



Communities Handbook



A handbook for



A green building program
for community developers

Developed by builders
for builders

September 2002

Revised January 2014

Copyright © 2014 by the Master Builders Association of King and
Snohomish Counties. All rights reserved.

No part of this publication may be reproduced or transmitted in any form, or by any
means, electronic or mechanical, including photocopy, recording, and any information
retrieval system, without the written permission of the copyright holders.

Built Green®

Mission Statement

To work in partnership to improve and protect the valuable natural features and environmental resources within King and Snohomish Counties' cities and communities to promote safer, healthier buildings, through:

- Using a non-regulatory, market-driven approach to optimize the use of innovative, industry-based solutions to potential environmental problems and minimize impacts of construction, design, and development.
- Actively promoting the use of environmentally sound design, construction, and development practices by design and building professionals in King and Snohomish Counties, in particular by members of the Master Builders Association, in an attempt to make these practices the preferred consumer standard.
- Creating a credible program that reflects the Master Builders Association's commitment to building better communities through environmental responsibility.
- Creating a program that attracts broad-based participation of existing and potential Master Builder Association members.
- Creating a model for approaching environmental concerns that the Counties may face.

Disclaimer



The Master Builders Association of King and Snohomish Counties (MBA) has provided this Handbook as part of the BUILT GREEN program. Foremost, it is a tool for developers, licensed builders and contractors to use as an aid to certifying projects.

The Handbook is not intended to eliminate or substitute for the builder or developer's own judgment or accepted engineering and construction practices. Each community may have characteristics that could make any one or more of the Action Items suggested in the Handbook inappropriate. It is the responsibility of the builder and/or developer to choose the Action Items that are appropriate in each case. Furthermore, product information provided in the Handbook is not intended to act as or imply a recommendation for using a particular product in a specific application. Where appropriate, products should be tested before installation. All products should be used according to the manufacturer's recommendations.

In addition, local, state, and federal regulations must be followed and are not to be superseded by any recommendations made in this Handbook. Every effort was made to ensure consistency with the standards of King and Snohomish Counties and its incorporated municipalities at the time of this writing.

Health and safety-related measures described in the Handbook are not intended to offer medical advice or to substitute for professional medical consultation.

BUILT GREEN is a third-party certification program. The MBA does not warrant whether or not a builder or developer has taken a specific action. The builder or developer or the independent BUILT GREEN Verifier warrants the builder's or developer's actions by signing the appropriate Checklist and providing the executed Checklist to the customer or customer's representative. A Checklist has been provided for this purpose at the front of the Handbook.

Acknowledgments



This Handbook was originally developed for the BUILT GREEN® Program of the Master Builders Association (MBA) in partnership with King County and Snohomish County in 2000. It represents nearly a decade's worth of effort by several committees composed of MBA members and representatives from King County, Snohomish County, and various environmental and community organizations. The original Communities Checklist and accompanying Handbook were published in 2002. We wish to thank the members of the BUILT GREEN Communities Checklist Revision Committee for their time and hard work on this major update:

Communities Checklist Update Task Force

Aaron Adelstein	BUILT GREEN of King and Snohomish Counties
Heidi Kandathil	Snohomish County
Alicia Uhlig	GGLO
David Barnes	City of Kirkland
Patti Southard	King County
Vicki Colgan	Washington Department of Ecology
Brian Cloward	Cloward Sustainable Design
David Hilgers	Triad Associates
Heather Swift	Cohabitats
David Burger	Stewardship Partners
Merle Ash	Land Technologies Inc.

Communities Handbook Technical Reviewers

The following volunteers reviewed select elements of the 2013 version of this Handbook:

Poppi Handy	SMR Architects
Brennon Staley	Seattle Department of Planning + Development
Dave LaClergue	Seattle Department of Planning + Development

Particular thanks are also due the Puget Sound Partnership for the use of many graphics and photographs throughout this Handbook. These images were sourced from The 2012 *Low Impact Development Technical Guidance Manual for Puget Sound*, an invaluable resource for creating more sustainable developments. The *Technical Guidance Manual* can be found at www.psp.wa.gov/LID_manual.php.

We would also like to acknowledge the contributions of sustainable building consultant O'Brien & Company, Inc., who led program development and produced the original Communities Handbook in 2002. Special thanks to Synthesis Consultants for providing extensive revisions for the 2013 Communities Handbook update, to Nellen Regier Design for Handbook design, and to Vicki Colgan for detailed editing and proofreading of the overall document.

Contents

7	Introduction
8	Handbook Organization
12	Certification Process
16	Communities Checklist

21	REQUIRED ACTIONS
----	------------------

35	SITE SELECTION
----	----------------

47	SITE DESIGN + TRANSPORTATION
----	------------------------------

135	CONSTRUCTION OPERATIONS
-----	-------------------------

179	EDUCATION + COMMUNITY
-----	-----------------------

Introduction

BUILT GREEN is an environmentally-friendly, non-profit, residential building program of the Master Builders Association of King and Snohomish Counties (MBA), developed in partnership with King and Snohomish Counties, with extensive and ongoing input from the building community, environmental groups and other agencies in Washington State. BUILT GREEN provides consumers with easy-to-understand rating systems, which quantify environmentally friendly building practices for remodeling and new home construction, communities and multifamily development units.

This Handbook is a tool for community developers enrolled in the BUILT GREEN program. Checklists are used to certify projects as BUILT GREEN. The Communities Checklist contains 130 Action Items and functions as a menu of environmentally friendly elements to include in a green development. In addition, the Handbook contains specific, detailed information about each Checklist Action Item, including suggested external resources to provide even greater detail.

Further information about the BUILT GREEN Communities program and its Action Items is provided through technical seminars and the BUILT GREEN Resource Library housed at the MBA Education Foundation office.

See www.builtgreen.net for more information.

As a market-based program, consumer education and outreach are critical to BUILT GREEN's success. Contact the MBA Education Foundation office for marketing tools to promote BUILT GREEN Communities projects. In addition, the MBA provides support through marketing seminars and public marketing activities.

Why Built Green?

A BUILT GREEN Community provides benefits to both people and the planet. Both the homeowner and the developer gain from using the strategies listed in the BUILT GREEN Communities Checklist.

