

Surface Water Management Background Report

Introduction

This Surface Water Management background paper is a part of *We Love Lake Oswego: Planning for People, Places and Prosperity*, a multi-year effort to guide the physical, economic, social, cultural and environmental development of Lake Oswego in the next 20 years.

This report addresses two Statewide Planning Goals; Stormwater Management (Goal 11, Section 2 of) and Water Quality Resources (Goal 6, Section 2). The 1994 Comprehensive Plan has goals and policies for each statewide planning goal. This update has combined both goals into one overarching goal Surface Water Management since they are inter-related and are addressed through the City's Clean Streams Plan which serves as the Surface Water Management Master Plan.

Additionally, how the City manages natural resources has a direct impact on surface water. Ideally these topics would be discussed together, however due to the numerous topics covered in each action area, the topics that are included in the Public Facilities Plan are addressed in Community Health and Safety. The Healthy Ecosystems Action Area addresses natural resources, however the importance that natural resources management plays on surface water management are referenced in this background report.

Existing Goals

Statewide Planning Goal 11:

To plan and develop a timely, orderly and efficient arrangement of public facilities and services as a framework for urban and rural development.

The City of Lake Oswego's 1994 Existing Comprehensive Plan Goal 11, Section 2:

The City shall reduce stormwater problems, which cause flooding, erosion, and water quality problems.

Statewide Planning Goal 6:

To maintain and improve the quality of the air, water and land resources of the state.

The City of Lake Oswego's 1994 Existing Comprehensive Plan Goal 6, Section 2:

The City shall: reduce water pollution and ensure that future land use activities protect and enhance are water quality, and; protect and enhance the functions and values of the natural ground and surface water drainage systems.

What We've Heard

Vision and Values Survey 2010 (830 responses)

When asked "What three factors do you believe will contribute most to improving the community's health over the next 25 years?" "Reduce the amount of chemicals entering our air and water" received the 3rd highest response (43%).

October 2010 Workshops (114 attendees)

Small group discussions addressed the following question:

All surface water runoff in the city- including pollutants from septic systems and storm water outfalls, chemicals from lawns, oil from roads and animal waste-eventually it way into the Willamette River, Tualatin and Oswego Lake. What can be done to improve the quality of our water?

Themes that emerged from discussion groups:

- Increase awareness and incentives to construct bioswales in parking lots and streets, have rebates for eco-roof and disconnecting downspouts, encourage native landscapes, create buffer zones on lakes and streams.
- Manage stormwater on site or pay a fee.
- Restrict the use of pesticides
- Integrate the use of natural systems to manage stormwater
- Educate and incentivize

During August & September of 2013 a survey was posted on-line in conjunction with the Community Health & Safety and Healthy Ecosystems Fair. The questions and responses tied to Surface Water Management are as follows:

1B. What concerns you about the <i>future</i> of Lake Oswego's natural environment? (multiple choice, more than one answer allowed)	
Total number of people that answered this question 223	
Selection	Percentage
Spread of invasive species	63%
Other	52%
Reduced water quality in streams rivers and Oswego Lake	42%
Development of rural land	42%
Use of pesticides herbicides and other chemicals	42%
Increased impervious surface area (e.g. driveways buildings parking lots)	38%
Loss of tree canopy	27%
Not enough open space protection	26%
Reduced air quality	18%
Not enough fish and wildlife protection	17%
None of the above	9%
<i>Note: the total percentages add up to more than 100 due to multiple responses allowed per participant. Percentages shown in the results reflect how many people selected that option out of the total people that answered this question.</i>	

