors	Project Phase Eligible
Clarification Facility Project	WaterSMART Water and Energy Efficiency Grants	U.S. Department of Interior, Bureau of Reclamation	Funds system upgrades improving water efficiency and drought resilience.	50% non-federal cost share required.	Quantifiable water savings, readiness, cost-benefit.	Specific Components (Efficiency / Reuse) – sludge recycle, decant water reuse.
Clarification Facility Project	Building Resilient Infrastructure & Communities (BRIC)	FEMA	Hazard mitigation projects that reduce risk to critical facilities; includes safety upgrades at water systems and replacement of hazardous infrastructure.	Generally, 75/25 federal/nonfederal; Tribes receive 90/10.	Demonstrated hazard risk reduction, cost effectiveness (BCA), shovel readiness.	Planning, design or construction
Clarification Facility Project	Drinking Water State Revolving Fund (DWSRF)- Planning & Engineering and Construction Loans	WA Department of Health (DOH) – funded by EPA	Low-interest loans (with some grants/forgivable principal) for planning, design, and construction of drinking water infrastructure that protects public health and ensures regulatory compliance. Eligible work includes source, treatment, storage, transmission, and related improvements.	No fixed match requirement; assistance is primarily low-interest loans that the water system repays. Some projects receive principal forgiveness (effectively a grant) based on disadvantaged community status, affordability, and public health priority.	DOH prioritizes projects that address acute public health risks, regulatory compliance, emerging contaminants, and disadvantaged communities, plus readiness to proceed (plans/permits in place). Scoring is detailed in program guidelines and the annual Intended Use Plan.	Planning; preliminary design; final design. Construction
Clarification Facility Project	Midsize & Large Drinking Water System Infrastructure Resilience & Sustainability Program	EPA	Projects that increase resilience of drinking water infrastructure to natural hazards (earthquakes, wildfires, flooding). Planning, design, and construction eligible.	10% non-federal required	Strong resilience nexus, hazard vulnerability data, clear risk reduction outcomes.	Planning, design, construction.
Clarification Facility Project	WA Public Works Board (PWB) Traditional Financing	WA Department of Commerce	Eligible infrastructure systems include: Domestic Water; Roads/Streets; Bridges; Sanitary Sewer; Solid Waste /Recycling/Organics; Stormwater	Low-interest loans (1–2%); some grants.	Readiness, financial need, federal leverage.	Planning, Design, Construction. Pre-Construction and Construction – ideal for preliminary engineering, permitting, and construction.
Clarification Facility Project	Water Infrastructure Finance and Innovation Act (WIFIA)	U.S. Environmental Protection Agency (EPA)	Federal long-term, low-interest loans for large water, wastewater, and stormwater projects.	WIFIA can finance up to 49% of eligible project costs; borrowers must secure the remaining funding from other sources (SRF loans, municipal bonds, other grants/loans, cash).	Highly competitive; EPA looks for large, well-defined projects with strong credit, readied planning/design, environmental review, and clear regional significance (e.g., part of a broader water resilience program).	Primarily design and construction financing for large capital programs; can also fund some planning and pre-construction costs within a broader project.
Filtration Facility Project	Commuity Developoment Block Grant (CDBG) General Purpose Grants	Washington State Dept. of Commerce – CDBG Program (funded by HUD)	Grants to small cities and counties for public facilities (water, wastewater, streets/sidewalks), community facilities, infrastructure supporting affordable housing, and economic development projects that primarily benefit low- and moderate-income (LMI) people.	CDBG typically expects some local and/or other funding; program guidance emphasizes “funding readiness” and pursuit of other resources. Local match amounts vary by project and package.	Commerce prioritizes: (1) LMI benefit and financial need, (2) funding readiness and leveraging other sources, (3) communities that have not received recent CDBG awards, and (4) equity considerations.	Design and construction.
Filtration Facility Project	Drinking Water State Revolving Fund (DWSRF)- Planning & Engineering and Construction Loans	WA Department of Health (DOH) – funded by EPA	Low-interest loans (with some grants/forgivable principal) for planning, design, and construction of drinking water infrastructure that protects public health and ensures regulatory compliance. Eligible work includes source, treatment, storage, transmission, and related improvements.	No fixed match requirement; assistance is primarily low-interest loans that the water system repays. Some projects receive principal forgiveness (effectively a grant) based on disadvantaged community status, affordability, and public health priority.	DOH prioritizes projects that address acute public health risks, regulatory compliance, emerging contaminants, and disadvantaged communities, plus readiness to proceed (plans/permits in place). Scoring is detailed in program guidelines and the annual Intended Use Plan.	Planning; preliminary design; final design. Construction
Filtration Facility Project	Drinking Water System Rehabilitation & Consolidation Grant (DWSRC)	Annual competitive cycle; usu	Grants to rehabilitate or consolidate water systems that are failing/at-risk; can support construction of treatment upgrades if needed to restore or sustain reliable service.	Grant (matching requirements vary — often minimal or subsidized for disadvantaged systems)	System condition, financial need, readiness to consolidate/rehabilitate, viability plan	Planning, Design, Construction (when tied to rehab/ consolidation)
Filtration Facility Project	Midsize and Large Drinking Water System Infrastructure Resilience & Sustainability Program	U.S. Environmental Protection Agency (EPA)	Projects that increase resilience of drinking water infrastructure to natural hazards (earthquakes, wildfires, flooding). Planning, design, and construction eligible.	10% non-federal required	Strong resilience nexus, hazard vulnerability data, clear risk reduction outcomes.	Planning, design, construction.
Intake Control Building Replacement Project Grants	Commuity Developoment Block Grant (CDBG) General Purpose Grants	Washington State Dept. of Commerce – CDBG Program (funded by HUD)	Grants to small cities and counties for public facilities (water, wastewater, streets/sidewalks), community facilities, infrastructure supporting affordable housing, and economic development projects that primarily benefit low- and moderate-income (LMI) people.	CDBG typically expects some local and/or other funding; program guidance emphasizes “funding readiness” and pursuit of other resources. Local match amounts vary by project and package.	Commerce prioritizes: (1) LMI benefit and financial need, (2) funding readiness and leveraging other sources, (3) communities that have not received recent CDBG awards, and (4) equity considerations.	Design and construction.

