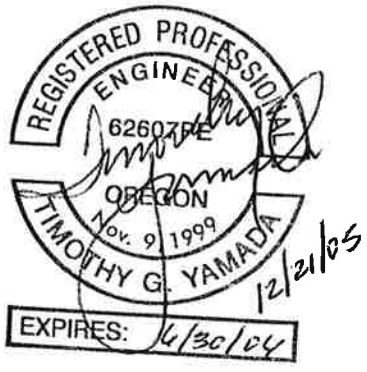
Report

Bridgeport Area Stormwater Master Plan

Prepared for

City of Tualatin

December 2005



Prepared by

CH2MHILL

Contents

Page

Tables

Figures

Executive Summary

Introduction

This plan lays the foundation for the City to undertake design and construction of the stormwater system needed to accommodate planned development in the Bridgeport area and to establish onsite stormwater management expectations and standards for land developers.

The scope of this master planning effort was to review existing available information, characterize basin conditions and evaluate stormwater management alternatives, confer with stakeholders, and identify general environmental permitting constraints and regulatory requirements associated with the Bridgeport area and the recommended alternative.

Several stormwater management alternatives were evaluated, including disposal systems (surface infiltration) and conveyance (piping) systems. The evaluation considered onsite (private development) disposal versus offsite (public) disposal, and combinations of both. Onsite and offsite water quality treatment were also evaluated.

Developed as part of the plan were order-of-magnitude cost estimates, an implementation schedule, and a capital improvement plan (CIP) summary sheet for the recommended alternative.

Stakeholder Involvement and Outreach

The jurisdictional entities that overlap in the Bridgeport area were engaged as stakeholders in the development of this plan. These included Clean Water Services, which is responsible for establishing system development charges for the infrastructure, and sets the standards for analysis and design of stormwater conveyance and water quality facilities in the project area; Washington County, which owns transportation facilities in the area (Bridgeport and Lower Boones Ferry roads); the Oregon Department of Transportation, which manages Interstate 5; and the Oregon Department of Environmental Quality (DEQ). Another stakeholder is the adjacent City of Durham, which is contemplating redevelopment activities within its own service area. In addition, property owners in the area were invited to comment on the plan.

Project Description

To meet the project objective of providing stormwater service to all of the properties within the project limits, the proposed storm sewer conveyance system starts near the intersection of Hazelfern Road and Bridgeport Road and conveys stormwater to an outfall on the Tualatin River. A majority of the alignment proposed for this project (shown in Figure ES-1) follows an existing sanitary sewer alignment.

The new conveyance system is sized based on the assumption that a 50 percent reduction in the peak runoff flow rate for the 25-year design storm event will be required for each new development or redevelopment within the master plan limits. This reduction, which is achievable with the use of a low impact stormwater management approach, limits the maximum pipe size to 24 inches in diameter.

Stormwater runoff from existing roadways is handled by existing infrastructure. Runoff from the reconstructed section of Hazelfern Road will be conveyed and treated by the proposed project.

Individual developments and the redeveloped portion of Hazelfern Road will be responsible to limit discharges from their sites to 0.9 cubic feet per second (cfs)/acre. Each development will be required to implement the highest category of onsite stormwater management feasible for the site. The proposed categories for the project are summarized in Table ES-1.

TABLE ES-1
Onsite Stormwater Management Requirements

Category[a]	Required Onsite Retention (Design Storm Event)	Maximum Allowable Release Rate for the Design Storm Event (25-Year)[b]	Required Stormwater Quality Treatment
1	25-year	Not applicable	Included in retention (surface infiltration)
2	10-year	0.9 cfs/acre	Included in retention (surface infiltration)
3	1/3rd of the 2-year	0.9 cfs/acre	Included in retention (surface infiltration)
4	None	0.9 cfs/acre	Water quality best management practices per Clean Water Services standards

[a]Category 1 = highest level; Category 4 = lowest level.

[b]Runoff for storm events greater than the design storm event (25-year) shall be managed as described in Section 3.05.4 of the Clean Water Services 2004 *Design and Construction for Sanitary Sewer and Surface Water Management Manual*, or as revised.

This hierarchical approach requires a development to implement a Category 1 management approach (onsite low impact stormwater approach) to the greatest extent practicable before it can consider using a lower category. In this case, the term *greatest extent practicable* means the developer must provide technical justification that the higher category requirements cannot be met. The technical justification must be based on scientific or engineering data that are acquired from site investigations or from previous studies or calculations prepared by a registered engineer.

Technical justifications that are sufficient to lower the required stormwater management category for the development site are as follows:

- Low impact stormwater retention system for the category will occupy more than 15 percent of the development site area.

- Contaminated soils are present onsite such that DEQ will not permit stormwater infiltration.
- Slope instability conditions are present onsite that stormwater infiltration may exacerbate. Slopes must not exceed 10 percent in the facility area.
- Presence of seasonal high groundwater that would prevent adequate filtration zone.

The City of Tualatin's Development Code requires that properties within the General Commercial Planning District (CG) landscape a minimum of 15 percent of the total area to be developed (73.240 (3)). In addition, the Off-Street Parking Lot and Loading Area Landscaping section of the code (73.360) requires development of 25 square feet of landscaping island for each parking stall installed. Since this landscaping has to be installed regardless of the stormwater management approach taken, using this area for the stormwater surface infiltration is encouraged.

The recommended outfall option is to connect to the existing 18-inch outfall owned by the City of Tualatin. The new conveyance system will connect to the existing City of Tualatin storm system upstream of the Willamette and Pacific Railroad crossing (See Figure ES-1). The diameter and slope of the pipe under the railroad tracks will be increased to accommodate the additional runoff flows. This approach limits modification of the outfall pipe south of the railroad, and limits disturbance to the Clean Water Services vegetated corridor to a small area.

Since this outfall is regulated under the Clean Water Services Municipal Storm Sewer System (MS4) permit, treatment of the runoff from all impervious surfaces, new and existing, is required. A majority of the runoff in the existing stormwater system is currently treated. However, a few properties at the downstream end of the basin are not. Instead of complicating the proposed pipe alignment to isolate the untreated areas, the runoff from the existing storm system will be treated with the use of a proprietary manufactured stormwater treatment unit (vortex type). This manufactured unit was sized to treat 1.6 cfs of flow, based on preliminary calculations using the Clean Water Services water quality storm event.

Permitting

Activities associated with the recommended storm sewer pipeline, and stormwater quality facility north of the Willamette and Pacific Railroad track do not appear to be subject to environmental permitting requirements. However, if construction disturbs an acre or more of land, then it will be necessary to meet the requirements of a National Pollutant Discharge Elimination System (NPDES) 1200-CA permit for municipalities, which includes development of an erosion control plan.

The recommended outfall improvement involves pipe replacement under the Willamette and Pacific Railroad track, but avoids activity below the ordinary high water line of the Tualatin River. Therefore, wetland removal/fill permits are not required for the outfall improvements. Consequently, Endangered Species Act (ESA) consultation is not required. However, improvements south of the railroad require Clean Water Services and City of Durham permitting. The estimated permit process timelines for remaining applicable

permits are summarized in Table ES-2. The overall permitting timeline for the proposed outfall is estimated to be 93-183 days, assuming that the permits can be pursued concurrently.

TABLE ES-2
Outfall Permitting Requirements of the Recommended Project

Agency	Permit	Timeline	Comments
Clean Water Services	Service Provider Letter	30–75 days	Wetland delineation, corridor width determination, Natural Resources Assessment, and coordination with Clean Water Services
Clean Water Services	Site Development	93–183 days	Engineering, Landscaping, and Erosion Control Plans, cost estimates, etc.
City of Durham*	Special Use Permit-Greenway, Floodplain	90–120 days	Required for vegetation removal, excavation, fill, pipe placement. Special Use Permit application, coordination with City of Durham

*Only if outfall improvements extend into the City of Durham's jurisdiction.

Implementation Plan

It is expected that the recommended policy change regarding onsite stormwater management will be adopted at the same time as this master plan by the Tualatin City Council on January 23, 2006. The other components of the proposed project are based on the adoption of that policy.

If the plan is adopted, design and Clean Water Services permitting of the Bridgeport area stormwater infrastructure can begin in February 2006.

Cost Estimates

The proposed project cost estimates are summarized in Table ES-3.

TABLE ES-3
Project Cost Estimates

Item	Cost
Total Construction Cost	$822,500
Total Engineering/Administration*	$337,500
Total Right-of-Way (Easement)	$168,500
Total Project	$1,328,500

*Includes permitting costs.

City of Tualatin Stormwater Management Objectives

The proposed project meets the City of Tualatin stormwater management objectives for the Bridgeport area as outlined in Table ES-4.

TABLE ES-4
How the Proposed Project Meets City of Tualatin Stormwater Management Objectives for the Bridgeport Area

Objective	Comments
Find a workable solution that meets the area's stormwater conveyance needs and local water quality and quantity regulations	Combined with the proposed level of source controls for the reduction of the 25-year flow at the development sites, the proposed conveyance system is sized to handle the reduced flows at build-out. Onsite stormwater quality control is required for runoff from future development sites. Stormwater quality control for the existing storm system (currently flowing to the City's 18-inch outfall) is provided by a stormwater quality facility upstream of the proposed outfall connection.
Accommodate rapid growth and development of the Bridgeport area with a solution that meets the needs of development and can be constructed in a timely manner	The proposed project addresses the stormwater management needs of the area and is planned to allow design and construction to commence in 2006.
Reduce, to the extent practicable, the size and extent of constructed "hard" stormwater infrastructure	By taking advantage of site conditions that allow surface infiltration at the development sites, the required conveyance pipeline diameter has been reduced significantly and the 18-inch outfall owned by the City of Tualatin has sufficient capacity to be used without improvements, which obviates the need to build a new outfall.
Optimize capital and long-term maintenance costs for the City	Source controls reduce the capital costs of required public facilities by reducing the facility (pipe) size.
Avoid alternatives and/or policies that would require timely and rigorous permitting	The proposed project avoids potential environmental constraints associated with the area south of the Willamette and Pacific Railroad along the Tualatin River by using the existing City of Tualatin outfall. Also avoided are potentially contaminated sites in the area.
Develop a stormwater management policy for this area that is equitable and consistent with local ordinances	Onsite retention of stormwater is endorsed by Clean Water Services, the regional surface water utility for the area, as the stormwater management alternative of first choice.
Give due consideration to aesthetic value for any exposed elements of the stormwater system.	The storm sewer system will be underground. Surface infiltration systems can be integrated with onsite landscaping so that they are unnoticeable or potentially enhance the aesthetics of the site. The proposed manufactured stormwater treatment unit (vortex type) treating the existing storm system will be underground and out of sight in a precast concrete manhole.

structures are a specified permitted use if they are "designed to not significantly impede the flow of floodwaters."

Potential Contaminants

Nine records of leaking underground storage tanks (LUSTs) were found. Seven of the sites have been cleaned up to DEQ standards. The remaining two sites noted that clean-up had begun, but did not indicate if it was completed. These two sites are:

- Goldbeck, Heating Oil Tank, 17710 SW Upper Boones Ferry Road, Durham
- Susan Stubbs, Heating Oil Tank, 17865 SW Upper Boones Ferry Road, Durham

The following facilities hold NPDES General Permits for industrial stormwater discharges:

- Fabricating Shop, 18205 SW Boones Ferry Road, Tigard
- Whole Foods Retail, 7380 SW Bridgeport Road, Tualatin

The following site is listed as contaminated:

- Bridgeport Village/Durham Quarry, SW Bridgeport Road/SW 72nd Avenue, Tualatin

None of the hazardous material incidents in the study area recorded by the Office of State Fire Marshal appear to be active.

If project activities are proposed at or near the two sites with unknown LUST status or the Bridgeport Village/Durham Quarry, then DEQ should be contacted to determine the clean-up status of the sites and what limitations, if any, may exist for proposed activities. Consideration should be given to potential regulatory liabilities of accepting stormwater from sites with NPDES General Permits for industrial stormwater discharges.

Existing and Future Conditions

The Bridgeport stormwater master plan boundaries are roughly described as west of Interstate 5 (I-5), south of SW Bridgeport Road, east of SW Upper Boones Ferry Road, and north of the Willamette and Pacific Railroad tracks (see Figure 2-1). The area includes portions of the cities of Tualatin and Durham.

Existing Conditions

The existing land use consists of commercial, light manufacturing, and medium low density residential. Most of the area is either fully developed or in the process of being redeveloped. The basin has a high percentage of impervious or semi-impervious area, estimated to be 80–85 percent.

The soils are highly porous and classified as hydrologic soil group "A" as defined by the Natural Resource Conservation Service soil classification system. The infiltration capacity of these soils results in very little runoff being generated if precipitation falls on the surface.

There are three sub-basins within the overall Bridgeport basin, draining a total area of approximately 103 acres. The three sub-basins are North Bridgeport, Middle Bridgeport, and South Bridgeport. Their boundaries are shown in Figure 2-1. Only the North Bridgeport and South Bridgeport sub-basins have existing stormwater systems.

The North Bridgeport sub-basin, approximately 50 acres, is served by a 36-inch pipe system with a 36-inch outfall at the Tualatin River. This piped system, owned by the Oregon Department of Transportation (ODOT), extends north from the outfall and parallels the west side of I-5 to the SW Lower Boones Ferry Road interchange. This system collects runoff from the interchange and surrounding roadways. Washington County prepared a hydraulic report (Washington County, 2004) that included analysis of the existing 36-inch ODOT storm sewer. The County designed an underground detention vault to reduce the peak runoff flow since their analysis concluded the downstream storm system was near capacity. A stormwater quality swale was designed to treat the runoff.

The Middle Bridgeport sub-basin, approximately 33 acres, does not have an existing public stormwater system. Currently, stormwater runoff is managed by either surface infiltration into the porous soil or by privately constructed dry wells.

Most of the properties on the east side of SW Upper Boones Ferry Road do not contribute runoff to an existing public stormwater system. Instead, these properties use dry wells to manage the runoff or ditches to convey flow to the Tualatin River to the south along SW Upper Boones Ferry Road. Two of the properties on the east side of SW Upper Boones Ferry Road manage their stormwater by surface infiltration. Overflow peaks from the surface infiltration system discharge into the storm system in SW Lower Boones Ferry Road. These properties are not included in the master plan analysis.

The South Bridgeport sub-basin, approximately 20 acres, is served by a piped system, 12-inch and 18-inch in size. The pipe system begins at the outfall at the Tualatin River, extends north under the Willamette and Pacific Railroad through the Club Sports parking lot, then northwest in SW Childs Road, and tees into a piped system in SW Lower Boones Ferry Road. This Lower Boones Ferry system collects runoff from the roadway and adjacent properties along SW Lower Boones Ferry Road and SW Childs Road. A hydrodynamic separator unit was installed during 2003 construction of the SW Lower Boones Ferry Road. A feasibility level analysis shows the system is at or slightly above its maximum capacity at the Willamette and Pacific Railroad crossing. The City of Tualatin owns the piped system in Childs Road and the outfall. Washington County owns the piped system in SW Lower Boones Ferry Road.

Future Condition

For this analysis, it was assumed the property within the master plan boundary will be fully built-out, with approximately 85 percent of the development being impervious surface area. Figure 2-1 shows the boundary of the future developed area, which is the same as the Middle Bridgeport sub-basin boundary. The North and South Bridgeport sub-basins are currently fully built-out. The existing drainage patterns are not expected to change, and the storm sewer system is relatively new and does not need further improvements.

