



Tualatin Basin Goal 5 Program Implementation Report

Encouraging Habitat Friendly Development Practices

Final Report on Functional Plan Title 13 compliance prepared for:

Metro

Prepared on behalf of:

Tualatin Basin Natural Resources Coordinating Committee

Prepared by
Tualatin Basin Steering Committee

and

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January, 2007

Program Implementation Report
Develop and Encourage Habitat Friendly Development Practices
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EXECUTIVE SUMMARY

Background and Purpose

The purpose of Goal 5, Oregon Administrative Rule (OAR) 660-015-0000(5), is to protect natural resources and conserve scenic and historic areas and open spaces. The Tualatin Basin's coordinated Goal 5 effort is known as *Partners for Natural Places* (Partners). The Partners represent an alliance of eight¹ cities (Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, Sherwood, Tigard and Tualatin) and Washington County working together with Metro, Tualatin Hills Parks and Recreation District and Clean Water Services to meet federal, state and regional requirements for protecting riparian corridors and wildlife habitat in the Tualatin Basin.

There are three basic steps for compliance with Goal 5:

- Creating an **Inventory** of Significant Regional Resources,
- Analyzing the Economic, Social, Environmental and Energy (**ESEE**) consequences of allowing, limiting or prohibiting conflicting uses in resource and impact areas, and
- Developing a **Program** to implement the allow/limit/prohibit (ALP) decision.

On September 29, 2005 the Metro Council voted to approve a regional Nature in Neighborhoods (Goal 5) program. This council action incorporated the Tualatin Basin Fish & Wildlife Habitat Program, as developed and recommended by the Tualatin Basin Partners for Natural Places. Applicable elements of the adopted Tualatin Basin Fish & Wildlife Habitat Program are required to be implemented within one year following the Metro Council's final decision (or within 60 days of LCDC's acknowledgement of Metro's Functional Plan provisions, whichever is later). These elements include:

- Providing tools designed to reduce environmental impacts of new development and removing barriers to their utilization, and
- Adopting provisions that facilitate and encourage the use of habitat-friendly development practices, where technically feasible and appropriate, in all areas identified as Class I and II riparian habitat areas.

An important feature of the Basin program is encouraging of land developers and property owners to incorporate habitat friendly practices in their site design. *Habitat friendly development practices* include a broad range of development techniques and activities that reduce the detrimental impact on fish and wildlife habitat relative to traditional development practices. The ***Program Implementation Report to Develop and Encourage Habitat Friendly Development Practices*** outlines a draft

¹ There were ten cities participating in the initial phases, which included the cities of King City and North Plains.

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program to implement the ALP decision within significant riparian corridor and wildlife habitat resources and their impact areas within the Tualatin Basin Study Area.

Public Outreach

The Partners, working with other interested parties, have undertaken a lengthy series of outreach efforts, beginning in 2003 and continuing to the present. Highlights of the public outreach program include the following:

- Numerous open houses were held at different stages of the project to share Goal 5 progress to date with the general public, the results of the ESEE analysis and the proposed Allow-Limit-Prohibit maps, and the proposed Tualatin Basin Goal 5 program.
- The Partners produced a panel television show under the auspices of Tualatin Valley Television (TVM) which was broadcast throughout the late winter and early spring of 2004.
- Tualatin Basin staff spoke before the Washington County Medical Society, the Westside Economic Alliance (WEA), Citizen Participation Organizations (CPOs), the Tualatin River Watershed Council, Commercial Real Estate Economic Coalition (CREEC), Raindrops to Refuge open house, Audubon Society of Portland, the Tualatin Riverkeepers and others.
- Media releases and editorial briefings resulted in stories in the major newspapers, as well as in the newsletters of all the Partners, including the CPOs. Information was also available at many community events and on the County's Planning web site.
- Public Hearings were held on the Basin Program and, as outlined this report, each participating jurisdiction has been conducting public worksessions and hearings to address the code amendments needed for full implementation of the recommendations for Habitat Friendly / Low-Impact Development practices.

Approaches and Methods

The report identifies those approaches and methods which potentially could be used within the Tualatin Basin to develop and encourage habitat friendly development practices. The potential benefits and challenges associated with each approach (including any technical issues and/or regulatory barriers) are noted. For example, some of the approaches and methods will have limited applicability in the Basin due to soil conditions. For each, the answers to the following key questions are summarized:

- Does the approach "help avoid and/or minimize impacts?"
- Is the approach "applicable basin-wide or adjacent to resource area?"
- Are "new or amended regulations required" to implement the approach?
- Does this approach provide "tools to reduce effective impervious area (EIA)?"
- Is the approach "Recommended for basin?"

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The approaches presented in this report are divided into three general categories:

- **Planning and development.** These approaches include methods that are typically associated with land use planning and development reviews such as site design, parking design and lighting design.
- **Engineering and design.** These approaches include methods that typically require a more innovative approach to engineering and may require the adoption of new design specifications and public works standards. They may require detailed geotechnical analysis and design for on-site soil suitability and slope stability. Within public rights-of-way, how these approaches affect emergency response access, utility access, roadway structure, and road maintenance costs will require careful evaluation.
- **Building design.** These approaches include methods that affect the building itself and may necessitate modifications to the building and/or plumbing code, for example green roofs.

Implementation Recommendations

The report then more specifically identifies those concepts that could be included in local comprehensive plans and development codes in order to implement and encourage habitat friendly practices. The recommended approaches fall within two general categories:

- 1) Some of the recommended approaches could only be effective on sites within or immediately adjacent to habitat areas;
- 2) Others could be effective anywhere within the basin (*including within or adjacent to habitat areas*) as a mean of reducing effective impervious area (EIA).

Implementation Recommendations for Site-Specific Approaches. The approaches that are recommended for development sites with habitat are intended to convey an advantage to the developer in exchange for the use of habitat friendly development practices. They are not intended to increase development restrictions. Use of these approaches would be at the option of the developer/property owner. However, the advantages should only be available to projects that provide habitat benefits above and beyond what is otherwise required by current regulations. Local jurisdictions should consider providing flexibility in their land development ordinances to encourage the protection of qualified Habitat Benefit Areas. The report suggests the following guidelines:

- *Process.* Discretionary processes represent increased time, money, and risk for the developer. Jurisdictions should evaluate their codes to determine if their review processes are appropriate to encourage the use of habitat friendly practices.
- *Land Division.* This includes consideration of on-site density transfers/lot size averaging, allowing lot dimensional standard reductions, and waiving minimum density requirements for these areas.

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- *Site Design.* Setbacks, lot coverage and building height standards should both be flexible in order to accommodate habitat benefit areas.
- *Parking.* Parking ratios and stall dimensions should be decreased, shared parking and on-street parking credits should be encouraged and compact parking spaces should be increased up to 40%.
- *Landscaping/Hardscape Design.* A reduction in parking lot landscaping equal to the size of the habitat benefit areas and reduction in sidewalk width should be considered.
- *Street Design.* Alternative pervious paving should be considered.
- *Stream crossing and street connectivity standards.* Minimizing the number and/or width of stream crossings and use of habitat sensitive designs should be considered. Healthy Streams culvert projects should be permitted out right.

Implementation Recommendations for Basin-Wide Approaches. In addition, the adopted Basin program is intended to provide tools designed to reduce environmental impacts of new development and removing barriers to their utilization. This effort is closely tied to Clean Water Services goal of reducing Effective Impervious Area (EIA) within the Basin. Suggested guidelines include:

- *Shared driveways and parking areas.* Codes should be evaluated for opportunities to reduce the need for paved areas by permitting shared driveways and parking areas where practicable.
- *Increased use of pervious paving materials.* Amendments to remove barriers to, and encourage the use of, pervious paving materials in parking areas and low traffic private streets should be considered.
- *Increased use of native plants / preservation of existing trees and maximize forest canopy.* Encouraging or requiring that a certain percent of mitigation trees be native species; or as an incentive, jurisdictions could allow somewhat smaller specimens to be planted if native species are used.
- *Improved soil amendment.* The use of soil amendments to improve the permeability of soils within landscaped areas should be encouraged.
- *Maximize street tree usage.* Jurisdictions should document their existing standards to ensure that they are requiring street trees be planted appropriately.
- *Use multi-functional open drainage systems / vegetated stormwater management facilities / modify drainage practices.* CWS and the Basin jurisdictions should consider developing and adopting Basin-wide standards for the construction and maintenance of stormwater management facilities.
- *Underground detention and/or treatment.* While underground detention and treatment facilities do not provide any habitat benefits on-site, by helping to improve water quality

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they do serve to benefit in-stream habitat within the watershed. Jurisdictions should address when it is appropriate to allow these facilities.

- *Encourage green roofs (eco-roofs).* CWS and the Basin jurisdictions should consider developing and adopting Basin-wide standards for the construction and maintenance of green roofs.
- *Disconnect downspouts / Use rain barrel or cistern system.* Technical design specifications will need to be adopted Basin-wide to facilitate the use of these methods.

Implementation by Jurisdiction

Each Basin jurisdiction is responsible for drafting and adopting local comprehensive plan and/or development code amendments necessary for implementation of habitat friendly practices. The final chapter of this report outlines the steps Clean Water Services and each of the Basin jurisdictions has taken, or plans to take, to implement these recommendations. Because most of the Basin jurisdictions already implement some practices which reduce the detrimental impact of development on fish and wildlife, all of the suggested changes may not be necessary in all cases. The table below summarizes the general timeframe for adoption for all of the jurisdictions.

2006 / 07 Adoption Schedule

(all dates are 2006 unless otherwise noted)

	PC Worksessions	PC Hearings	City Council or BOCC Worksessions	City Council or BOCC Hearings
Beaverton	7/19, 8/25, 9/6	10/11, 10/18	11/13	12/4
Cornelius	7/25, 9/12, 10/10	11/14		12/4, 12/18 Ord
Durham	See jurisdiction summary			
Forest Grove	9/5, 11/20, 1/29/07*	3/5/07	9/5, 11/20, 1/29/07*	3/26/07, 4/9/07
Hillsboro	8/30, 10/30**	1/10/07	10/30	2/6/07
Sherwood	3/14, 4/25, 6/27, 8/8	9/12, 10/24		12/5
Tigard	7/31, 9/25	10/16	11/21	12/12
Tualatin	7/13, 8/10***	9/14***	9/11, 9/25	10/23
Washington County	9/6	9/6	9/19, 9/26, 10/03, 10/17, 10/24	9/19, 9/26, 10/03, 10/17, 10/24****
* Joint PC/CC worksession ** Initiate amendments *** Tualatin Planning Advisory Committee **** Adoption of Ordinance				

CHAPTER 1: INTRODUCTION

This Program Implementation Report has been prepared by Angelo Planning Group on behalf of the Tualatin Basin Steering Committee (TBSC) as part of the *Tualatin Basin Fish & Wildlife Habitat Program*. This compliance report is intended to document the process, methods, and results of the program implementation work relative to the adoption of provisions that facilitate and encourage the use of habitat-friendly development practices.

A. Background

Oregon's nineteen statewide planning goals are the framework for local planning programs in the State. The purpose of Goal 5, Oregon Administrative Rule (OAR) 660-015-0000(5) is to protect natural resources and conserve scenic and historic areas and open spaces. Local governments, both counties and cities, must address Goal 5. In addition, the Goal 5 rule provides for a "Regional" Goal 5 process to be conducted by the Metropolitan Service District (Metro). The Tualatin Basin Goal 5 program addresses Riparian Corridors (OAR 660-023-0090), and Wildlife Habitat (OAR 660-023-110).

The steps necessary for compliance with Goal 5 are described in OAR 660, Division 23 Procedures and Requirements for Complying with Goal 5. However, in general, the basic steps include:

- Step 1: Mapping Significant Regional Resources (Inventory).
- Step 2: Preparing an analysis of the Economic, Social, Environmental, and Energy (ESEE) consequences of allowing, limiting or prohibiting conflicting uses in resource and impact areas
- Step 3. Develop a Program to implement the ESEE decision. This document provides a draft program to implement the ALP decision within significant Riparian Corridor and Wildlife Habitat resources and their impact areas within the Tualatin Basin Study Area.

In 2002 the intergovernmental agreement (IGA) forming the Tualatin Basin Natural Resources Coordinating Committee was signed. The IGA describes the goals the Tualatin Basin (Basin) must strive to achieve. The overriding goal of the Basin Approach is taken from Metro's fish and wildlife vision, which states:

The overall goal is to conserve, protect and restore a continuous ecologically viable stream-side corridor system, from the stream's headwaters to their confluence with other streams and rivers, and with their floodplains in a manner

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that is integrated with the surrounding urban landscape. This system will be achieved through conservation, protection and appropriate restoration of stream-side corridors through time.

In addition to this goal, the IGA also made improvement of the environmental health of each of the eleven regional sites and the entire Tualatin Basin a primary objective. The Basin's coordinated Goal 5 effort is known as *Partners for Natural Places* (Partners). The Partners represent an alliance of eight² cities (Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, Sherwood, Tigard and Tualatin) and Washington County working together with Metro, Tualatin Hills Parks and Recreation District and Clean Water Services to meet federal, state and regional requirements for protecting fish and wildlife habitat in the Tualatin Basin.

Since the 2002 IGA, the Partners have worked to analyze environmental, social, economic, and energy (ESEE) consequences of allowing, limiting or prohibiting (ALP) conflicting uses (ESEE Analysis) and then to develop a program to protect resources. The ESEE Analysis resulted in an ALP Map which was approved by the Natural Resource Coordinating Committee April 19, 2004. The *Tualatin Basin Fish & Wildlife Habitat Program* was then developed to implement the recommendations of the ESEE Analysis.

On September 29, 2005 the Metro Council voted to approve a regional Nature in Neighborhoods (Goal 5) program. This council action incorporated the Tualatin Basin Fish & Wildlife Habitat Program, as developed and recommended by the Tualatin Basin Partners for Natural Places. Applicable elements of the adopted Basin program are required to be implemented within one year following the Metro Council's final decision (or within 60 days of LCDC's acknowledgement of Metro's Functional Plan provisions, whichever is later).

Applicable elements included compliance with the six steps identified in Section B of Chapter 7 of the *Tualatin Basin Fish & Wildlife Habitat Program*. One of these steps is the development of a model Low Impact-Development (LID) ordinance for the basin, which would provide tools designed to reduce environmental impacts of new development and removing barriers to their utilization. This step includes local adoption of LID guidelines. In addition, Basin jurisdictions must adopt provisions that facilitate and encourage the use of habitat-friendly development practices, where technically feasible and appropriate, in all areas identified as Class I and II riparian habitat areas.

² There were ten cities participating in the initial phases, which included the cities of King City and North Plains.

B. Public Outreach

In 2002 the intergovernmental agreement forming the Tualatin Basin Natural Resources Coordinating Committee was signed. Its designated *Steering Committee* formed subcommittees to aid in its work, one of which was the *Public Outreach* subcommittee. This subcommittee has met and coordinated Basin Goal 5 public outreach since June of 2002. Members include public involvement or planning staff from the 13 public partner agencies, and importantly also include representatives from an assortment of interested private agencies: CPO's, Audubon Society of Portland, Tualatin Riverkeepers, Home Builders Association, Associated General Contractors, Westside Economic Alliance and SOLV. They named themselves and the Basin's coordinated Goal 5 effort *Partners for Natural Places*. Members include:

- Anne Madden, Washington County, Chair
- Sheri Wantland, Clean Water Services
- Gina Whitehill-Baziuk, Metro
- Karen Withrow, Metro
- David Endres, Tualatin Hills Park and Recreation District
- Megan Callahan, Beaverton
- Barbara Fryer, Beaverton
- Jennifer Wells, Hillsboro
- Julia Hajduk, Tigard
- Stacy Hopkins, Tualatin
- Steve Kelley, Washington County, liaison with Steering Committee

Private agency partners:

- Linda Gray/Patt Opdyke, CPO's
- Jim Labbe, Audubon Society of Portland
- Brian Wegener, Tualatin Riverkeepers
- Kelly Ross, Home Builders Association
- Cindy Catto, Associated General Contractors
- Betty Atteberry, Westside Economic Alliance

The Partners undertook a lengthy series of outreach efforts. This report summarizes their efforts and what they have heard from the public about the Tualatin Basin Goal 5 fish and wildlife habitat protection program.

Phase One: Inventory

In **September 2003** the Partners organized three open houses to share Goal 5 progress to-date with the general public. These were held in Forest Grove, Beaverton and at the TVF&R Training Facility between Tualatin and Sherwood. In all, approximately 240 people attended the open houses. Additional outreach activities included publication of a Newsheet, two televised presentations at the Washington County Public Affairs Forum in October 2003, talks at CPO's 1 and 5, the creation of a Partners' website, and numerous articles in jurisdictions' newsletters. Media releases and posters combined with creative outreach by all the Partners (see attached Advertising Report) helped with public awareness. The Partners produced a panel television show under the auspices of Tualatin Valley Television (TVTV) which was broadcast throughout the late winter and early spring of 2004. Outreach from other entities include multiple Metro presentations to interested parties, a well-attended Goal 5 Business Summit organized by CREEC in October 2003, a Raindrops to Refuge open house, and other outreach by organizations such as the Audubon Society of Portland and the Tualatin Riverkeepers.

Comment forms

Jurisdictional staff and elected officials were available at the Fall 2003 open houses to answer questions and listen to individuals' views on the habitat program. Maps of regionally significant habitat and informational newsheets were available at these events, along with public comment forms. The Basin Partners made use of the Comment Sheet created by Metro; it set forth six questions.

1. The first asked whether habitat protection should be equal or varied based on ecological value. The numbers were almost equally split between protecting the most ecologically valuable areas first and protecting all equally; a small minority said no new regulations were needed.
2. The second asked about varying protection by land use (zoning) and considering habitat while planning for roads and utilities. Respondents called for balance and flexibility in regulations to preserve economic viability, and were pleased with the idea of local knowledge being applied in decision making. However they affirm that natural resource protection does improve property values. Regarding infrastructure, respondents overwhelmingly favored considering the impacts of roads and utilities on habitat areas.
3. The third asked if habitat areas that provide connections to other areas should be given priority. Most respondents supported greater protection efforts for these areas, though a few of these suggest that all habitat areas should be equally protected. A few respondents raised

concerns about the impacts of this decision on private property. Others mentioned acquisition of these areas as a potential policy approach.

4. The fourth addressed protecting established versus new development, allowing exceptions from development restriction, and requiring mitigation. Most respondents support protection standards on newly developed and re-developed land, while some people favor exempting already developed land from protections. Still others favor protections on all land. Respondents mostly favor mitigation, though a few expressed concerns about whether mitigation was equal to protection. In general, people favored a balanced approach of avoiding impacts when possible and mitigating losses when they occur.
5. The fifth asked the public for input on the types of incentives that should be used to protect habitat. The most commonly reported suggestions include: tax incentives (e.g., reduced property taxes), grants and technical assistance for habitat protection and restoration, education efforts including school programs, community recognition and awards for habitat protection and restoration, free or reduced cost native plants and other restoration materials, and conservation easements or transfer of development rights.
6. The sixth addressed how the habitat protection program should be funded and personal willingness to support public financing mechanisms. The majority of respondents were supportive of public financing mechanisms, including bonding. Other funding mechanisms mentioned include fees on development, stormwater fees, grants, and voluntary contributions.

Letters

We received one from the Audubon Society of Portland and one from an interested citizen, both calling for strong protection standards. The Audubon Society is particularly concerned about riparian corridor continuity and upland wildlife habitat, which has fewer protections in place than riparian areas do.

Postcards

The Friends and Advocates of Urban Natural Areas (FAUNA) distributed pre-addressed postcards to be sent to Metro and the Tualatin Basin partners in support of the Goal 5 protection program. 1,320 postcards were sent to Metro and another 168 to the Tualatin Partners. Only two express concerns about property rights and are less supportive of a habitat protection program. The following are major themes expressed in the postcards that support a regional habitat protection program:

- Desire and need for additional regulations to protect watershed and habitat resources
- Need to pursue responsible development and stop reckless development
- Importance of habitat areas for environmental health and neighborhood livability
- Positive influence protected natural areas have on property rights
- Long time frame involved in recovering resource health relative to the short timeframe of degrading resources
- Desire and need to protect habitat resources to maintain the character of our region and for the benefit of future generations

Summary

Based on that early feedback, the public appeared generally supportive of protecting fish and wildlife habitat and including regulatory and non-regulatory measures. Metro reports that the majority of the critical feedback received was through phone calls from concerned citizens who worry about the impacts of Metro's habitat protection program on the use of their property or who oppose all habitat protection based on private property rights or anti-tax sentiments. Other critical feedback suggested that Metro was not currently doing *enough* to protection fish and wildlife habitat.

Phase Two: ESEE Analysis and Allow/Limit/Prohibit Decision

Over the fall and winter of 2003-2004, as the ESEE analysis and development of Allow-Limit-Prohibit maps was proceeding, Tualatin Basin staff spoke before the Washington County Medical Society, the WEA, CPO's 10 and 5, and the Tualatin River Watershed Council. They also made a presentation at the second CREEC Goal 5 Business summit March 2, 2004. Media releases, posters and continued creative outreach by all the Partners (see attached Advertising Report) continued to help build public awareness.

In **March 2004** the Partners held three open houses, one in Hillsboro, one in Tualatin, and one in Beaverton to share the results of the ESEE analysis and the proposed Allow-Limit-Prohibit maps; 255 people attended. The public notice for these events was created and mailed jointly by the Partners and Metro to 43,011 citizens. Planners and laptop computers loaded with property information were available for one-on-one interaction. A second edition of the Newsheet was produced for wide distribution. A slide show presentation on the status of the process was shown five times each evening (except in Beaverton). The Clean Water Services' video *Wild by Design* was shown. Citizens were encouraged to write their comments for the public record.

The March 29 Open House in Beaverton was followed by the Partners' first Goal 5 **Public Hearing**. Taped by TVTV, it was rebroadcast around the Basin through June of 2004 approximately a dozen times. About 100 persons attended, with 40 providing formal testimony.

Summary

All told, counting oral testimony, comment cards, letters and e-mail, approximately 160 pieces of testimony were received. Although the lines of demarcation were not always clear and many spoke to the need to balance environmental and economic concerns, in general the ratio of comments received was two-to-one in favor of higher levels of protection. Of the 56 who expressed support for development rights, these were their major themes:

- Regulations are already in place; stop moving the goal posts.
- Landowners must be compensated for loss of economic value.
- If the public wants more greenspace, they should buy it.
- Metro's inventory maps contain errors, especially in counting as habitat suburban gardens, orchards, etc.
- Site specific analysis is necessary.
- Honor the UGB and agricultural land by keeping development constrained, even if it means loss of habitat within the UGB.
- Institutional campuses (schools, universities, hospitals) are pressed for space.
- The region suffers from a shortage of industrial land.
- Too-strict regulations prohibit responsible stewardship, force people to harvest timber, etc.

Of the 104 who called for strengthening habitat protection, their major issues were as follows:

- We support science-based efforts to preserve and enhance eco-system health.
- It is foolish to develop flood-prone land or steep slopes.
- Please identify the habitat land already in public ownership (parks, etc.); this will help alleviate concerns.
- Please develop proactive conservation education programs.
- Environmental health improves economic value.
- Fragmenting habitat lessens its value.
- Environmental degradation is a major "takings" from us all and from our own future.
- Please protect the best interests of the greatest number of the citizenry.
- This is a unique opportunity to do the right thing – make the most of it.

One person summed it up this way: "No one these days objects to sanitary sewer requirements, as it is generally accepted that as population densities increase, our aquifers would suffer without the waste water management sewer systems provide. Our densities now require further community

actions to protect broader aspects of our natural environment. Flood control, wildlife protection, water quality, etc. are all required for a reasonable quality of life. If these benefits are sacrificed, property values throughout the basin will be reduced. Property values and natural values converge. I urge you to protect our region's natural assets for our children."

Phase Three: The Program

Public outreach efforts continued throughout the **spring and summer of 2004**. Media releases and editorial briefings resulted in stories in the major newspapers, as well as in the newsletters of all the Partners, including the CPOs. Mayor Tom Hughes of Hillsboro and Senior Planner Hal Bergsma of Beaverton made a guest appearance on TVTV's Talk of the Town (re run on cable TV four times). Information was also available at many community events, including Tualatin's Songbird Festival and a Public Works Fair at Washington Square on May 15; Beaverton's Neighborhood Clean Up on June 5; Tigard's Balloon Festival June 17-20; Tualatin River Discovery Day on June 26; Beaverton's Summerfest July 16-18; and the Washington County Fair July 28/August 1. Information was also available on the County's Planning web site.

Open houses and a public hearing in July and August were set to share possible program options with the public. In mid July Public Notices were mailed to approximately 35,000 property owners and interested parties inviting them to these events. Open Houses on the proposed Tualatin Basin Goal 5 program were scheduled for the following dates and locations:

- Monday July 26, 4 – 7:30 pm, Beaverton Library, 12375 SW 5th Street, Beaverton
- Wednesday July 28, 4 to 8 pm, Forest Grove Community Auditorium, 1915 Main St., Forest Grove
- Thursday July 29, 4 to 8 pm, Tualatin High School, 22300 SW Boones Ferry Rd., Tualatin

The Public Hearing was set for

- Monday August 2, 6 to 8 pm, Public Services Building Auditorium, 155 N. 1st Ave., Hillsboro

The public was also invited to submit comments in writing to:

The Tualatin Basin Natural Resources Coordinating Committee
Washington County Department of Land Use and Transportation
Planning Division, 155 N. 1st Avenue, Suite 350-14
Hillsboro, OR 97124

After the public hearing, the Coordinating Committee was to make final recommendations to the Metro Council on a Goal 5 program for the Tualatin River Basin. Metro would consider the Tualatin Basin program and in turn hold its own public hearings. The Basin Partners anticipated that Metro would accommodate the Tualatin Basin program into their regional Goal 5 program. Following Metro's approval, local governments would have had 180 days to adopt implementing ordinances.

Measure 37 and Course Correction

In **November 2004**, the landscape for land use regulation in the state of Oregon was substantially altered by the voters passage of Measure 37, a property rights measure that for the foreseeable future would make the imposition of new land use regulations very complex.

The Metro Council decided to carry on with implementing a Goal 5 habitat protection program, but to adjust public expectations by making it more voluntary. The regulatory component was scaled back to depend on existing vegetated corridor rules (Title 3). The revenue element rose in importance. For the region that meant a major campaign to pass a regional bond measure to *buy* important habitat properties from willing sellers. For the Basin that meant stressing the vital environmental improvement projects planned to be built using Surface Water Management (SWM) fees collected by Clean Water Services in their Healthy Streams Program. And the Voluntarism element also rose to the fore. For the Basin that meant a coordinated commitment to education, incentives, and the removal of barriers to Low Impact Development (LID).

To aid in public education about these new developments, a Newsheet and a Fact Sheet were developed, media releases were distributed, and the Web site was updated (see attached).

Program Results

In **September 2005** the Metro Council approved a regional *Nature in the Neighborhoods* program, and incorporated into it the Tualatin Basin Fish and Wildlife Habitat Program. Under an IGA the Tualatin Basin Partners then had one year to implement the Basin Program in their respective jurisdictions.

