Council Business Meeting

February 6, 2024

Agenda Item	Approval of a Professional Services Contract with The Freshwater Trust for a Flow Augmentation Feasibility Study-Phase 2 Thermal Benefits Analysis	
From	Scott Fleury PE	Public Works Director
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Item Type	Requested by Council ☐ Update ☐ Request for Direction ☒ Presentation ☒	

SUMMARY

Before the Council is a professional services contract with the Freshwater Trust to perform phase 2 "Thermal Benefits Analysis" of the flow augmentation feasibility study. This study in total is a regulatory requirement associated with the City's Wastewater Treatment Plant National Pollution Discharge Elimination System Permit (NPDES). The augmentation study has three (3) components: Feasibility, Thermal Benefits and Trading Plan Development.

The study is meant to determine the feasibility and benefits of cold water release from Reeder Reservoir along with developing a trading plan that trades cold water flow for thermal benefits in meeting NPDES requirements. It was previously determined that from late October through mid-November when under worst case scenario the Water Quality Trading (Shading) program might not provide the needed thermal benefits for NPDES permit compliance.

POLICIES, PLANS & GOALS SUPPORTED

City Council Goals:
Essential Services

- Sewer

Continue to leverage resources to develop and/or enhance Value Services

Department Goals:

- Maintain existing infrastructure to meet regulatory requirements and minimize life-cycle costs
- Deliver timely life cycle capital improvement projects
- Maintain and improve infrastructure that enhances the economic vitality of the community
- Evaluate all city infrastructure regarding planning management and financial resources

PREVIOUS COUNCIL ACTIONS

Council has taken numerous actions over the past decade that have had a nexus to renewal of the NPDES permit to ensure regulatory compliance for the Wastewater System. The Council approved

phase 1 of the Contract with the Freshwater Trust to develop the Feasibility and Limitations Study at the February 21, 2023 Business Meeting (Staff Report).

BACKGROUND AND ADDITIONAL INFORMATION

On March 8, 2022 Public Works released a Request for Proposal-Qualifications Based Selection document for consultant services to analyze the feasibility of flow augmentation in meeting the WWTP NPDES Permit. The proposal document outlined contractual phases associated with meeting the compliance schedule requirements in the NPDES permit as outlined below:

Complete (February 2024 Final Report):

Phase 1: Feasibility/Limitations Study - Complete a study and submit findings to Oregon Department of Environmental Quality (DEQ) identifying the feasibility and limitations of flow augmentation to Bear Creek via cold water releases in Ashland Creek from Reeder Reservoir. The final report on feasibility must be submitted to DEQ by March 1, 2024.

Current Proposed Scope:

Phase 2: Thermal Benefit Analysis - Complete a study and submit findings to DEQ, quantifying thermal benefits of cold water releases from Reeder Reservoir at the WWTP outfall site in Bear Creek. A final report on the study on the thermal benefits of cold water releases must be submitted to DEQ by March 1, 2025.

Future Scope and Fee Proposal:

Phase 3: Water Quality Trading Plan Development - Develop a DEQ-approved Flow Augmentation Water Quality Trading Plan (Plan) that details an analysis approach to evaluate benefits transferrable to the outfall site in Bear Creek and permit conditions. A draft Plan must be submitted to DEQ by March 1, 2026, and excess thermal loads (ETL) limit compliance must be fully achieved by March 1, 2027.

Feasibility and Limitations Study

The Freshwater Trust is almost complete with phase 1 of the project, which is the development of the draft Feasibility and Limitations Study. The executive summary is referenced as attachment #1. The final report is in progress and will be submitted to DEQ by March 1, 2024 as required by the compliance schedule.

With respect to the Feasibility and Limitations Study, the consulting team first defined the timing and magnitude of the City's potential 2040 ETL exceedance after accounting for actions already taken. This analysis found that the City has a forecasted 2040 ETL exceedance up to 4.95 million kcal/day in the period between October 15 and November 15. This is a period when deciduous trees are typically shedding their leaves and allow more solar penetration through the tree canopy, thereby making the City's existing riparian WQT program less effective at blocking incoming solar

load. The consulting team determined through various alternatives outlined in the study that it is feasible to obtain the necessary thermal reductions through cold water release from Reeder Reservoir. The various alternatives are outlined in attachment #2, Feasibility and Limitations Executive Summary Draft.

With phase 1 essentially complete it is necessary to move to phase 2, Thermal Benefits Analysis in order to model the actual temperature benefits from the various alternatives and develop the final report required to be submitted to DEQ by March 1, 2025, per the compliance schedule. The Freshwater Trust has developed the phase 2 scope and fee document, reference attachment #1.