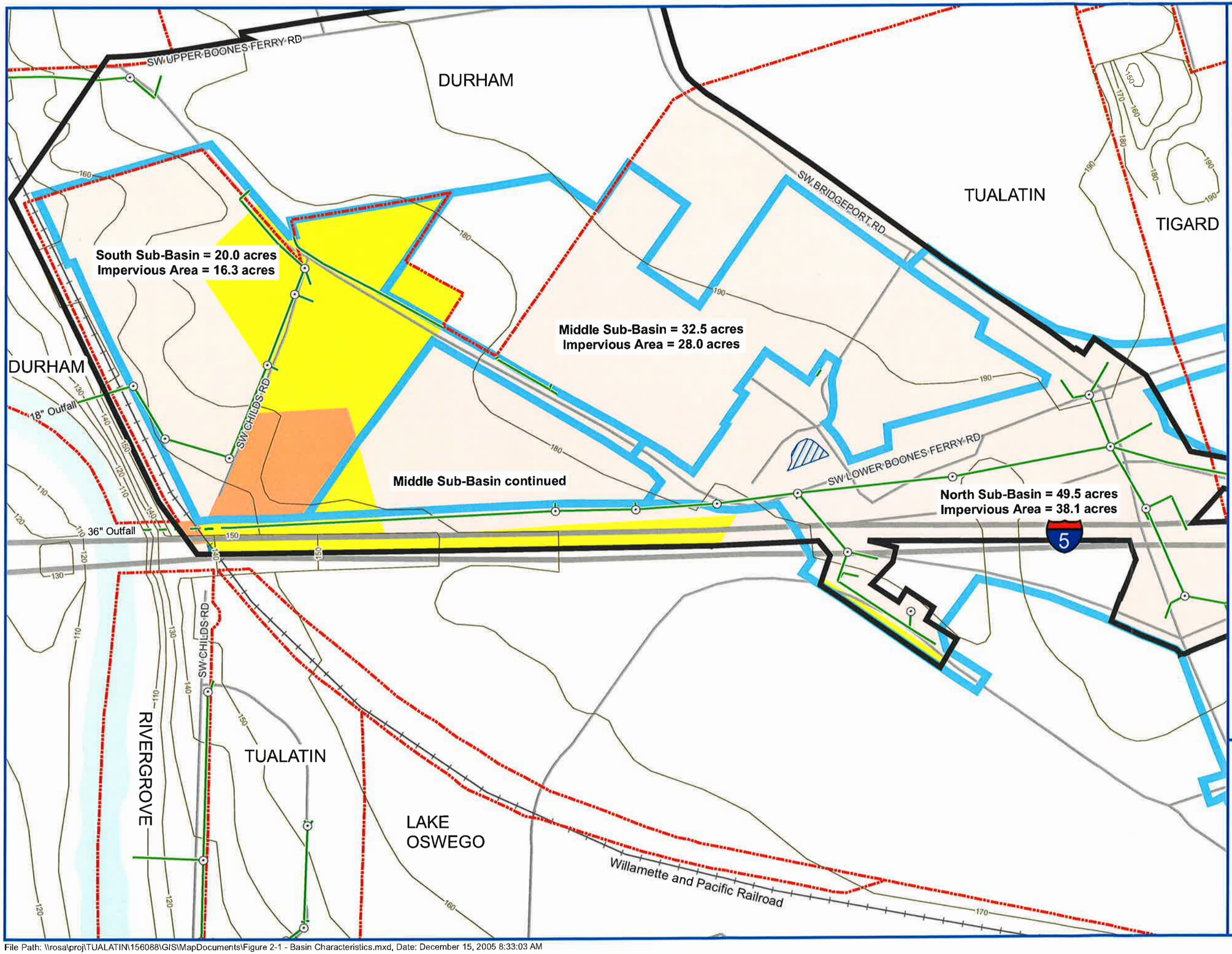
The City of Tualatin anticipates that much of the Middle Bridgeport sub-basin will be re-developed within the next 5 years. Twenty-two parcels were identified in the Middle Bridgeport sub-basin. These properties will need to address stormwater quality and quantity as they are redeveloped. This plan focuses on identifying the public stormwater system needed to serve these properties.

Bridgeport area drainage characteristics and estimated future peak runoff flow rates for the 25-year design storm are shown in Table 2-1. For information about the analysis refer to Appendix B, Basin Characterization and Alternatives Analysis.

TABLE 2-1
Bridgeport Area Sub-basin Characteristics and Estimated Future Peak Runoff Flow Rates

Bridgeport Sub-basin	Drainage Area (acres)	Estimated Pervious Area (percent)	Rational Method Weighted Runoff Coefficient (C)	Runoff Peak Flow Rate for 25-year Design Storm (cfs)*
North	49.5	23	0.77	96
Middle	32.5	15	0.82	56
South	20.0	18	0.80	40

* Assumes zero percent onsite retention.



Scale: 1" = 300'

Legend

- Project Boundary
- 10' Contours
- City Boundaries
- Streets
- I-5 Freeway
- Tualatin River
- Existing Stormwater Lines
- Approximate Pipeline Location
- Existing Stormwater Manholes
- Water Quality Facility
- Sub-Basin Boundary

Zoning_in_Project_Boundary

- General Commercial (CG)
- Office Commercial (CO)
- Light Manufacturing (ML)
- Medium High Density Res. (RMH)

FIGURE 2-1
Basin Characteristics

CH2MHILL

File Path: \\rosa\proj\TUALATIN\156088\GIS\MapDocuments\Figure 2-1 - Basin Characteristics.mxd, Date: December 15, 2005 8:33:03 AM

SECTION 3

Stakeholder Involvement and Outreach

Stakeholder involvement and outreach activities are outlined below. Refer to Appendix C, Stakeholder Involvement and Outreach Materials, for more information.

Stakeholder Groups Identified

It was determined that four distinct groups of stakeholders exist for the project:

- Tualatin City Council and key staff decision-makers
- A technical advisory committee (TAC) including regulating and cooperating public agencies
- Adjacent property owners, property owners within the project area, and potential site developers with interests in the proposed stormwater plan
- The community of Tualatin and its citizens

Each of these groups called for a different level of engagement in the planning process and a strategy was developed that incorporated the distinct needs of each.

City Council and Staff

The following were identified as key decision-makers from City elected officials and staff:

- City Council
- City Manager
- City Engineer
- Community Development Director
- Operations Director

Final adoption of the master plan is required by council.

Technical Advisory Committee

City staff extended an invitation to coordinating and cooperating partners with interests in the plan to join a technical advisory committee. This list included the following stakeholders:

- Clean Water Services
- Oregon Department of Environmental Quality (DEQ)
- City of Durham
- Oregon Department of Transportation (ODOT)
- Washington County

- Willamette and Pacific Railroad

The resulting technical advisory committee included Clean Water Services, City of Durham, ODOT, and Washington County. Although DEQ and Willamette and Pacific Railroad did not attend the committee meetings, they were contacted and kept informed, including receipt of meeting minutes. DEQ also reviewed the draft master plan; the comments were incorporated into the final plan.

The committee met twice. The first meeting introduced the committee to the project and outlined the City's goals. This meeting provided an opportunity for each member agency to express its expectations and needs for the project. Two key issues raised by the committee were impacts of onsite detention on flood conditions in the Tualatin River, and opportunities and constraints for connection to ODOT-owned facilities. In the first case, the preference was expressed for either disposing of stormwater onsite (retention) or immediate conveyance to the river. These approaches would avoid aligning discharge from the project area with the slower-building flood stage of the Tualatin River. This concern has been addressed by requiring that new developments and redevelopments pursue onsite retention as the presumed stormwater management approach. Only after technical review indicates retention is not possible, will detention systems be allowed.

In the second case, concerns were raised about impacts to ODOT facilities and necessary technical reviews and agreements needed to accept offsite stormwater and maintain the facilities over their expected life.

The second meeting was held after draft alternatives were developed. This meeting allowed the committee to see how the project was progressing and provide guidance on how the alternatives relate to the interests of the member agencies. This meeting again focused on requirements for discharging stormwater into the ODOT-owned facilities. As a result of this concern, and due to the uncertainties with respect to approval likelihood and schedule constraints, the recommended alternative selected did not require use of or connection to ODOT facilities. Instead, City-owned facilities will be used.

Property Owners and Developers

Individuals and organizations that have specific interest in the outcome of the plan include several groups.

- Property owners within the project area
- Adjacent property owners
- Potential site developers
- Railroad and utilities with easements and rights-of-way in the project area

City staff developed a contact list for these parties and extended an invitation to attend an informational meeting. This meeting was held after draft alternatives had been developed and shown to the technical advisory committee. Ten invited individuals attended the meeting. A recommended alternative and the selection process were presented at this meeting, prior to development of the final draft document. This allowed a focused discussion on the expected outcomes and potential implementation schedule, and provided an opportunity for input from the stakeholders and flexibility to adjust the plan before final

adoption. In general, the intense development pressure on the project area drove concerns of many of the attendees at this meeting. The pace of construction of facilities and the potential changes in City requirements and other permitting implications of the adoption of the master plan were primary issues raised. There were also questions raised regarding project financing options, potential credits available for onsite disposal of stormwater, and public-private partnerships options for accelerating construction schedules. To the extent possible, these issues have been addressed by an accelerated planning schedule, completing this plan in 4 months, and an accelerated implementation schedule, with an expected construction start 6-8 months after adoption of the plan by the City Council.

Community of Tualatin

A public meeting was held December 14, 2005, to inform the community about the need for the master planning effort and its goals and objectives. Notice of the meeting was posted on the City website and in the December Newsletter. The meeting provided an opportunity for members of the community with interest in the project to express preferences and concerns about the documents, implementation schedule, or recommended alternatives before the documents were completed and before the public hearing was held for adoption of the plan.

SECTION 4

Project Description

Overview

Within the Bridgeport area, the City of Tualatin has an opportunity to manage stormwater using a low impact approach that encourages onsite stormwater retention. This is possible because the permeable soils in this area are conducive to surface infiltration of stormwater—a unique condition in Washington County and the City of Tualatin. Using this cost-effective approach to limit stormwater runoff from development, the City can minimize infrastructure costs and impacts to the Tualatin River. The proposed project meets the City of Tualatin Stormwater Management Objectives as outlined in Table 4-1.

Stormwater runoff from existing roadways is currently handled by existing infrastructure. Runoff from the reconstructed section of Hazelfern Road will be conveyed and treated by the proposed project.

The onsite stormwater management component of the proposed project represents a policy change for the City. At present, developments are not required to limit stormwater runoff. With this proposed project, public and private developments will be required to reduce peak runoff flows by 50 percent, and will be encouraged to use a low impact approach such as surface infiltration to do it. Onsite retention of stormwater is endorsed by Clean Water Services, the regional surface water utility for the area, as the stormwater management alternative of first choice. Because of the favorable soil conditions, this approach is believed to be feasible in the Bridgeport area.

Stormwater not retained onsite will be conveyed by pipeline to an outfall on the Tualatin River. The four main components of the proposed project are onsite stormwater management, a Bridgeport area storm conveyance system, a stormwater quality facility for previously developed sites not treated but currently running to the City outfall, and an outfall. These are described individually below.

TABLE 4-1
How the Proposed Project Meets City of Tualatin Stormwater Management Objectives for the Bridgeport Area

Objective	Comments
Find a workable solution that meets the area's stormwater conveyance needs and local water quality and quantity regulations	Combined with the proposed level of source controls for the reduction of the 25-year flow at the development sites, the proposed conveyance system is sized to handle the reduced flows at build-out. Onsite stormwater quality control is required for runoff from future development sites. Stormwater quality control for the existing storm system (currently flowing to the City's 18-inch outfall) is provided by a stormwater quality facility upstream of the proposed outfall connection.
Accommodate rapid growth and development of the Bridgeport area with a solution that meets the needs of development and can be constructed in a timely manner	The proposed project addresses the stormwater management needs of the area and is planned to allow design and construction to commence in 2006.
Reduce, to the extent practicable, the size and extent of constructed "hard" stormwater infrastructure	By taking advantage of site conditions that allow surface infiltration at the development sites, the required conveyance pipeline diameter has been reduced significantly and the 18-inch outfall owned by the City of Tualatin has sufficient capacity to be used without improvements, which obviates the need to build a new outfall.
Optimize capital and long-term maintenance costs for the City	Source controls reduce the capital costs of required public facilities by reducing the facility (pipe) size.
Avoid alternatives and/or policies that would require timely and rigorous permitting	The proposed project avoids potential environmental constraints associated with the area south of the Willamette and Pacific Railroad along the Tualatin River by using the existing City of Tualatin outfall. Also avoided are the contamination sites in the area.
Develop a stormwater management policy for this area that is equitable and consistent with local ordinances	Onsite retention of stormwater is endorsed by Clean Water Services, the regional surface water utility for the area, as the stormwater management alternative of first choice.
Give due consideration to aesthetic value for any exposed elements of the stormwater system.	The storm sewer system will be underground. Surface infiltration systems can be integrated with onsite landscaping so that they are unnoticeable or potentially enhance the aesthetics of the site. The proposed manufactured stormwater treatment unit (vortex type) treating the existing storm system will be underground and out of sight in a precast concrete manhole.

Onsite Stormwater Management—Source Control

Individual developments and the redeveloped portion of Hazelfern Road will be responsible to limit discharges from their sites to 0.9 cubic feet per second (cfs)/acre. This value is based on 50 percent reduction of peak flow rate for the Middle Bridgeport Sub-basin divided by the total sub-basin area. Each development will be required to implement the highest category of onsite stormwater management feasible for the site.

It is recognized that the use of low impact stormwater approach may not be appropriate for all development because of site constraints, such as pockets of limited permeable soils or proximity to steep slopes. Therefore, it is recommended that the City implement a hierarchical approach to the stormwater management. The proposed categories for this project are as follows:

- Category 1: Provide onsite stormwater management using surface infiltration facilities or other source control best management practices (BMPs) that are sized to retain all surface water generated by the 25-year design storm event. Stormwater quality treatment is achieved by the retention system. For this category onsite detention is not needed.
- Category 2: Provide onsite stormwater management using surface infiltration facilities or other source control BMPs that are sized to retain the surface water generated during the 10-year design storm event. Stormwater quality treatment is achieved by the retention system. A stormwater quantity control facility is required to detain the surface water generated during larger design storm events. The allowable release rate for stormwater discharge from the site into the public stormwater system is limited to 0.9 cfs/acre for the 25-year design storm event.
- Category 3: Provide onsite stormwater management using surface infiltration facilities or other source control BMPs that are sized to retain the surface water generated by 1/3rd of the 2-year design storm event. Stormwater quality treatment is achieved by the retention system. A stormwater quantity control facility is required to detain the surface water generated during larger design storm events. The allowable release rate for stormwater discharge from the site into the public stormwater system is limited to 0.9 cfs/acre for the 25-year design storm event.
- Category 4: Provide onsite stormwater management using stormwater quality BMPs listed in the 2004 *Design and Construction for Sanitary Sewer and Surface Water Management Manual* (or as revised) by Clean Water Services and a stormwater quantity control facility. The allowable release rate for stormwater discharge from the site into the public stormwater system is limited to 0.9 cfs/acre for the design storm event (25-year).

The categories are summarized in Table 4-2.

TABLE 4-2
Onsite Stormwater Management Requirements

Category[a]	Required Onsite Retention (Design Storm Event)	Maximum Allowable Release Rate for the Design Storm Event (25-Year)[b]	Required Stormwater Quality Treatment
1	25-year	Not applicable	Included in retention (surface infiltration)
2	10-year	0.9 cfs/acre	Included in retention (surface infiltration)
3	1/3rd of the 2-year	0.9 cfs/acre	Included in retention (surface infiltration)
4	None	0.9 cfs/acre	Water quality best management practices per Clean Water Services standards

[a]Category 1 = highest level; Category 4 = lowest level.

[b]Runoff for storm events greater than the design storm event (25-year) shall be managed as described in Section 3.05.4 of the Clean Water Services 2004 *Design and Construction for Sanitary Sewer and Surface Water Management Manual*, or as revised.

This hierarchical approach requires a development to implement the Category 1 management approach (onsite low impact stormwater approach) to the greatest extent practicable before it can consider using a lower category. In this case, the term *greatest extent practicable* means the developer must provide technical justification that the higher category requirements cannot be met. The technical justification must be based on scientific or engineering data that are acquired from site investigations or from previous studies or calculations prepared by a registered engineer.

The technical justifications that are sufficient to lower the required stormwater management category for the development site are as follows:

- Low impact stormwater retention system for the category will occupy more than 15 percent of the development site area.
- Contaminated soils are present onsite such that DEQ will not permit stormwater infiltration.
- Slope instability conditions are present onsite that stormwater infiltration may exacerbate. Slopes must not exceed 10 percent in the facility area.
- Presence of seasonal high groundwater that would prevent adequate filtration zone.

The City of Tualatin's Development Code requires that properties within the General Commercial Planning District (CG) landscape a minimum of 15 percent of the total area to be developed (73.240 (3)). In addition, the Off-Street Parking Lot and Loading Area Landscaping section of the code (73.360) requires development of 25 square feet of landscaping island for each parking stall installed. Since this landscaping has to be installed

regardless of the stormwater management approach taken, using this area for the stormwater surface infiltration is encouraged.

Storm Sewer System

To meet the project objective of providing stormwater service to all of the properties within the project limits, the conveyance system needs to extend from the Tualatin River to a point near the intersection of Hazelfern Road and Bridgeport Road. A majority of the alignment proposed for this project (shown in Figure 4-1) follows an existing sanitary sewer alignment.

The new conveyance system is sized based on the assumption that a 50 percent reduction in the peak runoff flow rate for the 25-year design storm event will be required for each development within the master plan limits. A 50 percent peak runoff flow reduction is achievable with the use of the low impact stormwater management approach (surface infiltration). This reduction in flow limits the maximum pipe size to 24 inches in diameter.