An important feature of the Basin program is encouraging and removing barriers to habitat friendly practices and low impact development techniques for landowners and developers. The Steering Committee continued to meet, concentrating on a Gap Analysis of any areas in their respective Codes and Plans that would have to be modified to allow for LID.

In **March 2006** the Partners organized a special TBNRCC activity spotlighting a Community Tree Planting Challenge. The public was invited to help plant thousands of trees and shrubs along local creeks and wetlands. Two million trees will be planted in 20 years within the Tualatin River watershed as part of the Healthy Streams Plan.

In **June** Partners Sheri Wantland of Clean Water Services and Valerie Counts, City of Hillsboro, appeared as guests on Anne Madden's TVC-TV cable television series *Land Use 101*. They discussed the "Livability Impacts of Growth: Keeping Washington County Green" in front of a live (and interactive) studio audience. The show was rebroadcast dozens of times, and DVD's of it were made available to the CPOs and libraries.

In **July** the Partners held a Stakeholder Dialog to review the Tualatin Basin Natural Resources Coordinating Committee's proposed recommendations to encourage habitat friendly development. Held at Hillsboro's Civic Center, the agenda included:

- A brief history of Goal 5 in the Tualatin Basin and its inter-relationships with Clean Water Services programs (Healthy Streams, Storm Water Management Plan, new Design and Construction Standards)
- A Steering Committee presentation of the jurisdictions' draft Gap Analyses - gaps in city and county codes which may need attention to allow for Low Impact Development practices
- Public input/dialog with Steering Committee

A couple of dozen stakeholders from the environmental and development communities took part, along with staff from all the TB Partner agencies. The stakeholders asked for:

- One document with LID guidelines
- One document that compiles all barriers and the status of codes
- More information about existing impervious surfaces
- Trails (trials?) with LID
- Open spaces
- Long-term tracking of net environmental health
- Enforcement
- Discussion of adequacy
- Consistency of implementation
- Basin-wide approach
- "Basin-wide" does not mean sameness; jurisdictions are unique
- Post each jurisdiction's gap analysis on the G5 website

- Showcase project, tours, field trips
- Create demand with public education
- Builders need certainty, technical criteria
- Planners and reviews need a willingness to be open to new techniques
- Dichotomy between flexibility and consistency, both requested by builders
- True incentives: streamline permit process, discount SDCs
- Personalities affect permitting process, some are inclined to take risks
- Educate staffs, commissions, etc.
- Incentive: reduce size needed for stormwater treatment
- Require LID discussion during pre-application meetings
Focus on new development and redevelopment; maintenance for built communities
- Greater emphasis on transportation systems, green streets

This dialog helped shape the document that is now guiding local planning code changes for habitat friendly development.

In **October** the TBNRCC expressed strong support for Metro's green spaces acquisition bond measure, which was passed successfully by the voters in November 2006.

Local jurisdictions are now entering into their individual public hearings processes to adopt the Code and Plan changes which will make way for a greener and fishier future for the Tualatin Basin.

C. Implementation of Habitat Friendly Development Practices in the Basin

An important feature of the Basin program is the encouragement of land developers and property owners to incorporate habitat friendly practices in their site design. *Habitat friendly development practices* include a broad range of development techniques and activities that reduce the detrimental impact on fish and wildlife habitat relative to traditional development practices. As shown in Table 1 below, Metro has identified a wide range of habitat-friendly development practices that represent best management practices. While the phrases are sometimes used interchangeably, for the purposes of this report *low impact development (LID)*, which is more specifically focused on minimizing hydrologic impacts, e.g., reducing *effective impervious area (EIA)* and improving water quality, is considered a subset of habitat friendly practices.

The Basin jurisdictions currently implement many practices which reduce the detrimental impact of development on fish and wildlife; these are discussed in greater detail for each jurisdiction in Chapter 4. Not all approaches described Table 1 are appropriate for all areas of the Tualatin Basin.

Also, some methods may not be appropriate to implement together, as their combined effect may actually be detrimental. All approaches, both currently used and possible future practices, must consider specific topographic and soil constraints, and be evaluated for safety, effectiveness, longevity, and maintenance costs. The list of approaches and methods is not exhaustive, but is intended to highlight practices that have been used successfully in the Portland metropolitan region and could have limited or broad applicability in the Tualatin Basin.

Within the Tualatin Basin, the following concerns have been noted relative to the practices listed in Table 1-1:

- Infiltration and groundwater recharge practices will need to address DEQ / UIC standards;
- The potential implementation of infiltration / groundwater recharge practices in the Tualatin Basin will be subject to local soils and groundwater conditions;
- Stormwater ‘pollutants’ are identified and regulated under existing MS4 permits in the Tualatin Basin.

Table 1-1: Habitat-friendly development practices (Urban Growth Management Functional Plan Table 3.07-13c.)
<p>Part (a): Design and Construction Practices to Minimize Hydrologic Impacts</p> <ol style="list-style-type: none"> 1. Amend disturbed soils to original or higher level of porosity to regain infiltration and stormwater storage capacity. 2. Use pervious paving materials for residential driveways, parking lots, walkways, and within centers of cul-de-sacs. 3. Incorporate stormwater management in road right-of-ways. 4. Landscape with rain gardens to provide on-lot detention, filtering of rainwater, and groundwater recharge. 5. Use green roofs for runoff reduction, energy savings, improved air quality, and enhanced aesthetics. 6. Disconnect downspouts from roofs and direct the flow to vegetated infiltration/filtration areas such as rain gardens. 7. Retain rooftop runoff in a rain barrel for later on-lot use in lawn and garden watering. 8. Use multi-functional open drainage systems in lieu of more conventional curb-and-gutter systems. 9. Use bioretention cells as rain gardens in landscaped parking lot islands to reduce runoff volume and filter pollutants. 10. Apply a treatment train approach to provide multiple opportunities for storm water treatment and reduce the possibility of system failure. 11. Reduce sidewalk width and grade them such that they drain to the front yard of a residential lot or retention area. 12. Reduce impervious impacts of residential driveways by narrowing widths and moving access to the rear of the site. 13. Use shared driveways. 14. Reduce width of residential streets, depending on traffic and parking needs. 15. Reduce street length, primarily in residential areas, by encouraging clustering and using curvilinear designs. 16. Reduce cul-de-sac radii and use pervious vegetated islands in center to minimize impervious effects, and allow them to be utilized for truck maneuvering/loading to reduce need for wide loading areas on site. 17. Eliminate redundant non-ADA sidewalks within a site (i.e., sidewalk to all entryways and/or to truck loading areas may be unnecessary for industrial developments).

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18. Minimize car spaces and stall dimensions, reduce parking ratios, and use shared parking facilities and structured parking.
19. Minimize the number of stream crossings and place crossing perpendicular to stream channel if possible.
20. Allow narrow street right-of-ways through stream corridors whenever possible to reduce adverse impacts of transportation corridors.

Part (b): Design and Construction Practices to Minimize Impacts on Wildlife Corridors and Fish Passage

1. Carefully integrate fencing into the landscape to guide animals toward animal crossings under, over, or around transportation corridors.
2. Use bridge crossings rather than culverts wherever possible.
3. If culverts are utilized, install slab, arch or box type culverts, preferably using bottomless designs that more closely mimic stream bottom habitat.
4. Design stream crossings for fish passage with shelves and other design features to facilitate terrestrial wildlife passage.
5. Extend vegetative cover through the wildlife crossing in the migratory route, along with sheltering areas.

Part (c): Miscellaneous Other Habitat-Friendly Design and Construction Practices

1. Use native plants throughout the development (not just in HCA).
2. Locate landscaping (required by other sections of the code) adjacent to HCA.
3. Reduce light-spill off into HCAs from development.
4. Preserve and maintain existing trees and tree canopy coverage, and plant trees, where appropriate, to maximize future tree canopy coverage.

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CHAPTER 2: DESCRIPTION OF APPROACHES AND METHODS

Chapter 2 identifies those approaches and methods which potentially could be used within the Tualatin Basin to develop and encourage habitat friendly development practices. The potential benefits and challenges associated with each approach (including any technical issues and/or regulatory barriers) are noted. Some approaches may conflict with current locally adopted regulations, which may necessitate modification of the approach or a modification of local ordinances before they can be implemented. The importance of removing barriers from existing regulations in order to enable the use of these types of approaches was highlighted in the Audubon Society of Portland's 2004 *Stormwater/Pavement Impacts Reduction (SPIR) Project Report*.

The ten approaches presented in this chapter are divided into three general categories:

- A. Planning and development.** These approaches include methods that are typically associated with land use planning and development reviews.
- B. Engineering and design.** These approaches include methods that typically require a more innovative approach to engineering and may require the adoption of new design specifications and public works standards. These approaches may require detailed geotechnical analysis and design for on-site soil suitability and slope stability. Within public rights-of-way, how these approaches affect emergency response access, utility access, roadway structure, and road maintenance costs will require careful evaluation.
- C. Building design.** This approach includes methods that affect the building itself and may necessitate modifications to the building and/or plumbing code.

For each approach described in this chapter the following information is provided:

- A brief description of the various methods typical of the approach,
- The potential benefits and challenges associated with implementing the approach, and
- Examples and references of how the approach has, or might be, used.

In addition, at the beginning of each section, the answers to the following key questions are summarized:

- ? Does the approach “Help avoid and/or minimize impacts?” *Tools that help to avoid the intrusion of development into habitat areas to the extent practicable are the preferred. When impacts cannot be avoided, the use of tools that help lessen or minimize detrimental impacts to the extent practicable should be encouraged.*
- ? Is the approach “Applicable basin-wide or adjacent to resource area?” *Some practices could be effective anywhere within the basin; others are only effective within or adjacent to habitat areas.*

- ? Are “New or amended regulations required” to implement the approach? *In some cases implementing a practice would require new regulation to be effective; in others existing regulations may be sufficient or a non-regulatory approach is sufficient.*
- ? Does this approach provide “Tools to reduce effective impervious area (EIA)?” *Reducing EIA provides direct benefits to water quality and in-stream and streamside habitat through stream flow moderation, reduced frequency of flooding. Some, but not all, habitat-friendly practices will help reduce EIA.*
- ? Is the approach “Recommended for basin?” *Some practices may be particularly recommended for use in the Tualatin Basin; others may be less useful due to regulatory or locational constraints.*

A. Planning and Development Approaches

Planning and development approaches include those methods that can be implemented most easily at the time of land use approval, e.g., as part of a subdivision or development review. With the possible exception of the use of pervious materials within parking areas, these methods do not require any engineering innovations or new specifications. Many jurisdictions in the Tualatin Basin employ some, or even most, of these tools. For example, since 1974, Washington County has preserved flood-prone areas within easements and non-buildable tracts, which has resulted in much of THPRD’s parkland. However, in some cases, it may be necessary for jurisdictions to modify their development ordinances in order to enable the use of specific approaches.

The planning and development approaches considered in this section include the following:

- 1) Land Division Design
 - Methods include clustering/lot size averaging and on-site density transfers
- 2) Site Design
 - Methods include increased flexibility for setbacks, lot coverage, building heights
- 3) Parking Design
 - Methods include reduced parking ratios, shared driveways and parking areas, increased parking lot landscaping, smaller car spaces and stall dimensions, increased use of pervious materials
- 4) Landscaping/Hardscape Design
 - Methods include locating landscaping adjacent to habitat areas, increased use of native plant, improved soil amendment, reduction of non-ADA sidewalks within a site,

increased use of habitat-friendly fencing, preservation of existing trees, maximize forest canopy

- 5) Lighting Design
 - o Methods include re-directing outdoor lighting and reducing light spill-off
- 6) Density Reduction for Regionally Significant Habitat
 - o Methods include modifying definition of net buildable areas, establishing reduced minimum buildable lot sizes

1. Land Division Design

Key Questions	
Help avoid or minimize impacts?	<i>Both, but primarily these methods allow developments to avoid habitat areas.</i>
Applicable basin-wide or adjacent to resource area?	<i>Effective on sites adjacent to resource area; however, may have “smart development” benefits basin-wide.</i>
New or amended regulations required?	<i>Some codes may have to be amended to allow increased flexibility in lot size averaging and density transfers. Could be provided option rather than requirement for developer.</i>
Tools to reduce effective impervious area (EIA)?	<i>No, unless combined with other “green” design and development approaches.</i>
Recommended for basin?	<i>Yes, only for properties which include resources.</i>

Description of Methods (Lot Size Averaging and Transfer of Density)

Zoning and land division ordinances can require, allow, or encourage lot size averaging at the land division stage to avoid or minimize impacts to significant riparian and habitat areas. Lot size averaging is typically most relevant for residential land divisions, but the method could also be applicable in commercial and industrial zones that establish minimum lot sizes. These techniques are generally implemented through local Planned Development (PD) or Planned Unit Development (PUD) review options.

Rather than specify a minimum lot size for every lot in a land division (such as 8,000 square feet), lot size averaging could allow a combination of smaller and larger lots, with an overall average lot size of 8,000 square feet. Another approach could be zoning that establishes the overall maximum number of units per gross acre, and allows a mix of lot sizes to achieve that overall density.

Significant riparian and habitat areas could also be set aside and protected in an open space tract (dedicated to a public agency or owned by a homeowners association), with an allowance for the remaining lots to be smaller than the specified minimum lot size to achieve the overall average density. However, it should be noted that creating open space tracts may have implications for enforcement and the related costs for long-term maintenance.

Ordinances could also allow or encourage transfer of development potential from constrained portions of a site to non-constrained portions. This method is commonly used to permit transfer of development potential from floodplain and wetland areas to upland areas. The tool is less commonly used to transfer density from upland habitat areas. On-site density transfers can be implemented through a land division or site plan review process (for example, multifamily projects that do not involve a land division). For residential projects, on-site density transfers typically require lot size averaging or clustering of units on a smaller portion of the site. Ordinances can provide incentives for density transfers, such as “bonus” density or permitted flexibility on lot sizes, setbacks, street widths, and landscaping standards. The density transfer provides a tool to protect significant riparian and habitat areas through dedication, an open space easement or tract or deed restriction.

Benefits and Challenges

- A. The lot size averaging and density transfers can provide benefits, including the opportunity to avoid impacts on significant resource areas, and create neighborhoods that are responsive to natural features. In addition, there may be non-habitat related benefits such as the potential for a broad mix of lot sizes and associated housing types and sizes and varied development patterns.
- B. Developers could be reluctant to pursue lot size averaging or density transfers if they make the land division review process more complex, time-consuming, or vulnerable to appeal. For example, in jurisdictions where lot size flexibility is accomplished through the planned unit development process, requirements such as minimum development size, larger open space dedications, increased submittal requirements and, subsequently, longer processing times, will limit the use of this method.
- C. Smaller lots with shared open space may be seen by some developers as less marketable than traditional subdivisions.
- D. Most of the development in the urbanized portion of the Basin is now limited to relatively small-scale redevelopment and infill projects, which may reduce potential opportunities for (and benefits of) transferring density.
- E. In infill settings, surrounding property owners could be resistant to smaller lot sizes or clustered homes, even if the overall average density is maintained. Buffers may be required to mitigate impacts. Ordinances may also limit certain housing types (such as attached or multifamily units) in particular zones.

- F. Allowing lot size averaging and density transfer by right (subject to clear and objective standards) may help encourage preservation of the resource, but may be seen as conflicting with a jurisdiction's objectives for community involvement and citizen participation.
- G. Minimum density requirements can conflict with objectives to protect significant riparian and habitat areas. Unless a development site is quite large, there may not be enough area to effectively accommodate the on-site density transfer in a manner that is compatible with surrounding developments and marketable for the developer (*see discussion of Density Reduction for Regionally Significant Habitat – Section B6*).
- H. Average lot size and density transfer approaches may also necessitate greater flexibility in development standards such as maximum building coverage, lot dimensions, and setbacks. If use of lot size averaging or density transfer options require approval of a planned development, variance, or adjustment, developers will be less likely to use the methods.
- I. The resource area associated with the density transfer shall be provided with long-term protection through dedication, an open space easement, deed restriction or other appropriate tool. This is already common in the Tualatin Basin for dedicated floodplain areas. Issues of access, maintenance, and management of the resource area must be considered as part of the density transfer.
- J. If combined with other “green” design and development approaches, lot size averaging and density transfers could help to reduce effective impervious area in new development.

Examples and References

Most jurisdictions in the Basin have existing ordinance provisions that address lot size averaging and density transfers. These will need to be evaluated in order to ensure they provide adequate flexibility. For example:

The Washington County Code (Section 404-4) provides broad flexibility in lot sizes and development standards through the Type II planned development process to provide incentives for protection and dedication of open space. However, it appears only industrial and commercial planned development proposals are able to use floodplain, drainage hazard, or riparian open space on the subject property to offset up to 50% of the open space requirement. The Washington County Code (Section 300-3) also provides options for transfer of density from unbuildable lands within a single lot or parcel with the same land use designation or to an adjoining lot or parcel that is included in the development application and is within the same land use designation. For density transfer purposes, the definition of “unbuildable” lands includes designated significant natural resource areas, water quality sensitive areas or vegetated corridors. The transferred density shall not more than double the density allowed on the buildable portion of the site.

The Tigard Code (18.430.020D) permits “lot averaging,” but no lot may be less than 80% of the minimum lot size permitted in the underlying zone. The Tigard Code (18.715.030) allows residential density transfer from sensitive lands, which includes the 100-year floodplain, natural drainage ways, wetland areas, and steep slopes. However, the number of units that can be transferred is limited to the number of units that would have been allowed on 25% of the unbuildable area. The total number of units per site shall not exceed 125% of the maximum number of units per gross acre permitted by the applicable plan designation.

2. Site Design

Key Questions	
Helps avoid or minimize impacts?	<i>Primarily minimize, potential to use flexibility to avoid impact to a habitat area.</i>
Applicable basin-wide or adjacent to resource area?	<i>Primarily adjacent to resource areas, but may also be used to protect other attributes (e.g. mature trees or habitat connectivity).</i>
New or amended regulations required?	<i>Some codes may have to be amended to provide additional flexibility.</i>
Tools to reduce effective impervious area (EIA)?	<i>No, unless combined with other “green” design and development approaches.</i>
Recommended for basin?	<i>Yes, only for properties which include resources.</i>

Description of Methods

Zoning ordinance development standards typically establish specific minimum lot size, lot dimensions, setbacks, building heights, and maximum lot coverage, particularly within residential zoning districts. The standards are applied at the land division, site plan, or building permit phases of development. When applied too rigidly, these types of standards can result in increased impacts on resource areas. Allowing flexibility can enable and encourage sensitive site designs and may be necessary to facilitate lot size averaging and/or on-site density transfer (*see discussion in Section B1*). In addition to avoiding development immediately within or adjacent to resource areas, sensitive site designs could take into account the preservation of mature trees and connectivity between habitat areas. If a site is adjacent to or near habitat areas, wildlife and migratory birds may use the site as a pathway. Whenever possible, these pathways should be preserved or enhanced to provide continued access and protection for wildlife.

Examples include:

- Building setback flexibility to maximize the separation of the proposed development from the resource area (with the option to reduce setbacks to the minimum required by fire and building codes).
- Automatic flexibility in lot dimensional standards (such as 30% adjustment) to facilitate on-site density transfers and protection of the resource area.
- Building height flexibility (such as one-story bonus over base building heights) to facilitate avoidance and protection of the resource area.
- Bonus lot coverage if the proposed development is concentrated on smaller lots or in a smaller area of the overall site than permitted under base development standards.

Benefits and Challenges

- A. Greater flexibility in development standards (particularly if it doesn't trigger a more complex review procedure) could encourage avoidance and protection of significant resource areas and enable the use of other tools such as on-site density transfer and lot size averaging.
- B. Surrounding property owners or the larger community may be resistant to smaller lots, taller buildings, or reduced setbacks, particularly if they do not view the protection of the resource area as a corresponding benefit.
- C. Most of the development in the urbanized portion of the Basin is now limited to relatively small-scale redevelopment and infill projects. In infill settings in particular, surrounding property owners may feel that the new projects are out of character with neighborhood design, and that reductions in setback standards and increased building height reduce privacy on adjoining parcels.
- D. A developer will not pursue the more flexible development approach to protect the resource area if the alternative site plan is perceived as more difficult to permit, more difficult to finance, or less marketable.
- E. Providing site design flexibility by right (subject to clear and objective standards) may help encourage preservation of the resource, but may be seen as conflicting with a jurisdiction's objectives for community involvement and citizen participation.

Examples and References

The examples below illustrate how some of the Basin jurisdictions currently provide some flexibility from site design standards to facilitate natural resource protection.

The Washington County Code (404-2) allows only a limited modification of front, side, and rear yard setbacks (up to 10%) based on evidence that the modification is necessary to retain natural or topographic features such as mature trees, drainage swales, slopes, ridge lines, or rock

outcropping. More extensive modification of standards (including lot sizes) requires approval of a Type II planned development.

The Tualatin Development Code (Chapter 72) includes options for shift of density for residential development adjacent to greenways and natural areas; landscaping credit for commercial and industrial planning districts adjacent to greenways and natural areas; and reduction in setback requirements adjacent to greenways and natural areas. Implementation of these options typically requires Architectural Review approval (Type II or III).

Beaverton’s Code includes options for flexible setbacks (Chapter 40.30). However, flexible setback(s) for a proposed residential land division require a Type III approval.

3. Parking Design

Key Questions	
Helps avoid or minimize impacts?	<i>Use reductions in parking to avoid impact to a habitat area. Minimization also possible through EIA reduction.</i>
Applicable basin-wide or adjacent to resource area?	<i>Primarily adjacent to resource area, but could be used Basin-wide.</i>
New or amended regulations required?	<i>Yes – for some of the methods described.</i>
Tools to reduce effective impervious area (EIA)?	<i>Yes, these methods can provide EIA reduction.</i>
Recommended for basin?	<i>Yes, primarily for properties which include resources. Use of pervious pavement could have an EIA benefit, but use limited by soil constraints.</i>

Description of Methods

There are several methods related to parking lot design that could reduce the overall amount of impervious surface and cut down on stormwater runoff. The number of parking spaces created could be reduced through revisions to the parking requirements. Metro currently requires that all jurisdictions use parking maximums in their code to limit excessive parking. In addition, jurisdictions may allow alternative parking spaces to count towards the minimum parking standard. For example, adjacent on-street parking, nearby public parking and shared parking could all be included in the parking count. Metro recommends this, but does not require it.

Another technique is to minimize the size of the parking spaces created. Some jurisdictions have standards that allow a certain percentage of parking to be designed for compact vehicles. For example, the city of Tualatin allows no more than 35% of total parking stalls to be compact. Increasing this allowable percentage would be one way to reduce the overall size of a parking lot. Jurisdictions could also allow a higher percentage of compact parking (which would be a cost savings for the developer) in exchange for more beneficial landscaping. Parking stall design standards may also be revised in cases where the standard provides for a space that may be larger than necessary.

Large parking lots with catch basins generally require active stormwater control techniques, such as utilizing detention ponds and water quality treatment prior to discharge to a public system. As an alternative, the same amount of parking may be broken into several smaller parking lots that are separated by natural vegetation (outside of required vegetated corridors) and bioretention areas (*see discussion of bioretention areas - Section C3*). This could reduce or eliminate the need for detention and/or piping and provide more opportunities for natural infiltration.³

There are a number of alternatives to conventional paving materials that can be used to reduce impervious surface area. Pervious concrete and asphalt both allow for more infiltration than traditional impervious pavement, and therefore have the effect of reducing the amount of runoff created by a parking lot. Pervious pavement may be most effective for driveways, sidewalks, and other pedestrian and bikeways that are not associated with public rights-of-way, which are subject to typical safety and maintenance practices in this area (sanding in winter conditions, street sweeping). Brick, pavers, and natural stone or gravel provide similar benefits, although the amount of infiltration is not as high. These materials are not always appropriate for high use parking lots, but they can be used in combination with conventional paving materials to provide at least some benefit.



Example of pervious parking material

Benefits and Challenges

- A. In addition to possible water quality benefits, reducing the overall amount of required parking and/or the size of parking spaces reduces development costs, allows more space for landscaping,

³ Depending on local regulations, these methods related to parking lot design may not eliminate the need for required detention despite their effect on reducing stormwater runoff.

and provides greater efficiency of land use. However, in order to result in a reduction in EIA, the area that was no longer needed for parking should not be used for other impervious uses (e.g., larger buildings).

- B. Allowing for smaller parking spaces or proportionately more compact spaces may result in a smaller overall parking area, but may not reflect the actual mix of vehicles that will be using the facility; and thus, could create some frustration on the part of users. In addition, adequate parking for trucks, large SUV's and RV's still needs to be provided.
- C. Breaking up large parking lots and the use of natural vegetation creates a more attractive development while providing stormwater benefits.
- D. Permeable paving materials may reduce development costs by reducing the need for stormwater infrastructure and treatment.⁴ Bricks and pavers can also add visual appeal and character that may be desirable in commercial or residential areas.
- E. There may be resistance to the idea of reducing parking requirements on the part of the community, particularly neighboring property owners. There may also be property owner concerns regarding shared parking arrangements.
- F. Alternative paving materials may have higher installation costs to construct correctly and require more maintenance than regular asphalt and concrete. However, these costs could be offset to some degree by the savings associated with less stormwater treatment. This approach needs evaluation and monitoring to develop true costs. Overall development costs should always be considered when making a comparison between paving materials. Additionally, soil permeability issues in the Basin will also pose a challenge on some sites, as will slope stability and impacts to adjacent properties. Long term benefits are not well documented and required evaluation for long term effectiveness and maintenance costs.

Examples and References

CWS Merlo Road Field Operations Facility

The Field Operations Facility's employee parking lot is paved with porous concrete. Porous concrete allows rainfall to be absorbed directly into the soils below, recharging groundwater and reducing or eliminating any surface runoff. The porous parking lot acts as a retention facility, slowing the flow and replicating natural hydrology. The cost of porous concrete is offset in part by the elimination of catch basins and pipe conveyance systems.

⁴ According to Washington County Engineering Standards, the piping requirements for larger and longer duration storm events may still be required.

Concrete paver blocks provide seven additional parking places (945 square feet) for visitors to the Field Operations Facility. Spaces between the interlocking pavers allow stormwater to be absorbed into the sub-base and soils below. Porous pavers are commonly used and readily available, and can be more attractive than asphalt or conventional pavement.

Structural gravels supported by an 8-inch deep synthetic grid provide 3,000 square feet of storage area in the Field Operations Facility maintenance yard. The three-dimensional network of interconnected, perforated cells was filled with 1 1/2-inch to 3/4-inch open graded river gravel.