NPDES Permit Background

On February 15, 2022 the City was issued a new National Pollution Discharge Elimination System (NPDES) permit by the Department of Environmental Quality for the Wastewater Treatment Plant (WWTP). The permit is valid until January 31, 2027. The City has long been planning for a new NPDES permit and the planning has included master plan developing along with refined studies to ensure regulatory compliance by sound capital investments. These studies/analysis have targeted applicable water quality regulations in the Bear Creek watershed that the City must comply with when discharging effluent to receiving waters include criteria for ammonia and metals such as copper, stringent limitations on in-stream mixing zones, and regulations on temperature that were anticipated to be part of the new NPDES permit.

Within the newly issued permit is a compliance schedule. The compliance schedule establishes regulatory milestones for major phases in each anticipated project needed to ensure regulatory compliance. The items in the compliance schedule are the result of negotiations between the City and DEQ, where parties sought to find a balance between highly protective water quality regulations and affordable, achievable solutions.

Figure 1: NPDES Compliance Schedule

Compliance Date:	Requirement:
By March 1, 2023	The permittee must submit final design plans and specifications for the outfall relocation to Bear Creek to DEQ for review and approval
By March 1, 2024	• The permittee must submit to DEQ a progress report summarizing the progress made toward constructing the outfall to Bear Creek. • Permittee must complete flow augmentation feasibility studies and submit findings to DEQ.
By September 1, 2023	The permittee must submit to DEQ a progress report summarizing the progress made toward acquiring the thermal credit target. The permittee must have obtained a total of at least 40% of the needed kilocalories.
By March 1, 2025	• The permittee must complete construction of the outfall to Bear Creek. • Permittee must complete a study and submit findings to DEQ on the thermal benefits of cold-water releases from Reeder Reservoir at the new outfall site in Bear Creek.
By March 1, 2026	• The permittee must submit to DEQ a progress report summarizing the progress made toward acquiring the thermal credit target. The permittee must have obtained a total of at least 70% of the needed kilocalories to comply with the Outfall 004 excess thermal load limits • Permittee must submit a DRAFT Flow Augmentation Water Quality Trading Plan to DEQ that details an analysis approach to evaluate benefits transferrable to the outfall site in Bear Creek and possible permit conditions.
By March 1, 2027	The permittee must submit to DEQ a final report summarizing all of the thermal credits that have been obtained. The permittee must achieve compliance with the final Outfall 004 excess thermal load limits.

FISCAL IMPACTS

The proposed fee for the scope of work is $215,038 and is budgeted for in the 2023-2025 Budget Biennium as part of the professional services allocation.

DISCUSSION QUESTIONS

Does the Council have any questions regarding phase 1 or phase 2 of the project?

SUGGESTED NEXT STEPS

Next steps include providing The Freshwater Trust with formal notice to proceed for phase 2 and submit the final Feasibility and Limitations report to DEQ.

REFERENCES & ATTACHMENTS

Attachment #1: Scope of Service- Thermal Benefits Analysis
Attachment #2: Feasibility and Limitations Study Executive Summary "Draft"

The Freshwater Trust protects and restores freshwater ecosystems. Using science, technology and incentive-based solutions, we're changing the course of conservation on a timeline that matters.

City of Ashland
Flow Augmentation Water Quality Trading Plan for Excess Thermal Load

Scope of Work

January 9, 2024

Background

The City of Ashland, Oregon (City) outlined the components of the Flow Augmentation Water Quality Trading Plan for Excess Thermal Load (Project #2012-12) in a public Request for Qualifications Based Proposals that closed in April 2022. The project components described in that document were broken into the following project phases:

- Phase 1, Feasibility/ Limitations Study
- Phase 2, Thermal Benefit Analysis
- Phase 3, Water Quality Trading Plan Development

Following the evaluation of two qualifications-based proposals, the City notified The Freshwater Trust (TFT) in September 2022 that the City intended to begin contract negotiations with TFT for professional services for Phase 1 of Project #2021-12 Flow Augmentation Water Quality Trading Plan for Excess Thermal Load. The City is contracting for each phase of the project separately. Below is the proposed Scope of Work and Budget for Phase 2 submitted by TFT and its partners Jacobs Engineering Group (Jacobs) and Applied Ecosystem Sciences (AES), collectively the "Consulting Team".