Homeowner Benefits

BUILT GREEN community development strategies result in a healthier, more efficient and environmentally responsible community. Direct financial benefits, such as reduced utility bills, are coupled with indirect benefits, such as better and more varied transportation options and increased access to community amenities. BUILT GREEN communities also result in a smaller environmental footprint, with Checklist Action Items related to:

- Water quality protection.
- Habitat preservation and restoration.
- Natural resource and materials conservation.
- Energy efficiency and local renewable energy production.
- Water conservation.
- Human health protection and toxics reduction.

Additionally, BUILT GREEN homes perform well in the market. Two recent studies based on both Northwest Multiple Listing Service data and Assessors data of BUILT GREEN homes revealed an increase in per square foot home value, coupled with a reduced time on market for certified homes compared to their non-certified counterparts.

Developer Benefits

Developers with the skills to pursue BUILT GREEN certification possess a competitive advantage. Market analyses show a continued increase in demand for and interest in environmentally friendly products and services by the American public; this is especially true in the Pacific Northwest.

The BUILT GREEN Communities Handbook gives developers a quick reference tool for green building strategies, and provides additional resources for further learning. Experience on BUILT GREEN Community projects serves as a knowledge base and expanded skill set, offering developers access to this lucrative and quickly growing niche market.

The green consumer is well educated and skeptical, and will likely ask many questions about a prospective community. Showing knowledge and expertise in green development may help tip the scales in favor of a home purchase in a particular community.

When correctly applied, a green development approach can result in enduring value. Village Homes in Davis, California is a famous early example of a green, low-impact development that yields ongoing positive press for the developer and homeowners. Homes in that community have consistently sold faster and for higher per-square-foot prices than comparable homes outside the Village Homes development.

See www.smartcommunities.ncat.org/success/village.shtml for more on Village Homes.

Handbook Organization

Section I of the Handbook gives an overview of the BUILT GREEN Communities certification process and over-arching information on green development, along with general resources for independent learning.

Section 2 is a comprehensive list of BUILT GREEN Communities Checklist Action Items, arranged to provide quick access to information on specific Action Items. Action Items are organized to reflect the general phases of the development process, from site selection through community education and operations and maintenance, helping the user identify where in the process to focus on specific activities, and to identify critical path issues. The sections (or project phases) identified in this Handbook are:

1. Site selection
2. Site design + transportation
3. Construction operations
4. Education + community stewardship

It is important to note, moreover, that considering all elements of a project together at the outset of design is key to capturing opportunities and identifying challenges: for example, doing so can benefit both the project schedule and the budget (see *BUILT GREEN Communities and Integrated Design*, below). Use the Handbook organization to help prioritize and map the project flow.

The BUILT GREEN Environmental Categories

In order to help a builder communicate to a client the environmental benefits related to green building (most of which span the project phase categories above), this Handbook also contains information broken into the classic BUILT GREEN conceptual areas: Site and Water; Energy Efficiency; Health and Air Quality; and Materials Efficiency.

Site + Water

The Site and Water category contains Action Items to protect or enhance water quality, soil and plant health, hydrological function (drainage), and water conservation.

The Puget Sound region is renowned for its natural beauty, especially its forests, rivers, lakes and the Puget Sound fjord itself. Since the 1970s, however, the region has lost a large percentage of its forest cover, primarily due to development. Signature Northwest species such as Chinook salmon and the Puget Sound Orca are facing alarming population declines. Site development activities, including clearing and grading, topsoil removal, and installation of stormwater infrastructure elements that convey stormwater offsite have direct impact on the health and sustainability of local water resources.

A BUILT GREEN Community incorporates many aspects of Low Impact Development (LID), which strives to establish an onsite stormwater management approach mimicking that of a native forest. By preserving and restoring existing forestland, wetlands and soils, minimizing impervious surfaces, and capturing, cleansing and infiltrating development-related stormwater runoff, a BUILT GREEN Community accommodates development while also protecting vital habitat and water resources and capturing the “free” environmental services nature provides. These “ecosystem services” include stormwater retention and cleansing, and air filtration and cooling, and their value is revealed by tallying the cost of providing these services by mechanical and engineering methods and investments.

BUILT GREEN Action Items provide other community benefits including healthier soils and plants and reduced or eliminated use of fertilizers and pesticides (thereby reducing ongoing maintenance costs and exposure hazards to children, pets, and other vulnerable populations). By reducing residential, commercial, and common area water use (both indoors and outside), more water is left in streams for recreation and wildlife. While the popular conception of our region is rather soggy, the Puget Sound region is drier than Tucson, Arizona during the late summer months. Water-wise landscaping and rainwater harvest systems ease demand on regional water resources. Water efficiency also result in direct financial benefits by reducing water and wastewater utility expenses. This category also covers sustainable design alternatives that use land efficiently and promote safety.

Energy Efficiency + Renewable Energy

This category promotes energy efficiency and reduced carbon emissions with Action Items intended to encourage performance beyond standard practice and create more resilient communities.

The US Department of Energy’s Energy Information Agency reports that buildings are responsible for 40% of the country’s energy use, as well as 40% of our greenhouse gas emissions. Climate change related to atmospheric carbon loading is expected to result in a wide array of negative effects, including sea level rise, ocean acidification, and the expansion of invasive species and disease. In the Pacific West, the expanding range of the Pine Bark Beetle, for example, is causing massive forest die-offs. Beyond the general impacts of global climate change, residential energy use has a direct, ongoing cost to the homeowner.

A BUILT GREEN Community sets the stage for high-performance homes by orienting lots to maximize opportunity for passive solar and renewable energy at the building level, and leading by example by installing renewable energy sources on community structures. Covenants, codes, and restrictions are established to encourage energy efficiency and remove explicit or implicit barriers to renewable energy and local self-reliance. Action Items encourage the installation of community-scale renewable and distributed energy resources. And common area buildings are encouraged to sport renewable energy installations to educate and inspire homeowners to incorporate renewable energy into residences.

At the community level, transportation represents a significant portion of overall energy use. A community’s proximity to alternative transportation and mass transit options, its connectivity to jobs and essential services and daily amenities, and an overall facilitation of walking and bicycling all help reduce transportation energy. BUILT GREEN Action Items encourage site selection and community design approaches that support the aim of reduced transportation energy use.

Health + Air Quality

Action Items in this category promote and protect individual and public health through design choices and materials and product selection. Community designs that facilitate walking and bicycling can reduce automobile-related hazards through a series of design interventions, including traffic calming. Compact, connected communities access a rich assortment of community amenity and services within easy walking distance of residents.