Project	Program Name	Administering Agency	Purpose / Eligible Activities	Match & Cost Share	Competitiveness Factors	Project Phase Eligible
Intake Control Building Replacement Project Grants	Drinking Water State Revolving Fund (DWSRF)- Planning & Engineering and Construction Loans	WA Department of Health (DOH) – funded by EPA	Low-interest loans (with some grants/forgivable principal) for planning, design, and construction of drinking water infrastructure that protects public health and ensures regulatory compliance. Eligible work includes source, treatment, storage, transmission, and related improvements.	No fixed match requirement; assistance is primarily low-interest loans that the water system repays. Some projects receive principal forgiveness (effectively a grant) based on disadvantaged community status, affordability, and public health priority.	DOH prioritizes projects that address acute public health risks, regulatory compliance, emerging contaminants, and disadvantaged communities, plus readiness to proceed (plans/permits in place). Scoring is detailed in program guidelines and the annual Intended Use Plan.	Planning; preliminary design; final design. Construction
Intake Control Building Replacement Project Grants	Hazard Mitigation Assistance Grants (HMGP, BRIC, FMA – via WA Hazard Mitigation Grants)	FEMA/ WA ED	FEMA Hazard Mitigation Assistance (HMA) grants fund long-term risk-reduction projects that reduce future disaster losses. Eligible projects include mitigation reconstruction, wildfire mitigation, structure elevation or relocation, secondary power, and other structural retrofits for critical facilities and lifelines such as water systems in wildfire and flood hazard areas.	Typically 75% federal / 25% local, with higher shares for disadvantaged communities.	Strong proposals clearly tie the project to documented hazards (wildfire, flood), show avoided damages and benefit-cost ratio, and align with state mitigation priorities (WA emphasizes climate-related hazards such as fire, flood, and extreme weather).	Planning (mitigation planning, advanced assistance), design, and construction of hazard-mitigation projects.
Intake Control Building Replacement Project Grants	WA Public Works Board (PWB) Traditional Financing	WA Dept. of Commerce	Eligible infrastructure systems include: Domestic Water; Roads/Streets; Bridges; Sanitary Sewer; Solid Waste /Recycling/Organics; Stormwater	Low-interest loans (1–2%); some grants.	Readiness, financial need, federal leverage.	Planning, Design, Construction. Pre-Construction and Construction – ideal for preliminary engineering, permitting, and construction.
Intake Control Building Replacement Project Grants	Water Infrastructure Finance and Innovation Act (WIFIA)	U.S. Environmental Protection Agency (EPA)	Federal long-term, low-interest loans for large water, wastewater, and stormwater projects.	WIFIA can finance up to 49% of eligible project costs; borrowers must secure the remaining funding from other sources (SRF loans, municipal bonds, other grants/loans, cash).	Highly competitive; EPA looks for large, well-defined projects with strong credit, readied planning/design, environmental review, and clear regional significance (e.g., part of a broader water resilience program).	Primarily design and construction financing for large capital programs; can also fund some planning and pre-construction costs within a broader project.