Project Objectives

As outlined in the Request for Qualifications Based Proposals and summarized here, Ashland's Flow Augmentation Water Quality Trading Plan for Excess Thermal Load project will facilitate regulatory compliance with Excess Thermal Load (ETL) water quality provisions and compliance schedule requirements in the City's recently renewed National Pollution Discharge Elimination System (NPDES) Permit, effective March 1, 2022. The NPDES Permit regulates effluent discharges from Ashland's Wastewater Treatment Plant (WWTP) to receiving waters in Bear Creek and Ashland Creek. The Consulting Team will provide applicable studies, analysis, modeling, and reporting leading to, and including, the development of a water quality trading plan pursuant to applicable Oregon Water Quality Trading rules in OAR 340-039. The trading plan will provide a strategy for ETL reduction at the WWTP outfall in Bear Creek via thermal benefit Alternatives identified in Phase 1. The project phases and schedules are based on the NPDES Permit Compliance Schedule, and will include the following tasks and phases:

- **Phase 1: Feasibility/ Limitations Study** - Complete a study and submit findings to Oregon Department of Environmental Quality (DEQ) identifying the feasibility and limitations of Alternatives to generate thermal benefit in Bear Creek and offset the City's ETL, including cold-water releases from

Reeder Reservoir, flow augmentation in Ashland Creek, and expansion of the City's existing riparian WQT program. A final report on feasibility must be submitted to DEQ by March 1, 2024.

- **Phase 2: Thermal Benefit Analysis** - Complete a study and submit findings to DEQ, quantifying thermal benefits of Alternatives identified in Phase 1 and selected by the City for further analysis. A final report on the thermal benefits analysis must be submitted to DEQ by March 1, 2025.
- **Phase 3: Water Quality Trading Plan Development** - Develop a DEQ-approved Water Quality Trading Plan (Plan) that details an analysis approach to evaluate benefits transferrable to the outfall site in Bear Creek and permit conditions. A draft Plan must be submitted to DEQ by March 1, 2026, and ETL limit compliance must be fully achieved by March 1, 2027. While not explicitly stated in the Compliance Schedule, it is inferred that full compliance includes submission of a final Plan, following standard applicant and public review periods.

In Phase 1, the Consulting Team is completing a study identifying the feasibility and limitations of Alternatives for the City to offset its ETL by generating thermal benefit to Bear Creek and is supporting the City in discussing findings with the Oregon DEQ. Based on its feasibility and limitations analysis of thermal benefit Alternatives, the Consulting Team provided a recommendation to proceed with Phase 2 on November 1, 2023. The draft Feasibility and Limitations Report will be delivered to the City by January 31, 2024 with a final report delivered in February 2024, ahead of the City's deadline to submit the final report to DEQ by March 1, 2024. Contracting and initiation of Phase 2 of the project concurrent with the completion of Phase 1 is necessary to allow the City to stay on track with its NPDES Permit Compliance Schedule.

Proposed Scope of Work

Phase 2 of the project is organized into four tasks. The tasks include:

Phase 2: Thermal Benefit Analysis

- Task 1 Project Management
- Task 2 Thermal Model Development
- Task 3 Thermal Benefits Report
- Task 4 Regulatory Support

The work included under each task is described in more detail in the following sections.

General Assumptions

The level of effort and cost are based on the following general assumptions:

- Services covered under this project begin with Notice to Proceed and end with delivery of the deliverables noted under this scope of work.
- The Notice to Proceed is issued on or before February 9, 2024.
- The City will provide the Consulting Team with all data in the City's possession relating to services provided in this scope in response to data requests. The Consulting Team will reasonably rely upon the accuracy, timeliness, and completeness of the information provided by the City.

Additional assumptions are noted under individual subtasks.

Phase 2: Thermal Benefit Analysis

In Phase 2, TFT will work with the Consulting Team to develop a stream temperature model and quantify the thermal benefits at the WWTP outfall site in Bear Creek resulting from the cold-water release and flow augmentation alternatives presented in Phase 1. TFT and the Consulting Team will also support the City in discussing findings with DEQ.

Task 1 Project Management

TFT will organize and manage the Consulting Team, oversee the project, and coordinate with the City project manager and City staff. TFT will ensure that the work is performed with care, skill, and diligence and follows the team's quality control program. TFT, its partners, and City staff will meet as required during the project duration, including to review the scope, budget, schedule, and deliverables. TFT shall prepare monthly invoices and progress reports including:

- Work completed during the month by work task as a percentage of completion.
- Needs for additional information or reviews by the City.
- Any scope, schedule, or budget issues and changes.

Upon written approval from the City, TFT will also prepare contracting for Phase 3 of the project.

Assumptions:

- Task begins in Q1 2024 and continues through Q2 2025, for a 16-month duration.
- Regular meetings will occur between the City and TFT, with Consulting Team members included as necessary.
- As described further under Task 3, a draft go/no go decision on Phase 3 contracting will occur by November 27, 2024. Upon written approval from the City, TFT will initiate preparations for Phase 3 contracting to be ready to begin Phase 3 work by March 1, 2024.

