Executive Summary

Purpose

This master plan evaluates existing and future stormwater drainage needs in the City of McMinnville (City) and establishes a plan to implement the recommended improvements. This plan updates the 1991 *City of McMinnville Storm Drainage Master Plan*[1] to address recent growth in the community and relevant regulatory developments.

More specifically, this plan presents the results of the analysis of the existing drainage system, establishes performance criteria, identifies improvements designed to relieve existing problem areas or potential future problem areas, and recommends standards for the design of stormwater conveyance facilities.

To the extent practical, the form and methods of the 1991 Plan have been maintained. Some methods for determining stormwater runoff and system capacity during storm events have been adjusted to reflect current available information and design practice. The proposed improvements reflect a review and update of projects described in the previous plan, along with new recommendations based on recent maintenance reports and updated land use and development data.

Existing Drainage Facilities

The City is situated just upstream of the confluence of the North and South Forks of the Yamhill River. To the north, the City is bounded by Baker Creek. These waterways serve as perimeter points of discharge for stormwater generated within the City. The developed portions of the City lie on land that is sufficiently higher than these perimeter waterways to be generally unaffected by their flows, except that the backwater from the South Yamhill River controls the water surface elevations in Cozine Creek upstream as far as Fellows Street.

Cozine Creek drains a large portion of the City and is the only City drainageway that serves upstream areas beyond the City's urban growth boundaries (UGBs).

Stormwater runoff is drained by pipe and natural open channel systems throughout the watershed. Most of the runoff from the urbanized areas, especially the central business district, is piped. Runoff is transported through these pipes and discharged into the creeks and streams flowing through the City.

According to the McMinnville Comprehensive Plan (Volume II, Goals and Policies, Goal II, Policy 9.00), where possible and where it is consistent with development objectives, natural drainageways should be retained. A well-vegetated, slow-moving creek system can provide channel storage of runoff waters and water quality benefits.

[1] CH2M HILL and David J. Newton Associates, Inc., 1991.

In a small section of the downtown area, stormwater is combined with sanitary sewage flows and is conveyed to the sewage treatment plant. Lift stations are used in these systems to pump the combined flows to the treatment plant. During times of peak stormwater discharge, the capacity of these lift stations can be exceeded and the excess typically overflows directly to the river. The City's Water Reclamation Facility Master Plan (October 2008) addresses these issues in detail.

Rainfall Analysis

Rainfall patterns were analyzed to identify representative characteristics appropriate for the design of a stormwater drainage system for the City of McMinnville. From this analysis, it is recommended that the City continue to use a 24-hour synthetic storm developed from National Oceanic and Atmospheric Administration (NOAA) isopluvial maps and the U.S. Natural Resource Conservation Service (NRCS), formerly Soil Conservation Service (SCS), Type 1A rainfall distribution. The 24-hour, Type 1A storm distribution produces large peak runoff in the major drainage ways (compared to other common rainfall distributions) and it is the most commonly used distribution for the region surrounding McMinnville.

However, for analyzing and designing facilities for small project areas (less than 25 acres), the City is advised to use the Rational Method and peak rainfall intensities from the Oregon Department of Transportation (ODOT) intensity-duration-frequency (IDF) curves. This proven, simple approach is best suited to small urban drainage system design.

Runoff Analysis

The master plan study area is defined by the UGB with the exception that additional modeling was completed outside the UGB in the upper reaches of Cozine Creek, located to the west and southwest of the City. The modeling estimated the rates of runoff that flows into the City's drainage facilities.

The drainage network consists of 9 major basins and 144 sub-basins. Runoff from each sub-basin was determined using the U.S. Army Corps of Engineers' HEC-HMS hydrologic computer model. Peak flows from each sub-basin were computed for the 10-, 25-, 50-, and 100-year frequency events. The 10-year event represents the design storm for evaluating capacity of the piped drainage system. Peak flows for the larger, less frequent events were routed through the major drainageways to evaluate the frequency of roadway overtopping.

Hydrographs from each sub-basin were routed and combined using the HEC-HMS computer program to estimate the peak in-stream flows resulting from all sub-basins within the upstream watershed contributing to the point of interest, such as road crossings. For the major open channel drainageways, which must be evaluated for events greater than 10 years, the peak 10-, 25-, 50-, and 100-year flows were similarly computed.

Flow monitoring data were collected at three locations in the spring of 2008. These monitoring data were used to calibrate the hydrologic models for the major basins.

Based on model results for the Cozine Creek Basin and confirmed by observation of flood events, the elevation of Cozine Creek is affected by the backwater of the South Yamhill

River upstream as far as Fellows Street. It appears that the Yamhill River, in turn, is affected by backwater conditions from the Willamette River.

