



Willamette Basin TMDL Implementation Plan

City of Gladstone, Oregon

Updated: October 26, 2023

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Table 1-1 Acronyms and Abbreviations

1200-C	DEQ Erosion Control Permit for Construction Activities
ACWA	Oregon Association of Clean Water Agencies
BLM	Bureau of Land Management
BMP	Best Management Practice
CFR	Code of Federal Regulations
CS	Construction Site Standards
CWA	Federal Clean Water Act
CWR	Cold Water Refugia
DEQ	Oregon Department of Environmental Quality
DLCD	Department of Land Conservation and Development
DS	Development Standards
ESA	Endangered Species Act
FMA	Flood Management Area
FTE	Full Time Equivalent
ID	Illicit Discharges
IDDE	Illicit Discharge Detection and Elimination
MEP	Maximum Extent Practicable
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
OAR	Oregon Administrative Rule
OM	Operations and Maintenance
PE	Public Education
PF	Program Funding
PI	Public Involvement
PY	Permit Year
QA/QC	Quality Assurance and Quality Control
RR	Record Keeping and Reporting
SRF	State Revolving Fund
SWMP	Stormwater Management Program
TMDL	Total Maximum Daily Load
UA	Urbanized Area
UIC	Underground Injection Control
USEPA	United States Environmental Protection Agency
WPCF	Water Pollution Control Facilities
WQ	Water Quality
WQRA	Water Quality Resource Area

1.0 Introduction and Background

The Oregon Department of Environmental Quality (DEQ) has set Total Maximum Daily Loads (TMDLs) for water bodies located in the Willamette River Basin. Any agency or municipality that has legal authority over activities or areas that are sources of pollutants that impact water quality are known as Designated Management Agencies (DMAs). DMAs that are responsible for areas discharging to a TMDL water body must develop an Implementation Plan describing strategies to be undertaken to address TMDL pollutants (DEQ 2006).

The City of Gladstone, located on the border of the Clackamas River Subbasin and the Lower Willamette Subbasin of the Willamette River, must comply with this requirement. The TMDL parameters of concern for the Clackamas and Lower Willamette subbasins include temperature, bacteria, and mercury. This document represents the TMDL Implementation Plan for the City of Gladstone, specifically addressing the Willamette Basin TMDL for temperature. A detailed overview of management strategies for bacteria and mercury is also provided in this plan, although compliance with the TMDL for these parameters is covered by the City's municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) stormwater permit.

This document is arranged in five sections. Section 1.0 provides an overview of the TMDL Implementation Plan and provides background on the Willamette Basin TMDL with respect to Gladstone. Section 2.0 provides an overview of how the City's MS4 NPDES permit addresses TMDL compliance with respect to bacteria and mercury. Section 3.0 provides the temperature portion of the TMDL Implementation Plan. Section 4.0 provides evidence of compliance with land use requirements. Section 5.0 discusses additional elements required in the Water Quality Management Plan (WQMP) for the Willamette Basin TMDL: public involvement, fiscal analysis, legal authority, and cold water refugia.

1.1 Total Maximum Daily Loads Summary

The Federal Clean Water Act (CWA) of 1977 gave authorization to the U.S. Environmental Protection Agency (EPA) to restore and maintain water quality in all water bodies within the United States. In response to the CWA, the EPA designated certain state agencies, DEQ for the State of Oregon, to develop water quality standards, perform water quality monitoring to understand current conditions, determine sources of pollution, and develop TMDLs as a tool to improve water quality and restore the beneficial uses of surface waters. When a water body is found not to meet water quality standards, it is first placed on the 303(d) list as an impaired water body, and the development of a TMDL follows.

A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and it allocates pollutant loadings among point and non-point sources, background levels, reserves for future growth, and a margin of safety. Point sources are typically defined as those sources that enter surface waters through a pipe or defined conveyance system (i.e., municipal and industrial stormwater and/or wastewater). Wasteload allocations are provided in the TMDL for point sources. Nonpoint sources are typically defined as those sources that enter surface waters through more diffuse and dispersed overland flow (e.g., surface runoff from agricultural and forested lands). Load allocations are provided in the TMDL for nonpoint sources.

Implementation plans are prepared as a DMA's response to the TMDL, describing management strategies that they will implement and monitor to mitigate excess loading of TMDL pollutants (DEQ 2006).

In September 2006, DEQ issued a TMDL for nine subbasins within the Willamette River Basin in an effort to protect and restore the beneficial uses of the Willamette River. This TMDL is the largest TMDL undertaken by the DEQ thus far. The Willamette River watershed is divided into 12 subbasins; however, the Tualatin Subbasin is not covered under this TMDL since it already has a TMDL in place. The Molalla/Pudding and Yamhill Subbasins are still under review by DEQ. Mercury, bacteria, and temperature have been identified as problematic constituents for the Willamette River. Additional pollutants have been identified as problematic for specific tributaries and portions of the mainstem Willamette River; these pollutants are dissolved oxygen, turbidity, and toxics and are not covered under the scope of this plan as they are not listed parameters of concern in areas covered by Gladstone (DEQ 2006).

On November 22, 2019 DEQ issued a Final Revised Willamette Basin Mercury TMDL including updated NPS load allocations and waste load allocations for mercury to meet the more stringent methylmercury standard for human health that EPA approved in 2011 for DMA's with MS4 permits such as the City of Gladstone.

Chapter 13 of the 2019 Revised Willamette Basin TMDL provides a Water Quality Management Plan, which presents management measures for jurisdictions discharging to the Willamette River, in order to comply with the TMDL requirements. In addition, a TMDL Implementation Plan Checklist for State and Local DMAs (2021) is available to jurisdictions to assist in preparing their individual TMDL Implementation Plans. Both documents are referenced in the preparation of this TMDL Implementation Plan.

1.2 Willamette River and the Clackamas and Lower Willamette Subbasins

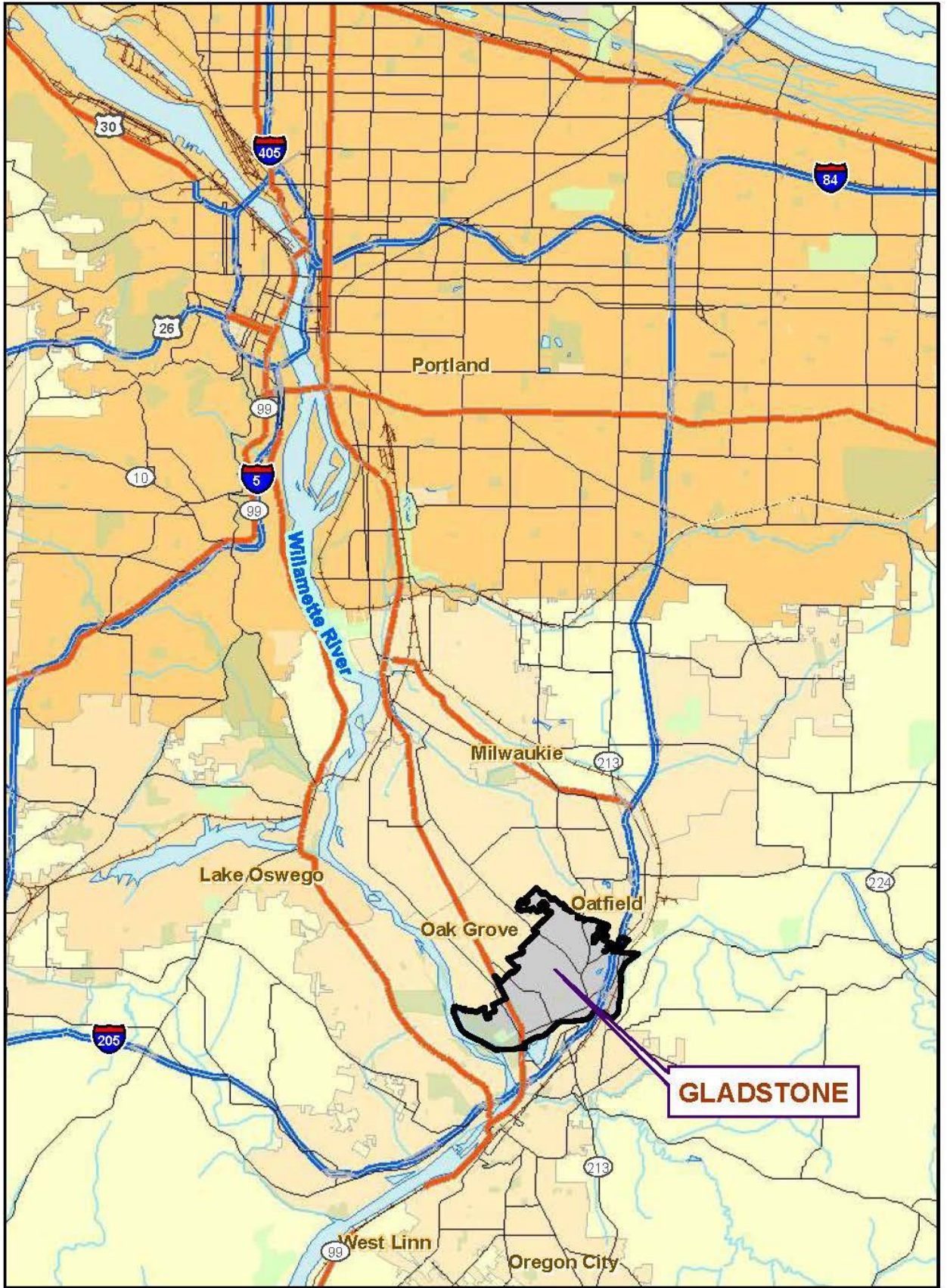
The Willamette River watershed encompasses 11,500 square miles and is home to 70% of Oregon's population, which equates to over two million people (DEQ 2006). The Willamette River and its tributaries are an important resource for residents of the watershed, providing beneficial uses such as private and public drinking water supply, industrial water supply, irrigation, recreation, aesthetic quality, natural habitat, and other functions.

Gladstone falls within the boundaries of both the Clackamas and Lower Willamette Subbasins of the Willamette River (Figure 1-1). Together, these two subbasins include portions of five counties and 19 cities, encompassing a total of 1,348 square miles.

The Lower Willamette Subbasin is situated in the northern portion of the Willamette Basin. Its boundary extends from the foothills of the Cascades on the east side of the Willamette River to the Tualatin divide on the west, from the City of St. Helens to the northeast, and to the Willamette Falls at river mile (RM) 26.6 to the south. Included in this subbasin is the City of Portland, which is Oregon's largest city. The area in this subbasin is almost completely privately owned, with some scattering of land owned by the U.S. Forest Service and state wildlife refuges in the northwest and lowlands near Sturgeon Lake. Primary land use includes urban, forestry, and agriculture.



1:120,000



0 1 2 Miles

VICINITY MAP

GLADSTONE, OREGON
TEMPERATURE TMDL IMPLEMENTATION PLAN

FIGURE 1-1

FILEPATH: K:\GLADSTONE\MXD\FIG_1_VICINITY.mxd



Print Date: March 20, 2008

The Clackamas Subbasin boundary extends northwest from the Mt. Hood National Forest to the Willamette River. Two wilderness areas, Bull of the Woods Wilderness Area and Salmon Huckleberry Wilderness Area are located within the subbasin collectively protecting 79,500 acres. The U.S. Forest Service manages the majority of the publicly owned land within the basin. Approximately one quarter of the Clackamas Subbasin is privately owned with a large portion of that land owned by timber companies. Forestry is the subbasin's chief land use by area. The majority of commercial and industrial land use is situated near the mouth of the Clackamas River as well as near the small urban areas and major roadways. Additionally, a small portion of the Warm Springs Indian Reservation is within the Clackamas Subbasin. (ODEQ 2006). The Clackamas River itself has a TMDL for temperature and bacteria and is included as Chapter 6 in the Willamette Basin TMDL.

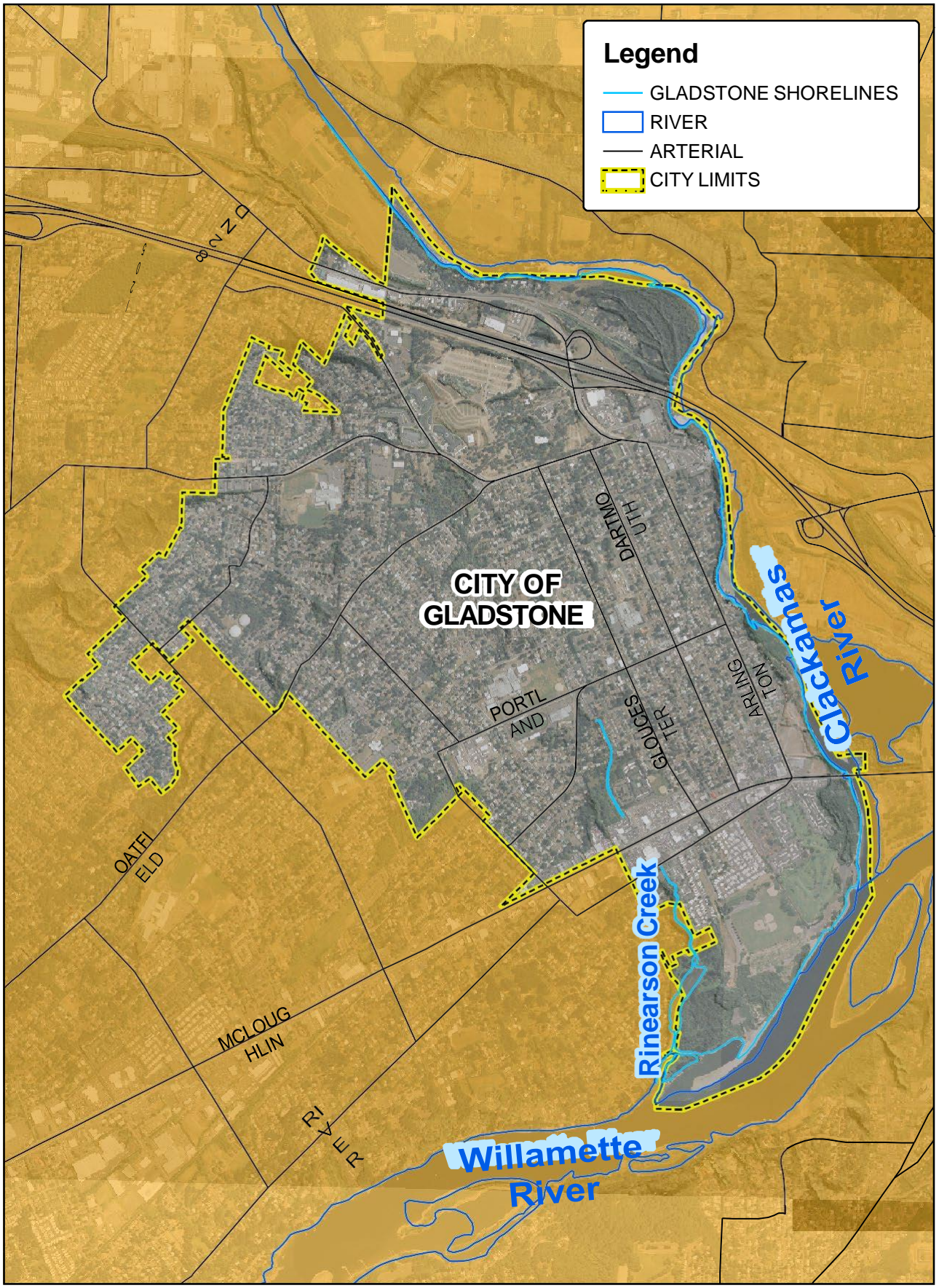
1.3 City of Gladstone Background

The City of Gladstone covers approximately 4 square miles and is located within Clackamas County. Per the US census in 2006, Gladstone has a population of approximately 12,200 residents (city website). The City is situated 12 miles southeast of Portland, Oregon's largest city and is bounded on the south by the Clackamas River and on the west by the Willamette River. Gladstone is primarily a residential community with virtually no vacant or undeveloped land. Commercial land use is primarily isolated to the corridor along Highway 99E and I-205.

The entire City drains into the Willamette or Clackamas Rivers (Figure 1-2). Approximately 49% of the city area discharges into the Clackamas River, 38% discharges into the Willamette River, and 12% discharges into Kellogg Creek, a tributary to the Clackamas River. Only one tributary, Rinearson Creek, of the Willamette River exists within the Gladstone city limits, and it is less than 20 feet wide for the majority of its length. Rinearson Creek is a short stream lacking tributaries that ends in a pool that was created by a dam. Major transportation corridors for I-205 and 99-E run through the City.

