STORMWATER PLAN

CITY OF OAKRIDGE

February 2011

Prepared by:
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EXECUTIVE SUMMARY

The intent of this stormwater plan is to provide guidance for stormwater system decisions at both the planning and engineering level. This study is intended to project the stormwater system needs of the City of Oakridge for the next 20 years. The study focuses primarily on identifying and improving existing stormwater system deficiencies. Future development is projected to be small. This study assumes that future development will mitigate its impacts to the existing storm system through the use of water quality and quantity stormwater management facilities. As with any plan, modifications in designs will be necessary as final design of some of these systems are undertaken, particularly when they are engineered at different times.

The primary goal of the plan is to identify major existing stormwater conveyance deficiencies and problem areas and develop preliminary storm improvements and cost estimates to address the identified areas of concern. Only the primary conveyance systems and flooding locations as identified by City staff have been analyzed. This analysis revealed numerous areas where flooding will occur under current conditions.

Where appropriate, the proposed improvements have been categorized in accordance with two alternatives. Alternative 1 generally includes only pipeline upsizing, while Alternative 2 includes a combination of pipeline upsizing and detention pond and swale improvements. The proposed improvements have been categorized in accordance with high, medium, and low priority levels based upon the severity of the deficiency.

The total cost for the entire proposed storm improvements has been estimated at $5,176,000 for Alternative 1 and $4,807,000 for Alternative 2. The Alternative 2 proposed improvements are less expensive, and provide additional sedimentation and water quality benefits over the pipeline improvements of Alternative 1. The detention pond and swale improvements of Alternative 2 also conform with the City of Oakridge Total Maximum Daily Load (TMDL) reduction goals. Therefore, Alternative 2 improvements should be constructed to the greatest extent possible.

CITY OF OAKRIDGE
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1. DEVELOPMENT CODE / POLICY SUGGESTIONS

1.1 WATER QUALITY AND QUANTITY

As development occurs, pervious surfaces that allow infiltration into the soil and slow stormwater runoff are converted to impervious surfaces such as roadways, parking lots, houses, and buildings. As the amount of impervious surface area increases, infiltration is significantly reduced and stormwater runoff flow intensity and volume is significantly increased. If not mitigated, this increased stormwater runoff will unnecessarily burden the City's existing stormwater system, increasing the likelihood of future flooding events. Also of concern is the introduction of pollutants from these impervious surfaces such as suspended solids, oxygen-demanding pollutants, temperature, bacteria, organic carbon, hydrocarbons, metals, and nutrients.

Development code regulations are commonly used to mitigate the reduced stormwater quality and increased stormwater runoff from land development. City staff has compiled proposed development code regulations that can be found in Appendix A. These development code regulations have been prepared in conjunction and to complement the goals of the City's Total Maximum Daily Load (TMDL) Implementation Plan, which can be found in Appendix B.

1.2 EROSION CONTROL

Stormwater runoff from construction projects is of significant concern because of the typically high volume of suspended solids content. Fortunately, through adequate planning, installation, and maintenance of erosion control Best Management Practices (BMP's), the transport of suspended solids off-site from construction projects can be controlled. It is recommended that the City require submission of a National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit (issued through the State of Oregon Department of Environmental Quality (DEQ)) prior to release of any City approvals or permits for construction. Further information regarding NPDES Stormwater Discharge Permits may be found online at:

http://www.deq.state.or.us/wq/stormwater/constappl.htm

1.3 UNDERGROUND INJECTION CONTROL (UIC)

Underground Injection Controls or UIC's are stormwater runoff disbursement facilities that discharge water below the ground surface. These types of facilities are of concern because if the stormwater runoff is not adequately treated prior to entering the UIC, the runoff may convey pollutants directly into groundwater. According to Federal and State regulations, all UIC's must be evaluated, upgraded as necessary, registered, and monitored to insure the protection of groundwater quality. Further information may be found online at:

http://www.deq.state.or.us/wq/uic/uic.htm

The City of Oakridge has six (6) existing UIC's, none of which have been registered with the State. To insure groundwater quality and bring the City's stormwater system into compliance with Federal and State regulations, the City should decommission and/or upgrade and register their existing UIC's as soon as possible. Failure to do so may result in future sanctions or fines. The City's UIC's are in the locations identified on the following page.

- Two on Birch Street east of W 2nd Street.
- Two on Klohn Drive north of Perkins Street.
- One large underground infiltration chamber at the intersection of Rainbow Street and Berry Street
- One at the SE corner of the cul-de-sac off of Fairyglen Drive

Decommissioning the City's existing UIC's has been given a high priority level in the development of the Capital Improvement Plan (CIP) found in Section 4 of this Stormwater Plan.

2. EXISTING CONDITIONS

The City of Oakridge Zoning, Figure 1, can be found on page 4. The City of Oakridge Existing Storm System, Figure 2, is on page 5. The City of Oakridge Storm Basins, Figure 3, is on page 6. Detailed exhibits of the existing storm system per storm basin can be found in Appendix C. Table 1 below summarizes the storm basin area both inside and outside the Urban Growth Boundary (UGB) of the City of Oakridge.

TABLE 1
URBAN GROWTH BOUNDARY (UGB) STORM BASIN DATA

STORM BASIN	AREA INSIDE UGB (acres)	AREA OUTSIDE UGB (acres)	TOTAL AREA (acres)
A	25.9	10.2	36.1
B	24.4	-	24.4
C	81.5	12.4	93.9
D	73.4	-	73.4
E	136.3	53.8	190.1
F	35.7	-	35.7
G	240.0	134.5	374.5
H	107.2	55.0	162.2
I	56.7	1.6	58.3
J	308.4	23.8	332.2
K	19.4	-	19.4
L	106.6	-	106.6
M	87.0	-	87.0
TOTAL	1,302.5	291.3	**1,593.8**

Table 2 on the following page summarizes the current development conditions based upon 2008 aerial photography of each basin. The various development conditions have been assigned an appropriate Curve Number (CN). The Curve Number is based on the soil type, ground cover, and other factors. High curve numbers (such as 98 for pavement) indicate complete high stormwater runoff with little retention and low curve numbers indicate high retention and reduced runoff.

TABLE 2
CURVE NUMBER STORM BASIN DATA

STORM BASIN	AREA (acres)*							
	WOODS CN 60	>75% GRASS COVER CN 61	50-75% GRASS COVER CN 69	¼ ACRE RESID. LOTS CN 75	GRAVEL ROADS CN 85	INDUST. CN 88	SURFACE WATER / ROADS CN 98	TOTAL AREA (acres)
A	25.7	-	-	10.4	-	-	-	36.1
B	6.0	-	-	18.4	-	-	-	24.4
C	28.5	-	-	63.0	-	-	2.4	93.9
D	73.4	-	-	-	-	-	-	73.4
E	60.5	-	-	128.8	-	-	0.8	190.1
F	35.7	-	-	-	-	-	-	35.7
G	198.9	-	16.2	157.6	-	-	1.8	374.5
H	78.0	-	-	48.4	24.1	-	11.7	162.2
I	-	54.3	-	-	-	-	4.0	58.3
J	166.7	-	-	164.9	-	-	0.6	332.2
K	3.0	13.9	-	1.0	-	-	1.5	19.4
L	19.3	39.6	-	13.2	-	30.2	4.3	106.6
M	-	38.7	-	-	30.2	-	18.1	87.0
TOTAL	695.7	146.5	16.2	605.7	54.3	30.2	45.2	**1,593.8**

* Approximate development conditions per 2008 aerial photography.

2.1 SYSTEM MAPPING

A City of Oakridge base map was compiled from a 1988 photogrammetric survey and Geographic Information Systems (GIS) data and 2008 aerial photography provided by Lane Council of Governments (LCOG). Because of a lack of available records, PACE and City staff field-located all storm drainage conveyance facilities throughout the City. Exact surveyed locations and elevations have not been established. Therefore, topographic survey mapping, including a verification analysis, should be undertaken before implementing any proposed stormwater conveyance improvements. Detailed exhibits of the existing storm system per storm basin can be found in Appendix C.

2.1.1 Basin A

Basin A is located in the northwestern portion of the City and is only 29 percent developed. The basin is bounded on the east by W. 2nd Street and on the south by Willamette Highway 58. Existing stormwater conveyance facilities include a swale flowing east to west through the middle of the basin and an underground piped conveyance system in Willamette Highway 58, owned and maintained by the Oregon Department of Transportation (ODOT).

2.1.2 Basin B

Basin B is located in the southwestern portion of the City and is bounded on the north by Willamette Highway 58, on the east by River Road, and on the south by the Middle Fork of the Willamette River. This basin is 76 percent developed, although development is sparse, with larger than average residential lots. This basin slopes gently from the northeast to the southwest towards the Middle Fork of the Willamette River. No stormwater conveyance facilities are located within Basin B. Nearby facilities include underground piped conveyance systems in Willamette Highway 58 and River Road.

2.1.3 Basin C

Basin C is bounded on the west by W. 2nd Street, on the east by the Southern Pacific Railroad and Union Street, and on the south by Willamette Highway 58. The basin's primary underground piped conveyance system flows from north to south in W. 2nd Street before discharging into the conveyance system in Highway 58, which is owned and maintained by ODOT.

2.1.4 Basin D

Basin D is bounded on the north by Willamette Highway 58, on the west by River Road, on the south by the Middle Fork of the Willamette River, and on the east by Garden Street. Basin D is 100 percent developed. The basin's primary underground piped conveyance system flows from east to west in School Street and then turns south down River Road before discharging into the Middle Fork of the Willamette River.

2.1.5 Basin E

Basin E is bounded on the west by the Southern Pacific Railroad, Union Street, and Garden Street, on the south by the Middle Fork of the Willamette River, and on the east by Locust Street and Rainbow Street. The basin's primary underground piped conveyance system flows from north to south in Commercial Street, Union Street, and Garden Street before discharging into the Middle Fork of the Willamette River.

2.1.6 Basin F

Basin F is bounded on the west by Rainbow Street, on the south by the Middle Fork of the Willamette River, and on the east by Rock Road. The basin's primary underground piped conveyance system flows

from north to south in Rainbow Street before discharging into a large underground infiltration chamber at the intersection of Rainbow and Berry Streets.

2.1.7 Basin G

Basin G contains the vast majority of central Oakridge north of the Southern Pacific Railroad. This basin is bounded on the west by Locust Street and Rock Road, on the south by the Middle Fork of the Willamette River, and on the east by Oak Street and the Oakridge Sand & Gravel property. The basin's primary conveyance system flows from north to south in Oak Street, turns west down Commercial Street, and then turns south again crossing the Southern Pacific Railroad and Willamette Highway 58 and continues south down Jones Road before discharging into the Middle Fork of the Willamette River. Because of the size of this central basin, it has been subdivided into the following sub-basins:

SUB-BASIN G-A
Sub-Basin G-A's primary underground piped conveyance system flows from north to south in Locust Street before tying into Sub-Basin G-G's main conveyance system in Commercial Street.

SUB-BASIN G-B
Sub-Basin G-B's primary underground piped conveyance system flows from east to west in 2nd Street before tying into Sub-Basin G-A's main conveyance system in Commercial Street.

SUB-BASIN G-C
Sub-Basin G-C's primary underground piped conveyance system flows from east to west in 2nd Street and then turns south down Diamond Street before tying into Sub-Basin G-G's main conveyance system in Commercial Street.

SUB-BASIN G-D
Sub-Basin G-D's primary underground piped conveyance system flows from north to south in Elder Street before tying into Sub-Basin G-G's main conveyance system in Commercial Street.

SUB-BASIN G-E
Sub-Basin G-E's primary underground piped conveyance system flows from north to south in Walnut Street before tying into Sub-Basin G-G's main conveyance system in Commercial Street.

SUB-BASIN G-F
Sub-Basin G-F's primary underground piped conveyance system flows from north to south in Pine Street before tying into Sub-Basin G-G's main conveyance system in Commercial Street.

SUB-BASIN G-G
Sub-Basin G-G contains Basin G's primary conveyance system which flows from north to south in Oak Street, turns west down Commercial Street, and then turns south again, crossing the Southern Pacific Railroad and Willamette Highway 58. It continues south down Jones Road before discharging into the Middle Fork of the Willamette River.

SUB-BASIN G-H
Sub-Basin G-H collects a small drainage area near the intersection of Locust Street and Commercial Street before tying into Sub-Basin G-G's main conveyance system in Commercial Street.

2.1.7 Basin H

Basin H drains into the Oakridge Sand & Gravel property before discharging into the Middle Fork of the Willamette River. The existing conveyance system in Basin H is located in Willamette Highway 58 and is owned and maintained by ODOT.