[Source: Clean Water Services, "Slow the Flow! Designing the Built Environment to Protect Urban Environments" brochure

<http://www.cleanwaterservices.org/content/documents/Permit/Slow%20the%20Flow%20brochure.pdf>

4. Landscape/Hardscape Design

Key Questions	
Helps avoid or minimize impacts?	<i>Both avoid and minimize.</i>
Applicable basin-wide or adjacent to resource area?	<i>Primarily adjacent to resource area, but could be used Basin-wide.</i>
New or amended regulations required?	<i>Yes – for some of the methods described.</i>
Tools to reduce effective impervious area (EIA)?	<i>Yes, subject to local soil conditions.</i>
Recommended for basin?	<i>Yes, primarily for properties which include resources. Tree preservation, additional landscaping and soil amendments would have an EIA benefit.</i>

Description of Methods

Methods can include enabling and encouraging the use of rain gardens, native landscaping, and tree canopy preservation. More information about rain gardens is provided in Section C3 of this paper. Native landscaping, also called "lawn conservation," focuses on planting or replanting lawns or sections of lawns to a more natural state. This includes planting hardy native plant species of grasses, shrubs, wildflowers and/or trees, which require less maintenance than the conventional lawn. One benefit of native landscaping to the local watershed is that it requires little or no fertilizer or pesticides. Lawn conversion also provides stormwater management that promotes groundwater infiltration, water quality treatment, and flood control. Some general conservation landscaping techniques are listed here.

- Minimize the use of supplemental watering by using appropriate plants, mulching, drip irrigation, and captured rainwater.
- Minimize the amount of lawn in order to reduce fertilizer and pesticide use, cut down on watering, and create habitat for wildlife.
- Plant to create windscreens and buffers and reduce erosion.
- Reduce the use of pesticides and fertilizers through the use of native plants, lawn conversion, natural soil enhancers, and soil aeration.
- Minimize bare soil and stabilize slopes with planted ground cover.
- Capture and detain water for use in landscaping.
- For hardscaped surfaces, use permeable paving like bricks or pavers instead of concrete and asphalt.
- Preserve existing trees and plant additional trees where appropriate.

Trees and the canopy they provide are an important component of landscaping for water quality. An intact tree canopy can reduce the amount of precipitation that results in runoff, thus reducing the amount of stormwater that needs to be treated. There are also habitat benefits to preserving resource areas with tree canopy and vegetative cover. Tree roots stabilize soil and reduce erosion, and the shade that trees provide acts as a shelter and cooling agent. Trees also purify the air, provide habitat for birds and wildlife, and add character and aesthetics to an area. Some development ordinances require preservation of trees during construction to the extent possible, and mitigation if a tree must be removed. Others impose a penalty if a tree is cut down on a property without a permit – the fine can vary depending on the type, size, and age of the tree.

Benefits and Challenges

- A. Conservation landscaping is a low-cost way to minimize stormwater runoff. Savings are created through reduced maintenance, water use, and treatment.
- B. Many people prefer the more natural look and feel of native landscaping. However, it may also be perceived as “weedy” and “unattractive.” Informative signage near these areas may help to educate the public and prevent negative impressions.
- C. If jurisdictions do not allow vegetated stormwater management facilities to count towards the overall landscaping requirement, it can act as a disincentive to developers. While it may provide some incentive for their creation, allowing these facilities to count toward landscaping requirements will not result in an increase in pervious surface.
- D. Many of these methods also provide air quality benefits, help to reduce temperatures during summer months, and create suitable habitat for wildlife, especially birds and butterflies.
- E. There is the potential to use development activities on a site as an opportunity to encourage improvement of existing resource areas.

F. Some jurisdictions currently allow hardscape areas to be counted toward the required landscaping percentage. While this may improve opportunities for pedestrian connectivity within a development site, it may reduce the overall perviousness.

Examples and References

Community Watershed Stewardship Program

Watershed stewardship grants provide up to \$5,000 to citizens and organizations to encourage watershed protection and enhancement at the local level. Grant money can be used for supplies, materials, equipment, room rentals, feasibility studies or technical assistance. The Grant Program is a partnership between the City of Portland Environmental Services, Portland State University, and the Northwest Service Academy. The program provides financial and technical support to foster partnerships that improve the health of local watersheds. From 1995 through 2004, the program dispersed \$360,000 to 92 projects across the city. These funds were matched by over \$1 million in community support through donations of services, materials and volunteer time. As of Fall 2002, of the 62 projects that included physical improvements to the landscape, 54 (87%) are still active and supported by the community. Over 17,000 people have donated 93,219 volunteer hours, which includes planting over 56,215 native trees and shrubs.

[Source: City of Portland Bureau of Environmental Services]

References:

[NOTE: While these references provide good examples of ways to employ conservation landscaping, implementation in the Tualatin Basin may require modifications due to the specific climate and soil types in the region.]

- ◆ “Healthy Landscapes,” University of Rhode Island
<http://www.uri.edu/ce/healthylandscapes/tips/5.html>
- ◆ Landscaping for a Healthy Planet” Pennsylvania Audubon and Alliance for the Chesapeake Bay
<http://www.envirolandscaping.org/conservation.htm>
- ◆ “Skills for Protecting Your Stream: Retrofitting Your Own Backyard,” Center for Watershed Protection, April 2002
http://www.cwp.org/Community_Watersheds/educating_constituents.htm

5. Lighting Design

Key Questions	
Helps avoid or minimize impacts?	<i>Minimize</i>
Applicable basin-wide or adjacent to resource area?	<i>Applicable to areas adjacent to resource areas.</i>
New or amended regulations required?	<i>Adoption of ordinance language required for jurisdictions that currently do not have a lighting ordinance; possible amendments to existing lighting ordinances to include measures associated with mitigation for habitat areas.</i>
Tools to reduce effective impervious area (EIA)?	<i>No</i>
Recommended for basin?	<i>Yes, although information on lighting impacts on Basin specific species may not be available.</i>

Description of Methods

When outdoor lighting is not designed, installed, or managed properly, deleterious effects to natural systems can occur. Some of the biological and behavioral activities of plants, animals (including birds and amphibians), insects, and microorganisms are either adversely affected by light or can only function effectively in darkness. Such activities include foraging, breeding, and social behavior in higher animals, amphibians and insects, which are all affected in various ways when artificial light is introduced into their environment.

Artificial light at night can disrupt hunting, migrating, and reproductive patterns of invertebrates, mammals and birds. Lighting used along river corridors, near woodland edges and near hedgerows can be particularly harmful to animals that hunt and live in these habitats. There is also evidence that trees and plants can be impacted by lighting because of their sensitivity to day length and seasonality. Prolonged artificial light can alter their flowering and dormancy cycles.

Different light sources have different emission spectra; different types of lamps give off more or less light of certain wavelengths (color).

Benefits and Challenges

- A. Many of the jurisdictions in the Basin already have current lighting regulations that mitigate the affects of artificial lighting in their development codes. Typically these regulations include allowed or prohibited lamp types, screening requirements, and required elements of a lighting

plan that mitigate the affects of artificial lighting on neighboring developments and existing housing. Measures that shield humans from unwanted light can also benefit habitat areas.

- B. Proposed lighting plans associated with new development can be reviewed and regulated with the development plan approval process. Measures that are related to habitat, and not typically required in local jurisdictions' ordinances, such as ensuring that the species of tree proposed is suitable with the lighting plan, shielding artificial lighting from habitat areas as well as existing development, or consultation with a habitat biologist regarding the presence and needs of animal species in the area, could be included in development regulations.
- C. There may be less opportunity for retrofitting lighting plans and fixtures in existing development where lighting may be detrimentally impacting riparian and habitat areas. Existing lighting designs with the most impact will likely be associated with large developments, such as commercial centers and industrial campuses, and the best opportunity to require changes to the lighting type or plan is when the property expands or redevelops.
- D. There is not a lot of available research that quantifies the long-term effects of artificial light on habitat areas. While species-specific information regarding the disruption of natural patterns due to artificial light is more abundant, not all of these species are prevalent in the Tualatin Basin. The lack of quantifiable evidence of the effects of artificial light or night lighting on habitat areas, and the existence of arguably more pressing issues, such as reduction of habitat areas due to development, may downplay the importance of this issue. The benefits of mitigating artificial light are also difficult to measure.

Examples and References:

[NOTE to TBSC: This section is still in work – It would be ideal to have descriptions and pictures of local examples, please suggest any local examples you might have available.]

- ◆ LightLinx List Index, Light Pollution Awareness Links. <http://members.aol.com/ctcadman/LiteLynx.htm>
- ◆ Alessi, Ryan. "Protecting Animals from 24-7 Light", Scripps Howard News Service, January 09, 2002 <http://www.knoxstudio.com/shns/story.cfm?pk=DARKSKY-SPECIES-01-09-02&cat=AN>
- ◆ Fatal Flight Awareness Program (FLAP). <http://www.flap.org/new/nocturnfr.htm>
- ◆ "Impact of Lighting on Bats", based on a document produced by Dr. Jenny Jones (May 2000) <http://www.0ad.co.uk/bats/downloads/Helpline/lighting.pdf>
- ◆ Chaney, William R. "Does Night Lighting Harm Trees?", Purdue University Department of Forestry and Natural Resources, Purdue University, West Lafayette, IN 47907
- ◆ <http://www.ces.purdue.edu/extmedia/FNR/FNR-FAQ-17.pdf>
- ◆ "Ecological Consequences of Artificial Night Lighting" Conference Abstracts, The Urban Wildlands Group, <http://www.urbanwildlands.org/abstracts.html>

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- ◆ “Ecology of the Night”, Muskoka Heritage Foundation (Canada) <http://www.muskokaheritage.org/ecology-night/scotobiology.asp>
- ◆ Bidwell, Tony. “Scotobiology of Plants”, Conference material for the Dark Sky Symposium held in Muskoka, Canada, September 22 -24, 2003 <http://www.muskokaheritage.org/ecology-night/media/tony-bidwell.pdf>

6. Density Reduction

Key Questions	
Helps avoid or minimize impacts?	<i>Avoid and minimize</i>
Applicable basin-wide or adjacent to resource area?	<i>Adjacent to resource areas</i>
New or amended regulations required?	<i>Codes may need to be amended to allow waivers from minimum density requirements.</i>
Tools to reduce effective impervious area (EIA)?	<i>Yes</i>
Recommended for basin?	<i>Yes, only for properties which include resources.</i>

Description of Methods

Objectives to preserve regionally significant riparian and habitat areas within the urban area may conflict with objectives to achieve minimum densities and avoid expansion of the Urban Growth Boundary (UGB). Minimum density requirements, along with other factors such as escalating land prices and development costs, have had an impact on shrinking residential lot sizes. Minimum density requirements may have also resulted in pressures and impacts on significant riparian and habitat areas inside the UGB. The impact of this issue may increase as many of the remaining developable areas within the UGB have constraints, and it can be a challenge to fit the required number of dwellings on these sites in a manner that is habitat friendly.

Metro’s Functional Plan (Section 3.07.140) states that “a city or county shall not approve a subdivision or development application that will result in a density below the minimum density for the zoning district.” The potential impact of this requirement is off-set by the fact that the Functional Plan (Section 3.07.1010) definition of a “net acre” excludes “... environmentally constrained areas, including any ... natural resource areas protected under statewide planning Goal 5 in the comprehensive plans of cities and counties in the region.... These excluded areas do not include lands for which the local zoning code provides a density bonus or other mechanism which allows the transfer of the allowable density or use to another area or to development elsewhere on the same site...” Similarly, most local ordinances already allow developers to subtract sensitive areas

such as floodplains, Title 3 buffers, and steep slopes from gross acres before calculating required minimum densities.

While many local ordinances offer density bonuses to encourage protection of significant resource areas and to avoid regulatory takings, a waiver from minimum density requirements may be just as attractive to the development community and could facilitate greater protection of resource areas. Minimum density requirements are most commonly an issue for residential development. However, minimum floor area requirements also apply to non-residential development in regional centers, town centers, and station areas. Expectations for minimum floor area ratios and more intensive mixed use development in these areas may be difficult to balance with resource protection and reductions in effective impervious area.

Local ordinances could be further amended to reduce or eliminate minimum residential density and floor area requirements for specific areas or types of resources (such as regionally significant habitat, and Goal 5 resources designated on local comprehensive plans). Potential *maximum* densities or floor area ratios would not be affected.

Benefits and Challenges

- A. Developers (and neighbors) may view waivers to minimum density requirements as a positive tool to avoid and protect significant resource areas.
- B. Combined with protection of the resource area, fewer residential lots or less commercial floor area could also result in reductions in effective impervious area.
- C. Minimum density requirements are an important regional tool to manage the UGB. Metro may be reluctant to allow waivers, or may want to tie them very tightly to protection of regionally significant habitat.
- D. Many individuals, neighborhood groups, or local governments in the region have concerns with or are opposed to minimum density requirements for other reasons (traffic and school congestion, urban design, etc.). If waivers to minimum density requirements are granted for protection of resource areas, there may be pressure to expand the waivers for other situations.
- E. Local governments may be hesitant to encourage the implementation of this approach because of the economic impacts resulting from a decrease in overall development capacity. This issue could be addressed by reallocating the “lost” density back to the jurisdiction or subregion.

Examples and References

All of the jurisdictions in the Basin have adopted ordinance requirements for minimum densities to comply with Title 1 of the Metro Functional Plan. Most jurisdictions have also adopted provisions that allow (1) subtracting Title 3 and Goal 5 natural resource areas from gross acreage before

calculating minimum density requirements; and (2) transferring density from constrained or unbuildable areas to buildable portions of the site.

See the Tigard Code (18.715.020), and the Washington County Code (300-2) for examples of approaches to calculate net density and minimum density requirements.

B. Engineering and Design Approaches

The engineering and design approaches described in this section typically require a more innovative approach to engineering and may require the adoption of new design specifications and public works standards. Amendments to transportation system plans may also be needed. These measures, in particular, will require close cooperation with Clean Water Services stormwater management program and updates of their Design & Construction Standards. Engineering and Design approaches described in this section consider innovative practices that are commonly used, as well as those that may not be as widely known to the public, as possible approaches.

Many jurisdictions throughout the Tualatin Basin currently employ practices that minimize the impacts of street construction and address water quality standards while minimizing maintenance costs. It is common for major road improvement projects to employ a variety of public involvement techniques, including citizen project advisory committees, open houses with the public, and mailers to homeowners in the area to solicit comments on the project design. This input can have a direct impact on landscape and sidewalk design, road alignments, and lighting details. Also, it is common practice for jurisdictions to coordinate road design closely with emergency responders to ensure safety is not compromised.

The clay soils of the Basin have limited the use of some methods. Implementing the engineering and design methods described in this section may require specific monitoring and evaluation on a prototype basis, as well as coordination with Clean Water Services and other local jurisdictions, to determine the short and long-term benefits of using specific approaches within the Basin. The engineering and design approaches considered in this section include the following:

1. Street design
 - o Methods include minimizing paving (reducing street width, length, cul-de-sac radii, using vegetated islands in center), using pervious paving materials, maximizing street tree coverage, using multi-functional open drainage systems in lieu of more conventional curb-and-gutter systems, modifying drainage practices (e.g., allowing sidewalks to drain into yards or adjoining landscape areas rather than to the street system)

2. Stream crossing and street connectivity standards
 - Methods include minimizing the number of stream crossings and placing crossings perpendicular to the stream channel, allowing narrow street right-of-ways through stream corridors, using habitat sensitive bridge and culvert designs

3. Stormwater management facility design
 - Methods include using vegetated stormwater management facilities, such as bioretention cells or rain gardens⁵; detention ponds, underground detention and detention criteria specific to the local stream needs; water quality swales

1. Street Design

Key Questions	
Helps avoid or minimize impacts?	<i>These methods can be used to minimize and avoid impacts.</i>
Applicable basin-wide or adjacent to resource area?	<i>Effective Basin-wide.</i>
New or amended regulations required?	<i>May require transportation system plan and code amendments and amendment to public works/engineering standards. Could be an option for developers, and encouraged for prototype public improvement projects.</i>
Tool to reduce effective impervious area (EIA)?	<i>Yes</i>
Recommended for basin?	<i>Yes; however, use of some methods will be limited by site suitability.</i>

Description of Methods:

The Practice of Low Impact Development (published by the Partnership for Advancing Technology in Housing in July 2003) notes that besides rooftops and driveways, residential streets account for an enormous share of a community's impervious surfaces. Street designs that minimize the amount of paved area by reducing street width, cul-de-sac radii or length, can result in an overall reduction of effective impervious area provided the area saved is not made impervious by development.

⁵ NOTE: these do not qualify as stormwater treatment facilities under CWS' standards.

Narrower roads encourage travel at posted speeds as well as reduce overall impervious area. In addition, the *Regional Transportation Plan (RTP)* Section 6.4.5 already requires that street design code language and guidelines allow for consideration of narrow street design alternatives (for local streets, no more than 46 feet of total right-of-way, including pavement widths of no more than 28 feet, curb-face to curb-face, sidewalk widths of at least 5 feet and landscaped pedestrian buffer strips that include street trees).⁶ However, because reduced street widths can create issues for emergency vehicle access, especially where on-street parking is allowed, implementation of narrow street standards will require additional review and concurrence by the Fire Marshall.⁷

Limiting street length is more difficult to address than street width as streets lengths are typically a matter of connectivity. However, for residential subdivisions, jurisdictions may be causing streets to be unnecessarily long by establishing large minimum frontage requirements. Further, the size of intersections could be reduced by allowing tighter turning radii. Reductions in the size of cul-de-sac radii are often precluded by the need to maneuver emergency and maintenance vehicles; however, jurisdictions could encourage the use vegetated islands in the center of cul-de-sacs or intersections.

According to an *APA PAS Memo* on low impact development, the Puget Sound Action Team, a government partnership charged with developing conservation programs to protect Washington State's Puget Sound, recommends several ways to reduce the length and amount of roadways:

- Lengthen street blocks to reduce the number of cross streets for grid or modified grid layouts.
- Provide pedestrian paths to connect the end of a cul-de-sac with other pathways, roads, or open spaces.
- Create pedestrian routes to neighborhood destinations that are direct, safe, and aesthetically pleasing.
- Narrow lot frontages and cluster homes to reduce the need for more roads.

These concepts are already being used in Washington County and other local Tualatin Basin jurisdictions to reduce the length and amount of roadways.

⁶ *The city of Beaverton currently allows a minimum 22 foot local street design and has noted a variety of issues and problems resulting from streets built to this standard. One key example cited by the city is that garbage haulers cannot use automated pick-up equipment in the narrow right-of-way. Washington County has a 24 foot minimum local street design standard and has also experienced a variety of problems. The Fire Marshall has recommended that these minimums be increased. [Source: Washington County Transportation Engineering]*

⁷ *Washington County Transportation Engineering notes that the existing standards have been closely coordinated with the State and local Fire Marshall and represent the minimum widths currently allowed. These standards are reviewed periodically with the Fire Marshall and may be revised in light of experience and practice.*

Pervious pavement allows stormwater to pass through it. While not recommended for high traffic areas, pervious paving materials could be used in low traffic areas within the public right-of-way, such as parking strips, shoulders, and sidewalks. However, local soil conditions and federal underground injection control (UIC) regulations may limit where pervious pavement may be successfully used in the Tualatin Basin. The stormwater impact of the street system could potentially be further mitigated by maximizing the use of street trees. Street trees may be able to help with runoff reduction and detention, conveyance attenuation, and water quality improvement. The use of multi-functional open drainage systems (e.g., swales or linear basins), as well as the modification of drainage standards for the movement of surface water (e.g., allow sidewalks to drain into yards or adjoining landscape areas rather than to the street system), can be used in lieu of, or in addition to, more conventional curb-and-gutter systems.

Benefits and Challenges:

- A. Narrower street widths will only result in a decrease in EIA if the extra width is used to provide landscaping or other pervious area. The *Stormwater/Pavement Impacts Reduction (SPIR) Project Report* recommends that street cross-sections be amended to conform to Metro's *Green Streets* and *Creating Livable Streets* design guidelines. To the extent that these cross-sections may be narrower than those within adopted transportation system plans, amending the cross-sections (especially where on-street parking is allowed) will require further discussions with public service providers to resolve accessibility issues for larger vehicles (fire trucks, street sweepers, garbage & recycling trucks, etc.).
- B. Longer blocks may result in an increase in out-of-direction travel and congestion (see discussion of street connectivity in the next section).
- C. Locating linear swales within the planting area between the sidewalk and the travel may have significant maintenance costs and affect pollutant load (e.g., increased pollutant loading from pet waste). CWS, as the stormwater management authority in the Basin, sets maintenance roles and responsibilities. However, adjacent property owners are traditionally responsible for maintaining the planting areas between the sidewalk and travel lane. Managing stormwater in the planting area creates a utility function within the planting area and may lead to conflicts with regard to maintenance responsibility and the increased costs. Ensuring long term stormwater function and maintenance has been a major challenge on private properties and it may not be feasible to transfer public runoff responsibility to private frontage owners.
- D. Structural design solutions such as infiltration trenches and basins and vegetated swales require regular inspection and maintenance. Because most public works departments are set up to maintain existing traditional systems, they may not currently have the staff or equipment

required for this maintenance.⁸ While these methods may result in a net cost-savings within the Basin, public works departments may experience a cost increase, at least in the short-term. For example, Metro's 2001 cost comparison for a regional boulevard estimated landscape/maintenance as follows: \$6,950 for a standard street (based on Washington County standards) vs. \$264,583 for a Metro Green Street Boulevard.

- E. The use of methods that rely on the infiltration of stormwater will be limited to those areas of the Tualatin Basin with suitable soils and ground water levels.⁹
- F. Potentially underground injection control (UIC) rules may restrict the infiltration of road runoff in areas which utilize underground storage of drinking water.

Examples/References:

CWS Merlo Road Field Operations Facility

The access road to the Field Operations Facility is a "green" street with no curb and gutter on the south side of the street. Vegetated swales planted with native trees and shrubs replace traditional catch basins and conveyance pipes. Stormwater is absorbed into the soil and plant roots instead of being concentrated and directed to a storm drain, stream or wetland. Green streets treat stormwater within the right of way, while providing maximum tree canopy to intercept rainfall and to cool road surfaces. There were no extra costs for this access road, compared to a standard street development. Swales replaced traditional catch basins and underground pipes, which reduced costs and minimized potential sediment impacts during construction. However, one study of construction costs found a "green" boulevard was 22 percent more costly than a conventional boulevard. The 2002 study was conducted by Metro regional government, comparing costs in Washington County, Oregon. Still, stormwater credits may be available to offset extra costs.

[Source: Clean Water Services, "Slow the Flow! Designing the Built Environment to Protect Urban Environments" brochure]

Street Edge Alternatives (SEA) projects

Seattle's public utilities and transportation departments are experimenting with LID design elements in their Street Edge Alternatives (SEA) projects. By modifying circulation design, SEA Streets significantly improved stormwater management: the initial project to retrofit a 660-foot long residential street has resulted in a 98 percent reduction in stormwater runoff over the past

⁸ Washington County Transportation Engineering staff notes that open drainage systems have been monitored and found to greatly increase stormwater maintenance costs for trash patrol. There are also issues regarding potential increases in fecal coliform pollution due to pet waste.

⁹ A review of the SCS (NRCS) Soil Survey of Washington County - Table 8 - show all soils except three to be listed with "restrictive soil features" which preclude infiltration including one or more of the following: "wetness, too clayey, or severe slopes." One soil that is not so restricted is the "Briedwell" series soil located in T.2S., R.1W., section 13 - in Tualatin/ Durham area. The other two, Hillsboro and Willamette soils, are listed as

three years. The project was initiated to control heavily polluted stormwater that ran off impervious road surfaces, adversely affecting the area's creeks and wildlife. To minimize these impacts, more than 100 evergreen trees and 1,100 shrubs were planted, the road width was reduced from more than 20 feet (plus space for angled parking) to 14 feet, and grassed swales and two feet of grass shoulder were added next to the curb-free roads. The amount of parking was determined by each owner, and parallel and angle parking was grouped between swales and driveways. Sidewalks were installed on only one side of the road, which was considered adequate for residential communities.

[Source: APA PAS MEMO, Low Impact Development: An Alternative Approach to Site Design]

References:

- ◆ Clean Water Services, "Slow the Flow! Designing the Built Environment to Protect Urban Environments" brochure
<http://www.cleanwaterservices.org/content/documents/Permit/Slow%20the%20Flow%20brochure.pdf>
- ◆ Creating Livable Streets: Street Design Guidelines for 2040, 2nd edition. Metro, June 2002.
- ◆ Green Streets: Innovative Solutions for Stormwater and Stream Crossings, 1st edition. Metro, June 2002.
- ◆ Low Impact Development: An Alternative Approach to Site Design. APA PAS MEMO, Asa Foss, May/June 2005
- ◆ The Practice of Low Impact Development. US Department of Housing and Urban Development, Office of Policy Development and Research, Contract No. H-21314CA, July 2003.
- ◆ Review of Low Impact Development Techniques. CH2MHILL on behalf of the Puget Sound Action Team., January 2004.
- ◆ Stormwater/Pavement Impacts Reduction (SPIR) Project Report, Audubon Society of Portland, 2004.

2. Stream Crossing and Street Connectivity Standards

Key Questions	
Helps avoid or minimize impacts?	<i>Primarily used to avoid impacts.</i>
Applicable basin-wide or adjacent to resource area?	<i>Primarily adjacent to resources.</i>
New or amended regulations required?	<i>Amendments may be required, but will not increase requirements for private development.</i>
Tool to reduce effective impervious area (EIA)?	<i>No</i>
Recommended for basin?	<i>Yes</i>

Description of Method:

Stream crossings can have a significant impact on in-stream water flow as well impacts on the adjacent riparian area. They can also impede the travel patterns of fish and wildlife. Typically, bridges have fewer in-stream impacts than culverts. CWS's *Healthy Stream Plan* found that "in the urban portion of the Tualatin Basin most bridges "... are adequately sized to convey significant flood flows, and allow for fish passage. Conversely, culverts ... are often undersized for significant flood flows, frequently alter the geomorphic condition of the stream, and limit fish passage." Stream crossing can also affect other wildlife by interrupting a pathway. When the crossing interrupts a terrestrial pathway, properly located fencing and natural landscaping can help guide animals around or through these areas.

Improving stream crossing within the Basin has been an on-going effort. Basin jurisdictions have constructed stream crossings to fish- and wildlife-friendly standards for more than 20 years. With State and Federal resource agencies as participants, each project is reviewed, designed and constructed with fish and wildlife benefits as a project feature. While many older culverts do impede fish and wildlife, these are being identified and corrected in a coordinated and systematic manner by the jurisdictions under the Healthy Streams Plan. In addition, culvert construction within the upper portions of the watershed allows for detention facilities that can offset the impacts of existing and proposed development and that help to restore stream geomorphology to a pre-development condition.

Street connectivity standards can also impact riparian and habitat areas. According to an *APA PAS Memo* on low impact development, depending on the density, location, and type of development, a hybrid street network that combines a conventional grid with a curvilinear system can reduce the amount of total roadways while still allowing for smooth traffic circulation. Most jurisdictions in the

Basin have adopted street connectivity standards that emphasize transportation functionality, but which also recognize barriers to connectivity, such as natural resource areas.

The *Regional Transportation Plan (RTP)* establishes the following standards for street connectivity within the region. As highlighted in bold below (emphasis added), the RTP design standards include some exceptions for stream crossings; however, exceptions for other habitat impacts are not provided (e.g., avoidance of upland habitat areas).