Gladstone obtained a MS4 NPDES permit from DEQ for its municipal stormwater discharges to surface waters as a co-permittee on Clackamas County's Phase 1 MS4 NPDES permit. Their municipal stormwater discharges are considered to be point sources since they are covered by a permit. As a Clackamas County Phase 1 MS4 NPDES co-permittee, the City of Gladstone prepared a SWMP that includes management strategies and schedules for controlling stormwater pollutants. Gladstone also has stormwater discharges that flow overland and enter receiving waters directly without first entering the City's stormwater conveyance system or MS4. While these discharges should be considered nonpoint sources, they have been included and covered under the City's NPDES permit for ease in management; therefore, the management strategies summarized in Section 2.0 for bacteria and mercury cover both point and non-point sources as the City's NPDES permit covers both of these sources.

1:24,000



0 0.1 0.2 Miles

GLADSTONE HYDROGRAPHY

CITY OF GLADSTONE, OREGON
TEMPERATURE TMDL IMPLEMENTATION PLAN

FIGURE 1-2



Print Date: March 12, 2008

1.4 TMDL and Implementation Plan Goals

The primary goal of the Willamette Basin TMDL is to ensure that levels of temperature, bacteria and mercury are not exceeded because waterways that are too warm will not support healthy salmon and trout; bacteria-contaminated water can cause illness in humans; and elevated levels of mercury have resulted in health advisories to limit the amount of fish that can be safely consumed. The goal of this implementation plan is to meet TMDL requirements by developing management strategies and schedules to minimize pollutant loads of heat energy (temperature). Another goal is to provide an overview (for reference purposes only) of management strategies and schedules that are implemented under the City's MS4 NPDES stormwater permit to comply with the bacteria and mercury portions of the TMDL.

1.5 TMDL Implementation Plan Requirements

The Willamette Basin TMDL addresses bacteria, mercury, and temperature. DEQ created a WQMP for the Willamette Basin TMDL in 2006 meant to provide the framework for the management strategies to attain and maintain water quality standards within the Willamette Basin (Oregon Administrative Rule (OAR) 340-042-0040-(4)). Per the WQMP, these strategies are to be submitted by DMAs to the DEQ as a TMDL Implementation Plan. The TMDL Implementation Plans need to identify activities that the City is currently conducting, or planning to implement, to address the TMDL parameters and minimize their effects on receiving water quality.

DEQ updated the mercury WQMP in 2019 which is now effective. This TMDL Implementation Plan reflects the updated 2019 WQMP for mercury. The 2006 TMDL and WQMP for temperature and bacteria is still effective.

OAR 340-042-0080(3), requires the TMDL Implementation Plan to cover the following five components:

1. Management strategies that the DMA or other responsible person will use to achieve load allocations and reduce pollutant loading;
2. A timeline and schedule to achieve measurable milestones;
3. A plan for performance monitoring and periodic review and revision of the implementation plan;
4. Evidence of compliance with applicable statewide land use requirements; and
5. Any other analyses or information as specified in the WQMP.

Section 2.0 provides an overview and reference regarding strategies in the City's MS4 NPDES permit that address TMDL compliance for bacteria and mercury. The first three requirements above are discussed separately for temperature and are covered in Section 3.0.

The fourth requirement requires an evaluation of the plan's conformance with the City's land use goals and comprehensive plan. This is covered in Section 4.0.

The fifth requirement, discussed in Section 5.0, addresses additional items identified in the WQMP that the DMA must address. These items include:

- Determine how best to provide for public involvement;
- Analyze funding to determine what additional resources are necessary to develop, implement, and maintain the management strategies;
- Include citations and brief descriptions of legal authority used to carry out the management strategies; and
- Address areas of cold water refugia.

2.0 Bacteria and Mercury TMDLs

As described in Section 1.0, a TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and it allocates pollutant loadings among point and non-point sources, background levels, reserves for future growth, and a margin of safety. Wasteload allocations are provided for point sources (e.g., municipal and industrial stormwater and wastewater) and load allocations are provided for nonpoint sources (e.g., surface runoff from agricultural and forested lands). Excess bacteria and mercury in the Willamette River Basin come from both “point” and “nonpoint” sources.

Gladstone obtained a MS4 NPDES permit from DEQ for its municipal stormwater discharges to surface waters (i.e., their point sources). As described in Section 1.0, Gladstone includes some stormwater discharges that do not first enter their conveyance system, rather they flow overland and enter receiving waters directly (i.e., nonpoint sources). However, for ease of management, the NPDES permit best management practices (BMPs) have been voluntarily applied to these sources as well. The City does not operate its own wastewater treatment plant that would also be considered a point source of bacteria and mercury. Therefore, all municipal sources of bacteria and mercury are represented by stormwater discharges that are covered under the City’s MS4 NPDES permit. The City’s MS4 NPDES permit serves as the Willamette Basin TMDL Implementation Plan for bacteria and mercury. The purpose of this section is only to provide an overview of the strategies, schedules, and monitoring activities that address bacteria and mercury that are included as part of the NPDES permit.

The revised 2019 DEQ TMDL has developed updated waste load allocations for DMA’s such as the City of Gladstone. These allocations are shown in the table 2-1 below.

2019 TMDL Mercury Update Waste Load Allocations

Source Category	Percent Total Mercury Reduction Targets:	
	<i>Lower Willamette Subbasin</i>	<i>Clackamas Subbasin</i>
Agriculture, forest, shrub, developed, other ¹ (runoff and sediment)	97%	88%
NPDES Permitted Stormwater Point Source Discharges	97%	75%

Willamette Basin Mercury TMDL Update: The U.S. Environmental Protection Agency (EPA) released the Total Maximum Daily Load (TMDL) for Mercury in the Willamette Basin, Oregon on Feb. 4, 2021. EPA notified Oregon DEQ that, “EPA has established this TMDL and is hereby providing it to the State for implementation.”

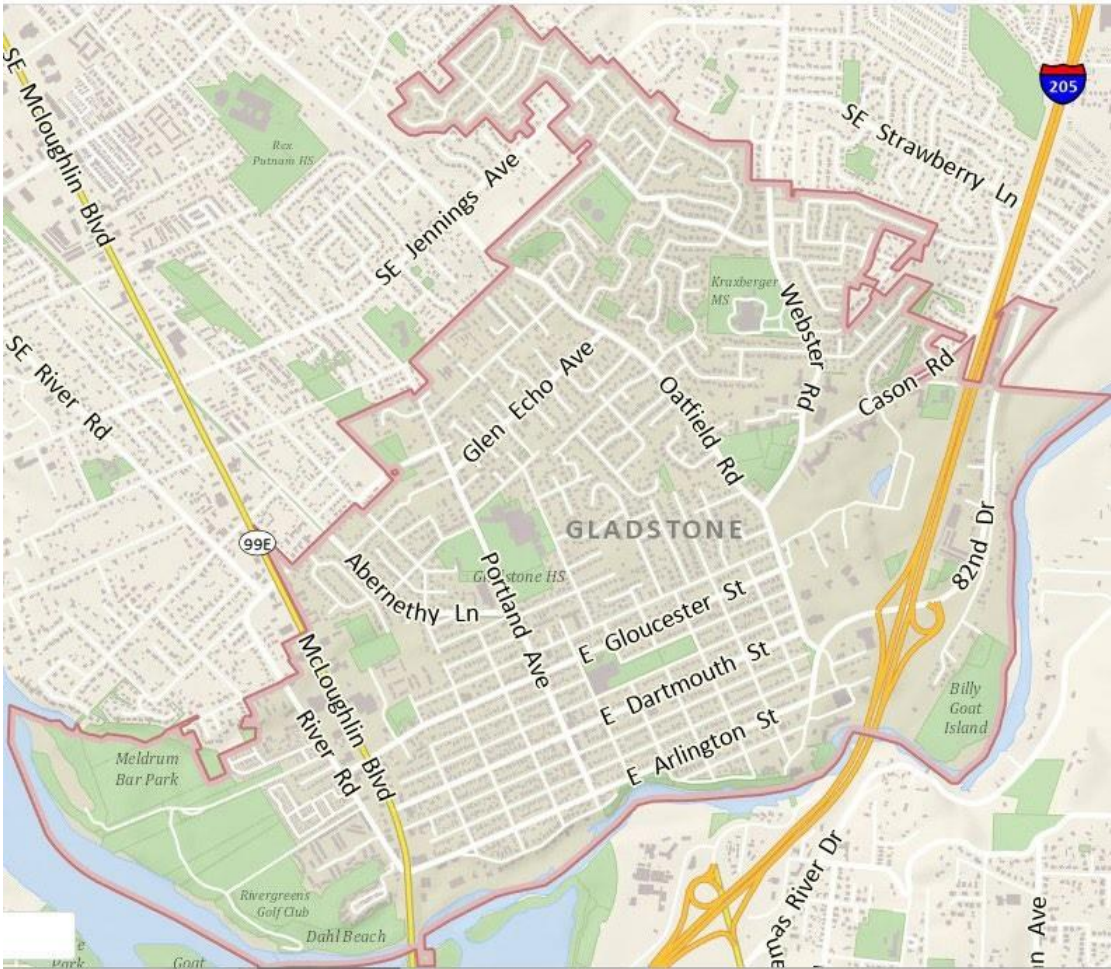
The EPA’s TMDL says that the required reasonable assurance of implementation for the TMDL relies on DEQ’s Water Quality Management Plan. The Oregon DEQ WQMP was issued on Nov. 22, 2019 as part of the DEQ Final Revised Willamette Basin Mercury Total Maximum Daily Load.

Sources of mercury in Gladstone include air emissions: atmospheric deposition from global sources. Point sources: municipal wastewater discharges from sanitary sewer overflows. Stormwater conveyance system: storm drains, piping system and open ditches/creeks.

Table 13-11, Minimum requirements for cities, pages 92-94 of the DEQ WQMP states 6 non-point storm water measures in addition to requirements in section 13.3.2.2 applying to cities such as Gladstone with MS4 permits that cover the entire area within the City. These 6 requirements include: 1. Pollution prevention and good housekeeping for municipal operations. 2. Public education and outreach. 3. Public involvement and participation. 4. Illicit discharge detection and elimination. 5. Construction site runoff control. 6. Post- Construction site runoff for new development and redevelopment. The City of Gladstone is currently meeting these 6 stormwater measures and more through MS4 permit requirements. Specifically, Stormwater Management Program Control Measures, Schedule A, Section 3 of the Clackamas Group MS4 Permit effective October 1, 2021. The City implements its MS4 permit throughout the entire City limits.

As the City is currently implementing its MS4 permit throughout the entire City limits, it will be able to continue to meet these requirements as the updated TMDL plan reflecting 2019 mercury WQMP updates was approved July 18, 2023.

Figure 2-1 MS4 Permit Implementation Area



*Gladstone city limits highlighted in Red. MS4 permit implemented throughout the entire area located inside highlighted outline.

The City of Gladstone currently has riparian management and temperature management strategies in place to mitigate temperature and sediment. Section 3 of this TMDL Implementation Plan outlines temperature requirements and strategies. The City of Gladstone also currently has riparian ordinances in place to protect waterbodies from direct discharges of sediment/runoff containing mercury. Section 3.3.2.2 of this TMDL Implementation Plan titled Gladstone Compliance with Title 3 outlines ordinances in place to protect vegetated corridors. Section 4 of this TMDL Implementation plan, titled Evidence of Compliance with Applicable Land Use Requirements outlines Gladstone ordinances in place to regulate development and require water quality standards to protect vegetated corridors, minimize stream degradation, protect against discharges/runoff containing sediment containing mercury and enhance water quality. The City implements its MS4 permit throughout the entire City limits. As the City is currently implementing its MS4 permit throughout the entire City limits, it will be able to continue to meet these requirements as the updated TMDL plan reflecting 2019 mercury WQMP updates was approved July 18, 2023.

2.2 Timeline and Schedule

The City's NPDES SWMP includes measurable goals for each BMP. These represent the schedule for implementing the TMDL implementation strategies for bacteria and mercury. The table in Appendix A includes the goals and schedules that are currently listed in the City's SWMP for each BMP. As mentioned previously, these goals have the potential to change on an annual basis through adaptive management.

2.3 Monitoring

Two types of monitoring are described in this section. Implementation monitoring relates to the tracking of BMP (management strategy) implementation and ensuring that BMP implementation goals are met. Effectiveness monitoring relates to the qualitative and quantitative analysis to evaluate effectiveness of BMPs (management strategies), and evaluate stormwater and instream concentrations of pollutants with respect to meeting water quality criteria.

2.3.1 Implementation Monitoring

With respect to implementation monitoring, Gladstone is required to submit an annual compliance report that summarizes implementation activities for all BMPs in their NPDES SWMP. Along with each BMP, the table in Appendix A includes a list of measurable goals and also provides an example of what the City's annual stormwater reports include as far as tracking and recording activities associated with those measurable goals (i.e., implementation tracking measures).

2.3.2 Effectiveness Monitoring

The City of Gladstone has been conducting effectiveness monitoring in the form of sample collection and analysis at one stormwater outfall site within the City. Stormwater quality related monitoring activities are conducted in conjunction with the monitoring requirements listed in its MS4 NPDES permit. The City of Gladstone is currently participating in a coordinated monitoring program with six Clackamas County co-permittees. Samples collected from these sites are analyzed for a list of parameters including bacteria. The City is currently collecting mercury data. Updated mercury requirements based on the new TMDL will be added to the new permit.

The City has partnered with North Clackamas Watersheds Council to conduct temperature monitoring along Rinearson Creek and has developed strategies to place two temperature monitoring devices in stream. These devices were installed in May 2022 and are located at Olson Wetlands and between River Road and Meldrum Bar Park. The data allow for a baseline temperature range and can also be used as a gauge for monitoring the success of implementation strategies.

See the latest version of the City's stormwater management plan for the City's most current monitoring plan.

https://www.ci.gladstone.or.us/sites/default/files/fileattachments/public_works/page/1141/2022_swmp_doc_final.pdf

3.0 Temperature TMDL

DMAs, including the City of Gladstone, must develop temperature TMDL implementation plans in order to address TMDL allocations for temperature, as mandated in the Willamette Basin TMDL. These plans must describe how each DMA will reduce temperature in order to meet water quality standards. The method most often used for reducing water temperatures is the installation of riparian vegetation where it is lacking along the banks of a stream. As riparian vegetation matures, it produces shade and creates a microclimate around the waterway that regulates and minimizes heating from solar radiation. Although other techniques are available for reducing water temperatures, the installation of native riparian corridors provides a cost-effective and relatively simple (low engineering/earthwork) approach that provides ancillary benefits beyond temperature regulation. Ancillary benefits include primary production of organic materials, source of large woody debris for in-stream channel complexity and habitat features, wildlife corridor connectivity, displacement of noxious vegetation, improved bank stability, and improved visual aesthetics.

Salmonids require cool, well-oxygenated water to survive. Elevated water temperature is a common problem in many tributaries to the Willamette River, resulting in TMDL load allocations and wasteload allocations designed to protect and remedy impaired aquatic habitats. Water temperatures in excess of water quality standards make streams unsuitable for coldwater fish and other coldwater aquatic species. Excessively warm streams lead to a variety of ill effects on many salmon and trout species, ranging from decreased spawning success to death (EPA 2003). Given the opportunity, juvenile and adult salmon will occupy water that is 13-18° C (55-64° F), with warmer water selected only if excess food is available. Water temperatures of approximately 23-25° C (73-77° F) are lethal to salmon and steelhead. Colder water is required for spawning, as genetic abnormalities or mortality of salmonid eggs can occur above 11° C (52° F) (WDOE 2000). The maximum temperature that salmonids can tolerate varies with species, life-stage (e.g., fry, fingerling or adult), prior acclimation, oxygen availability, duration of warmer temperature, and the presence of pollutants.

The purpose of this section is to describe Gladstone's development of an implementation plan to address temperature. Section 3.1 provides a documented summary of the load allocations and shade curves that are provided in the Willamette TMDL. Section 3.2 provides a summary of an analysis conducted to evaluate existing shade in Gladstone's riparian areas. Section 3.3 describes the City's strategies for addressing effective shade given the results of the riparian area analysis. Section 3.4 outlines the timeline and schedule for implementation, and Section 3.5 summarizes proposed monitoring.