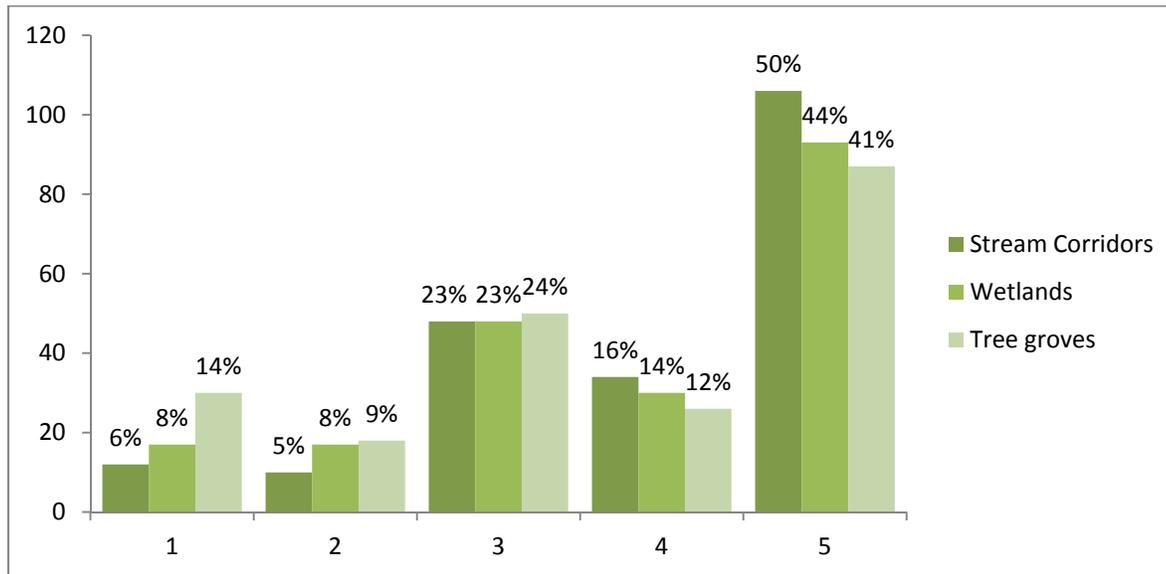
Question: How important do you think it is to protect and restore Lake Oswego's natural resources?

Respondents were provided sliding scale:

1 = not important

3 =somewhat important

5 = very important



Planning for people, places and prosperity

As the City develops key elements of the Comprehensive Plan update, sustainability – defined for Lake Oswego as meeting the vital human needs of the present without compromising our ability to meet future needs – is an important consideration. Strategic questions will aid in the decision-making framework moving forward. Planning in a sustainable way means looking at the community as an interrelated system that includes places around us (the natural and built environment), people (that live and work here), and prosperity (of the local economy) that supports society's needs.

People: Clean, healthy water is critical to all life. Having opportunities to recreate and fish in clean water improves quality of life and provides local food sources.

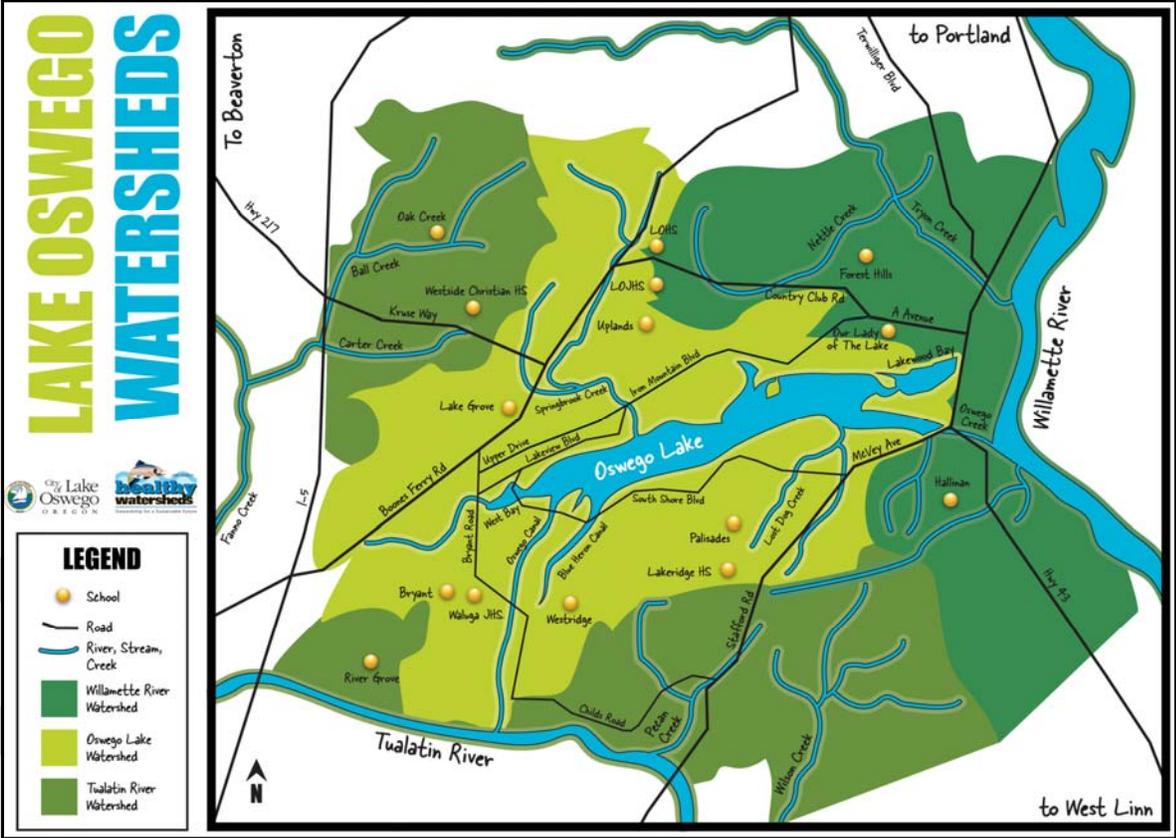
Places: Low impact development and green infrastructure, can enhance natural landscapes and biodiversity, creating more vibrant and healthy ecosystems. Green infrastructure provides the City with an opportunity to grow its network of green spaces, including wildlife habitat.