On-Site Sodium Hypochlorite Generation (OSG) Project	Building Resilient Infrastructure & Communities (BRIC)	FEMA	Hazard mitigation projects that reduce risk to critical facilities; includes safety upgrades at water systems and replacement of hazardous infrastructure.	Generally, 75/25 federal/nonfederal; Tribes receive 90/10.	Demonstrated hazard risk reduction, cost effectiveness (BCA), shovel readiness.	Planning, design or construction
On-Site Sodium Hypochlorite Generation (OSG) Project	Drinking Water State Revolving Fund (DWSRF)- Planning & Engineering and Construction Loans	WA Department of Health (DOH) – funded by EPA	Low-interest loans (with some grants/forgivable principal) for planning, design, and construction of drinking water infrastructure that protects public health and ensures regulatory compliance. Eligible work includes source, treatment, storage, transmission, and related improvements.	No fixed match requirement; assistance is primarily low-interest loans that the water system repays. Some projects receive principal forgiveness (effectively a grant) based on disadvantaged community status, affordability, and public health priority.	DOH prioritizes projects that address acute public health risks, regulatory compliance, emerging contaminants, and disadvantaged communities, plus readiness to proceed (plans/permits in place). Scoring is detailed in program guidelines and the annual Intended Use Plan.	Planning; preliminary design; final design. Construction
On-Site Sodium Hypochlorite Generation (OSG) Project	Midsize & Large Drinking Water System Infrastructure Resilience & Sustainability Program	EPA	Projects that increase resilience of drinking water infrastructure to natural hazards (earthquakes, wildfires, flooding). Planning, design, and construction eligible.	10% non-federal required	Strong resilience nexus, hazard vulnerability data, clear risk reduction outcomes.	Planning, design, construction.
On-Site Sodium Hypochlorite Generation (OSG) Project	WA Public Works Board (PWB) Traditional Financing	WA Department of Commerce	Eligible infrastructure systems include: Domestic Water; Roads/Streets; Bridges; Sanitary Sewer; Solid Waste /Recycling/Organics; Stormwater	Low-interest loans (1–2%); some grants.	Readiness, financial need, federal leverage.	Planning, Design, Construction. Pre-Construction and Construction – ideal for preliminary engineering, permitting, and construction.
On-Site Sodium Hypochlorite Generation (OSG) Project	Water Infrastructure Finance and Innovation Act (WIFIA)	EPA	Federal long-term, low-interest loans for large water, wastewater, and stormwater projects.	WIFIA can finance up to 49% of eligible project costs; borrowers must secure the remaining funding from other sources (SRF loans, municipal bonds, other grants/loans, cash).	Highly competitive; EPA looks for large, well-defined projects with strong credit, readied planning/design, environmental review, and clear regional significance (e.g., part of a broader water resilience program).	Primarily design and construction financing for large capital programs; can also fund some planning and pre-construction costs within a broader project.
Wildfire Response Support Site: Specific to: Transportation Grants for Access Road Improvements	Better Utilizing Investments to Leverage Development (BUILD) Grant Program	U.S. DOT	Funds capital projects that improve safety, resiliency, accessibility, and local infrastructure. Eligible for rural emergency access roads, safety improvements, and resilience upgrades tied to essential services.	*Up to 80% federal; rural project typically no match- 100% federal .*	Strong narrative, benefit-cost analysis, safety outcomes, resilience benefits, community benefit, climate resilience.	Planning, design, and construction.

