

## Chapter 7

### RECOMMENDATIONS FOR DRAINAGE IMPROVEMENTS

Continued improvements of the drainage system in Woodburn will rely on a number of activities and attention to the condition of the existing facilities. Specific recommendations for projects are found in Chapter 9, Recommended Capital Improvement Projects, of this report. These projects should be implemented as soon as funds, permitting and the public review process allow. However, these projects will only mitigate current shortcomings in the systems capacity and should not be relied upon to provide a drainage system which will adequately serve the City in the long term. Projects of growth and development patterns made in this study are based on the best understanding available at the time. Experience shows that trends change over time and forecasts of future conditions should be revisited periodically.

In light of this, the following general recommendations are provided to guide the City managers in their planning for future use of the drainage system.

#### Detention Policy Implementation

A city-wide Stormwater Flow Management Program including policies regarding detention has been developed concurrently with this study. It addresses on-site detention for individual parcels of land and identifies several locations in the City where a public detention facility may be sited. For the past number of years, the city has utilized a guide presented in Table 7-1, "Volumes for Different Intensity Storms for 10-Acre Site". This guide is presented here to document the city's recent position on detention facility sizing. The new guidelines are provided in the Stormwater Flow Management Program document and these should be used for analysis and

**Table 7 - 1  
VOLUMES FOR DIFFERENT INTENSITY STORMS  
FOR 10-ACRE SITE**

Storms	Results (Rates)	i (INTENSITIES)	A = 435,600 =10 acres	Developed C = 0.71 (UN)developed C = 0.25	ft <sup>3</sup> Sec (cfs)	Volumes storms	ft <sup>3</sup> 3600sec hrs	ft <sup>3</sup> storage volume
100 yr.	<u>1.26"</u> 2.7 hrs	0.467 in/hr	435,600 ft <sup>2</sup> or 10 acres	0.71	3.313	32,205 ft <sup>3</sup>	32,205 ft <sup>3</sup> -- <u>11,340 ft<sup>3</sup></u> 20,865 ft <sup>3</sup> storage volume	
				0.25	1.167	11,340 ft <sup>3</sup>		
50 yr.	<u>1.20"</u> 2.76 hrs	0.435 in/hr	435,600 ft <sup>2</sup> or 10 acres	0.71	3.087	30,672 ft <sup>3</sup>	30,672 ft <sup>3</sup> -- <u>10,800 ft<sup>3</sup></u> 19,872 ft <sup>3</sup> storage volume	
				0.25	1.087	10,800 ft <sup>3</sup>		
25 yr.	<u>1.14"</u> 2.86 hrs	0.399 in/hr	435,600 ft <sup>2</sup> or 10 acres	0.71	2.830	29,138 ft <sup>3</sup>	29,138 ft <sup>3</sup> -- <u>10,255 ft<sup>3</sup></u> 18,883 ft <sup>3</sup> storage volume	
				0.25	0.996	10,255 ft <sup>3</sup>		
10 yr.	<u>1.08"</u> 2.97 hrs	0.364 in/hr	435,600 ft <sup>2</sup> or 10 acres	0.71	2.582	27,605 ft <sup>3</sup>	27,605 ft <sup>3</sup> -- <u>9,720 ft<sup>3</sup></u> 17,885 ft <sup>3</sup> storage volume	
				0.25	0.909	9,720 ft <sup>3</sup>		
5 yr.	<u>0.935"</u> 3.28 hrs	0.285 in/hr	435,600 ft <sup>2</sup> or 10 acres	0.71	2.024	23,899 ft <sup>3</sup>	23,899 ft <sup>3</sup> -- <u>8,415 ft<sup>3</sup></u> 15,484 ft <sup>3</sup> storage volume	
				0.25	0.713 (320 gpm)	8,415 ft <sup>3</sup>		
2 yr.	<u>0.800"</u> 3.64 hrs	0.220 in/hr	435,600 ft <sup>2</sup> or 10 acres	0.71	1.560	20,448 ft <sup>3</sup>	20,448 ft <sup>3</sup> -- <u>7,200 ft<sup>3</sup></u> 13,248 ft <sup>3</sup> storage volume	
				0.25	0.549	7,200 ft <sup>3</sup>		

**CITY OF WOODBURN  
RUN OFF DETENTION REQUIREMENT**

- 1) Construct a device that has capacity for detaining difference in run off volume received by undeveloped and developed land for a 25-year storm.
- 2) Construct a discharge orifice of a size that the quantity of run off through the orifice is equal to run off flow from a storm of 5-year or less, undeveloped land.
- 3) Construct a detention facility to have a post-development 25-year capacity with a discharge orifice (or structure) sized to limit outflow to no more than the undeveloped site peak run off for the existing (undeveloped) 5 year frequency storm. Detention volumes calculated by the following methods are acceptable:
  - A. Santa Barbara Urban Hydrograph routing model (as prescribed by the King County Surface Water Design Manual) for the post development 25-year runoff hydrograph detained back to the existing 5 year peak site discharge.
  - B. 18,883 CF/ 10 Acre drainage area as per City of Woodburn standard table, above, based on the rational method.

**SAFETY REQUIREMENTS**

- 1) Depth of storm water within 30 feet from the edge of detention ponds, if open to public, shall be limited to 3 feet, then gradual slope (3%) to higher depth shall be allowed. Maximum pond side slopes shall be 3' horizontal to 1' vertical, however, gentler slope is desirable.