Prosperity: Best management practices work to preserve the region's valued natural resources for future generations– clean water, healthy fisheries and attractive places to live. Green infrastructure (GI) provide important ecosystem services such as water filtration and flood control that otherwise need to be managed with traditional infrastructure, which, in some cases, can be less effective and

cost more than LID or GI in the long run. GI contributes to creating desirable neighborhoods that will be attractive for live, work and play.

Background

The City of Lake Oswego surrounds Oswego Lake and lies in the eastern portion of the Tualatin Valley, approximately eight miles south of Portland. Lake Oswego is characterized by its steep hillsides, rises, and forested ridges that surround Oswego Lake. There are two sub-basins within Lake Oswego’s Urban Services Boundary (USB): the Tualatin River and the Lower Willamette. Each sub-basin within the City’s USB is a complex system of topography, vegetation and hydrology. Water flows through the sub-basin via a network of interconnected creeks and streams, pipes and inlets, swales, and ponds which collect stormwater runoff that eventually makes its way to the Tualatin or Willamette Rivers.



Existing Conditions



Unlike some cities that have combined sewer systems that treat both sewage and stormwater prior to discharging it into a water body, the City of Lake Oswego has separated sanitary sewer and stormwater systems. In separated sewer systems, sanitary sewage is treated at a treatment plant but stormwater runoff is not and is discharged directly into a water body. Thus pollution entering at any point in Lake Oswego's drainage basins can not only directly impact the nearest stream, but also all other downstream bodies of water, including the Willamette River, the Tualatin River, or Oswego Lake, and can sometimes affect groundwater.

As Lake Oswego has grown and redeveloped, natural surfaces within the City's sub-watersheds that used to absorb surface water have been covered over with streets, parking areas and buildings or have lost their natural soil structure due to grading and compaction during construction. In 2005 it was estimated that the total existing impervious surface area in the Lake Oswego city limits was ~32%. Channel stability (the ability of a stream to transport the sediment and flows produced by its watershed in such a manner that the stream maintains its dimension, pattern, and profile without either accumulating excess sediment or eroding) and fish habitat quality have been shown to decline rapidly at about ~10% impervious surface area.¹

Cumulatively, the development of impervious surfaces and alterations to natural surfaces in the City can have significant negative effects on surface water and ground water, causing harm to fish and wildlife, drinking water supplies, property, recreation, and other beneficial uses. Following are some of the impacts associated with alteration of natural surfaces:

¹ Booth, D. 1991. Urbanization and the natural drainage system-impacts, solutions and prognoses. Northwest Environmental Journal. 7(1): 93-118.

- The volume and speed of stormwater runoff increases, flowing over land surfaces or through conveyance pipes and ditches into nearby creeks and streams. Increased runoff volume and speed may cause flooding and erosion and impairment of natural habitat in rivers and streams.
- Because less water infiltrates into the ground, less groundwater recharge may occur. This can reduce drinking water and irrigation supplies and may also reduce base flows in streams, which can be detrimental to fish and aquatic organisms.
- Developed surfaces retain heat, which increases runoff temperature of the receiving waters, with potential negative impacts on aquatic life.
- Stormwater runoff picks up oil, fertilizers, pesticides, metals, chemical, sediments, bacteria, debris, pet waste, and other pollutants and may carry them into creeks and streams.