Project	Program Name	Administering Agency	Purpose / Eligible Activities	Match & Cost Share	Competitiveness Factors	Project Phase Eligible
Wildfire Response Support Site: Specific to: Transportation Grants for Access Road Improvements	Building Resilient Infrastructure & Communities (BRIC)	FEMA	Hazard mitigation projects that reduce risk to critical facilities; includes safety upgrades at water systems and replacement of hazardous infrastructure.	Generally, 75/25 federal/nonfederal; Tribes receive 90/10.	Demonstrated hazard risk reduction, cost effectiveness (BCA), shovel readiness.	Planning, design or construction
Wildfire Response Support Site: Specific to: Transportation Grants for Access Road Improvements	County Road Administration Board (CRAB) – Rural Arterial Program	Washington State CRAB	Provides funding for reconstruction and improvement of rural arterials and collectors. Projects may include widening, drainage, and safety improvements.	Approx. 10–20% match.	Safety, structural integrity, regional mobility, readiness.	Design and construction.
Wildfire Response Support Site: Specific to: Transportation Grants for Access Road Improvements	Federal Lands Access Program (FLAP)	FHWA	*Improves transportation facilities that provide access to federal lands. Eligible for construction, reconstruction, engineering, and roadway safety improvements. Access roads to water facilities count if they serve federal land areas such as national forests or federal watershed lands.*	*86.5% federal / 13.5% local match; can vary*	*Demonstrated federal access need; safety; resilience, connectivity to federal lands; coordination with federal land managers,*	Planning; Design and Construction
Wildfire Response Support Site: Specific to: Transportation Grants for Access Road Improvements	The Nationally Significant Multimodal Freight & Highway Projects program (INFRA)	USDOT	Highway/freight projects of regional significance, including bridges. Roads tied to critical lifeline facilities can qualify, especially under resilience and safety criteria.	Usually 20% match, though federal share may be higher for rural/tribal components.	National/regional significance, economic impact, resilience, readiness.	Design and construction.
Wildfire Response Support Site: Specific to: Transportation Grants for Access Road Improvements	Washington Transportation Improvement Board (TIB) – Emergency or Safety Programs	Washington State TIB	Funds road improvements in cities <50,000, including safety, active transportation, and emergency access improvements.	5–20% match depending on city size and program.	Safety benefits, urgency, readiness, community value.	Planning and construction.
Wildfire Response Support Site Grants	Hazard Mitigation Grant Program (HMGP)	FEMA / WA EMD	FEMA Hazard Mitigation Assistance (HMA) grants fund long-term risk-reduction projects that reduce future disaster losses. Eligible projects include mitigation reconstruction, wildfire mitigation, structure elevation or relocation, secondary power, and other structural retrofits for critical facilities and lifelines such as water systems in wildfire and flood hazard areas.	Typically 75% federal / 25% local, with higher shares for disadvantaged communities.	Strong hazard mitigation justification, benefit-cost ratio, alignment with local mitigation plan.	Planning (mitigation planning, advanced assistance), design, and construction of hazard-mitigation projects.
Wildfire Response Support Site Grants	Community Wildfire Defense Grant (CWDG)	USDA Forest Service	Wildfire mitigation tied to a CWPP; supports response infrastructure and readiness. Prioritizes communities that: Are in an area identified as having high or very high wildfire hazard potential; Are low income or; Have been impacted by a severe disaster within the previous 10 years which increased wildfire risk and/or hazard.	25% match; waivers possible.	Community Wildfire Protection Plan alignment, need, wildfire risk.	Planning + Implementation.
Wildfire Response Support Site Grants	Federal Lands Access Program (FLAP)	FHWA	*Improves transportation facilities that provide access to federal lands. Eligible for construction, reconstruction, engineering, and roadway safety improvements. Access roads to water facilities count if they serve federal land areas such as national forests or federal watershed lands.*	*86.5% federal / 13.5% local match; can vary*	*Demonstrated federal access need; safety; resilience, connectivity to federal lands; coordination with federal land managers,*	Planning; Design and Construction
Wildfire Response Support Site Grants	Nationally Significant Federal Lands and Tribal Projects (NSFLTP) Program	FHWA Federal Lands Division	*Major access improvements to federal/tribal lands*	*Up to 90–100% federal.*	*Federal land access, wildfire role.*	Planning, Design, Construction.
Wildfire Response Support Site Grants	WA DNR Wildland Fire Assistance	WA DNR	Fire equipment, communication upgrades, PPE, pumps, support tools.	~10% match.	Demonstrated wildfire need.	Equipment acquisition.
Wildfire Response Support Site Grants	WA Public Works Board (PWB) Traditional Financing	WA Dept. of Commerce	Eligible infrastructure systems include: Domestic Water; Roads/Streets; Bridges; Sanitary Sewer; Solid Waste /Recycling/Organics; Stormwater	Low-interest loans (1–2%); some grants.	Readiness, financial need, federal leverage.	Planning, Design, Construction. Pre-Construction and Construction – ideal for preliminary engineering, permitting, and construction.