Task 2 Thermal Model Development

The Consulting Team will formalize the temperature modeling methodology and develop a stream temperature model for Ashland Creek that quantifies thermal benefits resulting from the thermal benefit Alternatives identified in Phase 1 and selected by the City for further analysis, which may include cold-water releases, flow augmentation, expansion of the City's existing riparian WQT program, and combinations thereof. The model will be capable of accounting for potential heating and cooling in Ashland Creek as thermal benefits propagate downstream to the mouth of Ashland Creek as well as any additional temperature benefit from flow augmentation (e.g., volume increases and residence time decreases). Steps in thermal model development will include (firms with lead responsibility are indicated in parentheses):

- Integrate new Reeder Reservoir water quality profile data collected fall 2023 by the City and update analyses of thermocline dynamics and temperature differences between 30-ft and 60-ft intakes, and pH and DO as related to WTP treatment (AES)
- Compile and integrate new data from 2010-2015 provided by the City in fall 2023 for additional years of reservoir water level vs intake depths as well as temperature of water entering Ashland Creek via the bypass, and update analyses based on new data (AES)
- Compile and format data needed to complete the thermal benefits analysis in HeatSource (TFT/Jacobs)
    - LiDAR data
    - Aerial imagery

    - Meteorological data
    - Stream temperature data, including data collected fall 2023
    - Stream flow data
    - Stream channel profiles
    - Water inflow and diversion points.
- Collection of limited additional field data (TFT)
    - Collection of wetted channel measurements is expected to be necessary. Channel measurements will be collected at multiple locations (up to 5 locations) along Ashland Creek to define stream bathymetry. Locations of irrigation diversions and potential stormwater inflows will also be identified for inclusion in the model.
- Develop a shade model of Ashland Creek (TFT)
- Develop a hydrodynamic thermal model of Ashland Creek in HeatSource (TFT/Jacobs)
    - Model structure set-up
    - Tuning model flow (based on limited data)
    - Calibration using stream temperature data
- Model application (TFT/Jacobs)
    - Compute change in temperature across model domain resulting from each thermal benefit Alternative
    - Quantify the thermal benefits produced at the mouth of Ashland Creek resulting from likely thermal benefit scenarios (combination of Alternatives) for the October 15 to November 30 time period of forecasted future (2040) ETL exceedance
- Identify temperature benefits at discrete locations along Ashland Creek resulting from the likely thermal benefit scenarios (Jacobs/TFT)
- Quantify ancillary benefits such as the creation and expansion of cold-water refugia (Jacobs/TFT)
- Develop regression equations to translate the range of model results into applicable ETL offset of WWTP effluent discharge. Regression equation inputs will be based on measurable indicators of changed Reeder Reservoir and Ashland Creek operations (Jacobs/TFT)
- Refine operational considerations of thermal benefit Alternatives based on updated analyses, including dynamics of Reeder reservoir drawdown given potential increases in outflow (AES/Jacobs)

Assumptions:

- The model used for this analysis will be Heat Source (thermal model) and its Shade-a-lator module (shade model).
- The region covered by the temperature model will be Ashland Creek starting at the Ashland Creek bypass at the upstream end and the confluence of Ashland Creek and Bear Creek at the downstream end.
- The annual period of time the model will be calibrated around is October 15 through November 30.

Task 3 Thermal Benefits Report

The Team will compile the core components of the model development and results into a report that documents the thermal benefits and any ancillary benefits of these actions to offset the City's ETL at the Bear Creek outfall and discusses how these results can support a Water Quality Trading (WQT) plan that includes the thermal benefit Alternatives as eligible credit-generating actions. A draft Thermal Benefits report will be provided to the City by January 2025. A final Thermal Benefits report that integrates feedback and other discussion will be provided to the City by February 2025, ahead of the City's deadline to submit the final report to DEQ by March 1, 2025.

Assumptions:

- It is assumed that the City will review and provide comments on the draft Thermal Benefits report within approximately two weeks of draft report submittal.

Task 4 Regulatory Support

The Team will assist the City in responding to questions or concerns from DEQ related to the Thermal Benefits Report and key findings.

Assumptions:

- Relevant meetings will be held between the City and DEQ during the development of the report.
- Relevant meetings will be held between the City and DEQ within two months after the final report is submitted to DEQ.
- Up to two TFT staff and up to two Jacobs staff will support the City in preparation and attendance at these meetings, with as-needed support from other Consulting Team members.
- Meetings will be held via web conferencing.

Phase 2 Timeline:

Q1 2024 – Q2 2025 for 16 months to complete

Phase 2 Estimated Cost: $215,038

Phase 2 Deliverables:

A) Monthly progress reports submitted with invoice documentation.
B) Draft Thermal Benefits report provided to the City by January 2025.
C) Final Thermal Benefits report provided to the City by February 2025, ahead of the City's deadline to submit the final report to DEQ by March 1, 2025.

Optional Task A – WTP Treatability Analysis

The Team will assist the City in further analysis of potential water treatment optimization at the new WTP required to address elevated TOC, iron, and manganese when withdrawing water from the 60-ft intake for cold water release.