Lake Oswego's storm drainage system is a significant part of the City's overall public infrastructure. As of June 2012, the system encompasses approximately 200 miles of public and private stormwater pipe, approximately 7,600 public and private stormwater inlets/catch basins, and 178 miles of publicly owned streets.²

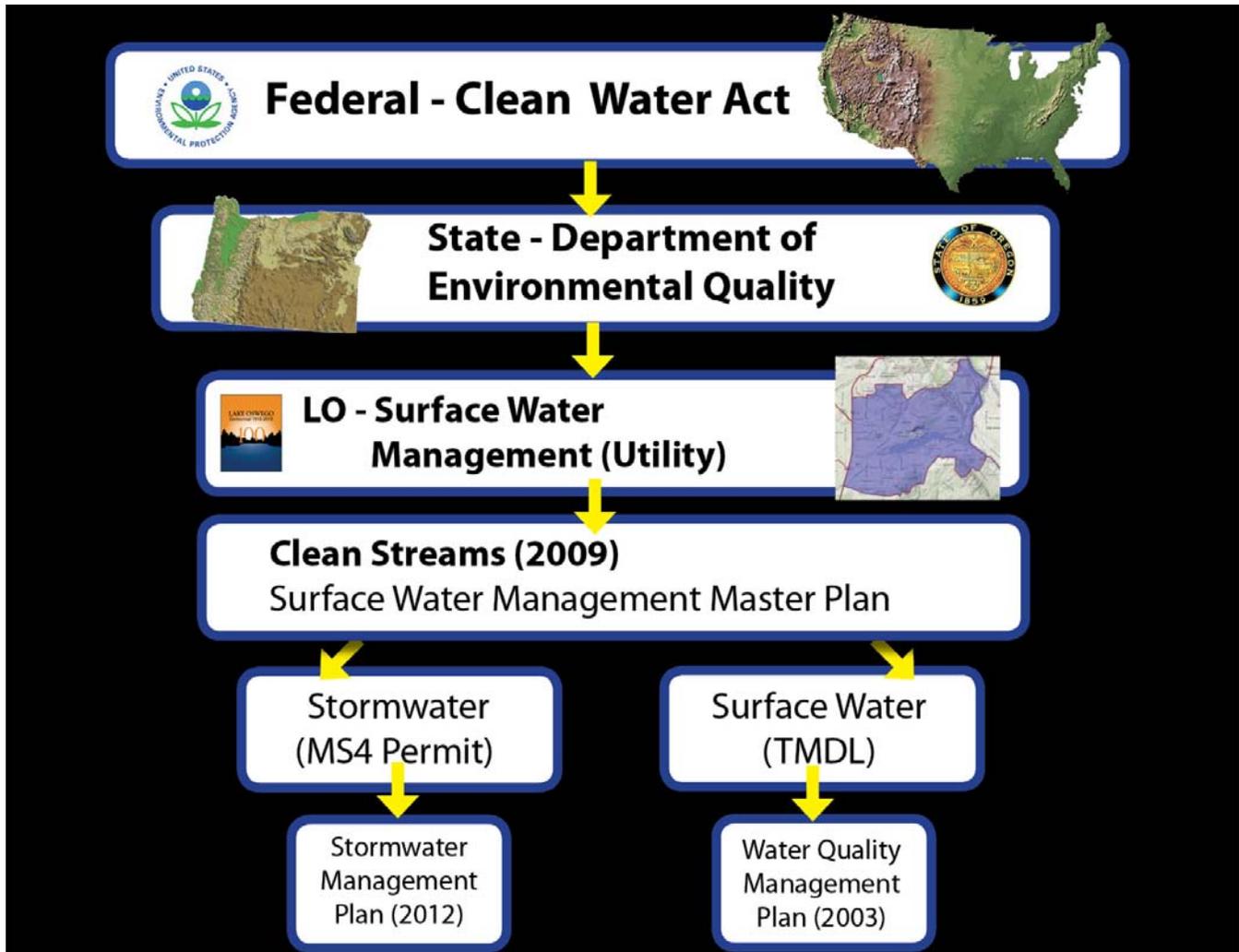
Regulatory Framework (for more detail see "Regulatory Obligation" section)

The Federal Government established the Clean Water Act in 1972 to prevent pollutants from reaching the nation's waterways. The Act provides the regulatory context for how the City manages Surface Water. In 1992 the City established a Surface Water Management Utility to fund the maintenance, operations, regulation and control of natural and man-made facilities and conveyances that comprise the surface water system. A Surface Water Management Master Plan was created that same year. The master plan was updated in 2008 (Clean Streams Plan) and addresses public education, water quality, flooding, maintenance and other issues related to surface water management. The plan assess and identifies current surface water management efforts and needs; to provide efficient and economical service delivery in compliance with regulatory requirements; and to support community goals identified in the Comprehensive Plan.