Project	Program Name	Administering Agency	Purpose / Eligible Activities	Match & Cost Share	Competitiveness Factors	Project Phase Eligible
Wildland Fire Response Access and Support Infrastructure Project Grants Bridge	Better Utilizing Investments to Leverage Development (BUILD) Grant Program	USDOT	Funds capital projects that improve safety, resiliency, accessibility, and local infrastructure. Eligible for rural emergency access roads, safety improvements, and resilience upgrades tied to essential services.	*Up to 80% federal; rural project typically no match- 100% federal .*	Strong narrative, benefit-cost analysis, safety outcomes, resilience benefits, community benefit, climate resilience.	Planning, Design, Construction.
Wildland Fire Response Access and Support Infrastructure Project Grants Bridge	Bridge Investment Program (BIP)	FHWA	*Replace, rehabilitate, or protect bridges on NBI.*	*Up to 80–90% federal.*	*Condition ratings, resilience benefits, readiness, cost-benefit.*	Design and Construction
Wildland Fire Response Access and Support Infrastructure Project Grants Bridge	Federal Lands Access Program (FLAP)	FHWA	*Improves transportation facilities that provide access to federal lands. Eligible for construction, reconstruction, engineering, and roadway safety improvements. Access roads to water facilities count if they serve federal land areas such as national forests or federal watershed lands.*	*86.5% federal / 13.5% local match; can vary*	*Demonstrated federal access need; safety; resilience, connectivity to federal lands; coordination with federal land managers,*	Planning; Design and Construction
Wildland Fire Response Access and Support Infrastructure Project Grants Bridge	Nationally Significant Federal Lands and Tribal Projects (NSFLTP) Program	FHWA Federal Lands Division	Major access improvements to federal/tribal lands.	Up to 90–100% federal.	Federal land connection, readiness, safety.	Planning, Design, Construction
Wildland Fire Response Access and Support Infrastructure Project Grants Bridge	The Nationally Significant Multimodal Freight & Highway Projects program (INFRA)	USDOT	Highway/freight projects of regional significance, including bridges. Roads tied to critical lifeline facilities can qualify, especially under resilience and safety criteria.	Usually 20% match, though federal share may be higher for rural/tribal components.	Benefit-cost, freight relevance, economic importance.	Design and construction.
Wildland Fire Response Access and Support Infrastructure Project Grants Bridge	WA Public Works Board (PWB) Traditional Financing	WA Dept. of Commerce	Eligible infrastructure systems include: Domestic Water; Roads/Streets; Bridges; Sanitary Sewer; Solid Waste /Recycling/Organics; Stormwater	Low-interest loans (1–2%); some grants.	Readiness, financial need, federal leverage.	Planning, Design, Construction. Pre-Construction and Construction – ideal for preliminary engineering, permitting, and construction.
Wildland Fire Response Access and Support Infrastructure Project Grants Bridge	WSDOT Local Bridge Program	WSDOT	Federal-aid funding specifically for local bridge replacement/rehabilitation.	Often required.	Condition code, load restrictions, readiness.	Design and Construction