2.1.8 Basin I

Basin I contains the majority of the Elk Meadows Subdivision and is located on the north side of the ridge running east/west along the northern boundary of the City of Oakridge. This basin discharges into the Circle Bar Golf Club located to the north of the City.

2.1.9 Basin J

Basin J is bounded on the west by Westoak Road and Oak Street, on the south by Salmon Creek, and on the north by the ridge running east/west along the northern boundary of the City of Oakridge. The basin's primary conveyance system flows from north to south just east of Douglas Street, turns west along the northern side of the Southern Pacific Railroad, turns south again to cross the railroad, continues south just west of Jasper Drive, and then turns southwest along the Salmon Creek Dike before discharging into Salmon Creek.

2.1.10 Basin K

Basin K contains the Salmon Creek Estates Subdivision and is generally located in the middle of Basin L. This basin discharges into a series of infiltration ponds located south of Salmon Creek.

2.1.11 Basin L

Basin L is bounded on the south by Willamette Highway 58 and on the north by Salmon Creek. This basin contains the western and southern portions of the City of Oakridge Industrial Park. Basin L's primary conveyance system is located on the north side of Highway 58 before discharging into Salmon Creek.

2.1.12 Basin M

Basin M contains the remaining portions of the City of Oakridge Industrial Park. The basin's primary conveyance system begins at the existing log ponds and flows from south to north through the Industrial Park before converging with the fish hatchery outlet. The combined runoff then enters a large settling pond before discharging into Salmon Creek.

3. HYDROLOGIC ANALYSIS

3.1 STORM INTENISITIES

The intensities of all storm events were taken from the National Oceanic and Atmospheric Administration (NOAA) Oregon Precipitation Frequency Maps, which show rainfall depths for the Oakridge area for different storm durations and frequencies. A storm duration is the time period of a storm, for example, a 24-hour storm. The frequency of a storm is the likely occurrence of a storm happening, for example, a 25-year storm means the largest 24-hour storm that is likely to occur within a 25-year time period. Table 3 summarizes the storm events for the City of Oakridge. The total rainfall depth given in the table is used for hydrologic models. The rainfall depth is first converted into a statistical type storm such as a Soil Conversation Service (SCS) Type 1A storm, which is typical for the Pacific Northwest. The storm is converted to a hydrograph and then routed through a conveyance system.

TABLE 3
STORM YEARS WITH 24-HOUR PRECIPITATION*

STORM YEAR	TOTAL RAINFALL DEPTH** (inches)
2	2.5
5	3.5
10	4.0
25	4.5
50	5.0
100	5.5

* Source: NOAA Atlas 2, 1973.
** Total rainfall depths were interpolated.

It should be kept in mind that these predicted storm events, in particular their associated patterns, will not actually happen in reality. They are statistical models with idealized storm intensities and shapes. They do, however, supply a reasonable scenario that can be used for design purposes.

3.2 THEORY VERSUS REALITY

In addition to the discussion above, to complete a thorough hydrological model of a system, actual soil infiltration rates, percentage of effective impervious area versus pervious areas, water table levels, slope, conveyance system disturbances from backwater, and antecedent moisture conditions (built-up water storage from previous storm events) are needed, along with an actual measurement of flows, to calibrate a realistic model.

Because of the lack of available data and limitations of the methods, modeling of actual storm systems is based largely on general assumptions and experience or precedence. Therefore, in order to engineer a stormwater system, assumptions must be made and methods chosen. It is likely that, given the same drainage problem, different engineers will predict different flows and system configurations.

3.3 HYDROLOGIC MODEL PARAMETERS

A hydrologic analysis was completed for the City of Oakridge using HydroCAD Stormwater Modeling System Version 9.10 software. The Soil Conservation Service (SCS) TR-20 Runoff Method with Type 1A 24-hour rainfall distribution curves were used to generate the storm hydrographs. The Lag Method was used to determine the Time of Concentration. The time of concentration is typically defined as the time required for a particle of water to travel from the most hydrologically remote point in the watershed to the point of collection.

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the majority of soils within the City of Oakridge are classified as Hydrologic Soil Group (HSG) B, although there are small pockets of HSG A, C, and D soils present. For the purposes of this hydrologic analysis, all soils have been modeled as HSG B. Group B soils have moderate infiltration rates when thoroughly wetted, and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Manning's roughness coefficient or Manning's "n" represents the resistance of a material to the flow of water in it. For the purposes of this hydrologic analysis, a Manning's "n" of 0.015 has been used for all pipes, which is typical for a concrete sewer system with manholes and inlets. A Manning's "n" of 0.080 has been used for all swales, which is typical for earthen swales with long dense weeds.

Only the primary conveyance systems and flooding locations identified by City staff have been analyzed for the 2, 5, 10, and 25-year, 24-hour rainfall events. Analysis of the City's stormwater system has revealed numerous areas that flood under current conditions. Appendix D includes exhibits which illustrate the respective storm event flooding locations for each respective basin. The hydrologic analysis was also used to size proposed stormwater conveyance improvements that would safely convey the 25-year, 24-hour storm event without any flooding. Appendix E includes exhibits of the proposed improvements to adequately convey the 25-year, 24-hour storm for each respective basin. The proposed stormwater improvements were analyzed under current development conditions. Current development conditions were chosen with the assumption that future development will be small and that mitigation will be provided for the increased stormwater runoff from future development in accordance with the development code regulations found in Appendix A.

3.3.1 Basin A

According to the hydrologic model and as supported by City staff, the existing swale in the middle of Basin A does not experience any flooding up to and including the 25-year, 24-hour storm event. If Basin A were to develop in the future, the developer should be responsible to provide a hydrologic analysis of the basin and the design of a stormwater conveyance system for the entire basin as appropriate.

3.3.2 Basin B

Hydrologic modeling has not been completed for this basin because the basin is primarily developed, there are no existing stormwater conveyance facilities within the basin, and City staff has not expressed any flooding concerns in this portion of the City. If Basin B were to redevelop in the future, the developer should be responsible to provide a hydrologic analysis of the basin and the design of a stormwater conveyance system for the entire basin as appropriate.

3.3.3 Basin C

City staff has not observed any flooding within Basin C. This is contradictory to the results of the hydrologic model, which indicates flooding in portions of the conveyance system even under the 5-year, 24-hour storm event. Because of the lack of observed flooding, Basin C has been given a low priority in the development of the Capital Improvement Plan (CIP). An exception is the decommissioning of the two existing drywells located at Birch Street east of W 2nd Street, which has been assigned a high priority level.

The hydrologic model results indicate that the ODOT storm line within Willamette Highway 58 is undersized. Upsizing this storm line has been omitted from the CIP because this storm line is owned and maintained by ODOT.

3.3.4 Basin D

According to the hydrologic model, the majority of the Basin D primary conveyance system begins flooding in the 5-year, 24-hour storm event. However, per City staff, the hydrologic model does not appear to match closely with observed events. Lack of observed flooding and near build-out of Basin D has resulted in assignment of a low priority for Basin D improvements in the development of the CIP. An exception is the decommissioning of the two existing drywells located at Klohn Drive north of Perkins Street, which has been assigned a high priority level.

Proposed Basin D improvements to adequately convey the 25-year, 24-hour storm based upon current development conditions have been developed for two different alternatives. Alternative 1, illustrated in Appendix E – Figure E.2, primarily includes pipeline upsizing and Alternative 2 illustrated in Appendix E – Figure E.3 includes a combination of pipeline upsizing and swale improvements.

3.3.5 Basin E

According to the hydrologic model, only a few minor segments of the Basin E primary conveyance system flood in the 25-year, 24-hour storm event. Per City staff, there have not been any observed flood events in the locations identified by the model. Therefore, all Basin E improvements have been given a low priority in the development of the CIP.

3.3.6 Basin F

According to City staff, the underground infiltration chamber at the intersection of Rainbow Street and Berry Street experiences flooding during the winter months when groundwater elevations are closest to surface grade. As flooding at this infiltration chamber is more directly related to groundwater elevations than to the intensity of a particular storm event, this infiltration gallery has been indicated as flooding during a 5-year, 24-hour event. Because of the observed flooding at this infiltration gallery and the necessity to decommission this UIC, the Basin F improvements have been assigned a high priority in the development of the CIP. The proposed improvements include decommissioning the existing infiltration gallery and constructing an underground piped conveyance system continuing down Rainbow Street and Fairyglen Drive to connect with the Garden Road storm system in Basin E. The proposed improvements also allow for decommissioning the UIC located at the SE corner of the cul-de-sac off of Fairyglen Drive.

3.3.7 Basin G

The hydrologic analysis for Basin G has been broken down by the following sub-basins:

SUB-BASIN G-A

According to the hydrologic model, Sub-Basin G-A does not experience any flooding up to and including the 25-year, 24-hour storm event. However, the draw feeding the upstream end of the main conveyance system is a good candidate for swale improvements to reduce stormwater runoff velocities and provide sediment deposition prior to the underground piped conveyance system. These Sub-Basin G-A swale improvements have been assigned a medium priority in the development of the CIP.

SUB-BASIN G-B

According to the hydrologic model and as supported by City staff, Sub-Basin G-B does not experience any flooding up to and including the 25-year, 24-hour storm event.

SUB-BASIN G-C

There is a pipe size restriction in the northern end of Diamond Street which results in flooding during the 10-year, 24-hour storm event. The Sub-Basin G-C improvements have been given a medium priority classification for the development of the CIP.

SUB-BASIN G-D

Sub-Basin G-D poses significant flooding and maintenance issues for the City of Oakridge. The Sub-Basin G-D improvements have been given a high priority CIP classification.

SUB-BASIN G-E

According to the hydrologic model, Sub-Basin G-E does not experience any flooding up to and including the 25-year, 24-hour storm event. Although draw improvements at the north end of Walnut Street would be desirable to reduce stormwater runoff velocities and provide sediment deposition, the topography is not very conducive to these types of improvements. Therefore, no proposed Sub-Basin G-E improvements have been developed for the CIP.

SUB-BASIN G-F

Sub-Basin G-F experiences some flooding during the 25-year, 24-hour storm event. However, per City staff, there have been no observed flooding events within Sub-Basin G-F. Therefore, the proposed improvements have been given a low priority level for the CIP. The draw at the north end of Pine Street is a good candidate for improvements to reduce stormwater runoff velocities and provide sediment deposition. The draw improvements have been given a high priority level for the CIP.

SUB-BASIN G-G

Sub-Basin G-G contains Basin G's primary conveyance system. According to the hydrologic model, there are numerous locations along the conveyance system that flood during the 10-year and 25-year, 24-hour storm events. City staff has indicated that Sub-Basin G-G does not experience any flooding problems, with the exception of the intersection of Oak Street and Commercial Street. Also, the draw at the north end of Oak Street is a good candidate for improvements to reduce stormwater runoff velocities and provide sediment deposition. All of the Sub-Basin G-G improvements have been given a low priority level except for the North Oak draw and Oak and Commercial intersection, which have been given a high priority level.

Proposed Sub-Basin G-G improvements to adequately convey the 25-year, 24-hour storm based upon current development conditions have been developed for two different alternatives. Alternative 1 illustrated in Appendix E – Figure E.6 includes primarily pipeline upsizing and Alternative 2 illustrated in Appendix E – Figure E.7 includes a combination of pipeline upsizing and swale improvements.

SUB-BASIN G-H

According to the hydrologic model and as supported by City staff, Sub-Basin G-H does not experience any flooding up to and including the 25-year, 24-hour storm event.

3.3.8 Basin H

Hydrologic modeling has not been completed for this basin because all portions of the basin located within the UGB are primarily developed, there are only minor existing stormwater conveyance facilities within the basin, and City staff has not expressed any flooding concerns in this portion of the City. The existing conveyance facilities are also owned and maintained by ODOT. If Basin H were to redevelop in the future, the developer should be responsible for providing a hydrologic analysis of the basin and for design of a stormwater conveyance system for the entire basin as appropriate.

3.3.9 Basin I

Basin I has been previously analyzed by K&D Engineering, Inc. prior to development of the Elk Meadows Subdivision. No further hydrologic modeling has been completed as part of this Stormwater Plan.

3.3.10 Basin J

According to the hydrologic model and as supported by City staff, there are numerous locations within Basin J that experience flooding. The storm system near the intersection of Jasper Drive and Hills Street is the greatest cause for concern, flooding even in the 5-year, 24-hour storm event. The majority of the Basin J improvements have been assigned a high priority level in the development of the CIP. The exceptions are the portions of the conveyance system between Commercial Street and Hills Street and along Salmon Creek, which have been assigned a medium level CIP priority.

Proposed Basin J improvements to adequately convey the 25-year, 24-hour storm based upon current development conditions have been developed for two different alternatives. Alternative 1 illustrated in Appendix E – Figure E.8 includes primarily pipeline upsizing and Alternative 2 illustrated in Appendix E – Figure E.9 includes a combination of pipeline upsizing and detention pond improvements.