The City also operates and maintains a municipal separate storm sewer system (MS4), which is a publicly-owned system comprised of natural and man-made facilities utilized the by the Surface Water Utility to regulate the quantity and quality of surface water, including drainage easements, culverts, storm drains, catch basins, stream corridors, rivers, ponds, wetland and impoundments.

Additionally, the DEQ requires the City to have a National Pollutant Discharge Elimination System (NPDES) permit which requires the City to develop and implement various stormwater management programs, monitor pollution of the City's waterways, and increase public awareness to generate proactive behaviors that prevent stormwater pollution. This permit must be renewed on a 5 year cycle and the City must continuously fulfill certain requirements on an annual basis to ensure recertification. And to complicate matters further the City has a stormwater code and design manual.

² City of Lake Oswego Hansen Database as of June 2012.



Changes Since the 1994 Comprehensive Plan Update

Since the Comprehensive Plan was last updated in 1994, best practices in surface water management policy and design have evolved on local, state and national levels. Below is a list of the policies, issues and changed circumstances that have occurred since 1994:

1. The Clean Streams Plan (adopted in 2009) addresses public education, water quality, flooding, maintenance, best management practices, and other issues related to surface water management.
2. The City was issued its first MS4 permit from the Department of Environmental Quality in 1995. This permit allows the City to discharge stormwater to waters of the state provided the provisions of the permit are met. Pursuant to this permit and the subsequent renewals, the City has implemented several best management practices (BMPs), including public involvement and education, regular maintenance of the storm system, illicit discharge detection and elimination, adoption of erosion control standards, implementation of water quality standards for new development, and enhancement of riparian areas, such as restoration projects along many creeks and streams in Lake Oswego to help filter toxins out before they reach waterways.

3. In some areas, urbanization has compounded storm drainage problems by increasing the volume of stormwater. Because of the increased volume, the existing systems tend to become undersized over time. The City will be addressing the discharge of this stormwater volume through a Hydromodification Assessment during this permit term. Hydromodification is the changes in the volume, speed, or timing of high and low flows in a water body, generally a stream or river. A major cause is development, which changes vegetation and covers land with roofs, sidewalks, streets, and parking lots. Rainwater, unable to soak into soil, rushes with flash-flood-like intensity to streams.
4. The Tualatin Total Maximum Daily Load (TMDL) was approved by EPA in 2001. The City is the Designated Management Agency for the implementation of the Water Quality Management Plan for affected areas within its jurisdiction.
5. The Willamette TMDL was approved by EPA in 2006; the City is the Designated Management Agency for the implementation of the Water Quality Management Plan for affected areas within its jurisdiction.
6. The City will likely receive an Underground Injection Control (UIC) permit for the drywells within the jurisdiction of the City.
7. The City's Sewer Inceptor in Oswego Lake has been replaced, improving water quality in the lake by eliminating overflows that occur during storm events.
8. The Erosion Control Standards were removed from the Development Standards and inserted as a stand-alone chapter in the City Code. This amendment requires all activities with erosion impacts to comply with the Erosion Control Chapter regardless of whether a development permit is necessary.
9. The Lake Oswego Public Facilities Plan was adopted in 1997. This document identifies the major facilities and capacity improvements to urban infrastructure and services that are necessary to support land uses allowed by the Comprehensive Plan for the period of 1997-2017). These facilities include water, sewer, surface water management, and substantial transportation system improvements. The City is updating the stormwater code and design manual; this will be used to update the stormwater portion of the PFP and meet the City's Periodic Review requirements.
10. City Council Resolution 10-51A (2010) directed staff to implement revisions to the City's Sensitive Lands program based on recommendations from the Second Look Task Force. The direction by Council includes making changes to the code that would provide more flexible development options to property owners and researching ways in which the City could engage in watershed-based environmental management that links Sensitive Lands with surface water management, while maintaining environmental protections and compliance with Metro and state standards. Many of the recommended changes were implemented between 2010 and 2012. Others are being, or will soon be, addressed. The stormwater design manual and code update are addressing some of

the watershed-based options and development options through the use of incentives, education and guidance from the City. (See more about Sensitive Lands in the Healthy Ecosystems Action Area)

Regulatory Obligations

The City of Lake Oswego must comply with various federal and state regulations that limit the amount of pollutants that can be discharged in surface water to streams and rivers; govern infiltration of stormwater into the ground; and protect Endangered Species Act-listed fish and fish habitat.