3.1 TMDL Load Allocations for Temperature

There are several factors that can contribute to elevated instream temperatures such as changes in watershed processes and channel morphology, climate, geographic location, riparian vegetation, dams, reservoirs, and point sources such as industrial waste water discharges (DEQ 2006). DEQ has found that the largest contributor to elevated temperatures is the increased impacts from solar radiation loads due to disturbances of riparian vegetation. In response to this finding, DEQ has defined effective shade targets as a surrogate measure for addressing temperature. Effective shade is determined through the use of shade curves on a region-specific basis. DEQ has developed region specific shade curves for areas within the Willamette Basin.

The shade curves, used along with stream orientation and width, provide a target for percent effective shade and corresponding solar radiation loading (DEQ 2006).

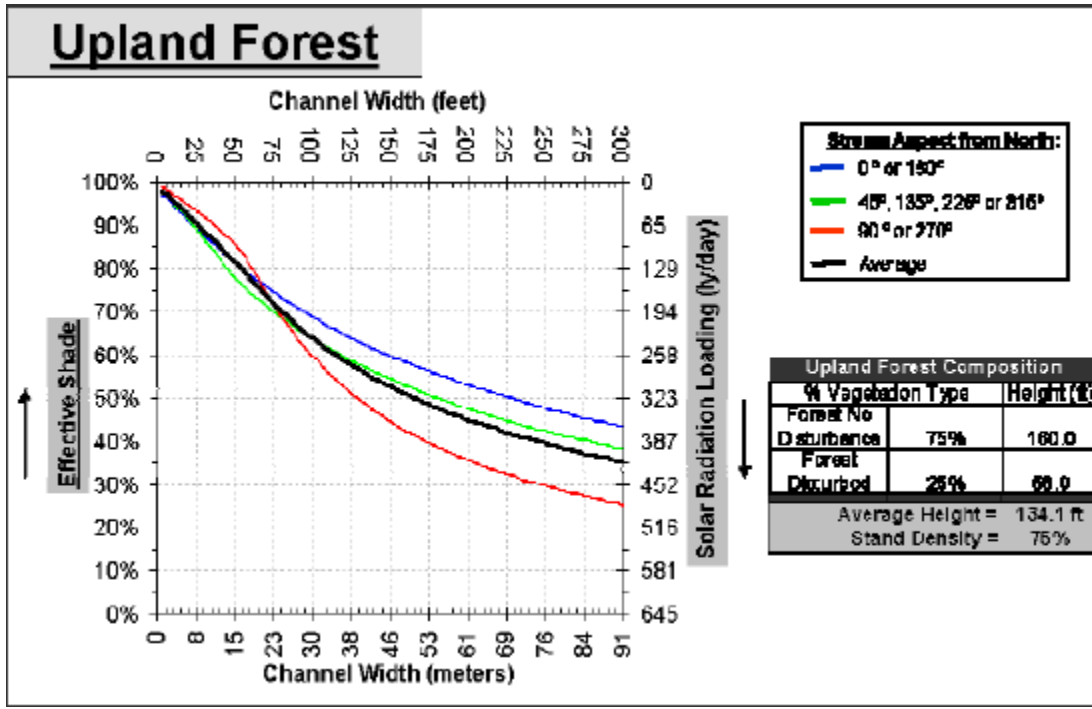
Shade is more effective on narrower streams than wider streams because shadows from trees in the riparian zone will cover a larger percent of water surface. Because Gladstone lacks an abundance of smaller streams to work with, URS also assessed the shorelines of the Willamette River and the Clackamas River, with the expectation that riparian plantings along these shorelines would still produce a net benefit in the reduction of summer water temperatures in those rivers, especially along the near shore environments that are critical to migrating salmonids. DEQ developed shade curves to project the effective shade that riparian vegetation would provide at maturity.

Different vegetation types have the capability of providing a different amount of shade. Since vegetation can vary regionally, the shade curves created by DEQ and presented in the Willamette TMDL were created to make certain system potential vegetation characteristics for each geographic area were taken into account appropriately when projecting effective shade goals. As mentioned in Section 1.0, the City of Gladstone is situated at the boundary of the Clackamas and Lower Willamette Subbasins, which have different methods for producing shade curves. For the Clackamas Subbasin DEQ projected shade curves through the designation of geomorphic units. Generally, geomorphic units can be described as units classified by specific soil characteristics differentiated in terms of surface deposits through processes such as erosion, sediment transport, and deposition (DEQ 2006). These geomorphic units were then used to project potential vegetation for the creation of shade curves. The area of Gladstone falls within the Upland Forest geomorphic unit.

For areas within the Lower Willamette Subbasin, shade curves were created based on ecoregions rather than the geomorphic unit approach taken for the Lower Willamette Subbasin. Ecoregions describe regions with relative likeness of ecological systems and are identified through patterns of soil composition, vegetation, climate, and topography (DEQ 2006). Potential vegetation type, height, canopy overhang, and canopy density were estimated for each identified ecoregion within the Lower Willamette Subbasin, and subsequently used to develop the shade curves. Gladstone falls within the Willamette Valley Prairie Terraces ecoregion (DEQ 2006).

Once the region-specific shade curve is selected, it is used along with knowledge of the stream channel width and stream aspect to project the effective shade goal at vegetation maturity for the specific location in question. For demonstration purposes, the shade curve for the Upland Forest geomorphic unit, from Figure 6.11 of Chapter 6 of the Willamette Basin TMDL, is shown below as Figure 3-1. As mentioned above, this curve is specific to the soils of Gladstone. The curve is meant to act as a guideline, since site specific conditions could inhibit the vegetation from reaching the height and overhang values used to generate the curves (DEQ 2006).

Figure 3-1 Effective Shade Curve for Gladstone



Only one tributary, Rinearson Creek, of the Willamette River exists within the Gladstone city limit that is less than 20 feet wide for the majority of its length. For this tributary, this results in an effective shade goal for the tributary to be between 90% - 98%. This is interpreted to mean historically prevalent riparian vegetation should block the majority (at least 90%) of solar radiation loading from this streams' water surface. It should be noted that based on this curve, percent effective shade decreases significantly as the width of the channel increases. Because of this, the most effective way to manage temperature in the mainstem of the Willamette River is through its smaller, narrower tributaries. To relate these shade goals to Gladstone, an analysis was conducted to evaluate the current condition of riparian areas and to identify opportunity areas for shading. The analysis is described in the following section.

3.2 Analysis of Current Riparian Area Conditions With Respect to Shade

The City of Gresham along with Pacific Habitat Services conducted a study on the benefits of effective shade on streams (Majidi 2007). The Gresham study looked at the amount of solar radiation blocked by riparian stream buffers of varying stream widths, aspects, and groupings of streambank plantings (i.e., south only versus south and north streambank plantings). The study made a key determination that the effective shade benefit of riparian plantings is diminished beyond 50 feet from a stream edge for typical regional riparian species. Using this Gresham study, URS developed a simplified method for identifying and prioritizing riparian shade restoration opportunities for Gladstone to assist with the development of their temperature TMDL implementation plans.

The results of the Gresham study are applicable to perennial creeks averaging 20 feet in width or less. These streams receive the most effective shade benefit from riparian plantings. Larger waterways, like the Clackamas and Willamette Rivers, receive less effective shade benefit from riparian vegetation simply due to their width. As discussed previously, only one tributary (Rinearson Creek) is less than 20 feet wide within the City limits, but the shorelines of the Willamette River and Clackamas River were also assessed for benefits from riparian plantings even though they may not benefit as much from the riparian vegetation.

A 50-foot buffer of all shorelines within Gladstone city limits was used as the study area for identifying and prioritizing shade opportunity areas. Shorelines were digitized based upon 2-foot contours derived from LIDAR data and 1-foot resolution aerial photography from 2006.

The next step was the identification and elimination of hard and soft planting “constraints” from the study area. Hard constraints include all impervious areas and areas where streams are routed beneath the ground surface (generally through culverts). Soft constraints include roadway, utility, and/or rail right-of-way (ROW) corridors as these generally have planting restrictions. Some ROW corridors may be planted with shrubs but most do not allow trees to be planted as they reduce aerial visibility, which is required for safety/maintenance flyovers. Soft constraints also include bank areas, specifically those on the Clackamas and Willamette Rivers that have steep topography and/ or gravel bars such that these areas would likely not support additional vegetation.

Within the remaining unconstrained portions of the study area, high-resolution aerial photography and other GIS data were used to delineate areas that appeared devoid of mature woody vegetation. Aerial photography data provided to URS by Oregon City for a similar study overlapped within the shoreline portions of Gladstone. These aerial photo data sets included 2006 color aerial photography, false infrared photography (same year), and 2005 leaf-off aerial photos. Other GIS data used in this step included digital elevation model datasets, 2-foot topographic contours, and local wetlands inventory data. These sources further illuminated areas where mature vegetation would be most beneficial. The resulting polygons constitute the shade opportunity areas.

A detailed GIS analysis revealed that over 50% of the total study area is already occupied by mature, shade producing vegetation. A total of 31 shade opportunity sites were identified. The great majority of these are small areas, many the result of intersecting a single large opportunity area with several tax parcels, resulting in several tiny fragmented shade opportunities. A site includes all individual shade opportunity patches within an individual tax parcel. Although some shade opportunity sites are contiguous with other opportunity sites located on an adjacent tax parcel, it is assumed that they would require separate land use and protection agreements, and thus are considered different sites.

The overall riparian study area used to determine the shade opportunity sites is approximately 30.5 acres, comprising approximately 2.5 lineal stream or River miles, all within the city limits. Of this, approximately 3.4 acres or 0.28 lineal stream miles were identified as potential shade opportunity areas. Half of the study area is already shaded by mature vegetation and many segments of the streams throughout Gladstone are now buried and flow through underground pipes and culverts. Table 3-1 summarizes the breakdown of the study area by description.

The acreage identified as opportunity area in Table 3-1 is a conservative estimate, as the acreage was determined assuming a planting area of 50 feet on either side of the stream. Most opportunity areas were identified along Rinearson Creek, which has a stream width significantly less than 20 feet. Therefore, a planting area less than 50 feet on either side of Rinearson Creek would be sufficient to provide shade.

Table 3-1 Summary of Opportunity Areas for Shading

Description of Area	Areas	% of Total Study Area
Currently Shaded	17.3 Acres	57%
Constraints Exist for Planting	9.8Acres	32%
Opportunities Exist for Planting	3.4 Acres	11%
Total Study Area:	30.5 acres	100%

Based on these results, two major strategies emerged for meeting shade targets: the development of a plan to provide shade where opportunities exist, and the implementation of protection measures for areas that are already currently shaded. These strategies are described in Section 3.3.

3.3 Implementation Strategies

This section describes the proposed locations and measures that the City will undertake to plant effective shade along their creeks and streams in areas where opportunities exist and it also describes the measures already in place to protect riparian areas and promote groundwater recharge. A summary of all strategies to address temperature is provided in Appendix B.

3.3.1 Opportunities for Planting to Provide Additional Shade

The prioritization of shade opportunity areas was based on measures of maximum shade benefits, procedural and economic ease of site acquisition/protection, duration of daily shading (stream aspect), support for endangered fish species (ESA-listed salmonids), size, and proximity to potential cold water thermal refugia. Each site was numerically scored as described below for the following factors:

- Ease of Acquisition/Protection: Public site (score =5), private site (score =1).
- Aspect (Duration of Shade): South bank (score =5), west bank and east bank (score =4), west bank only (score =3), east bank only (score =2), or north bank only (score =1).

Explanation: Where an opportunity spans both sides of a creek, that opportunity offers additional microclimate benefits, which additionally regulate solar radiation. Thus, sites having west and east bank shade opportunities were scored slightly higher. For other sites that include multiple bank aspects, these sites were scored based on the highest scoring bank site involved (e.g. a site with both north and south opportunities was scored as a south bank site). Because the hottest part of the day occurs after noon, sites on the west bank of a stream received a higher priority than those on the east bank. Vegetation on the south bank of a stream provides the maximum duration of shade for a stream.

- Rare Species Support: Presence of species listed as federally endangered or threatened (score =3) or species not protected under the federal Endangered Species Act (score =0)
- Size: Of the 31 shade opportunity sites identified, none was larger than one acre. Thus the size factor was scored as follows: Area \geq 0.5 acre (score =5), between 0.25 acre and 0.49 acre (score =3), and area smaller than 0.24 acre (score =1)
- Protection of Cold Water Refugia (CWR): Within 50^{ft} buffer of CWR (score =3), within 50ft - 100ft buffer of CWR (score =1), or beyond 100^{ft} from CWR (score =0).

The priority score for each site is the sum of the five individual scoring criteria. Because there are a wide range of scores (from a low of 2 to a high of 17), the scores were broken into two subjective priority categories for mapping purposes (Figure 3-2). Sites that received a score greater than 12 (3 sites) were mapped as “high priority” opportunities. All sites receiving a score less than 12 were mapped as “low priority” opportunities (28 sites). These two categories were established based on a clear break in the scores from the prioritization and are meant to be used for focusing attention towards the best opportunities on the map. The map, Figure 3-2, also identifies areas of potential cold water refugia, which is discussed in further detail in Section 5.3.

The scoring is summarized in Table 3-2 of this document. Table 3-2 is divided into two tables, one summarizing sites along Rinearson Creek and upper Rinearson Creek, the other summarizing sites along the Clackamas River. Given the width of the Clackamas River (greater than 20 feet) and the fact that all identified opportunity areas along the Clackamas River are located on private property, City efforts to address shade on these areas may be more focused on citizen or homeowner education as opposed to city-initiated planting efforts. Therefore the table was separated into those opportunity areas where planting would be more feasible and those opportunity areas where planting is less feasible.

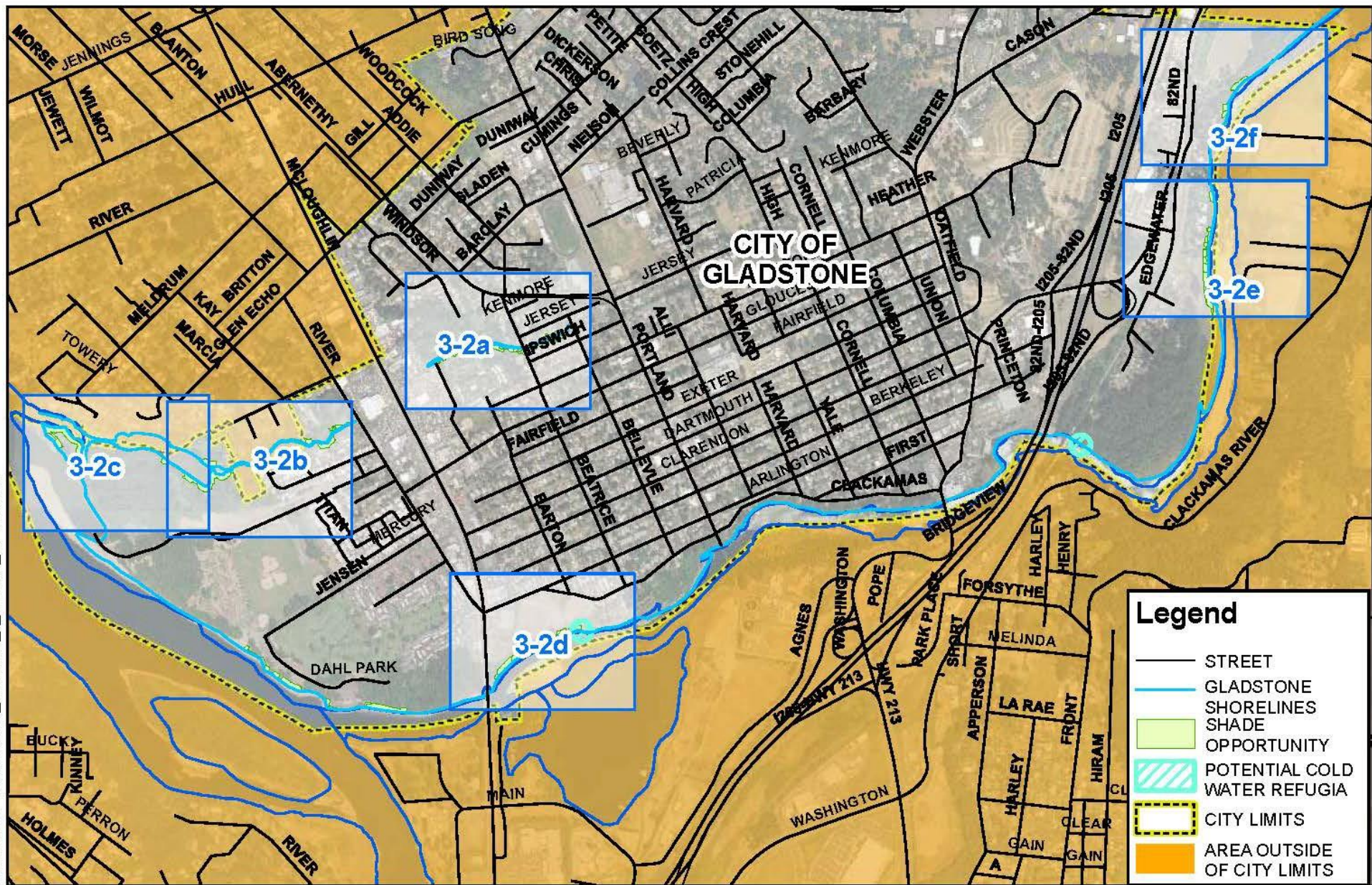
Since 2006, one of the main obstacles to the City’s planting efforts has been that a majority of the priority planting areas are on private property. Over the next five years, the City plans to consider the feasibility of using the backyard habitat certification program in order to facilitate some of the private property priority plantings. The backyard habitat certification program is a partnership between the Audubon Society of Portland and the Columbia Land Trust.

