

TMDL Implementation Plan

Prepared for
City of Milwaukie, Oregon
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List of Abbreviations

BHCP	Backyard Habitat Certification Program
BMP	best management practice
C	Celsius
City	City of Milwaukie
CWA	Clean Water Act
CWR	cold water refugia
DDT	dichlorophenyltrichloroethane
DEQ	Oregon Department of Environmental Quality
DMA	Designated Management Agency
LA	load allocation
LID	low-impact development
MMC	Milwaukie Municipal Code
OAR	Oregon Administrative Rules
MS4	Municipal Separate Storm Sewer System
NCUWC	North Clackamas Urban Watershed Council
NPDES	National Pollutant Discharge Elimination System
Plan	2014 TMDL Implementation Plan update
SWMM	Stormwater Management Manual
SWMP	Stormwater Management Plan
TMDL	total maximum daily load

UGMFP Urban Growth Management Functional Plan
UIC underground injection control
USGS U.S. Geological Survey
USEPA U.S. Environmental Protection Agency
WLA waste load allocation
WQMP Water Quality Management Plan

Section 1

Introduction and Background

The Federal Clean Water Act (CWA) of 1977 gave authorization to the U.S. Environmental Protection Agency (USEPA) to restore and maintain water quality in all water bodies within the U.S. In response to the CWA, the USEPA designated certain state agencies, (the Oregon Department of Environmental Quality [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 total maximum daily loads (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 USEPA's 303(d) list as an impaired water body, and the development of a TMDL follows.

A TMDL specifies the maximum amount of a pollutant load that a water body can receive and still meet water quality standards, and it allocates pollutant loadings among point and nonpoint 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). Waste load allocations (WLAs) 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 (LAs) are provided in the TMDL for nonpoint sources.

Any agency or municipality that has legal authority over activities or areas that are sources of TMDL pollutants that impact water quality are known as Designated Management Agencies (DMAs). A DMA responsible for areas that discharge to a TMDL water body must develop a TMDL Implementation Plan describing strategies to be undertaken to address LAs for nonpoint sources of TMDL pollutants. WLAs for point sources of pollutants are addressed through National Pollutant Discharge Elimination System (NPDES) permits (e.g., NPDES permits for Municipal Separate Storm Sewer System [MS4] discharges and NPDES permits for discharges from wastewater treatment plants).

This report represents an update to the 2014 TMDL Implementation Plan developed for the City of Milwaukie (city), to address the Willamette Basin TMDL. This report outlines strategies to address LAs for temperature and references strategies to address WLAs for bacteria, dichlorophenyltrichloroethane (DDT), dieldrin, and mercury, as implemented through the city's NPDES MS4 permit.

1.1 Jurisdiction and Organization

Milwaukie is located in northeast Clackamas County, just south of Portland. Milwaukie is approximately 4.8 square miles with a population of approximately 21,000. The city is primarily

comprised of single-family residential land use, but also includes a central business district and industrial development along its northern boundary.

Recent development activities have been limited to redevelopment, infill, and minor partitions. There are few, if any, remaining vacant parcels that would accommodate large-scale new development. As a result, the population of Milwaukie has remained fairly constant, along with the attendant tax base. Increases in city population that do occur are often the result of annexation of unincorporated, low-density residential areas along the eastern city limits. Access to sanitary sewer service is typically the motivating force behind annexation, which may be initiated by either the residents or City of Milwaukie (city) officials.

Milwaukie is located entirely in the Lower Willamette River watershed, bordered on the west by the Willamette River. Two Willamette River tributaries, Johnson Creek and Kellogg Creek, border the city to the north and south, respectively, and receive a majority of the stormwater discharges from the city. Approximately one-quarter of Milwaukie is located within a topographical “bowl” with highly permeable sand and gravel strata. Stormwater drainage from this area is discharged to groundwater via underground injection control (UIC) devices (i.e., dry wells and french drains).

1.2 TMDL Applicability

On September 21, 2006, DEQ finalized a TMDL for the Willamette Basin. The TMDL directly addresses water quality impairment of the Lower Willamette River and its tributaries (i.e., Johnson Creek and Kellogg Creek) and includes applicable WLAs and LAs. TMDL pollutants include the following:

- Bacteria
- Mercury
- Temperature
- DDT and dieldrin (Johnson Creek only)

Table 1-1 summarizes the TMDL pollutants and associated LAs and WLAs for Milwaukie.

Table 1-1. TMDL Summary for Milwaukie					
TMDL water body	Milwaukie drainage area, approximate % of total ¹	TMDL parameters	WLA ²	LA	TMDL Implementation Plan dates
Lower Willamette River (direct)	10	Mercury Bacteria (<i>E. Coli</i>) Temperature	Mercury = NA Bacteria = 78% reduction	Temperature = Shade surrogate 85-95%	Original = 2008 Update = 2014
Johnson Creek	30	Mercury Bacteria (<i>E. Coli</i>) Temperature	Mercury = NA Bacteria = 78% reduction DDT/dieldrin = 77% reduction	Temperature = Shade surrogate 85-95%	Original = 2008 Update = 2014

		DDT and dieldrin			
Kellogg Creek	30	Mercury Bacteria (<i>E. Coli</i>) Temperature	Mercury = NA Bacteria = 78% reduction	Temperature = Shade surrogate 85-95%	Original = 2008 Update = 2014

^{1.} Approximately 30 percent of the total city area discharges to groundwater via UICs. This area is not reflected in Table 1.

^{2.} Mercury is listed in the TMDL but a WLA has not yet been established. WLAs are scheduled to be adopted in 2019.

1.3 TMDL Implementation Plan Update and Organization

In 2007, DEQ prepared a guidance document for developing TMDL Implementation Plans in conjunction with issuance of the Willamette Basin River TMDL. The requirements for a TMDL Implementation Plan are listed as follows:

- (a) Prepare an implementation plan and submit the plan to the Department for review and approval according to the schedule specified in the WQMP. The implementation plan must:
 - (A) Identify the management strategies the DMA or other responsible person will use to achieve load allocations and reduce pollutant loading;
 - (B) Provide a timeline for implementing management strategies and a schedule for completing measurable milestones;
 - (C) Provide for performance monitoring with a plan for periodic review and revision of the implementation plan;
 - (D) To the extent required by ORS 197.180 and OAR chapter 340, division 18, provide evidence of compliance with applicable statewide land use requirements; and
 - (E) Provide any other analyses or information specified in the WQMP.

Note: It should be noted and emphasized that under the first requirement above; this implementation plan is associated with strategies to achieve load allocations, which are associated with nonpoint sources. Waste load allocations are associated with point sources and are covered through water quality permits for those sources (in this case the City's MS4 NPDES permit).

The city submitted a TMDL Implementation Plan for the Willamette River in March 2008. The TMDL Implementation Plan was approved by DEQ and implementation was initiated starting in July 2009. In conjunction with the end of the 5-year implementation period, the city submitted an updated TMDL Implementation Plan to DEQ in June 2014 that reflected progress made associated with the 2008 TMDL Implementation Plan and future goals for the next 5-year implementation period.

This TMDL Implementation Plan update (Plan) reflects the required 5-year update to the 2014 TMDL Implementation Plan for the Willamette River. It outlines updated strategies and activities the City is proposing to continue compliance with the Willamette River TMDL and addresses requirements (A) through (E) as listed above.