3.3.11 Basin K

Basin K has been previously analyzed by Branch Engineering, Inc. prior to development of the Salmon Creek Estates Subdivision. No further hydrologic modeling has been completed as part of this Storm Water Plan.

3.3.12 Basin L

According to the hydrologic model and as supported by City staff, Basin L does not experience any flooding up to and including the 25-year, 24-hour storm event.

3.3.13 Basin M

According to the hydrologic model and as supported by City staff, Basin M does not experience any flooding up to and including the 25-year, 24-hour storm event.

Appendix E – Figure E.10 illustrates possible storm improvements required to serve future development within Basin M. It is anticipated that these improvements would be constructed at the time of development by the developer. Therefore, the Basin M improvements have not been included in the CIP.

4. CAPITAL IMPROVEMENT PLAN (CIP)

The hydrologic analysis of the City of Oakridge stormwater system was used to develop proposed stormwater improvements that would safely convey the 25-year, 24-hour storm event under current development conditions. Based on the severity of the existing flooding problems, the proposed stormwater improvements were categorized into low, medium, and high level priorities. Table 4 below provides a summary of the CIP, while Tables 5, 6 and 7 on the following pages provide a more detailed breakdown per CIP priority level. Detailed CIP project cost estimates are included in Appendix F. The estimates are given with respect to 2011 dollars and should be projected appropriately into future dollars when considering funding of any part of these systems. Final design will dictate final costs and exact locations of systems.

TABLE 4
CAPITAL IMPROVEMENT PLAN SUMMARY*

CIP PRIORITY LEVEL	COST (ALT. 1)**	COST (ALT. 2)***
High	$1,931,900	$2,473,600
Medium	$542,100	$604,700
Low	$2,701,700	$1,728,200
TOTAL	**$5,175,700**	**$4,806,500**

* Cost of land, right-of-way, and easement acquisition, if any, excluded.
** Alternative 1 primarily includes pipeline upsizing.
*** Alternative 2 includes a combination of pipeline upsizing and swale and detention pond improvements.

TABLE 5
HIGH PRIORITY CIP*

BASIN	STREET	NODE	COST
C	W 2nd St.	C3-C4	$25,400
Basin C Subtotal			**$25,400**
D	Klohn Rd.	D1B-D2B	$92,700
D	Hansen St.	D2B-D3B	$75,400
D	Hansen St.	D3B-D4B	$75,400
D	Hansen St.	D4B-D5B	$75,400
D	Hansen St.	D5B-D11	$39,200
Basin D Subtotal			**$358,100**
F	Rainbow Rd.	F5-F6	$53,000
F	Rainbow Rd.	F6-F7	$32,900
F	Rainbow Rd.	F7-F8	$109,000
F	Fairyglen Dr.	F8-F9	$130,300
F	Fairyglen Dr.	F9-F10	$36,600
F	Fairyglen Dr.	F10-F11	$87,000
F	Fairyglen Dr.	F11-E22	$24,200
Basin F Subtotal			**$473,000**
G-D	Elder St.	G0D-G1D	$94,700
G-D	Elder St.	G1D-G1.5D	$17,900
G-D	Elder St.	G1.5D-G3.5D	$43,300
G-D	Elder St.	G3D-G3.5D	$12,200
G-D	Elder St.	G3.5D-G5D	$40,300
G-D	Elder St.	G4D-G5D	$14,600
G-D	Elder St.	G5D-G6D	$55,900
G-D	Elder St.	G6D-G15G	$14,600
Sub-Basin G-D Subtotal			$293,500
G-F	Pine St.	G0F-G1F	$7,900
G-F	Pine St.	G1F-G2F	$4,800
Sub-Basin G-F Subtotal			$12,700

* Cost of land, right-of-way, and easement acquisition, if any, excluded.

TABLE 5 CONTINUED*

BASIN	STREET	NODE	COST
G-G	Oak St.	G1G-G3G	$18,600
G-G	Oak St.	G3G-G4G	$6,200
G-G	Commercial St.	G6G-G7G	$17,900
G-G (Alt. 1)	Commercial St.	G7G-G8G	$126,000
G-G (Alt. 2)	Commercial St.	G7G-G7.5G	$12,700
G-G (Alt. 2)	Commercial St.	G7.5G-G8.5G	$205,200
G-G (Alt. 2)	Commercial St.	G13G-G8.5G	$14,800
G-G (Alt. 2)	Commercial St.	G8.5G-G9.5G	$111,200
G-G (Alt. 2)	Commercial St.	G9.5G-G10.5G	$44,600
G-G (Alt. 2)	Commercial St.	G10.5G-G11.5G	$24,500
G-G (Alt. 2)	Commercial St.	G11.5G-G25G	$239,900
Sub-Basin G-G Subtotal (Alt. 1)			$168,700
Sub-Basin G-G Subtotal (Alt. 2)			$695,600
Basin G Subtotal (Alt. 1)			**$474,900**
Basin G Subtotal (Alt. 2)			**$1,001,800**
J	Douglas St.	J0-J1	$23,100
J	Douglas St.	J1-J2	$6,200
J	Douglas St.	J3-J3.5	$44,700
J	Douglas St.	J3.5-J4.5	$42,200
J	Douglas St.	J4.5-J5.5	$41,300
J	Douglas St.	J7-J5.5	$6,600
J	Douglas St.	J5.5-J6.5	$62,700
J	Douglas St.	J6.5-J7.5	$61,500
J	Douglas St.	J7.5-J8	$74,300
J	Southern Pacific RR	J8-J9	$7,400
J	Commercial St.	J9-J10	$72,600
J (Alt. 1)	Commercial St.	J10-J11	$29,300
J (Alt. 2)	Commercial St.	J10-J12	$32,800
J (Alt. 1)	Hills St.	J16-J17	$30,100
J (Alt. 2)	Hills St.	J16-J17	$28,500
J (Alt. 1)	Hills St.	J17-J18.5	$25,000
J (Alt. 2)	Hills St.	J17-J18.5	$45,500
J (Alt. 1)	Hills St.	J18.5-J19.5	$37,600
J (Alt. 2)	Hills St.	J18.5-J19	$10,600
J (Alt. 1)	Hills St.	J19.5-J20.5	$35,900
J (Alt. 2)	Hills St.	J19-J20	$55,300
Basin J Subtotal (Alt. 1)			**$600,500**
Basin J Subtotal (Alt. 2)			**$615,300**
HIGH PRIORITY CIP TOTAL (ALT. 1)			**$1,931,900**
HIGH PRIORITY CIP TOTAL (ALT. 2)			**$2,473,600**

* Cost of land, right-of-way, and easement acquisition, if any, excluded.

+
= 20 YEARS
= 1400 ACCOUNTS
. 12 MONTHS
= $7.36/month

TABLE 6
MEDIUM PRIORITY CIP*

BASIN	STREET	NODE	COST
G-A	2nd St.	G0A-G1A	$23,500
G-A	2nd St.	G1A-G2A	$4,400
Sub-Basin G-A Subtotal			$27,900
G-C	Diamond St.	G7C-G8C	$25,800
G-C	Diamond St.	G8C-G9C	$28,400
G-C	Diamond St.	G9C-G10C	$32,000
G-C	Diamond St.	G10C-G11C	$48,300
G-C	Diamond St.	G11C-G22G	$18,300
Sub-Basin G-C Subtotal			$152,800
Basin G Subtotal			**$180,700**
J (Alt. 1)	Southern Pacific RR	J11-J12	$33,300
J (Alt. 1)	Southern Pacific RR	J12-J13	$92,700
J (Alt. 1)	Southern Pacific RR	J13-J14	$26,000
J (Alt. 1)	Southern Pacific RR	J14-J15	$18,200
J (Alt. 1)	Hills St.	J20-J21	$47,900
J (Alt. 1)	Salmon Creek	J21-J22	$28,900
J (Alt. 1)	Salmon Creek	J22-J23	$19,200
J (Alt. 1)	Salmon Creek	J23-J24	$95,200
Basin J Subtotal (Alt. 1)			**$361,400**
J (Alt. 2)	Southern Pacific RR	J12-J13	$334,800
J (Alt. 2)	Hills St.	J20-J21	$47,900
J (Alt. 2)	Salmon Creek	J21-J22	$22,100
J (Alt. 2)	Salmon Creek	J22-J23	$19,200
Basin J Subtotal (Alt. 2)			**$424,000**
MEDIUM PRIORITY CIP TOTAL (ALT. 1)			**$542,100**
MEDIUM PRIORITY CIP TOTAL (ALT. 2)			**$604,700**

* Cost of land, right-of-way, and easement acquisition, if any, excluded.

= 20 yrs
= 12 months
= 1400 accounts
= $1.80/mo

TABLE 7
LOW PRIORITY CIP*

BASIN	STREET	NODE	COST
C	W 2nd St.	C7-C8	$50,200
C	W 2nd St.	C8-C9	$41,400
C	W 2nd St.	C9-C10	$55,100
C	W 2nd St.	C10-C11	$51,200
C	W 2nd St.	C11-C12	$93,200
Basin C Subtotal			**$291,100**
D	School St.	D3-D4	$68,000
D	School St.	D4-D5	$116,700
D	School St.	D5-D6	$133,700
D	School St.	D6-D7	$12,200
D	School St.	D7-D8	$32,300
D	School St.	D8-D9	$92,000
D	River Rd.	D9-D10	$22,700
D	River Rd.	D10-D11	$148,800
D	River Rd.	D11- (Alt. 1)	$112,300
D	River Rd.	D11-D12 (Alt. 2)	$68,600
D	River Rd.	D12- (Alt. 2)	$27,900
Basin D Subtotal (Alt. 1)			**$738,700**
Basin D Subtotal (Alt. 2)			**$722,900**
E	Union St.	E8-E9	$111,700
E	Union St.	E9-E10	$13,100
E	Union St.	E10-E11	$108,900
E	School St.	E14-E15	$13,100
E	School St.	E15-E16	$36,800
Basin E Subtotal			**$283,600**
G-F	Pine St.	G5F-G6F	$25,100
G-F	Pine St.	G6F-G7F	$72,800
G-F	Commercial St.	G7F-G8F	$67,200
Sub-Basin G-F Subtotal			$165,100

* Cost of land, right-of-way, and easement acquisition, if any, excluded.

TABLE 7 CONTINUED*

BASIN	STREET	NODE	COST
G-G (Alt. 1)	Commercial St.	G10G-G11G	$10,700
G-G (Alt. 1)	Commercial St.	G11G-G12G	$45,800
G-G (Alt. 1)	Commercial St.	G12G-G13G	$85,800
G-G (Alt. 1)	Commercial St.	G13G-G14G	$81,500
G-G (Alt. 1)	Commercial St.	G14G-G15G	$93,200
G-G (Alt. 1)	Commercial St.	G15G-G16G	$59,900
G-G (Alt. 1)	Commercial St.	G16G-G17G	$37,300
G-G (Alt. 1)	Commercial St.	G17G-G18G	$13,600
G-G (Alt. 1)	Commercial St.	G18G-G19G	$84,600
G-G (Alt. 1)	Commercial St.	G19G-G20G	$192,600
G-G (Alt. 1)	Commercial St.	G20G-G21G	$119,600
G-G (Alt. 1)	Commercial St.	G21G-G22G	$112,400
G-G (Alt. 1)	Commercial St.	G22G-G23G	$253,200
G-G (Alt. 1)	Commercial St.	G23G-G24G	$33,000
Sub-Basin G-G Subtotal (Alt. 1)			$1,223,200
G-G (Alt. 2)	Commercial St.	G22G-G23G	$234,800
G-G (Alt. 2)	Commercial St.	G23G-G24G	$30,700
Sub-Basin G-G Subtotal (Alt. 2)			$265,500
Basin G Subtotal (Alt. 1)			**$1,388,300**
Basin G Subtotal (Alt. 2)			**$430,600**
LOW PRIORITY CIP TOTAL (ALT. 1)			**$2,701,700**
LOW PRIORITY CIP TOTAL (ALT. 2)			**$1,728,200**

* Cost of land, right-of-way, and easement acquisition, if any, excluded.

÷ 20
÷ 12
÷ 1400
= 5.14

HIGH 7.36
MED 1.80
LOW
$14.30/month

5. FINANCING

The challenge for any jurisdiction, and in particular a small city such as Oakridge, is to identify potential funding sources to complete capital improvement projects. The following is a brief description of various funding sources available to the City.