REV. A STRMVOLM-10/02/95 updated 08/30/96 Item #3 added 12/9/96 Safety Item revised.  
REV. B. APPROVED BY CITY COUNCIL 12/9/96

design of all future detention facilities.

Portions of the existing drainageways currently function as detention sites where high water flow is backed up by road crossings such as East Lincoln Street and Hardcastle Street. These crossings were built with culverts intended to pass normal stream flows but do not pass high flows as easily. The hydraulic model simulates the high water level created during flood conditions and these levels are verified by the historical record of high water levels observed in both Mill Creek and Senecal Creek. These sites, four located in the Mill Creek drainage and one located in the Senecal Creek drainage basin will continue to function as detention areas and, with the exception of a proposed high level overflow structure at Hardcastle will not be modified to increase flows past them during storm conditions. However programs directed at improving public safeguards during periods of high flow and incorporation of storm water treatment wherever possible will be continued as a part of the Master Plan.

In addition, the City's detention policy should be made available to private developers and others who plan to alter drainage conditions or runoff volumes or rates. This policy addresses both large and small properties throughout the Mill Creek and Senecal Creek drainages. The goals of the policy should be publicized and discussed whenever the opportunity presents itself.

### **Continued Planning**

City staff should become familiar with and use computer-modeling techniques to assess the impacts of proposed development. With available tools such as HEC-1, the Santa Barbara Urban Hydrograph (SBUH), the Storm Water Management Model (SWMM) and similar, well-documented programs, forecasts of future runoff should be developed and reviewed periodically to document the changes in flow rates and volume of storm water. Continued use of a system model will also allow City staff to update the facilities plan portion of the Comprehensive Plan

as dictated by state regulation.

The City should also plan to reanalyze the entire system and prepare new forecasts of storm water conditions every 20 years, a period typically used in major facility planning. This major effort provides opportunity to re-evaluate the entire system and incorporate changes in land use and other stormwater runoff conditions and parameters.

### **Operations and Maintenance**

The City has and follows a plan for ongoing operations and maintenance of the storm drainage system. This system should be continued and expanded to include regular inspection of drainage facilities including major culverts, bridges, detention areas (public and private) and major open stream segments. Periodic cleaning of debris in the stream and adjoining floodway areas should be done to prevent the buildup of flow-inhibiting materials.

Storm sewer maintenance activities which include regular inspections of inlets, catch basins, major storm sewers and outfalls should also be scheduled and findings documented.

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## Chapter 11

# STORMWATER FLOW MANAGEMENT PROGRAM

The following policies are intended to provide clear guidance for construction of public or private drainage facilities located within the jurisdiction of the City of Woodburn. These guidelines will provide land developers, city staff and design engineers with a common set of rules to be applied when calculating stormwater runoff quantities and flow rates and determining sizes for stormwater facilities downstream from the impacting property.

### AUTHORIZATION

**Under Oregon Water Law, all water is publicly owned. The State of Oregon has adopted the civil law of drainage. Under this law, adjoining landowners are entitled to have the normal course of natural drainage maintained. Landowners with water flowing past, through, or under their property do not have the right to use or control the water without following specific state and local laws and regulations pertaining to such use. Under the provisions of the Oregon Revised Statutes, Section 536.360, all cities (public corporations) are required to provide for management and control of public waters in accord with the provisions of the statute.**

### INTRODUCTION

The City is served by two major natural drainageways -- Senecal Creek and Mill Creek. Within each of these two major drainageways, smaller drainages (denoted as subbasins) may require specific solutions to stormwater management problems including capital construction of public facilities, detention facilities and on-site detention or retention facilities. Each solution developed as a part of the City's Stormwater Master Plan has been proposed after assessing the risk of flood and high water damage to public facilities and overall risk management goals of the City. Generally, the City policy on funding major improvements to the storm water system are:

- Construction of detention, retention and some conveyance facilities may be required prior to completion of developments and are intended to be constructed with private funds.
- Areawide Capital Improvements which are designed to facilitate future property development, in addition to resolving current problems, may be funded cooperatively by the developer, the City, and the benefiting property owners.

- Areawide Capital Improvement Projects outlined in the Stormwater Master Plan for resolution of existing problems are intended to be funded primarily by the City budget and as such are subject to budget constraints.

## **PROGRAM HISTORY**

Recent, rapid population growth and new federal and state regulations pertaining to operation of a stormwater utility brought a new initiative to the city's public works programs. Various tasks necessary to begin this process included documentation of the system inventory, hydraulic assessment of the natural and manmade storm sewer system, review of fiscal management of utility resources and eventual provision for stormwater treatment have led to development of this program.

Historically, the City has relied on a series of stormwater ordinances, published technical guidance, and regulations issued by the Federal Emergency Management Agency (FEMA) and the Corps of Engineers (COE) to guide and regulate development within its jurisdiction. This program intends to supplement and replace existing ordinances and technical guidance.

Most communities of Woodburn's size have not developed a comprehensive approach to management of the storm water system as they have for the water and wastewater utility systems. Woodburn is no exception. Due to a lack of dedicated revenue sources, the City has relied primarily on revenue provided by the Street Fund to finance storm water system cleaning and related maintenance activities and use of System Development Charges to undertake capital improvement projects.