This Plan is organized as follows:

- Section 2 provides an overview and reference regarding strategies for point sources in the city's NPDES MS4 permit that address TMDL compliance related to WLAs for bacteria, mercury, and DDT/dieldrin.
- Section 3 addresses the first three requirements above (A, B, and C) specifically for temperature (as a nonpoint source pollutant with LAs not otherwise addressed by NPDES MS4 permit compliance).
- Section 4 addresses the fourth requirement (D), and reflects the evaluation of this Plan's conformance with the City's land use goals and comprehensive plan.
- Section 5 addresses additional items identified in the water quality management plan (WQMP) (Requirement E) that the DMA must address. These items include the following:
 - Determine how to best 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.
 - Address cold water refugia.

Section 2

Management Strategies for Point Sources (WLAs)

As described in Section 1, a TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and it allocates pollutant loadings among point and nonpoint sources. WLAs are provided for point sources (e.g., municipal stormwater and wastewater covered by permits) and LAs are provided for nonpoint sources (e.g., surface runoff from agricultural and forested lands).

The city obtained its most recent NPDES MS4 permit from DEQ for its municipal stormwater discharges to surface waters in 2012 as one of 13 co-permittees on the Clackamas County Phase 1 NPDES MS4 permit. Collectively, the Clackamas County Phase 1 NPDES MS4 permit covers approximately 74 square miles and a population of approximately 300,000. The 2012 NPDES MS4 permit expired in February 2017 and is currently (as of January 2019) in administrative extension pending renewal.

Discharges to surface waters via the city's MS4 are considered to be point sources since they are covered by a permit. The city also includes stormwater discharges that flow overland and enter receiving waters directly without first entering the city's MS4. While these discharges are typically considered to be nonpoint sources, they have been included and covered under the city's NPDES MS4 permit for ease in management, and thus are considered to be subject to WLAs for stormwater discharges. Areas within the city that discharge to UICs (and thus to groundwater) are regulated under the city's Water Pollution Control Facility (WPCF) permit, and the discharges are not considered to be subject to WLAs because they do not enter surface waters and groundwater was not provided with a load or waste load allocation in the Willamette River TMDL. Therefore, the city does not have any nonpoint sources of bacteria, mercury, or DDT/dieldrin that would be subject to LAs under the TMDL. The management strategies discussed in this section apply to point and nonpoint sources of bacteria, mercury, and DDT/dieldrin as covered under the city's NPDES MS4 permit.

Because stormwater is not considered to be a source of water quality temperature exceedance, temperature is managed as a nonpoint source issue that needs to be addressed through a TMDL Implementation Plan as opposed to being addressed through an NPDES MS4 permit. Temperature is addressed in the following sections of this Plan.

The purpose of this section is to provide an overview and reference of the strategies, schedules, and monitoring activities that address bacteria, mercury, and DDT/dieldrin under the NPDES MS4 permit.

2.1 Pollutant Sources

Applicable TMDL parameters addressed through implementation of the city's NPDES MS4 permit include bacteria (*E. Coli*), mercury, and DDT/dieldrin.

2.1.1 Bacteria (*E. Coli*)

E. coli may discharge to surface waters in conjunction with rain events and stormwater runoff from riparian and upland areas.

Potential sources of *E. coli* that have been attributed to the MS4 (as reported in literature) and may be applicable to the city include:

- Wild bird and mammal feces
- Pet waste
- Failed septic systems
- Spills and illicit discharges
- Inadvertent or illicit cross connections with the sanitary sewer system

2.1.2 Mercury

Mercury is a naturally-occurring element in Oregon. Mercury is present in rocks and soils typical to our geographic area. Therefore, soil erosion and sediment suspension in stormwater runoff may contribute mercury to surface waters. Occasionally, industrial and municipal wastewater facilities may also treat or handle mercury-laden materials that could potentially enter receiving waters.

Air deposition is also a prominent source of mercury to surface waters, although it is not directly tied to stormwater as a source, it can be conveyed via the stormwater collection and conveyance systems (i.e., the MS4).

Specific sources of mercury in Milwaukie are not well known at this time, but potential sources applicable to the city's MS4 could include the following:

- Industrial properties
- Soil erosion/soil disturbance from development and maintenance activities
- Spills and illicit discharges
- Air deposition

2.1.3 DDT/Dieldrin

DDT and dieldrin are organochlorine insecticides that have been banned for approximately 40 years. Historically, both were used extensively in agricultural applications to manage mosquitoes and other insects. Both compounds are highly persistent in soils, highly hydrophobic, and bioaccumulate in the environment.

As use of DDT and dieldrin is banned, presence of the chemicals is most readily apparent in sediment, including streambed sediment in Johnson Creek (U.S. Geological Survey [USGS], 1999). Sources of DDT and dieldrin applicable to the MS4 could potentially include soil erosion/soil disturbance from development and maintenance activities.

2.2 Management Strategies to Address WLAs

The city prepared and submitted its current SWMP to DEQ in May 2012, in accordance with the issuance of the 2012 NPDES MS4 permit. Requirements of the city's NPDES MS4 permit are addressed through implementation of a Stormwater Management Plan (SWMP). The SWMP outlines various management strategies in the form of best management practices (BMPs) that address specific permit requirements and specific TMDL parameters. Such BMPs are listed and summarized in Appendix A of this document as applicable to the city's 2012 SWMP. The city's SWMP is an evolving document. Adaptive management may result in changes to BMPs that would then be reported in the annual compliance reports. However, because the NPDES MS4 permit is currently in administrative extension, no changes to the SWMP can be made. Upon permit reissuance (anticipated in 2020), BMPs and their associated measurable goals, and tracking measures may change for consistency with the reissued permit language and requirements. Therefore, BMPs summarized in Appendix A represent the 2012 SWMP as currently implemented.

In addition to the management strategies outlined in the SWMP, the city has conducted additional source control-related activities to address bacteria loading. Such strategies include the following:

1. Required connection to the piped sanitary collection system for city residents.
2. Incentive program for properties outside of city limits to connect to the piped sanitary collection system as part of the Northeast Sewer System Extension.

The incentive program expired in 2013 but the City continues to promote connection to the piped collection system through city-issued financing options.

2.3 Timeline and Schedule

The city's SWMP includes measurable goals and tracking measures for each BMP. These represent the schedule for implementing the TMDL management strategies for bacteria, mercury, and DDT/dieldrin. The table in Appendix A includes the measurable goals and schedules that are currently listed in the city's SWMP for each BMP. As mentioned, these goals have the potential to change for the upcoming permit renewal and on an annual basis through adaptive management.

With respect to TMDLs, the NPDES MS4 permit requires the city to conduct a pollutant load reduction evaluation and develop TMDL benchmarks to show progress toward meeting TMDL WLAs. The city conducted a pollutant load evaluation in 2015 and developed TMDL benchmarks in 2017 to show progress toward meeting TMDL WLAs. The pollutant load reduction evaluation and benchmarks reflect implementation of stormwater controls (structural and non-structural) as documented in the city's SWMP. Results were documented in the city's 2017 permit renewal application. Permit implementation requires adaptive management over time to refine stormwater management efforts with the goal of eventually achieving WLAs.

2.4 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 measurable goals are met. Environmental monitoring relates to the analysis and evaluation of stormwater and in-stream pollutant concentrations with respect to meeting pollutant load reduction benchmarks.

2.4.1 Implementation Monitoring

With respect to implementation monitoring, the city submits NPDES MS4 annual compliance reports to DEQ by November 1 of each year to summarize implementation activities for all BMPs in its NPDES SWMP. Each BMP has a defined measurable goal and tracking measure. Appendix A lists the measurable goals and tracking measures for each BMP for reference.