5.1 CITY OF OAKRIDGE STORM DRAINAGE FUND

In 2002, the City of Oakridge passed Ordinance 861, which created "The Storm Drainage Fund Ordinance," detailed in Oakridge City Code, Chapter 51.6. Ordinance 861 created a storm drainage utility fund. Money in the storm drainage utility fund shall be used for planning, design, construction, operation, maintenance, and administration of storm drainage facilities, including repayment of indebtedness, and for all expenses of operation and management of the storm drainage utility. The City's Storm Drainage Fund is anticipated to provide the most reliable funding source for CIP projects.

5.2 SYSTEM DEVELOPMENT CHARGES (SDC)

This type of charge, under various titles, has been increasingly used by cities and counties to help fund capital improvements necessary for new development to occur. They usually are applied to the development sector through fees associated with plat (subdivision) approvals, issuance of permits, or connection with utilities. They are especially useful when improvements include excess capacity in anticipation of future growth. Their use for stormwater systems would be to ensure financial participation in capital improvements by properties which develop after a project is partially or completely paid off. Although development is currently slow or even non-existent, adoption of SDC fees may be a viable funding source for CIP projects in the future.

The State of Oregon outlines the requirements and methodologies required to develop System Development Charges in Oregon Revised Statutes (ORS) 223.297-314.

5.3 LOCAL IMPROVEMENT DISTRICT (LID)

Projects funded through a Local Improvement District or LID must have an identifiable benefit to the properties included in the assessment area, and charges for each parcel must be consistent with the relative benefit to each property. This approach requires an assessment against the benefited property owners within the district boundaries. In order to establish the district and implement this approach, a majority percentage of property owners within the proposed district must vote their approval.

The use of LID's to fund stormwater projects is complicated by the difficulty in quantifying benefits for individual property owners. For water and sewer improvements, for example, the benefits are generally easy to identify. With drainage improvements, however, upstream or hillside properties which may contribute significantly to stormwater runoff may actually benefit little from improvements because of their protected location. One result may be to narrowly establish the boundaries of the LID, which then may be counterproductive to stormwater management.

5.4 GENERAL OBLIGATION BONDS

General obligation bonds are backed by the "full faith and credit of the City" and are paid for through property tax levies. These bonds require voter approval before they can be implemented.

5.5 UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) RURAL DEVELOPMENT (RD)

The United States Department of Agriculture Rural Development provides funding opportunities for communities with populations less than 10,000. For stormwater projects, only low interest loans are available through the Water and Environmental Programs.

5.6 OREGON WATERSHED ENHANCEMENT BOARD

The Oregon Watershed Enhancement Board provides grant funding for stormwater and other watershed enhancement projects. As the focus of the grant funding is for watershed enhancement, stormwater projects may not be highly competitive. If the City elects to pursue this funding option, it is recommended that they work closely with the Oregon Watershed Enhancement Board to discuss the merits of the project and weigh the likelihood of funding from this source. More information may be found online at:

http://www.healthywatersheds.org/home.html

5.7 OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

The State of Oregon Department of Environmental Quality administers Oregon's Clean Water State Revolving Fund to help public agencies finance water quality improvements. This program provides low-cost loans for the planning, design, and construction of various water pollution control activities. More information may be found on-line at:

http://www.deq.state.or.us/wq/loans/loans.htm

6. OPERATION AND MAINTENANCE

The objective of a stormwater operation and maintenance program is to assure that all of the elements of the stormwater system are functioning properly to avoid any impacts to the environment and properties. Regularly scheduled maintenance tasks and inspections are essential to the program. Major system problems can be avoided if defects are identified and addressed in a timely manner.

An operation and maintenance program begins in the design and permitting phase. Operation and maintenance should always be considered in the design and permit review of private development projects. Location and accessibility is important to maintaining a facility. Proper easements must be dedicated as necessary.

Some of the highlights of an operations and maintenance plan include:

- Cleaning storm inlets, manholes, pipes, culverts, and outfalls.
- Maintaining City-owned detention, infiltration, and water quality facilities.
- Removing sediment from roadside ditches while retaining or re-establishing vegetation.
- Controlling vegetation in roadside ditches and other stormwater facilities.
- Street sweeping, once equipment is available.

APPENDIX A

Title 5 – Public Works
Chapter 52 – Stormwater

TITLE V – Public Works

Chapter 52 - Stormwater

Sections:

52.01 - Purpose.

The purpose of this chapter is to define policies, minimum requirements, minimum standards and design procedures for the construction and maintenance of stormwater conveyance and quantity and quality control facilities in order to:

A. Minimize increased stormwater runoff rates from any new development so as to minimize the impact upon any downstream natural channel that may exist between the subject area and Salmon Creek and the Middle Fork of the Willamette River;

B. Prevent water runoff generated by development from exceeding the capacity of downstream stormwater facilities;

C. Reduce stormwater runoff rates and volumes, soil erosion and nonpoint source pollution, wherever possible, from lands that were developed without the stormwater management controls required by this chapter;

D. Prevent the uncontrolled or irresponsible discharge of stormwater from new development onto adjoining public or private property;

E. Maintain the integrity of stream channels for their biological functions, as well as for drainage and other purposes;

F. Have stormwater conveyance facilities of adequate design to manage all volumes of water generated in the contributing drainage area, for both the existing condition and the anticipated future condition;

G. Have all stormwater facilities:

1. Designed in a manner to allow economical future maintenance,

2. If city owned or maintained, designed for maintenance with city owned equipment,

3. Designed using materials that will ensure a minimum practical design life of seventy-five years, and;

4. Designed to have sufficient structural strength to resist erosion and all external loads (construction, traffic, seismic) which may be imposed;

H. Establish maintenance easements with the owners of privately owned/maintained stormwater facilities to ensure an appropriate level of maintenance and to help minimize public safety hazards;

I. Have all new stormwater facilities comply with applicable National Pollutant Discharge Elimination System (NPDES) requirements;

J. Minimize the deterioration of existing watercourses, culverts, bridges, dams and other structures;

K. Minimize increases in nonpoint source pollution; and

L. Allow for periodic inspections of both private and public stormwater quantity control and quality control facilities to verify that they are functioning in substantial conformance with the approved design intent.

52.02 - Adoption of standards.

The City Council may establish and modify from time to time by resolution Public Works Stormwater and Grading Design Standards to implement the requirements of this chapter.

52.03 - Superseding City of Oakridge Drainage Areas and Excavation and Grading Codes.

The policies and standards of this chapter are intended to be consistent with the applicable sections of the City of Oakridge Drainage Areas and Excavation and Grading City Code, dated August 1988 and February 1986, for land drainage and flood control within the City of Oakridge, as adopted by the city. No provisions within those codes shall supersede any requirements of this section.

52.04 - Definitions.

Unless specifically defined below, words and phrases used in this chapter shall be interpreted so as to give them the meaning they have in common usage and to give this chapter its most reasonable application.

"Applicant" means a person, party, firm, corporation or other legal entity that has applied for a development permit or approval.

"Biosolids" means solids derived from primary, secondary or advanced treatment of domestic wastewater that have been treated through one or more controlled processes that significantly reduce pathogens and reduce volatile solids or chemically stabilized solids to the extent that they do not attract vectors. This term refers to domestic wastewater treatment facility solids that have undergone adequate treatment to permit their land application.

"Bulk petroleum storage" means storage of any type of bulk liquid petroleum or petroleum waste materials stored outside in multiple above ground storage tanks (AST). Multiple ASTs include two or more tanks that are either within the same secondary containment structure or within twenty feet of each other.

"Catch basin" means a structure, normally with a sump, for receiving drainage from a gutter or median and discharging the water through a conduit.

"City" means the city of City of Oakridge.

"City engineer" means the city engineer, their duly authorized representative(s), or the city's duly authorized representative(s) as designated by the city manager.

"Clearing" means surface removal of vegetation.

"Closed depression" means a low lying area, which has no, or such a limited, surface outlet that in most storm events acts as a retention basin, holding water for infiltration into the ground or evaporation into the air. By their nature, closed depressions may contain wetlands.

"Constructed wetlands" means wetlands developed as a water quality or quantity facility, subject to change and maintenance as such. These areas must be clearly defined and/or separated from naturally occurring or created wetlands.

"Construction" means any site altering activity, including but not limited to: grading, paving, utility construction, and building construction.

"Contributing drainage area" means the subject property together with the watershed contributing runoff to it.

"Conveyance" means a channel or conduit to move water from one point to another point.

"Culvert" means a hydraulically short conduit that conveys surface drainage in artificial or natural watercourses through a roadway embankment or past some other type of flow obstruction.

"Dam" means a water storage structure that may or may not meet Oregon Revised Statute (ORS) requirements for height and storage capacity. All such structures require professional engineer design. If the water storage structure exceeds the ORS criteria for height or storage capacity, then the Oregon State Water Resources Commission shall have approval authority.

"DEQ" means the Oregon Department of Environmental Quality.

"Development" means any land use decision or manmade change defined as buildings or other structures, mining, dredging, paving, filling or excavation. Development does not include the following: (1) stream enhancement or restoration projects approved by the city; (2) farming practices as defined in ORS 30.930 and farm use as defined in ORS 215.203, except that buildings associated with farm practices and farm uses are subject to the requirements of this chapter; and (3) construction on lots in subdivisions meeting the criteria of ORS 92.040(2)(1995).

"Disturb" means man-made changes to the existing physical status of the land that are made in connection with development.

"Drainage feature" means any natural or man-made structure, facility, conveyance or topographic feature which has the potential to concentrate, convey, detain, retain, infiltrate or affect the flow rate of stormwater runoff.

"DSL" means the Oregon Division of State Lands.

"Easement" means the legal right to use a parcel of land for a particular purpose. It does not include fee ownership, but may restrict the owner's use of the land.

"Embankment" means a raised structure of earth, gravel or similar material above the surrounding grade.

"Engineer" means a registered professional engineer licensed by the state of Oregon.

"Engineer of record" means the project engineer who will affix his/her seal on project drainage plans and drainage analysis.

"Enhancement" means the process of improving upon the natural functions and/or values of an area or feature that has been degraded by human activity. Enhancement activities may or may not return the site to a pre-disturbance condition, but create/recreate processes and features that occur naturally.

"Erosion" means the movement of soil particles resulting from actions of water, wind or mechanical means.

"Excavation" means the mechanical removal of earth material.

"Fill" means any material such as, but not limited to, sand, gravel, soil, rock or gravel that is placed for the purposes of development or redevelopment.

"Floodplain" means the land area identified and designated by the United States Army Corps of Engineers, the Oregon Division of State Lands, the Federal Emergency Management Agency or city of City of Oakridge that has been or may be covered temporarily by water as a result of a storm event of identified frequency. It is usually the flat area of land adjacent to a stream or river formed by floods.

"Forebay" means an easily maintained, extra storage area provided near an inlet of a BMP to trap incoming sediments before they accumulate in a pond or wetland BMP.

"Fuel dispensing facilities" means the area (including fuel islands, above ground fuel tanks, fuel pumps, and the surrounding pad) where fuel is transferred from bulk storage tanks to vehicles, equipment, and/or mobile containers.

"Grading" means any excavating, filling, embanking or altering contours of earth material.

"Grubbing" means the removal of vegetative matter from below the surface of the ground, such as sod, stumps, roots, buried logs or other debris, and shall include the incidental removal of topsoil to a depth not exceeding twelve inches.

"Impervious surfaces" means a hard surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. It can also be a hard surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, rooftops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel surfaces with compacted subgrade, packed earthen materials and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered impervious surfaces.

"Inlet" means a connection between the surface of the ground and a drain or sewer for the admission of surface and stormwater runoff.

"Land disturbing activity" means any activity that results in a change in the existing soil cover (both vegetative and non-vegetative and both temporary and permanent) and/or the existing soil topography. Land disturbing activities include, but are not limited to, demolition, construction, paving, clearing, grading and grubbing.

"Low Impact Development or LID" means emphasizing conservation and use of on-site natural features to protect water quality. This approach implements engineered small-scale hydrologic controls to replicate the pre-development hydrologic regime of watersheds through infiltrating, filtering, storing, evaporating, and detaining runoff close to its source.

"Lot" means a single unit of land that is created by a subdivision of land (ORS 92.010(3)). For the purposes of this chapter, the word "lot" includes "plot," "parcel," or "tract."

"Maintenance" means any activity that is necessary to keep a stormwater facility in good working order so as to function as designed. Maintenance includes complete reconstruction of a stormwater facility, if needed to return the facility to good working order. Maintenance also includes the correction of any problem on the site property that may directly impact the function of the stormwater facilities.

"Maintenance easement" means a binding agreement between the city and the person or persons holding title to a property served by a stormwater facility where the property owner promises to maintain certain stormwater facilities; grants the city the right to enter the subject property to inspect and make certain repairs, or perform certain maintenance procedures on the stormwater control facilities when such repairs or maintenance have not been performed by the property owner; and promises to reimburse the city for the cost should the city perform such repairs or maintenance.