Table 3-2 Summary and Ranking of Opportunity Areas for Shading

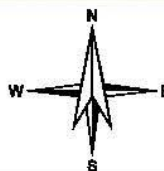
Rinearson Creek Shade Opportunity Areas							
Priority Score	Shade Opportunity	Tax Parcel	Acres	Aspect	Public?	ESA Fist Support?	Map Rank
17	R-5	22E19C 00300	0.877	W,E	Yes	Yes	High
15	R-4	22E19C 00200	0.866	S,N	Yes	No	High
11	UR-2	22E19DA00100	0.013	S	Yes	No	High
6	R-2	22E19DB02100	0.207	S	No	No	Low
6	UR-3	22E19AD09701	0.084	S	No		Low
6	UR-4	22E19AD09900	0.056	S	No		Low
6	UR-5	22E19AD10000	0.024	S	No		Low
6	UR-6	22E19DA00900	0.032	S	No		Low
6	UR-7	22E20BC07700	0.016	S	No		Low
6	UR-8	22E20BC07600	0.029	S	No		Low
6	UR-9	22E20BC07400	0.012	S	No		Low
6	UR-13	22E20BC08400	0.018	S	No		Low
6	UR-14	22E20BC07300	0.054	S	No		Low
5	UR-1	22E19DA00401	0.079	S	No	No	Low
2	R-1	22E19DB01301	0.045	N	No	No	Low
2	R-3	22E19DB01100	0.069	N	No	No	Low
2	UR-10	22E20BC08201	0.018	N	No		Low
2	UR-11	22E20BC08200	0.030	N	No		Low
2	UR-12	22E20BC08400	0.022	N	No		Low
Clackamas River Shade Opportunity Areas							
Priority Score	Shade Opportunity	Tax Parcel	Acres	Aspect	Public?	ESA Fist Support?	Map Rank
7	C-9	22E21B 01100	0.046	W	No	Yes	Low
7	C-8	22E21B 01001	0.030	W	No	Yes	Low
7	C-7	22E21B 00900	0.057	W	No	Yes	Low
7	C-6	22E21B 00803	0.047	W	No	Yes	Low
7	C-5	22E21B 00800	0.092	W	No	Yes	Low
7	C-4	22E21B 00805	0.118	W	No	Yes	Low
7	C-3	22E21B 00802	0.023	W	No	Yes	Low
7	C-10	22E16C 01200	0.095	W	No	Yes	Low
7	C-9	22E16C 01201	0.056	W	No	Yes	Low
7	C-11	22E16C 01101	0.171	W	No	Yes	Low
5	C-1	22E20 00600	0.118	N	No	Yes	Low
5	C-2	22E20CC07303	0.037	N	No	Yes	Low

(Note: Shade Opportunity Areas indicated by an R prefix indicate Rinearson Creek; those indicated by a UR prefix indicate Upper Rinearson Creek; those indicated by a C prefix indicate the Clackamas River)

FILEPATH: K:\Gladstone_MXD\FIG_3_SHADE_INDEX.mxd



0 1,000 2,000 Feet



1:16,000

GLADSTONE SHADE OPPORTUNITIES MAP INDEX

CITY OF GLADSTONE, OREGON
TEMPERATURE TMDL IMPLEMENTATION PLAN

FIGURE 3-2

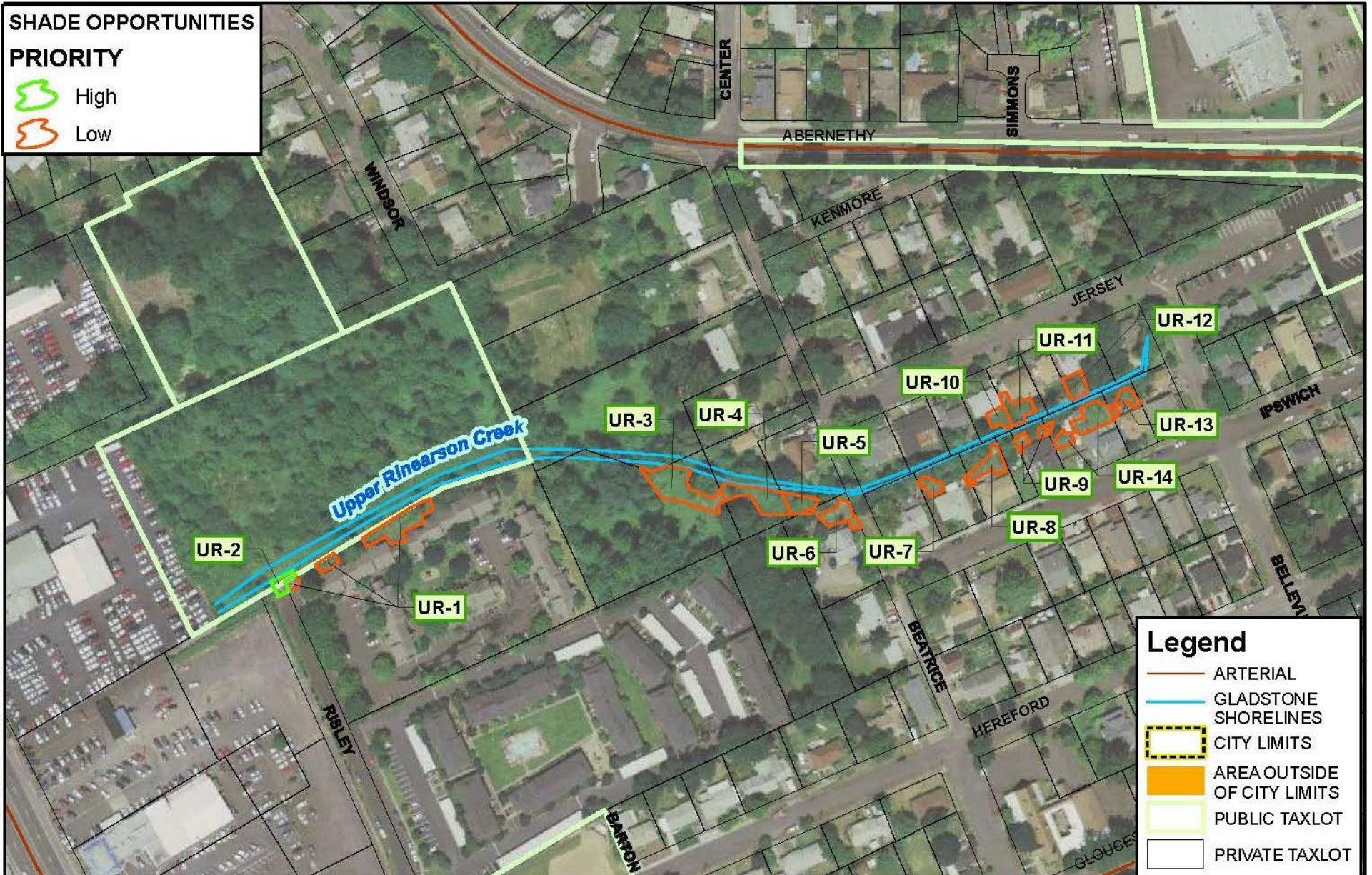
URS

Print Date: March 12, 2008

SHADE OPPORTUNITIES







PRIORITY

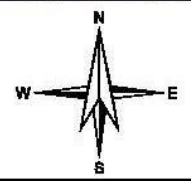
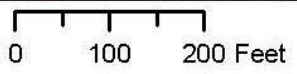
-  High
-  Low



FILEPATH: K:\Gladstone_MXD\FIG_3_SHADE_OPPS.mxd

Legend

-  ARTERIAL
-  GLADSTONE SHORELINES
-  CITY LIMITS
-  AREA OUTSIDE OF CITY LIMITS
-  PUBLIC TAXLOT
-  PRIVATE TAXLOT



1:2,400

URS
Print Date: March 20, 2008

**GLADSTONE
SHADE OPPORTUNITIES**

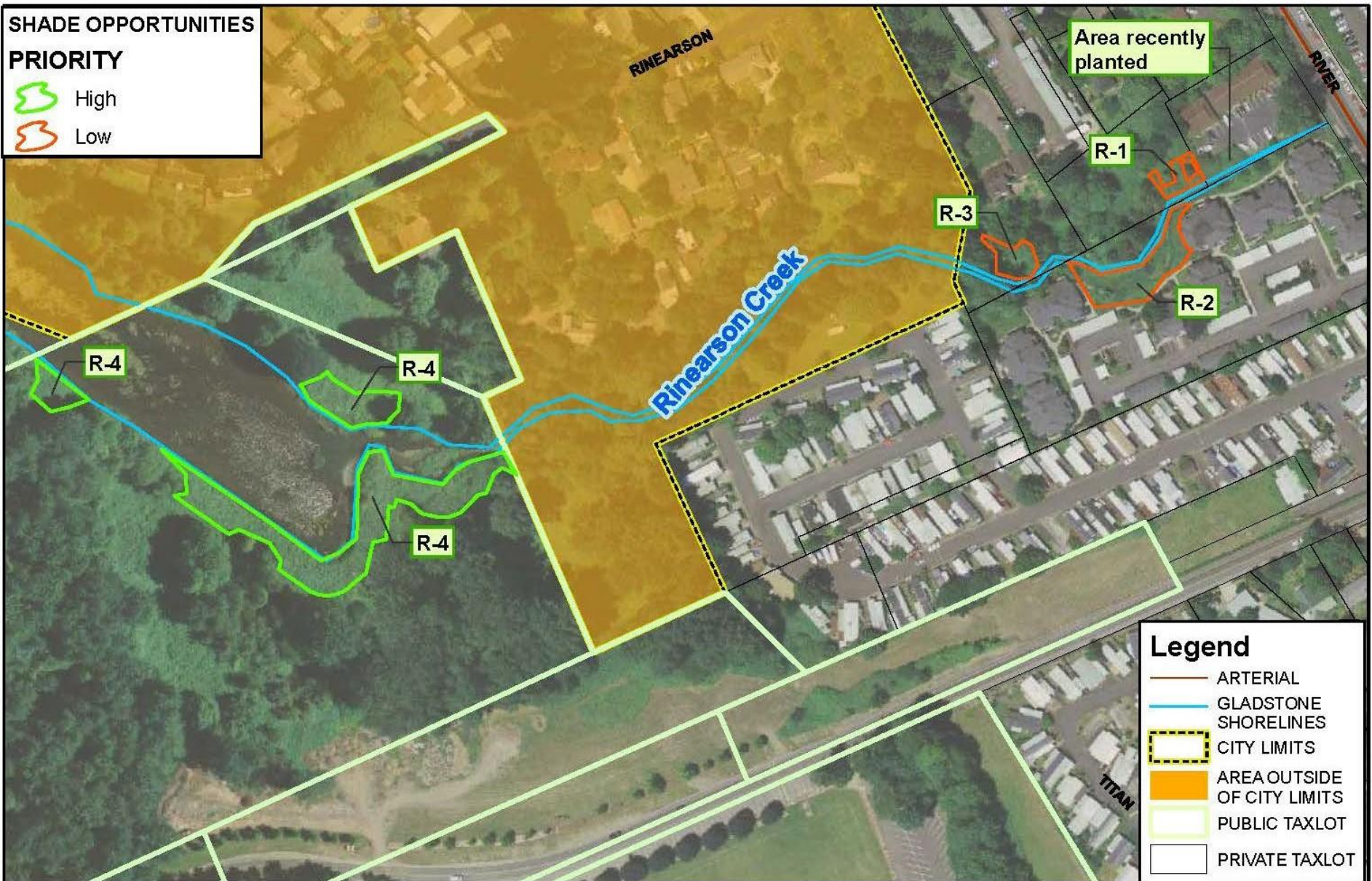
CITY OF GLADSTONE, OREGON
TEMPERATURE TMDL IMPLEMENTATION PLAN

FIGURE 3-2a
Map 1 of 6

SHADE OPPORTUNITIES

PRIORITY

- High
- Low

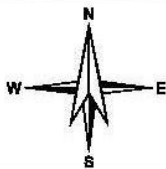


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Legend

- ARTERIAL
- GLADSTONE SHORELINES
- CITY LIMITS
- AREA OUTSIDE OF CITY LIMITS
- PUBLIC TAXLOT
- PRIVATE TAXLOT

0 110 220 Feet



1:2,400

URS
Print Date: March 20, 2008

**GLADSTONE
SHADE OPPORTUNITIES**
CITY OF GLADSTONE, OREGON
TEMPERATURE TMDL IMPLEMENTATION PLAN

FIGURE 3-2b
Map 2 of 6

SHADE OPPORTUNITIES

PRIORITY

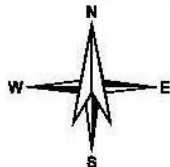
- High
- Low



- Legend**
- ARTERIAL
 - GLADSTONE SHORELINES
 - CITY LIMITS
 - AREA OUTSIDE OF CITY LIMITS
 - PUBLIC TAXLOT
 - PRIVATE TAXLOT

FILEPATH: K:\Gladstone_MXD\FIG_3_SHADE_OPPS.mxd

0 110 220 Feet



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Print Date: March 20, 2008

**GLADSTONE
SHADE OPPORTUNITIES**

CITY OF GLADSTONE, OREGON
TEMPERATURE TMDL IMPLEMENTATION PLAN

FIGURE 3-2c
Map 3 of 6

SHADE OPPORTUNITIES

PRIORITY

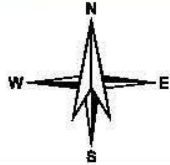
-  High
-  Low



Legend

-  ARTERIAL
-  GLADSTONE SHORELINES
-  CITY LIMITS
-  AREA OUTSIDE OF CITY LIMITS
-  PUBLIC TAXLOT
-  PRIVATE TAXLOT
-  POTENTIAL COLD WATER REFUGIA