## **READERS GUIDE**

General storm water management policies apply to all properties in the City and are presented on pages 4 through 12 of this chapter. These are supplemented with additional, specific stormwater management policies created for each of the two major drainage basins, Senecal Creek and Mill Creek. Specific policies for the Mill Creek and Senecal Creek drainage basins begin on page 13 of this chapter. Detailed hydraulic analysis of two small drainage areas generally east of Highway 99E have not been done as a part of this project since they drain to the Pudding River. However, the policies and recommendations contained in this document will apply to all land within the City.

## **STORMWATER MANAGEMENT GOALS, DETENTION and DEVELOPMENT GUIDELINES**

The following goals outline the City's intent to continue orderly development of the storm drainage facility system and provide for the **protection, enhancement and general public safety of life and property.**

These goals are:

- To mitigate for the hydraulic impacts on downstream properties and drainage conveyance structures resulting from increased runoff due to urbanization of parcels within the drainage basin.
- To provide for the conveyance of stormwater to established drainageways in a safe and economical manner and minimize environmental impacts.
- To establish a drainage routing plan which designates watershed limits in developing areas which do not directly abut an existing drainageway or a public storm sewer system facility.
- To establish detention performance criteria limiting stormwater discharge rates to a level which limits impacts on downstream properties and structures to acceptable levels.
- To integrate and formalize existing policies and provide developers with a known and predictable set of detention standards.
- To identify a mechanism whereby developers and property owners can be reimbursed for constructing or enlarging drainage system facilities which solely increases capacity to upstream users.
- To establish standards whereby the public or private nature of the ownership of storm water and detention facilities may be made.
- To provide for maintenance of storm water conveyance and detention facilities.
- To comply with state and federal rules and regulations pertaining to stormwater and runoff management.
- To continue preservation of existing (natural and constructed) floodwater storage volume.



## GENERAL STORMWATER POLICY PROVISIONS

### A. Responsibility to Convey Surface Runoff

It is the responsibility of any landowner, owning property which currently receives stormwater flows from parcels which are topographically upstream, to allow the continued discharge of such flows in such manner as preserves existing conveyance and provides for future upstream connections to waterways, drainageways and other routes carrying stormwater runoff.

### B. Restrictions on Runoff Discharge to an Existing Drainageway where it is:

#### 1. Private Property with an easement for the drainageway;

When the receiving drainageway is located on private property and an easement for the drainageway exists, no person shall cause an increase in the volume or rate of flows onto the downstream properties by channelizing existing flows, or by increasing impervious areas which discharge onto other privately owned properties, without the approval of the City Engineer. Single family residences located in an approved subdivision are excepted from this provision.

#### 2. Private Property without an existing drainageway easement;

When the receiving drainageway is located on private property and no easement for the drainageway exists, no person shall cause an increase in the volume or rate of flows onto the downstream properties by channelizing existing flows, or by increasing impervious areas which discharge onto other privately owned property, without the approval of the City Engineer and the affected property owner(s). This condition is intended to include and apply to all affected properties located between the property to be developed and the public storm water system, drainageway with a public easement, or a primary drainageway.

#### 3. A Public or Primary Drainageway;

When the receiving drainageway is located on public property or is classified as a Primary Drainageway, any new stormwater sources or increases in existing stormwater flows discharged directly to City stormwater facilities shall be permitted only upon approval by the City Engineer. Such approval shall be granted only if and when the applicant demonstrates to the satisfaction of the City Engineer that such new or increased discharges, (1) will not cause the capacity of downstream structures to be significantly impacted, and (2) will not cause increased erosion of downstream drainageways. Single family residences located in an approved subdivision are excepted from this provision.

### C. Extension of Drainage Services to Upstream Parcels.

1. In general, any new development shall install closed conduit drainage conveyances which are of sufficient capacity and depth, and are suitable to serve parcels topographically upstream of the development site. Such conveyances shall be sized to receive future post-development upstream, undetained flows for a 25-year storm event in a Local Drainageway and a 50-year storm event in a Secondary Drainageway.

In a Primary Drainageway, open channel conveyances shall be designed to convey a 100-year storm event. Open channels shall be used exclusively in Primary Drainageways except as roadway and pedestrian crossings where bridges and culverts may be used.

These criteria also apply to all structures designed as roadway crossings.

2. All stormwater facility designs must adhere to the following basic criteria:
  - a. Upstream flowrates and volumes must be calculated using the entire upstream basin area whether it is within or outside the city's Urban Growth Boundary. Calculation methods and assumptions must be provided as part of the design submittal.
  - b. Any stormwater conveyance facility designated for use by upstream properties must be extended to the upstream property limit of the proposed development.
  - c. The hydraulic capacity of new stormwater conveyance facilities must be calculated to convey post development runoff of the drainage basin. Runoff must be based on full buildout development created in accordance with the City's Comprehensive Plan in effect at the time of the proposal and the storm water policies and practices of the City.
3. A new development shall continue to receive upstream stormwater runoff in a manner that does not require alteration of the upstream drainage pattern unless specific written permission and appropriate easements are received from the upstream property owner. If the source of the upstream drainage flow is a public stormwater facility, then alteration of its point(s) of entry into, or exit from, the new development shall be at the discretion of the City Engineer.
4. The following provisions shall apply for all constructed stormwater conveyances:
  - a. Drainage conveyances shall provide suitable invert elevations and design hydraulic grade lines for the upstream points of service.
  - b. All piped (closed conduit) systems shall be designed and constructed in accordance with City of Woodburn "*Standard Design Manual*" and the "*Standard Construction Specifications*". American Public Works Association (APWA) documents will be utilized until the Woodburn Design Manual is

approved by the City Engineer. All systems shall be located within a public right-of-way or a public utility easement no less than sixteen (16) feet in width. Wider easements may be required at the discretion of the City Engineer if needed to accommodate larger or deeper pipes.