"Mitigation" means the reduction of adverse effects of a proposed project by considering, in the following order: (1) avoiding the impact all together by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action by monitoring and taking appropriate measures; and (5)

compensating for the impact by replacing or providing comparable substitute water quality resource areas.

"NPDES" means the National Pollutant Discharge Elimination System. A national permit system that covers discharges to waters of the United States and is enforced under the Federal Water Pollution Control Act, commonly known as the Clean Water Act.

"Nonpoint source pollution" means pollution from any source other than from discernible, confined and discrete conveyances, and includes, but is not limited to, pollutants from agricultural, silviculture, mining, construction, subsurface disposal and urban runoff sources.

"Oil/water separator" means a structure or device used to remove suspended, floating or dispersed oil and greasy solids from water.

"Off-site" means any area lying upstream of the site that drains onto the site and any area lying downstream of the site to which the site drains.

"On-site" means the entire property that includes the proposed development.

"Outlet" means a point of discharge of a culvert or other closed conduit.

"Owner or property owner" means the person who is the legal record owner of the land, or where there is a recorded land sale contract, the purchaser thereunder.

"Parcel" means a single unit of land that is created by a partitioning of land (ORS 92.010(7)).

"Partition" means the division of an existing land ownership into two or three parcels, within a calendar year, and is subject to approval under the City of Oakridge Municipal Code.

"Plans" mean the construction documents and specifications, including system site plans, storm drain plans and profiles, cross sections, detailed drawings, etc. or reproductions thereof, approved or to be approved by the city, county, or state. They will show the location, character, dimensions and details for the work to be done.

"Precipitation" means the process by which water in liquid or solid state falls from the atmosphere.

"Private stormwater facility" means a stormwater facility located on private property serving more than one structure and maintained by private property owners.

"Professional engineer" means a person who, by reason of his or her special knowledge of the mathematical and physical sciences and the principles and methods of engineering analysis and design, acquired by professional education and practical experience, is qualified to practice engineering as attested by his or her legal registration as a professional engineer in the state of Oregon.

"Project engineer" means the professional engineer responsible for the project, who will affix his/her seal on the project drainage plans and drainage analysis and supervise construction of the stormwater facilities. The project engineer shall be licensed in the state of Oregon and qualified by experience or examination.

"Public stormwater facility" means any stormwater facility in the public right-of-way or easement operated and maintained by the city, county or state.

"Record drawings" means a set of engineering or site drawings that show how the project was constructed and what materials were used. Record drawings are signed and dated by the project engineer.

"Restoration" means the process of returning a disturbed or altered area or feature to a previously existing natural condition. Restoration activities reestablish the structure, function, and/or diversity to that which occurred prior to impacts caused by human activity.

"Right-of-way" means all land, or interest therein, which by deed, conveyance, agreement, easement, dedication, usage or process of law is reserved for, or dedicated to, the use of the general public.

"Sedimentation" means the process of gravity deposition of water suspended matter; the process of depositing soil particles, clays, sands and other sediment, that were picked up by stormwater runoff.

"Solid waste storage area" means a place where solid waste containers are stored. Solid waste containers include trash compactors, solid waste dumpsters and garbage cans.

"Stormwater" means the surface water runoff that results from all natural forms of precipitation.

"Stormwater easement" means a legal encumbrance that is placed against a property's title to reserve specified privileges for the users and beneficiaries of the drainage facilities contained within the boundaries of the easement.

"Stormwater facility" means a component of a man-made drainage feature, or features designed or constructed to perform a particular function or multiple functions. Includes, but is not limited to, pipes, swales, ditches, culverts, street gutters, detentions basins, retention basins, wet ponds, constructed wetlands, infiltration devices, catch basins, oil/water separators and sediment basins. Stormwater facilities shall not include building gutters, downspouts, and drains serving one single-family residence.

"Stormwater management" encompasses "control," "developmental" and "maintenance" activities in which there is physical interaction with stormwater.

"Stormwater quality control" means the control of the introduction of pollutants into stormwater and the process of separating pollutants from stormwater. Stormwater quality control facilities include, but are not limited to, source controls, biofiltration/biofilter facilities, wet ponds,

wetland forebays, oil/water separators, constructed wetlands and erosion and sedimentation control facilities.

"Stormwater quantity control" means the control of the rate and/or volume of stormwater released from a development site. Stormwater quantity control facilities include, but are not limited to, detention and retention facilities.

"Stream" means a body of running water moving over the earth's surface in a channel or bed, such as a creek, rivulet or river. It flows at least part of the year, including perennial and intermittent streams. Streams are dynamic in nature and their structure is maintained through build-up and loss of sediment.

"Street, private" means any street, road, or right-of-way that is not a public street, as defined in this chapter.

"Street, public" means a street or road dedicated or deeded for public use. For the purposes of this chapter, public street may include "alley," "lane," "court," "avenue," "boulevard," "cul-de-sac" and similar designations, and any county roads and state highways.

"Structure(s)" means a building or other major improvement that is built, constructed or installed, or manmade improvements to land that are used, or expected to be used, in the operation of a utility. It includes buildings, utility lines, manholes, catch basins, driveways and sidewalks. It does not include minor improvements, such as fences, utility poles, flagpoles or irrigation system components that are not customarily regulated through zoning codes.

"Subdivide land" means dividing an area or tract of land into four or more lots. This applies for an area or tract of land that existed as a unit or contiguous units of land under a single ownership at the beginning of the year.

"Subdivision" means either an act of subdividing land or an area or tract of land subdivided as defined in this section.

"Surface waters" mean stormwater accumulating on a surface (including natural and man-made) and draining in the direction of least resistance due to gravity.

"Waste discharges" mean any discharge that requires an NPDES permit, Water Pollution Control Facility (WPCF) permit or 401 Certification. The following are excluded from this definition:

A. Individual on-site sewage disposal systems subject to issuance of a construction-installation permit;

B. Domestic sewage facilities that discharge less than five thousand gallons per day under WPCF permit;

C. Biosolids land applied within agronomic loading rates pursuant to OAR Chapter 340, Division 50; and

D. Reclaimed domestic wastewater land applied at agronomic rates pursuant to OAR Chapter 340, Division 55.

"Watercourse" means a channel in which a flow of water occurs, either continuously or intermittently, and if the latter with some degree of regularity. Such flow must be in a definite direction.

"Watershed" means a geographic unit defined by the flows of rainwater or snowmelt. All land in a watershed drains to a common outlet, such as a stream, lake or wetland.

"Wetlands" mean those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Wetlands are those areas identified and delineated by a qualified wetland specialist as set forth in the 1987 Corps of Engineers Wetland Delineation Manual.

52.05 - Applicability and exemptions.

This chapter establishes performance standards for stormwater conveyance, quantity and quality. Pursuant to each of the subsections below, proposed activities may be required to meet the performance standards for stormwater conveyance, stormwater quantity or stormwater quality.

A. Stormwater Conveyance. The stormwater conveyance requirements of this chapter shall apply to all stormwater systems constructed with any development activity, except as follows:

1. The conveyance facilities are located entirely on one privately owned parcel;

2. The conveyance facilities are privately maintained; and

3. The conveyance facilities receive no stormwater runoff from outside the parcel's property limits.

Those facilities exempted from the stormwater conveyance requirements by the above subsection will remain subject to the requirements of the Oregon Uniform Plumbing Code. Those exempted facilities shall be reviewed by the building official.

B. Stormwater Quantity Control. The stormwater quantity control requirements of this chapter shall apply to the following proposed activities, uses or developments:

1. Activities located wholly or partially within water quality resource areas that will result in the creation of more than five hundred square feet of impervious surface within the water quality resource area or will disturb more than one thousand square feet of existing impervious surface within the water quality resource area as part of a

commercial or industrial redevelopment project. These square footage measurements will be considered cumulative for any given seven-year period;

2. Activities that create more than two thousand square feet of impervious surface, cumulated over any given seven year period; or

3. Redevelopment of a commercial or industrial land use that will disturb more than five thousand square feet of existing impervious surface. This five thousand square foot measurement cumulates over any given seven year period;

4. An exemption to the stormwater quantity control requirements of this chapter will be granted in the following circumstances:

a. The development site discharges to a stormwater quantity control facility approved by the city engineer to receive the developed site runoff after verification that the facility is adequately sized to receive the additional stormwater, or,

b. The development site discharges to one of the following receiving bodies of water: Middle Fork of the Willamette River or Salmon Creek; and either lies within the one hundred year floodplain or is up to ten feet above the design flood elevation.

C. Stormwater Quality Control. The stormwater quality control requirements of this chapter shall apply to the following proposed activities, uses or developments:

1. Category A. Activities subject to general water quality requirements of this chapter:

a. The construction of four or more single-family residences;

b. Activities located wholly or partially within water quality resource areas that will result in the creation of more than five hundred square feet of impervious surface within the water quality resource area or will disturb more than one thousand square feet of existing impervious surface within the water quality resource area as part of a commercial or industrial redevelopment project. These square footage measurements will be considered cumulative for any given seven year period; or

c. Activities that create more than eight thousand square feet of new impervious surface for other than a single-family residential development. This eight thousand square foot measurement will be considered cumulative for any given seven year period;

d. An exemption to the stormwater quantity control requirements of this subsection will be granted if the development site discharges to a stormwater quality control facility approved by the city engineer to receive the developed site runoff after verification that the facility is adequately sized to receive the additional stormwater.

2. Category B. Uses Requiring Additional Management Practices. In addition to any other applicable requirements of this chapter, the following uses are subject to additional management practices as contained in the Public Works Stormwater and Grading Design Standards:

a. Fuel dispensing facilities;

b. Bulk petroleum storage in multiple stationary tanks;

c. Solid waste storage areas for commercial, industrial or multi-family uses;

d. Loading and unloading docks for commercial or industrial uses; or

e. Covered vehicle parking for commercial or industrial uses.

52.06 - Abrogation and greater restrictions.

Where the provisions of this chapter are less restrictive or conflict with comparable provisions of other portions of this code, regional, state or federal law, the provisions that are more restrictive shall govern. Where this chapter imposes restrictions that are more stringent than regional, state or federal law, the provisions of this chapter shall govern. However, nothing in this chapter shall relieve any party from the obligation to comply with any applicable federal, state or local regulations or permit requirements.

Compliance with this chapter and the minimum requirements, minimum standards, and design procedures as set forth in the city's adopted codes regarding stormwater and grading design standards does not relieve the designer, owner, or developer of the responsibility to apply conservative and sound professional judgment to protect the health, safety and welfare of the public. It is not the intent of this chapter to make the city a guarantor or protector of public or private property in regard to land development activity.

52.07 - Severability.

The provisions of this chapter are severable. If any section, clause, or phrase of this chapter is adjudged invalid by a court of competent jurisdiction, the decision of that court shall not affect the validity of the remaining portions of this ordinance.

52.08 - Submittal requirements.

A. Timing and Scope of Required Submittal.

1. Applications subject to the stormwater conveyance requirements of this chapter shall include an engineered drainage plan and design flow calculation report submitted prior to, or contemporaneous with, submittal of an application for a building, land use or other city issued permit.

2. Applications subject to the stormwater quantity and/or Category A quality requirements of this chapter shall include an engineered drainage plan and an engineered drainage report submitted prior to, or contemporaneous with, submittal of an application for a building, land use or other city issued permit.

3. Applications subject to Category B water quality special management practices shall demonstrate compliance with the additional management practices for commercial, industrial and multi-unit dwelling land uses of the Public Works Stormwater and Grading Design Standards as part of the site plan and design review process.

B. Required engineered drainage plans, drainage reports, and design flow calculation reports, which contain methods and proposed facilities to manage stormwater conveyance, quantity and/or quality, shall be prepared in compliance with the submittal requirements of the Public Works Stormwater and Grading Design Standards.

C. Each project site, which may be composed of one or more contiguous parcels of land, shall have a separate valid city approved plan and report before proceeding with construction.

52.09 - Approval criteria for engineered drainage plans and drainage report.