APPENDIX M

EQUIPMENT AND RESOURCE

INVENTORY EXAMPLE

EXAMPLE

City of Walla Wall Emergency Equipment and Resource Inventory

Updated By:

Owner / Agency	Material / Equipment Description	Quantity In stock	Storage Location	Lead Time to Order	Order Contact Info	Point of Contact		Comments
						Name	Phone/Email	
Example: City of Walla Walla	Emg Generator, trailer mtd, diesel, 150kW	2	Public Works Shop Address:	N/A	Public Works Ops Mgr.	John Smith	509-XXX-XXX	

consor

APPENDIX N
WATER QUALITY MONITORING

Appendix N

DRAFT - Memorandum

Increased or Adjusted Water Quality Testing in Response to Disturbances in the Mill Creek Watershed

Date: January 13, 2026
Project: Walla Walla Watershed Master Resiliency Plan
To: Adam Klein, City of Walla Walla
From: Ryan Billen P.E., Consor
Re: Increased or Adjusted Water Quality Testing

Introduction

This appendix was developed in response to a wildfire that occurred during a prescribed burn for the Tiger-Mill project that escaped containment, which raised concerns about potential impacts on source water quality in the Mill Creek Watershed. The purpose of this memorandum is to outline recommended considerations for water quality monitoring following disturbances such as fire, logging operations, or other activities that may increase soil runoff and adversely affect drinking water compliance under the Surface Water Treatment Rule. In addition to turbidity and pathogen control, burning activities may introduce additional risks, including EPA-regulated volatile organic compounds (VOCs), warranting expanded sampling. This document provides suggested monitoring parameters, recommended limits, and draft protocols for corrective actions if thresholds are exceeded, supporting proactive measures to ensure regulatory compliance and protect water quality.

Suggested Monitoring Approaches

Turbidity Monitoring

Current Practices

Turbidity is continuously measured at the point of diversion. This sample is used as a reference indicator for plant operations. For the purposes of regulatory compliance, monitoring is performed continuously at the treatment plant's hydro power facility. Regulatory limits are two-fold.

- When levels in source water exceed 1.0 NTU fecal coliform samples must be collected
- Turbidity levels in source water before primary disinfection must not exceed 5.0 NTU

Recommended Increase or Adjustment

Continue with current practice. Elevated turbidity levels should trigger targeted sampling and analysis of additional water quality parameters.

Total Organic Carbon (TOC) Monitoring

Current Practices

TOC is continuously monitored at the treatment plants hydro power facility and roughing filters. For drinking water, TOC is an indirect indicator of Disinfection Byproduct (DBP) formation. Direct limits for TOC are applicable to the Aquifer and Storage Recovery (ASR) program. Under the current agreement with Ecology, injection into ASR wells will cease when source water TOC's exceeds 2.0mg/L. TOC in source water is also sampled on a monthly basis for compliance with DBP monitoring requirements.

Recommended Increase or Adjustment

Like turbidity, TOC is a key bulk indicator, particularly relevant to compliance with disinfection byproduct regulations. It primarily reflects natural organic matter, including humic and fulvic acids which originate from decaying plants may or may not correlate with turbidity. For example, decomposition of wood debris can elevate TOC without affecting turbidity.

- Continue online and monthly monitoring of source water TOC's.
- Supplemental DOC analysis to better characterize the organic fraction in source water.

Additional Parameters for Supplementary Monitoring

To comprehensively assess water quality impacts, the following constituents should also be monitored on a weekly, monthly, quarterly, and/or event-based basis. Specific sampling frequencies should be determined in response to factors such as the severity of the disturbance, whether conditions are worsening or improving, seasonal concerns, regulatory compliance at the treatment plant, etc.