0 100 200 Feet



1:2,400

URS

Print Date: March 20, 2008

**GLADSTONE
SHADE OPPORTUNITIES**

CITY OF GLADSTONE, OREGON
TEMPERATURE TMDL IMPLEMENTATION PLAN

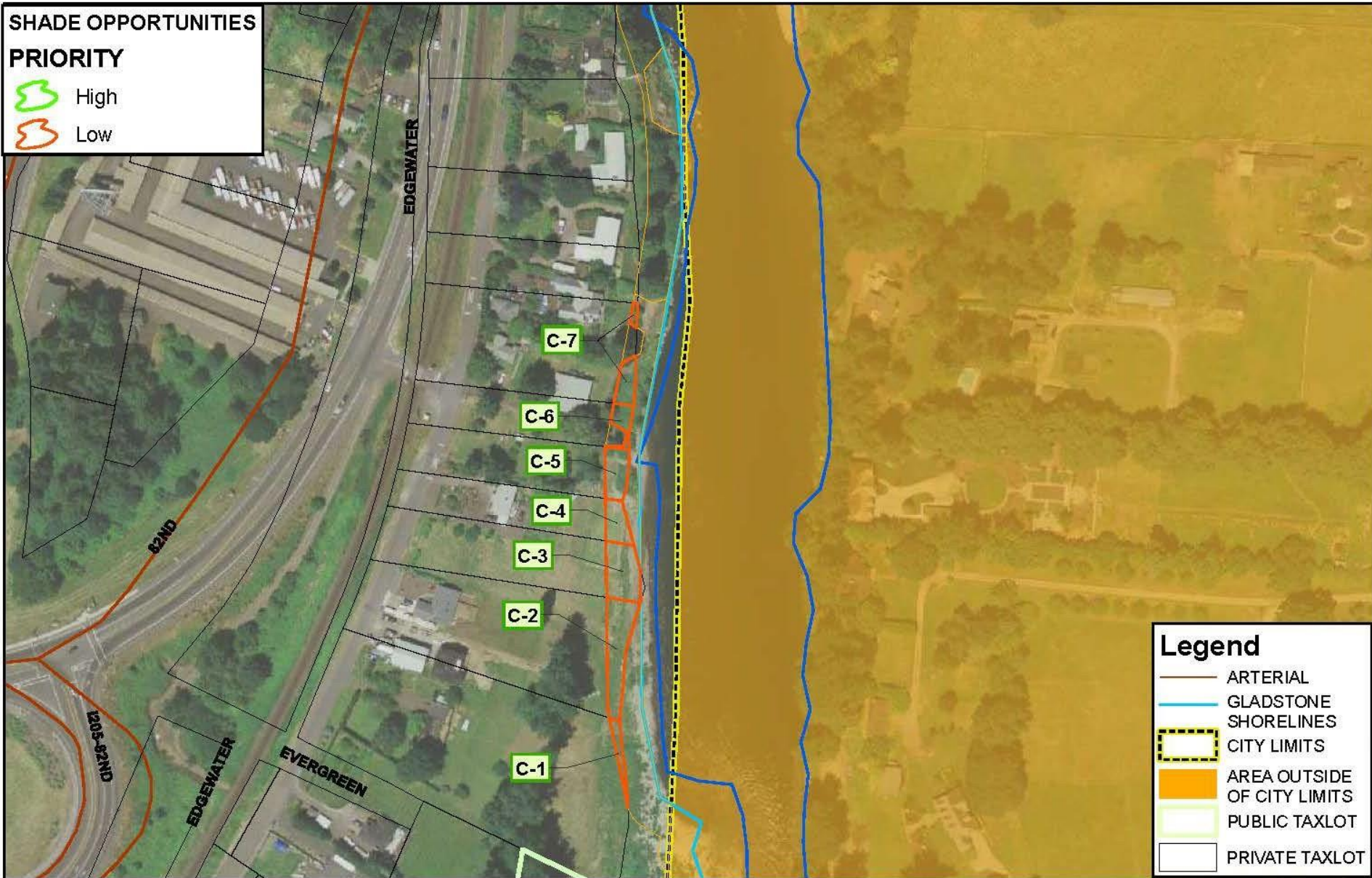
FIGURE 3-2d
Map 4 of 6

SHADE OPPORTUNITIES

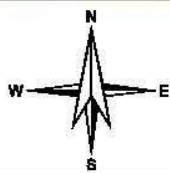
PRIORITY

-  High
-  Low

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0 100 200 Feet



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URS

Print Date: March 20, 2008

**GLADSTONE
SHADE OPPORTUNITIES**

CITY OF GLADSTONE, OREGON
TEMPERATURE TMDL IMPLEMENTATION PLAN







FIGURE 3-2e
Map 5 of 6

SHADE OPPORTUNITIES

PRIORITY

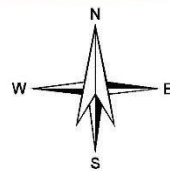
-  High
-  Low



- Legend**
-  ARTERIAL
 -  GLADSTONE SHORELINES
 -  CITY LIMITS
 -  AREA OUTSIDE OF CITY LIMITS
 -  PUBLIC TAXLOT
 -  PRIVATE TAXLOT

FILEPATH: K:\Gladstone_MXD\FIG_3_SHADE_OPPTS.mxd

0 100 200 Feet



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URS

Print Date: March 20, 2008

**GLADSTONE
SHADE OPPORTUNITIES**

CITY OF GLADSTONE, OREGON
TEMPERATURE TMDL IMPLEMENTATION PLAN

FIGURE 3-2f

Map 6 of 6

Based on soil survey data and local site knowledge, the species listed in Tables 3-3 and 3-4 are recommended for planting the shade opportunity areas depending on the hydrologic regime of an individual site. In order to estimate the resources necessary to complete a riparian planting project for the 2.5 acres of opportunity area where planting would be most feasible, the following cost estimate was prepared. For all areas, the cost estimate assumed a six foot-on-center planting density. This planting density resulted in 1,210 trees per acre. Containerized and dormant cuttings should occur in the spring or fall when precipitation is abundant. If bare root plant materials are used, planting should occur in the late winter/early spring only. Summer planting will require irrigation, which is costly and not accounted for in the prices provided by this plan for planning purposes. In addition, cost estimates do not take into account property acquisitions/easements or permitting costs. These costs do not include site preparation costs, including weed removal, as this would vary largely between sites. Plant costs are based on 1-gallon, containerized plant stock installed at 6ft on-center and estimated at \$3/plant. Materials include a 2-day utility vehicle charge (\$100/day), plant protectors (\$0.50/plant), and mulch (\$0.50/plant). Labor includes a crew of 4 laborers at \$16/hour each (i.e., \$64/hour) plus one supervisor, (\$32/hour) assuming a planting rate of 40 trees per hour (i.e., 10 trees per person per hour). Under this scenario, each acre will take approximately 30 hours to install, so the cost estimate below is displayed on a per acre basis.

Table 3-3 Planting Recommendation for Lower Streambanks and Wetlands

Species (Common Name)	Scientific Name	Percentage of Area Planted
Oregon ash	<i>Fraxinus latifolia</i>	30
Black cottonwood	<i>Populus balsamifera</i> spp. <i>Trichocarpa</i>	20
Red alder	<i>Alnus rubra</i>	20
Pacific willow	<i>Salix lucida</i>	10
Red-osier dogwood	<i>Cornus sericea</i>	10
Sitka willow	<i>Salix sitchensis</i>	10

Table 3-4 Planting Recommendations for Upper Streambanks and Floodplain

Species (Common Name)	Scientific Name	Percentage of Area Planted
Red cedar	<i>Thuja plicata</i>	25
Douglas fir	<i>Pseudotsuga menziesii</i>	25
Bigleaf maple	<i>Acer macrophyllum</i>	25
Red alder	<i>Alnus rubra</i>	15
Black cottonwood	<i>Populus balsamifera</i> spp. <i>Trichocarpa</i>	10

Cost Estimate:

Plants: \$3,630/acre
 Materials: \$1,410/acre
 Labor: \$2,880/acre
Total per acre: \$7,920

As stated above, this cost does not include permitting, summer irrigation, or site preparation, which could be a significant addition. In addition, while a 50 foot buffer is a goal, Rinearson Creek is very narrow (i.e., less than 10 feet), especially in the upstream portions, and even smaller buffer widths will provide significant shade benefits. Therefore, when space is constrained, the City will work to maximize the benefits of the available opportunity area.

Over the next five years, in addition to working with the backyard habitat restoration program to plant/shade some of the privately owned opportunities the City's main focus will be to preserve and maintain the plantings associated with the recently completed Rinearson Creek Restoration Project at Meldrum Bar Park.

Additionally, the City entered into an agreement with Clackamas River Basin Council to conduct the Cross Park Restoration Project along the Clackamas River. The project will improve the riparian area of Cross park with the intent to provide benefits to water quality and stormwater management through restoring native vegetation to riparian areas. This is a four year project that will end in 2025.

In addition to many of the priority planting opportunities being on private property, funding and staffing are two of the main challenges for the City of Gladstone's planting progress. The City has recently entered a MAO with DEQ in 2018 to address its problematic sanitary sewer overflows into the Clackamas River. Many of the City's funding to improve water quality will be going towards stopping sanitary sewer overflows. The I/I project will begin construction and finalize in 2024.

As shade opportunity sites were identified remotely using GIS, and ground truthing was not conducted, conditions may have changed since the aerial photographs were taken. This will be especially important in the case of wetland areas identified by the local wetland inventory (LWI). These areas, if capable of supporting wetland trees, can potentially offer excellent thermal regulation with forest cover because water is generally moving slowly through these shaded, near surface features. The City conducted ground truthing in 2022 and determined all of the shade opportunities included in the TMDL implementation plan are accurate.

3.3.2 Measures to Protect Existing Shaded Areas

The Willamette Basin TMDL defines shade as the surrogate for thermal load allocations. Encouraging the preservation and enhancement of riparian vegetation, especially shade-producing riparian vegetation, is one of the most important methods for reducing stream temperatures. To positively affect stream temperature, the amount and quality of the riparian shading must increase, so it is important to not only plant more shade-producing vegetation, but also to preserve what is there. Based on the results of the shade opportunity analysis shown in Table 3-1, the majority of the City of Gladstone's riparian areas are already shaded. Therefore, protecting the vegetation that already exists in these areas is an important implementation strategy.

Related to the preservation and maintenance of riparian shade, Metro developed Title 3, a section of Metro's Urban Growth Management Plan that addresses development in the riparian corridor. Specifically, Title 3 prohibits new development within specified established buffers, and provides replanting requirements for unavoidable new development. Since preserving and restoring shade are important strategies for addressing the temperature TMDL, jurisdictions that

currently comply with Title 3 are already utilizing strategies for addressing temperature. Section 3.3.2.1 describes Title 3 in more detail. Section 3.3.2.2 describes Gladstone's efforts to comply with Metro's Urban Growth Management Plan as related to Title 3.

3.3.2.1 Summary of Title 3

Title 3, specifically the Title 3 model ordinance, was created in 1997 by Metro, which is a regional government serving the Portland metropolitan area including 25 cities. The purpose of Title 3 is to implement the Oregon Statewide Land Use Goals 6 and 7 that address protecting streams, rivers, wetlands, and floodplains. Title 3 provides this protection by avoiding, limiting, or mitigating the impact on these areas from development. This Title limits development in identified water quality resource areas (WQRAs) and flood management areas (FMAs) and it limits development that would cause any extent of erosion within the Metro Boundary. Title 3 defines the WQRA as the protected water feature and associated vegetated corridor adjacent to the water feature and provides the method for determining the appropriate width of this vegetated corridor. Native vegetation within the WQRA should be maintained, enhanced or restored, if disturbed. Metro developed the Water Quality and Flood Management Areas map identifying these areas with input from the cities and counties within the Metro region. Table 3.07-3 in Title 3 is shown below and summarizes the vegetated buffer widths for protected water features.

Table 3–5: Title 3–Required Width of Vegetated Corridor

Table 3.07-3 - Protected Water Features
(Section 3.07.340(B)(2)(a))

Protected Water Feature Type (see definitions)	Slope Adjacent to Protected Water Feature	Starting Point for Measurements from Water Feature	Width of Vegetated Corridor
Primary Protected Water Features ¹	< 25%	<ul style="list-style-type: none"> Edge of bankfull flow or 2-year storm level; Delineated edge of Title 3 wetland 	50 feet
Primary Protected Water Features ¹	≥ 25% for 150 feet or more ⁵	<ul style="list-style-type: none"> Edge of bankfull flow or 2-year storm level; Delineated edge of Title 3 wetland 	200 feet
Primary Protected Water Features ¹	≥ 25% for less than 150 feet ⁵	<ul style="list-style-type: none"> Edge of bankfull flow or 2-year storm level; Delineated edge of Title 3 wetland 	Distance from starting point of measurement to top of ravine (break in ≥25% slope) ³ , plus 50 feet. ⁴
Secondary Protected Water Features ²	< 25%	<ul style="list-style-type: none"> Edge of bankfull flow or 2-year storm level; Delineated edge of Title 3 wetland 	15 feet
Secondary Protected Water Features ²	≥ 25% ⁵	<ul style="list-style-type: none"> Edge of bankfull flow or 2-year storm level; Delineated edge of Title 3 wetland 	50 feet

¹Primary Protected Water Features include: all perennial streams and streams draining greater than 100 acres, Title 3 wetlands, natural lakes and springs

²Secondary Protected Water Features include intermittent streams draining 50-100 acres.

³Where the Protected Water Feature is confined by a ravine or gully, the top of ravine is the break in the ≥ 25% slope (see slope measurement in Appendix).

⁴A maximum reduction of 25 feet may be permitted in the width of vegetated corridor beyond the slope break if a geotechnical report demonstrates that slope is stable. To establish the width of the vegetated corridor, slope should be measured in 25-foot increments away from the water feature until slope is less than 25% (top of ravine).

⁵Vegetated corridors in excess of 50-feet for primary protected features, or in excess of 15-feet for secondary protected features, apply on steep slopes only in the uphill direction from the protected water feature.

The cities and counties within the Metro region were given three alternatives for implementing Title 3:

1. Amend comprehensive plans and ordinances to adopt all or part of the Title 3 model ordinance or language that substantially complies with the Title, and adopt either the Metro Water Quality and Flood Management Area map or a map that substantially complies with the Metro map;
2. Demonstrate that existing city and county comprehensive plans and ordinances already substantially comply with the performance standards and the intent of Title 3; or
3. A combination of the first two alternatives that substantially complies with all performance standards of Title 3.

To implement Title 3, many cities have adopted Table 3.07-3, along with a portion of the Title 3 model ordinance into their city code. Several exemptions are allowed for various reasons and are outlined specifically in Title 3 (Metro 1998).

3.3.2.2 Gladstone Compliance with Title 3

Chapter 17.27, WQ-Water Quality Resource Area District (WQ district), of Gladstone’s municipal code implements the intent of Title 3 as developed by Metro. This chapter establishes objectives to protect water quality resource areas, which are defined by the chapter as “vegetated corridors and the adjacent protected water features.” This chapter establishes a vegetative corridor protected from development with goals of “maintaining or reducing stream temperatures; maintaining natural stream corridors; reducing potential sediment, nutrient, and pollutant loading into water; and providing filtration, infiltration, and natural water purification.” This chapter of the City’s municipal code specifically defines the protection and improvement of microclimate and shade in streamside areas as well as mitigation requirements for replacement of water quality and ecological values as objectives.

Chapter 17.27 also includes an adopted version of Table 3.07-3 from Title 3 (Section 3.3.2.1) which is used to define the boundaries of the WQ District within the City of Gladstone. The chapter defines four types of uses within the WQ District, which are 1) Uses allowed outright, such as stream restoration projects; 2) Uses allowed under prescribed conditions, such as repair, replacement, or improvement of utility facilities; 3) Uses subject to review, such as new public or private utility facility construction; and 4) Prohibited uses, such as any new development not covered in the first three categories and uncontained areas of hazardous materials. The uses that are allowed under prescribed conditions are required to restore disturbed areas within the WQ District and re-vegetate with native plants. Uses that are subject to review must comply with application requirements and development standards set forth in the chapter.

Application requirements include explanation of adverse effects to the WQ District, inventory of vegetation and percent ground and canopy cover, and a mitigation plan. Development standards include confirmation that no other reasonable development alternative exists that would not disturb the WQ District, impacts to the WQ District will be mitigated, and existing vegetation will be left in place to the extent possible. As part of Chapter 17.27 of Gladstone’s Municipal Code, a table is included which provides mitigation standards that are dependant upon the existing condition of the WQ District that would be affected by the development.

Gladstone is currently implementing Title 3 through Chapter 17.27 of its municipal code. Continued implementation of Title 3 represents one of Gladstone’s implementation strategies for protecting existing shade along riparian corridors. Enforcement of Title 3 is achieved during the development review process, and development review in the City is conducted by Clackamas County.

The City's development code has been updated with sections that address Statewide Land Use Goal 5 including habitat conservation areas, open space districts, flood plain development regulations and water quality resource areas. Title 13 addresses Oregon Statewide Land Use Goal 5, which focuses on the protection of natural resources and open space from a wildlife habitat perspective. In 2001, the comprehensive plan was amended and includes maps of protected areas which are used by Clackamas County as development reviews are conducted for the City.

3.4 Timeline and Schedule

This Section provides the anticipated timeline and schedule for implementation of management strategies for temperature as defined in Section 3.3.

3.4.1 Shading and Planting for Currently Exposed Areas

The City anticipates focusing on maintaining the recent plantings associated with the Rinearson Creek Restoration Project, partnering with Clackamas River Basin Council on the Cross Park Riparian Restoration Project, as well as reaching out to public outreach opportunities and evaluating the feasibility of using engines such as The Backyard Certification program to achieve private property shading opportunities. Annual reports will indicate how such efforts were conducted each year.

3.4.2 Protection of Existing Shaded Areas

The City of Gladstone currently implements Chapter 17.27, WQ-Water Quality Resource Area District, of their community development code to address Title 3 requirements. The code is consistent with the Metro Title 3 model ordinance and includes the City's version of Table 3.07-3 of Title 3. Compliance with Title 3 is currently achieved during development review.

In addition, the City is coordinating with Metro and Clackamas County to determine whether the City must amend their development code to comply with Title 13 requirements as well. Annual reports will indicate if and how the City anticipates ensuring compliance with Title 13 requirements.