5. In unusual circumstances, or to comply with federal, state, or City rules or regulations and laws, the City Engineer may approve open channel designs that meet the following criteria:

a. All open channel systems shall be designed and constructed in accordance with the City of Woodburn "*Standard Design Manual*" and the "*Standard Construction Specifications*". Oregon Department of Transportation (ODOT) design documents will be used in cases where City standards have not been approved by the City Engineer. All systems shall be located within a public right-of-way or a public utility easement. Such easements shall, at a minimum, extend from the top-of-bank to top-of-bank and include an additional twenty (20) feet in width outward from the top of bank along one side of the entire length of the open channel conveyance.

b. Open channel systems shall be designed using a Manning's "n" of no less than 0.080 to compensate for vegetative growth, accumulation of debris during and following storm events, and sediment accumulation between maintenance activities.

c. Open channel side slopes shall not exceed 3H:1V in inclination unless engineering and/or geotechnical analysis indicate the stability of another configuration. New open channel facilities shall allow for a maximum water depth no greater than 3 feet as measured at any point along the channel. A minimum of one (1) foot of freeboard shall be included in channel design.

d. Open channels shall be seeded or planted in order to stabilize the channel sides and shall be provided with sufficient erosion protection to minimize erosion until such seeding or planting has become mature and established.

#### **D. Reimbursement for Extension of Stormwater Service to Future Upstream Users.**

Developers of property located on a Primary Drainageway are required to allow the 100-year, undetained, existing stormwater flows from upstream properties to continue unimpeded to the next downstream properties and will do so at their own cost and are not eligible for reimbursement by the City. With the exception of roadway crossings, systems which are oversized may be eligible for reimbursement when oversizing is done at the request and approval of the City Engineer.

Developers of property located on a Secondary Drainageway are required to allow the 50-year, undetained, existing stormwater flows from upstream to continue unimpeded to the next downstream properties and will do so at their own cost and are not eligible for

reimbursement by the City. With the exception of roadway crossings, systems which are oversized may be eligible for reimbursement when oversizing is done at the request and approval of the City Engineer.

Developers who construct public stormwater conveyances in a Local Drainageway which are intended to increase capacity to benefit upstream properties (ie. flows greater than the 25-year undetained, post-development flows) may be eligible for reimbursement according to the following conditions:

1. Facilities considered for City participation may include:
  - a. Offsite lines, when the size of such lines are larger than required for the specific development under consideration as outlined above. The City's reimbursement will be limited to the incremental difference of the material cost of the oversized portion of the pipe only. Under special circumstances, consideration will be given to additional construction costs incurred as a result of increased diameter or extra depth, when required by the City
  - b. Onsite lines when such lines are designed and constructed in a local drainageway and with the expressed purpose of increasing capacity beyond that required to convey the 25-year, post-development, undetained flows from upstream properties plus the additional runoff due to the proposed development. The reimbursement will be limited to the incremental difference of cost incurred as a result of increased diameter or extra depth, when required by the City.

2. To be eligible for reimbursement, the developer must:

- a. Provide a written statement to the City Engineer **within two (2) weeks of Preapplication Conference** outlining the developers intention to request reimbursement funds for the project or have **received notification by the City of specific conveyance requirement**. All reimbursements are subject to the City's budget constraints and any requests exceeding \$7,500 in the aggregate will be subject to City Council approval by motion or resolution unless the cost sharing was part of an earlier council approval process for the project. The cost sharing for such improvements must meet the budget constraints of the City.

- b(1). Prepare estimates of cost for those portions of the drainage improvements which provide increased capacity for upstream properties,

- b(2). Identify the area encompassing all benefiting upstream properties,

- b(3). Propose a reasonable pro rata method for distributing a portion of the costs to benefiting upstream properties. The method shall be based on full-buildout impervious areas or number of developable lots, and degree of benefit to upstream properties relative to property being developed.

b(4). Submit a detailed reimbursement request concurrently with submittal of design drawings for review and approval.

3. The City Engineer, after review of requests from the developer, shall notify the developer in writing as to the applicability of the project for reimbursement and the acceptability of the reimbursement computation. The stormwater System Development Charges (SDC) paid by the developer for the project may be reduced by the amount of credits received for the project. However, the reimbursement amount will not exceed the total of the stormwater SDC for the project.
4. If reimbursement for oversized facilities downstream of a Secondary or Local Drainageway is approved, the following table will be used to determine the amount of reimbursement:

<b>Percent Diameter Increase</b>	<b>Reimbursement in \$/LF</b>
Up to 31 percent	\$ 10 / Lineal foot
Between 31 % and 60 %	\$ 20 / Lineal foot
Over 61 percent	\$ 40 / Lineal foot

5. Facilities excluded from City participation include:
  - New facilities or rehabilitated existing facilities using open channel conveyance,
  - local (non-regional) detention facilities,
  - any closed conduits of 18-inch diameter or less,
  - any structure constructed for vehicular, bikeway or pedestrian crossings (ie. bridges, culverts, etc.),
  - any facilities constructed in designated floodways or flood plains,
6. If a Reimbursement District or Local Improvement District is formed, it shall conform to City ordinances and policies.