2.4.2 Environmental Monitoring

The city has been conducting environmental monitoring (e.g., sample collection and analysis) at selected in-stream and stormwater outfall sites in Milwaukie. Environmental monitoring activities are conducted in conjunction with the monitoring requirements listed in the NPDES MS4 permit.

The city is a participant in the Comprehensive Clackamas County Stormwater Monitoring Plan (CCCSMP). The latest version of the CCCSMP was submitted to DEQ in December 2016 and implementation began in July 2017. Under the 2017 CCCSMP, Milwaukie is collecting samples from one in-stream site and one stormwater outfall site. Samples collected from these sites are analyzed for various parameters that include bacteria, nutrients, metals, sediment, and field parameters (e.g., pH, dissolved oxygen, temperature). The city was also required to conduct biological and mercury monitoring, and both of these activities were conducted as part of a coordinated effort with participants of the CCCSMP. Data results from environmental monitoring efforts are included in the NPDES MS4 annual reports.

Section 3

Management Strategies for Nonpoint Sources (LAs)

Designated Management Agencies (DMAs), including the city of Milwaukie, must develop temperature TMDL Implementation Plans to address TMDL exceedances for temperature, as mandated in the Willamette Basin TMDL. These plans must describe how each DMA will conduct efforts to reduce temperature to meet water quality standards.

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 LAs designed to protect and remedy impaired aquatic habitats. Water temperatures in excess of water quality standards make streams unsuitable for cold-water fish and other cold-water 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 (USEPA, 2003). Depending on the life-stage and species, water temperature of less than 18 degrees Celsius (C) is necessary for habitat, and for spawning, water temperature of less than 11 degrees C is needed.

This section describes the city's TMDL Implementation Plan to address temperature. Section 3.1 provides a summary of the LAs and shade curves provided in the Willamette TMDL document. Section 3.2 summarizes previous temperature management strategies, and Section 3.3 provides a summary of the city's proposed temperature management strategies to address the LAs. Section 3.4 outlines the timeline and schedule for implementation, and Section 3.5 summarizes proposed monitoring and reporting.

3.1 TMDL LAs for Temperature

Several factors can contribute to elevated in-stream temperatures such as changes in channel morphology, climate, geographic location, riparian vegetation, dams, reservoirs, and point sources such as industrial wastewater discharges (DEQ, 2006). DEQ has found that the largest contributor to elevated temperature 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 shade curves for four different Level IV ecoregions in the Lower Willamette watershed. The shade curves, along with stream orientation and width, provide a target for percent effective shade and corresponding solar radiation loading (DEQ 2006).

Shade is generally more effective in reducing temperatures for narrower streams (less than 20 feet wide) than wider streams because shadows from trees in the riparian zone will cover a larger

percentage of the water surface. In Milwaukie, Johnson Creek and Kellogg Creek both range from 20 to 40 feet wide. Smaller tributaries (Mt. Scott Creek and the open channel portion of Spring Creek) are less than 20 feet wide. Although a majority of tributaries exceed the 20-foot width, riparian vegetation that casts shade over the streams is still expected to be an effective management strategy. The effectiveness can be projected through the use of the shade curves.

Using Figure 5.69 in Chapter 5 of the Lower Willamette Subbasin in the Willamette TMDL, the primary corresponding ecoregions for the City are the Valley Foothills (applicable specific to the Johnson Creek drainage area) and the Portland/Vancouver Basin (applicable to the Kellogg Creek and Lower Willamette River drainage areas). Figure 3-1 is a graph of the corresponding shade curve for the Valley Foothills ecoregion, and Figure 3-2 is a graph of the corresponding shade curve for the Portland/Vancouver Basin ecoregion, as presented in the Willamette Basin TMDL.

Using this information, the effective shade goal taken from Figure 3-1 for Johnson Creek should range between 80 and 90 percent. This is interpreted to mean that historically prevalent riparian vegetation should block the majority (at least 80 percent) of solar radiation loading from the streams' water surfaces. From Figure 3-2 the effective shade goal for Kellogg Creek should range from 70 to 85 percent. It should be noted that based on these curves, percent effective shade decreases significantly as the width of the channel increases. Because of this, the most effective way to manage temperature in the main stem Willamette River is through its smaller, narrower tributaries. For those tributaries with a width of less than 20 feet, the effective shade goal is between 85 and 95 percent.

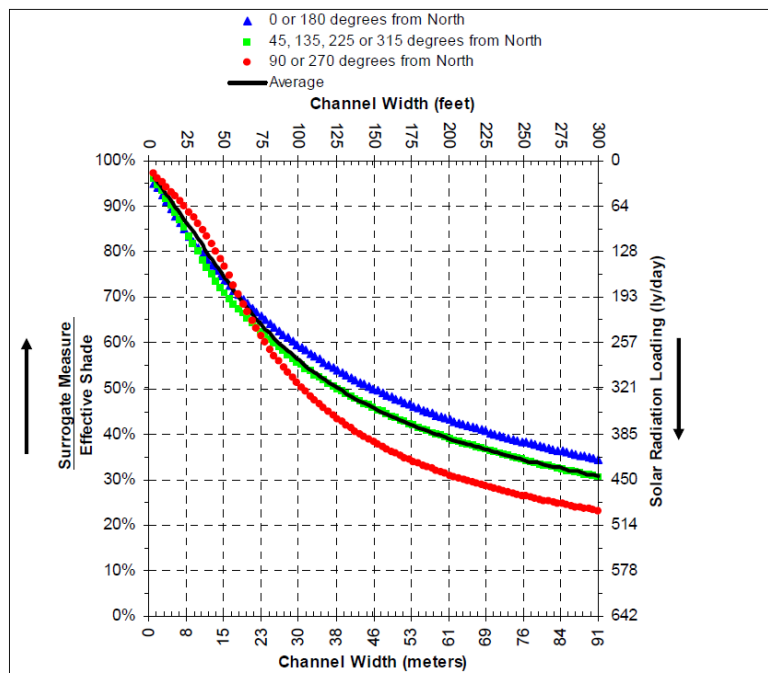


Figure 3-1. Effective shade curve for the city
(Valley Foothill ecoregion)

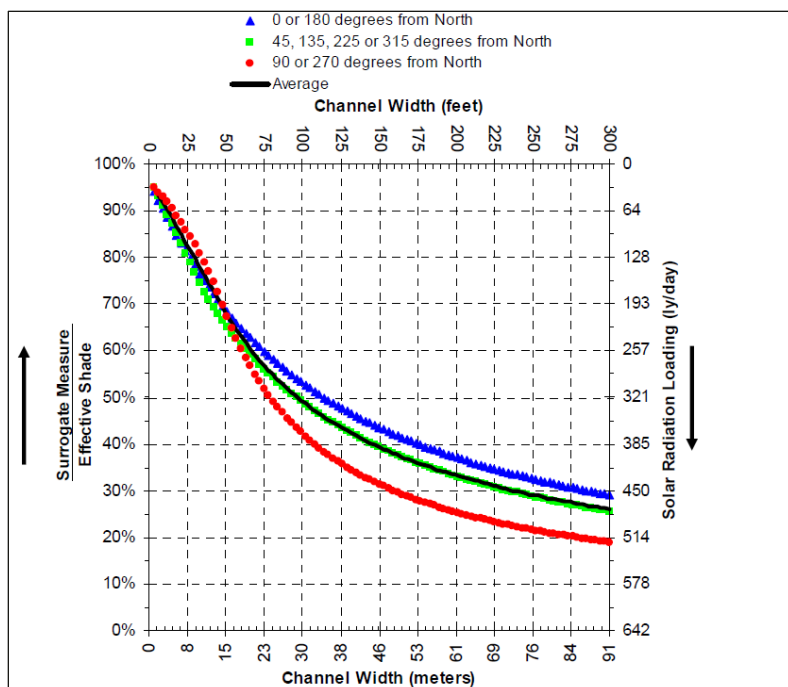


Figure 3-2. Effective shade curve for the city
(Willamette Valley Portland/Vancouver Basin ecoregion)

3.2 Past Management Strategies to Address LAs

Since 2008, temperature management efforts and strategies have included implementation of existing stormwater treatment standards (to encourage infiltration instead of direct discharge of stormwater runoff to surface waters), evaluation of riparian habitat and vegetation coverage, pursuit of a large rehabilitation project (removal of Kellogg Dam) to improve flow conditions and channel hydraulics, implementation of municipal code to address Title 3 and Title 13 requirements (see Appendix C for detail), and public education targeted at vegetation management.