Stormwater Quality Facility

Since this outfall is regulated under the Clean Water Services Municipal Storm Sewer System (MS4) permit, treatment of the runoff from all impervious surfaces, new and existing, is required. A majority of the runoff in the existing stormwater system is currently treated. However, a few properties at the downstream end of the basin are not. Instead of complicating the pipe configuration to strip out the untreated areas, the runoff from the existing storm system will be treated with the use of a proprietary manufactured stormwater treatment unit (vortex type). This manufactured unit was sized to treat 1.6 cfs of flow, based on preliminary calculations using the Clean Water Services water quality storm event.

Outfall

The recommended outfall option is to connect to the existing 18-inch outfall owned by the City of Tualatin. The new conveyance system will connect to the existing City of Tualatin storm system upstream (north) of the Willamette and Pacific Railroad crossing (See Figure 4-1). The diameter and slope of the pipe under the railroad tracks will be increased to accommodate the additional runoff flows. This approach limits modification of the outfall pipe south of the railroad, and limits disturbance to the Clean Water Services vegetated corridor to a small area.

TUALATIN

DURHAM

TUALATIN

DURHAM

SW UPPER BOONES FERRY RD

SW BRIDGEPORT RD

SW LOWER BOONES FERRY RD

SW CHILDS RD

HAZELFERN RD

Willamette and Pacific Railroad

Recommended
Stormwater Quality Facility

Junction Structure

36"

18" Outfall

24"

36" Outfall

24"

18"

12"

RIVERGROVE

TUALATIN

160 200 170 180 190 120 130 140 150 110

5

Scale: 1" = 250'

Legend

- Project Boundary
- 10' Contours
- City Boundaries
- Streets
- I-5 Freeway
- Railroads
- Tualatin River
- Existing Stormwater Lines
- Approximate Pipeline Location
- Existing Stormwater Manholes
- Water Quality Facility
- Middle Bridgeport Sub-Basin
- Recommended Stormwater MH
- Recommended Storm Sewer Alignment
- Recommended Stormwater Quality Treatment Facility (Treatment of Existing Stormwater System)

FIGURE 4-1
Recommended Project

CH2MHILL

File Path: \\rosa\proj\TUALATIN\156088\GIS\MapDocuments\Figure 4-1 - Recommended Project.mxd, Date: December 14, 2005 4:28:53 PM

SECTION 5

Implementation Plan

It is expected that the recommended policy change regarding onsite stormwater management will be adopted at the same time as this master plan by the Tualatin City Council on January 23, 2006. The other components of the proposed project are based on the adoption of that policy.

If the plan is adopted, design and permitting of the Bridgeport area stormwater infrastructure can begin in February 2006.

Development and Redevelopment

Private developments and redevelopments within the Bridgeport area will adhere to the low impact stormwater management approach described under *Onsite Stormwater Management – Source Control* in Section 4, Project Description, of this master plan. Similarly, public developments and redevelopments within the area will adhere to the same discharge and water quality requirements. Adherence to this approach establishes the basis for the design of the stormwater system capital improvements planned for the area.

The low impact stormwater management approach of this master plan does not allow the use of underground injection systems such as sumps and dry wells for the disposal of runoff. Underground injection systems must be permitted by the Oregon Department of Environmental Quality (DEQ), which will not allow them if an alternative disposal method is available.

Capital Improvements

Permitting

Activities associated with the recommended storm sewer pipeline, and stormwater quality facility north of the Willamette and Pacific Railroad track do not appear to be subject to environmental permitting requirements. However, if construction disturbs an acre or more of land, then it will be necessary to meet the requirements of a National Pollutant Discharge Elimination System (NPDES) 1200-CA permit for municipalities, which includes development of an erosion control plan.

The recommended outfall improvement involves pipe replacement under the Willamette and Pacific Railroad track, but avoids activity below the ordinary high water line of the Tualatin River. Therefore, wetland removal/fill permits are not required for the outfall improvements. Consequently, Endangered Species Act (ESA) consultation is not required. However, improvements south of the railroad require Clean Water Services and City of Durham permitting. The estimated permit process timelines for remaining applicable permits are summarized in Table 5-1. The overall permitting timeline for the proposed

outfall is estimated to be 93-183 days, assuming that the permits can be pursued concurrently.

TABLE 5-1
Outfall Permitting Requirements of the Recommended Project

Agency	Permit	Timeline	Cost Estimates[a]	Comments
Clean Water Services	Service Provider Letter	30–75 days	$8,000–$13,000	Wetland delineation, corridor width determination, Natural Resources Assessment, and coordination with Clean Water Services
Clean Water Services	Site Development	93–183 days	$44,000–$72,000	Engineering, Landscaping, & Erosion Control Plans, cost estimates, etc.
City of Durham[b]	Special Use Permit-Greenway, Floodplain	90–120 days	$10,000–$16,000	Required for vegetation removal, excavation, fill, pipe placement. Special Use Permit application, coordination with City of Durham

[a]The order-of-magnitude cost estimates for known environmental and land use planning requirements are planning level estimates intended to guide budget allocations by the City for stormwater improvements in the study area.

[b]Only if outfall improvements extend into the City of Durham's jurisdiction.

Clean Water Services

Clean Water Services has a two-step permitting process. The first step, which must be completed before submitting an application for local land use permits, is to obtain a Service Provider Letter (SPL) from Clean Water Services. The SPL specifies for the applicant and local land use agencies the conditions and requirements for vegetated corridors and water quality sensitive areas. Following receipt of local land use permits, applicants apply to Clean Water Services for a site development permit that authorizes activities in Water Quality Sensitive Areas and Vegetated Corridors. The Clean Water Services process steps and timeline are outlined in Table 5-2.

City of Durham—Greenway District Special Use Permit

The City of Durham Special Use Permit process follows a quasi-judicial process that includes a public Community Development Conference and a public hearing before the Planning Commission. City of Durham process steps and timeline are outlined in Table 5-3.

Permitting Costs

The overall estimated permitting timeline for the proposed outfall is 93–183 days. The estimated permitting cost is $62–$101,000. Cost estimates are based on experience with similar projects. The order-of-magnitude cost estimates for known environmental and land use planning requirements are planning level estimates intended to guide budget allocations by the City for stormwater improvements in the study area.

TABLE 5-2
Clean Water Services Permit Process and Timeline*

Process Step	Submittal Requirements	Timeline	Comments
Pre-Screening Assessment	Pre-Screening Form		Has been completed.
Site Certification & Service Provider Letter: Application Preparation	Sensitive Areas Certification Form Natural Resources Assessment Report Request for Statement of Design Considerations for Surface Water Management	15–30 days	
Site Certification & Service Provider Letter: Issuance		15–45 days	Timeline unspecified in Clean Water Services regulations.
Vegetated Corridor Restoration (Mitigation)	Construction Documents	Design Construction	Assume 1 acre construction.
Site Development Permit: Application Preparation	Engineering Plans Landscaping Plans Erosion Control Plans Land Use Approval	30–60 days	This step and subsequent steps can only occur after land use approvals have been obtained.
Site Development Permit: Plan Approval		3 days 15 days	Completeness review. Plan review.
Site Development Permit: Final Submittals	Cost Estimates for storm sewers, facilities, erosion control, and landscaping/restoration Performance Assurances (bonds, escrow, etc.) Construction Permit Agreement Off-site Easements if needed	30–60 days	Assume cost estimates and finalization of plans only. Other costs will be responsibilities of construction contractor.
Site Development Permit: Issuance		15–45 days	Timeline unspecified in Clean Water Services regulations.

* Timeline does not include additional work and time that may be required to address agency-required revisions, mutually-agreed upon time extensions, or administrative or legal challenges to permit issuance.

TABLE 5-3
City of Durham Special Use Permit Process and Timeline*

Process Step	Submittal Requirements	Timeline	Comments
Application	Engineering Plans	30–60 days	
	Landscaping Plans		
	Erosion Control Plans		
	Documentation that the proposed action is consistent with the intent of the Greenway District		
	Clean Water Services Service Provider Letter		
Pre-Application Conference		10 days	
Community Development Conference	Public Presentation	20 days	Required public notification.
Planning Commission Public Hearing	Public Presentation	20 days	Required public notification. Hearing must occur within 60 days of application.
Written Decision		10 days	

* Timeline does not include additional work and time that may be required to address agency-required revisions, mutually-agreed upon time extensions, or administrative or legal challenges to permit issuance.

Cost Estimates

The project cost estimates are summarized in Table 5-4. These are order-of-magnitude estimates, which are planning level estimates made without detailed engineering data. It is normally expected that estimates of this type are accurate within +50 percent or -30 percent. The recommended project capital improvement plan (CIP) sheet is attached.

TABLE 5-4
Project Cost Estimates

Item	Cost	Summary Costs
Storm Sewer Systems[a]		
12-inch Concrete Pipe, < 8 feet deep, 60 linear feet	$6,500	
18-inch Concrete Pipe, < 8 feet deep, 660 linear feet	$88,000	
24-inch Concrete Pipe, < 10 feet deep, 2,480 linear feet	$381,500	
36-inch Concrete Pipe, Jack and Bore Installation, 112 linear feet	$50,500	
Stormwater Quality Control Facility (for the existing storm system)[b]	$20,000	
Subtotal Direct Construction Cost (SOCC)	**$546,500**	
General Conditions, 10% of SOCC	$58,500	
Waste Allowance, 5% of SOCC	$27,500	
Total Direct Construction Cost (TDCC)	**$632,500**	
Contingency, 30% of TDCC	$190,000	
Total Construction Cost		**$822,500**
Engineering/Administration at 25% TDCC	$158,500	
Permitting[c]	$101,000	
Subtotal Engineering/Administration	**$259,500**	
Contingency at 30%	$78,000	
Total Engineering/Administration		**$337,500**
Right-of-Way (Easement)[d]	$129,500	
Contingency at 30%	$39,000	
Total Right-of-Way (Easement)		**$168,500**
Total Project		**$1,328,500**

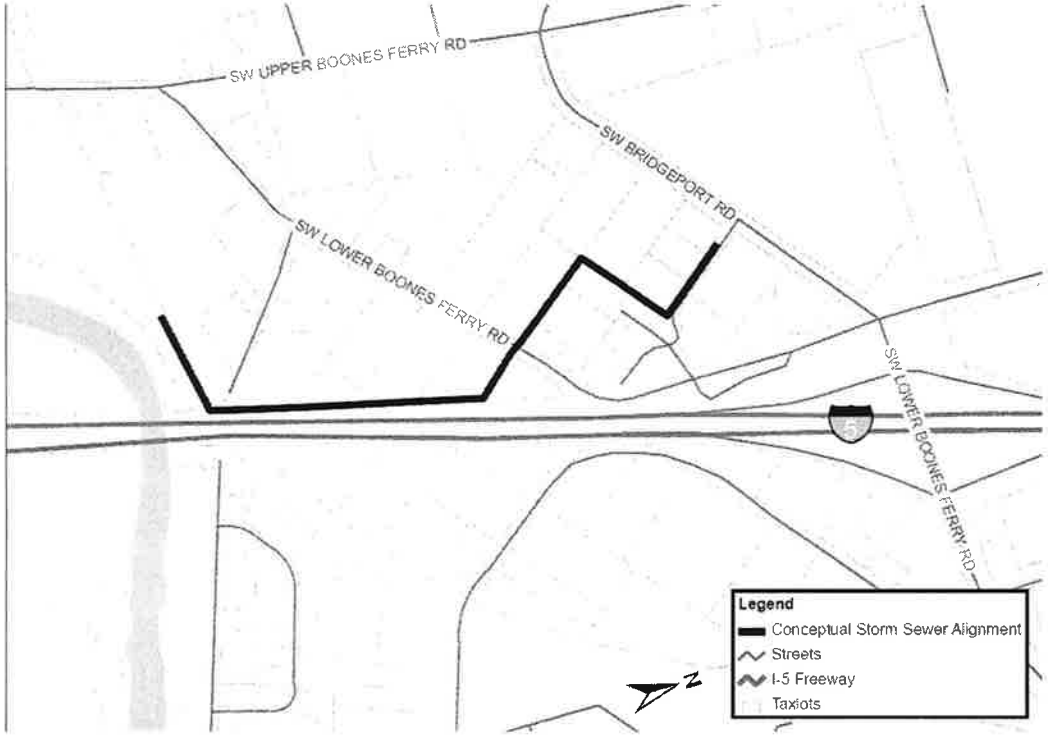
[a]Cost includes manholes at spacing interval of 250 feet.

[b]Estimated maintenance cost for the Stormwater Quality Control Facility (for the existing storm system) is $2,600 per year. This estimate assumes inspection of the unit twice a year and the removal and disposal of sediment with a Vactor truck once a year.

[c]Permitting costs were estimated at a range of $62,000–$101,000. The higher value was used to provide a conservative estimate.

[d]Cost based on assessed land values.

FY 05/06 CAPITAL IMPROVEMENT PROJECT INFORMATION SHEET
STORM DRAIN SYSTEM



PROJECT: **Bridgeport Area Storm Sewer System**

PROJECT NUMBER:

PROJECT DESCRIPTION: Design, permit, and construct a new storm sewer alignment from WPRR up through Hazelfern Road.

PROJECT NEED: Redevelopment of this area is anticipated by FY06 and currently there is no existing stormwater infrustructure in the area.

BEGIN PROJECT: 05/06 COMPLETE PROJECT: 06/07

PROJECT PROPOSED BY: Engineering and Building Department

CLASSIFICATION:

PROJECT STATUS:	[X] NEW	[ ] CONTINUING
PLAN AVAILABLE:	[ ] YES	[X] NO
PROJECT IN MASTER PLAN:	[X] YES	[ ] NO
R-O-W REQUIRED:	[X] YES	[ ] NO

SCOPE OF SERVICES	FY05/06	FY06/07	FY07/08	FY08/09	FY09/10	FY10/11	FY11/12	FY12/13
Engineering/Admin	$0	$337,500	$0	$0	$0	$0	$0	$0
Easement	$0	$168,500	$0	$0	$0	$0	$0	$0
Construction	$0	$822,500	$0	$0	$0	$0	$0	$0
TOTAL	**$0**	**$1,328,500**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

FUNDING SOURCE	FY05/06	FY06/07	FY07/08	FY08/09	FY09/10	FY10/11	FY11/12	FY12/13
	$0	$0	$0	$0	$0	$0	$0	$0

Date Prepared: 12/12/2005

SECTION 6

References

Buckallew, Chuck, Clean Water Services. 2005. Telephone conversation with Joel Shaich, CH2M HILL, on October 10, 2005.

Durham, City of. 1995. *Comprehensive Land Use Code*. Revised December 1995. Second printing February 1996.

Federal Emergency Management Agency (FEMA). 1982. Federal Insurance Rate Map, City of Durham, Oregon, Washington County. Community Panel Number 410263 0001 A. Effective Date January 6, 1982.

Federal Emergency Management Agency (FEMA). 1987. Federal Insurance Rate Map, City of Tualatin, Oregon, Washington and Clackamas Counties, Panel 2 of 4. Community Panel Number 410277 0002 D. Map Revised: February 19, 1987.

Oregon Department of Fish and Wildlife (ODFW). 2000. Oregon Guidelines for Timing of In-water Work to Protect Fish and Wildlife Resources. Oregon Department of Fish and Wildlife, Portland, OR. June 2000.

Washington County. 2004. *Final Hydraulic Report – SW Lower Boones Ferry Road to Bridgeport Avenue*. February 9, 2004.

APPENDIX A
Stormwater Management Objectives

Preliminary Bridgeport Area Stormwater Management Objectives

PREPARED FOR: Kaaren Hofmann / City of Tualatin
Dayna Johnson /City of Tualatin

PREPARED BY: Ryan Mitchell / CH2M HILL
Tim Yamada / CH2M HILL

COPIES: File

DATE: September 7, 2005

PROJECT NUMBER: 334122.01.01

The purpose of this memorandum is to summarize the stormwater management objectives for the Bridgeport area as were discussed during the project kick-off meeting held August 25, 2005. This memorandum will be amended for final concurrence from City staff after stakeholder meetings have been held and comments appropriately incorporated.

The need for a comprehensive stormwater management plan has been primarily driven by rapid commercial development which is anticipated to reach a fully developed condition within approximately 5 years. The urgency for establishing a stormwater management plan is compounded by the lack of existing drainage infrastructure in the area.