Assumptions:

- Jacobs will prepare a sampling and analysis plan for the City to utilize in collecting additional reservoir water quality samples.
- The City will conduct all sampling and analysis during Oct-Nov 2024 and will provide sampling results to Jacobs.
- Jacobs will conduct analysis of potential water treatment process optimization to address elevated TOC, iron, and manganese.
- Results will be summarized in a brief (up to 5 page) technical memorandum.

Optional Task A Estimated Cost: $20,226

Schedule

The following schedule is estimated for work on Phases 1 and 2, assuming a Notice to Proceed for Phase 2 is issued on or before February 9, 2024.

	2023										2024												2025				
Month	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**
Phase 1: Feasibility Study																											
Phase 2: Thermal Benefit Analysis																											

Estimated Budget

TFT will perform work on a time and materials basis. The budget for Phase 2 is $215,038, plus a budget for Optional Task A of $20,226. A detailed breakdown of hours, labor costs, expenses, and total cost by task is provided in the attached Exhibit A.

Who to Contact for Next Steps

The Freshwater Trust appreciates the City's interest and review. Please direct questions, comments, and additions to:

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Exhibit A – Phase 2 budget breakdown of hours, labor costs, expenses, and total cost by task

Organization	TFT	TFT	TFT	TFT	TFT	TFT	Jacobs	Jacobs	Jacobs	Jacobs	Jacobs	AES	Travel Expenses	Other Expenses	Total Cost
Employee	Olivia Duren	Tim Wigington	Chris Thomas	Eugene Wier	Tommy Franzen	Heather Jones	Jason Smesrud	Enoch Nicholson	Tim Bedford	Jordan Laundry	Steve Schnurbusch	Jacob Kann			
Role	Project Manager	VP - Finance & Policy	Policy Specialist	Restoration Program Manager	GIS Analyst	Bookkeeper	Principal Water Resources Engineer	Senior Drinking Water Engineer	Project Water Resources Engineer	Staff Water Resources Engineer	Regulatory Specialist	Principal Aquatic Ecologist			
Phase 2 (Feb 2024-May 2025) Rate	$150	$210	$165	$150	$150	$75	$289	$278	$174	$121	$259	$210			
Phase 2: Thermal Benefit Analysis															
Task 1 - Project Management															
Monthly Invoices and Progress Reports	45					20									
Monthly Meetings with City PM	50	25	10	5	10		25					10			
Task Total	*95*	*25*	*10*	*5*	*10*	*20*	*25*	*0*	*0*	*0*	*0*	*10*	$0	$0	$34,225
Task 2 - Thermal Model Development															
Collection & Analysis of Model Input Data	5			20	80		16		16	24		45			
Temperature Model Development and Calibration	10			10	195		32		16	32		20			
Application of Model to Develop Trading Plan Metrics	20	15	40	5	25		32		16	32					
Task Total	*35*	*15*	*40*	*35*	*300*	*0*	*80*	*0*	*48*	*88*	*0*	*65*	$0	$0	$121,020
Task 3 - Thermal Benefits of Cold Water Releases Report															
Draft Report	50	5	10		25		20		8	12	6	20			
Final Report	20	5	5		10		14		4	5	3	10			
Task Total	*70*	*10*	*15*	*0*	*35*	*0*	*34*	*0*	*12*	*17*	*9*	*30*	$0	$0	$42,927
Task 4 - Regulatory Support															
Support of City in DEQ Coordination & Meetings	10	15	20	5	5		12				12	4			
Task Total	*10*	*15*	*20*	*5*	*5*	*0*	*12*	*0*	*0*	*0*	*12*	*4*	$0	$0	$16,866
Phase 2 HOURS TOTAL	***210***	***65***	***85***	***45***	***350***	***20***	***151***	***0***	***60***	***105***	***21***	***109***			
Phase 2 SUBTOTAL COST	***$31,500***	***$13,650***	***$14,025***	***$6,750***	***$52,500***	***$1,500***	***$43,639***	***$0***	***$10,440***	***$12,705***	***$5,439***	***$22,890***	**$0**	**$0**	**$215,038**
Optional Task A - WTP Treatability Analysis															
SAP and Coordination	2						4	8				6			
Treatment Process Modeling							2	24							
Draft and Final TM	2						8	18				2			
Optional Task A Hours	***4***	***0***	***0***	***0***	***0***	***0***	***14***	***50***	***0***	***0***	***0***	***8***			
Optional Task A Cost	***$600***	***$0***	***$0***	***$0***	***$0***	***$0***	***$4,046***	***$13,900***	***$0***	***$0***	***$0***	***$1,680***	**$0**	**$0**	**$20,226**

City of Ashland Flow Augmentation for Excess Thermal Load: Phase 1, Feasibility and Limitations Study

January 16, 2024
Version # 0.6 DRAFT: EXECUTIVE SUMMARY EXCERPT

Prepared for:

City of Ashland

Prepared by:

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EXECUTIVE SUMMARY

This report was prepared for the City of Ashland under Phase 1 of its Flow Augmentation Water Quality Trading Plan for Excess Thermal Load project. This project facilitates regulatory compliance with Excess Thermal Load (ETL) water quality provisions and compliance schedule requirements in the City's 2022 National Pollution Discharge Elimination System (NPDES) Permit. The NPDES Permit regulates effluent discharges from the City's Wastewater Treatment Plant (WWTP) to receiving waters in Bear Creek and Ashland Creek and provides three major requirements for full temperature compliance by March 1, 2027:

1. A Water Quality Trading (WQT) program for thermal offsets through riparian reforestation in the Bear Creek watershed which increases shade and reduces solar loading to waterways, with verification that credits have been obtained
2. Relocation of Ashland's WWTP outfall from Ashland Creek to Bear Creek to address compliance obligations for mixing zones, temperature, and toxics
3. Study of a WQT program for thermal offsets through cold-water releases and/or flow augmentation into Ashland Creek for thermal benefit in the fall time-period after riparian reforestation projects lose most of their shade-blocking potential, including submission of a draft WQT Plan for such a program

An evaluation of the third item, potential thermal benefit from cold-water release and flow augmentation, is broken into three project phases that match the requirements established in the City's NPDES Permit Compliance Schedule and include: (1) Phase 1: Feasibility/Limitations Study; (2) Phase 2: Thermal Benefit Analysis quantifying thermal benefits available from cold-water release and flow augmentation at the WWTP outfall site in Bear Creek; and (3) Phase 3: Water Quality Trading Plan Development.

This Phase 1 report outlines the feasibility and limitations of three major Alternatives available to the City to produce thermal offsets at its point of compliance. These Alternatives include (1) Alternative A: Release of colder water from the 60-ft intake at Reeder Reservoir into Ashland Creek, (2) Alternative B: Flow augmentation in Lower Ashland Creek, and (3) Alternative C: Expansion of the City's existing riparian WQT program. The flow augmentation Alternative was further defined to include three methods to increase flow in Ashland Creek: discharge of treated filter backwash water from the new Water Treatment Plant (WTP), additional releases from Reeder Reservoir without purchasing supplemental water supply, and additional releases from Reeder Reservoir balanced by purchasing supplemental water supply.

For the purposes of assessing the feasibility and limitations of the thermal benefit Alternatives within the context of the City's offset need, the consulting Team first defined the timing and magnitude of the City's potential 2040 ETL exceedance after accounting for actions already taken. This analysis found that the City has a forecasted 2040 ETL exceedance up to 4.95 million kcal/day in the period between October 15 and November 15. This is a period when deciduous trees are typically shedding their leaves and allow more solar penetration through the tree canopy, thereby making the City's existing riparian WQT program less effective at blocking incoming solar load. After evaluating the ability of each Alternative to offset this relatively small potential 2040 ETL exceedance, the Team identified feasibility and limitations as summarized below.

Alternative A: Release of colder water from the 60-ft intake at Reeder Reservoir into Ashland Creek

Stream temperature could be reduced by releasing colder water from deeper in Reeder Reservoir through the 60-ft intake instead of the 30-ft intake from which water is normally drawn. Reservoir water levels have historically been sufficient to operate either the 30-ft or 60-ft intake, except in rare instances such as drought conditions in 2020. For this study, we identified a threshold temperature difference of 1.0 degree C between the 30-ft and 60-ft intakes associated with thermal benefits. Historical data show that this threshold temperature difference between intake levels was present in most years until October 31, after which the thermocline typically breaks down and the thermal benefit from releasing water through the lower intake is likely to be minimal. Temperature differences between the two intakes in some years have been as great as 3.9 degrees C in the October 15 to October 31 period.

For cold-water releases to provide a thermal benefit and ETL offset, the modified operation must result in lower stream temperature at the mouth of Ashland Creek and sufficient flow must be present at the mouth to transmit that benefit. Preliminary calculations suggest that stream temperature reductions at the mouth of Ashland Creek of 0.5 to 2.0 degrees C combined with Ashland Creek stream flow at the mouth of 1.0 to 4.0 cfs may produce sufficient thermal benefits to offset the City's maximum projected future ETL excess of 4.95 million kcal/day during the period of interest. A stream temperature model of Ashland Creek is required, and will be developed in Phase 2, to quantify thermal benefit at the mouth of Ashland Creek resulting from modified reservoir operations.

Water drawn from Reeder Reservoir through either intake is released both to Ashland Creek and to the City's WTP. The impact of reservoir intake operations and water quality changes on water treatment within the WTP were assessed as part of the analysis. The primary impact on water treatment is the lower pH of water at the 60-ft intake requiring increased caustic soda for pH control in the WTP. More water quality monitoring for total organic carbon, iron, and manganese is necessary to fully understand whether drawing from the 60-ft intake will create additional water quality issues at the WTP.