The city implements Titles 3 and 13 requirements through its Comprehensive Plan and Milwaukie Municipal Code (MMC). In August 2011, the City adopted amendments to Chapter 3 of its Comprehensive Plan and amendments to Title 19 – Zoning of its MMC. Specifically, MMC Section 19.402 – Natural Resources originally provided protection of water quality resources under Statewide Land Use Planning Goal 6 and Title 3. Amendment of Section 19.402 now also provides protection for designated natural resources under Statewide Land Use Planning Goal 5 and Title 13. The MMC amendments require water quality resource areas and habitat conservation areas to be established, and they require the city to implement setbacks, vegetated corridors, and mitigation requirements related to the encroachment of development on such areas.

A summary of activities conducted since 2009 related to temperature management strategies are as follows:

- Developed a review process for development activities within natural resource areas and refined the city's stormwater design standards and inspection and enforcement response procedures. (In progress)

- Used a desktop/GIS analysis to conduct a city-wide evaluation of vegetated stream buffers to determine where areas may be enhanced to maximize effective shade for the temperature TMDL. (2018)
- Worked with the Johnson Creek Watershed Council to identify CWR locations. (Ongoing)
- Developed a partnership (MOU) with the Johnson Creek Watershed Council (JCWC) to perform riparian restoration on private lands adjacent to Johnson Creek for no or low cost to the homeowner. (2018)
- Developed a partnership (MOU) with Backyard Habitat Certification Program (BHCP) to restore habitat throughout the whole city including riparian areas. (2018)
- Received the Capstone Project from PSU students looking into Kellogg Dam removal and other options to restore Kellogg Creek to free flowing conditions. (2017,2018)
- Continued work with various groups to look for funding of Kellogg Dam removal. (Ongoing)
- Continued with updates and refinements to the City's Comprehensive Plan and MMC Title 19 related to water quality resource areas, setbacks, and habitat conservation areas. (Ongoing)
- Hosted meetings for the Johnson Creek Inter-Jurisdictional Committee. (Ongoing)
- Existing efforts to improve temperature conditions will continue to be conducted by the City. Refinement of existing strategies is proposed to establish more quantitative tracking measures and performance metrics. (Ongoing)

3.3 Management Strategies to Address LAs

This section describes the strategies that the city will undertake to address temperature over the next 5-year implementation term, including new activities targeted at preserving and enhancing effective shade along creeks and streams in areas within the city limits. Efforts will build on management strategies for temperature that were originally presented in the City's 2008 TMDL Implementation Plan and refined in the city's 2014 TMDL Implementation Plan. Details regarding the proposed strategies are identified in Appendix B.

3.3.1 Riparian Area Management

The Willamette River Basin TMDL defines shade as the surrogate for thermal LAs. Preserving and enhancing riparian vegetation is an important method for reducing stream temperatures.

Riparian management strategies include maintaining and enforcing riparian buffers through implementation of the city's Comprehensive Plan (Chapter 3) and Milwaukie Municipal Code (MMC) Title 19 - Zoning. The city will continue to update and enforce their current code language to maximize shade potential.

The city conducted a city-wide evaluation of vegetated stream buffers in 2017 to determine where areas may be enhanced to maximize effective shade for TMDL water bodies and to promote improvement to water quality including thermal regimes. The city is proposing the following activities to build upon existing efforts to increase and enhance riparian buffers in conjunction with effective shade targets for applicable tributaries:

- Annually review the city's Comprehensive Plan with respect to protection of natural areas. Provide updates as deemed necessary.
- Utilize information/work from the Urban Forestry Management Plan, the desktop/GIS analysis and the Branch Out Milwaukie Map tool (2019) to identify percentage of canopy in priority sites for additional riparian forest and understory plantings with local watershed councils and not-for-profit groups (Johnson Creek Watershed Council, NCUWC and BHCP). Prioritize plantings at CWR sites where applicable.
- Maintain and develop partnerships with watershed councils and not-for-profit groups with defined interest in Johnson Creek, Kellogg Creek, and other tributaries within the city limits. Create and implement memorandum of understanding (MOU) with the North Clackamas Urban Watershed Council (NCUWC). Support partnerships through staff participation efforts and financial contributions as applicable.
- Provide funding as an incentive to promote riparian habitat restoration on private lands through JCWC, BHCP, and NCUWC. (Ongoing)

3.3.2 Kellogg Dam Removal

The Kellogg Dam removal project was initiated in 2010 following receipt of a Metropolitan Transportation Improvement Program grant of \$1 million to conduct an engineering and environmental assessment of the removal of the Kellogg Dam (on Kellogg Creek at Highway 99E). This project could lower water temperature in Kellogg Creek as the lake reverts to a stream, and would provide CWR at the Kellogg Creek confluence with the Willamette River. The city has been coordinating with a restoration firm to determine how this project could be applied in the realm of water quality trading and mitigation banking.

The city continues to make progress towards this effort but has not established specific measurable goals and tracking measures, due to the unknown schedule of the project pending funding identification. The city utilizes information as available to inform this effort, such as the Capstone Project (Portland State University 2017-2018) and networking with various groups. The city anticipates continued progress on this effort.

3.3.3 Design Standards for New Development and Redevelopment

Although shade is the surrogate measure defined by DEQ to address the temperature TMDL, implementation of the city's stormwater design standards and surface water code can also promote the reduction in surface water temperatures. This occurs through requirements for the installation of stormwater treatment facilities that use infiltration.

As development occurs, increases in impervious areas can decrease the natural pre-development levels of groundwater recharge. Because less water infiltrates into the ground, less groundwater recharge occurs. This can result in a reduction of summer stream base flows, which in turn results in higher temperatures due to unnaturally shallow base-flow conditions. By using structural stormwater treatment facilities during development that promote the infiltration of runoff, groundwater recharge is increased, thus augmenting stream flow during the warmer dry season and reducing temperature impacts.

The city's NPDES MS4 permit required an update to post-construction stormwater management standards by November 1, 2014, to prioritize low impact development and infiltration. The city continues to make updates and refinements to their standards. The city references the City of Portland's Stormwater Management Manual (SWMM) for stormwater treatment facility selection and design. Implementation of the SWMM prioritizes LID principles that promote infiltration.

3.3.4 Public Awareness and Education

A number of public education efforts and campaigns are implemented in conjunction with the city's NPDES MS4 permit (see Appendix A).

As part of this Plan, targeted public education efforts will focus on stewardship and enhancement of riparian buffers and vegetated corridors on private property. Educational information will be promoted through city mailings, media campaigns, staff participation in public schools, and other regional programs. A minimum of four temperature related articles will be published annually across standard medias.