Section 6.4.5 Design Standards for Street Connectivity

2. In addition to preparing the above conceptual street plan map, cities and counties shall require new residential or mixed-use development involving construction of new street(s) to provide a site plan that reflects the following:

a. Street connections:

- *Responds to and expands on the conceptual street plan map as described in Section 6.4.5(1) for areas where a map has been completed.*
- *Provides full street connections with spacing of no more than 530 feet between connections except where prevented by barriers such as topography, railroads, freeways, pre-existing development, or where lease provisions, easements, covenants or other restrictions existing prior to May 1, 1995, which preclude street connections.*
- *Where streets must **cross water features** identified in Title 3 of the Urban Growth Management Functional Plan (UGMFP), provide crossings at an average spacing of 800 to 1,200 feet, **unless habitat quality** or length of crossing prevents a full street connection.*

b. Accessways:

- *When full street connections are not possible provides bike and pedestrian accessways on public easements or rights-of-way in lieu of streets. Spacing of accessways between full street connections shall be no more than 330 feet except where prevented by barriers such as topography, railroads, freeways, pre-existing development, or where lease provisions, easements, covenants or other restrictions existing prior to May 1, 1995 which preclude accessway connections.*
- *Bike and pedestrian accessways that **cross water features** identified in Title 3 of the UGMFP should have an average spacing no more than 530 feet, **unless habitat quality** or length of crossing prevents a connection.*

*c. Centers, main streets and station communities: Where full street connections **over water features** identified in Title 3 of the UGMFP cannot be constructed in centers, main streets and station communities (including direct connections from adjacent neighborhoods), or spacing of full street crossings exceeds 1,200 feet, provide bicycle and pedestrian crossings at an average spacing of 530 feet, **unless exceptional habitat quality** or length of crossing prevents a connection.*

d. Other considerations:

- *Limits the use of cul-de-sac designs and other closed-end street systems to situations where barriers prevent full street extensions.*
- *Includes no closed-end street longer than 200 feet or with more than 25 dwelling units.*
- *Includes street cross-sections demonstrating dimensions of right-of-way improvements, with streets designed for posted or expected speed limits.*

- *For replacement or new construction of local street crossings on streams identified in Title 3 of the Urban Growth Management Functional Plan, Cities and Counties, TriMet, ODOT and the Port of Portland shall amend design codes, standards and plans to **allow consideration of the stream crossing design guidelines contained in the Green Streets handbook**.*

As noted above, the RTP includes a cross reference to the stream crossing design guidelines in the *Green Streets* handbook. Fewer street connections could reduce the overall amount of EIA within the Basin; however, by shifting traffic to fewer through streets, more travel lanes could be needed on the through-streets and therefore could be a potential increase in out-of-direction travel.

Benefits and Challenges:

- A. Additional analysis of existing stream crossing may be needed. The analysis conducted for the Healthy Stream Plan, which was limited in terms of time, budget and jurisdiction, represents only a portion of the total number of structures.
- B. Improvements to existing culverts are expensive. Based on a study of 1,200 culverts and bridges, the Healthy Stream Plan has identified 383 culverts in the Basin as priorities for improvement.¹⁰
- C. Providing a high level of street connectivity has a number of transportation benefits, but these benefits must be balanced with the environmental impacts of providing a connection.
- D. Amendments to transportation system plans to modify or reduce proposed stream crossings may impact regional transportation systems.
- E. Local FEMA floodplain jurisdictions must continue to require engineering hydraulic analysis of all culvert work.

Examples/References:

The County and local jurisdictions have constructed control structures on culverts to provide flow control. State and Federal permitting agencies agree that the “stream-forming” flows are approximately the two-year flow. Detaining storm flows behind these culverts for the developed basin to be released at the undeveloped 2-year flow mitigates stream impacts from existing and proposed development. Opportunities also exist to restrict large event flows with these same structures to provide flood control in the basin. CWS is now studying several sub-basins to optimize this program. The culvert control structures do not restrict local resident fish and wildlife

¹⁰ This preliminary study was the beginning of detailed culvert-by-culvert evaluation by the County, Clean Water Services (CWS), and the Tualatin Basin cities. Jurisdictions have included culvert projects in their adopted capital improvement project lists and have corrected many culverts. CWS maintains a detailed database and meets regularly with the jurisdictions to coordinate corrective projects. Many culverts in the preliminary study were subsequently removed from the barrier list. As of January 2006, progress on improvements to culverts continues throughout the Basin. [Source: Washington County Transportation Engineering]

during normal flows. Costs are little more than a standard culvert installation. Maintenance is not increased over the standard installation because these are located in public right-of-way or public easements: long-term operation and effective function is assured. Future modifications to the control structures can be easily completed when needed to address changes in technology, development impacts, or downstream goals. *[Source: Washington County Transportation Engineering]*

References

- ◆ Green Streets: Innovative Solutions for Stormwater and Stream Crossings, 1st edition. Metro, June 2002.
- ◆ Healthy Streams Plan, Clean Water Services, June 2005.
- ◆ Regional Transportation Plan, Metro.

3. Stormwater Management Facility Design

Key Questions	
Helps avoid or minimize impacts?	<i>Minimize</i>
Applicable basin-wide or adjacent to resource area?	<i>Applicable basin-wide.</i>
New or amended regulations required?	<i>Yes</i>
Tool to reduce effective impervious area (EIA)?	<i>Yes. Subject to UBC, Plumbing Code and local drainage conditions.</i>
Recommended for basin?	<i>Yes; however, use of some methods will be limited by site suitability.</i>

Description of Method:

The *Healthy Streams Plan* found that stormwater was a key factor in stream health and that the management of stormwater quality and quantity influences the ability of a stream to absorb changes in water quality and hydrology. The Plan includes stormwater policy and program refinements for the Basin. It recommends the development and evaluation of a policy that requires “cleaner” runoff from sidewalks, patios, and certain rooftops be retained and infiltrated into the ground where practical. The evaluation would consider soils, long-term effectiveness, maintenance responsibility and cost, as well as other factors. Based on the evaluation of the methods standards and stormwater quantity mitigation credits for effective impervious area, reduction techniques would be developed. These methods could offer several habitat benefits, including preserving existing resource areas and improving water quality (i.e., fish habitat). In addition, local jurisdictions in the Basin can continue to further augment the habitat benefits of the CWS’s *Design & Construction (D&C)* standards by, for

example, requiring the incorporation of minimum percentages of native plant species within vegetated stormwater facilities.

According to *The Practice of Low Impact Development*, in addition to protecting the environment, when correctly planned for and accommodated, stormwater management systems can satisfy regulatory requirements, act as desirable site design elements, and reduce infrastructure costs.

Stormwater treatment can be designed to mimic pre-development hydrologic conditions (particularly for smaller, more frequent storms¹¹) through the use of a variety of structural and nonstructural

practices that detain, retain, percolate, and evaporate storm water. Alternatives to conventional stormwater systems include infiltration systems such as rain gardens or bioretention areas. These are shallow, topographic depressions filled with engineered soils and vegetation that retain, treat, and infiltrate water. They are commonly located in parking lot islands or within small pockets in residential land uses. Bioretention systems are designed for the temporary storage of rainwater.

They provide an opportunity for the water to have increased contact time with soils and plant



Examples of bioretention in parking lot



Illustration of a rain garden

materials, allowing for the natural systems to filter pollutants and permitting the processes of infiltration, evaporation, and transpiration to occur. They can be used as a buffer to shoreline areas to capture runoff from the home landscape before it enters a lake, pond, or river. Jurisdictions in the Tualatin Basin, in cooperation with CWS, have approved construction of many of these facilities. However, performance is not well documented for this area and these soils and long term evaluations of effectiveness and costs are needed.

Filtering systems, such as “Filter Strips,” use soils and vegetation to remove pollutants from stormwater for pre-treatment. Filter strips are low-grade vegetated areas that permit sediment to be deposited. Alternative conveyance systems, such as vegetated channels or swales, slow the speed of stormwater and filter pollutants before treatment.¹²

¹¹ Bioretention systems may be better suited to accommodate small storm events. Larger storm events may still require some degree of conventional piping and detention systems in addition to low-impact development methods. [Source: Washington County Transportation Engineering]

¹² Filtering systems, such as cartridge filter systems, use filter media cartridges in vaults or above ground systems to filter pollutants out of stormwater. While these systems require yearly maintenance, they require

Benefits and Challenges:

- A. Low impact development storm water management systems can reduce development costs through the reduction or elimination of conventional storm water conveyance and collection system. However, larger storms may exceed those systems' capacity due to the Tualatin Basin's climate and soils.
- B. LID systems can reduce the need for paving, curb and gutter, piping, inlet structures, and storm water ponds by treating water at its source. However, installation and maintenance costs may be greater than the costs associated with other methods such as piping. Further evaluation of LID systems is needed to verify long-term effectiveness.
- C. LID practices remove pollutants from storm water naturally and may help restore a site's pre-development hydrology. Certain practices can help recharge local groundwater tables, reduce domestic water use for lawns and vegetation, and provide habitat for a variety of species.
- D. UBC and Plumbing code requirements, as well as local soil conditions, groundwater, adjacent development, future utility construction, and slope stability may limit or prohibit the application of alternative drainage features and designs.
- E. Inadequate or poorly maintained systems may fail to perform and may negatively impact adjacent properties. Standards for the construction and maintenance of stormwater management facilities are needed to ensure their effectiveness. An evaluation of existing LID systems within the basin and their effectiveness is the logical first step prior to development of new standards.

Examples/References:

Clean Water Services Merlo Road Field Operations Facility

Vegetated swales, biofiltration, and "softscaping" at the site was designed to mimic a natural landscape and manage stormwater runoff on site. Instead of underground pipes, catch basins and large detention ponds, there is an integrated system of vegetated swales. Planted with trees, shrubs and herbaceous perennials, the swales provide the stormwater conveyance system. This biofiltration system disperses stormwater on site, controls the rate and volume of runoff, and improves water quality.

All landscaped areas were designed to retain as much rainfall as possible and drain their runoff to swales. Even the runoff from the traditional parking lots flows to swales. The adjacent Nature

little or no added right-of-way. Construction costs can be slightly more than swales. Maintenance costs are predictable and manageable to budget. Testing and monitoring are easily provided. Within road rights-of-way, road projects have, in the past, constructed underground detention vault systems. These have been designed as necessary to release runoff from impervious surfaces as a designed controlled rate. These are easily maintained and not affected by future utility construction, which would destroy porous

Park is protected by a 50-foot wide by 600-foot long water quality swale that runs the downstream length of the site. Dispersing stormwater runoff at its source is especially suited for the rainfall patterns here in the Pacific Northwest, where nearly 90 percent of all 24-hour rainfall events are less than 1/2 inch. These small events are easily managed with “softscaping” or biofiltration landscaping that absorbs rain, recharges groundwater, reduces winter runoff and virtually eliminates summer runoff.

In contrast, typical pipe conveyance systems concentrate and accelerate flows creating artificially high peaks and volumes that negatively impact stream hydrology and aquatic habitat. Warm weather rains can increase water temperature, especially when runoff courses over hot pavement and roofs. Warm water temperatures lower the available oxygen for aquatic organisms, critical for healthy streams and wetlands. Piped systems rush rain downstream, disrupting the natural process of replenishing groundwater.

The facility’s vegetated conveyance swales were designed as major or minor, with 2:1 or 3:1 slopes respectively. The depth and width of the swales vary by location. All swales were lined with 6-inches of topsoil, jute mat and a 3-inch layer of 2-inch to 3/4-inch river run rock.



[Source: CWS Slow the Flow ! Designing the Built Environment to Protect Urban Environments brochure]

References

- ◆ The Practice of Low Impact Development. US Department of Housing and Urban Development, Office of Policy Development and Research, Contract No. H-21314CA, July 2003.
- ◆ Low Impact Development: An Alternative Approach to Site Design. APA PAS MEMO, Asa Foss, May/June 2005.

pavements or infiltration systems. These continue to be an excellent and cost-effective option where needed. [Source: Washington County Transportation Engineering]

- ◆ Lower Phalen Creek Project, St. Paul, Minnesota
http://www.mepartnership.org/sites/LOWERPHALENCREEK/sub_page7.asp

D. Building Design Solutions

Key Questions	
Helps avoid or minimize impacts?	<i>Minimize</i>
Applicable basin-wide or adjacent to resource area?	<i>Applicable basin-wide</i>
New or amended regulations required?	<i>Some codes may have to be amended, or new guidelines drafted, to ensure proper placement of disconnected downspouts. Codes may have to be amended to allow green roofs as an element of new development or redevelopment and to account for the structural requirements necessary to support green roofs.</i>
Tools to reduce effective impervious area (EIA)?	<i>Yes. May be subject to UBC, Plumbing Code and local drainage conditions.</i>
Recommended for basin?	<i>Yes; however, seismic design and the health concerns of moisture within the building (mold) require careful evaluation.</i>

Description of Method

Incorporating certain elements into the design of new buildings and retrofitting existing buildings can minimize the amount of stormwater runoff leaving a property or site. Elements that can be incorporated into building and landscaping designs that reduce or detain runoff include green roofs, disconnecting downspouts, and rain barrel detention. There are several examples of this approach constructed and operating in Basin.

Green roofs, also known as *vegetated roof covers* or *eco-roofs*, are thin layers of living vegetation installed on top of conventional flat or sloping roofs. Potential benefits associated with green roofs include

Brewery Blocks - Block 4 – from BES slide show
 “Portland Ecoroof Tours”



Photograph-GBD Architects

controlling storm water runoff, improving water quality, mitigating urban heat-island effects, and creating wildlife habitat. Green roofs may be appropriate as an addition to many types of buildings, including commercial, industrial, institutional, and residential settings. They are particularly effective at controlling runoff on the large roofs typical of commercial and institutional buildings.

Green roofs reduce the amount of stormwater runoff and also delay the time at which runoff occurs, resulting in decreased stress on sewer systems at peak flow periods. Water is stored by the substrate of the green roof and then taken up by the plants, where the water is returned to the atmosphere through transpiration and evaporation. In summer, depending on the plants and depth of growing medium, green roofs retain 70-90% of the precipitation that falls on them; in winter they retain between 25-40%. Because flows from larger storms or longer duration storms will not be fully retained, other systems will likely also be needed.

Green roofs can be designed to achieve specified levels of storm water runoff control, including reductions in both total annual runoff volume (reductions of 50-60% are common) and peak runoff rates for storms. By reducing both the volume and the rate of storm water runoff, green roofs benefit cities with combined sewer overflow (CSO) impacts. Green roofs not only retain the rainwater, but also moderate the temperature of the water and act as natural filters for any of the water that happens to run off. In addition, in urban areas, up to 30% of total nitrogen and total phosphorus released into receiving streams is derived from dust that accumulates on rooftops. Acting as natural bio-filtration devices, green roofs reduce this water contamination. However, to survive the long, dry summers, existing green roofs in Washington County are maintained through irrigation.

Clean Water Services Merlo Road Field Operations Facility from the *Slow the Flow!* brochure

The 8,000 square foot green roof system at Clean Water Services Merlo Road Field Operations Facility has drought-resistant plants that absorb rainfall and help insulate the building. Nearly all rain is expected to be retained in warm, dry months. Nearly 80 percent of water is expected to be returned to the atmosphere through evapotranspiration, which will cool the roof and the surrounding air.



Disconnecting downspouts from the

stormwater system is another way to manage stormwater runoff. Reducing the volume of runoff being diverted directly into municipal storm systems is of primary importance to those jurisdictions with a combined sewer/stormwater system. Disconnecting downspouts from this system reduces pressure on combination sewer system and helps prevent overflows into streams and rivers. This is the case with the city of Portland, who provides grants and materials to neighborhood associations and other volunteer groups that donate time disconnecting downspouts for interested property owners.¹³

While the Tualatin Basin does not have this type of combined system, allowing stormwater to be absorbed or detained on site instead of being conveyed to a piped system could still play a role in reducing storm water volumes where local conditions support these applications. According to Washington County Transportation Engineering, disconnecting downspouts in some locations in the County has led to flooded crawlspaces. This is a health and safety concern due to mold infestation. The plumbing code requires positive crawlspace drainage, but older homes may not have the required safety system in place.

Another way of dealing with localized stormwater runoff is through a rain barrel or cistern system. This type of rainwater collection system stores rooftop runoff to be used later for activities such as lawn and garden watering, car washing, and window cleaning. A cistern functions similarly to a rain barrel, but has a much greater storage capacity and, in addition to rainwater collection, can be used to filter the water for a wider range of domestic uses. Over the rainy season, even a small roof has the potential to capture enormous amounts of water that otherwise flows down the drain. For example, a typical residence in Portland (36 inches of rain per year) with a 2,000 square foot roof collection area will result in around 35,000 gallons of water captured per year, an average of almost 100 gallons per day.

Rainwater collection and reuse is beneficial to the environment because the stored water would otherwise run off into the storm sewers, bringing pollutants such as oil and grease, bacteria, and nutrients with it. The more rainwater that is reused, the less need there is to chlorinate or chemically treat it before reusing or releasing it back into the watershed. Rainwater harvesting, or capturing rain and storing it for later use, also results in less water use and lower water bills.

Other sustainable or “green” building practices have an indirect benefit on watersheds and habitat areas. Providing efficient landscape irrigation and systems that utilize “low-flow” fixtures to minimize water usage can reduce the impact new development has on the ecosystem.

¹³ NOTE: Depending on specific locations, soils in the Tualatin Basin may not be as suitable for this approach as those in the City of Portland. Also, the City of Portland has building and plumbing codes that

Many of these sustainable practices have been incorporated into building practices associated with the US Green Building Council's national LEED™ (Leadership in Energy and Environmental Design) certification. Portland has developed the country's first supplemental guide to the LEED™ standards. Portland's green building incentive program includes a series of pre-approved innovation credits that reflect the City's goals for mixed use development, construction waste management, alternative transportation, and stormwater management. This program has also centralized local building and zoning code regulations and relevant green building resources into a resource guide for Portland-area development professionals.

Benefits and Challenges

- A. Detaining stormwater runoff on site through the use of disconnected downspouts or rain barrels can be accomplished relatively easily and at a low cost. In some cases, these solutions can be easily integrated into site design for new developments, as well as installed by property owners of existing homes/buildings. Careful design and construction is important in order to avoid flooding crawlspaces or impacting adjacent properties.
- B. Not all areas are suitable candidates for retaining stormwater on site. It is not advisable to encourage disconnecting from the stormwater system in areas that have poor soil percolation or a high water table.
- C. Rain water collection systems (e.g., rain barrels) can freeze and degrade with age, they may require pumps and filter which will need maintenance and care needs to be taken to restrict access from children.
- D. Development guidelines or revisions to building codes may be necessary to regulate onsite stormwater conveyance in a manner that does not damage property or pose a threat to neighboring sites.
- E. Development guidelines or revisions to building codes may be necessary to ensure structures are strong enough to support proposed green roofs.¹⁴ To construct a green roof on an existing building may require minor or possibly extensive structural upgrades to meet local seismic requirements. Evaluate existing green roofs to verify loading assumptions currently employed and draft or update development guidelines as appropriate.
- F. Green roofs are expensive. The initial cost of a green roof can be 30% greater than a conventional roof, despite the fact that long term maintenance (green rooftops prolong the life

allow a degree of flexibility in implementing LID techniques.

¹⁴ From "Extensive Green Roofs" (see "Examples/References"): In the United States, green roof designs are generally regulated using existing standards for ballasted roofs. The International Code Council (ICC) code, formerly the BOCA code, used for guidance by many municipal authorities, recognizes roof gardens. It requires that the 'wet weight' of the green roof be treated as an additional dead load. It also supplies live load requirements for maintenance-related foot traffic and for regulated pedestrian access. One limitation of the ICC standards is that it does not specify the testing methods to be used in satisfying the code.

of a conventional roof) and energy cost savings can offset this cost increase to some degree. Market fluctuations in the cost of building materials can also be a disincentive to building structures that can support green roofs.

- G. The challenge is to explain the costs and benefits, both in financial terms and relating to the environment, of these typically non-traditional building design elements. Education is the key to garnering public acceptance, excitement, and action. Education must include the long-term maintenance requirements.

Resources

- ◆ Miller, P.E., Charlie. "Extensive Green Roofs", Roofscapes, Inc., Whole Building Design <http://www.wbdg.org/design/greenroofs.php>
- ◆ Green Roofs for Healthy Cities <http://www.greenroofs.net/index.php>
- ◆ <http://www.greenroofs.com>
- ◆ "Skills for Protecting Your Stream: Retrofitting Your Own Backyard", Center for Watershed Protection, April 2002
http://www.cwp.org/Community_Watersheds/educating_constituents.htm
- ◆ City of Portland Green Building Resource <http://www.green-rated.org/default.asp>
- ◆ City of Portland, Bureau of Environmental Services, Portland Ecoroof Tours, <http://www.portlandonline.com/shared/cfm/image.cfm?id=53988>
- ◆ King, Jason, ASLA, LEED AP, "Working With Water: Innovative Design Approaches for Stormwater Management", January 3, 2006, , Macdonald Environmental Planning, p.c.
http://www.edcmag.com/CDA/Articles/Feature_Article/e79855c9ff298010VgnVCM100000f932a8c0
- ◆ Portland Office of Neighborhood Involvement
<http://www.portlandonline.com/oni/index.cfm?c=28992>
- ◆ Clean Water Services, "Slow the Flow! Designing the Built Environment to Protect Urban Environments" brochure
<http://www.cleanwaterservices.org/content/documents/Permit/Slow%20the%20Flow%20brochure.pdf>

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CHAPTER 3: IMPLEMENTATION RECOMMENDATIONS

Chapter 3 identifies code concepts that could be included in local comprehensive plans and development codes in order to implement and encourage those habitat friendly practices described in Chapter 2 that are recommended for the Basin. These concepts include addressing typical barriers to habitat friendly development, as well as those that may preclude the implementation of low impact development techniques being considered by Clean Water Services (CWS) as acceptable methods of on-site stormwater management.

Fully implementing the recommended approaches and methods outlined in Chapter 2 raises significant policy issues. For example, allowing density transfer by right may facilitate resource protection, but may upset neighboring property owners and lessen public involvement (in a sense, creating a conflict between Statewide Planning Goal 1 and Goal 5). Resolving these issues will require policy “trade-offs.” The implementation discussion in this chapter is meant to identify those provisions that facilitate and encourage the use of habitat-friendly development practices for the benefit of Goal 5 resources. In considering these implementation concepts, each of the Basin jurisdictions has determined which trade-offs it finds appropriate; these are addressed in Chapter 4.

As previously described in Chapter 2, some of the approaches and methods that can be used to encourage habitat friendly development could be effective anywhere within the basin (*including within or adjacent to habitat areas*); others are only recommended for areas within or adjacent to habitat areas. This distinction becomes particularly important in terms of implementation. In some cases, a method may be effective in both situations. For example, reducing parking space requirements basin-wide may help reduce Effective Impervious Area (EIA), if the “saved” area is used for landscaping or to retain existing vegetation. Alternatively, if the concept were only applied on a more limited basis to those sites which contain Goal 5 resources, it could help create the flexibility needed to protect the resource while allowing development of the site.

In addition, some of the approaches and methods described in Chapter 2 will have limited applicability in the Basin due to soil conditions. As noted previously, a review of the SCS (NRCS) *Soil Survey of Washington County - Table 8* shows all but three soils types in the Basin to be listed with “restrictive soil features”. These soils are not necessarily impervious, but may be very slow draining. Those approaches and methods which are listed as “soil limited” will require soil amendments or other engineering solutions to offset the permeability issue when located on these soils. Finally, full implementation of some methods is dependent on adoption of technical design specifications. CWS has developed, or will be developing, technical specifications for some approaches. In other cases,

the input of the Basin jurisdictions' building officials or engineers will be required. Metro may also be able to assist in the development of technical design specifications.

The table below summarizes the approaches and methods recommended in Chapter 2 and notes whether they are applicable basin-wide or only on sites that include habitat. In addition, the table notes whether they are limited or constrained in applicability by soil conditions. It also identifies those methods that will require technical specifications to be developed in order to be fully implemented.

Table 3-1: Applicability of Approaches and Methods from Chapter 2

Approaches and Methods from Issue Paper #1	Sites w/ Habitat	Basin- Wide	Soil Limited	Design Specs
Planning and development approaches				
<i>1) Land Division Design</i>				
o Clustering/lot size averaging, on-site density transfers	X			
<i>2) Site Design</i>				
o Increased flexibility for setbacks	X			
o Increased flexibility for lot coverage	X			
o Increased flexibility for building heights	X	x*		
<i>3) Parking Design</i>				
o Reduced parking ratios	X	x*		
o Shared driveways and parking areas		X		
o Flexibility in parking lot landscaping / Additional parking lot landscaping	X			
o Smaller car spaces and stall dimensions	X	x*		
o Increased use of pervious materials		X	X	X
<i>4) Landscaping/Hardscape Design</i>				
o Locating landscaping adjacent to habitat areas	X			
o Increased use of native plant	X	X		
o Improved soil amendment		X		X
o Reduction of non-ADA sidewalks within a site	X	x*		
o Increased use of habitat-friendly fencing	X			
o Preservation of existing trees and maximize forest canopy	X	X		
<i>5) Lighting Design</i>				
o Re-directed outdoor lighting, reducing light spill-off	X			
<i>6) Density Reduction for Regionally Significant Habitat</i>				

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Approaches and Methods from Issue Paper #1	Sites w/ Habitat	Basin- Wide	Soil Limited	Design Specs
o Modified definition of net buildable areas	X			
o Reduced minimum buildable lot sizes	X			
Engineering and Design Approaches				
<i>1) Street design</i>				
o Minimize paving	X	x*		
o Use pervious paving materials		X	X	X
o Maximize street tree usage		X		
o Use multi-functional open drainage systems / modify drainage practices		X	X	X
<i>2) Stream crossing and street connectivity standards</i>				
o Minimize the number of stream crossings/place crossings perpendicular	X	x		X
o Allow narrow paved widths through stream corridors	X	x		
o Use habitat sensitive bridge and culvert designs	X	x		X
<i>3) Stormwater management facility design</i>				
o Use vegetated stormwater management facilities		X	X	X
o Use detention ponds		X		X
o Use of underground detention and/or treatment		X		X
Building Design Solutions				
o Encourage Green roofs (eco-roofs)		X		X
o Disconnect downspouts		X	X	X
o Use rain barrel or cistern system		X		X
* The encouragement of these methods basin-wide, above and beyond current practices, may not be practicable or may have conflicts with other policy considerations. The primary recommendation is for consideration within or adjacent to habitat areas at this time.				

A. Implementation Recommendations for Development Sites with Habitat

1. Encouragement through Flexibility

Pursuant to the intergovernmental agreement with Metro, Basin jurisdictions must adopt provisions that facilitate and encourage the use of habitat-friendly development practices, where technically feasible and appropriate, in all areas identified as Class I and II riparian habitat areas. Jurisdictions may also choose to encourage habitat-friendly development practices in other habitat areas including Class III riparian areas and Class A uplands. For development sites that include Class I and II riparian habitat areas (and other habitat types), providing increased flexibility in the development

standards for projects that use habitat-friendly development techniques is one way of facilitating and encouraging habitat protection.