Hydraulic Analysis

Hydraulic analysis was performed to identify problem areas and develop recommended improvements for the City of McMinnville storm drainage system. A hydraulic deficiency rating of low, medium, or high was used to rank the capacity of each pipe for the 10-year design storm under existing conditions.

Pipes with low hydraulic deficiency ratings were determined to have adequate hydraulic capacity to pass the design flow. Pipes with a medium rating may cause street flooding to some degree for the given design flow. Pipes with a high deficiency rating are likely to cause street flooding during the 10-year design storm. The hydraulic analysis results are summarized in Table ES-1.

TABLE ES-1
Summary of Hydraulic Analysis Results
McMinnville Storm Drainage Master Plan

Basin	Pipe Inventory (LF)	Pipe Analyzed (LF)*	Percent of Pipe Analyzed with High Deficiency Rating for 10-year Storm under Existing Conditions (%)
Cozine Creek	61,488	10,256	7.3
West Cozine	80,751	9,735	27.3
North Cozine	85,735	21,865	11.8
Baker Creek	20,207	2,813	7.8
Midtown	33,071	6,744	58.1
Highway	51,748	1,979	35.7
North Yamhill	7,700	0	Not applicable
South Yamhill	31,475	9,627	29.0
East End	66,391	13,746	39.2

* For smaller local pipe systems, the focus of this master plan was to update the hydraulic analyses of pipelines analyzed in the 1991 *City of McMinnville Storm Drainage Master Plan*.

LF = linear feet.

Water Quality

Regulatory Climate

In 1990, rules were adopted for permitting of municipal separate storm sewer systems (MS4s). This approach treats the City's system as a single pollutant source, instead of permitting each individual storm sewer outfall. At this time, the program does not include end-of-pipe monitoring, but focuses instead on program-level performance and in-stream monitoring of the receiving waters. Phase I MS4 regulations were applied to communities

with separate storm sewer populations greater than 100,000. Initially, Phase II regulations were applied to cities of greater than 50,000, but they are in the process of being expanded to reach smaller communities in Oregon. The list of Phase II communities does not include McMinnville at this time.

The Oregon Department of Environmental Quality (DEQ) is revising the Yamhill Sub-Basin Total Maximum Daily Load (TMDL). The Yamhill Sub-Basin was included in the 2006 Willamette Basin TMDL for mercury. The Yamhill TMDL is expected to include temperature and nutrients.

Mercury is naturally occurring within the Willamette watershed, but within the City, the primary expected source is from wastewater discharge. The small portion of the City that is served by a combined sewer may also contribute to receiving water levels. It is currently unclear how significant the programmatic stormwater management elements may be to ensure compliance. Enhanced erosion control standards may be the most relevant stormwater best management practice (BMP).

Also of DEQ concern is the concentration of phosphorus present in the Yamhill River during the summer months. High concentrations of phosphorus and other nutrients combined with warmth, sunlight, and the long residence times of the slow-moving river, can cause unacceptably high levels of algae growth. DEQ has determined that if total phosphorus concentrations in the river can be sufficiently reduced (to below 70 micrograms per liter), then algae growth and pH can be maintained within acceptable limits. Stormwater runoff contributes to phosphorus discharge resulting from naturally occurring soils and vegetation detritus, as well as from development-related sources such as lawn care, garden, and agricultural chemical products.

Water Quality Recommendations

Although future stormwater quality regulations cannot always be accurately predicted, the direction is apparent and several steps may be prudent to take in anticipation of the actual rule promulgation. The following actions are recommended with respect to stormwater quality.

Water Quality Testing

Conduct sampling to comply with a DEQ-approved TMDL Implementation Plan, as required.

Catch Basin Types

Consider adoption of the sumped and siphoned style of catch basins for both public and private facilities within the City. Adopt this style as new catch basins are built or as old catch basins are replaced within the normal schedule of maintenance and improvements.

Preservation of Open Channel Waterways

To preserve open channel waterways, do the following:

- Retain natural existing open channel waterways as such to the extent possible, rather than allow their replacement with piped systems. Exceptions to this policy should include situations where the waterway cannot be maintained sufficiently free from

encroaching vegetation or human activities to prevent flooding of adjacent lands due to such encroachment.

- Consider increased detention requirements to manage potential sediment loss and instability impacts (for example, channel down-cutting) or significant growth is expected in a specific stream basin.

Passive Water Quality Treatment Facilities

Consider for treatment a much lower threshold of increased impervious area (5,000 to 10,000 square feet is common). This lowered threshold would represent a major change for development within the City. Types of allowable treatment facilities have expanded greatly in recent years, with refined design criteria and presumptive treatment efficiencies. More discussion of design criteria and efficiencies, and the interaction with water quantity management techniques, would be appropriate additions to design standards.