#### **E. Fill within the 100-Year Floodplain**

Fill may be allowed in the floodway fringe of the 100 year floodplain of any primary drainageway. Filling must be done in accordance with Section 8, "Fill Standards", City of Woodburn Floodplain Ordinance, No. 2018, and be placed as engineered fill in accordance with a plan prepared by a Registered Engineer and submitted to the City for review and approval.

#### **F. Fill within the Floodway of a Primary Drainageway.**

No new fill, debris, or other obstructions shall be placed in the floodway of a Primary Drainageway. An exception to this requirement may be considered for purposes of

constructing an essential roadway crossing of the drainageway if all the following conditions are met:

1. The road crossing is essential as determined by the City of Woodburn. Typically, approval will be limited to those cases where a roadway crossing is needed to facilitate the public transportation system.
2. All local, state and federal requirements are met.
3. The new culvert(s) or other structure must have a hydraulic capacity to pass the 100 year undetained runoff flows from the upstream watershed. Watershed runoff shall be calculated using parameters in accord with the City's current Comprehensive Land Use Plan. The culvert or other structure shall be designed to minimize the resulting head loss to no more than 0.3 feet including entrance losses. Losses greater than 0.3 feet must receive approval by the City Engineer.
4. The invert elevation of the culvert shall be set at an elevation and grade as approved by the City Engineer. In no circumstances shall the culvert invert be below the natural stream bottom.
5. The inlet and outlet of the culvert are to be sufficiently armored to prevent scour.
6. The embankment is to be constructed of compacted earth with sideslopes inclined no steeper than 3 feet horizontal to 1 foot vertical. Embankments must be seeded as specified in the city's design standards and newly-seeded areas protected from erosion until vegetation is safely established.
7. The lower chord of any bridge must be located at least 0.5 feet higher than the projected 100-year flood elevation which results from full buildout of the upstream areas as projected by the City's Comprehensive Plan. Head losses through any bridge structure must be no more than 0.3 feet, unless the City Engineer approves a higher loss design.
8. Private agricultural stream crossings are exempt from the performance standards of this section if the width and elevation of the crossing design is such that an overtopping flood causes no adverse upstream impacts. The landowner will be responsible for demonstrating this to the satisfaction of the City Engineer.

## **G. Detention Requirement for Large Developments**

Any new construction, or expansion of existing construction, for commercial, industrial, institutional, or multi-family development uses which creates greater than 2.5 acres of total impervious areas (not including public roads created as a part of the development) are required to provide onsite detention of storm flows. Any new single family

residential development larger than 5 acres (gross area, all phases), shall also provide on-site storm water detention facilities. All onsite detention facilities shall meet the following design criteria:

1. All detention facilities shall be designed and constructed in accordance with City of Woodburn "*Standard Design Manual*" and the "*Standard Construction Specifications*". The City's Detention Facility Sizing Table or the Santa Barbara Urban Hydrograph method as specified in the current edition of the King County (Washington) Surface Water Quality Manual, shall be used to determine the volume of the detention facility. Technical issues not addressed in the City's design guides will defer to Oregon American Public Works Association/ODOT documents until the Woodburn Design Manual is approved by the City Engineer.

**Detention facilities must be designed to contain stormwater flows resulting from a post-development 25 year storm event with a discharge orifice (or structure) sized to limit the outflow to a flow no greater than the undeveloped site peak run off for the existing 5 year frequency storm.**

The detention facility shall include provisions for a high flow bypass and maintain a 1-foot minimum freeboard at the highest water surface elevation during a bypass event. The facility designer must also provide a hydraulic analysis showing the overflow conveyance route and downstream impacts of passing the 100-year storm event.

2. Such detention shall be provided off-line from the Primary Drainageway. Off-line is defined as outside the Primary Drainageway floodway/floodplain.

3. Such detention shall also be provided off-line for Secondary Drainageways except as approved by the City Engineer. In-channel detention within Secondary Drainageways may be used if designed using dynamic hydraulic modeling performed by a qualified engineer registered in the State of Oregon. Such designs must be submitted to the City Engineer for review and must receive specific approval prior to any construction. The design must demonstrate that peak discharges are equivalent to the off-line detention specified above when calculated using both existing and future upstream development conditions.

4. The developer must provide a permanent, all weather road access for vehicular traffic to the detention facility inlet and outlet structures.

5. The developer must provide the City with a stormwater facilities easement to provide for future maintenance needs.

Derivation of the criteria for selection of the 5-acre and 2.5-acre development sizes is found in the Storm Drainage Master Plan.

## **H. Detention Requirement for Small Developments**

Any new construction, or expansion of existing construction, for commercial, industrial, institutional, or multi-family uses which creates less than 2.5 acres of total impervious areas (not including public roads created as a part of the development) may be required to provide on-site detention to address downstream system capacity limitations, satisfy requirements of other jurisdictions, or mitigate local conditions which preclude full discharge of stormwater. At a minimum, the following information will be required for City staff review:

1. Calculations of the volume and rate of stormwater runoff prior to and following development, done in conformance with City policy and the Storm Drainage Master Plan.
2. Identification of the closest public storm sewer or drainageway which will receive the runoff from the development.
3. Calculations showing the peak flow rate of storm water which will be discharged to the public system including any deleterious hydraulic impacts of stormwater runoff on downstream facilities (pipes, culverts, ditches, etc.)