As proposed, the approach is intended to convey a benefit to the developer in exchange for the use of habitat-friendly development practices. It is not intended to increase development restrictions. Use of the standards would be at the option of the developer/property owner.

2. Defining Habitat Areas

The general location of Habitat Benefit Areas is indicated on Metro's Regionally Significant Fish and Wildlife Habitat Inventory Map (or Habitat Conservation Areas Map), and Basin jurisdictions may wish to include a reference to the map as a source document. However, the standards should be applied based on the definition of habitat and delineation methodologies (see example in Appendix B). Because use of these standards is optional and conveys a benefit to the property owner, delineation of the habitat area and its buffer is not likely to be a major issue.

3. Establishing a Habitat Benefit

Given the policy trade-offs that are necessary for implementation of these standards, the public should be assured of a reciprocal habitat benefit. The advantages should only be available to projects that provide habitat benefits above and beyond what is otherwise required by current regulations (e.g., CWS D&C standards, Division of State Lands). Only qualified "Habitat Benefit Areas" would be allowed to take advantage of the flexibility offered by the standards. Table 3-2, below, outlines some suggested minimum criteria for qualifying Habitat Benefit Areas.

**Table 3-2:
Suggested minimum criteria for qualifying Habitat Benefit Areas**

Resource Type	Requirements for Habitat Benefit Areas
Class I riparian habitat area	<ul style="list-style-type: none"> ▪ Habitat and buffer areas must be placed in a non-buildable tract or protected with a restrictive easement. ▪ Restoration and enhancement of habitat and buffer areas required, including monitoring for a minimum of five years. Restoration and enhancement include, but are not limited to: <ul style="list-style-type: none"> ○ Revegetation of non-vegetated areas ○ Removal of non-native vegetation ○ Improved soil amendments ○ Preservation of existing trees and forest canopy ○ Planting native vegetation ○ Use of habitat-friendly fencing, if needed ○ Use of habitat friendly outdoor lighting design adjacent to buffer ▪ Buffer area must be adjacent to a protected habitat area ▪ As defined, the Habitat Benefit Area would be in addition to any areas required for natural resource protection by existing regulations.
Class II riparian habitat area	
Class III riparian habitat area	
Class A Upland habitat area	
Habitat buffer area	

4. Guidelines for Local Jurisdictions

Local jurisdictions should consider providing flexibility in their land development ordinances to encourage the protection of qualified Habitat Benefit Areas. Below are some suggested concepts to do so. Not all of the suggested concepts will be appropriate in every jurisdiction. Basin jurisdictions should review their codes using the concepts below as general guidelines. Individual jurisdictions may already meet or exceed some of these suggestions; in those cases, the jurisdiction should simply document current practices.

Process

- ◆ Discretionary processes represent increased time, money, and risk for the developer. Optimally, the standards to encourage the protection of habitat would be clear and objective, with no additional land use processes required to take advantage of them. Jurisdictions should evaluate their codes to determine if their review processes are appropriate to encourage the use of the standards. Some jurisdictions may wish to allow this flexibility only through their existing planned development processes. In that case, fees, approval criteria, open space dedications, and review processes for planned developments should be reviewed and minimized for sites with Habitat Benefit Areas.

Land Divisions

- ◆ On-site density transfers/lot size averaging – At a minimum, all jurisdictions should consider allowing all development potential to be transferred from a qualified Habitat Benefit Area to the remainder of the development site; provided that the transferred density shall not more than double the density allowed on the buildable portion of the site. For development sites with split zoning, transfers should be permitted across zoning districts. NOTE: Most jurisdictions already allow some level of on-site transfer to protect resources. These should remain in place as this transfer would only apply to Habitat Benefit Areas and not those areas already protected by existing natural resource regulations (e.g., DSL/COE, CWS).
- ◆ Lot dimensional standards – Jurisdictions should consider allowing lot dimensional standards (width, depth, and frontage) to be reduced by up to 40%.
- ◆ Minimum density – Local jurisdictions should adopt procedures to allow a waiver of the minimum density requirements. These procedures would be used at the option of the subdivider and should only allow for a reduction in the minimum number of units required to be built based on the amount of area protected. This reduction would not be limited to only Habitat Benefit Areas, but could include all regionally significant habitat on the property that has been protected through a public dedication or restrictive covenant. Procedures should include a standard protocol for notifying Metro by Report to Metro by April 15 of every year of the impact of this provision. Jurisdictions should work with Metro to ensure that “lost” units are allocated back to the Basin.
- ◆ Net Acre –Alternatively, jurisdictions could amend their definitions of “net acre” or “buildable area” to exclude Habitat Benefit Areas (at the option of the developer). However, this may require an amendment to the Functional Plan (Section 3.07.1010) definition of “net acre” as the definition does not “net out” lands for which the local zoning code provides a density bonus or other mechanism which allows the transfer of the allowable density or use to another area or to development elsewhere on the same site.

Site Design

- ◆ Setbacks – Encouraging protection of Habitat Benefit Areas may require flexibility in terms of setbacks. Except for lot lines adjacent to property zoned single-family residential, jurisdictions should consider allowing the minimum building setback established by the base zone to be reduced to any distance between the base zone minimum and zero, unless this reduction conflicts with applicable fire or life safety requirements. Codes should also allow this level of flexibility for setbacks that are internal to new single family residential developments.
- ◆ Lot coverage - Smaller single family lots (and townhouse lots) created through density transfer may need increased lot coverage in order to be buildable. Jurisdictions should consider allowing

lot coverage to be increased up to 80%, provided the square footage of the additional coverage doesn't exceed the total square footage of the Habitat Benefit Area. NOTE: This will need to be established at the time of the land division.

- ◆ Building heights - Except for areas within 40 feet of property zoned single-family residential, jurisdictions should consider allowing an increase in the maximum building height established by the base zone of up to 12 feet, unless this increase conflicts with applicable fire or life safety requirements.

Parking

- ◆ Shared parking and On-Street Parking Credit - Jurisdictions should review their codes to confirm that they encourage the use of shared parking and on-street parking credits as a means of reducing the amount of required on-site parking.
- ◆ Reduced parking ratios – For sites with Habitat Benefit Areas, jurisdictions should consider reducing parking ratios for non-residential development by up to 10%.
- ◆ Smaller car spaces and stall dimensions – For sites with Habitat Benefit Areas, jurisdictions should consider allowing up to 40% of the required parking spaces to be compact. Parking space dimensions may vary by jurisdiction; however, as a general guideline, DLCD's *Model Development Code & User's Guide for Small Cities* (Model Code) includes the following dimensions for 90° compact stall: width = 7' 6" and length = 15'. The suggested standard vehicle parking space is 8' 6" wide by 18' long (or 16' feet long, with not more than a 2' overhang).

Landscaping/Hardscape Design

- ◆ Flexibility in parking lot landscaping/Locating landscaping adjacent to habitat areas – For sites with Habitat Benefit Areas, jurisdictions should consider allowing a reduction of up to 15% of the required landscaping and/or parking lot landscaping square footage; provided that the square footage of landscaping reduction does not exceed the size of the Habitat Benefit Area. Jurisdictions should also consider allowing a commensurate reduction in their parking lot landscaping dimensional and spacing standards.
- ◆ Reduction of non-ADA sidewalks within a site – For sites with Habitat Benefit Areas, jurisdictions should consider creating an exception in their pedestrian connectivity standards that allows a reduction in the width of required sidewalks and pedestrian accessway to the minimum necessary to comply with the Americans with Disabilities Act.

Street design

- ◆ Minimize or allow alternative (pervious) paving – Jurisdictions should consider allowing reductions in required pavement (and sidewalk) width (and right-of-way dedications) for sites with Habitat Benefit Areas.

Stream crossing and street connectivity standards

[NOTE: Most stream crossings occur within Class I, II, or III riparian areas. Therefore, these guidelines are recommended for sites with habitat; however, they are also applicable in cases where stream crossings occur in areas not designated as riparian habitat.]

- ◆ The approaches include minimizing the number of stream crossings/placing crossings perpendicular; allowing narrow paved widths through stream corridors; using habitat sensitive bridge and culvert designs. Implementation is on-going. CWS has existing standards and technical specifications for these methods.
- ◆ Jurisdictions, together with CWS, continue to coordinate culvert work and efforts to verify the critical basins where safe fish passage is a design issue.
- ◆ Jurisdictions should confirm that their culvert list has been evaluated relative to their capital programming to determine the order of implementation.
- ◆ Jurisdictions should consider amending their codes to permit culvert replacement and associated enhancement work outright and not require additional land use or vegetative corridor mitigation review for those culvert projects and enhancement projects listed in the Healthy Streams Plan.
- ◆ Jurisdictions should review their Transportation System Plans and Comprehensive Plan Transportation Elements to ensure that block length and connectivity standards include necessary flexibility to minimize stream crossings.
- ◆ Basin should encourage Metro to amend the RTP (Section 6.4.5 Design Standards for Street Connectivity) to refer to all Goal 5 resources, as well as Title 3 water features, and to include a reference to the other stream crossing standards (e.g., CWS).

B. Implementation Recommendations for Basin-Wide Approaches

One element of the adopted Basin program is the development of a model Low Impact-Development (LID) ordinance for the basin, which would provide tools designed to reduce environmental impacts of new development and removing barriers to their utilization. This step includes local adoption of LID guidelines. This effort is closely tied to Clean Water Services goal of reducing Effective Impervious Area (EIA) within the Basin and a number of the suggested methods will be addressed in the update of CWS Design and Construction Standards. It is also closely related to the issues raised in the Audubon Society of Portland's 2004 *Stormwater/Pavement Impacts Reduction (SPIR) Project Report*, which made recommendations for stormwater management for new development, redevelopment and public projects.

1. Guidelines for Local Jurisdictions

Shared driveways and parking areas

- ◆ Jurisdictions should evaluate their codes for opportunities to reduce the need for paved areas by permitting shared driveways and parking areas where practicable. The *Model Development Code & User's Guide for Small Cities* (Model Code) suggests that when a shared driveway is provided or required as a condition of approval, the land uses adjacent to the shared driveway may have their minimum parking standards reduced in accordance with the shared parking provisions of Section 3.3.300C. However, the extent to which this area is then retained as pervious will likely be affected by the availability of incentives to reduce effective impervious area.

Increased use of pervious materials/ Use pervious paving materials

- ◆ Jurisdictions should consider amendments to remove barriers to, and encourage the use of, pervious paving materials in parking areas and low traffic private streets. For example, many existing codes require parking and street areas to be hard-paved surfaces with asphalt or concrete.
- ◆ Technical design specifications will need to be adopted Basin-wide to facilitate the use of this method. Specifications should address site suitability criteria and additional steps needed for sites that are not highly suitable in terms of soil permeability. Concerns about slope stability and impacts to adjacent properties should also be addressed. Specifications should include project monitoring to help ensure that these facilities are functioning as designed. The work completed at CWS Merlo Road Field Operations Facility could be used as the basis to establish Technical Specifications for the use of porous concrete, concrete paver blocks, and structural gravels.

Increased use of native plant/ Preservation of existing trees and maximize forest canopy

- ◆ Jurisdictions should document their existing tree cutting and mitigation standards. Avoiding the cost of mitigation can be a significant incentive for preserving existing trees. However, most tree preservation standards don't make a distinction between native species and non-native species and trees are typically not required to be replaced with native species. Jurisdictions could consider encouraging or requiring that a certain percent of mitigation trees be native species. Alternatively, as an incentive, jurisdictions could allow somewhat smaller specimens to be planted if native species are used (e.g., 2" caliper instead of 2.5").
- ◆ Jurisdictions should consider adding language to encourage the use of native plants and the preservation of existing trees throughout the Basin. The Model Code suggests the following language: "Existing non-invasive vegetation may be used in meeting landscape requirements. When existing mature trees are protected on the site (e.g., within or adjacent to parking areas)

the decision making body may reduce the number of new trees required by a ratio of one (1) inch caliper of new tree(s) for every one (1) inch caliper of existing tree(s) protected.” Most jurisdictions require the irrigation of landscaped areas. Installing irrigation in existing vegetated areas may not be possible without destroy the existing vegetation. Jurisdictions could consider waiving the irrigation requirement for landscaped areas that are retaining existing, native vegetation. [NOTE: CWS further augments the habitat benefits provided by vegetated stormwater facilities by requiring the incorporation of native plant species.]

- ◆ Jurisdictions may also wish to consider allowing some flexibility in their parking lot landscaping standards (the number, dimension, spacing of landscape islands and required trees) to retain individual mature trees in, or adjacent to, the parking area. For example, requiring one tree per X parking spaces *on average* be planted *or retained* to create a partial tree canopy over and around the parking area. Using an average would allow some rows of parking to have more spaces between trees and some to have fewer and this flexibility could allow for the retention of more existing trees.

Improved soil amendment

- ◆ Jurisdictions should encourage the use of soil amendments to improve the permeability of soils within landscaped areas. While stormwater management is typically not a stated benefit of landscaped areas, it could be noted as an ancillary benefit in the purpose statement. For the purposes of calculating effective impervious area, performance standards and technical specification for soil permeability should be adopted basin-wide.

Maximize street tree usage

- ◆ Jurisdictions should document their existing standards to ensure that they are requiring street trees be planted appropriately. For example, Metro’s *Green Street* recommends spacing large and very large trees 35 feet to 50 feet, respectively. Jurisdictions may also wish to document any street tree planting efforts they have engaged in.

Use multi-functional open drainage systems / vegetated stormwater management facilities / modify drainage practices

- ◆ Technical design specifications will need to be adopted Basin-wide to facilitate the use of these methods. Specifications should address site suitability criteria and additional steps needed for sites that are not highly suitable in terms of soil permeability. CWS and the Basin jurisdictions should consider developing and adopting Basin-wide standards for the construction and maintenance of stormwater management facilities, including working with building officials to identify UBC and Plumbing code issues. This may help to encourage the use of alternative systems and would ensure fair application of any stormwater mitigation credits. Specifications

should include project monitoring to help ensure that these facilities are functioning as designed. The work completed at CWS Merlo Road Field Operations Facility could be used as the basis to establish Technical Specifications for vegetated conveyance swales and biofiltration.

Underground detention and/or treatment

- ◆ While underground detention and treatments facilities do not provide any habitat benefits on-site, by helping to improve water quality they do serve to benefit in-stream habitat within the watershed. Jurisdictions should address when it is appropriate to allow these facilities (e.g., in conjunction with street/road projects).

Encourage green roofs (eco-roofs)

- ◆ Technical design specifications will need to be adopted Basin-wide to facilitate the use of this method. CWS and the Basin jurisdictions should consider developing and adopting Basin-wide standards for the construction and maintenance of green roofs, including working with building officials to identify UBC and Plumbing code issues. This may help to encourage the use of these systems and would ensure fair application of any stormwater mitigation credits. Specifications should include project monitoring to help ensure that these facilities are functioning as designed. The green roof completed at CWS Merlo Road Field Operations Facility could be used as the basis to establish Technical Specifications.

Disconnect downspouts / Use rain barrel or cistern system

- ◆ Technical design specifications will need to be adopted Basin-wide to facilitate the use of these methods. Specifications should address site suitability criteria and additional steps needed for sites that are not highly suitable in terms of soil permeability. Concerns about slope stability and impacts to adjacent properties should also be addressed. If overflow from the cistern is connected to the stormwater system, then site suitability may not be an issue.

Methods Not Recommended for Basin-wide Implementation at this time

As noted in Table 1, some of methods (shown in the table with “x*”) are only recommended for consideration within or adjacent to habitat areas at this time. However, these could have potential benefits basin-wide and may be considered in the future. These are noted briefly below:

- ◆ Increased flexibility for building heights – Allowing increased building height may allow for reduction in effective impervious area if the “reserved” area is used for landscaping or other pervious uses. However, building height is often seen as a major public issue, especially with infill development.
- ◆ Reduced parking ratios - Reducing parking ratios basin-wide may allow for reduction in effective impervious area if the “reserved” area is used for landscaping or other pervious uses. However,

the current parking ratios are seen as quite low and there are concerns about the impact on adjacent uses of not requiring sufficient parking on-site.

- ◆ Smaller car spaces and stall dimensions - Reducing stall dimensions or allowing more compact spaces basin-wide may allow for reduction in effective impervious area if the “reserved” area is used for landscaping or other pervious uses. However, the existing parking stall sizes are seen as quite small given the current mix of automobiles and there are concerns about the impact on adjacent uses of not requiring sufficient parking on-site.
- ◆ Reduction of non-ADA sidewalks within a site – Public policy has been emphasizing pedestrian connectivity for a number of years. Code requirements help implement that policy by requiring wide (e.g. 6’ to 8’) sidewalks and multiple connections, especially in commercial areas. Reducing these requirements basin-wide may allow for reduction in effective impervious area if the “reserved” area is used for landscaping or other pervious uses. However, there would be a significant public policy trade off.
- ◆ Minimize paving - Public policy has been emphasizing “skinny” streets for a number of years. Jurisdictions in the Basin have been successful in implementing that policy to a considerable extent. Reducing street widths further basin-wide may allow for reduction in effective impervious area if the “reserved” area is used for landscaping or other pervious uses. However, concerns have been raised by the State and local Fire Marshals.

CHAPTER 4: IMPLEMENTATION BY JURISDICTION

As described in Chapter 3 there are a number of code concepts that could be included in local comprehensive plans and development codes in order to implement and encourage those habitat friendly practices which are recommended for the Basin. Each Basin jurisdiction is responsible for drafting and adopting local comprehensive plan and/or development code amendments necessary for implementation of habitat friendly practices. Chapter 4 outlines the steps Clean Water Services and each of the Basin jurisdictions has taken, or plans to take, to implement these recommendations. Because most of the Basin jurisdictions already implement some practices which reduce the detrimental impact of development on fish and wildlife, all of the suggested changes may not be necessary in all cases. In these cases, Basin jurisdictions have documented current practices.

The table below summarizes the general timeframe for adoption for all of the jurisdictions. A more detailed schedule for each jurisdiction follows.

Table 4-1: 2006 2006 / 07 Adoption Schedule
(all dates are 2006 unless otherwise noted)

	PC Worksessions	PC Hearings	City Council or BOCC Worksessions	City Council or BOCC Hearings
Beaverton	7/19, 8/25, 9/6	10/11, 10/18	11/13	12/4
Cornelius	7/25, 9/12, 10/10	11/14		12/4, 12/18 Ord
Durham	See jurisdiction summary			
Forest Grove	9/5, 11/20, 1/29/07*	3/5/07	9/5, 11/20, 1/29/07*	3/26/07, 4/9/07
Hillsboro	8/30, 10/30**	1/10/07	10/30	2/6/07
Sherwood	3/14, 4/25, 6/27, 8/8	9/12, 10/24		12/5
Tigard	7/31, 9/25	10/16	11/21	12/12
Tualatin	7/13, 8/10***	9/14***	9/11, 9/25	10/23
Washington County	9/6	9/6	9/19, 9/26, 10/03, 10/17, 10/24	9/19, 9/26, 10/03, 10/17, 10/24****
* Joint PC/CC worksession ** Initiate amendments *** Tualatin Planning Advisory Committee **** Adoption of Ordinance				

A. Clean Water Services

In 2005 after nearly five years of research, modeling and policy analysis and development, Clean Water Services (District) and its partners completed the Healthy Streams Plan, a 20-year plan to improve the health and sustainability of urban streams in Washington County. The Plan is a comprehensive update and expansion of the District's previous watershed planning efforts that will help improve water quality, manage water quantity and support aquatic habitat through \$95 million of investments in the streams, wetlands, floodplains and buffers of the surface water infrastructure. The \$3.2 million effort was funded by Clean Water Services, the Cities of Beaverton, Hillsboro, Tualatin, Tigard, Sherwood, Forest Grove and Cornelius, Washington County, Tualatin Hills Park and Recreation District (THPRD), Metro, and the Federal Emergency Management Agency (FEMA).

The Healthy Streams Plan work included:

- Detailed inventory and survey of 338 miles of urban and urban fringe streams including data collection on stream corridor conditions, fish, macroinvertebrates, topographic mapping and survey, and water resources modeling.
- Analysis of social values and behaviors regarding water resources
- Cost-benefit and other economic analysis of project options
- Creation of a Basin specific watershed management decision tool called RESTORE
- Identification of project opportunities and policy and program refinement options
- Coordination with the Healthy Streams Plan Advisory Committee and other local committees elected officials, engineers, planners, and other stakeholders

The science and engineering information compiled for the Healthy Streams Plan led to an update of Clean Water Services' vegetated corridor standards in 2004, and a partnership with FEMA to update the floodplain maps for several urban tributaries.

The Healthy Streams Plan data suggests that local streams need more flow in the summer and less scouring stormwater in the rainy season. Our streams also need more trees for shade and in-stream wood, and fewer dams, ponds and impassible culverts to improve water quality and aquatic habitats. The Plan identifies capital projects to address these findings, as well as program and policy refinement options. Clean Water Services is coordinating and tracking the implementation of the Plan with its local partners.

Progress on key elements of the Plan includes:

Stream Enhancement Activities--45 miles of stream corridors are being revegetated, plus large woody debris placement and removal of dams and in-stream ponds that are fish passage barriers.

Flow Restoration Projects--several potential flow restoration projects may include the purchase or trading of water rights with willing participants, the use of cleaned wastewater effluent for irrigation water rights, and augmentation of summer stream flows with stored water.

Community Tree Planting Challenge (AKA Tree for All: Community Stream Planting Challenge)—the goal is to plant 1 million trees in 20 years along small streams to increase shade, reduce invasive species, and create urban habitat; the District and Cities have annual performance targets which most are exceeding to date.

Culvert Replacement Projects--383 priority culverts are to be replaced over the next 20 years to manage flooding and/or provide fish passage, with yearly performance targets for the Cities, Washington County and Clean Water Services at a rate of 20 to 24 culverts per year.

Stormwater Outfall Retrofit Projects--68 priority stormwater discharge pipes built before stormwater treatment was required were identified by the Plan. Additional analysis on the conditions of these outfalls was completed in 2005, and they will be retrofitted with appropriate water quality designs. The retrofits are being completed in cooperation with the Cities, Clean Water Services, and Oregon Department of Transportation.

Policy and Program Options--The Plan identifies options for new or modified policies and programs throughout the watershed that could help improve stream health, including stormwater regulations, land use and building codes, sensitive areas and vegetated corridors, operations and maintenance of the storm system, and inspection and code enforcement. Also addressed are incentives, public education and awareness, monitoring effectiveness and implementation progress, Surface Water Management funding and implementation of capital projects. The Tualatin Basin Goal 5 Response incorporates many elements of the Healthy Streams Plan policy and program options.

Design and Construction Standards Update

Clean Water Services operates the stormwater facilities within its boundary in accordance with its MS4 Permit. One condition of the Permit is water quality treatment for all development projects within the District boundary. Design and Construction Standards, among other requirements, outline specific water quality treatment requirements of all development projects to comply with the

MS4 Permit. The Standards are periodically updated to incorporate the latest technological advances, new Permit requirements, clarifications, etc. The latest Update is in progress and expected to be completed in April 2007. Anticipated relevant changes include standards for the following low impact development practices:

1. Pervious pavement
2. Eco-roof
3. Infiltration planter
4. Flow-through planter
5. Vegetated filter
6. Vegetated infiltration basin
7. Sand filter

On September 19, 2006, the District's Board adopted a financial incentive program for the use of low impact development practices for projects that meet specific conditions. Applicants for development projects that cannot construct on-site water quality and/or water quality facilities may request to pay System Development Charge fees in-lieu. The amount of the fee may be reduced if the developer uses approved low impact development practices.

B. Beaverton

In 2000, the City adopted a Local Wetland Inventory and Riparian Assessment through the Statewide Planning Goal 5 process. The Program protects wetlands and riparian areas by implementing the Clean Water Services vegetated corridor requirements. Significant trees, groves and trees within significant natural resource areas are covered through the city's Tree Plan application.

The adopted program for the Tualatin Basin Goal 5 is a voluntary – incentive based program to protect areas above and beyond the areas protected through the City's goal 5 program. The program allows flexibility for applicants proposing to preserved, enhance, and create new habitat. Additionally, incentives are provided for applicants using low impact development techniques anywhere in the city. Additional details are provided in the Summary below and in *Appendix C*.

1. Adoption/Public Involvement Schedule

Task	2006					
	Jul	Aug	Sep	Oct	Nov	Dec
PC Worksession	7/19	8/25	9/6			
Planning Commission Hearings				10/11 & 10/18		
City Council Work Session					11/13	
City Council Adoption						12/4/06
Effective Date of Ordinances						1/3/07

2. Summary of Planned Implementation

A. Planning and development approaches	
1. Land Division Design	
Clustering/lot size averaging, on-site density transfers	Allowed lot size averaging and building foot print off set for preserving habitat benefit area. On-site density transfers are allowed through the Planned Unit Development Application.
Reduction of lot dimensional standards;	The adopted program allows for reduction of lot dimensional standards when habitat is preserved. The Planned Unit Development application allows additional reductions not available through the clear and objective program.

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Allow for waiver of minimum density requirements (Metro);	The new program allows the developer to calculate minimum net density by subtracting out the areas preserved in an easement or tract.
2. Site Design	
Increased flexibility for setbacks	Flexibility in setbacks is achieved through a setback offset allowance. If habitat is preserved on the property, the setback can be adjusted to equal the amount of habitat preserved down to a minimum of 5 feet total setback.
Increased flexibility for lot coverage	Beaverton regulates lot coverage generally through the landscaping requirements. By allowing reductions in landscaping requirements, the city is increasing flexibility in lot coverage.
Increased flexibility for building heights	In the Mixed Use zoning districts heights can be increased as much as 36 feet. In commercial and industrial districts, not abutting certain residential zones may increase height up to 12 feet.
3. Parking Design	
Reduced parking ratios	Parking is a premium in the City of Beaverton. The Planning Commission, Traffic Commission and the City Council receive repeated testimony that the city does not have enough parking. Allowing parking reductions for habitat preservation is not a choice available, politically, at this time.
Shared driveways and parking areas; On-street parking credit	Allows shared parking (Type 2 review) and shared driveways, assuming certain criteria are met. The City may want to re-visit the requirement for abutting property and may want to consider a change in the review type to a Type 1 for shared parking when arrangement benefits HBAs. The City did not propose any changes to the current shared driveways and parking areas as they are currently allowed through a Type II application. On street parking is not a choice available, politically, at this time as noted above.
Flexibility in parking lot landscaping / Additional parking lot landscaping	Each of the proposed credits provides an opportunity to reduce parking lot landscaping by up to 50% when using low impact development techniques.
Smaller car spaces and stall dimensions	Both the Traffic Commission and City Council receive testimony regarding the number and size of parking stalls. Reduction in dimensions to save habitat is not feasible, politically, at this time.