In addition, choices related to common space and landscape design and construction can help create healthy indoor spaces, reduce ambient particulates, and reduce or eliminate the use of chemical fertilizers and pesticides. Building BUILT GREEN certified homes in a BUILT GREEN community extends the health benefits of better air quality from the public realm to private residences.

Materials Efficiency + Green Materials Selection

Numerous activities reduce waste during development, saving money for the builder. In addition to using materials efficiently, Communities materials efficiency Action Items offer recognition for using a variety of building materials that reduce resource extraction and waste creation.

Thoughtful materials selection and efficient materials use is important. For example, in the City of Seattle alone, approximately 300,000 tons of construction and demolition materials were delivered to private and city transfer stations in 2007, much of which could be either reused or recycled if properly managed. Globally, natural resource extraction is responsible for massive energy expenditures, deforestation, habitat loss, damage to land and water supplies, and air pollution.

Many conventional developments generate a significant amount of land-clearing debris. BUILT GREEN Action Items encourage retention and reuse of these organic material resources through preservation, replanting, reusing onsite or donating for other habitat protection and restoration activities.

Assembling the pieces

Action Item descriptions in this Handbook also identify relevant green building conceptual areas (Site + Water, Energy Efficiency + Renewable Energy, Health + Air Quality, and Materials Efficiency + Green Materials Selection) using an icon system. This is meant to serve as shorthand to the developer, calling attention to the benefits and desired outcomes of the Action Item.

The icons take the shape of puzzle pieces, symbolic of the interrelated nature of green building. If an Action Item applies to more than one conceptual category, more than one puzzle piece is shown. For example, using compost assists with stormwater management, reduces erosion, and revitalizes soils; additionally, compost is a valuable resource derived from the municipal waste stream and is therefore a recycled content product. The compost-related Action Items in BUILT GREEN consequently show both the Site and Water icon and the Materials Efficiency icon. For more on the interconnected nature of green building strategies, see *BUILT GREEN and Integrated Design*, below.



The BUILT GREEN Action Items

To make increasing the environmental and health performance of a community easier for a developer and contractors, BUILT GREEN breaks strategies into bite-sized pieces called Action Items, the titles of which are listed on the BUILT GREEN Checklist. In this Handbook, each Action Item is explored further to provide context and guidance for developers considering implementing the Action Item on their project. The following elements are part of each Action Item in this Handbook:

action item number

The Action Item Number is a unique identifier to help organize the credits within the BUILT GREEN Communities program. The number is hyphenated, with the prefix representing the section to which the credit belongs. For example, Action Item 3-15 is the fifteenth item located in Section 3, *Construction Operations*.

points

Each Action Item lists the points, or the point spread, available when an Action Item is implemented on a project. The number of points assigned to an Action Item represents a combination of the relative environmental and health impact of the measure, and/or the difficulty in attaining the credit: Action Items with larger environmental and/or health benefit, and those that are more difficult to implement, garner more points. Points provide both incentive for maximizing the performance of the home, and encourage developers to try newer, innovative, and more challenging green building measures.

action item rationale

The rationale provides the logic behind incorporating this particular Action Item into the Checklist, including benefits to the developer, community members, public health and the environment overall.

what

This section describes in more detail the Action Item, providing definitions and descriptions of referenced processes, products, or technologies. It also describes specifically what a developer must do to achieve points for the Action Item, and lists any performance thresholds, where applicable.

how

Look to this section for information on executing the Action Item, including design and construction approaches, relevant professionals to involve, and sequencing.

considerations

This section lists connections between the specific Action Item and others on the Checklist, and when the goal of the Action Item may be at odds with other green development goals. For example, choosing a cluster development or cohousing approach (Action Items 2-22 and 2-38 respectively) may facilitate preservation of existing habitat and vegetation on a site (Action Item 2-26). Identifying such opportunities and trade-offs can help better integrate the specific strategies being considered for a particular community. (See *Built Green and Integrated Design* below.)

resources

The resource section provides the top recommended sources of additional information for learning more about and implementing the Action Item.

The BUILT GREEN Certification Process

The BUILT GREEN Communities certification process entails a series of important steps. The following is a synopsis:

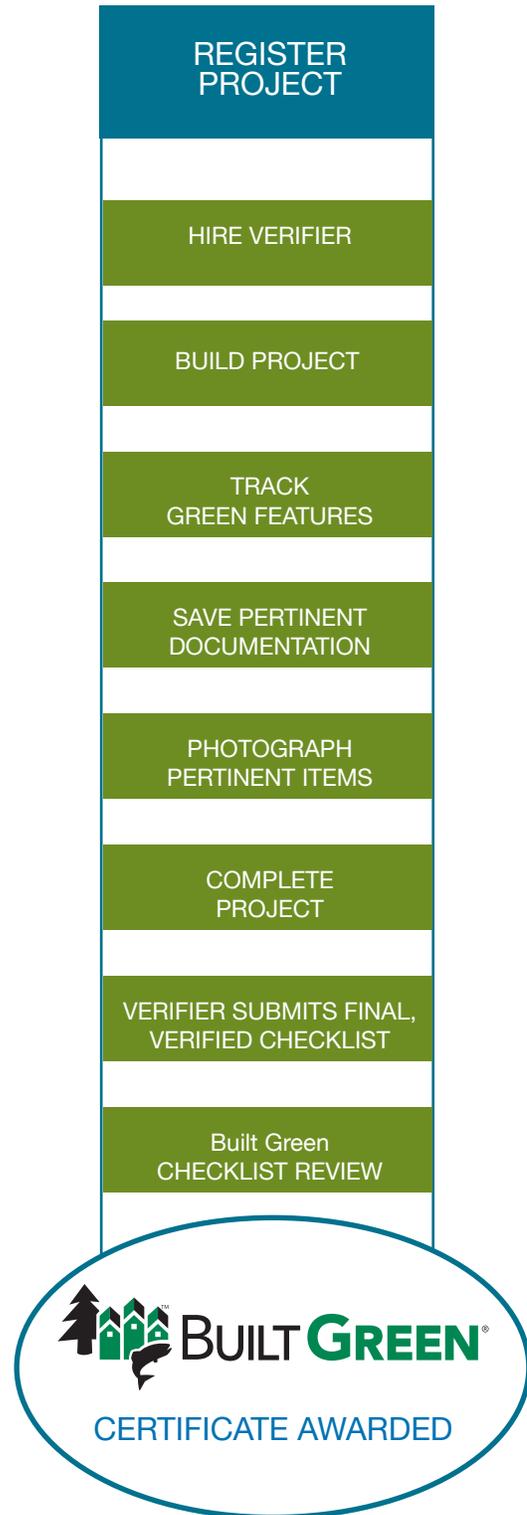
1. **Join BUILT GREEN.** Visit www.builtgreen.net to download the “Join BUILT GREEN Form” and the “BUILT GREEN Membership Info and Benefits.” These two documents describe the membership process and benefits.
2. **Enroll project.** Visit www.builtgreen.net for the project enrollment form. Enroll the project prior to groundbreaking.
3. **Complete a preliminary checklist.** After enrolling a project, complete a preliminary Communities Checklist. This valuable step in the process leading up to certification gives the project team an opportunity to have a comprehensive discussion both internally and with permitting authorities, adjoining communities, and potential homeowners in terms of project goals. The Communities Checklist is also available at www.builtgreen.net.