3.5 Monitoring

The City of Gladstone is required to submit a TMDL Implementation Plan progress report to DEQ annually, related to their implementation of identified management strategies. In order to provide progress reports, the City will track planting efforts by acreage and/ or activities to enhance vegetation or protect existing vegetation. Additional information tracked will include modifications to development/ design codes where relevant to the promotion of enhanced infiltration or protection of vegetation.

4.0 Evidence of Compliance with Applicable Land Use Requirements

OAR 340-042-0080(3)(a)(D) defines one of the required elements of a TMDL implementation plan to be evidence of compliance with applicable statewide land use requirements. Per the TMDL Implementation Plan Guidance Document, this would consist of the following:

- 1) Identify applicable acknowledged local comprehensive plan provisions and land use regulations, and
- 2)
- 3) Explain how the implementation plan is consistent with these local planning requirements or what steps will be taken to make the local planning requirements consistent with the implementation plan.

Per item #1 above, Gladstone's comprehensive plan, which is implemented by Title 17 of the City's Municipal Code, has been acknowledged by the Land Conservation and Development Commission (LCDC) to be in compliance with the Statewide Planning Goals. The Plan is periodically reviewed by the City in coordination with LCDC and updated to ensure that it continues to comply with these goals. There are three chapters within Title 17 of Gladstone's municipal code containing intentions consistent with this TMDL plan. These Chapters are 17.27, 17.29, and 17.56.

Per item #2 above, this TMDL Implementation Plan is consistent with the City's acknowledged comprehensive plan to the extent required by law. The above mentioned chapters of the City's comprehensive plan (chapters 17.27, 17.29, and 17.56) align with specific components of the TMDL Implementation Plan, as the two documents contain similar goals and methods for improving water quality.

Chapter 17.27 of Gladstone's municipal code is titled, "Water Quality Resource Area District" and is intended to create an overlay district of water features and associated vegetated corridors. This district, known as the WQ District, is meant to assist in many functions, including: maintaining or reducing stream temperatures; maintaining natural stream corridors; and reducing potential sediment, nutrient, and pollutant loading into water. The Chapter outlines numerous provisions for development within the WQ District in order to prevent or mitigate negative effects from the development. Chapter 17.27 of Gladstone's municipal code is described in more detail in Section 3.3.2.2 of this plan. The intent of Chapter 17.27 closely matches the goals and strategies described in Section 3.0 of this TMDL plan to address temperature.

Chapter 17.29, Flood Management Area District also contains goals that correspond with the intent of this TMDL. Chapter 17.29 of Gladstone's municipal code intends to promote public health and safety through provisions such as: flood storage to reduce velocities, flows, and wave and wind impacts; reducing sediment and nutrient loads to maintain water quality; manage groundwater through recharge, storage, and discharge; and support riparian ecosystems by providing plant and animal habitat. While the purpose of this ordinance is to promote health and minimize losses due to floods, it contains methods and goals that complement the strategies and goals of this TMDL plan addressed in both Sections 2.0 and 3.0 of this plan.

Chapter 17.56, Drainage provides development standards to minimize erosion, minimize stream degradation, and enhance water quality. Provisions of the chapter include implementing techniques such as sedimentation ponds, reseeded, and phasing in order to assure site drainage is considerably free of pollutants; provide site drainage that does not result in increased erosion; and provide alternative methods for supplementing storm drain systems such as drywells or French drains. This chapter contains provisions that are consistent with management strategies discussed in Sections 2.0 and 3.0 of this plan.

In general, Gladstone's acknowledged comprehensive plan has components that coincide with the management strategies contained in this TMDL Implementation Plan. Based on the above findings, this TMDL plan is considered to be compatible with the land use requirements as set forth in the comprehensive plan.

5.0 Additional Requirements

The fifth component of TMDL Implementation Plans required by OAR 340-042-0025 is “any other analyses or information as specified in the WQMP.” The WQMP for the Willamette Basin TMDL requires a summary of legal authority, a fiscal analysis, DMAs below river mile 50 of the Willamette mainstem to address areas of cold water refugia, public involvement, and record keeping and reporting. This section addresses these requirements.

5.1 Legal Authority

The City has existing ordinances that provide authority for implementation of portions of the TMDL Implementation Plan. As the City currently operates under an MS4 NPDES permit, they have ordinances for illicit discharges and erosion control as necessary to implement the BMPs outlined in their permit and to implement the management strategies described in Section 2.0 to address bacteria and mercury. MS4 NPDES annual compliance reports submitted to DEQ have also included, as required, a demonstration of continued legal authority to implement the programs outlined in the SWMP. The City also has ordinances to implement Title 3 requirements, including the establishment of a Water Quality Resource Area for protection, in addition to having a comprehensive plan that addresses the Department of Land Conservation and Development (DLCD) statewide planning goals. These ordinances all pertain to the management strategies proposed to address the temperature TMDL (Section 3.0).

5.2 Funding

The implementation of the BMPs described in the City’s MS4 NPDES permit is funded through the City’s recently adopted stormwater utility fee in 2016. A fiscal analysis is submitted with the NPDES annual report. The City plans to partner with The Clackamas Soil and Water Conservation District and private development to address planting opportunities UR-1 and Ur-2 along Rinearson Creek near the Olson Wetlands. The City anticipates using funds from their stormwater utility fee to help support efforts to address riparian vegetation along those identified opportunity areas (Table 3-2).

5.3 Cold Water Refugia

Per the WQMP, the TMDL Implementation Plans for areas below river mile 50 of the Willamette mainstem “shall look at identifying existing cold water refugia and provide options for protecting or enhancing such areas.” Cold water refugia (CWR) can be described as patches of water within a stream that are one or two degrees cooler than the surrounding ambient stream temperature resulting from the cool in-flow of tributaries and/or upwelling of groundwater. Studies indicate that CWR may provide critical habitat for salmonids in basins affected by warm temperatures (Bartholow 1995). CWR are associated with different aspects of stream morphology, including side channels, alcoves, lateral seeps, and floodplain spring brooks (Ebersole 2003). McIntosh et. al. (1998), in their study of CWR in the Klamath Basin using forward- looking infrared (FLIR), concludes that areas of CWR appeared to be at a junction where tributaries meet.

With DEQ's most recent 2020 cold water refuge study, the Clackamas River has been identified as a significant cold water refuge. The City has made it a priority to identify and implement CWR projects.

Ongoing projects on the radar to protect CWR:

Rinearson Natural Area Restoration project: Completed, in maintenance phase for at least the next 5 years.

Cross Park Riparian Restoration Project: Began in 2025, to be completed in 2025.

Because tributary junctions are easy to map, a likely source of cool groundwater, and documented as commonly providing CWR, URS used these confluence points as an indicator of potential CWR. GIS data showing historic stream alignments (RLIS) indicates that two other creeks, in addition to Rinearson, historically flowed through Gladstone to the Clackamas River. They now appear to be subterranean systems (piped) but it is assumed that they are still a source of cold water inputs into the Clackamas River. Therefore, their junction points with the river were designated potential CWR. The outfall of Rinearson Creek was assumed to be a source of cool water because of the dam just above the confluence of the creek with the Willamette River as it was believed the dam created a large open water pond. Because of the low flow and exposure to direct solar radiation, it was believed unlikely that the creek is providing cold water refugia at the mouth of the Willamette. However, the dam was removed as part of the Rinearson Natural Area Restoration Project completed in 2018.

The shade opportunity prioritization analysis described in Section 3.3.1 and displayed in Table 3-2 and Figure 3-2 assigned higher prioritization to areas within close proximity to a potential CWR site. Shade opportunity sites as far away as the tallest potential vegetation may provide shade benefit to CWR (i.e., 250^{ft}-tall cedar trees); however, this shade is only effective for a small portion of the day. Sites within 50 feet of tributary junctions were therefore scored highest for the CWR prioritization factor. These sites were assumed to provide the most effective shade benefit to CWR. The identified CWR locations require field verification (Figure 3-2). In addition to shading, protection for CWR requires protection against near-shore groundwater withdrawal. Groundwater withdrawal in near shore areas can remove the source of cold water that is required for the presence of CWR.

5.4 Public Involvement

DEQ has promoted public involvement for the TMDL and TMDL Implementation Plans with existing interest groups having an interest in the Willamette TMDLs. The City addresses public involvement for management measures described in Section 2.0 through their NPDES Permit and SWMP. With regards to temperature, the City looks to soliciting public involvement through its newsletter as well as using the Backyard Habitat Certification Program. The City will continue to look for articles and information specific to provide updates to the Willamette River temperature issues to include in future newsletters.

A copy of the TMDL Implementation Plan will be kept at City Hall and an announcement indicating its availability for public viewing will be made on the City website and in the City newsletter.

5.5 Record Keeping and Reporting

The TMDL Guidance Document requires the DMA to submit two types of reports to DEQ on a regular basis: 1) progress report and 2) an implementation plan review report. The progress report would provide the results of implementation and monitoring, as described above in Sections 2.3 and 3.5. The progress reports would be submitted to DEQ on an annual basis. The progress report will be submitted annually by December 1st, which is consistent with when the MS4 annual report is due.

The implementation plan review report would use existing data and other information to evaluate this TMDL Implementation Plan effectiveness relative to pollutant reduction goals. If evidence indicates that the Plan and associated management strategies are not adequate, then modifications may be considered. The implementation plan review report would be submitted to DEQ once every five years or as determined by DEQ.

6.0 References

- Bartholow, J.M. and J.A. Henriksen. 2006. Assessment of Factors Limiting Klamath River Fall Chinook Salmon Production Potential Using Historical Flows and Temperatures. USGS Open File Report 2006-1249. 111 p.
- City of Gladstone. 2005. Gladstone Municipal Code. Chapter 17.02, Chapter 17.26, Chapter 17.27, Chapter 17.56. Gladstone, Oregon.
- City of Gladstone website. <http://www.ci.gladstone.or.us/>
- Ebersole, Joseph L., William J. Liss, and Christopher A. Frissell. 2003. Cold Water Patches I Warm Streams: Physicochemical Characteristics and the Influence of Shading. *Journal of the American Water Resources Association (JAWRA)* 39(2):355-368.
- Majidi, Kathy. 2007. VOLUME III: Gresham's Temperature TMDL Implementation Plan, Natural Resources Program Watershed Management Division, Department of Environmental Services, City of Gresham, Oregon.
- McIntosh, Bruce and Hiram W. Li. 1998. Klamath Basin Pilot Project: Coldwater Refugia Study and Videography. U.S. Department of Commerce, National Technical Information Service. Springfield, Virginia.
- Metro. 1998. Title 3 Model Ordinance. Portland, Oregon.
- Metro. 2005. Title 13 Model Ordinance. Portland, Oregon.
- Oregon DEQ 2006. Willamette Basin TMDL, Chapter 5, Chapter 6, Chapter 14.
- Van Staveren, John. 2007. Gresham's Response to Temperature TMDLs. Presentation made at the Clean Water Act & TMDLs Conference. January 26, 2007. Portland, Oregon.
- WDOE (Washington Department of Ecology) 2000. FOCUS: Effects of Elevated Water Temperatures on Salmonids. Focus Publication Number 00-10-046. Olympia, Washington.
- URS Corporation. 2006. City of Gladstone: Interim Evaluation Report to Comply with MS4 NPDES Requirements. Portland, Oregon.

Appendix A
Summary of Strategies to Address Bacteria and Mercury for the
Willamette Basin TMDL

Appendix A. Status of Implementing Components of Gladstone's MS4 NPDES Permit SWMP

Appendix A. Status of Implementing Components of Gladstone's MS4 NPDES Permit SWMP

Best Management Practice or Activity	Addresses Bacteria?	Addresses 2019 Mercury TMDL	Responsible Department	Measurable Goals (2022 SWMP)	Tracking Measures (2022 SWMP)	BMP Estimated Cost	Additional Detail Related to Activities Conducted
Element #1							
Education and Outreach							
Public Education and Outreach Strategy	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> During the MS4 Permit term, include educational goals targeting audiences and topics in the Strategy. Maintain RCCRS membership. Update the Public Education and Outreach Strategy once before December 1, 2022 and then as needed. Each year, complete 80% of planned City newsletter outreach articles. Annually review and update (if necessary) City website outreach/informational material related to stormwater and IDDE education and reporting channels. Perform annual catch basin stenciling upkeep as required. Maintain partnership with WES and CCC for k-12 watershed health education program. Maintain partnership with CRBC to provide volunteer education and stewardship opportunities. 	<ol style="list-style-type: none"> Running total of target audiences included in the Public Education and Outreach Strategy. Status of RCCRS membership. Date(s) the plan was updated. Number of planned articles each year. -Number of articles published each year. -Percentage of planned articles published each year. Date(s) website material reviewed/updated. Number of catch basins stenciled annually. Watershed health education program partnership status. Current partnership status and volunteer events conducted annually. 	\$1,500	
Outreach and Priority Audiences	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> Reference the WES ESPC Manual at 80% of pre-construction meetings to construction site operators each year. Over the permit term, update the City website to offer information about 1200-C and 1200-CN permits. Over the permit term, update the City website to maintain a list of local and regional training opportunities for EPSC. During the permit term, update City website to offer private stormwater facility maintenance guidance. During the Permit term, upgrade City website to promote CWS online Private Water Quality Maintenance Program and explore partnership opportunities to offer additional education opportunities. During the Permit term, develop program to identify and reach out to businesses, City staff and property owners that have high potential to spill oil and hazardous substances into the MS4. During the permit term, create program to distribute spill prevention messages to businesses. Once during the permit term, conduct one check in meeting for City staff, volunteers and City contractors performing landscaping and building in the City. 	<ol style="list-style-type: none"> Number of pre-construction meetings held annually. -Number of references to WES EPSC Manual at pre-construction meetings. -Percentage of pre-construction meetings in which WES EPSC Manual was referenced. Status of 1200-C and 1200-CN permit information available on City website. -Date(s) website updated. Status of EPSC training opportunities available on City website. -Date(s) website upgraded. Status of private maintenance guidance on City website. -Date(s) website updated. Status of CWS online Water Quality Maintenance Program promotion and consideration of additional education opportunities. Date(s) website upgraded. Status of program. Status of program. Date of check in meeting. 	\$700	The City of Gladstone directs Construction Site Operators to the Erosion Control Planning and Design Manual, which is available for free download from the Water Environment Services / CCSD #1 website. Inspectors have handouts that are distributed as needed to convey proper installation and maintenance techniques. In addition, WES continues to mail out to applicants an informational flyer on the correct type of sediment fencing and how to install it.
Evaluation of Education and Outreach Activities	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> Evaluate the Education and Outreach activities by April 3, 2026. 	<ol style="list-style-type: none"> Date of evaluation and results included in permit renewal package. 	\$500	
Element #2							
Public Participation							

Publicly Accessible Website	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Post MS4 Permit renewal documents to City website by April 3, 2026. 2. Post MS4 Annual Report to City website by Dec. 5 each year. 3. Post draft documents for public comment on City website for at least 30 days 4. Consideration of comments received during public comments periods. 5. Post reports, plans, and other documents to the City website. 6. Annual review of website for current information and accuracy. 7. Conduct at least one IDDE reporting publicity campaign during the MS4 Permit term. 	<ol style="list-style-type: none"> 1. Date documents posted to City website. 2. Date(s) MS4 Annual Report posted to City website each year. 3. Title of each document and starting and ending date of document postings on City website. 4. Summary of comments received and how they were addressed prior to final issuance for each document that was available for public comment. 5. Title of each document and date of posting. 6. Date of completed review. 7. Running total of IDDE reporting publicity campaigns to date. 	\$600	
Public Stewardship	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Continue to offer stormwater utility bill credits for private businesses and property owners that construct stormwater quality BMPs above and beyond minimum criteria. 2. Evaluate the feasibility of co-sponsoring at least one volunteer activity with an education component. 	<ol style="list-style-type: none"> 1. Annual number of billing credits granted. 2. Report evaluation results. 	\$500	
Evaluation of Public Participation Activities	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Evaluate the public participation activities by April 3, 2026. 	<ol style="list-style-type: none"> 1. Date evaluation results included in permit renewal package. 	\$500	