A series of alternatives will be evaluated that encompass a range of potential solutions including green stormwater systems (surface infiltration) and piping systems. Alternatives will consider on-site (private development) disposal verses off-site (public) disposal, and combinations of both. The final selection of the preferred alternative will be guided by the following stormwater management objectives:

- To find a workable solution that meets the area's stormwater conveyance needs and local water quality and quantity regulations
- To accommodate rapid growth and development of the Bridgeport area with a solution that meets the needs of development and can be constructed in a timely manner
- To reduce, to the extent practicable, the size and extent of constructed "hard" stormwater infrastructure
- To optimize capital and long-term maintenance costs for the City
- To avoid alternatives and/or policies that would require timely and rigorous permitting
- To develop stormwater management policy for this area that is equitable and consistent with local ordinances
- To give due consideration to aesthetic value for any exposed elements of the stormwater system.

Final concurrence of these objectives will be requested once the stakeholder meetings are held and appropriate comments incorporated.

APPENDIX B

Basin Characterization and Alternatives Analysis

Alternatives Analysis and Recommended System for the Bridgeport Area Stormwater Master Plan

PREPARED FOR: Kaaren Hofmann/City of Tualatin
Dayna Johnson/City of Tualatin

PREPARED BY: Ryan Mitchell/CH2M HILL
Tim Yamada/CH2M HILL

REVIEWED BY: Mark Anderson/CH2M HILL

DATE: November 15, 2005

PROJECT NUMBER: 334122.01.01: Tasks 2.2 and 2.5

Introduction

The purpose of this technical memorandum is to summarize the analysis of the existing drainage basin and the alternatives considered to address future stormwater conveyance and water quality treatment needs for the Bridgeport basin. Alternative solutions were evaluated based on the goals and objectives outlined in the technical memorandum titled *Bridgeport Area Stormwater Management Objectives.*

Basin Characterization

Existing Condition

The Bridgeport stormwater master plan boundaries are roughly described as west of Interstate 5 (I-5), south of SW Bridgeport Road, east of SW Upper Boones Ferry Road, and north of the Willamette and Pacific Railroad tracks (see Figure 1).

The existing land use consists of commercial, light manufacturing, and medium low density residential. Most of the area is either fully developed or in the process of being redeveloped. The basin has a high percentage of impervious and semi-impervious area, estimated to be 80–85 percent.

The soils are highly porous and classified as hydrologic soil group "A" as defined by the Natural Resource Conservation Service soil classification system. The hydraulic conductivity of these soils results in very little runoff being generated if precipitation falls on the surface.

There are three sub-basins within the overall Bridgeport basin, draining a total area of 102.5 acres. The three sub-basins are North Bridgeport, Middle Bridgeport, and South Bridgeport. Their boundaries are shown in Figure 1. Only the North Bridgeport and South Bridgeport sub-basins have existing stormwater systems.

The North Bridgeport sub-basin, approximately 49.5 acres, is served by a 36-inch pipe system with a 36-inch outfall at the Tualatin River. This piped system, owned by the Oregon

Department of Transportation (ODOT), extends north from the outfall and parallels the west side of I-5 to the SW Lower Boones Ferry Road interchange. This system collects runoff from the interchange and surrounding roadways. Washington County prepared a hydraulic report (*Final Hydraulic Report – SW Lower Boones Ferry Road to Bridgeport Avenue*, February 9, 2004) that included analysis of the existing 36-inch ODOT storm sewer. The County designed an underground detention vault to reduce the peak runoff flow since their analysis concluded the downstream storm system was near capacity. A stormwater quality swale was designed to treat the runoff.

The Middle Bridgeport sub-basin, approximately 33 acres, does not have an existing public stormwater system. Currently, stormwater runoff is managed by either surface infiltration into the porous soil or by privately constructed dry wells.

Most of the properties on the east side of adjacent to SW Upper Boones Ferry Road do not contribute runoff to an existing public stormwater system. Instead, these properties use dry wells to manage the runoff or ditches to convey flow to the Tualatin River to the south along SW Upper Bones Ferry Road. These properties are not included in the master plan analysis.

The South Bridgeport sub-basin, approximately 20 acres, is served by a piped system, 12-inch and 18-inch in size. The 18-inch pipe system begins at the outfall at the Tualatin River, extends north under the Willamette and Pacific Railroad, through the Club Sports parking lot, then northwest in SW Childs Road, and tees into a piped system in SW Lower Boones Ferry Road. This Lower Boones Ferry system collects runoff from the roadway and adjacent properties along SW Lower Boones Ferry Road and SW Childs Road. A feasibility level analysis shows the system is at or slightly above its maximum capacity at the railroad crossing. The City of Tualatin owns the piped system in Childs Road and the outfall. Washington County owns the piped system in SW Lower Boones Ferry Road.

Refer to Attachment A for additional information about sub-basin characteristics.

Future Condition

For this analysis, it was assumed the property within the master plan boundary will be fully built-out, with approximately 85 percent of the development being impervious surface area. Figure 2 shows the boundary of the future developed area, which is the same as the Middle Bridgeport sub-basin boundary. The North and South Bridgeport sub-basins are currently fully built-out. The existing drainage patterns are not expected to change, and the storm sewer system is relatively new and does not need further improvements.

The City of Tualatin anticipates that much of the Middle Bridgeport sub-basin will be re-developed within the next 5 years. Twenty-two parcels were identified in the Middle Bridgeport sub-basin. These properties will need to address stormwater quality and quantity as they are redeveloped. This memorandum focuses on identifying the public stormwater system needed to serve these properties. Several alternatives were developed and evaluated.

Evaluation of Alternatives

Hydrologic and Hydraulic Methodology

The Bridgeport stormwater master plan area was delineated into sub-basins according to the local drainage patterns and existing stormwater infrastructure. CH2M HILL staff conducted field visits to verify drainage patterns and identify potential stormwater solutions. Existing hydraulic and drainage reports, as-built drawings, site photos, and GIS data were obtained and reviewed to understand how the existing stormwater systems operate and to assess their capacities. Also, the data helped identify previous design assumptions, such as contributing drainage basin limits, runoff routing, and flow detention.

The Rational Method was used to predict the peak flows for both the existing and future conditions. The Manning's equation was used to determine the existing pipe capacity and to size the proposed pipe system for the 25-year return storm event. A Manning's *n*-value of 0.013 and a full flow condition was used for the flow calculation.

Water Quality Requirements

The Bridgeport stormwater master plan area lies within the Clean Water Services district boundary. Therefore, any development or redevelopment of the properties must meet the stormwater quality requirements specified in the Clean Water Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management*, March 2004. The manual requires that the runoff from all impervious surfaces (new and directly connected existing) during the water quality storm event (0.36 inch of rain over a 4 hour period) must be treated.

Alternatives Analysis

CH2M HILL investigated several stormwater system alternatives to meet the project objective of providing a public stormwater conveyance system that serves the properties within the master plan boundaries. The three alternatives evaluated were as follows:

- **Alternative 1:** Size conveyance system to accommodate runoff flows assuming no onsite stormwater detention provided.
- **Alternative 2:** Design a 12-inch-diameter conveyance system and determine the allowable release rate from each development.
- **Alternative 3:** Size the conveyance system based on identification of significant breakpoints in construction cost associated with percentage of peak runoff flow reduction (amount of stormwater runoff allowed to enter the system).

Alternative 1 looked at a conveyance system without any onsite stormwater detention/retention systems. Since all of the runoff is allowed to leave the developments, this alternative requires the largest conveyance pipe sizes. Runoff flows from the unserved area were calculated for the 25-year return storm event. The calculated pipe sizes needed to convey the runoff from the 25-year event ranged between 12-inch to 30-inch. Also, the undetained flow rates exceeded the capacity of the existing outfalls. Therefore, this alternative requires construction of a new outfall or reconstruction of the existing outfalls.

Alternative 2 looked at minimizing the conveyance system (12-inch) while maximizing the use of onsite detention/retention. As discussed in the Source Control section of this memorandum, the native soils within the project area are conducive to surface infiltration. The flow capacity of a 12-inch pipe system would require detention/retention of 95 percent of the peak runoff from the 25-year return storm event. Calculations were performed to see if the native granular soils could be used to meet the flow reduction requirement. The calculations showed that the flow reduction could be achieved by retention in an area approximately equal to 10 percent of the development area.

For Alternative 3, seven levels of detention/retention (0, 20, 40, 50, 60, 80, and 95 percent) were evaluated to identify significant breakpoints in construction cost. The proposed system was sized for the range of peak flow conditions. This process identified two significant breakpoints: (1) at 50 percent retention, the pipe diameter in the lower part of the system could be reduced from 30-inch to 24-inch, and (2) at 80 percent retention, it could be reduced to 18-inch. The length of pipe associated with the identified reduction is nearly 2,000 feet, which represents a significant decrease in construction cost (approximately $218,000) for the storm sewer trunk line. Attachment B summarizes the storm sewer trunk line analysis. Assuming conservative expectations about the amount of stormwater retention that is achievable in the study area, Alternative 3 would consist of a program to reduce peak runoff flows by 50 percent (see Source Control section below) and the conveyance system would be designed with 24-inch-diameter pipelines.

Conveyance System Alignment

To meet the project objective of providing stormwater service to all of the properties within the project limits, the conveyance system needs to extend from the Tualatin River to a point near the intersection of Hazelfern Road and Bridgeport Way. Because Washington County has recently improved SW Lower Boones Ferry Road, it is preferred that the alignment minimizes impacts to that road. The alignment proposed for this project (shown in Figure 2) follows an existing sanitary sewer alignment.

Source Control

The stormwater management approach for Alternatives 2 and 3 of this project is to encourage management of stormwater generated on a development at its source. Within the Bridgeport stormwater master planning area, there is a unique opportunity to use a low impact approach to manage the stormwater on public and private developments. This approach is recommended because of the permeable soils that underlay the land—a unique condition for property in Washington County and the City of Tualatin.

It is recognized that the use of low impact stormwater approach may not be appropriate for all development because of site constraints, such as pockets of limited permeability or slope instability. Therefore, it is recommended that the City implement a hierarchical approach to the stormwater management. The proposed categories for this project are as follows:

- Category 1: Onsite stormwater management using surface infiltration facilities or other source control best management practices (BMPs) that are sized to retain all surface water generated by the 25-year return storm event.
- Category 2: Onsite stormwater management using surface infiltration facilities or other source control BMPs that are sized to retain the surface water generated during the 10-

year return storm event. A stormwater quantity control facility will be required to detain the surface water generated during larger return storm events. The allowable release rate for stormwater discharge from the site into the public stormwater system will be limited to 0.9 cfs/acre based on the runoff from the developed site for the 25-year, return storm event.

- Category 3: Onsite stormwater management using surface infiltration facilities or other source control BMPs that are sized to retain the surface water generated during the Clean Water Services water quality storm event. A stormwater quantity control facility will be required to detain the surface water generated during larger return storm events. The allowable release rate for stormwater discharge from the site into the public stormwater system will be limited to 0.9 cfs/acre based on the runoff from the developed site for the 25-year return storm event.
- Category 4: Onsite stormwater management using stormwater quality BMPs currently listed in the 2004 *Design and Construction for Sanitary Sewer and Surface Water Management Manual* by Clean Water Services and a stormwater quantity control facility. The allowable release rate for stormwater discharge from the site into a public stormwater system will be limited to 0.9 cfs/acre based on the runoff from the developed site for the 25-year return storm event.

This hierarchical approach would require a development to implement a Category 1 management approach (onsite low impact stormwater approach) to the greatest extent practicable before it could consider using a lower category. In this case, the term *greatest extent practicable* means the developer must provide technical justification that the higher category requirements cannot be met. The technical justification must be based on scientific or engineering data that are acquired from site investigations or from previous studies or calculations prepared by a registered engineer.

The City of Tualatin's Development Code requires that properties within the General Commercial Planning District (CG) landscape a minimum of 15 percent of the total area to be developed (73.240 (3)0). In addition, the Off-Street Parking Lot and Loading Area Landscaping section of the code (73.360) requires development of 25 square feet of landscaping island for each parking stall installed. Since this landscaping will have to be installed regardless of the stormwater management approach taken, using this area for the stormwater surface infiltration would be encouraged.

An analysis for a generalized 1-acre development was performed to determine whether onsite retention (surface infiltration) could feasibly retain runoff from the 25-year event. The Santa Barbara Urban Hydrograph method was used to calculate the stormwater retention volumes and flow rates. The 2004 *Stormwater Management Manual* by the City of Portland Bureau of Environmental Services (BES) was used to size a street swale. The analysis assumed 15 percent of the development was available for surface infiltration. Other assumptions used in the analysis were: the porosity of drain rock = 30 percent; native soil infiltration rates = 2 inches/hour; includes a correction factor = 4. For the worst case scenario, 100 percent retention of peak flow can be handled within a basal surface area for the swale equal to 15 percent of the 1-acre development. Therefore, surface infiltration is a viable method to detain/retain the runoff from developments. Attachment C summarizes the details of this analysis.

Outfall

The two existing outfalls are located within 450 feet of each other, on the north bank of the Tualatin River. One outfall, a 36-inch concrete pipe is owned and maintained by ODOT. It is located on the west side of I-5. The other outfall, an 18-inch concrete pipe, is owned and maintained by the City of Tualatin. It is located approximately 450 feet west of I-5. The ends of both outfalls are located in the riparian corridor of the Tualatin River. The corridor is densely vegetated with medium to large diameter trees. Refer to *Potential Environmental Constraints for Implementing the Bridgeport Area Stormwater Master Plan Technical Memorandum* (CH2M HILL, 2005) for additional information.

The outfall requirements for this project depend on the selected conveyance system alternative. If additional capacity is required (for example, conveyance system Alternative 1), then the existing outfall pipe will need to be upsized, its slope increased, or a new pipe installed. These improvements would disturb the riparian corridor and would require mitigation and restoration work to acquire a permit. Therefore, utilizing the existing outfalls, as-is, is the preferred outfall utilization option.

An alternative to connecting the new conveyance directly to the outfall pipe was to connect it to the storm pipe system upstream of the outfall pipe. This alternative was reviewed because it has the merit of not requiring a new crossing under the railroad tracks. Data research for this project revealed that the existing storm system's flow capacity was controlled by the capacity of the pipe segments under the railroad tracks. These segments are installed at a flatter slope than the steeper outfalls. Therefore, if the proposed conveyance system is connected to the upstream storm system, the existing pipe under the railroad will either need to be upsized or its slope increased.

Various pipe slope and pipe diameter combinations were reviewed for this analysis. Pipes with steeper slopes could be smaller in diameter to convey the same flow rates, but the increased pipe slope would disturb more of the downstream riparian corridor because the pipe would extend farther down the embankment. For example, a 36-inch pipe with a pipe slope of 1 percent would be required to convey the discharge flow rate calculated for a 50 percent onsite detention of Alternative 3. At this slope, approximately 12 feet of riparian corridor would be disturbed with the installation of this pipe. The calculation in Attachment D summarizes the relationship between the pipe slope and the additional length of riparian corridor that would be disturbed for each retention alternative.