The primary costs for this alternative are additional water treatment and monitoring costs. The cost of pH adjustment with additional caustic soda demand is $192/day when using the 60-ft intake, resulting in a $5,760 cost each year for 30 days of fall period operations, plus any additional water treatment costs that may be needed to address other water quality issues that require additional data and further study to define. Installation of a new temperature monitoring system at Hosler Dam with monitoring at the 30-ft and 60-ft intakes is estimated to cost $100,000.

While cost effective and operationally available, Alternative A would need to be combined with sufficient flow at the mouth of Ashland Creek to produce thermal offsets. In addition, after thermocline breakdown in late October, Alternative A would need to be combined with other Alternatives to fully offset the City's 2040 ETL exceedance.

Alternative B: Flow augmentation to Lower Ashland Creek

For flow augmentation to provide a thermal benefit and ETL offset, the modified operation must result in lower stream temperature at the mouth of Ashland Creek and sufficient flow must be present at the mouth to transmit that benefit. Flow augmentation can reduce water temperature by reducing the residence time of water in the creek and reducing heating as water travels downstream. As noted for Alternative A, a stream temperature model of Ashland Creek is required to fully assess the ETL benefits, and will be developed in Phase 2, to quantify thermal benefit at the mouth of Ashland Creek resulting from modified reservoir operations. However, relationships between stream cooling effects and stream flow were developed in Phase 1 to gauge the potential feasibility of flow augmentation on Ashland Creek. Preliminary calculations suggest that Ashland Creek stream flow at the mouth of 1.0 to 4.0 cfs combined with stream temperature reductions at the mouth of Ashland Creek of 0.5 to 2.0 degrees C may produce sufficient thermal benefits to offset the City's maximum projected future ETL excess of 4.95 million kcal/day during the period of interest.

Ashland Creek flow augmentation may be available from three sources which are presented below as Alternatives B1, B2, and B3.

Alternative B1 (Discharge of Treated WTP Filter Backwash Water): WTP filter backwash could be treated and discharged into Ashland Creek instead of into the sewer and the WWTP per current practice. With this alternative, Ashland Creek flow would increase but the temperature of a Reeder Reservoir release would remain unchanged. This alternative will not be available until the new WTP and its filter backwash treatment systems become operational in 2027-2028. The feasibility of this Alternative also assumes the new treatment system will be effective to meet discharge requirements. Due to the small flow rates made available for flow augmentation from this alternative (0.06 to 0.15 cfs), this alternative alone is not capable of offsetting all projected ETL excesses in the future. However, the reduction in sewer inflows and WWTP effluent discharges (0.1 MGD reduction from current conditions) could produce a meaningful thermal benefit by roughly halving the maximum ETL excess from WWTP effluent discharges projected for 2040 to 2.30 million kcal/day and eliminating the smaller ETL exceedances during the period of interest. Costs beyond normal operations are expected to be minimal or negligible but some additional monitoring may be required to allow treated filter backwash water to be returned to Ashland Creek.

Alternative B2 (Additional Releases from Reeder Reservoir without Purchasing Additional Water Supply): Additional water could be released from Reeder Reservoir into Ashland Creek when reservoir levels are adequate to support additional releases; in Alternative B2, no additional supply would be purchased to replace reservoir water released downstream. For this alternative, Ashland Creek flow would increase but the temperature of the Reeder Reservoir release would remain unchanged.

The release of an additional 2.0 cfs would result in 0.315 feet per day or 2.2 feet per week of reservoir drawdown. Based on an analysis of historical data (2015-2022), releasing an additional 2.0 cfs from Reeder Reservoir during October 15-November 15 was feasible (i.e., did not lower the reservoir level below the 30-ft intake) in 5 of the 8 years evaluated (63% probability) and was infeasible in 3 of the 8 years evaluated (37% probability).

Additional release would entail no additional cost unless it caused water levels to drop below the 30-ft intake, which would result in additional water treatment costs (see Alternative B3) or trigger the need to purchase water supply from the Talent Ashland Phoenix (TAP) water delivery pipeline from Lost Creek Reservoir (see Alternative B3). Some increased power generation revenue would be possible (see Alternative B3).

While Alternative B2 would have been feasible at times in recent years, growing municipal demand for the City's supply in Reeder Reservoir as well as climate change may limit the ability to release additional water in the future. By 2043, municipal water demands are projected to increase by 12-13% from current demands and future climate change is expected to reduce water supplies in the summer and fall months affecting available Reeder Reservoir water supplies. Therefore, this alternative would likely become less feasible in the future without the support of supplemental water imports. During years in which Alternative B2 is infeasible, Alternative B3 could be evaluated for application.