**Element #3
Illicit Discharge Detection and Elimination**

Illicit Discharge Legal Authority	✓	✓	Gladstone Public Works Department, Gladstone Administration, Gladstone Code Enforcement	<ol style="list-style-type: none"> 1. Review and update legal authority as necessary to prohibit illicit discharges by Dec. 1, 2024. 	<ol style="list-style-type: none"> 1. -Date legal authority reviewed. -Date legal authority updated, if necessary. 	\$700	
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<p>Illicit Discharge Response</p>	<p>✓</p>	<p>✓</p>	<p>Gladstone Public Works Department, Gladstone Fire Department, Gladstone Code Enforcement</p>	<ol style="list-style-type: none"> 1. Each year investigate and confirm 100% of reports of suspected illicit discharges within 24 hours. 2. Each year evaluate removal of 100% confirmed illicit discharges within five working days of determining the source of the discharge. 3. Each year halt 100% of illicit discharges within 15 working days after the source has been confirmed. 4. Each year report 100% of reportable spills on public roadways or in the MS4 to state and federal authorities within required reporting timelines. 	<ol style="list-style-type: none"> 1. Annual number of illicit discharges investigated within 24 hours. -Annual number of reported suspected illicit discharges. -Annual percentage of illicit discharges investigated within 24 hours. 2. Annual number of illicit discharges evaluated for removal within five working days. -Annual number of confirmed illicit discharges (not including spills cleaned up within 24 hours). -Annual percentage of illicit discharges evaluated for removal within five working days. 3. Annual number of illicit discharges removed within 15 working days. -Annual number of confirmed illicit discharges (not including spills cleaned up within 24 hours). -Annual percentage of illicit discharges removed within 15 working days. 4. Annual number of reportable spills on public roadways or in the MS4 reported within required timelines. -Annual number of reportable spills on public roadways or in the MS4. -Annual percentage of reportable spills on public roadways or in the MS4 reported within required timelines. 	<p>\$2,000</p>	
<p>Illicit Discharge Enforcement Procedures</p>	<p>✓</p>	<p>✓</p>	<p>Gladstone Public Works Department, Gladstone Code Enforcement</p>	<ol style="list-style-type: none"> 1. Track 100% of enforcement actions initiated in that MS4 Permit year and their resolution. 2. Review and revise "Illicit Discharge Detection & Elimination Program Enforcement Response Plan" by December 1, 2023. 	<ol style="list-style-type: none"> 1. Annual number of enforcement actions initiated in that MS4 Permit year that were resolved by the discharger. -Annual number of enforcement actions initiated in that MS4 Permit year that were abated by the City. -Annual number of enforcement actions initiated in that MS4 Permit year that paid a civil penalty. -Annual number of enforcement actions. 2. Date the SOP was reviewed. -Date the SOP was revised, if necessary. 	<p>\$2,000</p>	
<p>Dry Weather Inspections</p>	<p>✓</p>	<p>✓</p>	<p>Gladstone Public Works Department</p>	<ol style="list-style-type: none"> 1. Review and update of prioritization criteria for dry weather screening Priority Locations by December 1, 2023. 2. Each year inspect 100% of priority locations as identified in the most recent list. 3. Each year, conduct investigations on 100% of confirmed (and unconfirmed) illicit discharges discovered through dry-weather inspection within one working day. 	<ol style="list-style-type: none"> 1. Date prioritization criteria submitted with Annual Report. -Date MS4 Map updated with new locations. 2. Annual number of priority locations inspected. -Number of priority locations in most recent list. -Annual percentage of priority locations inspected. 3. Annual number of confirmed and unconfirmed illicit discharges investigated within one working day. -Annual number of confirmed and unconfirmed illicit discharges discovered through dry-weather inspection. -Annual percentage of confirmed and unconfirmed illicit discharges investigated 	<p>\$500</p>	

					within one working day.		
IDDE Staff Training	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Evaluate and document staff training and education needs one time during the MS4 Permit term. 2. Provide training documented in the staff training and education strategy. 	<ol style="list-style-type: none"> 1. Date staff training and education strategy published. 2. Number of employees who receive training and education and type received. 	\$500	
Evaluation of IDDE Activities	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Evaluate IDDE activities by April 3, 2026. 	<ol style="list-style-type: none"> 1. Date evaluation results included in permit renewal package. 	\$500	
Develop Mapping Strategy	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Complete mapping strategy by December 1, 2022. 	<ol style="list-style-type: none"> 1. Date Mapping Strategy completed. 	\$500	
Inventory and Map MS4 Infrastructure	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. MS4 Map and Digital Inventory submitted to DEQ by December 1, 2022. 2. 70% of existing public stormwater conveyances and stormwater facilities mapped by December 1, 2022. 3. 100% of existing public stormwater conveyances and stormwater facilities mapped by December 1, 2025 4. 20% of existing private stormwater facilities mapped by December 1, 2022. 5. 100% of existing private stormwater facilities mapped by December 1, 2025. 6. 100% of new public stormwater conveyances and public and private stormwater facilities are mapped within 3 months of public acceptance and private final construction approval (see POST-4). 7. 100% of IDDE Priority Locations mapped by December 1, 2023. 	<ol style="list-style-type: none"> 1. Date MS4 Map and Digital Inventory submitted. 2. Number of in-service public stormwater assets mapped by December 1, 2022. - Number of in-service public stormwater assets. - Percentage of in-service public stormwater assets mapped by December 1, 2022. 3. Number of in-service public stormwater assets mapped by December 1, 2025. -Number of in-service public stormwater assets. -Percentage of in-service public stormwater assets mapped by December 1, 2025. 4. Number of existing private stormwater facilities mapped by December 1, 2022. -Number of existing private stormwater facilities. -Percentage of existing private 	\$3,000	

					<p>stormwater facilities mapped by December 1, 2022.</p> <p>5. Number of existing private stormwater facilities mapped by December 1, 2025. -Number of existing private stormwater facilities. -Percentage of existing private stormwater facilities mapped by December 1, 2025.</p> <p>6. Number of new public stormwater conveyances and stormwater facilities mapped within three months of acceptance. -Number of new public stormwater conveyances accepted. -Percentage of new public stormwater conveyances mapped within three months of acceptance. -Number of new private stormwater facilities mapped within three months of final construction approvals. -Number of new private stormwater facilities with final construction approval. -Percentage of new private stormwater facilities mapped within three months of final construction approval.</p> <p>7. Number of Priority Locations mapped by December 1, 2023. -Number of Priority Locations. -Percentage of Priority Locations mapped by December 1, 2023.</p>		
Track and Map Locations of Concern	✓	✓	Public Works Department	1. MS4 Map and Digital Inventory submitted to DEQ by December 1, 2022.	1. Date MS4 Map and Digital Inventory submitted.	\$100	
MS4 Mapping Evaluation	✓	✓	Public Works Department	1. Evaluate the MS4 mapping activities by April 3, 2026.	1. Date evaluation results included in permit renewal package.	\$500	
Element #4 Construction Site Runoff Control (EPSC)							

<p>Construction Site Runoff Legal Authority</p>	<p>✓</p>	<p>✓</p>	<p>Gladstone Public Works Department and Gladstone Code Enforcement</p>	<ol style="list-style-type: none"> 1. Review, and update, if necessary, Public Works boilerplate contract terms to ensure contract language adequately requires EPSC plans by Dec. 1, 2024. 2. Review, and update, if necessary, Gladstone City code to ensure alignment with the MS4 Permit Schedule A.4.c by Dec. 1, 2024. 3. Review, and update, if necessary, in coordination with Clackamas County, <i>WES Rules and Regulations</i> to ensure alignment with MS4 Permit Schedule A.4.c by Dec. 1, 2024. 4. Review, and update, if necessary, in coordination with Clackamas County, Clackamas County Code and Building and Development Ordinance to ensure alignment with MS4 Permit Schedule A.4.c by Dec. 1, 2024. 5. Review, and update, if necessary, in Coordination with Clackamas County WES, Clackamas County Erosion Prevention Planning and Design Manual once during the MS4 Permit Term. 	<ol style="list-style-type: none"> 1. Date legal authority reviewed. -Date legal authority updated, if necessary. 2. Date legal authority reviewed. -Date legal authority updated, if necessary. 3. Date legal authority reviewed. -Date legal authority updated, if necessary. 4. Date legal authority reviewed. Date legal authority updated, if necessary. 5. Date manual reviewed. -Date manual updated, if necessary. 	<p>\$1,500</p>	
<p>EPSC Plan Review</p>	<p>✓</p>	<p>✓</p>	<p>Gladstone Public Works and Clackamas County WES</p>	<ol style="list-style-type: none"> 1. Public Works to internally review the EPSC plan of 100% of City CIPs going to construction in the Permitted Area each year. 2. Per IGA between Clackamas County and Gladstone, Clackamas County WES is to review EPSC plans for 100% of land use and building permit applications meeting threshold for erosion prevention and sedimentation control in the City each year. 3. Per IGA, Clackamas County WES to Attend 80% of pre-construction meetings for development projects meeting threshold for erosion prevention and sediment control in the City. 	<ol style="list-style-type: none"> 1. Annual number of City CIP EPSC plans reviewed by Public Works. -Annual number of new land use and building permit applications meeting threshold for EPSC in the City. -Annual percentage of EPSC reviews conducted. 2. Annual number of EPSC reviews. -Annual number of new land use and building permit applications meeting threshold for EPSC in the City. -Annual percentage of EPSC reviews conducted. 3. Annual number of pre-construction meetings attended by WES. -Annual number of pre-construction meetings for projects needing EPSC. -Annual percentage of pre-construction meetings attended by WES. 	<p>\$1,000</p>	
<p>Inspection and Enforcement</p>	<p>✓</p>	<p>✓</p>	<p>Gladstone Public Works and Clackamas County WES</p>	<ol style="list-style-type: none"> 1. Conduct at least three EPSC inspections over the life of the project at 100% of City CIP construction sites within the Permitted Area that require EPSC review. 2. Each year conduct the initial EPSC inspection prior to construction 100% of City CIP projects. 3. Inspect 90% of EPSC permitted sites at least three times over the life of the project. 4. Inspect 100% of EPSC permitted sites at least twice over the life of the project. 5. For building permit, new construction and redevelopment projects, each year WES to conduct the initial EPSC site inspection prior to construction at 100% of EPSC permitted sites within the City limits on behalf of the City. 6. On behalf of the City, WES to inspect 90% of EPSC permitted sites within the City limits at least three times over the life of the project. 7. On behalf of the City, WES to inspect 100% of EPSC permitted sites within the City limits at least twice over the life of the project. 	<ol style="list-style-type: none"> 1. Annual number of City CIP projects in the Permitted Area that completed construction and that Public Works inspected for EPSC at least three times over the life of the project. -Annual number of City CIP projects in the Permitted Area that met the threshold for EPSC review and that completed construction. -Annual percentage of City CIP projects that Public Works inspected for EPSC at least three times. -Number of EPSC complaints received per project. 2. -Annual number of EPSC permitted sites that received an initial EPSC inspection prior to construction. -Annual number of EPSC permitted sites that began construction. -Annual percentage of EPSC permitted sites that received an initial EPSC inspection prior to construction. 	<p>\$10,000</p>	

				8. Adopt construction site enforcement procedures by December 1, 2023.	<ul style="list-style-type: none"> -Number of EPSC complaints received per permitted site. 3. Annual number of EPSC permitted sites that completed construction and received at least three EPSC inspections over the life of the project. <ul style="list-style-type: none"> -Annual number of EPSC permitted sites that completed construction. -Annual percentage of EPSC permitted sites that received at least three EPSC inspections. 4. Annual number of EPSC permitted sites that received at least two EPSC inspections over the life of the project. <ul style="list-style-type: none"> -Annual number of EPSC permitted sites that completed construction. -Annual percentage of EPSC permitted sites that received at least two EPSC inspections. -Number of EPSC complaints received per project. 5. Annual number of EPSC permitted sites that received an initial EPSC inspection by WES prior to construction. <ul style="list-style-type: none"> -Annual number of EPSC permitted sites that began construction. -Annual percentage of EPSC permitted sites that received an initial EPSC inspection by WES prior to construction. -Number of EPSC complaints received per permitted site. 6. Annual number of EPSC permitted sites that received at least three EPSC inspections by WES over the life of the project. <ul style="list-style-type: none"> -Annual number of EPSC permitted sites that completed construction within the City limits. -Annual percentage of EPSC permitted sites within the City limits that received at least three EPSC inspections by WES. -Number of EPSC complaints received per project. 7. Annual number of EPSC permitted sites that received at least two EPSC inspections by WES over the life of the project. <ul style="list-style-type: none"> -Annual number of EPSC permitted sites that completed construction in the City. -Annual percentage of EPSC permitted sites in the City that received at least two EPSC inspections by WES. -Number of EPSC complaints received per permitted site. 8. Date construction site enforcement procedures adopted for each jurisdiction. 		
Construction Site Runoff Staff Training	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Evaluate and document staff training needs one time during the MS4 Permit term. 2. Conduct or procure training documented in the staff training and education strategy. 	<ol style="list-style-type: none"> 1. Date staff training and education strategy published. 2. Number of employees who receive training and type of training received. 	\$600	
Evaluation of Construction Site Runoff Control Activities	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Evaluate construction site runoff control activities by April 3, 2026. 	<ol style="list-style-type: none"> 1. Date evaluation results included in permit renewal package. 	\$500	

Element #5 Post-Construction Site Runoff (POST)							
Post-Construction Legal Authority	✓	✓	Gladstone Public Works and Gladstone Code Enforcement	<ol style="list-style-type: none"> 1. Review, and update, if necessary, Gladstone Municipal code to ensure alignment with the MS4 Permit Schedule A.3.e by December 1, 2024. 2. Review, and update, if necessary, <i>Gladstone Public Works Design Standards</i> to ensure alignment with MS4 Permit Schedule A.3.e by December 1, 2024. 	<ol style="list-style-type: none"> 1. Date legal authority reviewed. -Date legal authority updated, if necessary. 2. Date legal authority reviewed. -Date legal authority updated, if necessary. 	\$1,000	
Post Construction Stormwater Standards	✓	✓	Gladstone Public Works	<ol style="list-style-type: none"> 1. By Dec. 1, 2023, review and update or develop and begin a LID/GI strategy. 2. Update the <i>Public Works Stormwater Standards</i> by Dec. 1, 2024. 	<ol style="list-style-type: none"> 1. Date LID/GI strategy update or adoption and adopted, if necessary. 2. Date stormwater design standards updated. 	\$1,000	
Stormwater Management Plan (SWMP) Review	✓	✓	Gladstone Public Works	<ol style="list-style-type: none"> 1. Review 100% of City CIP SWM Plans that meet the minimum impervious surface threshold each year. 2. Review 100% of SFR SWM Plans received prior to signing off on building permit each year. 3. Public works/engineering services to attend 100% of pre-application meetings for land use applications. 4. Public works/engineering services to review and approve 100% of non-SFR SWM Plans for projects that meet the minimum impervious threshold each year. 	<ol style="list-style-type: none"> 1. Annual number of City CIP SWM Plans reviewed and approved. -Annual number of City CIPs that meet the minimum impervious surface threshold approved for construction. -Annual percentage of City CIP SWM Plans reviewed and approved where the project met the minimum impervious surface threshold. 2. Annual number of SFR SWM Plans reviewed by engineering services/public works prior to signing off on building permit. -Annual number of SFR building permit applications referred to Clackamas County DTD. -Annual percentage of SFR SWM Plans reviewed by engineering services/public works prior to signing off on building permit. 3. Annual number of pre-application meetings attended by public works/engineering services. -Annual number of pre-application meetings held for applicants. (Clackamas County DTD). -Annual percentage of pre-application meetings attended by public works/engineering services. 4. Annual number of non-SFR SWM Plans approved by engineering services/public works. -Annual number of non-SFR stormwater management plans submitted to engineering services/public works that meet the minimum impervious area threshold. -Annual percentage of non-SFR SWM Plans approved by engineering services/public works. 	\$2,000	