## **I. Developer Maintenance Responsibilities of Constructed Facilities**

For any detention facility or open channel drainage facility which a developer constructs or causes to be constructed;

1. The developer shall provide adequate maintenance and erosion control, ensure proper performance, and re-grade, re-seed and/or re-plant as necessary to replace any eroded or failed areas within a period of two (2) years following completion and acceptance of the facility by the City.
2. Long term maintenance responsibility for all detention facilities or open channel drainage facilities must be specified prior to construction. The City may elect, but is not required, to accept responsibility for maintenance of detention facilities. If the party deemed responsible for maintenance is not the City and is other than the owner(s) of the property served by the facility, then a maintenance bond shall be posted by the developer until such time that the maintenance responsibility has been accepted by the home owners association or the City.
3. The detention facilities must be properly maintained by the responsible party. If they are not so maintained, and, following 30 days written notice from the City, the City is authorized to enter the facility, perform maintenance on the facility as needed, and to lien the property for payment of three times the cost of such services or by utilizing policies authorized by the City Council for such reimbursements.



## **J. Authorization of Adoption of Watershed Management Standards**

The City Engineer may establish or adopt written standards which affect individual watersheds within the City limits. Such standards may include, but are not limited to the following:

1. Technical specifications and design standards.
2. Routing of a storm drainage conveyance within, or outside of, public rights-of-way.
3. Identification of public storm sewer easements or acquisitions necessary for the provision of City storm drainage services.
4. Adoption of specific storm drainage performance standards for individual watersheds in response to requirements of other regulatory agencies such as the Oregon Department of Environmental Quality (DEQ), the Oregon State Division of State Lands (DSL) or the Corps of Engineers (COE).

## **K. Final Design for Stormwater Detention Facilities**

All elevations, slopes, dimensions and pipe sizes shown in the Storm Drainage Master Plan are preliminary and must be verified as part of the final design of stormwater detention facilities. Final design decisions must be based on actual field conditions and routing patterns selected by the designer at the time of final design.

## **L. Variances and Referral**

Interpretation of the policies in this document adopted by the City Council shall be the responsibility of the City Engineer or his designated representative.

# SPECIFIC BASIN REQUIREMENTS

## INTRODUCTION

The following sections outline specific detention requirements for individual basins contributing stormwater to either Mill Creek or Senecal Creek and within the jurisdiction of the City.

## MILL CREEK

In addition to the City's General Detention Policy Provisions, the following provisions apply to the Mill Creek drainage areas. References to specific tables and figures are taken from the City of Woodburn Storm Drainage Master Plan. Areas intended for use as Primary Drainageway detention facilities have been identified along the main stem of Mill Creek. Flood elevations referenced below are based on FEMA studies and reported flood levels. Elevations referenced in this document are based on the NGVD 29 datum. Also, in keeping with historical practice, a freeboard zone of 1.5 vertical feet is established above the FEMA flood elevation and sets the elevation below which no permanent structures may be erected in the flood plain. The following flood water storage/detention areas are shown on Figure 15 of the City's Storm Drainage Master Plan. Specifically they are:

**Goose Creek** - Goose Creek is a tributary drainage to Mill Creek generally north of and parallel to Highway 214. Goose Creek is a well defined channel whose storm water flows originate in the North Senior Estates area and the properties immediately north and south of the drainage. While not currently used for detention for storm water, the Goose Creek drainageway should be preserved by the city for use as a storm water control and treatment facility.

**Detention Area Between the Railroad Embankment and Hardcastle Avenue** - An area of approximately 4.8 acres immediately upstream of the Front Street/SPRR line along Mill Creek and extending to Hardcastle Avenue within the 100 year floodplain. With a 100-year flood event elevation projected to be 156.0 msl, a floodwater storage elevation for this area has been set at an elevation of 157.5 feet msl. Below this elevation, no permanent structures should be constructed without adequate flood protection nor should filling in the flood plain be allowed without offsetting mitigation. Posted warnings of potential flood water detention should be placed in the area, specifically at the common entrances to the area from Legion Park to the east.

**Hardcastle Avenue to Lincoln Avenue Detention** - An area of approximately 2.5 acres extending from Hardcastle Avenue to Charles Street and is currently part of the City's park system. A 100-year flood event occurring in this area is projected to reach an elevation of 160.5 feet msl. A floodwater storage elevation for this area has been set at an elevation of 162.0 feet msl. This land use will be

continued and approval to construct permanent structures which would be damaged by high water levels will not be allowed if the structure is below 162.0 feet msl. Filling in the floodplain will not be allowed unless offsetting mitigation measures proposed and accepted. Posted warnings of potential flood water detention should be placed in the area, specifically at the common entrances to the park area.

**Brown Street Detention Area** - The City is preserving the Settlemier Park tributary of the Mill Creek floodplain extending from Brown Street on the east to the Southern Pacific Railroad right-of-way on the west. This area serves as a natural detention site and can be expected to flood to an elevation of about 169.5 during a 100-year storm event. The City owns most of the low-lying land in this reach of Mill Creek and will continue maintenance of the area by cutting the grass and limiting the number of trees and shrubs that grow there. Any permanent construction below elevation 171.0 will not be allowed. In the future, this area could be reshaped to maximize detention volume, provide for a controlled outlet and ensure complete drainage after high water events. Like other detention areas accessible to the public, posted warnings of potential floodwater detention should be erected in the area.

**Settlemier Park Detention Area** - The floodplain immediately downstream of Settlemier Park is 171.0 as shown on the FEMA maps. Controlling the floodplain at this elevation within this area will allow continued use of the park facilities, however this area provides for flood storage and should continue to remain an open space. Improving facilities, adding parking or constructing other, similar improvements in Settlemier Park may be done providing that no filling occurs below the flood plain elevation.