An engineered drainage plan and/or drainage report shall be approved only upon making the following findings:

A. The plan and report demonstrate how the proposed development and stormwater management facilities will accomplish the purpose statements of this chapter;

B. The plan and report meet the requirements of the Public Works Stormwater and Grading Design Standards as adopted by resolution under Section 52.02;

C. Unless otherwise exempted by Section 52.50(B), the plan and report includes adequate stormwater quantity control facilities, so that when the proposed land development activity takes place, peak rates and volumes of runoff:

1. Do not exceed the capacity of receiving drainage conveyance facilities;

2. Do not increase the potential for stream bank erosion; and

3. Do not add volume to an off-site closed depression without providing for mitigation.

D. The proposed development includes:

1. Adequate stormwater quality control facilities, so that when the proposed land development activity takes place, the temperature and overall pollution level of stormwater runoff is no greater than the water entering. When no water enters a project, then stormwater runoff shall be compared to rain samples; and

2. Stormwater quality control facilities which:

a. Are in compliance with applicable National Pollutant Discharge Elimination System (NPDES) requirements;

b. Minimize the deterioration of existing watercourses, culverts, bridges, dams and other structures; and

c. Minimize any increase in nonpoint source pollution.

E. The storm drainage design within the proposed development includes provisions to adequately control runoff from all public and private streets and roof, footing, and area drains and ensures future extension of the current drainage system.

F. Stream bank erosion protection is provided where stormwater directly or indirectly, discharges to open channels or streams. In the absence of LID improvements to control stormwater discharge, one of the following methodologies shall be utilized:

1. Two-Year Over-Control – Control the two-year post-development discharge rate to the one-year pre-development rate using the 24-hour storm event.
2. 24-Hour Extended Detention of the One-Year Storm – Detain the one-year, 24-hour post-development storm event and gradually release over a 24-hour period.

G. Specific operation and maintenance measures are proposed that ensure that the proposed stormwater quantity control facilities will be properly operated and maintained.

52.10 - Alternative materials, alternative design and methods of construction.

The provisions of this chapter are not intended to prevent the use of any material, alternate design or method of construction not specifically prescribed by this chapter, provided any alternate has been approved and its use authorized by the City. The City may approve any such alternate, provided that the city engineer finds that the proposed design is satisfactory and complies with the intent of this chapter and that the material, method, or work offered is, for the purpose intended, at least the equivalent of that prescribed by this chapter in effectiveness, suitability, strength, durability and safety. The city engineer shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in the City files.

52.11 - Transfer of engineering responsibility.

Project drainage plans shall always have an engineer of record performing the function of project engineer. If the project engineer is changed during the course of the work, the city shall be notified in writing and the work shall be stopped until the replacement engineer has agreed to accept the responsibilities of the project engineer. The new project engineer shall provide written notice of accepting project responsibility to the city within seventy-two hours of accepting the position as project engineer.

52.12 - Standard Construction Specifications.

The workmanship and materials shall be in accordance with the edition of the "Standard Specifications for Public Works Construction," as prepared by the Oregon Chapter of American Public Works Association (APWA) and as modified and adopted by the city, in effect at the time of application. The exception to this requirement is where this chapter and the Public Works Stormwater and Grading Design Standards provide other design details, in which case the requirements of this chapter and the Public Works Stormwater and Grading Design Standards shall be complied with.

52.13 - Administrative provisions.

An applicant shall submit the following additional items to the city and complete the following tasks prior to proceeding with construction of proposed development plans. These items include the following:

A. Engineer's cost estimate (also may be known as engineer's opinion of probable construction cost);

B. Plan check and inspection fees (as set by city resolution);

C. Certificate of liability insurance for city funded public projects contracted by the city;

D. Preconstruction meeting (if required);

E. Performance Assurance(s). Applicant must submit a letter of commitment, cash deposit or other form of assurance in form and substance satisfactory to the city engineer and city attorney, to cover the engineer's cost estimate for the construction of the stormwater facility. This is required to assure that the following are accomplished to the satisfaction of the city engineer:

1. Work shown on the development plans is accomplished,

2. Appropriate as-built/record drawings, on four mil Mylar, and electronic files are delivered to the city. Electronic files shall be submitted per city engineer format requirements,

3. Compliance with the criteria in this chapter, as well as with other city standards, ordinances, resolutions or rules,

4. Permanent stabilization and/or restoration of the impact from the development,

5. Fulfillment of all conditions of approval,

6. Payment of all outstanding fees,

7. Submittal of any required maintenance guarantee(s);

F. Developer/engineer agreement for public works improvements;

G. Land division compliance agreement (if applicable);

H. Project engineer's certificate of completion;

I. Operation and maintenance easement, if required by subsection A of this section;

J. Details on individual items required by this subsection can be obtained by contacting the city's engineering division. Many items, such as the engineer's cost estimate and plan check and inspection fee, are frequently incorporated with other infrastructure improvements that are done with the development (such as street, sanitary sewer, and water).

52.14 - Maintenance of public stormwater facilities.

A. Where proposed drainage patterns require stormwater facilities to receive stormwater runoff from public streets, the city shall be responsible for maintenance of those stormwater facilities. Access for maintenance of the stormwater facilities shall be provided to the city through the granting of a stormwater easement or other means acceptable to the city.

B. Responsibility for maintenance of stormwater management facilities on private property including all landscaping, irrigation systems, and other stormwater facilities with sumps shall remain with the property owner. To ensure the facility landscaping is actively and properly maintained during the critical plant establishment time period, the owner shall deposit with the city an amount equal to maintaining these facilities during a three-year warranty period; the owner shall be responsible for reimbursing the city for replacement trees, shrubs, and grass mixes during this three-year period should the owner fail to replace dead or dying plant material.

C. Transfer of maintenance of all other stormwater facilities shall occur when the city accepts the stormwater facility, along with a necessary easement.

D. The city will perform an inspection of the development's entire tributary, publicly maintained, stormwater system before acceptance. The stormwater system must be found to be in a clean, functional condition by the city engineer before acceptance of maintenance responsibility by the city.

52.15 - Penalties and enforcement.

A. The city is authorized to make inspections and take such actions as required to enforce the provisions of this chapter. The city has the authority to enter onto land for the purpose of inspecting site development activities or resulting improvements. City staff will make an effort to contact the property owner before entering onto that property.

B. If the city engineer determines a site has any unpermitted or illegal facilities placed, constructed or installed on the site, then the city engineer shall notify the owner in writing directing the owner to submit a written plan (with construction drawings completed by a professional engineer, if otherwise required by this chapter) within ten calendar days. This plan (and drawings, if required) shall depict the restoration or stabilization of the site or correct the work that has adversely impacted adjacent or downstream property owners. The city engineer shall review the plan (and drawings, if required) for compliance with city standards and issue comments for correction, if necessary, or issue an approval to the owner. The city shall establish a fee by resolution for such review, with all costs borne by the owner. If the required corrective work constitutes a grading permit, then the city shall collect the appropriate grading permit fee.

C. Any person, firm, corporation or entity violating any of the provisions of this chapter, whether they be the property owner, the applicant, the contractor or any other person acting with or without the authorization of the property owner or applicant, shall be subject to the code enforcement procedures of the Oakridge City Code.

52.16 - Hazardous conditions.

A. Determination and Notification. If the city engineer determines that any excavation, embankment, erosion/sedimentation control or drainage facility is a safety hazard; endangers property; or adversely affects the safety, use or stability of a public way, water quality resource areas, or drainage course, the owner(s) of the subject property and/or the person or agent in control of the property shall be required to repair or eliminate the hazard in conformance with the requirements of this chapter. At the time that the city engineer makes the determination that a hazardous condition exists, the property owner and/or person or agent in control of the property will be notified in writing that the hazard exists.

B. Order to Correct. The city engineer will order the specific work to be undertaken or will order that an engineering design be submitted for review and approval by the city engineer, and will specify the time periods within which the hazardous conditions be repaired or eliminated. In the event that the owner and/or the person or agent in control of the property fails to comply with this order, that person shall be subject to the code enforcement procedures of the Oakridge City Code.

52.17 - Permits from other jurisdictions.

A. The Oregon State Department of Environmental Quality (DEQ) currently issues 1200-C permits for projects that cover areas of one acre or greater. No permit will be issued for projects of this size (or any other size as modified by DEQ) without a copy of said DEQ permit being on file with City of Oakridge. DEQ is responsible for policing its own permits, however, if city personnel observe conditions that are believed to be in violation of any such permit, and cannot get corrections made, the city will bring such conditions to the attention of the appropriate DEQ representatives.

B. Projects often require Oregon State Division of State Lands (DSL) and/or United States Army Corps of Engineers (USACE) permit. If, in the city's opinion, such permits are required,

no permission to construct will be granted until such a time as a copy of such permit is on file with the city or notice is received from those agencies that a permit is not required. DSL/USACE is responsible for enforcing its own permits, however, if city personnel observe conditions that are believed to be in violation of any such permit, and cannot get corrections made, the city will bring such conditions to the attention of the appropriate DSL/USACE representatives.

C. Occasionally, projects may require Oregon State Department of Fish and Wildlife (ODFW) permits. No work will be authorized until the receipt of a copy of the ODFW permit. ODFW is responsible for policing its own permits, however, if city personnel observe conditions that are believed to be in violation of any such permit, and cannot get corrections made, the city will bring such conditions to the attention of the appropriate ODFW representatives.

APPENDIX B

Total Maximum Daily Load (TMDL) Implementation Plan

City of Oakridge
Total Maximum Daily Load (TMDL)
Implementation Plan

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Section One – Introduction

This document is the total maximum daily load (TMDL) Implementation Plan for the City of Oakridge. Implementation Plans from Designated Management Agencies (DMAs), such as the City of Oakridge, are required to comply with the Willamette Basin TMDL order set by the Oregon Department of Quality (DEQ) in 2006. By completing and implementing this Plan, the City of Oakridge fulfills the requirements of the federal Clean Water Act, Oregon Administrative Rule 340-042-0030 and water pollutant load allocations for the Middle Fork subbasin as approved by the US Environmental Protection Agency (EPA) in September of 2006.

This narrative and attached matrix describes current and future strategies the City will implement to reduce temperature, bacteria, and general pollutants in the Middle Fork subbasin of the Willamette River. The matrix summarizes activities the City will undertake to meet TMDL requirements. The City will annually report on implementation progress by filling in the "status" column of the matrix and submitting it to the DEQ.

This plan is organized into five sections. This first section introduces the Plan followed by the second section which gives a brief overview of the TMDL program, describes each of the three major pollutants addressed in the Willamette Basin TMDL (Temperature Bacteria, and Mercury), and explains the region's water resources, land use, and important issues related to water quality. Sections three, four and five explain current and future measures the City of Oakridge is doing to address the TMDL parameters of temperature, bacteria and general pollutants. Conclusions follow in section six. The matrix, included in appendix one, clearly displays when and how strategies will be implemented and also identifies how effective implementation will be measured.

The ultimate goal of this Implementation Plan is to minimize or eliminate heat inputs, bacteria, and other pollutants to surface waters within the jurisdictional control of the City of Oakridge. Through a multi-faceted approach of incentives, land use mechanisms, public operations, partnerships, and education this plan not only fulfils our legal TMDL compliance obligations but it also targets specific sources of contamination within our jurisdiction and offers feasible solutions.

Section Two – Background

Overview of TMDL Requirements

The Clean Water Act of 1977 "authorizes the U.S. Environmental Protection Agency (EPA) to 'restore and maintain the physical, chemical, and biological integrity of all waters of the nation'" (DEQ 2006). In response to the Clean Water Act, the EPA designated state agencies to develop water quality standards, perform water quality monitoring to understand current conditions, determine sources of pollution, and develop TMDLs as a tool to improve water quality. As a component of the overall effort to protect and restore the beneficial uses of Oregon's waterbodies, the DEQ issued TMDLs for the entire Willamette Basin.

The TMDL process begins when a stream, lake, or river does not meet water quality standards and is classified as water quality-limited on the state's 303(d) list. TMDLs identify the maximum amount of a specific pollutant that can be present in a water body without violating water quality standards. This is known as the loading capacity. After extensive water quality monitoring and modeling efforts, TMDLs establish the difference between the loading capacity and the current pollutant load. TMDLs are expressed as numeric standards or percent pollutant reductions that need to be met to bring water bodies into compliance with water quality standards. The difference between the current load and the loading capacity is known as excess load (DEQ, 2004).

The excess load is split up between the different sources of pollution according to their contribution to the overall pollution load. Any difference between the waterway's loading capacity and the current pollutant load must be mitigated by pollution reduction activities. The DEQ develops wasteload allocations for point sources such as wastewater treatment plants and industrial discharges. They develop load allocations for non-point pollution from agricultural, urban, and forestry lands such as erosion, animal wastes, and stormwater.

In the Willamette Basin, DMAs are to develop and submit these plans to the DEQ within 18 months after the release of the final TMDLs. On September 21, 2006, the Willamette Basin TMDL was issued as an order by the DEQ. TMDL Implementation Plans were due on March 31, 2008.