3.3.5 Environmental Monitoring

As described in Section 2.4, the city is conducting environmental monitoring under its NPDES MS4 permit and 2017 CCCSMP. Water quality samples are currently collected from one in-stream site and one stormwater outfall site, and the samples collected from these sites are analyzed for various parameters including temperature.

Additionally, the city coordinates with USGS (and other jurisdictions) to maintain a continuous sampler on Johnson Creek that includes temperature measurements.

The city will continue collecting stream temperature samples throughout the duration of its NPDES MS4 permit term. Water quality sampling is conducted by the city using grab sampling techniques. Provided that the coordinated USGS study effort is funded by all parties, the city will continue to participate.

3.4 Timeline and Schedule

This Plan remains effective until such time DEQ approves an updated plan.

Specific to the management strategies reported in Section 3.3, Appendix B summarizes measurable goals and tracking measures for each activity. The tracking measures reflect the timeframe and schedule for implementing the specific strategies.

3.5 Monitoring and Reporting

The 2006 TMDL Guidance Document requires the DMA to submit two types of reports to DEQ on a regular basis, a progress report and an implementation plan review report.

The progress report is submitted to DEQ on an annual basis and provides information related to implementation of identified management strategies, as described in Section 3.3. To consolidate reporting requirements, DEQ allows the TMDL Implementation Plan annual progress report to be submitted with the NPDES MS4 annual report. Such annual reports are due November 1 of each

year, reflecting implementation of activities over the previous fiscal year (July 1 to June 30). The city has submitted its TMDL Implementation Plan annual progress reports consistent with this process since 2010. Appendix B was formatted in a manner that is consistent with how the TMDL Implementation Plan progress reports will be submitted in the future and includes measurable goals and tracking measures for purposes of monitoring progress. For the 2018 reporting year, the annual report was replaced with an online survey from DEQ.

Every 5 years, the city is required to review the TMDL Implementation Plan to assess progress towards meeting goals and to propose changes to the management strategies as appropriate. This Plan reflects the second TMDL Implementation Plan update. It is based on review of existing data and activities relative to pollutant reduction goals. Existing strategies have been refined to reflect progress made over the last 10 years. New strategies have been refined to continue to address in-stream temperature.

Section 4

Evidence of Compliance with Applicable Land Use Requirements

Oregon Administrative Rules (OAR) 340-042-0080(3) (a) (D) define 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 consists of the following:

- Identify applicable acknowledged local comprehensive plan provisions and land use regulations.
- 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.

The city's Comprehensive Plan was adopted in 1989 and is updated regularly to comply with Statewide Planning Goals. Most recent amendments to Chapter 3 (Environmental and Natural Resources) were completed in 2011 to comply with Statewide Planning Goals 5 and 6 and Titles 3 and 13 of Metro's Urban Growth Management Functional Plan (UGMFP). The Comprehensive Plan is in the process of being updated again for 2019. The Comprehensive Plan supports the general goals, policies, and action measures that relate to improving the quality of Milwaukie's ground and surface water. These include the preservation of natural habitats and vegetation by "protecting and enhancing major drainageways, springs, existing wetlands, riparian areas, water bodies, and significant tree and vegetative cover..." (Comprehensive Plan Chapter 3, Objective #2).

Two chapters from the Comprehensive Plan are most pertinent to the TMDL Implementation Plan. These are Chapter 3 – Environmental and Natural Resources, and Chapter 4 – Land Use. Measurable goals documented for riparian area management are consistent with the policies listed in Chapter 3 (Objective #2) of the Comprehensive Plan.

In conjunction with the 2011 Comprehensive Plan amendments, the MMC Section 19.402 – Natural Resources was updated to designate habitat conservation areas to implement Title 13 of the UGMFP and Statewide Planning Goal 5. The regulations compliment and support long held city policies for the environmental protection for natural resources identified for the purposes of implementing Title 3 of the UGMFP and Statewide Planning Goal 6. The amendment includes updated provisions related to setbacks, mitigation, and development requirements if development contains or falls within 100 feet of a water quality resource area or habitat conservation area.

Section 5

Additional Requirements

The fifth component of TMDL Implementation Plans required by Oregon Administrative Rules 340-042-0025 is “any other analyses or information as specified in the Water Quality Management Plan (WQMP).” The WQMP for the Willamette Basin TMDL requires a fiscal analysis, a summary of legal authority, public involvement and requires that cold water refugia (CWR) to be addressed for DMAs below river mile 50 of the Willamette River main stem. 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. The city currently operates under an NPDES MS4 permit that has ordinances for illicit discharges, erosion control, and post-construction site runoff, as necessary to implement the BMPs outlined within it, and also to implement the management strategies described in Section 2 to address bacteria, mercury, and suspended sediment (as a surrogate for DDT/dieldrin).

The city also has ordinances to implement Titles 3 and 13 requirements, specifically Ordinance 2036 which amends the Comprehensive Plan and MMC Title 19 (Section 19.402 – Natural Resources) to address the Statewide Planning Goals. This ordinance and code provisions pertain to the management strategies proposed to address the temperature TMDL (Section 3).

5.2 Funding

The city receives funds from stormwater utility rates. These funds provide funding for NPDES MS4 permit requirements and some capital improvement projects. However, these funds are unable to cover all of the needed budget.

Select management strategies associated with increasing existing shade and riparian habitat quality require identification and development of a funding source for ongoing implementation (i.e., development of an incentive program for private property owners, targeted planting activities). During this 5-year TMDL implementation period, long-term funding options for these activities will be investigated.

Historically, the city has also leveraged grant funding to help promote implementation of activities specifically related to temperature management (i.e., Kellogg Dam removal). Utilization of the available grant funds are tied directly to the applicable project, although grants continue to be pursued as a possible funding source.

In the past five years, the city has spent approximately \$6,000,000 on capital improvement projects. In the forecasted five years, the city plans to spend about \$12,000,000 on stormwater capital projects. Although not all stormwater capital improvement projects directly involve shade

components, they offer benefits to stormwater which can have benefits to receiving streams. In addition, in the last two years, the city has started partnering with Johnson Creek Watershed Council, Clackamas Watershed Council and Backyard Habitat Certification Program. As of now, each group is given \$7,500 per year. These are standard funds with the option to reduce or add to as needed. These groups specifically deal with plantings on private property. The majority of riparian areas found within the city are on private properties. These can have a direct benefit to temperature by adding to tree canopy and shading on local creeks.

5.3 Cold Water Refugia

Per the WQMP, the TMDL Implementation Plans for areas below river mile 50 of the Willamette River main stem “shall look at identifying existing CWR and provide options for protecting or enhancing such areas.” 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). Alteration to river channel structure including removal or lack of large woody debris and modifications to deep pools and overhanging bank areas can reduce the presence of cold water refugia. McIntosh et. al. (1998), in its study of CWR in the Klamath Basin using forward-looking infrared technology, conclude that areas of CWR appeared to be at a junction where tributaries meet. In conjunction with this assessment, per management strategies outlined in Section 3.3, junction locations that may provide CWR will be prioritized for riparian enhancement or restoration activities.

Two locations specified within the city limits of Milwaukie for CWR are at the mouths of Johnson and Kellogg Creeks. Work in the past includes woody debris project at the mouth of Johnson Creek in 2011. The city also participates in the Interjurisdictional Committee for Johnson Creek to work with other local agencies to protect Johnson Creek. The city continues movement towards removing Kellogg Dam, including a Portland State University Capstone project in 2017/2018, to return Kellogg Lake back to Kellogg Creek. The City of Milwaukie is involved in various vegetation projects through riparian requirements for construction projects and partnerships with funding the Johnson Creek Watershed, North Clackamas Watershed and Backyard Habitat Certification Program within the city to help shade these creeks and their smaller tributaries.