Construction of an engineered swale extending from a point near the east side of Settlemier Road and extending east toward the railroad embankment will allow excess flows to exit the 48 inch storm drain conduit and overflow to the low-lying park area. At the east side of the park, a grated entry will allow overflowing storm water to reenter the storm drain after flooding subsides. Construction of this surface overflow will mitigate the restricted capacity of the underground conduit during 100-year storm events. With it's proximity to Settlemier Park, posted warnings of potential flood levels should be installed in this flood storage area.

**Stubb Road Detention Facility** - Future storm runoff flows entering the culvert at Settlemier Road are computed to be 177 cfs for the 100 year frequency event. Flood elevations upstream of Settlemier Road must be controlled in a manner that does not allow future floodwater to exceed elevation 173.4 in the area west of Settlemier Road. Detention of storm water at this location is required for three reasons. These are:

- to prevent flood overtopping of Settlemier Road, a major thoroughfare and emergency vehicle route;

- to allow development of upstream properties to the densities specified in the City's Comprehensive Plan; and
- to limit detention system outflows at a flow rate that will allow the downstream primary drainageway to function as planned.

When constructed in a manner that will allow its operation to complement the Settlemier Park overflow swale facility, the Stubb Road detention facility will contain about 17.5 acre-feet of storage and detain storm flows coming from the developing upstream land. As development occurs upstream of this point, land owners and land developers may be required to contribute financial support to this project.

In addition to these planned detention facilities and protected areas, the following detention facilities exist or being planned for construction in the Mill Creek drainage area:

**Woodburn School Site Detention** - The Woodburn School District has constructed a 0.7 acre-foot detention facility is located at the north east corner of the Middle School property on Parr Road. This facility collects storm runoff from the school district property and discharges controlled flows to the west branch of Mill Creek through the storm drainage system serving the Parr Acres development.

**Steklov Addition Detention Site** - This 0.85 acre-foot, single pond, private detention facility is located west of Brown Street and south of Parr Road and serves the Steklov Addition development site and includes piping suitable for flows from 83 acres upstream of the development. The detention facility itself is sized to only accommodate flows from the Steklov Addition.

**North Front Street Park** - This 1-acre site is currently owned by the City and provides a small but effective detention site. It is located at the confluence of two storm water systems and will lessen downstream flooding conditions with construction of a detention facility. To mitigate this potential for future flooding and inundation of Front Street, the park area should be converted to a detention facility to provide an additional 0.7 acre-feet of storage below elevation 167.0. In addition to construction of the detention facility, the storm sewer crossing Front Street and the railroad immediately east of the park should be replaced with a 42 inch diameter reinforced concrete storm sewerline. (Refer to CIP Project No. 2).

**Young Street to Cleveland Street** - The area between Young and Cleveland Streets provides flood storage to approximately elevation 169.5 when storm conditions reach a 100 year frequency event intensity or a series of smaller intensity storms occur in a relative short time span. The City should restrict construction in this area and post flood warnings in this area as well.

**Marshall Street to Wilson Street** – The Marshall Street embankment acts as a weir when the conduit under Marshall Street becomes filled to capacity. When the basin floods, the backwater extends south from Marshall Street to Wilson Street. With construction of a second conduit (54-inch diameter) at Marshall Street, floodwaters that currently overtop Marshall Street during a 5 year event will be lessened to a frequency of a 25 year event. High water warnings should be posted in this area.

**Wilson Street to the South City Limit** - This area is currently designated as part of the City's green space areas and should be maintained as a part of the storm water control and management area. The City should acquire storm utility easements covering the flood plain at a minimum from Wilson Street to the south city limit line. If the city limit line is extended further to the south, additional flood plain easements in the new areas should also be acquired.

**Parr Acres** - A privately owned, single pond detention facility is currently in operation west of Settlemier Avenue. This 1.1 acre/foot facility controls storm runoff coming from the Parr Acres development and discharges a controlled flow to the west arm of Mill Creek.

**Heritage Park** - A privately constructed detention facility is currently in operation in the Heritage Park subdivision located west of Boones Ferry Road between Vanderbeck and Centennial Roads. Detention facilities for this development includes two ponds, one a park area which has been deeded to the City, and the second designed as underground storage giving a total detained volume of 1.5 acre feet of water. Subsequent development of the subdivision will cause a third facility to be constructed.

Storm water discharged from this facilities, crosses Boones Ferry Road, enters the storm drainage system in Hazelnut Road and is finally discharged to Mill Creek.

## **SENECAL CREEK**

In addition to the City's General Detention Policy Provisions, the following provisions apply to the Senecal Creek drainage areas. References to specific tables and figures are taken from the City of Woodburn Storm Drainage Master Plan. This stream has been divided into five primary subbasins (S-1, S-2, S-3, S-4 and S-5). Of these, most of the area within subbasins S-1, S-2, S-3 and S-5 is located outside the City's Urban Growth Boundary both north and south of the existing boundary. Very little development is expected in subbasins S-1, S-3 and S-5 in the near future and they have been modeled as undeveloped. Subbasin S-2 contains a portion of the West Woodburn development area. New development in this area is not anticipated at this time as it is almost completely built out according to the City's Comprehensive Plan.

Subbasin S-4 contains the East Tributary of Senecal Creek which is wholly within the UGB and in which most of the development is expected to occur in the foreseeable

future. This major subbasin has been divided into 13 smaller subbasins for analysis purposes. Refer to Chapter 4 for specific information on this developing area.