Verification

As of 2014, an independent party must verify all BUILT GREEN Communities. Verification confirms that strategies, practices and materials have been implemented as claimed by the developer. Beyond the potential marketing benefits, verification serves a quality control function by bringing in a technical expert to review green building strategies on the project.

BUILT GREEN project verification starts with identifying and hiring an approved BUILT GREEN Verifier. Verification is accomplished via a series of site visits, performance tests, and photographic and other documentation. The developer works with the identified Verifier to establish an inspection schedule and review the Checklist to identify items for verification.

A list of Verifiers is maintained at www.builtgreen.net.



BUILT GREEN and Integrated Design

Key to sustainable development and green building is the concept of integrated design. This is the idea that the design and construction process now consider the various goals for a project and their design implications early in the process, accounting for occupant needs, environmental and health goals, community and social concerns, and up-front and lifecycle costs and benefits.

The conventional design and construction process often uses what is essentially “dis-integrated” design, with decisions regarding product transportation, building massing and placement, stormwater management, habitat preservation and restoration etc., being made in isolation. The conventional approach makes it easy to miss opportunities for capturing synergies between design and product selection choices, often resulting in a community design that fails to reach its full potential. More problematically, the dis-integrated approach can result in expensive call-backs and serious problems, including property damage and flooding.

The integrated design approach helps identify and resolve these issues during the design phase, when they’re much cheaper to address. It begins with a systematic assessment of the projected community development’s site, water, habitat, wildlife, and cultural context, which is called for in the Built Green Action Items. Only by knowing the current context will can a project effectively evaluate and plan to optimize the project through smart decisions.

An integrated design approach specifically looks for both the opportunities and challenges that present themselves on any green development or construction project, and recognizes these can be even more numerous on a community that is aiming for advanced levels of environmental and human health performance.

Challenges to resolve on green development projects may include:

- Tree canopy preservation and coverage goals conflicting with building solar access for passive solar or renewable energy generation.
- Housing density objectives at odds with impervious surface reduction, open space, and/or tree coverage goals.
- Existing health, land use, and building codes that inhibit leading-edge sustainable development approaches.

Common opportunities include:

- Preserved open space and habitat, rain gardens, porous pavement and other low impact strategies that allow for downsizing or even elimination of conventional stormwater detention facilities.
- Cluster development benefitting walkability, public health, open space preservation, and transportation alternatives.
- Water conservation strategies that can downsize potable water costs, connections, and associated hookup fees.
- Onsite sewage treatment approaches that can downsize or eliminate expensive municipal sewage connections.

The *Considerations* component of each Action Item description in the BUILT GREEN Communities Handbook attempts to identify these opportunities and challenges. Each project possesses unique characteristics, so a comprehensive identification process will require careful evaluation, as well as creative thought by the developer and the project’s design and construction professionals.

Note that consultants tend to focus on a subset of green building, such as low impact development, community-scale energy use and production, public health, or sustainable materials selection. When hiring specialists, be sure they are apprised of the integrated goals of the project, and select experts based on their understanding of larger green building concepts. Once critical information has been assembled during the assessment phase, the next step toward a truly integrated project is employing a hallmark of the integrated design process: the *design charrette*.

Charrettes are essentially carefully facilitated design brainstorming sessions, conducted at the earliest possible stage in a project, that involve key participants: design and construction professionals, maintenance staff, permitting authorities, and (ideally) future owners and occupants. On large community projects, a series of charrettes may be needed, involving dozens of players and requiring substantial preparation and meeting time. Well-run charrettes yield invaluable design ideas and project insight, saving the developer time and money.

Where integrated design is a project protocol and the project team is diverse, inclusive, and skilled on the technical and process fronts, the odds increase markedly that the community will reach its full potential and become a great place to live.

General Resources

Green building and development is a broad, quickly evolving field. Keeping pace of the changes can be challenging. To help with this, BUILT GREEN suggests a series of print and online resources. The following is a streamlined list aimed at helping professionals stay up-to-date. For resources related to particular BUILT GREEN Action Items, please refer to the specific Action Item.

Online

- **BUILT GREEN**
The Built Green website includes information on certification, verifiers, and case study projects, and the BUILT GREEN checklists. Sign up for the monthly BUILT GREEN News as well.
www.builtgreen.net
- **King County GreenTools**
King County's green building resource, with a focus on waste reduction and recycling.
www.greentools.us
- **Ecodistricts**
The Ecodistricts initiative looks for neighborhood and district-scale solutions to sustainability challenges, publishes toolkits for action, and hold annual summits to share knowledge.
www.ecodistricts.org
- *The Low Impact Development Technical Guidance Manual for Puget Sound*
(Puget Sound Partnership, 2012)
This essential technical resource, referenced consistently throughout this Handbook, provides extensive guidance on LID strategies and their implementation.
www.psp.wa.gov/LID_manual.php
- *Smart Growth Guidelines for Sustainable Design and Development*
by Jonathan Rose Companies/Wallace Roberts Todd
(US EPA, 2009)
These guidelines cover much of the same territory represented by the Built Green Communities Handbook, but organize them by functional outcome rather than design and construction phase.
www.epa.gov/smartgrowth/pdf/sg_guidelines.pdf
- *Environmental Building News*
A monthly periodical exploring all facets of green building. Subscribers can search back issues and access the Building Green Suite, which includes the Greenspec directory of green building products.
www.buildinggreen.com

Print

- *Design with Nature*
by Ian McHarg
(Wiley 25th Anniversary Edition, 1995)
- *Green Development: Integrating Ecology and Real Estate*
by Alex Wilson, et al.
(Wiley, 1998)
- *Village Homes: A Community by Design*
by Mark Francis
(Island Press, 2003)
- *Inside the Civano Development: A Case Study of Large-Scale Sustainable Neighborhood Development*
by Al Nichols and Jason Laros
(McGraw Hill Professional, 2009)
- *Sustainable Urbanism: Urban Design with Nature*
by Douglas Farr
(Wiley, 2007)
- *The Philosophy of Sustainable Design*
by Jason F. McLennan
(Ecotone Publishing, 2004)

Many more resources, both online and print, exist to help developers and builders understand and implement sustainable development strategies. Action Items within this Handbook provide resources specific to the topic covered. Explore these resources for additional information.