Recommended System

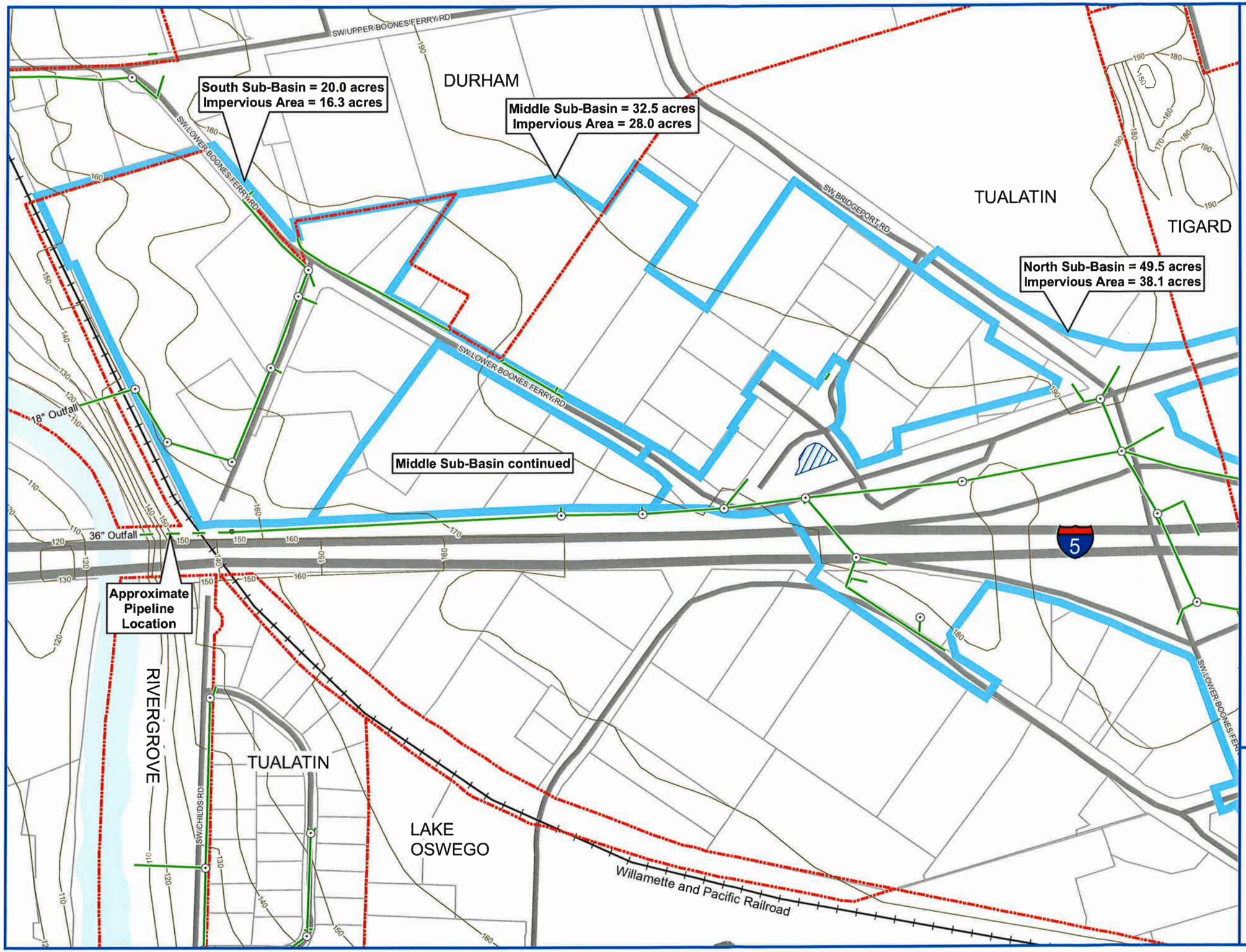
Alternative 3 is recommended. With this alternative, the new conveyance system will be sized based on the assumption that a 50 percent reduction in the peak runoff flow rate for the 25-year return event will be required for each development within the master plan limits. A 50 percent peak runoff flow reduction is achievable with the use of the low impact stormwater management approach (surface infiltration). This reduction in flow will limit the maximum pipe size to 24 inches in diameter. The recommended conveyance system alignment is shown in Figure 2.

Individual developments will be responsible to implement the low impact stormwater approach (using the four categories described in the Source Control section above) and limit

discharges from their sites to 0.9 cfs/acre. Each development will be required to implement the highest category of onsite stormwater management feasible for the site.

The recommended outfall option is to connect to the existing 18-inch outfall owned by the City of Tualatin. The new conveyance system will connect to the City of Tualatin storm system upstream of the railroad crossing. The pipe under the railroad tracks will be modified to accommodate the additional runoff flows. This approach will limit disturbance to the riparian corridor caused by the increase in the pipe slope under the railroad tracks to approximately 12 feet.

Since this outfall is regulated under the Clean Water Services Municipal Storm Sewer System (MS4) permit, a water quality facility designed to treat flows from the existing impervious area is needed. The water quality flow rate requiring treatment is 1.6 cfs. A relatively small off-line proprietary hydrodynamic separator would be sufficient.



Scale: 1" = 300'

Legend

- 10' Contours
- City Boundaries
- Streets
- I-5 Freeway
- Railroads
- Taxlots
- Tualatin River
- Existing Stormwater Lines
- Existing Stormwater Manholes
- Water Quality Facility
- Sub-Basin Boundary

FIGURE 1
Bridgeport Sub-Basin Boundaries

CH2MHILL

File Path: \\rosa\proj\TUALATIN\156088\GIS\MapDocuments\Figure 1 - Bridgeport Sub-Basin Boundaries.mxd, Date: November 18, 2005 8:49:43 AM

CH2MHILL

Project Name: Bridgeport Area Stormwater Management Plan
Project Number: 334122.01.01
Rev. Date: 12/12/2005
Description of Calc.: Feasibility analysis of on-site retention/detention.
By: Ryan Mitchell

Assumptions: 1. Storage volume in drain rock equals 30% of rock volume
2. Maximum Drawdown Time (Td) Hours; <30 hours

Ref.: Based on Washington State Department of Ecology (Aug 2004) SWMM for Western Washington; Table 3.7 Vol. III
Sand 2 in/hr; maximum rate to provide treatment (includes Correction Factor = 4 over short term rate)
BES Street Swale w/ Infiltration w/o surface storage

Calculations:

Trench Data		
Min. Swale Basal Area =	5,250	sf; Approx. 12% of an acre
Drain Rock Depth (D) =	1	ft
Drain Rock Void Ratio =	30%	
Long Term Infiltration	2	in/hr; Includes Correction Factor = 4

Infiltration Flow Rate:	0.24	cfs; entire trench length
Available Storage Volume:	1,575	ft3; 58 cyd
Required Storage Volume:	1,511	ft3; Storage Volume Check - OK, < 1575 ft3
Drawdown Time:	2	hrs; Drawdown Time Check - OK,< 30 hrs.

25-yr Hydrograph

Flow Time	Inflow	Flow Volumes Inflow	Outflow	Required Storage Volume Net	Cumulative	Check Req vs. Avail
(min)	(cfs)	ft^3	ft^3	ft^3	ft^3	
0	0.00	-	146	-	-	
10	0.00	-	146	-	-	
20	0.00	0	146	-	-	
30	0.00	2	146	-	-	
40	0.01	6	146	-	-	
50	0.01	11	146	-	-	
60	0.02	16	146	-	-	
70	0.03	19	146	-	-	
80	0.04	22	146	-	-	
90	0.04	25	146	-	-	
100	0.04	29	146	-	-	
110	0.05	35	146	-	-	
120	0.06	39	146	-	-	
130	0.07	42	146	-	-	
140	0.07	43	146	-	-	
150	0.07	45	146	-	-	
160	0.08	49	146	-	-	
170	0.09	55	146	-	-	
180	0.10	59	146	-	-	
190	0.10	60	146	-	-	
200	0.10	61	146	-	-	
210	0.10	63	146	-	-	
220	0.11	67	146	-	-	
230	0.12	73	146	-	-	
240	0.13	77	146	-	-	
250	0.13	78	146	-	-	
260	0.13	79	146	-	-	
270	0.13	80	146	-	-	
280	0.13	85	146	-	-	
290	0.15	93	146	-	-	
300	0.16	97	146	-	-	
310	0.16	98	146	-	-	
320	0.16	99	146	-	-	
330	0.17	100	146	-	-	

25-yr Hydrograph Flow		Flow Volumes		Required Storage Volume		
Time	Inflow	Inflow	Outflow	Net	Cumulative	Check Req vs. Avail
(min)	(cfs)	ft^3	ft^3	ft^3	ft^3	
340	0.17	104	146	-	-	
350	0.18	113	146	-	-	
360	0.20	118	146	-	-	
370	0.20	119	146	-	-	
380	0.20	119	146	-	-	
390	0.20	120	146	-	-	
400	0.20	133	146	-	-	
410	0.24	158	146	11.7	12	
420	0.28	171	146	24.7	36	
430	0.29	187	146	40.9	77	
440	0.34	218	146	72.5	150	
450	0.39	287	146	141.6	291	
460	0.57	461	146	315.5	607	
470	0.97	560	146	414.6	1,022	
480	0.90	420	146	274.4	1,296	
490	0.50	256	146	110.4	1,406	
500	0.35	196	146	49.9	1,456	
510	0.30	181	146	34.8	1,491	
520	0.30	165	146	19.6	1,511	
530	0.25	135	146	-	1,511	
540	0.20	119	146	-	1,511	
550	0.20	119	146	-	1,511	
560	0.20	119	146	-	1,511	
570	0.20	119	146	-	1,511	
580	0.20	120	146	-	1,511	
590	0.20	120	146	-	1,511	
600	0.20	120	146	-	1,511	
610	0.20	120	146	-	1,511	
620	0.20	120	146	-	1,511	
630	0.20	120	146	-	1,511	
640	0.20	115	146	-	1,511	
650	0.18	104	146	-	1,511	
660	0.16	98	146	-	1,511	
670	0.16	99	146	-	1,511	
680	0.16	99	146	-	1,511	
690	0.16	99	146	-	1,511	

25-yr Hydrograph

Flow Time	Inflow	Flow Volumes			Required Storage Volume	
	Inflow	Inflow	Outflow	Net	Cumulative	Check Req vs. Avail
(min)	(cfs)	ft^3	ft^3	ft^3	ft^3	
700	0.16	99	146	-	1,511	
710	0.16	99	146	-	1,511	
720	0.16	99	146	-	1,511	
730	0.16	99	146	-	1,511	
740	0.16	99	146	-	1,511	
750	0.16	99	146	-	1,511	
760	0.16	94	146	-	1,511	
770	0.15	84	146	-	1,511	
780	0.13	78	146	-	1,511	
790	0.13	78	146	-	1,511	
800	0.13	78	146	-	1,511	
810	0.13	78	146	-	1,511	
820	0.13	79	146	-	1,511	
830	0.13	79	146	-	1,511	
840	0.13	79	146	-	1,511	
850	0.13	79	146	-	1,511	
860	0.13	79	146	-	1,511	
870	0.13	79	146	-	1,511	
880	0.13	76	146	-	1,511	
890	0.12	71	146	-	1,511	
900	0.12	69	146	-	1,511	
910	0.12	69	146	-	1,511	
920	0.12	69	146	-	1,511	
930	0.12	69	146	-	1,511	
940	0.12	69	146	-	1,511	
950	0.12	69	146	-	1,511	
960	0.12	69	146	-	1,511	
970	0.12	69	146	-	1,511	
980	0.12	69	146	-	1,511	
990	0.12	69	146	-	1,511	
1000	0.12	66	146	-	1,511	
1010	0.10	59	146	-	1,511	
1020	0.09	55	146	-	1,511	
1030	0.09	55	146	-	1,511	
1040	0.09	55	146	-	1,511	
1050	0.09	55	146	-	1,511	

25-yr Hydrograph Flow		Flow Volumes			Required Storage Volume	
Time	Inflow	Inflow	Outflow	Net	Cumulative	Check Req vs. Avail
(min)	(cfs)	ft^3	ft^3	ft^3	ft^3	
1060	0.09	55	146	-	1,511	
1070	0.09	55	146	-	1,511	
1080	0.09	55	146	-	1,511	
1090	0.09	55	146	-	1,511	
1100	0.09	55	146	-	1,511	
1110	0.09	55	146	-	1,511	
1120	0.09	55	146	-	1,511	
1130	0.09	55	146	-	1,511	
1140	0.09	55	146	-	1,511	
1150	0.09	55	146	-	1,511	
1160	0.09	55	146	-	1,511	
1170	0.09	55	146	-	1,511	
1180	0.09	55	146	-	1,511	
1190	0.09	56	146	-	1,511	
1200	0.09	56	146	-	1,511	
1210	0.09	56	146	-	1,511	
1220	0.09	56	146	-	1,511	
1230	0.09	56	146	-	1,511	
1240	0.09	56	146	-	1,511	
1250	0.09	56	146	-	1,511	
1260	0.09	56	146	-	1,511	
1270	0.09	56	146	-	1,511	
1280	0.09	56	146	-	1,511	
1290	0.09	56	146	-	1,511	
1300	0.09	56	146	-	1,511	
1310	0.09	56	146	-	1,511	
1320	0.09	56	146	-	1,511	
1330	0.09	56	146	-	1,511	
1340	0.09	56	146	-	1,511	
1350	0.09	56	146	-	1,511	
1360	0.09	56	146	-	1,511	
1370	0.09	56	146	-	1,511	
1380	0.09	56	146	-	1,511	
1390	0.09	56	146	-	1,511	
1400	0.09	56	146	-	1,511	
1410	0.09	56	146	-	1,511	

25-yr Hydrograph

Flow Time	Inflow	Flow Volumes Inflow	Outflow	Net	Required Storage Volume Cumulative	Check Req vs. Avail
(min)	(cfs)	ft^3	ft^3	ft^3	ft^3	
1420	0.09	56	146	-	1,511	
1430	0.09	56	146	-	1,511	
1440	0.09	42	146	-	1,511	
1450	0.05	14	146	-	1,511	
1460	0.00	-	146	-	1,511	
1470	0.00	-	146	-	1,511	
1480	0.00	-	146	-	1,511	
1490	0.00	-	146	-	1,511	
1500	0.00	-	146	-	1,511	
1510	0.00	-	146	-	1,511	
1520	0.00	-	146	-	1,511	
1530	0.00	-	146	-	1,511	
1540	0.00					

ATTACHMENT D

Analysis of Potential Pipe Upgrades at the Railroad Crossing

ATTACHMENT D - Analysis of Potential Pipe Upgrades at the Railroad Crossing

CH2MHILL

Project Name: Bridgeport Area Stormwater Management Plan
Project Number: 334122.01.01
Date: 11/18/2005
Description of Calc.: Analysis of pipe upgrades at the railroad crossing and the impacts to the riparian corridor.
By: Ryan Mitchell

	Alternative Peak Flow Retention Levels						
Description of Values	**0% Retention**	**20% Retention**	**40% Retention**	**50% Retention**	**60% Retention**	**80% Retention**	**95% Retention**
Total Flow to 18-inch Outfall, [cfs]	96	85	74	68	62	51	43
Require Slope of 24" Pipe Under The Rail Road	18.0%	14.0%	10.7%	9.0%	7.6%	5.1%	3.6%
Additional length required to intesect with downstream pipe, [ft].	50	31	18	12	7	0	-4
Require Slope of 36" Pipe Under The Rail Road	2.1%	1.6%	1.2%	1.0%	0.9%	0.6%	0.4%
Additional length required to intesect with downstream pipe, [ft].	-7	-9	-10	-10	-11	-11	-11

APPENDIX C

Stakeholder Involvement and Outreach Materials

Bridgeport Area Stormwater Master Plan Stakeholder Outreach Plan

TO: Kaaren Hofmann/City of Tualatin
Dayna Johnson/City of Tualatin

COPIES: Mark Bransom/CH2M HILL
File

FROM: Mark Anderson/CH2M HILL

DATE: September 6, 2005

PROJECT NUMBER: 334122

Introduction

A project kick-off meeting for the Bridgeport Area Stormwater Master Plan was held on August 25, 2005. At that time, a strategy was developed for identifying and engaging with interested stakeholder groups. It was determined that four distinct groups of stakeholders exist for the project.

- Tualatin City Council and key staff decision-makers
- A technical advisory committee (TAC) comprised of regulating and cooperating public agencies.
- Adjacent property owners, property owners within the project area, and potential site developers with interests in the proposed stormwater plan.
- The community of Tualatin and its citizens

Each of these groups requires a different level of engagement in the planning process and a strategy has been developed that incorporates the distinct needs of each.

City Council and Staff

The following were identified as key decision-makers from City elected officials and staff.

- City Council
- City Manager
- City Engineer
- Community Development Director
- Chief of Maintenance

Tualatin City Council meets the 2nd and 4th Monday of each month. Final adoption of the master plan is required by council. A tentative date for a decision is January 23rd, 2006. To

keep the council apprised of progress on the plan, City staff, with support from CH2M HILL will present a status report to council, tentatively on October 24, 2005.

In addition to these formal actions, communication with key city staff, including maintenance, city engineer, and community development director will be made periodically by city staff. This will occur as consultation at project decision points and as draft documents become available.

Technical Advisory Committee

Prior to September 15, 2005, city staff will extend an invitation to coordinating and cooperating public agencies with interests in the plan to join a technical advisory committee. This list includes the following stakeholders:

- Clean Water Services (CWS)
- Department of Environmental Quality (DEQ)
- City of Durham
- Oregon Department of Transportation (ODOT)
- Washington County

It is anticipated that this group will hold two meetings. The first will introduce the committee to the project and outline the City's goals. This meeting will be an opportunity for each member agency to express its expectations and needs for the project. This meeting will be held early in the project development, prior to October 1, 2005.

The second meeting will be held once draft alternatives have been developed. This meeting will allow the committee to see how the project is progressing and provide guidance on how the alternatives relate to the interests of the member agencies. Although a draft of the plan document may not be available at the time of this meeting, arrangements will be made to provide a draft for comment to committee members, once it is available. It is anticipated that this meeting will be held prior to November 1, 2005.

Property owners

Individuals and organizations that have specific interest in the outcome of the plan include several groups.

- Property owners within the project area
- Adjacent property owners
- Potential site developers
- Railroad and utilities with easements and rights-of-way in the project area

City staff will develop a contact list for these parties and extend an invitation to attend an informational meeting. This meeting will be held after draft alternatives have been developed and shown to the technical advisory committee. A recommended alternative and the selection process used will be presented at this meeting, prior to development of the final draft document. This allows a focused discussion on the expected outcomes and potential implementation schedule, but provides an opportunity for input from the

stakeholders and flexibility to adjust the plan before final adoption. Tentatively, this meeting will be held prior to November 10, 2005.