- Nutrients from Soil Erosion:
    - General considerations: Nitrogen and phosphorus are key nutrients that promote algal growth and contribute to eutrophication.
    - Specific concerns for Walla Walla water system: algal growth has been an intermittent problem within the twin open reservoirs. Additional nutrient loading would likely exacerbate this issue and may require peroxide dosing and more frequently cleaning/washdown of the basins.
    - Alert threshold: Deviation from norms as the initial consideration. Regulatory limit for nitrogen is 10 ppm for total nitrogen. Phosphorus is not regulated, but concentrations exceeding 0.03 ppm would likely contribute to excessive plant growth.
    - Current sampling regimen: nitrate is sampled annually in treated water.
- Micronutrients:
    - General considerations: Iron and manganese, which may oxidize and precipitate, leading to water discoloration, infrastructure fouling, and interference with chlorine residuals.
    - Specific concerns for Walla Walla water system: Precipitated iron and manganese oxides can accumulate in pipes, valves, and pumps, reducing flow and increasing maintenance

- Alert/Actionable Threshold: Secondary MCL - 0.3 ppm for iron and 0.05 ppm for manganese
- Current sampling regimen: Iron is sampled every 3 years and manganese is sampled every 9 years in treated water.

➢ PFAS Compounds:

- General Considerations: PFAS chemicals, are highly persistent, bioaccumulative, and linked to serious health risks such as cancer, immune system suppression, and developmental issues.
- Specific concerns for Walla Walla water system: If disturbances occur in areas of the watershed with historical use of chemical fire retardants, testing for per- and polyfluoroalkyl substances (PFAS) is advised. Focus on PFOA and PFOS, the most commonly regulated PFAS compounds.
- Alert/Actionable Threshold: 4 ppt for both
- Current sampling regimen: PFAS compounds are sampled every 3 years in treated water. Historical sampling required for UCMR5 compliance did not indicate the presence of PFAS compounds in the City's treated water.

➢ Volatile Organic Compounds (VOCs):

- General Considerations: In the event of burning activities, sampling for EPA-regulated VOCs is recommended. These compounds can enter water through ash runoff or atmospheric deposition during wood combustion.
- Specific concerns for Walla Walla's water system: Many VOCs (e.g., benzene, toluene, trichloroethylene) are carcinogenic or toxic, even at low concentrations. For this reason VOC's are regulated under federal and state MCL limits.
- Alert/Actionable Thresholds: Deviation from norms as the initial alert consideration. Regulatory state MCL limits as supplementary considerations for further actions.
- Current sampling regimen: VOC's are sampled every 6 years in treated water.

➢ Other Physical Water Quality Parameters

- General considerations: Testing for TSS, TDS, alkalinity and pH can provide additional insight into the composition of water, distinguishing between suspended and dissolved fractions, and indicating the potential acidity or buffering capacity of leached constituents.
- Current sampling regimen: The parameters listed below are monitored weekly in source water from Mill Creek
  - Alkalinity
  - Conductivity
  - Total Dissolved Solids (TDS)
  - Hardness
  - Turbidity

        - Temperature
        - pH

Monitoring Based Response Actions

Considerations for monitoring based response actions include the following:

- Action considerations when an increase in turbidity is observed, particularly when observed within the subbasin where logging/burning has occurred relative to the upstream baseline levels:
    - Additional sediment control measures may need to be implemented within the affected subbasin
    - Sample testing should be performed to determine if other water quality parameters are also increasing (see preceding list of additional parameters)
- Action considerations If turbidity concentrations approach, but do not exceed regulatory thresholds:
    - Compare turbidity measurement of finished water at WTP to evaluate behavior of turbidity concentrations as they move downstream through:
        - Identify affected subbasin
- In addition to any turbidity related actions, when TOC concentrations approach the 2 to 3 mg/L range:
    - Adjust/reduce chlorine dosing within the WTP system
    - Adjust/reduce water levels in tanks to minimize residence time (2 days ideal, 3 days max)
- Action considerations when turbidity or TOC exceed threshold levels
    - Discontinue use of surface water supply and transition fully to groundwater supply
- If sample testing of additional water quality parameters approach or exceed alert thresholds, increase testing frequency and evaluate the need to partially or fully transition to groundwater supply