Communities Certification Checklist

The BUILT GREEN Communities Checklist presents the Action Items that comprise the program. Visit www.builtgreen.net to access a user-friendly spreadsheet version of the checklist that automatically tabulates the points within the system to easily determine a project's estimated certification level.

Note that the minimum point thresholds for each achievement or Star Level within BUILT GREEN depend on the status of the land on which the community is built. To encourage the reuse of previously developed lands, the minimum point thresholds for brownfield and grayfield lands is lower than for greenfield sites. BUILT GREEN defines greenfield, grayfield, and brownfield as follows:

- Greenfield: any previously undeveloped land, including previously harvested timberlands.
- Grayfield: any developed or historically developed lands, including agricultural lands.
- Brownfield: any previously developed lands with documented or perceived contamination issues (see Action Item 1-1 for more information on brownfield sites).

3-STAR REQUIREMENTS

Point Minimums

Greenfield: 230

Grayfield: 200

Brownfield: 180

- Program orientation (one time only)
- Properly dispose of hazardous wastes
- All new home starts in the development must be BUILT GREEN 3-Star Level or higher
- Orient and promote BUILT GREEN to builders in the development
- If building near wetlands, shorelines, bluffs, and other critical areas, preserve and protect beyond code
- Do not dispose of any materials in lowlands or wetlands
- Optimally maintain all temporary erosion control elements
- Provide comprehensive recycling plan for community and facility areas
- Create a Stormwater Pollution Prevention Plan

4-STAR REQUIREMENTS

Point Minimums

Greenfield: 330

Grayfield: 300

Brownfield: 270

- Meet 3-Star requirements
- Attend a BUILT GREEN approved workshop within the 12 months prior to certification
- Use an Integrated Design Process, including at least one charrette for each phase

5-STAR REQUIREMENTS

Point Minimums

Greenfield: 550

Grayfield: 520

Brownfield: 500

- Meet 4-Star requirements
- Earn Salmon-Safe® certification or equivalent

CODES & REGULATIONS

(These actions are required of all projects pursuing Built Green certification.)

- Recycle antifreeze, oil, and oil filters at appropriate outlets
- Stabilize construction entrance(s) with quarry spall, crushed rock, or other approved material
- Establish tire wash near construction site entrance(s); require use by all exiting vehicles
- Clean roads thoroughly at the end of each day to prevent sedimentation
- Inspect and protect storm drain inlets during construction
- Protect permanent stormwater facilities from siltation during construction
- Install supplemental erosion control BMPs as backup
- Preserve and protect wetlands, shorelines, bluffs and other critical areas during construction
- Do not dispose of any materials in lowlands or wetlands
- Optimally maintain all temporary erosion control practices
- Properly dispose of hazardous wastes
- Provide comprehensive recycling plan for community and facility areas

SECTION ONE: SITE SELECTION

Item#	Points	Action Item Description
1-1	25	Redevelop and restore existing brownfield sites
1-2	5	Develop on previously developed infill site near urban centers
1-3	8	Locate to maximize access to non-motorized and mass transit
1-4	8	Prepare historical biological site analysis and habitat inventory for all sites
1-5	5	Choose site with no environmentally critical areas
1-6	5	Do not convert "resource lands," agricultural land or forest
1-7	5	Locate within 1/2 mile of essential services
1-8	4	Locate community to be served by existing water and wastewater infrastructure
1-9	1-10	Extra credit for innovation

SECTION TWO: SITE DESIGN + TRANSPORTATION

2-1	15	Design to achieve no more than 10% effective impervious surface
2-2	30	Infiltrate 100% of stormwater onsite
2-3	4	Design to protect sensitive areas beyond code
2-4	3	If sensitive areas are impacted, restore to pre-development conditions
2-5	3	Design site to minimize disturbance of original topography
2-6	2-5	Use filter strips to separate impervious surfaces
2-7	5-10	Use green roofs on common area buildings to reduce impervious surfaces
2-8	5	Use rain gardens or bioswales
2-9	10-20	Rainwater catchment/harvesting for at least 50% of: site irrigation, sewage conveyance, potable water:
2-10	4	Provide stormwater treatment for parking lots/traffic island runoff using bioretention
2-11	10	Use bioretention or rain gardens to reduce volume of cubic feet of detention by 40%
2-12	1-5	Use infiltration system for surface water runoff
2-13	1	Meet treatment standards using nature-based methods
2-14	1	Clearly label all storm sewer inlets with stenciling to remind residents about proper stormwater protection:
2-15	8	Use constructed wetlands for stormwater storage and detention
2-16	2	Design retention pond to be a public amenity
2-17	25	Onsite wastewater treatment beyond septic systems
2-18	10	Install greywater infrastructure at community scale
2-19	5-10	Onsite greywater generation and use
2-20	5	Use reclaimed water or industrial wastewater from offsite
2-21	3-15	Design site to maximize density
2-22	5	Cluster homes on site
2-23	3-5	Preserve and/or create usable open spaces beyond code
2-24	15	Maintain or enhance wildlife corridors and connectivity to open space near the site
2-25	3-10	Preserve percentage of lowlands and areas with mature vegetated soils
2-26	4-10	Preserve percentage of existing native vegetation
2-27	20	Design for Complete Streets
2-28	5	Design streets to conform to natural terrain
2-29	5	Integrate vegetated areas or innovative community features into any traffic calming devices
2-30	4-18	Minimize impervious surfaces in street design
2-31	5-15	Use porous paving options for: a) streets, b) parking, c) paths
2-32	4	Use recycled content materials for paving
2-33	10	Provide 50% light color, open cell, or shaded pavement
2-34	10	Provide alleys for rear access on at least 50% of the dwelling units
2-35	10	80% of dwelling units within 1/2 mile walking distance of community services
2-36	6	Provide mix of housing types
2-37	10-20	Affordable housing
2-38	15	Cohousing
2-39	5	Provide variable lot sizes to encourage higher density
2-40	1-15	Provide community amenities
2-41	10	Create or preserve tree canopy based on urban density classification
2-42	5-15	Use Green Factor
2-43	15	Rural projects of more than 40 homes: conduct a traffic study for wildlife and wildlife crossing aids: culverts, underpasses, overpasses