Community of Tualatin

A billing insert should be sent to ratepayers early in the planning process. This notice should provide information regarding the planning effort, reasons for its current priority, expected outcomes, and opportunities for public involvement and comment. A draft plan document will be provided to the City for its review approximately November 15, 2005. After the City has completed that review, CH2M HILL will revise based on comments received by December 1, for anticipated submittal of the final documents by December 15, 2005. During this revision period, December 1-15, is an appropriate stage to hold an open public meeting. Notice of the meeting will be posted to the City website and provided in the November billing insert for City utilities. This provides an opportunity for any member of the community with interest in the project to express preferences and concerns about the documents, implementation schedule, or recommended alternatives before documents have been completed and prior to public hearing for adoption of the plan.

Schedule

BRIDGEPORT AREA STORMWATER MANAGEMENT PLAN STAKEHOLDER OUTREACH SCHEDULE

Activity	Date Completed By (Tentative)	Performed By	Supporting Materials provided by CH2M HILL
Prepare stakeholders contact list	September 15	City staff	None needed
Communication with city staff	On-going	City staff	On request
Send invitations for 1st TAC meeting	September 15	City staff	None needed
1st utility billing insert	October billing cycle	City staff	On request
1st TAC meeting held	October 1	City staff and CH2M HILL	Large scale paper plots or digital display
Invitations to property owners sent	October 15	City staff	On request
Status report to City Council	October 24	City staff	Large scale paper plots or digital display
2nd TAC meeting held	November 1	City staff and CH2M HILL	Large scale paper plots or digital display
Property owners meeting held	November 10	City staff and CH2M HILL	Large scale paper plots or digital display
2nd utility billing insert	November billing cycle	City staff	On request
Community meeting held	December 10	City staff and CH2M HILL	Large scale paper plots or digital display
Final plan document submitted	December 15	CH2M HILL	None needed

BRIDGEPORT AREA STORMWATER MANAGEMENT PLAN STAKEHOLDER OUTREACH SCHEDULE

Activity	Date Completed By (Tentative)	Performed By	Supporting Materials provided by CH2M HILL
Prepare stakeholders contact list	September 15	City staff	None needed
Communication with city staff	On-going	City staff	On request
City Council hearing for adoption	January 23	City staff and CH2M HILL	Large scale paper plots or digital display

APPENDIX D
Permitting

Potential Environmental Constraints for Implementing the Bridgeport Area Stormwater Master Plan

PREPARED FOR: Kaaren Hofmann/City of Tualatin
Dayna Johnson/City of Tualatin

PREPARED BY: Joel Shaich/CH2M HILL

REVIEWED BY Steve Mader/CH2M HILL

DATE: November 16, 2005

PROJECT NUMBER: 334122.01.01: Task 4.1

Introduction

This memorandum identifies environmental resources that may be affected by proposed stormwater management projects and evaluates potential associated regulatory requirements. The study area includes portions of the cities of Tualatin and Durham that are in the Bridgeport basin, which is west of Interstate 5, south of SW Bridgeport Road, east of SW Upper Boones Ferry Road, and north of the Tualatin River. Two small areas east of I-5 are also included because they share a common drainage basin. The total drainage area is approximately 70 acres (Figure 1).

Potentially Affected Environmental Resources

Sources of information reviewed to identify potential environmental resources in the study area include true color 2004 aerial photography (Metro, 2005), City of Tualatin digital Goal 5 mapping (natural areas, wetlands, water quality facilities, ditches, historic properties), City of Durham Comprehensive Land Use Plan, and Metro's Riparian Corridor and Wildlife Habitat Inventories (Metro, 2005). Additional information sources for environmental resources are described in the sub-section for each resource type, below. A ground survey of the study area was conducted on September 25, 2005, to ground truth the existing information and search for undocumented resource sites.

Natural Areas and Open Space (Greenways)

Existing Conditions

The area north of the Willamette and Pacific Railroad has been altered by land clearing and development. Existing vegetation is ornamental trees, shrubs and lawns, scattered large Douglas-fir trees, and small thickets of Himalayan blackberries and other invasive species in undeveloped or unmanaged areas.

South of the railroad, forestland slopes steeply toward the Tualatin River, and is vegetated with large Douglas-fir, big-leaf maple, Oregon grape, sword-fern, and hazelnut. English ivy has invaded much of the forest and there is evidence of regular human use, including several paths and trash piles. Metro fish and wildlife habitat inventory classifies the forestland as Class 1 riparian habitat, bordered by Class 2 riparian habitat and Class B wildlife habitat (Figure 2). Classifications are described in Table 1.

The City of Durham has identified the forest as open space and adopted policies in its comprehensive land use plan to protect it as a greenway along the Tualatin River (City of Durham, 1995a).

Potential Constraints

The City of Durham has zoned the forestland area as "Greenway District" (Figure 3). The purpose of this District is to protect and preserve native vegetation, fish and wildlife habitat, natural water storage areas, floodplains, and drainageways; and to provide opportunities for passive recreation. Uses and activities in the District are regulated under the City's Greenway code provisions, which also serve to implement the floodplain management requirements of the federal flood insurance program. The City requires a Special Use Permit for filling, grading, excavating, constructing permanent structures, and conducting other activities in the District. Review standards for Special Use Permit applications include consistency with the intent and purpose of the Greenway District and specify that the proposed activity will not adversely impact runoff, erosion, ground stability, water quality, groundwater level or flooding (City of Durham, 1995b).

The Metro fish and wildlife habitat inventory data are intended to influence land use planning so that more valuable habitats receive relatively greater protection. However, the data alone do not constitute a regulatory constraint unless the City of Durham and City of Tualatin incorporate concomitant land use restrictions into their community development code.

Rare, Threatened, and Endangered Species

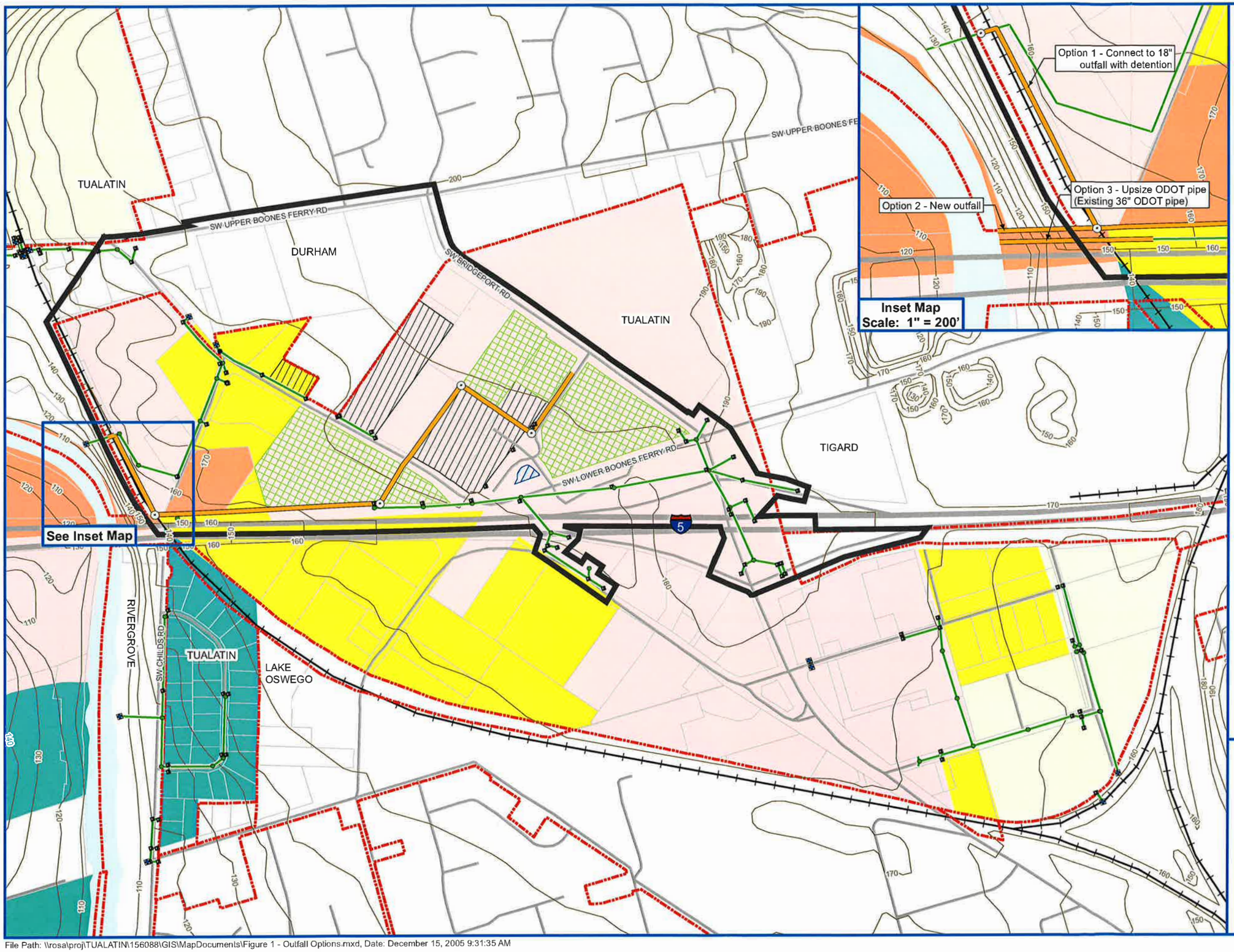
The following information sources were reviewed for potential rare, threatened, and endangered (RTE) species in the study area:

- Oregon Natural Heritage Information Center (ONHIC) database search for observations of rare, threatened, and endangered plants and animals (ONHIC, 2005).
- Federally Listed and Proposed Endangered and Threatened Species, Candidate Species, and Species of Concern That May Occur in Washington County (USFWS, 2005)

Existing Conditions

The ONHIC database search identified five records of RTE species observations within a 2-mile radius of the study area. Four of the records are for locations far outside the study area. The fifth record is for winter steelhead (federally listed as threatened) that use the Tualatin River as a migration corridor.

The U.S. Fish and Wildlife Service (USFWS) listed 41 species of RTE birds, fish, mammals, amphibians, reptiles, and plants that may occur in Washington County.



Scale: 1" = 500'

Legend

- Project Boundary
- Proposed Stormwater MH
- Recommended Storm Sewer Alignment
- 10' Contours
- City Boundaries
- Streets
- I-5 Freeway
- Railroads
- Taxlots
- Tualatin River

Existing Stormwater System

- MH
- CB
- OL
- IL
- DW
- PUMP
- DI
- Existing Stormwater Lines
- Water Quality Facility

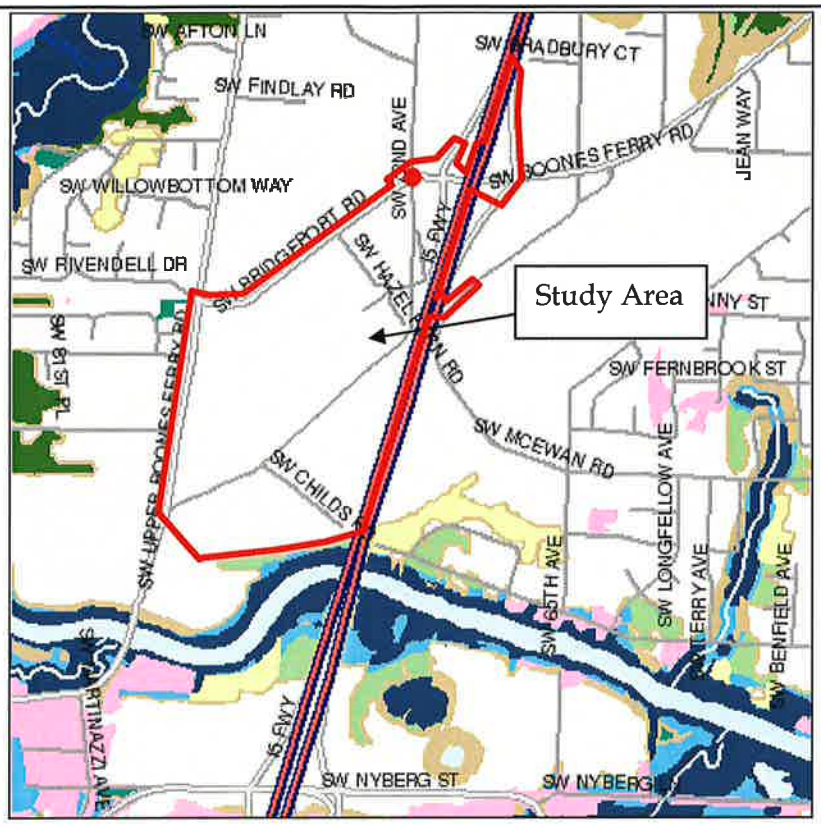
Zoning

- General Commercial (CG)
- Office Commercial (CO)
- General Manufacturing (MG)
- Light Manufacturing (ML)
- Medium High Density Res. (RMH)
- Underdeveloped
- Vacant or Pending

FIGURE 1
Outfall Options

CH2MHILL

File Path: \\rosa\proj\TUALATIN\156088\GIS\MapDocuments\Figure 1 - Outfall Options.mxd, Date: December 15, 2005 9:31:35 AM



LEGEND

- Class 1 riparian, highest-value
- Class 2 riparian, medium-value
- Class 3 riparian, lower-value
- Class A wildlife, highest-value
- Class B wildlife, medium-value
- Class C wildlife, lower-value
- Impact areas

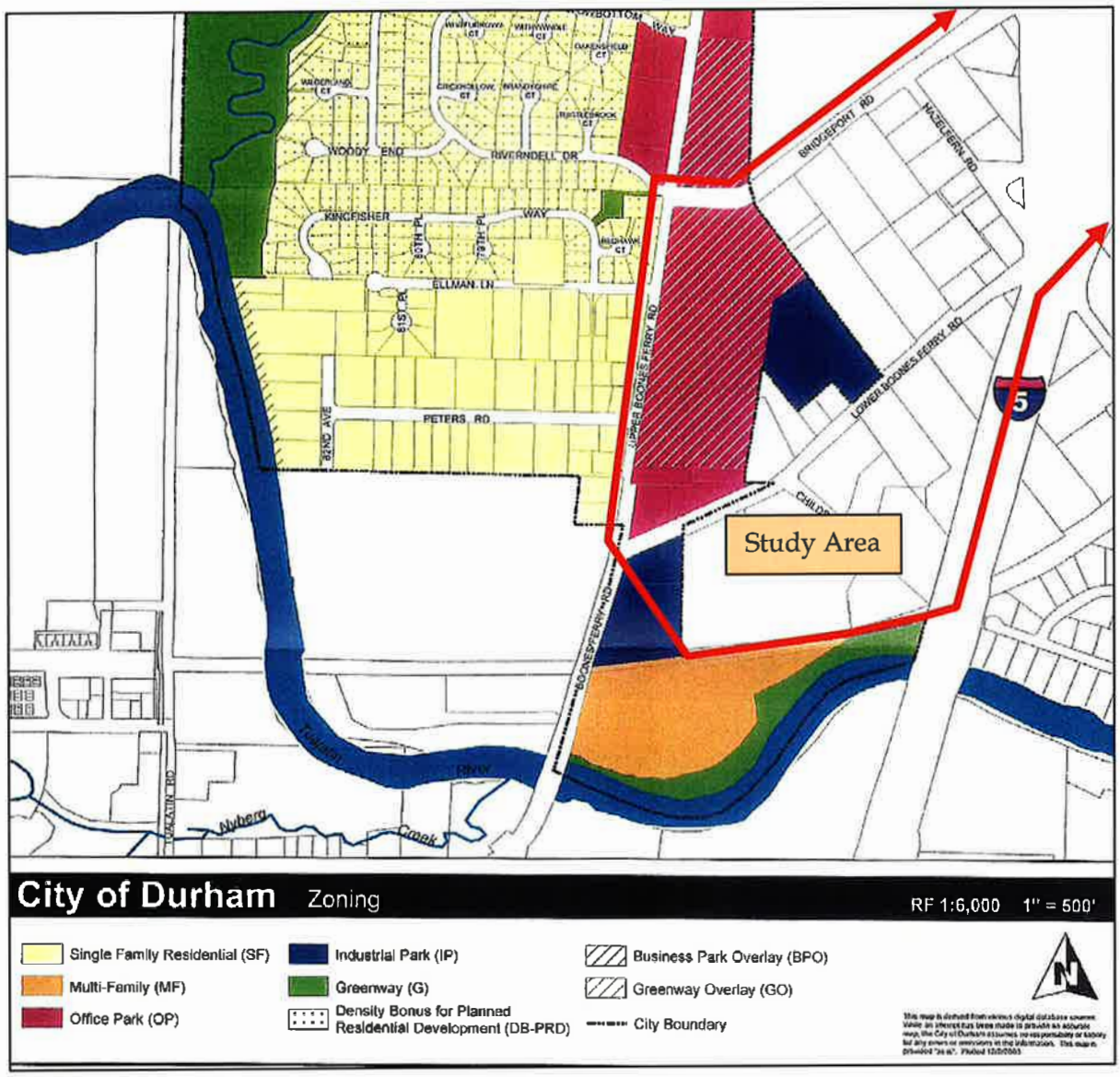
Source: Metro, 2005

FIGURE 2
Metro Inventory of Regionally Significant Habitat
Bridgeport Area Stormwater Master Plan

TABLE 1
Metro Habitat Classes

Classification	Description
Riparian Class I (highest value)	Rivers, streams, wetlands, undeveloped floodplains, forested areas within 100 feet of streams or within 200 feet of streams in steep areas and unique, rare, or at-risk streamside habitats known as habitats of concern.
Riparian Class II (moderate value)	Rivers, streams, areas within 50 feet of developed streams, areas with trees and other vegetation within 200 feet of streams and portions of undeveloped floodplains. These areas provide fewer ecological values than Class I areas but are still important for stream health.
Riparian Class III (lowest value)	Developed floodplains, grassy areas within 300 feet of streams, and small forested areas that are further away from streams but still influence them. Many Riparian Class III areas are degraded due to development but still provide some important ecological values and opportunities for restoration.
Upland Wildlife Class A (highest value)	Very large forested areas (for example, Portland's Forest Park) and upland habitats of concern that are further away from streams, lakes, or wetlands.
Upland Wildlife Class B (moderate value)	Medium-sized and large forested areas that are not habitats of concern, and non-forested habitat areas that allow wildlife to access water or move from one habitat area to another.
Upland Wildlife Class C (lowest value)	Smaller forested areas, plus smaller non-forested areas somewhat near, but no more than 300 feet from, streams and rivers that allow wildlife to move from one area to another.
Impact Areas	Non-habitat areas within 150 feet of streams and wetlands, or within 25 feet of remaining habitat areas where land uses may influence the quality of the habitat.