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Increased use of pervious materials	The city has approved pervious pavement for areas that do not require access for large vehicles (80,000 pounds). The city encourages, through education, use of pervious materials in those areas that do not require access for large vehicles, including parking spaces and bicycle and pedestrian ways. The detention goal of each site will need to be taken into account when engineering and reviewing plans for each site.
4. Landscaping/Hardscape Design	
Locating landscaping adjacent to habitat areas	The adopted ordinance allows certain stormwater quality and quantity facilities, such as raingardens and flow through planters to be placed within required landscaping and to count towards up to 50% of the required landscaping. A reduction in the amount of landscaping, up to 50%, is also allowed for preservation of HBA.
Increased use of native plant	City currently requires review for removal of existing trees, places emphasis on retaining native trees and understory, and requires preservation areas to be set aside in conservation easements or set aside in tracts. Through the use of the City of Beaverton Guidance Manual and participation in the Pre-Application conferences, city staff is able to promote the use of native plants in the landscaping of projects. Brochures will also be produced listing native plant landscaping as an important part of habitat friendly development practices. Native plant selectors, City of Portland and Clean Water Services, are featured in the Guidance Manual.
Improved soil amendment	Standards addressing improved soil amendments where native soil or post-development disturbed soil conditions in landscape areas do not provide identified benefits is included in the City of Beaverton Guidance Manual and the Development Code
Reduction of non-ADA sidewalk widths within a site	The EDM allows for pre-approved modifications of sidewalk design by the City Engineer.
Increased use of habitat-friendly fencing	The city regulates fencing for protection of preservation areas during construction & with regard to vision clearance for permanent fencing.

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Preservation of existing trees and maximize forest canopy	The city may look for opportunities to further encourage the use of native vegetation in conjunction with current Tree Plan application required for tree removals and protections. An equal trade off of tree canopy with square footage of up to 50% of required landscaping is provided in the Development Code.
5. Lighting Design	
Re-directed outdoor lighting, reducing light spill-off	The city limits illumination at the property line to 0.5 foot-candles or less. Modified City Code to more closely explain what glare means and added Habitat Benefit Areas to the paragraph.
6. Density Reduction for Regionally Significant Habitat	
Modified definition of net buildable areas	Modified definition of Net Acreage to include HBA as an undevelopable area, provided the HBA is set aside in a separate tract or dedicated to a public entity.
Reduced minimum buildable lot sizes	The city does not have minimum buildable lot sizes. No changes made. There is a minimum lot area, but this can be averaged over an entire development through the PUD process.

B. Engineering and Design Approaches	
1. Street design	
Minimize paving	No changes made. A process exists to reduce the minimum pavement width to 22 feet in certain circumstances.
Use pervious paving materials	City allows use of pervious pavement on case by case basis. The Guidance Manual provides some specific standards and maintenance requirements for pervious paving.
Maximize street tree usage	Status: Requires spacing every 30 ft on center. Ongoing urban forestry program. Recognized as a Tree City USA. No changes made.
Use multi-functional open drainage systems / modify drainage practices	Guidance is provided in the City's guidance manual. Engineering staff and site development staff are ready for an application using alternative techniques.
2. Stream crossing and street connectivity standards	
Minimize the number of stream crossings/place crossings perpendicular	This provision is already in place due to changes made following Title 3.
Allow narrow paved widths through stream corridors	City staff will review each stream crossing on a case by case basis for opportunities to reduce the pavement width when crossings are necessary.

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Use habitat sensitive bridge and culvert designs	No changes made, as city complies with CWS Healthy Streams Plan.
3. Stormwater management facility design	
Use vegetated stormwater management facilities	No changes needed.
Use detention ponds	No changes needed.
Use of underground detention and/or treatment	No changes needed.

C. Building Design Solutions	
Encourage Green roofs (eco-roofs)	Use of green roofs can yield credits of reduced landscaping or increased building height.
Disconnect downspouts	Opportunity where adequate landscape area exists, proper distance from structure, and high flows are directed toward a catch basin that connects to the public storm sewer system. This is addressed in the City's guidance manual.
Use rain barrel or cistern system	This is referenced in the City's guidance manual.

C. *Cornelius*

The City of Cornelius has a *Significant Natural Resources Inventory* that was updated in 2002. It includes all regional significant natural resources mapped subsequently in 2004 and 2005 as part of the Clean Water Services Healthy Stream Study and Tualatin Basin Goal 5 Study program. This inventory is found in the Cornelius Comprehensive Plan. The *City of Cornelius Natural Resource Protection Plan*, including the analysis and regulation for the protection of wetlands, streams, riparian areas and fish & wildlife habitat, was adopted as part of the Chapter 11 of our Comprehensive Plan in 2003 as Ordinance 837. The Tualatin Basin Goal 5 Study, conducted consistent with regional Goal 5 plan inventories and criteria, has resulted in local consideration and adoption of amendments to the Cornelius Development & Zoning Code that specify certain incentives for habitat friendly low-impact development practices. These additions to our city code, along with improved habitat friendly information dissemination by city staff and local participation in basin-wide planting programs will result in lower-impact development and carry us toward our goal of improving wildlife habitat and the state of natural resources in our part of the Tualatin Basin.

The Amendments (see *Appendix D*) provide both mechanism and guidance to avoid, minimize and mitigate impacts to wildlife habitat areas identified in Metro, Clean Water Services and City of Cornelius mapping as significant natural resources. It should be noted that this program is voluntary and incentives are provided to encourage and facilitate use of the habitat friendly development practices.

1. Adoption/Public Involvement Schedule

Task	2006					
	Jul	Aug	Sep	Oct	Nov	Dec
PC Work sessions	7/25		9/12	10/10		
PC Public Hearing & Decision					11/14	
City Council Public Hearing						12/4
City Council Adoption of Ord.						12/18

2. Summary of Planned Implementation

Besides the planning, development, engineering and building design approaches summarized in the following chart, the land use approval process in Cornelius has been amended to allow a shorter and less costly decision process as incentive for approved use of low-impact development practices. Conditional Use Permits for Low-Impact Development Practices may be reviewed and approved now through a Type II Design Review Process rather than the here-to-for required Type III process through the Planning Commission.

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A. Planning and development approaches	
1. Land Division Design	
Clustering/lot size averaging, on-site density transfers	Natural Resource Overlay Zone allows density transfers or clustering through a CUP-PUD approval.
Reduction of lot dimensional standards;	Code provides a formula for lot size reduction based on protection buffer sizes.
Allow for waiver of minimum density requirements (Metro);	Code requires development to maintain minimum densities.
2. Site Design	
Increased flexibility for setbacks	Commercial, Industrial, and Mixed-Use districts permit zero side & rear yard setbacks. Code allows a 10% setback reduction through a Type 1 Admin. Review.
Increased flexibility for lot coverage	Residential zoned property coverage may be increased proportional to natural resource preserved.
Increased flexibility for building heights	Building heights may be exceeded through approval by the Planning Commission. Building height may be increased specifically when an off-street parking structure is incorporated into the design of a building, when it results in reduction of impervious surface or preservation of a significant natural resource.
3. Parking Design	
Reduced parking ratios	Code allows a 10% reduction in measurable standards (i.e., parking) through a Type 1 Administrative Review process
Shared driveways and parking areas; On-street parking credit	The Off-Street Parking section of the Code provides for shared parking. Local and Collector streets allow on-street parking in the Main Street District. Arterial streets permit some on-street parking. Off-Street Parking standards may permit a reduction of required number of parking spaces when a development provides pedestrian/bicycle connection from its intended use to a transit stop or public trails and pathway access improvements.
Flexibility in parking lot landscaping / Additional parking lot landscaping	Code allows for a 10% reduction in measurable parking standards through a Type 1, Administrative Review process. Reduction in parking lot landscaping allowed, when the applicant demonstrates a reduction in the required amount of landscaping for preserving existing mature tree canopy cover.

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Smaller car spaces and stall dimensions	Code allows for a 10% reduction in measurable standards through a Type 1 Admin Review process
Increased use of pervious materials	Allowances for use of gravel for vehicle maneuvering and storage in residential and commercial development under certain conditions.
4. Landscaping/Hardscape Design	
Locating landscaping adjacent to habitat areas	Natural Resource Overlay zone permits through a CUP-PUD approval of a 1:1 ratio exchange for square footage of native landscaped protection setback area in-lieu of required private on-site landscaping. Reduction of landscaping allowed in exchange for equivalent preserved upland natural resources.
Increased use of native plant	Reduction of required landscaping proportional to area planted exclusively with native plants.
Improved soil amendment	NA
Reduction of non-ADA sidewalk widths within a site	NA
Increased use of habitat-friendly fencing	NA
Preservation of existing trees and maximize forest canopy	Site Design Review criteria requires developers to design where possible to incorporate & preserve existing trees or vegetation of significant size and species. Consideration shall be given to whether habitat, survival of tree species, and aesthetics can be achieved by preserving groves or areas of trees opposed to only individual trees. Tree canopy preservation credit for parking area landscaping.
5. Lighting Design	
Re-directed outdoor lighting, reducing light spill-off	Site Design Review approval criteria states adequate exterior lighting shall be provided to promote public safety, and there shall be designed to avoid unnecessary glare upon other properties.
6. Density Reduction for Regionally Significant Habitat	
Modified definition of net buildable areas	Natural Resource Overlay Zone allows density transfers or cluster development through a CUP-PUD approval.
Reduced minimum buildable lot sizes	Code requires development to maintain minimum densities, but provides a formula for lot size reduction based on protection buffer sizes.

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B. Engineering and Design Approaches	
1. Street design	
Minimize paving	Natural Resource Overlay Zone requires approval of a CUP for new streets, roads, recreational trails and paths in riparian areas. City Engineer may reduce impervious surface on streets to preserve a significant natural resource.
Use pervious paving materials	The City Public Works Public Utilities Design Standards allows for 'alternative surfaces' to be used under certain conditions and certain vehicle maneuvering and display. Reduction of required landscaping in Commercial areas may be allowed when substituted with a pervious hard surface plaza or patio area related to the intended use.
Maximize street tree usage	All City street designs require planter strips with street trees spaced every 30 feet.
Use multi-functional open drainage systems / modify drainage practices	Natural Resource Overlay zone requires approval of a CUP for new drainage facilities.
2. Stream crossing and street connectivity standards	
Minimize the number of stream crossings/place crossings perpendicular	Natural Resource Overlay zone requires approval of a CUP for new streets, roads, recreational trails and paths in riparian areas.
Allow narrow paved widths through stream corridors	Natural Resource Overlay zone requires approval of a CUP for new streets, roads, recreational trails and paths in riparian areas.
Use habitat sensitive bridge and culvert designs	Natural Resource Overlay zone requires approval of a CUP for new streets, roads, recreational trails and paths in riparian areas. Natural Resource Overlay zone requires approval of a CUP for new drainage facilities. Bridges and culverts with natural bottoms are allowed if maintenance and flood hazard issues are resolved.
3. Stormwater management facility design	
Use vegetated stormwater management facilities	Comply with CWA standards for water quality and quantity
Use detention ponds	Comply with CWA standards for water quality and quantity
Use of underground detention and/or treatment	Comply with CWA standards for water quality and quantity

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C. Building Design Solutions	
Encourage Green roofs (eco-roofs)	Stormwater credits are given for “green roofs”, using CWS & State Building Code approval criteria.
Disconnect downspouts	City implements State building and plumbing codes for the collection and conveyance of surface water into approved systems. Generally our local soils and high water table do not allow this option.
Use rain barrel or cistern system	City implements State building and plumbing codes for the collection and conveyance of surface water into approved systems. Generally our local soils and high water table do not allow this option.

D. Durham

The City of Durham is unique in the basin in that it has no urban growth area and is near 100% built out, with less than 38 acres divided among multiple non-contiguous lots remaining for development. The City of Durham's code was not evaluated as part of the Audubon's Society's SPIR Report. However, City staff performed a gap analysis of the code to identify any potential barriers to facilitating and encouraging habitat friendly development practices. City staff found that a number of Tualatin Basin recommendations have already been met. For example:

- The current code establishes a greenways overlay district that requires dedication of riparian habitat areas to the City (upon development) for incorporation into Durham City Park, a 55 acre nature park having within its boundaries the protected habitat of Fanno Creek.
- Upland habitat areas are protected by Durham's Tree Preservation Ordinance that requires a permit for removal of any tree 5" DBH and mitigation replacement for trees removed by the necessity of construction.
- Durham's existing land use code is sufficiently flexible to allow for voluntary development practices beneficial to the habitat.

Additional details are provided in *Appendix E*.

1. Adoption/Public Involvement Schedule

Combined with the implementation of Clean Water Services Design and construction standards the goal for habitat protection and the removal of barriers to habitat friendly construction will be met without amendments to the existing Code and Plan.

2. Summary of Planned Implementation

A. Planning and development approaches	
1. Land Division Design	
Clustering/lot size averaging, on-site density transfers	Code allows on-site density transfer but not lot size averaging.
Reduction of lot dimensional standards;	Current Code does not specify width and depth and does require frontage; no reduction provision other than the variance procedure
Allow for waiver of minimum density requirements (Metro);	Current Code does not provide procedure to allow a waiver of the minimum density requirements
2. Site Design	
Increased flexibility for setbacks	Current Code allows reductions in front, side, and rear setbacks for a planned residential development.

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Increased flexibility for lot coverage	Current Code does not specify a provision for lot coverage for residential development. Office Park, Industrial Park, and Business Park developments are limited to a maximum 35% floor area ratio.
Increased flexibility for building heights	Status: An increase in maximum building height only available through the variance procedure
3. Parking Design	
Reduced parking ratios	No code provision
Shared driveways and parking areas; On-street parking credit	Code presently allows shared access and could be amended to allow shared parking. No code provision for on-street parking.
Flexibility in parking lot landscaping / Additional parking lot landscaping	Would be subject to review and approval by the Design Review Board, which may consider making allowance for parking lot landscaping on sites adjacent to HBAs.
Smaller car spaces and stall dimensions	Current code allows compact car spaces.
Increased use of pervious materials	Good idea if there is a low maintenance pervious paving material available for use.
4. Landscaping/Hardscape Design	
Locating landscaping adjacent to habitat areas	No code provision
Increased use of native plant	Tree ordinance seeks to accomplish this.
Improved soil amendment	Code does not have such a provision and city would need to be provided with suitable performance standards and technical spec's. This may not be a workable requirement to administer.
Reduction of non-ADA sidewalk widths within a site	No code provision allowing reduction in width of required sidewalks and ped walkways
Increased use of habitat-friendly fencing	No code provision
Preservation of existing trees and maximize forest canopy	Current Tree Ordinance includes a policy that emphasizes a preference for native mitigation trees and does specify standards (ratios) for replacement of preserved trees depending on diameter of removed tree.
5. Lighting Design	
Re-directed outdoor lighting, reducing light spill-off	No code provision

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6. Density Reduction for Regionally Significant Habitat	
Modified definition of net buildable areas	No code provision
Reduced minimum buildable lot sizes	No code provision

B. Engineering and Design Approaches	
1. Street design	
Minimize paving	No code provision
Use pervious paving materials	Considered allowing alternative (pervious) paving for streets. Maintenance cost associated with a pervious pavement surface imposes an excessive cost burden on small city with limited funds.
Maximize street tree usage	No code provision
Use multi-functional open drainage systems / modify drainage practices	No code provision
2. Stream crossing and street connectivity standards	
Minimize the number of stream crossings/place crossings perpendicular	Already addressed in code & CWS D&C Standards
Allow narrow paved widths through stream corridors	Already addressed in code & CWS D&C Standards
Use habitat sensitive bridge and culvert designs	Already addressed in code & CWS D&C Standards
3. Stormwater management facility design	
Use vegetated stormwater management facilities	No code provision
Use detention ponds	No code provision
Use of underground detention and/or treatment	No code provision

C. Building Design Solutions	
Encourage Green roofs (eco-roofs)	No code provision
Disconnect downspouts	A voluntary effort on the part of the property owner could be implemented and would need to be monitored

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Use rain barrel or cistern system	A voluntary effort on the part of the property owner could be implemented and would need to be monitored
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E. Forest Grove

Forest Grove adopted its Goal 5 program in 1980 as part of its overall Comprehensive Plan adoption. The plan included a 1977 inventory produced by the Oregon Department of Fish and Wildlife and included upland game, big game and waterfowl habitats as well as wetlands and stands of redwoods, oaks, fir and cedar trees. These inventories and related key policies were subsequently acknowledged by the Land Conservation and Development Commission (LCDC). Additional wetland sites were inventoried in 1993 as part of the City's local wetland inventory.

Protection of these areas was addressed in two ways. The Zoning Ordinance was amended in 1982 to establish environmental review overlay districts that in part applied to wetland areas. The second was the City's Tree Protection Ordinance, initially adopted in 1992, that addressed tree removal as part of any development and trees in natural resource areas. Both of these provisions lacked standards, which is the focus of the amendments at this time (see draft text in *Appendix F*).

Forest Grove works cooperatively with Clean Water Services in complying with water quality and fish habitat requirements of the State Department of Environmental Quality (DEQ) and the Federal Endangered Species Act (ESA). This compliance process provides significant protection for all fish and wildlife habitat located within stream corridors and wetland and riparian areas throughout the basin.

1. Adoption/Public Involvement Schedule

At this time, Forest Grove is considering a set of amendments that provides more specific standards consistent with Metro's model ordinance. Further, it would expand those provisions beyond the Clean Water Services water quality requirements to address all Class I and II habitat areas identified by Metro. In addition, it will also provide flexibility to allow the use of low impact development techniques.

Task	2006-07					
PC / CC joint Worksessions	9/5/06	11/20/06	1/29/07			
Planning Commission Hearing				3/5/07		
City Council – first reading					3/26/07	
City Council – second reading						4/9/07

File Numbers

Comprehensive Plan Amendment CPA-06-03

Zoning Text Amendment Number ZA-06-03

Land Division Ordinance Text Amendment Number LDO-06-02

2. Summary of Planned Implementation

The following are the approaches either currently in place or changes to be pursued by the City of Forest Grove to implement the Tualatin Basin Goal 5 program. These approaches are based on the list of concepts developed by the Tualatin Basin Goal 5 Program Implementation Report Issue Papers 1 and 2.

Policy Basis: Relevant Goals from the Forest Grove Comprehensive Plan that support the amendments are as follows:

Natural Resource Local Goal 1: Preserve and maintain the quality of existing agricultural, forestry, wildlife and other natural resource areas.

Natural Resource Local Goal 2: Open space valuable to fish and wildlife resources shall be protected.

Natural Resource Local Goal 3: The preservation of existing trees shall be encouraged.

Open Space Local Goal 1: Preserve open space by guiding urban growth into efficient areas of development.

Open Space Local Goal 2: Preserve and maintain the quality of existing agricultural, forestry, wildlife and other natural resource areas.

Open Space Local Goal 4: Maintain desirable existing open space and enhance the environment within the City through preservation and landscaping.

Zoning Ordinance allows for amendments to support Goal 5 objectives as follows:

9.615 DEVELOPMENT GUIDELINES. In order to protect the quality of Forest Grove which makes it a desirable place in which to live, the Planning Commission may recommend and the City Council may adopt as ordinance such development guidelines and accompanying maps as may be necessary for:

- (1) the conservation and development of natural resources;
- (2) the protection of areas having historical and/or aesthetic importance;
- (3) the safe and desirable use of environmentally sensitive and/or geologically hazardous areas; and
- (4) utilization and development of any of the air, land or water uses which may have significant impact on the quality of the Forest Grove environment.

Policy Level Amendments

1. New Natural Resource Policy 3: The City shall implement the Tualatin Basin Goal 5 program through amendments in the Zoning and Land Division ordinances, and through education and other public information efforts.

2. Amend Section 9.601 of the Zoning Ordinance:

9.601 PURPOSE. This ordinance has been designed in accordance with the adopted goals, and policies of the Forest Grove Comprehensive Plan. It is the general purpose of this ordinance, therefore, to provide one of the principal means for the implementation of the Forest Grove Comprehensive Plan as well as: encourage the most appropriate use of the land; conserve natural resource areas, conserve and stabilize the value of property; promote a variety of housing opportunities; aid in the rendering of fire and police protection; provide adequate open space for light and air; lessen the congestion on streets; promote orderly growth in the city; prevent undue concentrations of population; facilitate adequate provisions for community utilities and facilities such as water, sewerage, electrical distribution systems, transportation, schools, parks and other public facilities; and in general promote public health, safety, convenience and general welfare.

3. Amend Section 9.101 of the Land Division Ordinance:

9.101 PURPOSE. This ordinance has been formulated in accordance with the adopted goals and policies of the Forest Grove Comprehensive Plan. It is the general purpose of this ordinance, therefore, to provide one of the principal means for the implementation of the Comprehensive Plan. It is also the intent of this ordinance to accomplish the orderly development of land within the City through rules, regulations and standards governing the approval of subdivisions and partitions, taking into consideration all of the applicable goals and policies and the locations of proposed subdivisions and partitions, as well as their impact on the surrounding area and the entire City. These rules, regulations and standards are intended to provide for lessening congestion in the streets, for securing safety from fire, flood, slides, pollution or other dangers, for providing adequate light and air, including solar energy access, for preventing overcrowding of land, for facilitating drainage, education, recreation and other needs, for conserving natural resource lands and in general to promote the public health, safety, convenience and general welfare.

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A. Planning and development approaches	
1. Land Division Design	
<p>Land Division Design: Land Division Ordinance Section 9.110 l. requires that natural resources (defined as streams, riparian areas, wetlands, etc.) shall be protected, integrated into the design of the subdivision and platted as a common area. Further, land division design can be accomplished through a planned residential development. Approval criteria for a PRD (Section 9.680 (2) (b)) include “to permit the flexible spacing of lots and buildings in order to encourage ... the conservation of natural amenities of the landscape.” Propose to add wording to clarify the use of the planned development approach to conserve resource areas identified by the Metro inventory. The City Council and Planning Commission wants to retain the review process where standards are to be varied to assure higher design standards are achieving intended results concerning habitat preservation and a well designed built environment. May consider requiring planned developments on sites containing habitat areas as inventoried by Metro, and/or clarifying that natural resources under Section 9.110 include Class I and II inventoried areas. One possible variation is to require planned developments where a standard subdivision cannot be designed to avoid Class I and II habitat areas. Through a planned development, intrusion into a habitat area may be allowed provided it is at the edge of the area, does not consume more than 25 percent of the habitat area unless no other alternatives are available, and low impact development techniques are employed in the habitat area being developed.</p>	
Clustering/lot size averaging, on-site density transfers	<p>Clustering: Currently allowed through planned development. Revise provisions to allow either clustering or larger lot approach through a planned development where Class I or II riparian areas. The large or small lot approach would depend on soil and slope characteristics.</p> <p>The purpose of the larger lot approach is to reduce the percentage of</p>
Reduction of lot dimensional standards;	

<p>Allow for waiver of minimum density requirements (Metro);</p>	<p>impervious surface and provide greater separation between building and resource area.</p> <p>Lot Size Averaging: All single family residential zones are based on lot size averaging with a minimum of 4,000 square feet for single family detached. For land divisions of 20 lots or more, the Land Division Ordinance (Section 9.110 j.) allows up to 20 percent of the lots within a single family residential district to be townhouses with certain findings as to the design of the structures. This provision can provide for clustering to save habitat areas, particularly when combined with the requirements of Section 9.110 l. Further, the minimum lot size as well as housing type can be modified through a planned development approach.</p> <p>On-site Density Transfers: Can be accomplished through planned development process. However, the City does not count any area for open space as part net density or dwelling unit yield determinations for a site due to the definition of net density in the Zoning Ordinance (Section 9.603 42.)</p>
<p>2. Site Design</p>	
<p>Increased flexibility for setbacks</p>	<p>Similar to land division design, it is the intent of the City to allow flexible standards through the planned development process. This would be for setbacks and building heights. However, except for the single family residential and the neighborhood commercial districts, the Zoning Ordinance has no height limitations. The Zoning Ordinance, aside from setbacks, has no lot coverage requirements for either residential or non-residential uses.</p>
<p>Increased flexibility for lot coverage</p>	
<p>Increased flexibility for building heights</p>	
<p>3. Parking Design</p>	
<p>Reduced parking ratios</p>	<p>This would be a citywide approach rather than focusing on lands adjacent to sensitive areas.</p> <p>Reduced Parking Levels: The following code provisions contribute to reducing parking area needs:</p> <p>1. Section 9.696 (1): Within the Central Business District, all permitted uses are exempt from off-street parking and loading space requirements of the ordinance.</p> <p>Section 9.696 (2): If parking is provided, it cannot exceed the combined footprint of all structures on-site.</p> <p>Section 9.823 (1) establishes minimum and maximum parking</p>
<p>Shared driveways and parking areas; On-street parking credit</p>	
<p>Flexibility in parking lot landscaping / Additional parking lot landscaping</p>	
<p>Smaller car spaces and stall dimensions</p>	

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<p>Increased use of pervious materials</p>	<p>requirements in the city.</p> <p>Section 9.823 (1) (a) allows up to 50% reduction of off-street parking through a submitted parking study.</p> <p>Section 9.820 (2) allows owners of two or more uses, structures or parcels to jointly use the same parking and loading spaces when peak hours of operation do not overlap.</p> <p>Section 9.821 (3) provides that where several uses occupy a single building or parcel of land, a reduction of up to 25% of the total allowed parking is allowed based on a blended parking ratio for complementary use.</p> <p>Section 9.821 (4) reduces the minimum parking spaces by 10% if the multi-family, commercial or industrial use is located within 500 feet of a transit line.</p> <p>Section 9.822 (4) allows counting on-street parking spaces for all uses except single-family and two-family dwellings. By interpretation, it is limited to on-street parking along the frontage of the site in question.</p> <p>Section 9.823 (2) (a) requires that for uses over 90,000 square feet, the maximum number of parking spaces cannot exceed 90% of that required by the parking ratios.</p>
<p>4. Landscaping/Hardscape Design</p>	
<p>Locating landscaping adjacent to habitat areas</p>	<p>Currently, there is no such requirement in the ordinance. The city will amend its ordinances to require locating landscaping next to Class I and II riparian areas.</p>
<p>Increased use of native plant</p>	<p>Section 9.858 (3)(c)(x) (General Landscaping Standards – Development Standards) encourages the use of native plant materials to reduce irrigation and maintenance demands. The City will amend its ordinance to require the use of native vegetation in all circumstances where landscaping is required. Further, the city will amend its street tree species list to allow for the installation of native trees.</p>
<p>Improved soil amendment</p>	<p>Amend code to specify amending soils where swales, rain gardens and other open style water conveyances are to be installed.</p>
<p>Reduction of non-ADA sidewalk widths within a site</p>	<p>Where not required, allow for non-ADA sidewalks. This has already been done through planned residential development approvals.</p>

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Increased use of habitat-friendly fencing	City will require that walls and solid fences provide for water conveyance provided that all state and Clean Water Service requirements on off-site drainage are met.
Preservation of existing trees and maximize forest canopy	<p>City has tree preservation requirements for trees (Section 9.940 et. seq.) in public rights of way (Section 9.943), natural resource areas (Section 9.944), developable land (prior to and during development) (Section 9.945), trees in approved developments (Section 9.946) and trees on the City’s tree registry (Section 9.947). Natural resource areas are not defined but natural resource vegetation is defined as “trees and vegetation within wetlands or wetland buffer areas, flood plains, within 30 feet of centerline of mapped drainage ways, and open space areas as designated on the Comprehensive Plan.”</p> <p>Within natural resource areas, vegetation removal shall be approved based on:</p> <p>Negligible or minor permanent impact; Removal is necessary to prevent the spread of disease or insects declared to be a nuisance by a governmental agency or arborist, or to correct or eliminate a natural hazard (e.g. falling trees) to the property owner, surrounding properties, or community at large; Loss of value will be of temporary duration until new vegetation can be established or the mitigation plan provides satisfactory replacement of a new resource area of equal value within two planting seasons. Mitigation on-site or within immediate vicinity of the site is preferred and off-site only allowed if there is no reasonable alternative and a method of guaranteeing permanent use of the area off-site is found (i.e. long-term method of ownership to assure continuation of the resource area); and Timetables for the work must minimize impact on wildlife.</p> <p>The City will consider revising definition of natural resource areas to include Class I and II riparian areas as defined by Metro and incorporate into the Metro methodology to determine the location of such areas. Further, the City would revise the code to allow development of sites through a planned development process where allowed units cannot be achieved through a standard development process and comply with the Tree Ordinance for natural resources.</p>

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5. Lighting Design	
Re-directed outdoor lighting, reducing light spill-off	Section 9.825 (10) specifies that lighting for parking facilities be designed to deflect light away from surrounding residences and not create a hazard to the public use of any road or street. City Light and Power standards for street lights high-pressure sodium lamps but can serve metal halide lamps. City will revise Zoning Ordinance to require shielding of any outdoor light within 100 feet of a Class I or II riparian area to minimize light intrusion into habitat areas. Further, the code will specify the use of metal halide in street lights located within 100 feet of a Class I or II riparian area.
6. Density Reduction for Regionally Significant Habitat	
Modified definition of net buildable areas	City already defines net buildable area to exclude roads and all open space areas. May consider including open space areas in Class I and II riparian areas not subject to CWS Vegetative Corridor requirements as part of the net density calculation in order to get credit for these areas (or any portion thereof) being retained in open space.
Reduced minimum buildable lot sizes	City does not define buildable lot sizes except through setback requirements. As discussed above, lot sizes in single family residential zone districts are by average lot size with a minimum lot size of 4,000 square feet. This can be further modified through planned residential process. The City would rather allow larger lot sizes to achieve large lot development through a PRD near riparian areas. The City will amend its Zoning Ordinance to allow a reduction in density below the minimum to allow for preservation of Class I and II riparian areas as defined by Metro.