The city has looked at aerial imaging through GIS to record vegetation percentage along streams within the city limits of Milwaukie. The city will continue to monitor over a period of many years to monitor changes in streamside vegetation.

5.4 Public Involvement

The city addresses public involvement for management strategies described in Section 2 in conjunction with its NPDES MS4 permit requirements.

Public involvement will be provided for this Plan (and associated management strategies highlighted in Section 3.3) through use of the city’s website. The Plan will be posted on the city’s

website, available for public review, for a minimum of 7 days. Comments will be received, logged, and considered by city staff.



Section 6

Limitations

This document was prepared solely for the city in accordance with professional standards at the time the services were performed and in accordance with the contract between the city and Brown and Caldwell dated July 8, 2016. This document is governed by the specific scope of work authorized by the city; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the city and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Section 7

References

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Appendix A: SWMP Implementation Activities

Table A-1. Milwaukie (City) Implementation Activities

Program element	BMP name	Addresses bacteria?	Addresses DDT/dieldrin (via sediment management)?	Addresses mercury?	Responsible City Division/Department	Measurable goals (2012 SWMP)	Annual tracking measures
Illicit Discharge Detection and Elimination	Implement the Illicit Discharge Elimination Program	●	●	●	City of Milwaukie Public Works Department	<ol style="list-style-type: none"> 1. Document and implement the details of the City's IDDE program in a Standard Operating Procedures manual by November 1, 2012. 2. For identified illicit discharges, conduct appropriate actions to remove the discharge in conjunction with time frames outlined in the City's MS4 NPDES Permit and procedures documented in the City's IDDE SOP. 3. Track and record all identified illicit discharges and how such discharges were removed. 	<ol style="list-style-type: none"> 1) Track the status of completing the IDDE SOP manual. 2) Track the number, location, resolution and enforcement activities related to any identified illicit discharge.
	Conduct Annual Dry Weather Field Screening	○	○	○	City of Milwaukie Public Works Department	<ol style="list-style-type: none"> 4. Conduct annual dry-weather illicit discharge inspections for all priority outfalls. 5. Conduct investigations on all suspected non-permissible discharges. 6. Develop pollutant parameter action levels to assist in the identification of non-permissible discharges by November 1, 2012. 7. Annually maintain a map of dry weather screening priority locations (i.e., priority outfalls). 	<ol style="list-style-type: none"> 1) Track the number and location of high priority outfalls inspected during dry weather illicit discharge inspection activities. 2) Summarize inspection results and indicate outfalls requiring sampling and/or investigations. 3) Indicate the outcome and resolution of any investigation activities conducted.
	Implement the Spill Response Program	○	○	○	Clackamas Fire District #1 (Hazardous Materials Team) and Milwaukie Public Works Department	<ol style="list-style-type: none"> 8. Respond to all reported non-hazardous material spills. 9. Equip all Public Works vehicles with spill response equipment, the Spill and Illicit Discharge Investigation Form, and spill response procedures continuously during the permit term. 	<ol style="list-style-type: none"> 1) Indicate the number of spills reported to the Public Works Department. 2) Indicate the number of spills responded to by the Public Works Department. 3) Indicate sources, causes, and resulting types of discharges resulting from spill activities.
	Minimize Water Quality Impacts Related to Water Line Flushing				City of Milwaukie Public Works Department	<ol style="list-style-type: none"> 10. When chlorinated water is discharged to the City's stormwater distribution system, the City tests the chlorine residual at all entry points to the storm sewer for a maximum allowable concentration of 0.10 PPM. 11. Requirements for chlorination/DE chlorination are discussed at all pre-construction meetings and requirements are referenced in applicable contract documents. 	<ol style="list-style-type: none"> 1) Chlorine test data is tracked in monitoring sampling logs and daily logs and data is kept on file at City.
Industrial and Commercial Facilities	Screen Existing and New Industrial Facilities				City of Milwaukie Public Works Department	<ol style="list-style-type: none"> 12. Review the business license inventory and new industrial development applications once during the permit term to identify additional facilities needing to obtain 1200-Z permits. If facilities are identified, DEQ and the facility will be notified within 30 days. 	<ol style="list-style-type: none"> 1) Track the number of existing or new facilities subject to a stormwater industrial NPDES permit once during the permit term.

Key to pollutant symbols: A full circle (●) indicates the BMP is expected to address the parameter. An empty circle (○) indicates the BMP may be expected to address the parameter. A blank cell indicates that the effect of the BMP is unknown at this time.

Table A-1. Milwaukee (City) Implementation Activities							
Program element	BMP name	Addresses bacteria?	Addresses DDT/dieldrin (via sediment management)?	Addresses mercury?	Responsible City Division/Department	Measurable goals (2012 SWMP)	Annual tracking measures
	Conduct Industrial and Commercial Inspections	○	○	○	City of Milwaukee Public Works Department	13. Inspect all facilities with 1200-Z permits two times per permit term. Inspect all commercial and industrial food service facilities required to install grease traps or grease interceptors in accordance with the City's FOG program at a minimum of semi-annually during the permit term. 14. Inspect any other high priority facilities if identified as potentially contributing a significant pollutant load. 15. Keep an inventory of all 1200-Z permitted industrial facilities within permit area and update it annually. Require abatement measures for any industry found to be inappropriately discharging to the municipal stormwater system. 16. Develop an SOP for high priority facility inspections and implementation of strategies by July 1, 2013. 17. Develop an SOP for the FOG inspection program by July 1, 2013.	1) Track the number of permitted (1200-Z) industrial facilities within the City. 2) Track the number of industrial and FOG inspections conducted. 3) Note any water quality concerns identified during inspections. 4) Report status and abatement measures required for any industry or food service facility found to be inappropriately discharging to the municipal stormwater system.
Construction Site Runoff Control	Implement Erosion Control for New and Redevelopment	●	●	●	City of Milwaukee Public Works and Engineering Departments	18. Require structural and non-structural erosion and sediment control BMPs for all construction sites disturbing an area greater than 500 ft ² . 19. Require sites disturbing over 500 ft ² to acquire an erosion control permit prior to issuing them a plumbing and electrical permit. 20. Conduct site plan reviews for applicable new and re-development to ensure compliance with the City's erosion control standards.	1) Report any updates or modifications to the "Erosion Prevention and Sediment Control Planning and Design Manual (2008)". 2) Record the number of erosion control plan reviews completed and approved.
	Provide Educational Information to Construction Site Operators	○	○	○	City of Milwaukee Public Works Department	21. Coordinate with other jurisdictions to provide Erosion Control Certification programs at the Clackamas Community College. 22. Give discounts on erosion control permit fees to contractors participating in the Erosion Control Certification Program.	1) Track the number of contractors receiving a discount on erosion control permit fees. 2) Track number of program sessions and refresher courses offered each year.
	Conduct Erosion Control Inspections	●	●	●	City of Milwaukee Public Works Department	23. Inspect all sites disturbing over 500 ft ² at least twice during construction activities. 24. Issue erosion control violations when ineffective erosion control is observed. 25. Issue stop work orders or fines if erosion control violations are not resolved. Timelines for corrections at construction sites are indicated on the inspection report given to the permit holder. Depending on the infraction, the timeline for correction could be 24, 48, 72 hours or other.	1) Record the number of erosion control inspections conducted annually. 2) Report the number of written notices of non-compliance issued during inspections and the number of stop work orders issued annually.
Education and Outreach	Provide Public Education and Outreach Materials Regarding Stormwater Management	○	○	○	City of Milwaukee Public Works Department	26. Promote public awareness of water quality issues through newsletters, brochures, and/or bill inserts. A minimum of one distribution of educational materials will be conducted annually. 27. Send an annual stormwater brochure to City residents. 28. Conduct annual catch basin stenciling.	1) Track the number, types, and topics of public educational materials dispersed to the public annually. 2) Indicate any large-scale public educational campaigns initiated during a given year. 3) Track coordinated public outreach activities with local co-permittees. 4) Record the number of catch basins stenciled in a given year. 5) Record the number of storm manhole lids that have been retrofitted annually.
	Participate in a Public Education Effectiveness Evaluation	○	○	○	City of Milwaukee Public Works Department	29. Coordinate with other local, Phase 1 jurisdictions in providing/compiling information regarding a public education effectiveness evaluation by July 1, 2015. During permit year one, interested Phase 1 jurisdiction will meet to develop an initial coordinated strategy. Depending on the developed strategy, implementation of the strategy will occur during subsequent years of the permit term. Results of the effectiveness evaluation will be documented during the final year of the permit term.	1) Report on activities conducted annually.