Recommended Capital Projects

Capital improvement project were identified using a risk rating system that is based on the computed hydraulic deficiency rating in addition to seven other factors:

- Surcharge severity
- Reports of historical flooding
- Reported maintenance problems
- Location relative to other deficient pipes
- Proximity to high use or important public areas
- Projects that were previously identified as recommended capital improvement projects
- Correction factor for pipes that have not been surveyed

Each pipe receives a total risk rating based on the cumulative total of risk factors. Areas with pipes that have a risk rating of five or more are recommended capital improvement projects. Since the hydraulic analysis was limited to areas were survey data were available, these areas were furthered reviewed qualitatively as "systems" to account for the fact that other adjacent and downstream pipes that were not included in the analysis would also need to be replaced. This approach provides a better means for estimating the probable project cost.

Other Stormwater Program Recommendations

In addition to capital improvements, the City is responsible for the operation, maintenance, and management of storm drainage infrastructure and assets. Through the course of the master plan update, additional, program-related tasks were identified that are recommended for the continued management of the City's facilities:

- Enhance the City's geographical information system (GIS) mapping and database of drainage facilities by collecting additional field survey data to more effectively evaluate system capacity and possible improvements, identify maintenance priorities, and track system changes over time. A complete database with pipe invert data, pipe material, manhole rim elevations, catch basin types, water quality facilities, and detention

facilities would be valuable. Much of this information will be needed during predesign of capital improvements, and might be collected more efficiently citywide.

- Perform a review of maintenance activities and best practices gap analysis to ensure that the current system is functioning at full effectiveness before investing in capital improvements. Many maintenance practices have implications for receiving water quality and should also be considered in light of potential regulatory requirements
- Create stormwater ordinances and revise design and construction standards to reflect water quality best practices.
- Perform a review of financing, utility, and rate structure to ensure adequate program operating and capital funds.

Table ES-2 summarizes these recommendations and assigns a cost allowance to each.

TABLE ES-2
Recommended Capital Projects
City of McMinnville Storm Drainage Master Plan

Project Name	Total Length of Pipe (feet)	Range of Replacement Pipe Diameter (inches)	Estimated Project Cost
Hilary St from Clifton Ct to Hilary Ct	581	18-21	$130,000
Linfield Ave from Baker St to Melrose Ave	729	21	$170,000
Brockwood Ave to Edmunston St then east to Drumwood Ave	957	36	$330,000
Cleveland Ave from Davis St to east of Villard St	2,349	21	$550,000
1st St from Adams St to Evans St	1,544	18-24	$350,000
4th St from Birch St to Davis St	1,672	18-30	$410,000
Elm St and 12th St	2,968	21-48	$970,000
Alpine St from 7th Ave to 12th Ave	1,750	15-21	$380,000
Kirby and 13th St	790	21	$180,000
Adams St from 20th St to 17th St	928	21	$220,000
Evans St from 15th St to 17th St	466	21	$110,000
Galloway St from 13th to McMinnville High School	690	27-30	$200,000
McDonald Ln from 17th St to 18th St	363	21	$90,000
Outfall stabilization*	4 locations	Not applicable	$200,000
Booth Bend and Davis*	Unknown	Unknown	$200,000
Michelbook Catch Basins*	Unknown	Unknown	$100,000
High School Catch Basins*	Unknown	Unknown	$100,000
3rd Street west to City Park*	Unknown	Unknown	$200,000
TOTAL			**$4,900,000**

* Lump sum cost estimate is provided as a project allowance; a detailed cost estimate was not prepared.

TABLE ES-3
Program Recommendations
City of McMinnville Storm Drainage Master Plan

Recommendation	Cost Allowance*
Conduct detailed asset survey and GIS analysis	$300,000
Review maintenance practices	$50,000
Update ordinances and standards	$50,000
Review finance and rate structure	$50,000
Total	**$450,000**

* Lump sum cost estimate is provided as a project allowance.

Drainage System Standards

The City of McMinnville has developed a comprehensive and detailed set of storm drainage policies and construction standards. As part of this master plan update, these policies and standards were updated.

In the future, the City may wish to split the drainage system standards information into three locations: a Citywide stormwater ordinance, the master plan, and a storm drainage design manual. In this way, the ordinance language can integrate more fully with land use, environmental, and flood control requirements and reference the current master plan and design manual. The focus of the master plan would be to outline how the City should manage its surface water, describe the capital improvements plan, and detail schedules and budgets for financing. The design manual can be more dynamic, and can be modified regularly (as needed) to address design changes or regulatory requirements that may arrive in a way that requires timely response. If this is done, one document, usually the ordinance must be given explicit supremacy to address discrepancies that may arise. To facilitate this process, design guidance has been consolidated in Appendix E of this document (City of McMinnville Storm Drainage Design and Construction Standards).