Alternative B3 (Additional Releases from Reeder Reservoir Balanced by Purchasing Replacement Water): More water could be released from Reeder Reservoir into Ashland Creek and additional supply would be purchased to replace reservoir water released downstream. In this alternative, Ashland Creek flow would increase but the temperature of Reeder Reservoir releases would remain unchanged. Alternative B3 is similar to Alternative B2 but addresses potential supply limitations by replacing released water with water purchased from the TAP pipeline if Reeder supplies are not sufficient on their own to fully offset the City's 2040 ETL exceedance while also meeting future demand.

Based on forecasted annual municipal demands, it is anticipated that all the City's 1,000 ac-ft annual TAP allocation will be required to satisfy projected municipal water demands by 2047, at which time this Alternative would become infeasible. Until that time, the unused portion of the City's allocation could be utilized to provide in-lieu replacement for additional Reeder Reservoir flow augmentation releases. In addition to contractual limits, water imports from TAP are also constrained by the physical ability to convey TAP water within the City's distribution system. The current TAP pipeline capacity for water deliveries to Ashland is 2.13 MGD but future upgrades are planned to increase this capacity to 3.00 MGD. In dry years such as 2018 and 2020, the unused TAP delivery capacity could have supported approximately 2 cfs of Ashland Creek flow augmentation, if the firm capacity for the Ashland TAP booster pump station were increased to 3.0 MGD.

The cost for operating this alternative includes increased TAP water costs, partially offset by increased power generation through releases from Reeder Reservoir. TAP water is purchased at a raw water rate of $810/MG but this cost is partially offset by additional power generated by releases at a benefit of $0.08/kWh. If a hypothetical 2 cfs (1.3 MGD) flow augmentation was released for 30 days, the City would spend $31,416 on TAP water purchase, offset by $2,340 of increased power revenue, for a net cost of $29,076 each year. Net costs would double to $58,152 for a release of 4 cfs (2.6 MGD) over the same period. This annual cost would only be required in years in which additional ETL offsets are needed.

Alternative C: Expansion of the City's existing riparian WQT program

This Alternative does not involve changes to reservoir operations or flow/temperature of water in Ashland Creek. Instead, additional thermal offsets would be produced by growing new tree canopy to block incoming solar radiation from waterways. The feasibility of the City's existing riparian WQT program has been proven by its successful delivery of currently targeted thermal offsets. However, program expansion to cover the City's potential future exceedance in mid-fall would need to adjust to two major factors: (1) the date of thermal offset needed in late October/early November when tree canopy is less effective at providing thermal offsets due to lower sun angle and less incoming solar load, as well as the onset of seasonal leaf drop; and (2) a more constrained supply of remaining potential project sites. Because the City's existing program is almost complete, the major components necessary to operationalize an expanded program are already in place. For example, riparian restoration is an approved Best Management Practice for thermal offset in the City's DEQ-approved WQT Plan and is part of the City's NPDES permit. However, an expanded riparian program is unlikely to be the City's most cost-effective Alternative: the Class 4 cost estimate to fully offset the City's 2040 ETL exceedance is $1.43 million to $2.42 million in 2023 dollars. This cost covers the 25-year life of a program. Further, the feasibility and cost of an expanded riparian program would be strongly tied to the willingness of specific landowners to participate. If the City wishes to consider this Alternative more thoroughly, the Team recommends that the City complete an initial recruitment check of remaining priority sites, and perhaps even secure option agreements to lock in the future right to replant for thermal offset.

Conclusion:

After studying the three alternatives presented in this report, the Team believes that the City could develop a new or expanded WQT program based on a combination of the three alternatives to achieve compliance with its excess thermal load limits. While cold-water release and flow augmentation are expected to be the most cost-effective alternatives when they are feasible, additional work is required in Phase 2 to develop a stream temperature model that will allow a more certain conclusion on the feasibility of each alternative to provide thermal benefits and the conditions under which each could offset future ETL exceedances. The Team also concluded that the City could expand its existing riparian WQT program, but this is likely to be a less cost-effective approach if Phase 2 work confirms that flow augmentation and cold-water release can offset future ETL exceedances.

In Phase 2 of the City of Ashland's Flow Augmentation Water Quality Trading Plan for Excess Thermal Load project, a complete thermal benefits analysis will be conducted that will enable the Team and the City to confirm the feasibility of flow augmentation and cold-water release. Due to the work completed in Phase 1, the Team now has the primary background datasets necessary to begin the thermal benefits analysis in Phase 2. Phase 2 will entail the development of a HeatSource stream temperature model of Ashland Creek as well as empirical equations useful for operationalizing and tracking flow augmentation and cold-water release. Phase 2 will conclude with an updated analysis of conditions over which these actions are likely feasible to offset future ETL exceedances as part of a draft WQT Plan to be developed in Phase 3.