2-44	30	Develop and implement an integrated mobility plan
2-45	1-4	If design calls for cul-de-sacs, hammerheads, or other dead-ends, connect ends with paths
2-46	7	Provide connectivity with surrounding street network
2-47	15	Require all homes in development to meet BUILT GREEN 4-Star Level or higher standards
2-48	5-15	Orient lots for passive solar and solar access
2-49	20	Use district energy (includes community geexchange, geothermal)
2-50	10	Use alternative heat and energy sources for community structures
2-51	12	Light pollution reduction
2-52	15	Environmental certification of non-residential buildings
2-53	10	Provide for community scale recycling and composting
2-54	5-20	Provide for community scale rainwater harvest
2-55	3-10	Require shared parking for mixed use developments
2-56	15	Use minimum parking requirements as maximums for on-street and off-street parking
2-57	7	Write and implement alternative parking plan beyond code to limit surface parking
2-58	3	Introduce water feature(s) to the site if no natural body of water is present
2-59	5	For buildings three or more stories tall or that have significant use of glass, use bird-friendly building guidelines
2-60	10	Conduct pre-development site studies: wildlife species survey and habitat assessment
2-61	10-20	Permanently preserve a percentage of community's developable land
2-62	1-10	Extra credit for innovation

SECTION THREE: CONSTRUCTION OPERATIONS

3-1	10	Phase grading so that no more than 40% of the site is disturbed at one time
3-2	5	Prohibit clearing or grading during winter months
3-3	3	Clearly mark clearing limits
3-4	5	Construct stormwater management facilities as a first step in grading
3-5	10	Balance cut and fill while minimizing import and export of material
3-6	5	Retain native topsoil on-site and protect stockpiles from erosion
3-7	3	Use compost or related material to stabilized disturbed slopes
3-8	5	Use compost filter berms, tubes, and socks in place of silt fences
3-9	5	Landscape common areas with plants that will not need supplemental watering once established
3-10	5-10	Limit or eliminate turf grass in common areas
3-11	15	Amend disturbed soil to a depth of 10 to 12 inches to restore soil environmental function
3-12	7	Scarify to 12-inch depth compacted soils in areas that will be returned to vegetation
3-13	5	Mulch landscape beds with organic material
3-14	5-8	Use natural organic or no fertilizer to establish vegetation in common areas
3-15	5	Install landscapes needing no supplemental watering
3-16	2-10	Use third-party certified wood products for site lumber
3-17	5	Use recycled content or resource-efficient site accessories
3-18	10	Install no permanent irrigation
3-19	2-8	Install high-efficiency irrigation system where ongoing irrigation is needed
3-20	10	Install high-efficiency irrigation system using potable water alternative
3-21	3	Avoid clearing trees and shrubs during March-June to protect wildlife raising young
3-22	6	Landscape with native plants that provide forage for wildlife

3-23	5	Landscape with native plants that provide natural cover for wildlife at different levels (trees, shrubs, ground plants)
3-24	5	Maintain or introduce large woody debris onsite (snags, downed logs, stumps)
3-25	3	Restrict heavy equipment use to areas within 40ft of building and hard surfaces
3-26	4	Supplement permanent stormwater flow-control measures with necessary temporary controls
3-27	10	Test waterways near or in development during construction
3-28	6	Reuse all land clearing woody debris onsite
3-29	5	Deliver large woody debris for salmon habitat restoration purposes
3-30	3	Replant or donate removed vegetation for immediate reuse
3-31	3	Inventory and secure all hazardous materials during construction
3-32	1	Maintain heavy equipment so as to protect ground and stormwater
3-33	3-5	Use alternative fuel equipment onsite
3-34	5	Provide support, education, and resources on green building to builders in development
3-35	1-10	Extra credit for innovation

SECTION FOUR: EDUCATION + COMMUNITY STEWARDSHIP

4-1	15	Conduct planning and design charrette for builders
4-2	5	Provide a builders' field guide of best management practices
4-3	3	Require builders to provide homeowners/residents with recycling storage and collection system
4-4	2	Prepare builders' guidelines on exterior lighting to reduce light pollution and trespass
4-5	1	Allow laundry clotheslines outside
4-6	5-10	Allow agriculture including vegetable gardens and greenhouses
4-7	10	Provide P-Patch space for community residents
4-8	5	Allow small livestock such as chickens and goats
4-9	20	Provide farmers market space for community including availability of produce and products from within the community
4-10	2	Prohibit tree topping
4-11	2	Allow solar panels
4-12	1	Allow ENERGY STAR® roofing
4-13	4	No lawn watering requirements
4-14	3-6	Promote integrated pest management, rather than pesticides, herbicides, fungicides, or chemical fertilizers
4-15	5	Prepare a green community guide for residents
4-16	8	Provide interpretive signs highlighting key environmental and other features
4-17	5	Provide educational events, including tours or seminars, to promote your green development
4-18	8	Prepare a landscape operations and maintenance plan
4-19	5-10	Prepare an operations and maintenance plan for common area facilities' commissioned areas
4-20	20	Work with jurisdiction on demonstration ordinance with environmental benefit
4-21	4	Educate residents on LID maintenance strategies
4-22	3	Prevent human-wildlife conflict
4-23	10	Smoke-free buildings and community spaces
4-24	1-10	Extra credit for innovation

REQUIRED ACTIONS

A development must complete a series of actions to qualify for consideration as a BUILT GREEN Community. The following Action Items ensure a minimum level of human and environmental health performance is reached.

3-Star Required Action

Properly dispose of hazardous wastes



what: Washington uses the term *dangerous wastes* to describe materials posing health and safety risks that must be managed. The designation encompasses a broad group of substances. Common dangerous wastes on construction and demolition sites include aerosol cans, asbestos- and lead-containing materials, petroleum products, oil-based paints and some stains, many adhesives, and solvents.