The Oregon Administrative Rule (OAR 340-042-0025) that addresses TMDLs requires local governments and other agencies to develop TMDL Implementation Plans. Responsible parties that are able to implement pollution reduction strategies are classified as Designated Management Agencies (DMAs). In the Willamette Basin, DMAs include federal agencies such as the Bureau of Land Management, state agencies such as the Department of Forestry and the Department of Agriculture, counties, cities, and others. According to OAR 340-042-0025, TMDL Implementation Plans must include the following five elements:

1. Management strategies that will be used to achieve load allocations

2. A timeline and schedule to achieve measurable milestones

3. A plan for periodic review and revision of the implementation plan

4. Evidence of compliance with applicable statewide land use requirements

5. Any other analyses or information as specified in the Water Quality Management Plan

Performance monitoring, review and evaluation, and reporting will be completed to ensure that the City's TMDL Implementation Plan addresses all the required elements listed in the state TMDL rule (OAR 340-042-0080(3)).

Performance Monitoring
Performance monitoring shall be tracked utilizing the TMDL Implementation Tracking Matrix included in this plan. This matrix will be used to track the effectiveness of the City's efforts in reducing pollutant loads.

Review and Evaluation
A review of the TMDL Implementation Plan will be conducted as required under OAR 340-042-0080(3)(a)(C) once every five years. Results of that review will be submitted to DEQ. Modifications will be made in accordance with DEQ requirements.

Reporting
As required, an annual report will be submitted to DEQ describing the progress of the City's TMDL management strategies.

The Oregon Department of Agriculture (ODA) is working with farmers to address contributions from farmland, the Oregon Department of Forestry is addressing contributions from forestland, and federal land management agencies are implementing TMDLs according to their internal procedures. Point sources, such as wastewater treatment facilities will be addressed through their individual permitting processes. Cities and counties must address contributions through the development of Implementation Plans.

The Lane County portion of the Willamette River Basin includes the McKenzie, Coast Fork, Middle Fork subbasins and the southern portion of the Upper Willamette subbasin. Within this headwaters region, there are eleven local government DMAs including Lane County and ten cities. Oakridge is one of three DMAs within the Middle Fork subbasin.

General TMDL Parameters

Temperature, bacteria, and mercury are the three parameters that have been included in all of the Willamette Basin TMDLs. Although other parameters are included in subbasin TMDLs, these three pollutants are the major concerns throughout the entire Willamette Basin.

Following are brief summaries of these three TMDL parameters, but more in-depth information on these parameters and the processes used to develop the TMDLs can be found in Chapters 2, 3, and 4 of the *Willamette Basin TMDL* (DEQ, 2006). The summaries below include basic information about the characteristics of the parameter, the potential sources of each pollutant, waterways in the region not meeting water quality standards, and a brief list of potential strategies to address each parameter.

Temperature

The temperature problem in the Willamette Basin is that the water is too warm at certain times of year and poses a threat to cold water fish species such as salmon. This is known as thermal pollution. Removal or disturbance of streamside vegetation is the primary activity that negatively impacts stream temperature due to the loss of shade cover, but water temperature is also affected by erosion, loss of channel complexity, low streamflows, dams, and heated discharges from industrial or municipal operations.

The major sources of thermal pollution that the DEQ evaluated for the Willamette Basin temperature TMDLs are wastewater treatment facilities, dam and reservoir operations, and the loss of streamside vegetation. Point sources will continue to be regulated through the existing National Pollution Discharge Elimination System (NPDES) permit methods. Sewage treatment plants, as well as large industrial permitted discharges, will be allocated heat loads during the next renewal of their NPDES permits.

The focus of the non-point source temperature TMDL is to mitigate the removal or disturbance of streamside vegetation. The most effective way to minimize thermal pollution is by reducing the amount of solar radiation that reaches the water. This is accomplished by protecting and reestablishing vegetation along waterways to provide shade cover. Temperature benefits can also be realized through stream restoration projects including streambank stabilization, increasing stream flows, decreasing channel width, and restoring channel complexity.

Temperature TMDLs have been developed for the Willamette subbasins and mainstem Willamette River within Lane County. The DEQ used two different approaches in developing the temperature TMDLs. One TMDL focuses on the mainstem Willamette River and its major tributaries up to the first dam. Using the other approach, the DEQ developed TMDLs on a more localized scale for stream segments upriver from dams.

The maximum temperature increase in the waters of the state from all human activities can be no more than 0.3 degrees C. This was designated by the State of Oregon in Oregon Administrative Rule 340-041-0028. In the TMDLs, this allowance is known as the Human Use Allowance and is split up between various sources of human-caused thermal pollution. Models indicate that restoring shade cover to natural levels could reduce temperatures in the mainstem Willamette River by 0.5 degrees Celsius (DEQ, 2004).

The amount allocated to each source of thermal pollution varies by location, but, generally, non-point sources are allowed to contribute no more than 0.05 degrees C, point sources can contribute up to .25 degrees C, and the TMDL allocates 0.0 degrees C to the U.S. Army Corps of Engineers Willamette Project reservoirs. The DEQ factors in .05 degrees as a reserve capacity that will be set aside now to accommodate future growth by meeting the increased demand for industrial and municipal wastewater discharges. On average, waterways in the Willamette Basin need to receive 23 percent less thermal input than is currently being received (DEQ, 2004).

The major implication of the temperature TMDLs is the protection and restoration of streamside vegetation. Examples of options to address thermal pollution include mechanisms such as:

- Develop materials that explain why landowners should preserve natural streamside vegetation
- Implement demonstration projects on public land to illustrate potential riparian management techniques
- Institute a riparian ordinance that prohibits the removal of native streamside vegetation
- Acquire critical streamside property
- Become involved in a water quality trading program

Bacteria

Even though the Middle Fork has no waterbodies on 303 (d) list for bacteria, the DEQ has set planning targets for DMAs in order to prevent the degradation of water quality. Chapter Two of the Willamette Basin TMDL, states that, "In subbasins with no listings, generalized reductions will be used as planning targets by designated management agencies" (DEQ, 2006). The bacteria targets are generalized into percent reduction ranges that are applied in all the subbasins of the Willamette Basin. These planning targets have been allocated among the two major land uses that contribute bacteria to waterways; agricultural and urban. The Willamette Basin Bacteria TMDL states that urban and agricultural areas must reduce their bacteria contributions by 80-94% and 66-83%, respectively, to meet water quality standards.

According to the Willamette Basin TMDL, point sources in the upper reaches of the Willamette Basin cause less than a one percent increase in the bacteria concentrations over natural conditions (DEQ, 2006), so the focus of the TMDL

implementation efforts should be on non-point sources. Models indicate that if these allocations are met within each subbasin, the entire upper reach of the mainstem Willamette River will be in compliance with water quality standards.

Seventy percent of the flow in the upper reach of the Willamette is from the Coast Fork, Middle Fork, McKenzie, and North and South Santiam Rivers (DEQ, 2004). These rivers effectively dilute bacterial concentrations from other tributaries in the mainstem of the Willamette River. It is important to maintain low bacteria levels in the headwaters region to preserve the ability of the Willamette River to meet water quality standards.

Bacteria violations of water quality standards are most common in creeks and streams that drain urban and agricultural land. The mainstem Willamette River is water quality limited for bacteria during the high flows of the fall-winter-spring months, but is in compliance during summer low flows when there is the least amount of runoff. Above Willamette Falls, violations in the bacteria standards are usually single sample events that are related to high levels of precipitation and the resulting runoff.
The major sources of bacteria in the urban and rural residential areas are stormwater runoff, erosion, domestic and wild animal waste, failing septic systems, and municipal sewer overflows. Other sources of bacteria include livestock, irrigation runoff, and streambank erosion.

Local jurisdictions can focus on urban issues to ensure that the quality of water does not degrade due to current land use, population growth, and land use changes. Strategy options to address bacteria in our urban area include:

- Preventing erosion and controlling sediment from new construction
- Detaining and treating stormwater prior to discharge into waterways
- Keeping stormwater conveyance channels clear of organic matter
- Controlling animal waste
- Maintaining and restoring riparian buffers
- Encouraging better site design to decrease runoff
- Preventing non-stormwater and illegal discharges
- Developing stewardship and educational programs to prevent pollution
- Street sweeping

Mercury
Mercury is a very complex pollutant. The way it acts in nature and the different forms it takes make it difficult to understand and accurately monitor. With no regard to local, state, or even international boundaries, mercury can be transported in the air after soil disturbance, automobile emissions, and industrial emissions across many miles and deposited by rainfall. Air deposition from emissions is one of many ways that mercury moves through the environment. Some point sources, including timber processing plants and mills, discharge low levels of mercury in their wastewater effluent. Stormwater runoff suspends mercury molecules and carries them to waterways. Mercury is naturally

occurring at low levels, but when native soil erodes at an accelerated rate those molecules are released in abnormal amounts. Mercury is also set in motion when sediment that has been deposited long ago is re-suspended due to high flows or a significant disturbance.

Headwaters Region of the Willamette Basin

The Lane County portion of the Willamette Basin could be considered the Headwaters region of the entire Basin because it forms the southernmost, furthest upstream area of the Basin (see Map One). There are four subbasins within the Headwaters region. Understanding the characteristics and unique issues in the Middle Fork subbasin as well as the other subbasins assists in coordinating efforts and identifying opportunities for the region as a whole.

The area encompasses 3,769 square miles and is home to approximately 300,000 people. There are eight incorporated cities outside the Eugene-Springfield metropolitan area in the Lane County portion of the Basin. There are approximately 27,660 people living in these urban incorporated areas (PSU Population Research Center, 2004) and 56,733 rural residents living in unincorporated areas outside Urban Growth Boundaries (Lane Council of Governments, 2000).

The McKenzie, Middle Fork Willamette, Coast Fork Willamette, and the Upper Willamette subbasins contain thousands of waterways, the quality of which is impacted by adjacent land uses. There are many different types of waterways in this region including a network of higher elevation rushing forest streams, channelized urban stormwater conduits, agricultural irrigation ditches, rural roadside ditches, mid-sized tributary rivers, and the beginnings of the broad, meandering Willamette River. The surrounding land uses are also very diverse. Table 1.3 shows the land area for each of the subbasins.

Table 1.3: Subbasin Land Area in Lane County

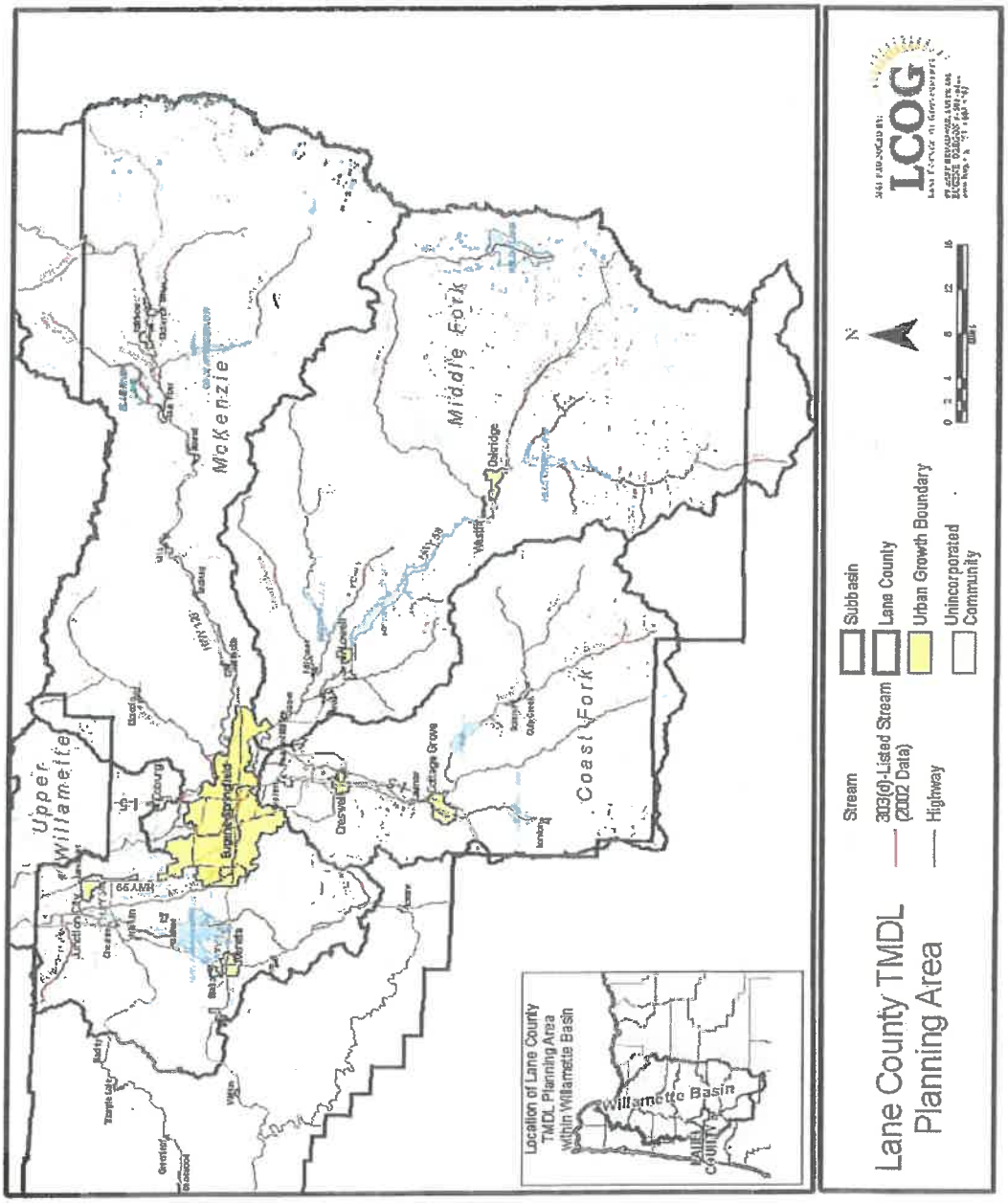
Subbasin	Area (square miles)
Middle Fork	1,355
Coast Fork	666
McKenzie	1,338
Long Tom portion of the Upper Willamette	410 (includes some land outside Lane County)
Total	*3,769*

Source: Willamette Basin TMDL Chapters 10,11,12,13 and Long Tom Watershed Council

These four subbasins are a patchwork of ownership and land use. The higher elevations on the western slopes of the Cascades are mostly federally managed forestland. Rural residential settlement has followed the river valleys of the Mohawk, McKenzie, Middle Fork, Coast Fork, Long Tom, and other smaller

valleys. Near the Middle Fork and Coast Fork confluence and the Willamette and McKenzie confluence, urban settlement dominates the landscape.