Key to pollutant symbols: A full circle (●) indicates the BMP is expected to address the parameter. An empty circle (○) indicates the BMP may be expected to address the parameter. A blank cell indicates that the effect of the BMP is unknown at this time.

Table A-1. Milwaukie (City) Implementation Activities							
Program element	BMP name	Addresses bacteria?	Addresses DDT/dieldrin (via sediment management)?	Addresses mercury?	Responsible City Division/Department	Measurable goals (2012 SWMP)	Annual tracking measures
	Conduct Annual Staff Training	○	○	○	City of Milwaukie Public Works and Engineering Departments	30. Provide City Storm crews with approximately 40 hours of stormwater related training per year. 31. Continue to train all operations and maintenance staff involved with stormwater activities. 32. Conduct regular stormwater staff meetings one to four times per year.	1) Track the hours of stormwater related training provided to City Storm crews each year. 2) Track number and responsibilities of staff participating in training each year. 3) Track regular stormwater staff meetings.
Public Involvement and Participation	Provide for Public Participation with Submittals				City of Milwaukie Public Works Department	33. Provide a minimum 30-day public comment period for the updated SWMP elements and pollutant load reduction benchmarks prior to the permit renewal application deadline. 34. Provide a public comment period for the updated monitoring plan and annual reports prior to submittal to DEQ.	N/A
	Participate in Intergovernmental Coordination Efforts	○	○	○	City of Milwaukie Public Works and Engineering Departments	35. Annually coordinate with other Clackamas County co-permittees regarding regional water quality efforts. 36. Annually participate with local agencies involved in water quality issues.	1) Indicate groups, committees, and organizations with which the City is currently participating.
Post-Construction Site Runoff	Implement Municipal Development Codes	●	●	●	City of Milwaukie Engineering Department	37. Until completion of the City's review and possible update of their applicable code and development standards to meet provisions of the City's NPDES permit, continue to review all new and re-development plans for conformance with the City's Development Standards including design standards for water quality facilities. 38. By November 1, 2014, review and revise if necessary, the City's design storm and inspection and enforcement response procedures to be in accordance with permit requirements.	1) Track the number of development applications reviewed and approved for compliance with the stormwater regulations. 2) Track status of the design storm reviews. Note: The number and type of water quality facilities constructed/implemented to address these requirements will be tracked and mapped under Element 8: BMP Private Water Quality Facility Maintenance Program.
Pollution Prevention for Municipal Operations	Conduct Street Sweeping and Roadway Repair Activities	●	●	●	City of Milwaukie Public Works Department	39. Sweep curbed streets once per month. 40. Sweep roads promptly after icy conditions recede to remove fine gravel used for de-icing. 41. Schedule and conduct routine road repair and maintenance as needed, during the dry-weather conditions if possible.	1) Track the number of miles swept per year. 2) Track the volume of debris removed during sweeping activities.
	Minimize Water Quality Impacts Associated with Landscape Management Practices	○	○	○	City of Milwaukie Public Works Department and Clackamas County Parks Department	42. Require all chemical applicators (both City employees and City contractors) to be licensed and certified. 43. Use the Portland Integrated Pest Management (IPM) Program as a guide for appropriate pesticide and fertilizer application procedures along roadways, within public rights-of-way, and around water quality facilities.	1) Track any policy and/or procedural changes associated with pest management activities within the City. 2) Track current number of staff licensed and certified for chemical application.
	Implement a Program to Reduce the Impact of Stormwater Runoff from Municipal Facilities	○	○	○	City of Milwaukie Public Works and Engineering Department	44. Develop procedures for storage and disposal of street wastes in conjunction with operation of the covered, on-site Decant Facility. Such procedures shall be finalized by the beginning of the Decant Facility operation and implemented within 6 months thereafter.	N/A
	Control Infiltration and Cross Connections to the Stormwater Conveyance System	●			City of Milwaukie Public Works and Engineering Department	45. Investigate sanitary lines for damage every five to six years. 46. Inspect for cross-connections during annual dry weather outfall inspections and remove any discovered cross connections. 47. Review all new and re-development plans associated with new building permits for possible cross-connections; eliminate them upon discovery.	1) Indicate whether any cross-connections were discovered during illicit discharge investigations, and describe follow-up activities.

Key to pollutant symbols: A full circle (●) indicates the BMP is expected to address the parameter. An empty circle (○) indicates the BMP may be expected to address the parameter. A blank cell indicates that the effect of the BMP is unknown at this time.

Table A-1. Milwaukie (City) Implementation Activities							
Program element	BMP name	Addresses bacteria?	Addresses DDT/dieldrin (via sediment management)?	Addresses mercury?	Responsible City Division/Department	Measurable goals (2012 SWMP)	Annual tracking measures
	Implement Master Plan Capital Improvement Projects for Stormwater Quality Improvement	●	●	●	City of Milwaukie Public Works and Engineering Department	48. Annually contribute to the reserve fund for future CIP design and construction. 49. Review the CIP list and update as necessary each year.	1) Track the number of CIP projects implemented each year and discuss the added benefit (water quality, habitat restoration, etc.) of each project. 2) Map the location and drainage area of CIPs. 3) Track the amount contributed to the CIP reserve fund each year. 4) Track changes to the CIP list.
Stormwater Management Facilities Operation and Maintenance	Conduct Stormwater Conveyance System Cleaning and Maintenance	●	●	●	City of Milwaukie Public Works Department	50. Inspect stormwater conveyance system components (i.e., manholes, culverts and ditches) every two years and perform maintenance based on inspection results. 51. Perform ditch maintenance activities through an IGA between Clackamas County and the City based on inspection results.	1) Track percent of conveyance system inspected each year. 2) Estimate the volume of debris removed during conveyance system cleaning activities. 3) Track the conveyance system repair efforts conducted.
	Conduct Catch Basin Cleaning and Maintenance	●	●	●	City of Milwaukie Public Works Department	52. Clean 50% of public catch basins each year. 53. Schedule repair or replacement of catch basins based on inspection results.	1) Track the percent of total public catch basins cleaned per year. 2) Track the volume of debris removed during cleaning activities.
	Private Water Quality Facility Maintenance Program	●	●	●	City of Milwaukie Public Works Department	54. Develop procedures to guide the private facility maintenance program by July 1, 2013.	1) Track the number of onsite private stormwater quality facility inspections conducted annually.
	Public Structural Control Facility Cleaning and Maintenance	●	●	●	City of Milwaukie Public Works Department	55. Inspect and maintain public water quality facilities annually.	1) Track the percent of total structural facilities inspected and maintained each year. 2) Track the volume of debris removed during cleaning activities.