National Pollutant Discharge Elimination System (NPDES)

Beginning in 1990, the U.S. Environmental Protection Agency (EPA) required communities of 100,000 or more to obtain “Phase I” NPDES permits for their municipal separate storm sewer systems (MS4). An MS4 is a conveyance or system of conveyances (e.g., roads with drainage systems, municipal streets, catch basins, curbs, gutters, manmade channels or storm drains) owned or operated by a governmental entity that discharges to waters of the State. Polluted stormwater runoff is commonly transported through MS4s and is often discharged untreated into local waterbodies. To prevent harmful pollutants from being washed or dumped into an MS4, operators must obtain a NPDES permit and develop a stormwater management program to reduce its quantity and improve its quality of stormwater; for Lake Oswego, it is the 2012 Stormwater Management Plan. EPA has delegated the NPDES-MS4 Program to the State of Oregon and is administered through the Oregon Department of Environmental Quality (DEQ).

Although Lake Oswego has a population of less than 50,000, the State of Oregon required Lake Oswego and 12 other nearby jurisdictions in Clackamas County (which collectively have a population greater than 100,000) to be co-permittees subject to Phase I program requirements starting in 1995. The City of Lake Oswego is required to renew its NPDES-MS4 permit from DEQ every five years.

Table 1: NPDES Co-Permittees
Clackamas County
Clackamas County Service District No. 1
Surface Water Management Agency of Clackamas County
City of Gladstone
City of Happy Valley
City of Johnson City
City of Lake Oswego
City of Milwaukie
City of Oregon City
City of River Grove
City of West Linn
City of Wilsonville
Oak Lodge Sanitary District

The NPDES permit requires the City to implement BMPs to improve the quality of stormwater before discharging to the City's lakes, rivers, and streams. A BMP is an activity, device, or structure that serves as a means of reducing or eliminating the generation of pollution or the movement of pollution towards stream, rivers, and lakes. The permit also requires that performance indicators be developed for each BMP, and a monitoring plan be established to determine the effectiveness of the program. A Stormwater Management Plan is submitted to DEQ describing the City's program for meeting NPDES permit requirements. Yearly reports are submitted to DEQ describing progress in meeting those requirements. The MS4 permit requires the City's update of the stormwater code and design manual.

Total Maximum Daily Load and 303D listings

Under the federal Clean Water Act, the State of Oregon is required to develop a list of impaired or threatened waters within the state. To meet this mandate, DEQ establishes water quality standards and prepares a list of impaired waters known as the 303(d) List. Waters are added to the 303(d) list if they do not meet the water quality standards set by DEQ. To address water quality issues in these 303(d) listed waters, TMDLs are developed by DEQ, and approved by EPA for identified contaminants. A TMDL is the total amount of a contaminant (for example phosphorous, bacteria, temperature, or mercury) a water body can accept without violating the water quality standard.

Implementation plans, called Water Quality Management Plans, are prepared to meet the TMDL goals and are administered by Designated Management Agencies (DMAs). Lake Oswego is a DMA for select tributaries and mainstem sections of the Tualatin River, Springbrook Creek, Tryon Creek, Oswego Lake, and the Willamette River. Strategies for meeting TMDL requirements are included in the Stormwater Management Plan developed for the City's NPDES permit.

Underground Injection Control

The UIC is a federal program that is a part of the Safe Drinking Water Act. The program's goal is to protect groundwater aquifers from contamination due to underground injection systems. DEQ operates Oregon's UIC Program for the EPA.

A UIC system is used for discharging stormwater into the ground. UICs can also be used for septic effluent and other fluids, but stormwater is the most common use. Drywells, which are bottomless manholes with holes in the sides, are commonly used as UICs. Their use is encouraged by many jurisdictions because they help replenish the groundwater table, and they protect streams from erosion due to increased stormwater flow rates and volumes that occur with new developments. However, if the stormwater is not treated properly, or if the groundwater table is close to the surface, then there is potential to contaminate the groundwater with pollutants in the stormwater.

DEQ requires the City to review all their existing UICs and register those UICs with the state, if they are not already registered. DEQ allows UICs to remain in use if they meet certain requirements and can be "rule authorized", and if they can't be rule authorized, they must be permitted or decommissioned. The City of Lake Oswego currently has 32 UICs, all of which have been registered with DEQ. None of the UICs are currently Rule Authorized or permitted. The City needs to evaluate each of their UICs to determine if they can be Rule Authorized, and if they cannot, then they will need to be either

permitted through DEQ or abandoned; this work is currently under way.