Map One: Lane County TMDL Planning Area



Middle Fork Subbasin

The Middle Fork subbasin is the south eastern portion of the Willamette Basin and falls within the political jurisdiction of Lane and Douglas Counties. Cities include Hemlock, Oakridge, Westfir, Lowell and a portion of Springfield. The majority (85%) of the 1,355 square miles of the subbasin is federally owned and

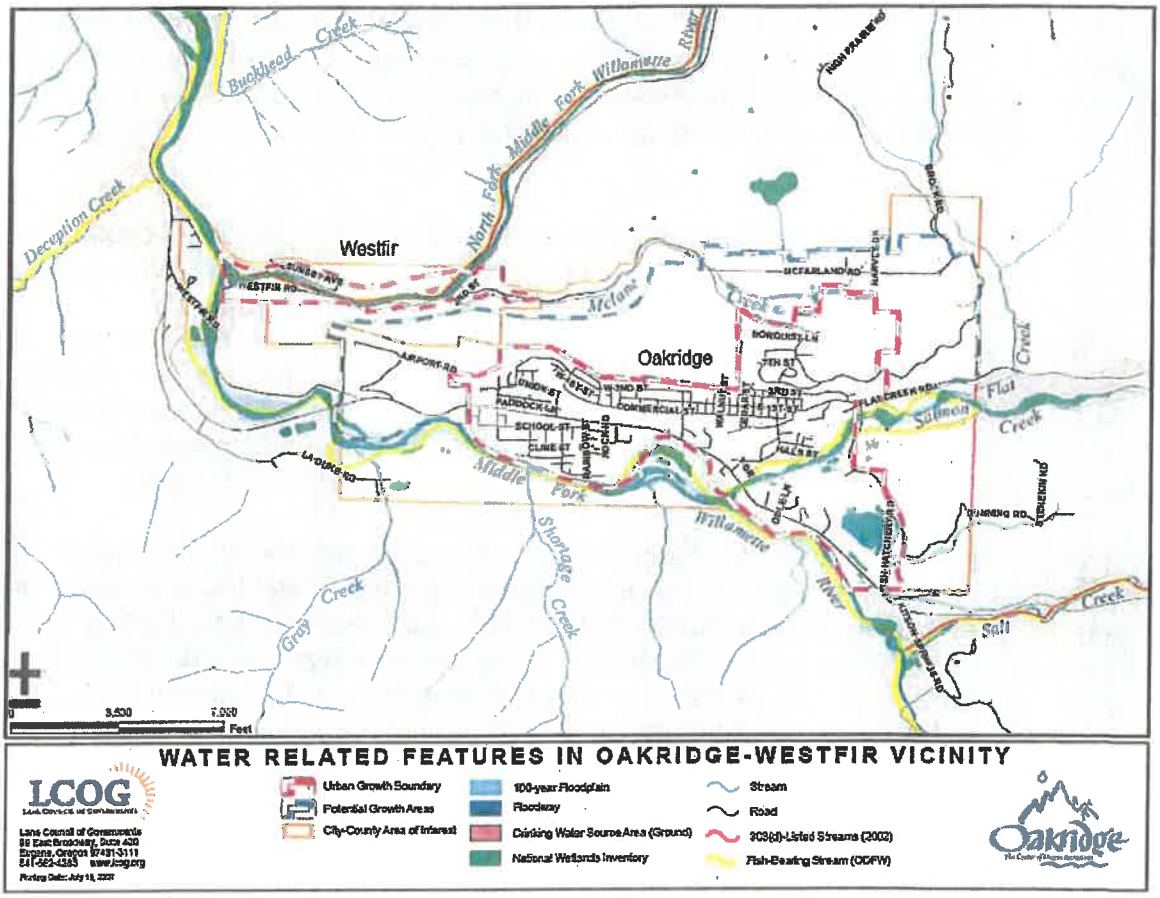
managed by the Willamette National Forest (USFS) and the Eugene Bureau of Land Management (BLM). Other land use in the subbasin is primarily industrial timber operations, with some agricultural and residential land use near the mouth of the drainage. The subbasin consists of 10 watersheds, all eventually draining into the Middle Fork Willamette River. The Middle Fork Willamette River flows into the Willamette River at its mouth at river mile (RM) 186.

Oakridge

Oakridge is located in the upper reaches of the Middle Fork subbasin. Located east of the confluence of the North Fork Middle Fork and Middle Fork Willamette River and southwest of Hills Creek Reservoir, Oakridge is surrounded by numerous and beautiful waterways (see Map Two). The population of Oakridge is 3,680, making it the sixth largest city in the region. Approximately 54% of land within city limits is designated for residential use, 32% is designated commercial, industrial or mixed-use and the remaining land is zoned for parks/open space, public use and aggregate extraction (Lane Council of Governments 2007).

To address water quality, the Oakridge performs a comprehensive stormwater maintenance program through the public works department and trains employees in proper maintenance procedures. The City has also implemented a Critical Drainage Area Ordinance which requires a vegetation removal permit for activity on steep slopes. The City is also in process of completing a Stormwater Plan.

Map Two: Water Related Features in Oakridge-Westfir Vicinity



Section Three – Temperature

Middle Fork Subbasin

The Middle Fork subbasin contains 16 waterbodies that have been listed on the DEQ's 303(d) list because the quality of the water does not meet temperature standards. These waterbodies include Anthony Creek, Bohemia Creek, Coal Creek, Fall Creek, Hills Creek, Little Fall Creek, Lost Creek, Middle Fork Willamette River, Mike Creek, North Fork Middle fork Willamette, Packard Creek, Portland Creek, Salt Creek, South Fork Winberry Creek, Winberry Creek and tributaries of Goodman Creek (DEQ 2006).

Heat loads in waterways come from natural background sources, point sources, and non-point sources. Causes of elevated summer stream temperatures include increased solar radiation due to loss of mature riparian vegetation; water withdrawals, which reduce streamflow volume, increase the rate of warming, and reduce the amount of riparian vegetation the stream can support; loss of side channel and wetland habitat, which sustain summer streamflows and provide cool water inputs; and changes in natural sediment loads contributes to bank

erosion and stream channel widening. The DEQ will measure reductions by the amount of streamside vegetation restored to system potential levels.

Oakridge
The City of Oakridge will address the temperature TMDL in by decreasing solar radiation inputs into waterways that lie within the city's jurisdiction. Through a collaborative effort, several actions have been decided upon in order to tackle this pollutant of concern. First, the City may protect and enhance existing riparian vegetation by developing, adopting and implementing "riparian protection" overlay and protection requirements in its Development Code. The city may also work with selected partners (i.e. Middle Fork Willamette Watershed Council) to initiate riparian restoration projects on private property. Third, the city may investigate opportunities to address the temperature issue on Salmon Creek (within city limits). Public education and outreach opportunities concerning the importance of riparian zones and opportunities of interested landowners will be conducted with the support from appropriate partners. These efforts by the City of Oakridge should be done as funding and staff time become available.

The Oakridge Wastewater Treatment Plant will not only maintain compliance with NPDES permit requirements, but the City will explore the possibilities of diverting a portion of treated effluent from directly entering the surface water during times of elevated river temperature.

Section Four – Bacteria

Even though no waterways in and around the City of Oakridge are on the 303(d) list for bacteria, the City has incorporated appropriate planning targets to meet the goals of the Willamette Basin Bacteria TMDL and to ensure high water quality for the future.

The wastewater treatment plant of Oakridge chlorinates its sewage effluent and conducts routine effluent monitoring which indicates this effort is successful in removing bacteria. The City will continue to maintain compliance with its NPDES permit requirements and monitor effluent bacteria levels as required. Another avenue to curb bacterial contamination is to limit the amount of animal/pet waste and yard debris from entering the waterways. In addition to providing pet waste stations in selected locations, the City may take measures to educate residents about the importance of proper pet waste and yard debris disposal, as funding and staff time allow.

Erosion and sedimentation from new and re-construction will be limited to maintain clear and clean water by continuing to distribute 1200-C permits to new large (over one acre) developers and ensure smaller (less than one acre) developments have an "erosion control plan" if required. Also, if needed, stormwater detention and treatment requirements for new and re-development

can be incorporated into Oakridge Development Code, as time and funding allow.

One of the major actions the City will execute to address the bacteria TMDL is in regards to stormwater discharge and will be coordinated with the City's Stormwater Plan. Components of this task include: increasing detention time and treatment facilities for stormwater to allow for infiltration and sediment deposition for new or re-development projects; raise awareness of actions that individuals can take to minimize stormwater impacts; and create a stormwater system map and identify areas where water quality protection actions would have the greatest benefit. These will be shown in the stormwater RFQ as "add" items, and will be included as funding allows.

Section Five – Mercury

Aside from direct industrial effluent, as in mine drainage or manufacturing (none of which exist in the Upper Middle Fork watershed), mercury generally comes from natural sources (soil and rock) that are mobilized through erosion. Based upon DEQ's analysis of mercury loading in the Willamette Basin, erosion of native soil represents 47.8% of the relative mercury load contribution for the Willamette mainstem. The mercury TMDL is Willamette Basin wide since upstream sources (urban, industrial, agricultural, and forestry) in all subbasins of the Willamette Basin contribute to the mercury loading of the Willamette mainstem, which exceeds the water quality standard for mercury. The cumulative impact of sedimentation from all human-caused sources within the basin contributes significantly to this violation. To control mercury loading in the Willamette mainstem, upstream sources of mercury must be controlled, even though water bodies in the Upper Middle Fork watershed are not listed on the 303(d) list.

While accelerated soil erosion is not likely to affect mercury levels in Oakridge area rivers and streams, it is still in the City's interest to limit erosion to maintain the clear and clean water it currently enjoys. The city is working on land development code requirements for geotechnical evaluation on new development on erosive areas, and limiting development on steep slopes. Under DEQ rules, regardless of slope, a 1200-C stormwater permit (with an approved stormwater management plan) is required for any developments over one acre. The Master Storm Plan will call for sedimentation ponds and bio-swales, which will also limit runoff problems with routine maintenance.

Section Six – All Pollutants

This section of the Plan describes the City's commitment to reducing all pollutants from entering the aquatic ecosystem. This includes most of the stormwater run-off issues and new codes proposed by the city. Also, Oakridge, with Lane County Solid Waste Management as a partner, hosts and will continue

to host an annual hazardous waste event in the area. Hazardous waste disposal education is incorporated into this event along with other outreach activities. As the City of Oakridge proceeds toward the goals outlined in this TMDL Implementation Plan, it will work with the MFWWC to pursue opportunities to partner with other local governments and organizations to implement mutual strategies.

Section Seven – Conclusion

As previously stated, it is our understanding that this Plan and attached matrix will meet the DEQ's order to prepare a Total Daily Maximum Load Implementation Plan. All of the strategies outlined in this document are consistent with Oakridge's land use plans. The City will continue to abide by local and statewide land use laws in any future action related to TMDL project implementation.