Appendix B: Temperature Management Strategies

Table B-1. Management Strategies for Temperature Reduction					
BMP or Activity	Commitment/Implementation Strategy	Measurable Goal(s)	Implementation Tracking/Performance Measure	Lead Department/Division	Budget
Riparian Area Management	Promote preservation, restoration, and enhancement of riparian and instream habitat on public and private lands.	Continue to implement Milwaukie Municipal Code (MMC) Section 19.402 – Natural Resources and Comprehensive Plan Chapter 3 to address Title 3 and Title 13 requirements relative to designated water quality resource areas (including vegetated corridors) and habitat conservation areas (HCA) that may provide effective shade for surface waters.	56. Annually track any changes to ordinances applicable to the MMC and Comprehensive Plan related to Title 3/13 compliance.	Planning	\$3,500.00
		Annually review current Comprehensive Plan with respect to development in a natural resource area.	57. Annually document changes as relevant.	Planning	\$2,000.00
		Utilize results from the UFMP, tree canopy percentages from the Branch out Milwaukie tool, and the previously initiated desktop analysis/GIS analysis to continue to identify and prioritize riparian areas and vegetated stream buffers for vegetation enhancement.	58. Annually track efforts to map and prioritize shade opportunity areas. 59. As applicable, document planting activities on public properties. 60. Create a map of priority riparian area for streamside planting and restoration activities by June 30, 2021.	Public Works	\$300.00
		Partner with watershed councils (e.g., Johnson Creek Watershed Council) in support of riparian planting projects. Partnership may include in-kind staff participation on governing boards, technical/ permitting support for sponsored projects within the City, or financial contributions.	61. Annually document partnership efforts.	Public Works	\$300.00
		Provide funding as a potential incentive to promote riparian habitat restoration efforts on private property.	62. As applicable, track efforts to provide funding to improve riparian habitat on private property.	Public Works	\$112,500.00
Training	Build knowledge of TMDL strategies.	Attend relevant trainings pertaining to TMDL development.	63. Document in annual report any related trainings.	PW, Planning, Engineering	\$0.00
Kellogg Creek Dam Removal	Continue efforts to remove Kellogg Creek Dam, return Kellogg Lake to a stream condition, and revegetate the affected area.	Continue coordinating with partners in pursuit of the Kellogg Creek Dam Removal project	64. Annually track progress on the project.	Assistant City Manager	\$3,000.00
Implement Stormwater Design Standards	Continue implementation and refinement of the City's stormwater design standards, which include provisions to prioritize use of infiltration-based stormwater treatment.	Annually review stormwater design standards and as needed include additional guidance for stormwater treatment promoting infiltration practices.	65. As applicable, document changes to stormwater design standards.	Engineering	\$2,000.00
Public Awareness and Education	Continue to provide articles regarding temperature related issues and shade preservation efforts in the City newsletter and direct mailings.	Distribute four articles annually on temperature issues and management approaches. Promote regional programs targeted at improving habitat on private property. Continually distribute information regarding regional programs in City outlets.	66. Annually track the number and content of temperature – related articles, commercials/ advertisements, or notices distributed to City residents.	Public Works	\$1,600.00
Cold Water Enhancement and Protection	Protect Johnson and Kellogg Creeks, and their tributaries upstream of mouths.	Continue existing work to protect riparian and wetland areas. Explore options to better provide protection.	67. Annually track progress on these efforts.	Planning	\$600.00
Environmental Monitoring	Monitor temperature in surface waters to document status and evaluate trends with respect to water quality standards.	In conjunction with NPDES MS4 requirements and the CCCSMP, conduct sampling for temperature at required instream monitoring locations. To the extent that an intergovernmental agreement is maintained by all parties, continue participation with USGS on their continuous monitoring efforts on Johnson Creek.	68. As applicable, annually report any modification to existing temperature monitoring activities. 69. As applicable, annually confirm existing agreements and track new efforts to coordinate with other Clackamas co-permittees, existing cost-share partners, and the USGS to maintain the Johnson Creek USGS stream gauge.	Public Works	\$59,000.00
Efficiency tracking	Show effectiveness in nonpoint source control.	Develop process to monitor success/ effectiveness of minimizing nonpoint source pollution by June 30, 2025.	70. Document progress and efficiency of process in annual report.	Public Works	\$1,600.00

Appendix C: Summary of Title 3/Title 13 Requirements

Appendix C

Metro Title 3 and Title 13 Summary

Metro Title 3

Title 3, specifically the Title 3 model ordinance, was developed 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 on the following page and summarizes the vegetated buffer widths for protected water features.

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

- 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;
- Demonstrate that existing city and county comprehensive plans and ordinances already substantially comply with the performance standards and the intent of Title 3; or
- 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).

Title 13

The Title 13 model ordinance was also created by Metro in 2006. However, it was created to provide clear objective standards and a discretionary review process for implementation of Oregon Statewide Land Use Goal 5. Goal 5 is focused on the protection of natural resources and open space. The purpose of Title 13 is to provide guidelines in order for local jurisdictions to 1) conserve, protect, and restore a continuous ecologically viable streamside corridor that is integrated with upland wildlife habitat, and 2) control and prevent water pollution in order to protect public health and improve the region's water quality.

Title 13 focuses on regulating development that would affect riparian or upland wildlife habitat, as documented on the Habitat Conservation Area (HCA) map that Metro has produced. The HCA map was created by Metro and was intended for adoption by local jurisdictions in the same manner as the Water Quality and Flood Management Areas map developed for Title 3 compliance. HCA priority levels (high, medium, and low) were assigned to areas by cross-referencing habitat classifications (e.g., Class I and Class II Riparian and Class A and Class B Upland Wildlife) and urban development values.

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

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

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

³ Where 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).

⁴ A 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).

⁵ Vegetated 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.

[Ord. 98-730C, Sec. 1.]

Figure C-3. Title 3 (Table 3.07-3) - required width of vegetated corridor

New development restrictions differ depending on the HCA priority level as well as zoning type.

Cities and counties are given three alternatives for implementation of Title 13:

1. Adopt Title 13 model ordinance and map;
 - Demonstrate that the existing or amended comprehensive plan and ordinances “substantially” comply with the title, and existing or adopted maps also comply with Metro’s HCA map; or
 - Demonstrate that an alternative program with comparable protection and restoration results has been implemented.

Several exemptions are allowed for various reasons and are outlined specifically in the title. In essence, Title 13 promotes vegetative buffers around water bodies for protection of wildlife habitat through the preservation and improvement of designated habitat conservation areas. Title 13 and its corresponding model ordinance describe specific design and construction practices to minimize impacts on wildlife corridors and fish passage. Performance and implementation objectives and measurable targets are outlined in the title, specifically related to design and construction practices that would be employed.

Metro monitors the region’s progress toward implementation of Title 13, and cities and counties are required to submit progress reports on their efforts (Metro 2005).

Title 3 and Title 13 Comparison

Both Title 3 and Title 13 promote the protection of vegetative buffers around water bodies. The goal for Title 3 is to protect water quality and flood areas while Title 13 aims to protect and improve riparian and wildlife habitat. Because Title 3 and Title 13 have different goals, the methods for implementation and performance standards are not identical. Title 13 is more specific than Title 3 in that it has specific numerical targets. However, Title 13 also enables the cities to use their own discretion when defining the protective buffer areas by evaluating the economic effects (urban development values), which is not a component of Title 3 (Metro 1998 and Metro 2

Appendix D: Map of Milwaukie City Limits and Streams