UIC permits will have requirements for managing, monitoring, and reporting on the condition of these UICs. In addition, the number of UICs owned by the City has an impact on the permit requirements. Municipalities with over 50 UICs will have stricter requirements for managing and monitoring. The City is attempting to maintain a total UIC count less than 50 in order to minimize both the staff time and the financial resources that will need to be dedicated to this program.

Endangered Species Act (ESA)

Species of Salmon and Steelhead in the Pacific Northwest have been listed as endangered or threatened under the ESA. Under federal ESA legislation, this listing requires that endangered or threatened fish and their habitat be protected. The law prohibits any action that causes a “taking” of any listed species, which means harming or harassing a listed species or modifying a significant amount of its critical habitat. City programs have the option to apply for protection from liability for harming fish and fish habitat if the programs meet certain criteria and are approved by the National Marine Fisheries Service (NMFS). NMFS currently lists 13 approved “limits”, or exceptions, to the take prohibition. These limits are either approved programs or categories of activities NMFS may evaluate for approval in the future. An example of a category NMFS may evaluate in the future is Municipal, Residential, Commercial, and Industrial development and redevelopment activities. If jurisdictions submit programs for management of these activities to NMFS, they will evaluate the programs for an exception to the take prohibition.

Metro Title 3

Title 3 is a component of Metro’s Urban Growth Management Functional Plan, the long-range growth management plan for the region that addresses water quality and flood management conservation. The City of Lake Oswego completed a planning process to implement the flood management component of Title 3 and is currently in the process to comply with the water quality component of Title 3.

The goal of Title 3 is to protect the region’s health and public safety by reducing flood and landslide hazards, controlling soil erosion and reducing pollution of the region's waterways. Title 3 specifically implements the Oregon Statewide Land Use Goals 6 (Air, Water and Land Resources Quality) and 7 (Areas Subject to Natural Disasters and Hazards) by protecting streams, rivers, wetlands and floodplains by avoiding, limiting or mitigating the impact on these areas from development.

The water quality component of Title 3 contains performance standards related to streams, rivers and wetlands. The purpose of these standards is to protect and allow enhancement of water quality. Water quality resource areas include rivers, streams and wetlands and the associated protected vegetated corridor. The performance standards require erosion and sediment control, planting of native vegetation on the stream banks when new development occurs and prohibition of the storage of new uses of uncontained hazardous material in water quality areas. The performance standards apply to development in Water Quality Resource Areas and development which may cause temporary or permanent erosion on any property.

Metro area cities are required to amend their comprehensive plans and implementing ordinances to adopt all or part of the Title 3 code language that substantially complies with the performance standards and the intent of Title 3, and adopt either the Metro Water Quality Area Map or a map that substantially complies with the Metro map. The City is not technically in compliance with Title 3, but anticipates compliance by the end of 2010 or soon thereafter.

SUMMARY OF EMERGING ISSUES, CHALLENGES AND TRENDS

Trends and Emerging Issues

1. Stormwater Management Strategies

When the Comprehensive Plan was last updated in 1994, stormwater management strategies focused mainly on the installation of centralized facilities for controlling flooding. Management strategies permit conditions, and BMPs used for improving stormwater quality have changed remarkably and the latest research shows that centralized detention facilities are not effective in protecting streams from erosion. The use of decentralized facilities that mimic natural processes or facilities sized to match flow durations rather than matching peak flow rates is more effective at protecting streams.

2. Council Resolution 10-51A

Council Resolution 10-51A directed staff to report on the pros and cons, funding mechanisms, and an implementation plan to organize and operate internal resources to support watershed-based environmental management, including integrating the stormwater and sensitive lands programs. Since that time Council members have changed it may not be a Council priority.

3. Sustainability

Reducing impervious surfaces in new development through the use of pervious pavements, swales, and rain gardens to address stormwater management are gaining popularity. Methods that restore or mimic natural processes are thought to be more effective.

4. Land Development Patterns

Current trends are for redevelopment of residential areas, where smaller, older homes are being replaced with larger homes. This trend results in a reduction of pervious area (“pervious” refers to surfaces that allow rainwater to pass through them and be absorbed into the ground) and contributes to increasing amounts of runoff from residential areas. Other than infill, the city has little available land for new development. In addition, larger lots in the urban area are subdividing to create smaller lots with multiple homes and driveways.

Opportunities & Constraints

- The City’s current stormwater code allows many developments to avoid having to treat stormwater runoff. The stormwater design manual utilized by the City was never adopted by the City Council and contains outdated requirements. Recommendations in the Clean Streams Plan include revisions to codes and manuals, and a review of City Code for impediments to allowing sustainable

and low impact development approaches. If the recommendations are not implemented, the City will continue to allow new developments to avoid meeting stormwater treatment requirements, and the requirements developers do follow will be out of date and ineffective.