Detention and management controls in subbasin S-4 are controlled by the two major thoroughfares that bisect the basin, Interstate 5 and Highway 214. In order to set specific detention and stormwater management control requirements in the East Tributary subbasin (S-4) it has been divided into four quadrants, ES-1, ES-2, ES-3 and ES-4. The management criteria for these four areas are:

#### **MANAGEMENT ZONE ES - 1 (North of Highway 214 and west of I - 5)**

On the East Tributary of Senecal Creek, a wetlands area west of Interstate 5 and north of Highway 214 serves to detain storm water and should be preserved as part of the City's wetlands inventory unless it is replaced by a constructed wetland approved by regulatory agencies. An area immediately east of the wetlands has recently been developed with high density commercial facilities. This development has installed on-site storm water detention facilities that discharge to a small subtributary of the East Tributary of Senecal Creek.

#### **MANAGEMENT ZONE ES - 2 (North of Highway 214 and east of I - 5)**

The following conditions will apply to development and storm water infrastructure changes in Zone ES-2:

1. Any new development that creates over 1 acre of impervious area shall be routed directly to the existing 48-inch diameter storm drain that crosses I - 5 immediately north of the Highway 214 interchange. The east end of this 48-inch storm sewer is not accessible from the ground surface as it was covered over during construction of the I-5 freeway. The end of this line should be excavated and a manhole access constructed at that point. Piping changes should also be made to connect this line to existing storm sewers on the east side of Interstate 5. See CIP project No. 11.
2. No new storm water flows generated in this subbasin should be allowed to discharge to the existing 18-inch culvert that crosses I - 5 north of the 48-inch culvert.
3. No additional or new detention facilities are planned for construction in this basin.

#### **MANAGEMENT ZONE ES - 3 (South of Highway 214 and west of I - 5)**

The following conditions will apply to development and storm water infrastructure changes in Zone ES-3:

1. The East Tributary shall be retained as an open channel drainageway. The location of the creek may be altered upstream (south) of the future connecting

culvert across I - 5, provided that all other local, state and federal requirements are met and that drainage is provided to the upstream property at Point "C" as shown on Figure \_\_\_\_\_. Point "C" is the location at which the East Tributary enters the City limits from the subbasin south of Zone ES - 3.

2. Sufficient hydraulic capacity for the East Tributary in Zone ES - 3 shall be maintained by constructing a minimum of 3-acre feet detention facility east of Interstate 5. (See ES-4 narrative). Surface water flows must be controlled to assure that the water surface at Point "B" does not exceed an elevation of 174.5 feet (NGVD 29) during the 100 year detained flow event.
3. Two (2.0) acre-feet of flood storage volume shall be retained on Parcel "A" as shown on Figure \_\_\_\_ of the Storm Drainage Master Plan. This flood storage volume shall be located contiguous with the East Tributary, above the normal water surface level and below an elevation of 174.0. The East Tributary floodway shall not be filled or piped through this parcel.
4. Except for Parcel "A", all new development within Zone ES - 3 shall provide on-site detention as specified in the General Policy.
5. When development occurs on parcels that abut the existing East Tributary in Zone ES - 3, creek maintenance easements specific to the East Tributary shall be deeded to the City of Woodburn.

**MANAGEMENT ZONE ES - 4 (South of Highway 214 and east of I - 5)**

Development of detention and conveyance facilities in Zone ES-4 are required to control flows and mitigate runoff resulting from development in the management zone. The following design parameters and conditions will apply to development of infrastructure facilities in Zone ES-4:

1. A culvert shall be constructed at Point "B" (Figure \_\_\_\_ of the Storm Drainage Master Plan) across I - 5. Design and construction shall be coordinated with the Oregon Department of Transportation and other state and federal agencies that may be involved. Design of the crossing shall comply with the following criteria:
  - a. The culvert shall have the capacity of a 42-inch diameter concrete sewer pipe.
  - b. The downstream invert shall be placed at approximately 171.0 feet and shall hydraulically connect to the East Tributary.
  - c. The pipe slope shall be between 0.0012 and 0.005 feet per foot if a 42-inch pipe is used.
2. A detention facility should be constructed near the upstream (east) end of the culvert described above. The facility will be located as close as possible to the Interstate 5 right-of-way and shall use the following design parameters:

- a. The facility shall provide a minimum of 7 acre-feet of off-line detention and:
1. limit the upper water elevation to 177.0',
  2. limit the post development release flows from a 25-year event to a rate no greater than produced by a predevelopment 5-year storm event, and
  3. detain the full flows of the 100-year storm event
- b. The facility shall be designed to cause the water surface in the detention facility to return to elevation 172.50 between rainfall events and the facility shall be designed to empty completely following cessation of runoff.
- c. Facility side slopes shall not exceed 3H:1V.
- d. The facility excavation shall be stabilized to minimize erosion and shall be seeded or planted with vegetation native to the region and suitable for the hydraulic and soils conditions of the site. Vegetation that may hinder the filling, emptying or maintenance of the facility shall not be used.
- e. A 15-foot wide access road shall be provided to the facility and shall extend along one side of the facility and shall include access to the inlet and outlet structures. The access road shall be an all weather road suitable for vehicular use.
- f. The detention facility including the perimeter access roadway shall be deeded to the City of Woodburn. A 20-foot wide access easement from a public street shall be granted to the City of Woodburn if the facility does not abut a public right-of-way.