B. Engineering and Design Approaches	
1. Street design	
Minimize paving	Section 9.110 (1) a. of the Land Division Ordinance requires 28 foot street width for neighborhood routes and allows the same width for local streets where serving not more than 16 single family dwellings (dead end) to 32 single family units (where connected to another street at each end of the segment) or not more than 20 multi-family units (dead end) to 40 units (where connected). The same section also allows street widths of 24 feet where 12/24 single family units or

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	16/32 multi-family units are being served. Further, local streets can be reduced to 15 foot width for one way lanes to preserve natural features or where a full width street would result in excessive cut-and-fill. No further change is proposed.
Use pervious paving materials	As noted above, the City may consider use of paving materials either for private facilities such as parking areas or low-load bearing use such as sidewalks and alleys. The City will revise the Zoning Ordinance to allow the City Engineer to approve the use of pervious materials on City streets where found appropriate due to traffic levels, proposed materials and other relevant factors.
Maximize street tree usage	Where there is no street tree plan, Land Division Ordinance Section 9.109 (1) g. ii. requires street trees at a rate of one for every thirty feet although the total number can be adjusted based on optimum tree spacing. The Code also allows for street tree plans (Section 9.109 (1) g. i. and preservation of trees (6 inches or greater in diameter at 4 ½ feet) in developing areas. Between these requirements, existing trees are intended to be saved and be incorporated into the street tree plan.
Use multi-functional open drainage systems / modify drainage practices	At this time the City wants to conduct further evaluation of open space public drainage facilities from the standpoint of maintenance costs. As noted above, the Zoning Ordinance does allow for bio-swales for interior landscape areas in a parking area and are proposing the use of bio-swales in exterior landscape areas. The Zoning Ordinance will be amended to allow bio-swales built to the satisfaction of the City Engineer for on-site drainage not part of the public system.
2. Stream crossing and street connectivity standards	
Minimize the number of stream crossings/place crossings perpendicular	A review of the City's Transportation System Plan indicates that five proposed collectors and arterials (David Hill Extension, A Street, Main Street, 23 rd /24 th Avenue and 26 th Avenue)) would cross stream corridors. In all instances the crossings would be perpendicular. These crossings cannot be avoided if an efficient transportation system is to be provided in Forest Grove. The City will consider amending its Land Division Ordinance to require new local roads not be designed to be perpendicular within Class I and II riparian areas and to the extent feasible, minimize the number of crossings these areas taking into account the provision of adequate circulation and opportunities to

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	reserve open space sites.
Allow narrow paved widths through stream corridors	This requirement has already been imposed by Division of State Lands on two road crossings in the City (Main Street and Bonnie Lane). It is believed with these state requirements this provision has been addressed in Forest Grove.
Use habitat sensitive bridge and culvert designs	The City installed habitat friendly culverts for the Main Street project and will be doing so for the Bonnie Lane project. This provision from the City's standpoint, has been and will continue to be addressed.
3. Stormwater management facility design	
Use vegetated stormwater management facilities	The city operates under Clean Water Services Design and Construction Standards and will allow or, where mandated, require appropriate stormwater facility designs.
Use detention ponds	
Use of underground detention and/or treatment	

C. Building Design Solutions	
Encourage Green roofs (eco-roofs)	The state adopted building code has a special section to allow green roofs. Thus, it is allowed but the City is not anticipating offering any incentives for such designs but could be addressed on a basin-wide approach.
Disconnect downspouts	The current building code allows and the City has approved disconnected down spouts for one and two family dwellings. The City has also approved downspouts connected to engineered bio-swales for multi-family projects. On-site drainage must be design to accommodate on-site runoff for a 25 year storm. The City will allow similar approaches for non-residential development.
Use rain barrel or cistern system	The City will allow the use of cisterns or rain barrels to capture runoff from downspouts and hard surface areas provided the cisterns/rain barrels are connected to an approved storm water collection system to prevent any additional off-site runoff for a 25 year storm.

F. Hillsboro

The City of Hillsboro adopted its Natural Resources Management program in 2003 to comply with state Goal 5. The City conducted the required inventory of potential Goal 5 resources within the City in the summer and fall of 2000 in accordance with OAR 141-86-180 through 141-86-240 and OAR 660-023-0090 through 660-023-0110. The results of this inventory are contained in the “*City of Hillsboro Goal 5 Natural Resource Inventory and Assessment Report*” which includes a Local Wetlands Inventory and Assessment, and Riparian Corridor and Upland Wildlife Habitat Inventories and Assessments.

The inventory of significant riparian and upland resources was completed incorporated into the Hillsboro Comprehensive Plan in 2001, and subsequently, a Significant Natural Resources Overlay District (SNRO) was created indicating the appropriate levels of resource protection as determined through the ESEE analysis to implement goals and policies of the program.

A new Section 131A was added to the Hillsboro Zoning Ordinance (HZO) in 2003 which regulates development activities within the SNRO and specifies mitigation requirements. The SNRO code specifies permitted uses that are allowed within the district to the extent that they are not prohibited by the provisions of the underlying zone or any applicable conditions of approval, and are otherwise in compliance with applicable Federal, State and local requirements. Uses requiring a Significant Natural Resources Permit (SNRP) are also identified, with different levels of permitting requirements and review procedures required dependant on proposed uses and scale of impact. In addition, certain uses are designated “Prohibited” throughout the district.

HZO Section 131A(8), Standards Governing Approvals in the SNRO District is structured to minimize, minimize to the extent practicable and avoid potential adverse impacts of development activities within a resource site based on level of protection and proposed use and size of disturbance. Compensatory mitigation standards are based on level of protection, area of disturbance, with ratios for enhancement being twice that required for replacement.

In the case of residential land divisions on property contained within the SNRO district, adjustments to standards for minimum lot width, depth and area, and to minimum densities are allowed, provided consideration is given to the potential impacts on neighboring properties. Where a proposed land division would create twelve or more lots, and 50% or more of the site is within the SNRO district, the development proposed must be reviewed as a Planned Unit Development pursuant to HZO Section 127. In cases where otherwise developable land is contained within the SNRO district, residential density within the SNRO district cannot exceed 50% of the maximum

permitted by the underlying zone. The surplus density may be transferred to developable portions of a lot. This transfer is intended to permit densities equivalent to 80% of the maximum otherwise allowed in the SNRO to be developed elsewhere on the site.

To complement and enhance the effectiveness of the existing SNRO district regulations, and to achieve the goals and objectives of the Tualatin Basin Fish & Wildlife Program, the City is considering amendments to the Comprehensive Plan, Zoning Ordinance, and Subdivision Ordinance that will remove regulatory barriers, and further encourage and facilitate the use of Habitat Friendly Development and Low Impact Development practices and techniques. A new HZO Section 131B is proposed that incorporates Metro's Title 13, Table 1-1, Habitat Friendly Development Practices, to provide a menu of techniques that a developer may consider when designing and building projects within or near the SNRO or Habitat Benefit Area (see *Appendix G*).

1. Adoption/Public Involvement Schedule

Task	2006						2007
	Jul	Aug	Sep	Oct	Nov	Dec	Jan
PC Worksession		8/30					
Initiate amendments				10/11			
PC Hearing							1/10
City Council Adoption							2/6

2. Summary of Planned Implementation

A. Planning and development approaches	
1. Land Division Design	
Clustering/lot size averaging, on-site density transfers	Lot size averaging and on-site density transfers permitted for properties with a Significant Natural Resource. Amended Hillsboro Comprehensive Plan (HCP) Section 1. 3. (III)(Y) and Hillsboro Zoning Ordinance (HZO) Section 4. 127 PUD (III)(E)(5) to allow density transfers within HBA's. Section 131B Habitat Friendly Development added to the HZO to encourage the use of Habitat Friendly Development practices including the use clustering.
Reduction of lot dimensional standards;	Currently allow adjustments from the structural setbacks and lot coverage standards (minimum and maximum) of the underlying zone, provided consideration is given to potential impacts to neighboring

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	properties. HZO Section 131 A allows adjustments to the required lot width and depth in SNR Areas.
Allow for waiver of minimum density requirements (Metro);	An adjustment to the min. required density is allowed through the SNRP process. Amended HCP Section 1. 3. (III)(Y) and HZO Section 4. 127 PUD (III)(E)(5) to allow density reductions within HBA's.
2. Site Design	
Increased flexibility for setbacks	Code standards currently allow adjustments from the structural setbacks and lot coverage standards (minimum and maximum) of the underlying zone, provided consideration is given to potential impacts to neighboring properties. The city may consider HBA conservation as an exception criterion to support increased flexibility for setbacks when preserving HBAs and/or using habitat friendly development practices. HZO Section 131 A allows adjustments to the required setbacks in SNR Areas.
Increased flexibility for lot coverage	Code standards currently allow adjustments from the minimum and maximum structural setbacks and minimum and maximum lot coverage standards of the underlying zone, provided consideration is given to potential impacts to neighboring properties. The city may consider increased flexibility for lot coverage when preserving HBAs and/or using habitat friendly development practices. HZO Section 131 A allows adjustments to the minimum lot coverage standards for SNR Areas.
Increased flexibility for building heights	Planning Commission may grant an exception through the PUD process. The city may consider incorporating Building Height flexibility (such as one-story bonus over base building heights) to facilitate avoidance and protection of the HBA.
3. Parking Design	
Reduced parking ratios	Allowed through the PUD process. The city may consider HBA conservation as an exception criterion. Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including reduced parking ratios.
Shared driveways and parking areas; On-street parking credit	The city does not preclude shared parking areas; requires commission or committee approval in some cases. Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including the use of shared driveways and parking areas.

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Flexibility in parking lot landscaping / Additional parking lot landscaping	When preserving HBAs and/or using habitat friendly development practices, the city may consider allowing a 15% reduction of the required parking lot landscaping square footage; provided that the square footage does not exceed the size of the HBA. Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including encouraging landscaping in parking areas be located adjacent to HBA's.
Smaller car spaces and stall dimensions	Current Zoning Ordinance allows up to thirty (30) percent of the minimum number of off-street automobile parking spaces required may be constructed as compact spaces. Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including minimizing the required number of parking spaces and stall dimensions.
Increased use of pervious materials	Section 3 (86) General Provisions – Off-Street Parking and Loading (9a) of the HZO was amended to encourage the use of pervious surface techniques. Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including the use of pervious paving materials.
4. Landscaping/Hardscape Design	
Locating landscaping adjacent to habitat areas	Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including encouraging landscaping in parking areas be located adjacent to HBA's.
Increased use of native plant	Section 3. Article II. Section 6 Pedestrian/Bicycle Accessways (C) (6)(b) of the Subdivision Ordinance was amended to encourage the planting of native shrubs along fences. Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including the use of native plants throughout the development.
Improved soil amendment	Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including use of improved soil amendment.
Reduction of non-ADA sidewalk widths within a site	Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including reduction of sidewalk width and the elimination of non-ADA sidewalks.
Increased use of habitat-	Section 3. Article II. Section 6 Pedestrian/Bicycle Accessways (C)

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friendly fencing	(6)(b) of the Subdivision Ordinance was amended to encourage the planting of native shrubs along fences.
Preservation of existing trees and maximize forest canopy	Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including the preservation and maintenance of existing trees and canopy, as well as the planting of new trees.
5. Lighting Design	
Re-directed outdoor lighting, reducing light spill-off	For development near SNR, a permit is required that limits types, sizes and intensities of lights. Section 3. Article II. Section 6 Pedestrian/Bicycle Access-ways (C) (4) of the Subdivision Ordinance was amended to encourage the direction of lighting away from HBAs.
6. Density Reduction for Regionally Significant Habitat	
Modified definition of net buildable areas	The City currently subtracts out wetlands, wetlands buffer and floodplains (most of the HBA) when the gross development area.
Reduced minimum buildable lot sizes	HZO Section 131 A allows adjustments to the minimum lot coverage standards in SNR Areas.

B. Engineering and Design Approaches	
1. Street design	
Minimize paving	Section 4 (127) PUD (I.6) added to the HZO allowing for street standards that minimize paving.
Use pervious paving materials	Section 4 (127) PUD (I.6) added to the HZO allowing for the use of pervious paving materials.
Maximize street tree usage	Street tree standards for PUDs; Section 4 (127) PUD (I.6) added to the HZO allows the maximization of street tree coverage. Currently conducting inventory to become recognized as a Tree City USA and to provide the foundation for an Urban Forestry Management Program
Use multi-functional open drainage systems / modify drainage practices	Section 4 (127) PUD (I.6) added to the HZO allowing for the use of multi-functional open drainage systems.

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2. Stream crossing and street connectivity standards	
Minimize the number of stream crossings/place crossings perpendicular	Status: For SNR Permit approval process, city uses standards for bridge types. The number of crossing shall be minimized through the use of shared access for abutting lots and access through easements for adjacent lots. Section 4 (127) PUD (I.6) added to the HZO allowing for street standards that minimize the negative effects of stream crossings.
Allow narrow paved widths through stream corridors	Status: For SNR Permit approval process, design rights-of-way, roadways, driveways and pathways to be the minimum width necessary within the SNR Site while also allowing for safe passage of vehicles, bicycles and/or pedestrians. Section 4 (127) PUD (I.6) added to the HZO allowing for street standards minimizing the negative effects of stream crossings.
Use habitat sensitive bridge and culvert designs	Status: Through SNRP, use bridges and culverts with a natural bottom. Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including the use of habitat sensitive bridge and culvert designs.
3. Stormwater management facility design	
Use vegetated stormwater management facilities	Amended HCP Section 1. 3. (III)(L); Section 2 Section 12(V)(E)(2) and Section 3 Section 12(V)(E)(6); Section 4. Section 13 (I) & (H); Section 5 Section 13(II)(F); Section 9 Section 13(III)(F)(4); Section 13 Section 13(VII)(U); Section 14 Section 17(IV)(A)(2); Section 16 Section 18(II)(A)(7) to encourage the use of vegetated stormwater facilities. Amended HZO Section 2. Section 20J and Section 4 Section 127 PUD (I) (6) to encourage the use of vegetated stormwater facilities. Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including the use of vegetated stormwater facilities. Subdivision Ordinance Section 2. Article II. Section 5. (J) Street and Pedestrian/Bicycle Design Standards was added to encourage the use of “green streets” designs.
Use detention ponds	Requires detention facilities for all projects. Uses CWS standards. Section 131B Habitat Friendly Development was added to the HZO to encourage the use of Habitat Friendly Development practices including the use of detention ponds.

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Use of underground detention and/or treatment	The city requires installation for all projects using CWS Design & Construction Standards.
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C. Building Design Solutions	
Encourage Green roofs (eco-roofs)	Section 131B Habitat Friendly Development added to the HZO to encourage the use of Habitat Friendly Development practices including the use of green roofs.
Disconnect downspouts	Section 131B Habitat Friendly Development added to the HZO to encourage the use of Habitat Friendly Development practices including the use of disconnected downspouts. Technical design specifications may need to be adopted Basin-wide to facilitate the use of this method. Specifications should address site suitability criteria and additional steps needed for sites that are not highly suitable in terms of soil permeability.
Use rain barrel or cistern system	Section 131B Habitat Friendly Development added to the HZO to encourage the use of Habitat Friendly Development practices including the use of rain barrels. Technical design specifications may need to be adopted Basin-wide to facilitate the use of this method. Specifications should address site suitability criteria and additional steps needed for sites that are not highly suitable in terms of soil permeability.

G. Sherwood

Sherwood currently has natural resource protections in place and meets the statutory requirements under Goal 5 (OAR 660-023). The protections address both riparian and upland wildlife habitat areas. The riparian habitat protections are regulated by the CWS standards, as well as Chapter 8 of the Sherwood Zoning & Community Development Code (SZCDC). The SZCDC does not outright “prohibit” development in the floodplain, but the standards are restrictive to the point that it is essentially impossible to obtain approval and there is no development of the floodplains.

Sherwood’s wetland, habitat and natural resources section of the code requires protection of wetland resources in addition to CWS, Division of State Lands, and US Army Corps of Engineers protections. The standards for protection of upland wildlife habitat and/or riparian habitat beyond the boundaries of the floodplain or CWS buffer standards are also very extensive in Sherwood. Section 8.305 of the code has standards for “natural features” referred to in the Natural Resource Inventory in Part 2 of the Comprehensive Plan. This section provides additional and detailed review for projects proposed in an area designated as a natural resource.

Section 8.304.07 provides protection for all trees and woodlands when associated with a development application by requiring that trees and woodlands be protected to the maximum extent feasible and that mitigation take place when trees must be removed. While there are existing protections in place, it is recognized that there are additional actions that could be taken to further protect natural resources in Sherwood. In addition to code amendments that remove barrier to and encourage habitat friendly development, the City is also proposing to strengthen the current tree removal standards to apply to property even when it is not subject to a land use application. While not required to comply with the Tualatin Basin program or Metro Title 13, these new standards compliment the Tualatin Basin program. Additional details are provided in *Appendix H*.

1. Adoption/Public Involvement Schedule

Task	2006					
	Jul	Aug	Sep	Oct	Nov	Dec
PC Worksessions: 3/14, 4/25, 6/27,		8/8				
Planning Commission Hearings			9/12	10/24		
City Council hearings						12/5

2. Summary of Planned Implementation

A. Planning and development approaches	
1. Land Division Design	
Clustering/lot size averaging, on-site density transfers	<p>Density transfers only allowed through a PD process which is a legislative change adopted by Council. The process is lengthy and costly, but does provide for protection of openspace.</p> <p>Sherwood is very concerned about reduction in lot sizes and is hesitant to give up discretion when a developer is proposing reduced lot sizes. The Planning Commission discussed the idea of waiving or reducing the fees for a PD when there are inventoried Goal 5 resources on the site.</p> <p>The newly adopted standards allow lot sizes to be reduced by up to 10% if the equal amount of land reduced was dedicated as public open space. In an example of LDR property where the minimum lot size is 7,000 square feet, the lot could be reduced by 700 square feet if 700 square feet of openspace were dedicated.</p>
Reduction of lot dimensional standards;	<p>Dimensional standards can only be varied via an administrative or traditional variance. The fee, process and requirements are not conducive to encouraging a developer to protect resources.</p> <p>The newly adopted standards allow reduction of setbacks up to 30%, provided the setback for garages remains 20 feet from the property line and the setbacks otherwise comply with TVF&R separation requirements. Reduction is allowed subject to clear and objective standards outright when clearly demonstrated that such reduction will protect an inventoried natural resource.</p>
Allow for waiver of minimum density requirements (Metro);	<p>Definition of density states: “The intensity of residential land uses per acre, stated as the number of dwelling units per net acre. Net acre means an area measuring 43,560 square feet after excluding present and future rights-of-way, environmentally constrained areas, public parks and other public uses. Current definition of net buildable acre does not clearly define “environmentally sensitive areas” or “other public uses”. There is no definition of “environmentally constrained areas”.</p> <p>The definitions have been revised to: define environmentally constrained as 100-year floodplain, floodway, wetland, and CWS vegetated corridor; add environmentally sensitive definition which</p>

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	refers to the Metro inventory; and to add a provision in the density definition that properties with environmentally sensitive areas may, by choice, remove the environmentally sensitive areas (but not constrained) from the density calculations when determining the net buildable area, provided the environmentally sensitive areas are protected through tracts or easements.
2. Site Design	
Increased flexibility for setbacks	Current commercial and industrial setbacks already allow zero setbacks except when adjacent to residential zone. No change was necessary.
Increased flexibility for lot coverage	Sherwood Code does not have a minimum or maximum lot coverage requirement. No change was necessary.
Increased flexibility for building heights	The City considered allowing for increased building heights, but determined that the heights are currently high enough and should be able to accommodate the reduced setbacks.
3. Parking Design	
Reduced parking ratios	The code revisions allow a 10-25% reduction in the required parking spaces for sites depending on the amount of required parking spaces provided there is inventoried natural resources that will be protected as a result of the parking reductions. If protection is not in the form of dedication, the natural resource must be enhanced with native vegetation and incorporated into the landscaping design.
Shared driveways and parking areas; On-street parking credit	Sherwood code allows shared parking and credit for on-street parking. Sherwood Code also allows and encourages shared driveways. For access along major streets, shared driveways may be required. No change was necessary.
Flexibility in parking lot landscaping / Additional parking lot landscaping	Code does not have specific percentage of parking lot landscaping (has been fixed with the revisions) and has specific widths for perimeter landscaping. One landscaping island (not less than 64 square feet) is required for every 15 parking spaces. The code revisions allow flexibility in the location and width of landscaping when there is a resource that would otherwise be reduced to provide the required landscaping.
Smaller car spaces and stall dimensions	Sherwood currently allows only 25% of the required parking to be compact. The dimensions are 9x20 feet for standard and 8x18 feet for compact. The city does not wish to increase the percent of permitted compact spaces or decrease the required stall dimensions. The current

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	Sherwood resident tends to require larger parking spaces and any further reduction in stall dimension is not supported by the Planning Commission or Council. However, the City is supportive of reducing the overall number of spaces if habitat areas are preserved (discussed in previous row)
Increased use of pervious materials	Code does not specifically prohibit use of pervious materials, therefore changes were made to the code to specify that they are permitted and encouraged where appropriate.
4. Landscaping/Hardscape Design	
Locating landscaping adjacent to habitat areas	As discussed above, the code revisions add exception language to landscaping standards allowing modifications or “shifting” of landscaping where necessary to preserve habitat areas
Increased use of native plant	Sherwood Code already requires landscaping to be native materials – irrigation not specifically required but property owners must show how the landscaping will be maintained. No changes were necessary
Improved soil amendment	Code requires applicants to show adequate preparation of topsoil and subsoil to establish healthy growth of landscaping. No change were necessary
Reduction of non-ADA sidewalk widths within a site	The current Code requires all new development (except single family detached housing) to provide a continuous system of private pathways/sidewalks at least 6 feet wide. 5.401.03 requires the path to extend from ground floor entrances or the ground floor landing of stair, ramps or elevators to the public sidewalk or curbs. 5.402.02 and 5.403.02 also requires the sidewalk to connect to existing development, vehicular parking, common areas, storage areas, adjacent development, and transit facilities within 500 feet of the site. As a general rule to reduce the amount of impervious surface, amendments were made to allow the pedestrian path to be decreased for any areas not providing primary connections to the public right of way. The “primary” connectivity system shall continue to be 6 feet wide, but the “secondary” or “internal” connectivity system may be reduced to 4 feet, provided ADA requirements are fully satisfied.
Increased use of habitat-friendly fencing	Amendments include changes to allow vegetation to be used as screen in lieu of fencing when adjacent to habitat areas.
Preservation of existing trees and maximize	Sherwood requires mitigation for trees removed as part of a land use application on a 1:1 ratio. Trees mitigated must be similar species to

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forest canopy	that removed. There is no requirement to mitigate hazardous trees or trees in easements or right of way To address a loop hole in the existing code, amendments were proposed and approved to limit tree removal on properties even when not associated with a land use application while still allowing private property owners the ability to remove trees on their property without permit. Mitigation is required for trees removed within one year of a land use application being submitted.
5. Lighting Design	
Re-directed outdoor lighting, reducing light spill-off	Current code already requires lighting to be directed away from adjacent properties.
6. Density Reduction for Regionally Significant Habitat	
Modified definition of net buildable areas	With the code amendments, environmentally significant areas (not constrained areas) may be removed from the density calculation for net buildable area in exchange for habitat protection.
Reduced minimum buildable lot sizes	See above.

B. Engineering and Design Approaches	
1. Street design	
Minimize paving	Chapter 6 provides a street design modification through a Type III process. 8.304.07.D.1 indicates the City may grant exceptions to the established street, utility and other infra-structure standards in order to retain trees and woodlands. The City recently adopted an updated TSP after a very long and extensive public process. For this reason, the City is reluctant to re-open any discussion for reduction of pavement width. With the code amendments, the City will allow a reduction in the ROW cross-section elements when clearly necessary to preserve existing natural resource areas when there is no function or safety issues at no additional charge (fee waiver). Modification will be outright but subject to specific criteria such as the requirement that there be inventoried habitat area.
Use pervious paving materials	No specific barrier identified in the current code -- Code modifications were made to encourage use of pervious materials
Maximize street tree usage	City of Sherwood requires one street tree to be planted for every 25 feet of frontage (as opposed to every 25 feet on center) which is

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	greater than most neighboring jurisdictions. No change was necessary
Use multi-functional open drainage systems / modify drainage practices	CWS and Engineers need to develop design standards Code should not preclude options
2. Stream crossing and street connectivity standards	
Minimize the number of stream crossings/place crossings perpendicular	Code and TSP allow flexibility when there is a stream, wetland or topographical constraint. No change was necessary.
Allow narrow paved widths through stream corridors	
Use habitat sensitive bridge and culvert designs	Sherwood Code does not have a permit process for culvert replacement or in-stream enhancements; however the City is implementing the Healthy Streams Plan and will be making infrastructure improvements consistent with the Healthy Stream Plan including habitat friendly culvert replacement where necessary.
3. Stormwater management facility design	
Use vegetated stormwater management facilities	The existing code and amendments would not prohibit, but need CWS to develop Design and construction standards.
Use detention ponds	
Use of underground detention and/or treatment	

C. Building Design Solutions	
Encourage Green roofs (eco-roofs)	Development Code does not preclude options
Disconnect downspouts	Technical design specifications still need to be developed. Code should not preclude options
Use rain barrel or cistern system	

H. Tigard

Based on a thorough analysis of existing City of Tigard regulations, it was determined that a number of the Tualatin Basin recommendations are already substantially met by standards within Tigard's Community Development Code. However, some amendments to the Code were required in order to fully satisfy Tualatin Basin guidelines to provide greater code flexibility, remove existing barriers and add language encouraging the use of recommended practices. The Summary of Planned Implementation table below discusses the proposed amendments (see also *Appendix I*).