Proper disposal of hazardous wastes involves identification and storage, followed by delivery of the material to certified handling and disposal facilities.

Note: Chapter 176-303 WAC, Washington's dangerous waste code, is more strict in some areas than federal statute, which uses the term 'hazardous' to describe these same materials. This means two things: the WAC takes precedence, so use the stricter definitions, AND dangerous and hazardous wastes / materials are synonymous terms with Washington State agencies and within this Handbook.

To participate in the BUILT GREEN program, projects must provide evidence of a dangerous waste management and disposal plan.

how: Incorporate dangerous waste reduction, management, and disposal into the project's overall construction and demolition waste recycling and disposal plan. Work with the jurisdiction's local hazardous waste management program to develop an overall plan for dangerous waste reduction and management (see *Resources*).

Most residential developers qualify as a *small quantity generator* (SQG) under State and County regulations. SQGs produce less than 220 pounds of hazardous waste per month (about half of a 55 gallon drum), or less than 2.2 pounds of extremely hazardous waste, and never accumulate more than 2,200 pounds at any one time.

Hazardous waste generated by SQGs is classified as Moderate Risk Waste, which is exempt from regulation under WAC Chapter 173 303.

Contractors who qualify as SQGs may be eligible to dispose of their hazardous wastes at collection sites operated by local governments. This option is often less expensive. Information about local programs can be obtained from local governments or the Washington Department of Ecology regional offices.

Projects involving demolition or modification of existing structures face additional dangerous waste management considerations. Existing buildings may contain a variety of hazardous substances, including lead (primarily in the form of lead-based paint but including lead flashing and other materials), asbestos (found in some flooring, siding, insulation, duct wrap, etc.), mercury (in some thermostats, switches, fluorescent lamps, etc.) and PCBs (older caulk, floor mastic, ballasts/transformers, foam board, etc.).

Washington State laws regarding PCB handling and disposal, for example, are significantly more stringent than US EPA requirements. Designating demolition waste can be challenging; see *Resources* for help with identifying and managing hazardous materials in demolition debris.

Businesses generating more than 2,200 pounds of dangerous waste per month are classified and fully regulated as medium or large quantity generators and must contract with licensed haulers to have wastes delivered to specially permitted facilities.



Action Item Rationale:

Proper management of dangerous waste is required by law to protect human health and the environment.

Reducing hazardous wastes in the first place helps avoid exposures that can injure workers or future residents, pollute soils, air and water, and create liability issues.

3-Star Required Action

Become an EnviroStars business, and encourage builders and subs to become certified under EnviroStars. EnviroStars businesses prioritize waste prevention and least-toxic alternatives. Find out more by visiting www.envirostars.org.

See *Resources* for information on proper management and disposal options, depending on the classification of the waste generator and types of hazardous material generated.

considerations: Selecting least-toxic materials and products, using biofuels rather than fossil fuels (Action Item 3-33), and exercising proper care when working with materials containing asbestos, lead, PCBs and other toxins all reduce the generation of dangerous wastes in the first place.

In addition, inventorying and securing all hazardous materials during construction (Action Item 3-31) and properly maintaining heavy equipment so as to protect ground and stormwater (Action Item 3-32) reduces the likelihood of an inadvertent release of hazardous materials on the job site.

resources:

King County definition of small quantity generator of hazardous waste:
www.lhwmp.org/home/BHW/sqg.aspx#whatis

Snohomish County business hazardous waste info:
www1.co.snohomish.wa.us/Departments/Public_Works/Divisions/SolidWaste/Haz_Waste/bushazwaste.htm

The jurisdiction's health department can often help identify dangerous waste reduction and management resources.

Department of Ecology list of common construction and demolition hazardous wastes:
www.ecy.wa.gov/programs/hwtr/dangermat/common_demo_wastes.html

Department of Ecology information on identifying and classifying wastes:
www.ecy.wa.gov/programs/hwtr/manage_waste/identify_categories_dw.html

Department of Ecology Northwest Regional Office (Bellevue): 425.649.7000

Washington State Dangerous Waste legislation (WAC Chapter 173-303):
www.apps.leg.wa.gov/wac/default.aspx?cite=173-303

3-Star Required Action

All new home starts in the development must meet the BUILT GREEN 3-Star Level or higher



what: BUILT GREEN offers certifications for both communities and buildings: single family residential new construction, remodels, and multifamily buildings. As with the BUILT GREEN Communities certification, builders are provided a checklist or menu of green and healthy Action Items, customizable to a particular project. Visit the BUILT GREEN website (see *Resources*) to learn more about the other BUILT GREEN certification programs.

To meet this program requirement, all new home starts within the community must meet the 3-Star level of achievement using the BUILT GREEN Single Family or Multifamily New Construction checklists, as appropriate.

how: Learn more about the BUILT GREEN residential rating systems at www.builtgreen.net.

Select builders with demonstrated experience achieving BUILT GREEN certification with previous projects. Find BUILT GREEN member builders on the BUILT GREEN website and through the Northwest Eco-Building Guild (see *Resources*).

A requirement to build to BUILT GREEN specifications can be included in the developer's builder requirements.

considerations: Many of the Action Items within the BUILT GREEN Communities checklist help homebuilders pursue Action Items at the building level. In fact, a home is eligible for points simply for being located in a BUILT GREEN certified community.

Including prospective builders in the design charrette for the community (see 4-Star Requirements), and holding a dedicated charrette for builders in the development (Action Item 4-1) well before construction begins helps align expectations and generates creative ideas for enhancing the environmental performance of the community.

During the required BUILT GREEN orientation (see 3-Star Requirements), outline what is expected of builders in terms of achieving BUILT GREEN residential certification.

For leading edge green communities, consider requiring builders within the community to achieve the more ambitious 4-Star Level within BUILT GREEN (Action Item 2-47).

resources:

BUILT GREEN offers free downloads of the Single Family New Construction, Multifamily, and Remodel checklists and extensive descriptions of the programs and the certification process. www.builtgreen.net

Projects pursuing BUILT GREEN certification in King County may be eligible for incentives or technical assistance from the King County GreenTools program: www.your.kingcounty.gov/solidwaste/greenbuilding/built-green.asp

The Northwest EcoBuilding Guild is a regional association of architects, builders, developers, consultants, and product suppliers committed to green building: www.ecobuilding.org



Action Item Rationale:

Building BUILT GREEN certified homes within a BUILT GREEN Community provides a consistent product for consumers. A BUILT GREEN Community is notable for its green features; prospective homeowners will expect the homes located in the community to possess environmental features as well.