Source: Metro, 2005



Source: City of Durham, 1995a

FIGURE 3
City of Durham Zoning
Bridgeport Area Stormwater Master Plan

Several of the RTE fish species use the Tualatin River as a migration and movement corridor. See the section on Fish Populations for details below.

None of the other listed RTE species are likely to occur in the study area because most natural habitats have been developed and altered, ongoing human activity is at a high level, and RTE-dependent habitat types (old-growth forest, wetland prairie, upland prairie, open grassland, and ponds) are absent. No RTE species or evidence of their presence was observed during the site visit.

Potential Constraints

It is possible, although unlikely, that terrestrial RTE species use the riparian forest along the Tualatin River. It is very unlikely that other areas within the Bridgeport basin support RTEs. If projects are proposed south of the railroad, further RTE surveys may be useful to confirm absence. The presence of such species or their habitat could require mitigation actions such as changes in facility location, alignment, design, construction timing, or construction methods, and/or compensatory mitigation actions.

RTE fish species and their potential constraints are discussed in the Fish Populations section below.

Fish Populations

Fish distribution and status information for the Tualatin River was reviewed on internet sites of the National Marine Fisheries Service (NMFS), Oregon Department of Fish and Wildlife (ODFW), and Tualatin River Watershed Council (TRWC). Greg White, CH2M HILL Fisheries Biologist, also contributed information on Tualatin Basin fisheries.

Existing Conditions

The Tualatin Basin supports a number of anadromous and resident fish species (Table 2). Fish communities in the Tualatin River mainstem are dominated by non-native warm water species such as largemouth and smallmouth bass, crappie, bluegill, and catfish. There are four resident/anadromous salmonid species that potentially use the Tualatin River system: fall Chinook salmon, coho salmon, steelhead trout, and anadromous cutthroat trout (ODEQ, 2001; ODFW, 1992; ODFW, 2001). Pacific lamprey is another sensitive species that inhabits the basin and may be present in the study area (USFWS, 1995). ODFW has jurisdiction over residential and anadromous fish species.

Upper Willamette River Evolutionarily Significant Unit (ESU) steelhead trout are listed as a "threatened" species under the federal Endangered Species Act (ESA). Steelhead use the Tualatin River as a migration corridor to reach spawning areas on Tualatin River tributaries upstream of the study area. Neither coho, fall Chinook salmon, anadromous coastal cutthroat trout in the upper Willamette River, nor Pacific lamprey are currently listed under the federal ESA, but all are on the State of Oregon sensitive species list (ODFW, 1997). Coho and fall Chinook salmon are not native to the Tualatin River or areas in the Willamette River system above Willamette Falls. Coho and fall Chinook salmon were allowed passage to the Tualatin River and other upstream Willamette River system areas by the construction of a fish ladder at Willamette Falls. Coho salmon were also planted in the Tualatin Basin in the 1920s and have become naturalized. Coho salmon use the Tualatin River as a migration

corridor to reach spawning areas on Tualatin River tributaries upstream of the study area. Fall Chinook salmon are generally found in the lowest reaches of the Tualatin River, near the confluence with the Willamette River (ORIS, 1994), but were found in Scoggins Creek in the 1970s (ODFW, 1992). However, few have been documented in the basin in recent years and those documented are thought to be strays from the Clackamas system (ODFW, 2001). Cutthroat trout occur as anadromous and resident populations in the Tualatin Basin.

Potential Constraints

The Tualatin River is identified by ODFW and the Oregon Department of State Lands (DSL) as "essential salmon habitat," which lowers the regulatory threshold for state Removal-Fill permits to any amount of activity. Requirements for obtaining permits include a preference for avoidance and minimization of impacts to fish habitat and compensatory mitigation for authorized impacts. Avoidance and minimization apply to construction and operation. Outfall designs should minimize temporary construction impacts and prevent negative impacts during operation. Temporary or permanent obstruction of fish passage must be avoided. Compensatory mitigation may include maintenance or improvement of fish passage or habitat restoration, creation, and/or enhancement. Permits generally contain conditions limiting the time periods for in-water work based on ODFW guidelines. The preferred in-water work period for the Tualatin Basin (below Scoggins Creek) is June 1 to September 30 (ODFW, 2000).

The federal Clean Water Act Section 404 permit process will need to address the requirements of the ESA because of the presence of "threatened" steelhead in the Tualatin River. When a federal permit application includes activities that can potentially affect a listed species, the Corps of Engineers is required to consult with the appropriate federal resource agency under Section 7 of the ESA. In this case, the Corps would consult with the NMFS on potential project impacts to steelhead trout utilizing the Tualatin River. Consultation with USFWS for other species is possible, but unlikely, because species under that agency's jurisdiction probably will not be encountered. The ESA consultation can either be informal or formal depending on the Corps' determination of the project's potential effects on the species. A "may effect, not likely to adversely effect" determination will likely result in an informal consultation. A "may effect, likely to adversely effect" determination will likely result in a formal consultation process. It is possible that consultation with NMFS could invoke a requirement to apply NMFS' *HCD Stormwater Online Guidance* for project design. If applied narrowly to a new outfall or similar structure, these constraints would be minimal. If applied broadly to the entire study area, these constraints could be onerous, influencing the required level of water quality and quantity treatment. The Clean Water Act Section 404 permitting for the Tualatin River also invokes a requirement to consult with NMFS under the Magnuson-Stevens Act (MSA) on activities that may adversely affect Essential Fish Habitat (EFH). The Pacific Fisheries Management Council (PFMC) has designated EFH for the Pacific Salmon Fishery and federally managed groundfish, which may enter the Tualatin River. Constraints imposed by MSA usually are subordinate to those imposed by ESA.

TABLE 2

Resident and Anadromous Fish Species in the Tualatin Basin

Anadromous Fishes		Resident Fishes			
		Game		Non-Game	
Common Name	Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name
Chinook salmon	*Oncorhynchus tshawytscha*	Yellow Bullhead	*Ameiurus natalis* *	Chiselmouth	*Acrocheilus alutaceus*
Coho salmon	*Oncorhynchus kisutch*	Brown Bullhead	*Ameiurus nebulosus* *	Peamouth	*Mylocheilus caurinus*
Cuttroat trout	*Oncorhynchus clarki*	Black bullhead	*Ameiurus melas* *	Northern pikeminnow	*Ptychocheilus oregonensis*
Steelhead trout	*Oncorhynchus mykiss*	Channel catfish	*Ictalurus punctatus* *	Goldfish	*Carassius auratus* *
White sturgeon	*Acipenser transmontanus*	White catfish	*Ameiurus catus* *	Common carp	*Cyprinus carpio* *
Pacific lamprey	*Lampetra tridentatus*	Yellow Perch	*Perca flavescens* *	Longnose dace	*Rhinicthys cataractae*
		Walleye	*Stizostedion vitreum* *	Redside shiner	*Richardsonius balteatus*
		Pumpkinseed	*Lepomis gibbosus* *	Prickly sculpin	*Cottus asper*
		Warmouth	*Lepomis gulosis* *	Reticulate scuplin	*Cottus perplexus*
		Bluegill	*Lepomis macrochirus* *	Torrent sculpin	*Cottus rhotheus*
		Green sunfish	*Lepomis cyanellus* *	Largescale sucker	*Catostomus macrocheilus*
		Smallmouth bass	*Micropterus dolomieui* *	Mountain sucker	*Catostomus platyrhynchus*
		Largemouth bass	*Micropterus salmoides* *	Sand roller	*Percopsis transmontana*
		White crappie	*Pomoxis annularis* *	Starry flounder	*Platichthys stellatus*
		Black crappie	*Pomoxis nigromaculatus* *	Banded killifish	*Fundulus diaphanus* *
		American shad	*Alosa sapidissima* *	Mosquitofish	*Gambusia affinis* *
		Cutthroat trout	*Oncorhynchus clarki*	Speckled dace	*Rhinichthys osculus*
		Rainbow trout	*Oncorhychus mykiss*	Three-spine stickleback	*Gasteroesteus aculeatus*
				Western brook lamprey	*Lampetra richardsoni*

* Not "indigenous." These species were not found in the Tualatin Basin before 1800.

Cultural Resources

The cities of Tualatin and Durham and the Washington County Historical Society were contacted for information on cultural or historic resources in the study area.

Existing Conditions

The City of Tualatin has not identified any historic properties in the study area (City of Tualatin, dates unknown). The City of Durham has not identified any historic sites or cultural areas (City of Durham 1995a). The Washington County Historical Society has no records of historic structures (Winnifred Herrschafp, Washington County Historical Society, 2005).

Potential Constraints

None identified to date. Although a few structures may be older than 50 years, there is no knowledge of their eligibility for the National Register of Historic Places.

Wetlands/Waters

In addition to the general information sources listed above, the following sources were reviewed for information on wetlands and other waters subject to regulation under Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, and Oregon's Removal-Fill Law.

- National Wetlands Inventory (NWI) map, Beaverton and Lake Oswego quadrangles (USFWS, 1983a and 1983b)
- Soil Survey of Washington County, Oregon (SCS, 1982)
- Hydric Soils List for Washington County (NRCS, 2000)

Existing Conditions

The Tualatin River is a perennial stream that is located along the southern edge of the study area. No other regulated waters or wetlands were identified.

Potential Constraints and Opportunities

Fill or excavation activities in the Tualatin River below ordinary high water will require permits under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, administered by the Corps of Engineers, and Oregon's Removal-Fill Law, administered by the DSL. Requirements for obtaining permits include a preference for avoidance and minimization of impacts to wetlands and waters, avoidance of navigation obstructions, and compensatory mitigation for authorized impacts. Compensatory mitigation for impacts to non-wetland waters usually requires replacement of ecological function and stabilization of disturbed soil surfaces. Compensatory wetland mitigation may be required if projects impact wetlands; compensatory wetland mitigation could include wetland restoration, creation, enhancement, purchase of mitigation bank credits, and/or payment-in-lieu. However, no wetlands were identified in the study area.

Since 2004, federal and state wetland permits have been conditioned with a requirement that the permit applicant obtain Oregon Department of Environmental Quality (DEQ) approval for the project's stormwater management plan. The approval process could invoke

more stringent requirements for water quality treatment, and could expand the treatment area to potentially all impervious areas as defined by the project. For federal permitting, this process is required for the Clean Water Act Section 401 Water Quality Certification.

Proposed projects may qualify for the new Statewide Programmatic General Permit (SPGP), a Corps permit administered by DSL for projects that fit within a specific set of guidelines, including a size limit of 0.5 acre and 1,000 cubic yards of removal/fill. The SPGP will be available after January 1, 2006, and should replace many, but not all federal Nationwide Permits. The proposed pipeline project may qualify for a state General Authorization, expected to be available in 2006.

Water Quality Sensitive Areas and Vegetated Corridors

Clean Water Services requires that all development in urban Washington County comply with regulations for the protection of "Water Quality Sensitive Areas," which include wetlands, streams, springs, lakes, ponds, and in-stream impoundments. Protection in most cases includes maintenance or restoration of "Vegetated Corridors" (buffers) around sensitive areas. A pre-screening assessment was performed by Clean Water Services for potential water quality sensitive areas in the study area.

Existing Conditions

The Tualatin River is identified as a water quality sensitive area by Clean Water Services. Two potential water quality sensitive areas are identified as north-south running linear features in the western portion of the study area. Clean Water Services does not provide site-specific information about the nature of potential water quality sensitive areas; however, field inspection determined that there are no water quality sensitive areas other than the Tualatin River in or adjacent to the study area.

The required minimum vegetated corridor width for this reach of the Tualatin River is 125 feet (Chuck Buckallew, Clean Water Services, 2005). Additional vegetated corridor width (up to a maximum of 200 feet) is required for sites with slopes greater than 25 percent. Slopes in the study area beyond the 125 foot minimum width are well below 25 percent, based on review of available topographic mapping, so the Tualatin River's vegetated corridor width is probably 125 feet.

Potential Constraints

Clean Water Services regulations require a review and authorization process for work in water quality sensitive areas and vegetated corridors. Typically, Clean Water Services defers to the Corps and DSL for regulation of the water quality sensitive areas. Conditions of authorization for temporary or permanent impacts to vegetated corridors may include the preparation of a Natural Resource Assessment and mitigation requirements, i.e., protection and/or restoration of vegetated corridors per Clean Water Services landscaping specifications.

Flood Hazard Zones

The City of Tualatin regulates development in "areas of special flood hazard," which are defined as "the land in the floodplain within a community subject to a 1-percent or greater chance of flooding in any given year," i.e., floodways and the 100-year floodplain (Tualatin

Development Code, Chapter 70 Floodplain District). The National Flood Insurance Program mapping is the designated source for identifying locations of areas of special flood hazard and was reviewed for the study area.

The City of Durham regulates development in "Flood Management Areas," which are defined as "all lands contained within the 100-year floodplain, flood area, and floodway as shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Maps and the area of inundation for the February 1996 flood; in addition, all lands which have documented evidence of flooding or updated information related to the FEMA maps."

Existing Conditions

No portions of the study area within the City of Tualatin are mapped as floodways or areas of 100-year floodplain on the FEMA map (FEMA, 1987).

Areas adjacent to the Tualatin River in the City of Durham are mapped as 100-year floodplain on the FEMA map (FEMA, 1982). The city's comprehensive plan includes a map of the 100-year floodplain, which appears to be a refinement of the FEMA map (Figure 4).

Potential Constraints and Opportunities

The mapped 100-year floodplain along the Tualatin River is within the City of Durham's Greenway District. Development in the District requires a Special Use Permit as described above. Standards related to Flood Management Areas for Special Use Permit applications include "that the proposed improvements will not change the flow of floodwaters during future flooding such as to cause a compounding of flood hazards and to thereby seriously interfere with the intent and purposes of the Flood Management Area regulations." Utility structures are a specified permitted use if they are "designed to not significantly impede the flow of floodwaters."

Potential Contaminants

The Oregon DEQ Facility Profiler 2.0 database was reviewed for possible hazardous materials contamination that could affect surface or groundwater in the study area. The Office of State Fire Marshal was consulted for a historical listing of all hazardous material incidents within the 97224 zip code area.