Post-Construction Verification and Acceptance	√	√	Gladstone Public Works, Clackamas County DTD, and Clackamas County WES	<ol style="list-style-type: none"> 1. Perform final SWM construction site inspection on 100% of residential development sites each year. 2. Perform final SWM construction site inspection on 100% of subdivision and partition sites each year. 3. Perform final SWM construction site inspection on 100% of commercial development sites each year. 4. Inspect 100% of stormwater facilities for new City CIPs. 	<ol style="list-style-type: none"> 1. Annual number of final SWM construction site inspections performed on residential development sites. -Annual number of residential development sites that complete construction. -Annual percentage of final SWM construction site inspections performed on residential development sites. 2. Annual number of final SWM construction site inspections performed on subdivision and partition development sites. -Annual number of subdivision and partition development sites that complete construction. -Annual percentage of final SWM construction site inspections performed on subdivision and partition development sites. 3. Annual number of final SWM construction site inspections performed on commercial development sites. -Annual number of commercial development sites that complete construction. -Annual percentage of final SWM construction site inspections performed on commercial development sites. 4. Annual number of stormwater facility inspections of new City CIPs. -Annual number of City CIPs completing construction. -Annual percentage of stormwater facility inspections of new City CIPs. 	\$1,500	
Post-Construction Site Runoff Staff Training	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Evaluate and document staff training needs one time during the MS4 Permit term. 2. Conduct or procure training documented in the staff training and education strategy. 	<ol style="list-style-type: none"> 1. Date staff training and education strategy published. 2. Number of employees who receive training and type of training received. 	\$500	
Evaluation of Post-Construction Site Runoff Activities	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Evaluate the City's post-construction site runoff activities by April 3, 2026. 	<ol style="list-style-type: none"> 1. Date evaluation results included in Permit renewal package. 	\$500	
Element #6							
Pollution Prevention for Municipal Operations (PREV)							
Road Operations and Maintenance	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Sweep all public streets within the City a minimum of four times per year. 2. Remove 90% of solid waste dumps in the City ROW within six weeks of notification or discovery. 3. Review and update pollution prevention procedures related to road maintenance during the MS4 permit term. 	<ol style="list-style-type: none"> 1. Total number of City-wide sweeps each year. 2. Annual number of solid waste dumps removed within six weeks. -Annual number of solid waste dumps discovered or notified about. -Annual percentage of solid waste dumps removed within six weeks. 3. Summary of review of pollution prevention procedures. -Summary of updates to pollution prevention procedures, if any. 	\$35,000	

Winter Operations and Maintenance	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Maintain winter materials stockpile. 2. Implement winter operations and maintenance activities if snow and/or ice events occur. 	<ol style="list-style-type: none"> 1. List of types of materials stored and/or used in the Permitted Area per MS4 Permit year. 2. Number of winter weather events where winter maintenance materials are used in the Permitted Area per MS4 Permit year. -Quantities and general location of each material used in relation to distance (e.g., pounds per mile) in the Permitted Area per MS4 Permit year. -Any other actions taken to protect waters of the state in the Permitted Area per MS4 Permit year. 	\$500	
Landscape Maintenance and Vegetation Control	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Adopt and implement the most recent ODOT Guide or an approved alternative for vegetation maintenance in City-maintained ROW during the permit term. 	<ol style="list-style-type: none"> 1. Date manual adopted. 	\$300	
Litter Control	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Coordinate with volunteer groups to station litter storage bags in parks available to the public. 2. Respond to 100% of roadway litter reports each year. 	<ol style="list-style-type: none"> 1. Number of litter storage bags stationed in City parks each year. 2. Number of reports resolved. -Number of submitted reports each year. -Percentage of roadway litter reports resolved. 	\$600	
Municipal Facilities	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Each year, inspect municipal waste facilities at least once. 	<ol style="list-style-type: none"> 1. Annual number of municipal waste facilities inspected. 	\$200	

Control Sewage Infiltration	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> Each year, conduct periodic TV inspections of public storm and sanitary sewer systems as budget allows. Eliminate 100% of sanitary sewer discharges to the MS4 public within five days of discovery each year. 	<ol style="list-style-type: none"> Annual length (linear feet) of public storm sewer pipe TV inspected. - Annual length (linear feet) of public sanitary sewer pipe TV inspected. Annual number of discharges to the MS4 resulting from cracked or broken public sanitary sewer lines that were eliminated within five days of discovery. - Annual number of discharges to the MS4 resulting from cracked or broken public sanitary sewer lines. - Annual percentage of discharges to the MS4 resulting from cracked or broken public sanitary sewer lines that were eliminated within five days of discovery. 	\$18,000	
Fire Fighting Training	√	√	Gladstone Public Works Department and Clackamas County Fire Department	<ol style="list-style-type: none"> Once during the MS4 Permit term, contact the Fire Department, visit site and confirm training practices are being conducted in a manner that is watershed safe. 	<ol style="list-style-type: none"> Date(s) of site visit and discussion with Fire Department. 	\$200	
Pollution Prevention Staff Training	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> Evaluate and document staff training needs one time during the MS4 Permit term. Conduct or procure training documented in the staff training and education strategy. 	<ol style="list-style-type: none"> Date staff training and education strategy published. Number of employees who receive training and type of training received. 	\$1,000	
Evaluation of Pollution Prevention for Municipal Operations Activities	√	√	Gladstone Public Works Department	<ol style="list-style-type: none"> Evaluate the pollution prevention for municipal operations activities by April 3, 2026. 	<ol style="list-style-type: none"> Dave evaluation results included in Permit renewal package. 	\$1,000	

Element #7
Industrial and Commercial Facilities (COMM)

Identify Industrial NPDES Permit Facilities	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Review new industrial development applications for applicability of 1200-Z permit a minimum of one time each year. 2. Survey existing industrial facilities for 1200-Z permit applicability a minimum of one time each year. 3. Each year notify facility operator and DEQ of 100% of facilities newly identified as potentially needing a 1200-Z permit within 30 days of discovery. 	<ol style="list-style-type: none"> 1. Date(s) new development applications were reviewed. 2. Date(s) survey performed. 3. Annual number and list of facilities where operator and DEQ were notified within 30 days of discovery. -Annual number and list of newly identified facilities. -Annual percentage of facilities where operator and DEQ were notified within 30 days of discovery. 	\$1,500.	
Industrial/Commercial Stormwater Pollutant Prevention	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Update Industrial/Commercial Facilities Strategy by December 1, 2023. 2. Each year, inspect 100% of sites referred through complaint of referral within ten business days. 	<ol style="list-style-type: none"> 1. Date Industrial/Commercial Facilities Strategy updated. 2. Annual number of sites inspected within ten business days based on complaint of referral. -Annual total of complaints and referrals. -Annual percentage of sites inspected within ten business days based on complaint or referral. -List of SIC categories of facilities inspected. -Overview of results from inspections. 	\$5,000	
Industrial/Commercial Site Inspection Staff Training	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Evaluate and document staff training needs one time during the MS4 Permit term. 2. Conduct of procure training documented in the staff training and education strategy. 	<ol style="list-style-type: none"> 1. Date staff training and education strategy published. 2. Number of employees who receive training and type of training received. 	\$1,000	
Evaluation of Industrial and Commercial Facilities Activities	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Evaluate the City's industrial and commercial facilities activities by April 3, 2026. 	<ol style="list-style-type: none"> 1. Date evaluation results included in permit renewal package. 	\$1,000	- -
Element #8							
Stormwater System Operation and Maintenance							
Operation and Maintenance Legal Authority	✓	✓	Gladstone Public Works Department and Gladstone Code Enforcement	<ol style="list-style-type: none"> 1. Review, and update, if necessary, legal authority to require maintenance and inspect private storm systems (once during the MS4 Permit term) by Dec. 1, 2024. 	<ol style="list-style-type: none"> 1. Date legal authority verified. -Date legal authority updated, if necessary. 	\$1,000	
Inspection and Maintenance Strategy	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Complete Inspection and Maintenance Strategy document during the MS4 Permit Term. 	<ol style="list-style-type: none"> 1. Date Inspection Schedule and Maintenance Standards document completed. 	\$1,000	

Per SWMP, Continue using existing goals and tracking measures as described for MAINT-3.1 until the BMP activities are superseded by MAINT-3.2 and 3.3. Expected date to be superseded is March 31, 2025.							
Public Facility Inspection and Maintenance	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Inspect the public and existing private structural storm water control facilities annually and maintain as necessary. 2. Conduct annual spot inspections of all new private structural stormwater quality control facilities. 3. Require signed maintenance agreements for new private structural stormwater facilities as a condition of plan approval. 	<ol style="list-style-type: none"> 1. Record the Structural control inspection and maintenance activities that occur annually. 2. Record annual spot inspections conducted. 3. Track any additional (public or private) structural control facilities installed within the City on an annual basis. 	\$1,500	
Per SWMP, begin using goals and tracking measures as described below for MAINT-3.2 and 3.3 when the SWMP City implements the inspection-based maintenance program, supported by MAINT-2, Inspection and Maintenance Strategy. Anticipated implementation date is March 31, 2025.							
Public Facility Inspection and Maintenance continued	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Complete 90% of scheduled preventive maintenance on time each year. 2. Perform 100% of scheduled facility inspections each year. 3. Correct 100% of maintenance deficiencies discovered during a public facility inspection within allowed time period. <p>(Allowed time period based on maintenance schedule established in MAINT-2)</p> <p>(Does not include repairs.)</p>	<ol style="list-style-type: none"> 1. Running total of facilities with maintenance deficiencies (excluding repairs) that were corrected within the allowed time period. <ul style="list-style-type: none"> -Running total of facilities with maintenance deficiencies (excluding repairs) discovered during public facility inspection. -Percentage of maintenance deficiencies corrected within allowed time period. -Estimated volume of debris removed as a total or by category or type of activity, if known. 2. Annual number of facility inspections conducted. <ul style="list-style-type: none"> -Annual number of facility inspections scheduled. -Annual percentage of facility inspections completed. 3. Running total of facilities with maintenance deficiencies (excluding repairs) that were corrected within the allowed time period. <ul style="list-style-type: none"> -Running total of facilities with maintenance deficiencies (excluding repairs) discovered during public facility inspections. -Percentage of maintenance deficiencies corrected within the allowed time period. -Estimated volume of debris removed as a total or by category or type of activity, if known. 	\$60,000	
Per the SWMP, continue using existing goals and tracking measures as described below for MAINT-4.1 until the BMP activities are superseded by MAINT-4.2 once the City implements BMP MAINT-2 (expected to be implemented March 31, 2025).							
Public Facility Inspection and Maintenance continued	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Clean 100% of catch basins and inlets (with sumps) each year. 	<ol style="list-style-type: none"> 1. Annual number of catch basins and inlets cleaned. <ul style="list-style-type: none"> -Total number of catch basins and inlets (with sumps) cleaned. 	\$50,000	

Per the SWMP, Begin using goals and tracking measures as described below for MAINT-4.2 when the City implements the inspection-based maintenance program, supported by BMP MAINT-2, Inspection and Maintenance Strategy. BMP MAINT-2 expected to be implemented March 31, 2025.

Public Facility Inspection and Maintenance continued	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Perform 100% of scheduled catch basin/inlet inspections each year. (Number of scheduled inspections may differ each year, based on priorities and schedules established in MAINT-2 of the SWMP.) 2. Clean 100% of catch basins/inlets that fail a sediment depth inspection within allowed time period. (Allowed time period based on maintenance schedule established in MAINT-2 of the SWMP.) 3. Repair or replace 60% of catch basins/inlets that fail condition inspection within allowed time period from date of inspection. (Allowed time period based on maintenance schedule established in MAINT-2 of the SWMP.) 	<ol style="list-style-type: none"> 1. Annual number of catch basins/inlets inspections performed. -Annual number of scheduled catch basin/inlet inspections. -Annual percentage of catch basins/inlets inspected. 2. Running Total of catch basins/inlets that were cleaned within the allowed time period. -Running total of catch basins/inlets that failed sediment depth inspection. -Percentage of catch basins/inlets that were cleaned within the allowed time period to date. 3. Running total of catch basins/inlets that were repaired or replaced within the allowed time period. -Running total of catch basins/inlets that failed condition assessment. -Percentage of catch basins/inlets that were repaired or replaced within the allowed time period to date. 	\$75,000	
Public Conveyance Cleaning and Maintenance	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Complete 75% of scheduled conveyance system cleaning maintenance activities each year. 	<ol style="list-style-type: none"> 1. Annual number of conveyance system feet cleaned each year. -Annual number of conveyance system feet scheduled to be cleaned each year. -Annual percentage of conveyance system planned cleanings completed each year. 	\$65,000	
Regulated Private Storm System Inspection and Maintenance Program	✓	✓	Gladstone Public Works Department	<ol style="list-style-type: none"> 1. Following completion of MAINT-2, inspect 25% of prioritized regulated private storm systems each year. 2. 50% of prioritized regulated private storm systems to pass initial inspection each year. 3. Provide technical assistance to 90% of prioritized regulated private storm systems found to have a maintenance deficiency within one year. 	<ol style="list-style-type: none"> 1. Annual number of prioritized regulated private storm systems inspected at least one time. -Total number of prioritized regulated private storm systems within the City in reporting year. -Annual percentage of prioritized regulated private storm systems inspected. 2. Annual number of prioritized regulated private storm systems that passed initial inspection. - Annual number of prioritized regulated private systems inspected. -Annual percentage of prioritized regulated private storm systems that passed initial inspection. 3. Running total of prioritized regulated private storm systems that received technical assistance within one year of an inspection that discovered a maintenance deficiency. - Running total of prioritized regulated private storm systems where an inspection discovered a maintenance deficiency. -Percentage of prioritized regulated private storm systems that received technical assistance within one year to date. 	\$2,000	

Urgent Conditions/Storm Preparation and Response	√	√	Gladstone Public Works Department	1. Maintain a list of conveyances and facilities to inspect and clear of debris and blockages when weather reports call for heavy rainfall.	1. List currently maintained and implemented?	\$2,000	
Storm Sewer System Retrofit Program and Hydromodification Assessment	√	√	Gladstone Public Works Department	1. Assessment of outcomes related to the Hydromodification Assessment and Stormwater Retrofit Strategy reports by December 1, 2023.	1. Progress or completion of projects identified in Retrofit Strategy. -Dates Hydromodification Assessment and Stormwater Retrofit Strategy assessed and, if needed, updated.	\$5,000	
Stormwater Facility Maintenance Training	√	√	Gladstone Public Works Department	1. Evaluate and document staff training needs one time during the MS4 Permit term. 2. Conduct of procure training documented in the staff training and education strategy.	1. Date staff training and education strategy published. 2. Number of employees who receive training and type of training received.	\$3,000	
Evaluation of Stormwater System Operations and Maintenance Activities	√	√	Gladstone Public Works Department	1. Evaluate the City's operations and maintenance activities by April 3, 2026.	1. Date evaluation results included in permit renewal package.	\$2,000.	

Appendix B
Summary of Strategies to Address Temperature for the Willamette
Basin TMDL

Best Management Practice or Activity	Commitment/ Implementation Strategy	Measurable Goal	Implementation Tracking/ Performance Measure	BMP Cost Estimate	Responsible Division
Public Education	Implement public outreach activities for lower priority revegetation locations along the Clackamas River.	<ul style="list-style-type: none"> Utilize some of the annual committed funds towards public outreach activities including mailings or newsletters. 	<ul style="list-style-type: none"> Track public outreach activities conducted. 	\$1,000	Public Works
	Continue membership with RCCRS and support RCCRS public outreach efforts	<ul style="list-style-type: none"> Attend at least one RCCRS meeting per year. 	<ul style="list-style-type: none"> Track meeting and activity attendance. 	\$500	Public Works
Preservation of Existing Shade	Continue to enforce efforts to protect the natural resources and restrict development of Meldrum Park (along the south bank of the downstream end of Rinearson Creek at junction with the Willamette).	<ul style="list-style-type: none"> Utilize some of the annual committed funds towards public outreach activities including mailings or newsletters associated with this area. 	<ul style="list-style-type: none"> Track public outreach activities conducted. Track any actions taken to protect existing shade. 	\$500	Public Works
	Continue to enforce regulations pertaining to the protection of riparian vegetation and buffer areas.	<ul style="list-style-type: none"> Work with Clackamas County to continue to implement Chapters 17.25 and 17.27 of the City's development code to address Title 3 and some requirements of Title 13. 	<ul style="list-style-type: none"> Track any enforcement actions taken to protect existing shade. 	\$500	Public Works
Planting Activities for Identified Shade Opportunity Areas	Conduct planting activities for the identified shade opportunity areas.	<ul style="list-style-type: none"> Utilize some or all of the annual committed funds towards shading and planting activities for identified opportunity areas. 	<ul style="list-style-type: none"> Track planting activities for public, high priority areas. Track planting activities for other identified shade opportunity areas. Track any revegetation and maintenance activities conducted. 	\$10,000	Public Works
Protection of Cold Water Refuges	Develop and evaluate possible strategies to enhance/protect cold water refuges along the Clackamas River. Implement as feasible.	<ul style="list-style-type: none"> Continue to implement current CWR projects/strategies along the Clackamas River and continue to consider the feasibility of implementing new CWR projects/strategies. 	<ul style="list-style-type: none"> Track and review CWR strategies Track and review CWR activities annually on annual report 	\$10,000	Public Works
	Continue to implement temperature monitoring activities along Rinearson Creek.	<ul style="list-style-type: none"> -Continue to implement temperature monitoring and evaluate data 	<ul style="list-style-type: none"> Implement, evaluate and track temperature monitoring activities 	\$2,500	Public Works