- Monitoring of streams, public education plans, and the implementation of new stormwater management practices are mandated in the City's NPDES permit, which is up for renewal every five years. As permit requirements continue to increase in complexity, they often necessitate additional staffing, funding, and the development of new programs and projects.

Future Changing Conditions

- Stormwater Code Revision and Design Manual Revision (In Process)
 - A Surface Water Code/Surface Water Design Manual Revisions project is being initiated as a result of the findings of the Clean Streams Plan (Otak/City of Lake Oswego, 2009), the City of Lake Oswego's MS4 Permit Renewal Package (Oswego, URS/City of Lake, 2008; Otak/City of Lake Oswego, 2009), and technical reports produced in support of City activities related to surface water (Cole & Harris, 2004), (Lemke & Cole, 2007), (Lemke & Cole, 2009). This project is also a result of numerous City Council Goals related to water quality improvement, Low Impact Development (LID) and protection of water resources within the City.

The MS4 Permit issued on 3/16/2012 indicates that the City's code be reviewed and updated on a regular interval and that the City use iterative management to improve the City's local MS4 program. The TMDLs in place for the Willamette River and Tualatin River also outline local codes as a best management practice to maintain and improve water quality.

SUSTAINABILITY CONSIDERATIONS AND PROPOSED INDICATORS

Sustainable stormwater practices are normally considered synonymous with Low Impact Development (LID) Approaches. LID seeks to mimic natural hydrologic responses in a built environment through the use of decentralized practices. Rain gardens, planters, infiltration strips, and pervious pavement all seek to dispose of runoff at the source in a way that reduces environmental impacts. This is contrasted with traditional stormwater approaches where runoff is collected in catch basins and pipes, and conveyed either directly to the receiving water, or to a detention or water quality facility.

Stormwater sustainability can go beyond LID practices. Other measures can include:

1. Capture and Reuse of Stormwater

Rainwater harvesting and reuse, such as for toilet flushing or irrigation, reduces the amount of potable water used for such purposes, and it reduces a site's impact on the environment by capturing runoff that would otherwise be conveyed to receiving waters. The City has seen some use of this practice with businesses and homes. Because most rainfall occurs in the winter, and the largest potential use of water (irrigation) occurs mostly in the summer, this use can be challenging because of storage needs. However, businesses and some homes have found ways to collect and store enough

rainwater to make this use feasible. The current code revisions will allow for this practice, as allowed by state law and building codes.

2. Maintenance and Monitoring Practices that Reduce Carbon Footprint

An example of a practice the City is using today includes the cleaning of catch basins.

Catch basin cleaning practices developed with the City's latest NPDES permit requirements and discussed in the Clean Streams Plan tracks the amount of sediment removed from catch basins. This data will be collected and analyzed so that the city is not cleaning some catch basins more than they should be, and not cleaning others frequently enough.

3. Environmental Site Design

LID can be used individually as an effective means to treat and dispose of stormwater. However, a true LID uses reduced road widths, separated sidewalks, clustering of homes, and other measures to significantly reduce or eliminate stormwater leaving the site. These measures, along with other sustainable building practices, can produce a sustainable community or building.

4. Evaluating BMPs for Sustainability

With the Clean Streams Plan, an evaluation matrix (Appendix G) was developed to review BMPs commonly used for treating water quality for sustainability. Ranking criteria include:

- Their impact on the ecosystem;
- Maintenance needs;
- Use of sustainable materials;
- Short term and long term energy needs;
- Waste production;
- Cost efficiency; and
- Promotion of sustainable businesses.

These criteria were used to rank different classifications of BMPs including basins, swales, filters, and infiltration measures. Appendix G of the Clean Streams Plan includes a matrix that was developed for ranking each of these BMPs for these criteria. This appendix also includes a more detailed discussion of the ranking criteria.

Stormwater infrastructure shares with other utilities the opportunity to provide more sustainable construction practices, and the life of the structure can be extended through asset management. The Plan recommends the City develop sustainability guidelines/practices for capital project delivery and develop and implement a formal asset management program.

As discussed within the code section reviews, it is also recommended that the City review their policies and codes for impediments to implementing sustainability measures such as for storage and reuse of stormwater, and for implementing development and redevelopment projects that utilize sustainable and low impact development measures for managing stormwater.