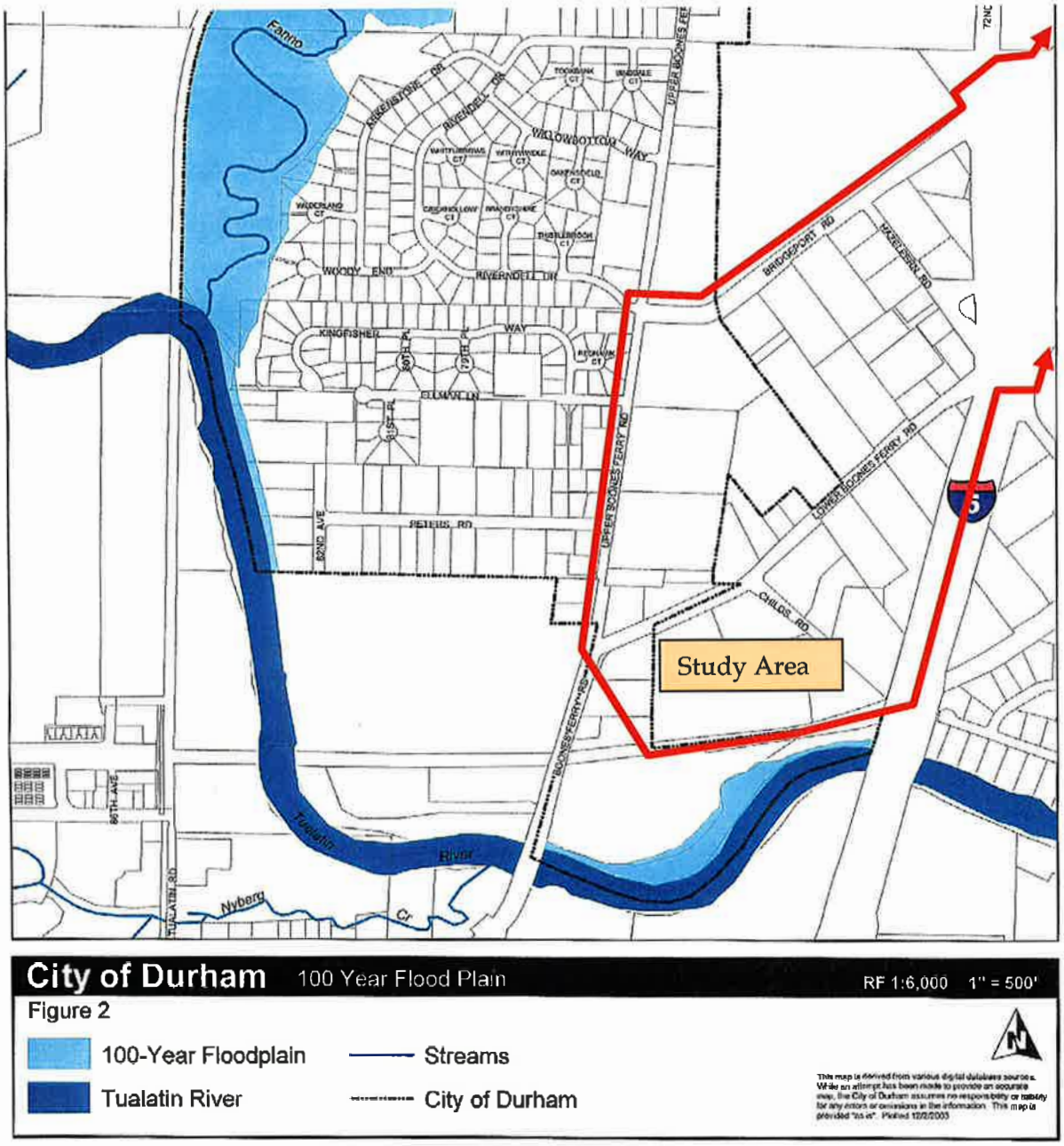
Existing Conditions

Nine records of leaking underground storage tanks (LUST) were found. Seven of the sites have been cleaned up to DEQ standards. The remaining two sites noted that clean-up had begun, but did not indicate if it was completed. These two sites are:

- Goldbeck, Heating Oil Tank, 17710 SW Upper Boones Ferry Road, Durham, OR 97224
- Susan Stubbs, Heating Oil Tank, 17865 SW Upper Boones Ferry Road, Durham, OR 97224

The following facilities hold NPDES General Permits for industrial stormwater discharges:

- Fabricating Shop, 18205 SW Boones Ferry Road, Tigard, OR 97224
- Whole Foods Retail, 7380 SW Bridgeport Road, Tualatin, OR 97224



Source: City of Durham 1995a

FIGURE 4
City of Durham 100-Year Floodplain
Bridgeport Area Stormwater Master Plan

The following site is listed as contaminated:

- Bridgeport Village/Durham Quarry, SW Bridgeport Road/SW 72nd Avenue, Tualatin, OR 97062

None of the hazardous material incidents in the study area recorded by the Office of State Fire Marshal appear to be active.

Potential Constraints and Opportunities

If project activities are proposed at or near the two sites with unknown LUST status or the Bridgeport Village/Durham Quarry, then DEQ should be contacted to determine the clean-up status of the sites and what limitations, if any, may exist for proposed activities. Consideration should be given to potential regulatory liabilities of accepting stormwater from sites with NPDES General Permits for industrial stormwater discharges.

Permitting Requirements

Outfall Options

All of the proposed stormwater management alternatives include use of an outfall to the Tualatin River south of the railroad tracks: either modifications to existing outfalls or construction of a new outfall facility (Figure 1). The outfall options are as follows:

1. Connect the proposed stormwater system to the existing City of Tualatin 18-inch outfall, located near Childs Road (in Tualatin and possibly Durham).
2. Construct a new outfall on the west side of Interstate 5 (in Durham).
3. Connect the proposed stormwater system to the existing Oregon Department of Transportation 36-inch outfall located in the Interstate 5 right-of-way (in Tualatin).

These outfall options are expected to involve vegetation removal, excavation of trenches, installation of outfall pipe, and trench backfill. Option 2 would also include construction of a new outfall discharge structure. Potential environmental impacts and associated mitigation/restoration requirements appear substantially similar for the three options, although there are uncertainties about the amount of new construction required to utilize the existing outfalls.

Portions of these outfall options for all three alternatives may occur in the Clean Water Services Vegetated Corridor, potentially triggering Clean Water Services permitting requirements. Options 1 and 2 may occur in the City of Durham Greenway District, potentially triggering the City's Greenway permitting requirements. Option 3 would be subject to City of Tualatin permitting only. Options 1 and 3 may also require retrofit water quality improvements to treat existing impervious areas.

All of the proposed outfall options would avoid activity below the ordinary high water line of the Tualatin River, thus avoiding the need for permits associated with activities in waters of the United States and waters of the state, as well as avoiding ESA consultation requirements.

Activities associated with project alternatives that occur north of the railroad track do not appear to be subject to permitting requirements for environmental constraints (except NPDES 1200-CA permitting for erosion control during construction) and will not be discussed further.

Estimated permit process timelines and costs for possible work south of the railroad are summarized in Table 3 and described in detail below.

Permitting Timelines

The similarities in potential environmental impacts and mitigation/restoration requirements for the three outfall options make it likely that the timeline for each type of permit will be equivalent for the three outfall options. Option 3 would not require a City of Durham permit and should take less time overall to obtain all required permits.

Clean Water Services

Clean Water Services has a two-step permitting process. The first step, which must be completed before submitting applications for local land use permits, is to obtain a Service Provider Letter (SPL) from Clean Water Services. The SPL specifies for the applicant and local land use agencies the conditions and requirements for vegetated corridors and water quality sensitive areas. Following receipt of local land use permits, applicants apply to Clean Water Services for a site development permit that authorizes activities in Water Quality Sensitive Areas and Vegetated Corridors. The Clean Water Services process steps and timeline are outlined in Table 4.

City of Durham – Greenway District Special Use Permit

The City of Durham Special Use Permit process follows a quasi-judicial process that includes a public Community Development Conference and a public hearing before the Planning Commission. City of Durham process steps and timeline are outlined in Table 5.

Permitting Costs

Permitting costs for Outfall Options 1 and 2 should be similar. The options have similar potential environmental impacts and mitigation/restoration requirements, both require Clean Water Services and City of Durham permits, and should have similar documentation and coordination requirements to obtain the permits. Option 3 should not require a City of Durham permit, avoiding the associated permitting costs. Details of estimated permitting costs for Clean Water Services permits are provided in Table 4. Details of estimated permitting costs for City of Durham permits are provided in Table 5. Cost estimates are based on experience with similar projects. The permitting timelines and costs for the three outfall options are compared in Table 6.

TABLE 3
Permitting Requirements Checklist

Agency	Permit	Outfall Option 1	Outfall Option 2	Outfall Option 3	Timeline	Cost Estimates[a]	Comments
Clean Water Services	Service Provider Letter	Required for work in 125-foot-wide vegetated corridor	Required for work in 125-foot-wide vegetated corridor	Required for work in 125-foot-wide vegetated corridor	30–75 days	$8–$13,000	Wetland delineation, corridor width determination, Natural Resources Assessment, and coordination with Clean Water Services
Clean Water Services	Site Development	Required	Required	Required	93–183 days	$44–$72,000	Engineering, Landscaping, & Erosion Control Plans, cost estimates, etc.
City of Durham	Special Use Permit-Greenway, Floodplain	Required for vegetation removal, excavation, fill, pipe placement	Required for vegetation removal, excavation, fill, pipe placement, outfall structure	Not Required[b]	90–120 days	$10–$16,000	Special Use Permit application, coordination with City of Durham

[a]The order-of-magnitude cost estimates for known environmental and land use planning requirements are planning level estimates intended to guide budget allocations by the City for stormwater improvements in the study area. These estimates do not represent a cost proposal from CH2M HILL, INC., and do not commit CH2M HILL to perform the work.

[b]Assumes all work to occur in Oregon Department of Transportation right-of-way located in City of Tualatin.

TABLE 4
Clean Water Services Permit Process, Timeline and Estimated Costs[a]

Process Step	Submittal Requirements	Timeline	Estimated Costs[b]	Comments
Pre-Screening Assessment	Pre-Screening Form			Has been completed
Site Certification & Service Provider Letter: Application Preparation	Sensitive Areas Certification Form Natural Resources Assessment Report Request for Statement of Design Considerations for Surface Water Management	15–30 days	$8–$13,000	
Site Certification & Service Provider Letter: Issuance		15–45 days		Unspecified in Clean Water Services regulations
Vegetated Corridor Restoration (Mitigation)	Construction Documents	Design Construction	$8–$13,000 $24–$39,000/acre	Assume 1 acre construction
Site Development Permit: Application Preparation	Engineering Plans Landscaping Plans Erosion Control Plans Land Use Approval	30–60 days	$8–$13,000	This step and subsequent steps can only occur after land use approvals have been obtained
Site Development Permit: Plan Approval		3 days 15 days		Completeness review Plan review
Site Development Permit: Final Submittals	Cost Estimates for storm sewers, facilities, erosion control, and landscaping/restoration Performance Assurances (bonds, escrow, etc.) Construction Permit Agreement Off-site Easements if needed	30–60 days	$4–$7,000	Assume cost estimates are for finalization of plans only. Other costs will be responsibilities of construction contractor
Site Development Permit: Issuance		15–45 days		Unspecified in Clean Water Services regulations

[a]Timeline and cost estimates do not include additional work and time that may be required to address agency-required revisions, mutually-agreed upon time extensions, or administrative or legal challenges to permit issuance.

[b]The order-of-magnitude cost estimates for known environmental and land use planning requirements are planning level estimates intended to guide budget allocations by the City for stormwater improvements in the study area. These estimates do not represent a cost proposal from CH2M HILL, INC., and do not commit CH2M HILL to perform the work.

TABLE 5
City of Durham Special Use Permit Process, Timeline and Estimated Costs[a]

Process Step	Submittal Requirements	Timeline	Estimated Costs[b]	Comments
Application	Engineering Plans	30–60 days	$8–13,000	
	Landscaping Plans			
	Erosion Control Plans			
	Documentation that the proposed action is consistent with the intent of the Greenway District			
	Clean Water Services Service Provider Letter			
Pre-Application Conference		10 days	$500–1,000	
Community Development Conference	Public Presentation	20 days	$500–1,000	Required public notification
Planning Commission Public Hearing	Public Presentation	20 days	$500–1,000	Required public notification Hearing must occur within 60 days of application
Written Decision		10 days		

[a]Timeline and cost estimates do not include additional work and time that may be required to address agency-required revisions, mutually-agreed upon time extensions, or administrative or legal challenges to permit issuance.

[b]The order-of-magnitude cost estimates for known environmental and land use planning requirements are planning level estimates intended to guide budget allocations by the City for stormwater improvements in the study area. These estimates do not represent a cost proposal from CH2M HILL, INC., and do not commit CH2M HILL to perform the work.

TABLE 6
Comparison of Outfall Options

Outfall Option	Estimated Permitting Timeline	Estimated Permitting Cost*
1. Existing 18-inch Outfall near Childs Road	93–183 days	$62–101,000
2. New Outfall West of I-5	93–183 days	$62–101,000
3. Existing ODOT 36-inch Outfall in I-5 Right-of-Way	93–183 days	$52–85,000

*The order-of-magnitude cost estimates for known environmental and land use planning requirements are planning level estimates intended to guide budget allocations by the City for stormwater improvements in the study area.

Works Cited

Buckallew, Chuck, Clean Water Services. 2005. Telephone conversation with Joel Shaich, CH2M HILL, on October 10, 2005.

Durham, City of. 1995a. *Comprehensive Land Use Plan*. June 23, 1995. First printing February 1996.

Durham, City of. 1995b. *Comprehensive Land Use Code*. Revised December 1995. Second printing February 1996.

Federal Emergency Management Agency (FEMA). 1982. Federal Insurance Rate Map, City of Durham, Oregon, Washington County. Community Panel Number 410263 0001 A. Effective Date January 6, 1982.

Federal Emergency Management Agency (FEMA). 1987. Federal Insurance Rate Map, City of Tualatin, Oregon, Washington and Clackamas Counties, Panel 2 of 4. Community Panel Number 410277 0002 D. Map Revised: February 19, 1987.

Herrschafp, Winnifred, Washington County Historical Society. 2005. Telephone conversation with Joel Shaich, CH2M HILL on October 10, 2005.

Metro. 2005. Custom Maps and Reports: Habitat Protection Concept, Inventory and Data. http://www.metro-region.org/article.cfm?articleid=8385.

Oregon Department of Environmental Quality (ODEQ). 2001. Tualatin Subbasin Total Maximum Daily Load (TMDL). Oregon Department of Environmental Quality, Portland, OR. August 2001.

Oregon Department of Fish and Wildlife (ODFW). 1992. Tualatin River Subbasin Fish Management Plan. Oregon Department of Fish and Wildlife, Clackamas, OR. 68 pp.

Oregon Department of Fish and Wildlife (ODFW). 1997. Oregon Sensitive Species List. Oregon Department of Fish and Wildlife, Portland, OR. December 1997.

Oregon Department of Fish and Wildlife (ODFW). 2000. Oregon Guidelines for Timing of In-water Work to Protect Fish and Wildlife Resources. Oregon Department of Fish and Wildlife, Portland, OR. June 2000.

Oregon Department of Fish and Wildlife (ODFW). 2001. Unpublished Fish Sampling Data in the Tualatin Basin. Oregon Department of Fish and Wildlife, Portland, OR. 2001.

Oregon Natural Heritage Information Center (ONHIC). 2005. Letter to Joel Shaich, CH2M HILL dated September 19, 2005.

Oregon Rivers Information System (ORIS). 1994. Oregon Rivers Information System, Coordinated by Oregon Department of Fish and Wildlife, Portland, OR. April 1994.

Tualatin, City of. Dates unknown. Digital mapping of natural areas, wetlands, water quality facilities, ditches, historic properties.

U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). 2000. Hydric Soils List, Washington County, OR: Detailed Soil Map Legend. March 2, 2000.

U.S. Department of Agriculture, Soil Conservation Service (SCS), in cooperation with the Oregon Agricultural Experiment Station. 1982. *Soil Survey of Washington County, Oregon*. Washington, DC.

U. S. Fish and Wildlife Service (USFWS). 1983a. Beaverton Quadrangle National Wetlands Inventory Map. USFWS. Washington, DC.

U. S. Fish and Wildlife Service (USFWS). 1983b. Lake Oswego Quadrangle National Wetlands Inventory Map. USFWS. Washington, DC.

U.S. Fish and Wildlife Service (USFWS). 1995. Threatened and Endangered Species List. Threatened and Endangered Species Department, Portland, Oregon.

U. S. Fish and Wildlife Service (USFWS). 2005. Letter to Nichole Coulter, CH2M HILL, dated June 17, 2005.