At the October 16th, 2006 Planning Commission meeting the Commission voted unanimously to recommend approval of the proposed amendments subject to the following modifications:

1. Density Transfer: At the Commission's September 25th worksession staff proposed a density transfer provision based on the Tualatin Basin recommendation (i.e. allow development potential to be transferred from qualified habitat areas) to augment existing regulations which provide density transfer /bonuses for the following:
 - 100-yr floodplain, steep slopes and drainageways: Up to 25%;
 - Wetlands: Up to 100% for land zoned R-12, R-25, and R-40;
 - Tree retention: 1% bonus for each 2% of canopy cover, up to 20%; and
 - Planned developments: 1% bonus for each 5% of the gross site area set aside in open space, up to 5%.

The Planning Commission recommended to the City Council that code amendments be deferred until further consideration can be given to establishment of design standards and review procedures to ensure that proposed density transfers will be compatible with the surrounding neighborhood. The issue was added to the Planning Commission calendar for further discussion in the near term.

2. Exemption for Projects to Implement CWS Healthy Streams Plan: At the October 16th Public Hearing, public testimony was given in opposition to exempting projects which implement Clean Water Services Healthy Streams Plan from the City's Sensitive Lands provisions since this would remove the process for citizens to review and comment on proposed actions. Based on the testimony, the Planning Commission decided to exclude this exemption from the habitat-friendly development provisions being recommended for approval by Council.

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These modifications were discussed by the Council at the November 21st City Council worksession. The changes were made and are included in the final copy of the ordinance, which passed unanimously at the December 12th City Council Public Hearing.

The City of Tigard is currently engaged in a process to significantly update its Comprehensive Plan. Revisions to make Comprehensive Plan policies and content consistent with the new standards (Volume II, Findings, Policies and Implementation Strategies) are expected summer of 2007.

1. Adoption/Public Involvement Schedule

Task	2006					
	Jul	Aug	Sep	Oct	Nov	Dec
PC Worksessions	7/31		9/25			
Materials for PC Hearing				10/2		
PC Public Hearing				10/16		
City Council Worksession					11/21	
Council Public Hearing						12/12*
*Ordinance Effective 1/23/07						

2. Summary of Planned Implementation

A. Planning and development approaches	
1. Land Division Design	
Clustering/lot size averaging, on-site density transfers	Planning Commission considered a proposed administrative density transfer provision for significant habitat areas based on the Tualatin Basin recommendation to augment Tigard's existing density transfer provisions for the 100-yr floodplain, steep slopes and drainageways; wetlands; tree retention; and planned developments. The Planning Commission decided that an amendment expanding permitted density transfers should be momentarily deferred until greater consideration can be given to appropriate design compatibility standards and review procedure.

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Reduction of lot dimensional standards	Add strictly & moderately limit habitat areas to the list of areas (including CWS vegetated corridor) where the Planning Director may approve up to 50% adjustment to any dimensional standard (e.g., setback height or lot area) of the underlying zone district to reduce adverse impacts on wetlands, stream corridors, fish and wildlife habitat, water quality and the potential for slope of flood hazards.
Allow for waiver of minimum density requirements (Metro);	Allow reduction to minimum density by subtracting the number of square feet of inventoried significant habitat that is permanently protected from the total number of square feet used to calculate the minimum density requirement.
2. Site Design	
Increased flexibility for setbacks	Add strictly & moderately limit habitat areas to the list of areas (including CWS vegetated corridor) where the Planning Director may approve up to 50% adjustment to any dimensional standard (e.g., setback height or lot area) of the underlying zone district to reduce adverse impacts on wetlands, stream corridors, fish and wildlife habitat, water quality and the potential for slope of flood hazards.
Increased flexibility for lot coverage	Current code allows lot coverage to be increased up to 80% or greater, thus meeting the Basin's recommended flexibility for lot coverage.
Increased flexibility for building heights	Add strictly & moderately limit habitat areas to the list of areas (including CWS vegetated corridor) where the Planning Director may approve up to 50% adjustment to any dimensional standard (e.g., setback height or lot area) of the underlying zone district to reduce adverse impacts on wetlands, stream corridors, fish and wildlife habitat, water quality and the potential for slope of flood hazards.
3. Parking Design	
Reduced parking ratios	Current code allows for up to 20% reduction in required parking for commercial, industrial or civic uses, thus exceeding the 10% recommended by the Tualatin Basin.
Shared driveways and parking areas; On-street parking credit	Existing regulations address the issue of joint access, egress, parking and loading areas.
Flexibility in parking lot landscaping / Additional parking lot landscaping	Current code allows for a 1% reduction in the required amount of landscaping for every 2% of canopy cover preserved, totaling a reduction of up to 20%.

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Smaller car spaces and stall dimensions	Current code allows stalls to be distributed 50% compact and 50% standard spaces, thus exceeding the Basin recommendation. The standard stall dimensions for both width (at 8' 6") and length (at 18' 6") are substantially equivalent to the Basin recommendation.
Increased use of pervious materials	Add pervious paving to list of allowed hard surface materials for walkways, parking areas and access drives. Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
4. Landscaping/Hardscape Design	
Locating landscaping adjacent to habitat areas	Current code allows for up to 20% reduction (greater than the 15% recommended) of required landscaping in exchange for preservation of existing tree canopy (1% reduction for each 2% of canopy).
Increased use of native plant	Current code includes language promoting the use of native plant materials to reduce irrigation and maintenance demands.
Improved soil amendment	Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
Reduction of non-ADA sidewalk widths within a site	Add significant habitat areas to the list of natural features eligible for adjustments to street improvement standards.
Increased use of habitat-friendly fencing	Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
Preservation of existing trees and maximize forest canopy	Current code contains provisions and incentives for tree preservation and mitigation of removed trees. Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
5. Lighting Design	
Re-directed outdoor lighting, reducing light spill-off	Current code addresses light spill-off in commercial areas by requiring all lighting fixtures to incorporate cut-off shields to prevent the spillover of light to adjoining properties. Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.

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6. Density Reduction for Regionally Significant Habitat	
Modified definition of net buildable areas	Amend the definition of net development area to all "significant habitat areas" to be deducted along with other sensitive land areas at the option of the developer.
Reduced minimum buildable lot sizes	The current code allows for a reduction of lot area/size below the minimum allowed by the underlying zone as an incentive for tree retention (18.790.040.A.2) and avoiding the vegetated corridor (18.775.100).

B. Engineering and Design Approaches	
1. Street design	
Minimize paving	"Skinny" roadway widths are currently allowed on local residential streets if criteria is met. Add "bodies of water and significant habitat areas" to the list of natural features considered for adjustments to street improvement standards. Add "significant habitat areas" to the list of natural features precluding block size and planter strip requirements.
Use pervious paving materials	Add pervious paving to list of allowed hard surface materials for walkways, parking areas and access drives. Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
Maximize street tree usage	Tigard has a Street Tree Planting Program, which provides free street trees for public right-of-way areas. A Street Tree List was developed to assist Tigard homeowners, businesses, and developers in choosing appropriate street trees. Current code meets Basin recommendation.
Use multi-functional open drainage systems / modify drainage practices	City requires measures to address the additional runoff caused by the development to confirm with CWS Design and Construction Standards. Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
2. Stream crossing and street connectivity standards	
Minimize the number of stream crossings/place crossings perpendicular	Add "bodies of water and significant habitat areas" to the list of natural features considered for adjustments to street improvement standards. Add "significant habitat areas" to the list of natural features precluding block size.

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Allow narrow paved widths through stream corridors	“Skinny” roadway widths are currently allowed on local residential streets if criteria is met. Add “bodies of water and significant habitat areas” to the list of natural features considered for adjustments to street improvement standards. Add "significant habitat areas" to the list of natural features precluding block size and planter strip requirements.
Use habitat sensitive bridge and culvert designs	The City of Tigard is actively coordinating with CWS to implement the Healthy Streams Plan, in accordance with CWS Design and Construction Standards.
3. Stormwater management facility design	
Use vegetated stormwater management facilities	Numerous water quality facilities have been constructed in the City of Tigard. Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
Use detention ponds	Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
Use of underground detention and/or treatment	Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.

C. Building Design Solutions	
Encourage Green roofs (eco-roofs)	No apparent barriers exist within the Development Code precluding options. The City administers specialty codes & building requirements adopted by the state. Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
Disconnect downspouts	No apparent barriers exist within the Development Code precluding options. The City administers specialty codes & building requirements adopted by the state. Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.
Use rain barrel or cistern system	No apparent barriers exist within the Development Code precluding options. Require consideration of innovative methods and techniques to reduce development impacts to site hydrology and fish and wildlife habitat as part of Site Development Review.

I. Tualatin

The City of Tualatin has participated directly with other jurisdictions in the Tualatin Basin in the early 1990s when Clean Water Services' role was expanded to include stormwater management. In the late 1990s the City worked with the Basin's jurisdictions, Metro, the State, citizens, nonprofit organizations and developers to create and adopt a Basin wide approach to comply with Metro's Urban Growth Management Functional Plan's Title 3 for Floodplain Management and Water Quality. Currently, the City is working with the Basin jurisdictions, Metro, the State, citizens, nonprofit organizations and developers to create the Tualatin Basin Program to comply with the Functional Plan's voluntary program in Title 13 to protect fish and wildlife habitat. The Tualatin Community Plan and its implementing regulations already address many of the elements in Title 13 and the Tualatin Basin Program, but amendments are proposed to the Tualatin Development Code to remove barriers and to encouragement low impact development (see *Appendix J*). A limited number of the Basin Program's elements are not proposed to be added because they are inappropriate for Tualatin or their effectiveness would be minor as applied in Tualatin.

1. Adoption/Public Involvement Schedule

Task	2006					
	Jul	Aug	Sep	Oct	Nov	Dec
Tualatin Planning Advisory Committee* (TPAC) Worksession	7/13	8/10				
TPAC Recommendation to Council			9/14			
Council Public Hearing				10/23		
Council Pass Ordinance					11/13	
Ordinance Effective						12/13

* Tualatin does not have a Planning Commission. The Tualatin Planning Advisory Committee reviews proposed Plan Text and Plan Map amendments and makes recommendations to the Tualatin City Council in an advisory capacity.

2. Summary of Planned Implementation

A. Planning and development approaches	
1. Land Division Design	
Clustering/lot size averaging, on-site density transfers	The Tualatin Development Code (TDC) uses lot size averaging for single-family development. The TDC's only single-family district allows incentives to cluster homes and protect habitat. It has allowed on-site density transfers for multi-family development since the 1970s. The proposed amendments do not include adopting a PUD process for residential development.
Reduction of lot dimensional standards;	Amendments are not proposed because the single-family lot size was reduced and changed to an average, and dimensions were reduced in 1995, 1998 and 2000.
Allow for waiver of minimum density requirements (Metro);	Amendments are not proposed because the TDC uses net density, not gross density, thus residential developments are not negatively affected when habitat is placed in Tracts. The Minor and Major Variance processes are also available.
2. Site Design	
Increased flexibility for setbacks	Amendments are not proposed to reduce single-family setbacks because the setbacks were reduced in 1995 and 2001, including dwellings near habitat. It is not clear that allowing even narrower yards is appropriate given other factors such as fire, safety, space, air and light access to single family dwellings. For commercial and industrial uses almost all of the side and rear setbacks already can be zero and amendments are proposed to allow a 35% reduction in front, side or rear yard setbacks.
Increased flexibility for lot coverage	Amendments are not proposed to increase lot coverage because it was increased from 35% to 45% in 2000 for single-family homes. Greater than 45% coverage is not appropriate in the City's only single-family district. There is no lot coverage standard for multi-family, commercial and industrial uses, thus buildings can cover much of the lot provided setbacks, parking and other requirements are met.
Increased flexibility for building heights	Amendments are not proposed to increase building height because current limits go up to 35 feet for four residential districts and 64 feet for one district; 45 feet for many commercial districts and up to 75 feet in the downtown area; and 60 feet for industrial districts.

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3. Parking Design	
Reduced parking ratios	Amendments are not proposed because the TDC already provides this flexibility by allowing less than the required number of spaces. The reductions do not apply to on-street parking. Parking ratios comply with the Functional Plan's standards.
Shared driveways and parking areas; On-street parking credit	Amendments are not proposed because the TDC already provides for and requires shared driveways. It allows residential parking to be on private property up to 500 feet away. It provides for shared parking and joint parking. The parking provisions do not apply to on-street parking. In the commercial and industrial areas there is little on-street parking because the curb-to-curb street widths are wide enough to accommodate only travel lanes and bike lanes, not parking lanes, that reduces impervious surface areas and stormwater runoff.
Flexibility in parking lot landscaping / Additional parking lot landscaping	Amendments are proposed to allow parking lot runoff to flow to landscape areas and to allow parking lot landscaping to abut habitat areas. The TDC already requires parking lot shade trees and perimeter parking lot landscaping.
Smaller car spaces and stall dimensions	Amendments are not proposed because many vehicles are wide and long and necessitate sufficient stall widths and lengths so vehicle doors aren't damaged when opening them. The aging population will need to open their doors wide to get in and out of their vehicles. The TDC allows 35% of required spaces to be compact spaces and all spaces in excess of the required number can be compact spaces. The TDC allows the bumper overhang area to be landscaped, thus the full length need not be paved.
Increased use of pervious materials	The city allows pervious parking surfaces, but the TDC does not clearly say so, except in the Central Design District (downtown). Amendments are proposed to clearly allow pervious materials.
4. Landscaping/Hardscape Design	
Locating landscaping adjacent to habitat areas	The TDC requires perimeter landscaping in multi-family, commercial and industrial districts that effectively enlarges any abutting habitat area. The landscaped perimeter areas are measured from property lines, thus when a tract is created for habitat, the setback is measured from the new tract/property line.
Increased use of native plants	Amendments are proposed to encourage the use of native plants.

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Improved soil amendment	Amendments are proposed to encourage the use of soil amendment.
Reduction of non-ADA sidewalk widths within a site	Amendments are not proposed because the minimum widths for on-site accessways and walkways have been.
Increased use of habitat-friendly fencing	Amendments are proposed to require habitat-friendly fencing consistent with Metro Code 3.07, Table 3.07-13c, Part (a).
Preservation of existing trees and maximize forest canopy	Amendments are not proposed because the Architectural Review (AR) process requires a tree survey. Tree retention is reviewed in the AR process. Trees can be removed only through the AR process or the City's Tree Cutting Permit program. All development except single family detached housing must go through the AR review process. The TDC allows and encourages tree retention. The City has been a Tree City USA since 1987 and has received the National Arbor Foundation's Above-and-Beyond award numerous times.
5. Lighting Design	
Re-directed outdoor lighting, reducing light spill-off	Amendments are proposed to add to the TDC's existing lighting standards to not allow parking lot and security lights to shine into habitat areas.
6. Density Reduction for Regionally Significant Habitat	
Modified definition of net buildable areas	Amendments are not proposed because the TDC uses net acres, which does not negatively affect residential density. When habitat is placed in a Tract, that area is netted-out and not counted. The TDC's 80% minimum density requirement applies to the net acres, not the gross acres.
Reduced minimum buildable lot sizes	Amendments are not proposed because, as noted above, the minimum lots size was reduced several years ago and later it was changed to an average minimum lot size. Also, as an incentive to protect habitat the minimum lot size can be reduced an additional 1,000 square feet to 5,000 square feet when habitat is protected.

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B. Engineering and Design Approaches	
1. Street design	
Minimize paving	Amendments are not proposed to reduce the paved width of streets from curb to curb because the TDC provides a “skinny street” option for local residential streets, and the TDC, Chapter 74, allows the City Engineer to allow narrower streets for hazardous, impractical or detrimental situations. No policy sets the stage for that allowance, thus an amendment is proposed to add a policy in TDC, Chapter 11, authorizing the City Engineer to allow narrow rights-of-way and streets for unusual circumstances, including habitat.
Use pervious paving materials	Pervious paving material for streets is possible between the curbs, but the City has not allowed it due to durability issues. Pervious paving material for public sidewalks in the right-of-way is possible, but the Public Works Construction Code (PWCC) does not clearly allow it. The PWCC will be amended to show construction details for pervious public sidewalks as well as accessways on private property.
Maximize street tree usage	Amendments are not proposed to the City’s street tree program because the program is coordinated as to species, street tree planting strip width and spacing. The TDC requires street trees per Chapter 74. Schedule A and Map 74-1 set the appropriate specie and planting spacing for strip widths of 4, 5 and 6 feet. It is inappropriate to plant trees with a 30 foot diameter drip line closer than 30 feet because the trees will grow into one another. In some cases a reduced number of trees are planted, especially around cul-de-sacs, because driveway drops, power transformers, water hydrants, street lights and natural gas facilities do not allow tree planting.
Use multi-functional open drainage systems / modify drainage practices	Amendments are not proposed because the City is participating in CWS’s stormwater regulations review and until the review is complete it is not known what changes to make. It is not likely the City will allow open ditches in the City Limits when development occurs and streets are improved to urban standards, but the City is open to all options.

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2. Stream crossing and street connectivity standards	
Minimize the number of stream crossings/place crossings perpendicular	Amendments are not proposed because the CWS regulations apply in the City and they require perpendicular crossings. The number of stream crossings is a balance between an efficient and safe street system and habitat protection. The City's Transportation System Plan calls for some crossings of habitat. As part of a construction project a crossing will be reviewed and CWS and Statewide Goal 5 requirements will be met.
Allow narrow paved widths through stream corridors	Amendments are proposed to clarify the longtime City practice of narrowing rights-of-way and street widths for habitat protection. The city allows reduced paved widths and meets CWS standards and regulations for stream crossings.
Use habitat sensitive bridge and culvert designs	The city has adopted by reference CWS's regulations for Metro's Title 3 and all bridge and culvert designs meet CWS's standards.
3. Stormwater management facility design	
Use vegetated stormwater management facilities	Amendments are not proposed because the City is participating in CWS's stormwater regulations review and until the review is complete it is not known what changes to make. The City is open to all options. Based on current CWS requirements vegetated stormwater facilities have been used with all development since the early 1990's.
Use detention ponds	Amendments are not proposed because the City is participating in CWS's stormwater regulations review and until the review is complete it is not known what changes to make. The City is open to all options. Based on current CWS requirements detention ponds have been possible since the early 1990s.
Use of underground detention and/or treatment	Amendments are not proposed because the City is participating in CWS's stormwater regulations review and until the review is complete it is not known what changes to make. The City is open to all options. Based on current CWS requirements underground detention and/or treatment has been possible since the early 1990s.

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C. Building Design Solutions	
Encourage Green roofs (eco-roofs)	Amendments are not proposed because green roofs are allowed. The TDC, Central Design District, encourages green roofs. Green roofs are, primarily, a Building Code issue and the Tualatin Building Official indicates they are permitted provided plans and specifications are submitted to show how it will be constructed.
Disconnect downspouts	Amendments are not proposed because disconnected downspouts are allowed. Disconnected downspouts are a Building Code issue and the Tualatin Building Official indicates they are permitted provided plans and specifications are submitted to show how they will work.
Use rain barrel or cistern system	Amendments are not proposed because rain barrels and cisterns are allowed. Rain barrels and cisterns are a Building Code issue and the Tualatin Building Official indicates they are permitted provided plans and specifications are submitted to show how they will be constructed.

J. Washington County

Washington County completed inventories of locally significant fish and wildlife habitat and adopted protection standards in 1982 and 1983. These inventories and related protection standards were subsequently acknowledged by the Land Conservation and Development Commission (LCDC). Additional sites were added to the inventory of locally significant resources during periodic review in the late 1980's and were acknowledged by LCDC in 1990 and 1991.

Washington County works cooperatively with the cities in the Tualatin River Basin and with Clean Water Services in complying with water quality and fish habitat requirements of the State Department of Environmental Quality (DEQ) and the Federal Endangered Species Act (ESA). This compliance process provides significant protection for all fish and wildlife habitat located within stream corridors and wetland and riparian areas throughout the basin.

On October 24, 2006 Washington County adopted Ordinance No. 662. This Ordinance amends various elements of the Washington County Comprehensive Plan, including the Community Development Code, in order to facilitate and encourage the utilization of low-impact / habitat friendly development practices in unincorporated areas. Through the adoption of Ordinance 662, Washington County substantially complies with applicable requirements of Title 13 of Metro's Urban Growth Management Functional Plan.

Metro staff has reviewed Ordinance 662 and noted the following two points related to full compliance with applicable requirements of Title 13:

- 1. The Community Development Code (CDC) Section 300-5 does not limit application of the density reduction provision to lands that were within the Metro UGB as of January 1, 2002 as required under Title 13.*
- 2. Provide both a simple and detailed process for property owners to verify the location of habitat areas identified on Metro's Regionally Significant Fish and Wildlife Inventory Map as adopted by reference in CDC 300-5, 300-1, 422-2, and Policy 10.*

Further, Metro staff has provided the following recommendation related to potential enhancement of County Code standards which could encourage habitat friendly development practices:

As part of a companion ordinance, adopt CDC 404-5 Habitat Protection Planned Development that was included as part of the original Ordinance 662 package or comparable provisions to further facilitate and encourage habitat-friendly development practices.

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With respect to the Title 13 compliance requirements noted above, County staff will prepare CDC amendments for consideration by the Board of Commissioners during the 2007 Ordinance season. Staff is continuing to examine ways to provide incentives and increased flexibility through changes to the county's Planned Development standards. Those changes will also be considered in 2007. Additional details are provided in *Appendix K*.

1. Adoption/Public Involvement Schedule

Task	2006					
	Jul	Aug	Sep	Oct	Nov	Dec
Planning Commission meeting			9/6			
Board of Commissioners Mtg.-1 / potential adoption			9/19			
Board of Commissioners Mtg.-2			9/26			
BCC -Engrossment (if needed)				10/17		
BCC -Engrossment - 2 nd hearing (if needed)				10/24		
Effective date of 'A' engrossed Ordinance					11/23	

2. Summary of Adopted or Planned Implementation

A. Planning and development approaches	
1. Land Division Design	
Clustering/lot size averaging, on-site density transfers	Clustering and lot size averaging already allowed in R-5 through R-9; no potential gain in higher density districts.
Reduction of lot dimensional standards;	High level of flexibility currently allowed through Planned Development process - recommend development of "Habitat Protection Planned Development" process (HPPD) to provide incentives to protect significant habitat areas.
Allow for waiver of minimum density requirements (Metro);	Allow for waiver of minimum density requirements in exchange for habitat protection.

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2. Site Design	
Increased flexibility for setbacks	Some flexibility currently exists – recommend development of “Habitat Protection Planned Development” process (HPPD) which would allow for more significant level of flexibility in exchange for protected habitat.
Increased flexibility for lot coverage	Development of “Habitat Protection Planned Development” process
Increased flexibility for building heights	Development of “Habitat Protection Planned Development” process
3. Parking Design	
Reduced parking ratios	CDC currently provides options for reduction in parking requirements.
Shared driveways and parking areas; On-street parking credit	CDC supports shared driveways and parking areas – propose amending design standards to address typical subdivision designs; Modify code to allow on-street parking; exempt “partitions” from on-street parking requirements in urban areas.
Flexibility in parking lot landscaping / Additional parking lot landscaping	Pursue allowing protected Habitat Benefit Areas to count toward minimum landscaping requirements. No change to internal landscaping requirements.
Smaller car spaces and stall dimensions	Existing Code standard minimums may be too small for the current average vehicle size – further reductions not recommended.
Increased use of pervious materials	Amending CDC Sections 408 & 409 to permit alternative structural designs to incorporate pervious paving on lands outside the Public R.O.W.
4. Landscaping/Hardscape Design	
Locating landscaping adjacent to habitat areas	Existing standards allow for flexibility in locating required landscaping except for those portions required within parking areas – no change recommended.
Increased use of native plants	Currently encouraged. Coordinating enhancements with CWS
Improved soil amendment	Coordinating with CWS for technical guidance
Reduction of non-ADA sidewalk widths within a site	Amending Section 408 to allow reductions where appropriate.

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Increased use of habitat-friendly fencing	Amending screening and buffering and other code sections requiring fencing to require habitat friendly designs for fencing located adjacent to habitat areas.
Preservation of existing trees and maximize forest canopy	Preservation of existing trees and vegetation is addressed in Sections 422, 407 and 410. Considering further clarification of standards to encourage tree preservation.
5. Lighting Design	
Re-directed outdoor lighting, reducing light spill-off	Amending standards to require lighting adjacent to Regionally Significant Fish & Wildlife Habitat areas to be directed away from or appropriately screened to protect the habitat areas.
6. Density Reduction for Regionally Significant Habitat	
Modified definition of net buildable areas	Existing standards allow non-buildable lands to be removed from calculation of net buildable areas - minimum densities may be applied to resulting net buildable area.
Reduced minimum buildable lot sizes	Reductions below currently allowed minimums may be permitted through the existing Planned Development or proposed Habitat Protection Planned Development process.

B. Engineering and Design Approaches	
1. Street design	
Minimize paving	Minimums conform to fire and life safety requirements
Use pervious paving materials	Amend CDC Sections 408 & 409 to permit alternative structural designs to incorporate pervious paving on lands outside the Public R.O.W.
Maximize street tree usage	General standard is 35 feet on center – increased planting density will require further review and analysis.
Use multi-functional open drainage systems / modify drainage practices	Will require further review prior to recommending changes to established practices. Potential changes to be coordinated with Clean Water Services for lands outside of the public right-of-way.
2. Stream crossing and street connectivity standards	
Minimize the number of stream crossings/place crossings perpendicular	Already addressed in code & CWS D&C Standards
Allow narrow paved widths through stream corridors	Already addressed in code

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Use habitat sensitive bridge and culvert designs	Already addressed in code & CWS D&C Standards
3. Stormwater management facility design	
Use vegetated stormwater management facilities	Currently allowed – must be approved by CWS.
Use detention ponds	Currently allowed – must be approved by CWS.
Use of underground detention and/or treatment	Currently allowed – standard practice in appropriate areas on county road system.

C. Building Design Solutions	
Encourage Green roofs (eco-roofs)	Currently allowed.
Disconnect downspouts	Potential Plumbing Code, drainage and health issue – being coordinated with CWS for potential future code amendments.
Use rain barrel or cistern system	Potential Plumbing Code issue – being coordinated with CWS for potential future code amendments.