The BUILT GREEN Home Builder Program creates market distinction for builders using green building practices in their homes in the same way that BUILT GREEN Communities certification differentiates developers.



what: To satisfy this requirement, the developer must hold at least one meeting with builders in the development that describes the BUILT GREEN program, encourages enrollment in the program, and provides resources for certifying their homes. This orientation must also outline the developer's BUILT GREEN Communities priorities and goals for the development.

how: A builder orientation should include both essential information about BUILT GREEN Communities certification in general and the green priorities of the development in particular. Many of the BUILT GREEN Communities Checklist Action Items facilitate the achievement of BUILT GREEN Action Items at the residential building scale.

As part of the orientation, it is helpful to distribute a customized list of the Action Items being pursued at the community level. This will help the builders understand the community features, and at the same time allow builders to take advantage of activities happening at the community scale. For example, community scale low impact stormwater strategies could be integrated with rain gardens or rainwater harvesting features on individual homes.

Developers new to BUILT GREEN can profit from hiring a BUILT GREEN Verifier or green building consultant with experience in the BUILT GREEN certification process to conduct, or at a minimum consult on, the builder orientation. BUILT GREEN Verifiers have deep understanding of the BUILT GREEN checklists and the certification process, and often also have extensive applied green building experience. A list of Verifiers can be found on the BUILT GREEN website (see *Resources*).

considerations: A design charrette (Action Item 4-1) can follow an orientation session and build off the information provided during orientation. Charrettes identify and clarify the environmental and health goals of the project and serve as a forum for brainstorming project features and solutions to challenges specific to the project.

resources: Visit www.builtgreen.net for checklists, fact sheets, BUILT GREEN Verifiers, and other resources to help create an orientation.

3-Star Required Action

Orient and promote BUILT GREEN to builders in the development



Action Item Rationale:

Providing BUILT GREEN education and training increases the chances of builders' success in pursuing sustainability goals.

In addition, helping builders understand the value of BUILT GREEN in particular and green features in general facilitates buy-in and can assist builders in positioning their homes favorably in the marketplace.

3-Star Required Action

If building near wetlands, shorelines, bluffs, and other critical areas, preserve and protect beyond code



SITE/WATER

what: Sensitive lands and critical areas are mandated a basic level of protection by regulations. To participate in BUILT GREEN, the community must have established beyond-code protective measures for wetlands, shorelines, bluffs, and other environmentally sensitive areas.

A variety of strategies help preserve and protect critical areas on a site, including:

- Expanding buffer zones
- Preserving trees and existing soils
- Removing invasive species and those competing with native vegetation, and
- Employing additional best management practices related to construction stormwater protection.

This Action Item also requires an education component in the protection approach. Training materials and sessions to alert contractors to protected areas and enhanced preservation measures that must be met will accomplish this requirement.

how: Work with a wetland or wildlife biologist, geotechnical engineer or other experts to develop an enhanced critical areas protection strategy and boundaries.

Numerous federal, state and local laws affect the use and protection of wetlands and other critical areas. Local regulations vary; contact the jurisdiction's building department to determine code requirements applicable to the project. Strategies to protect beyond code must fit the nature of the critical area and existing site conditions. Protection beyond code includes both construction-phase activities and permanent landscape and building features.

Extending the no-build area beyond those established by code is the easiest way to protect critical areas. Determine the boundaries of the protected area, and then clearly mark these boundaries to avoid the accidental disturbance or destruction of protected areas. In addition, set-aside easements and habitat connections enhance the resilience of critical areas.

For example, protect wetlands from sedimentation during construction using appropriate BMPs such as compost berms or silt fences. Leave a vegetated buffer zone a minimum of 100 feet wide on each side along streams or other water bodies unless approved plans indicate larger buffers are required. Check with the local jurisdiction for buffer size requirements.

Develop training and education materials to help ensure contractors comply with critical areas protection goals.



Action Item Rationale:

Wetlands provide essential cover, feeding, nesting, and breeding habitat for fish and wildlife. They also supply critical ecosystem services, buffering the effects of storm surges and filtering pollutants from stormwater.

Coastal slopes on Puget Sound are inherently unstable areas. Approaching shoreline development in a safe and environmentally sound manner can reduce the risk of catastrophic property damage.

Furthermore, careful management of site drainage is often a more cost effective approach to minimizing bluff hazards than extensive shoreline armoring.

3-Star Required Action

considerations: On bluffs and other areas prone to landslide or erosion, be certain to consult with a hydrologist and/or civil engineer prior to using any LID strategies aimed at allowing the groundwater to recharge (see Action Items 2-1 and 2-2). Added infiltration can destabilize slopes. Instead, stormwater planters, constructed wetlands (Action Item 2-15), and other systems that detain water onsite but limit infiltration may be preferable.

Avoiding any building near critical areas (Action Item 2-3) and clustering development (Action Item 2-22) away from critical areas also helps.

A thorough site habitat assessment (Action Item 1-4) is a key component to understanding the critical areas on the site.

resources:

The Municipal Research and Services Center of Washington maintains a list of links to Critical Areas ordinances throughout the state:
www.mrsc.org/Subjects/Environment/criticalpg.aspx

Seattle Department of Planning and Development's *Green Shorelines* manual provides low-impact strategies for reducing shoreline armoring, reestablishing habitat and restoring lake frontage:
www.seattle.gov/dpd/Planning/Green_Shorelines/Overview/

King County's Northwest Native Plant Guide for landscape design examples for steep slopes and marine properties, among others:
www.green.kingcounty.gov/Go-Native/Index.aspx

3-Star Required Action

Do not dispose of any materials in lowlands or wetlands



what: For the purposes of this Action Item, *lowlands* are defined as areas receiving stormwater drainage from the site and adjacent properties.

To participate in BUILT GREEN, a community must prohibit the disposal of all materials in lowland and wetland areas, including construction materials, demolition waste, land clearing debris, or soils generated from earth-moving activities.

Note: woody debris required for and deliberately placed in the course of habitat restoration activities under the guidance of a habitat restoration professional is exempt from this prohibition.

how: Determine wetland and lowland areas on the site using GIS resources and a site assessment and habitat inventory (Action Item 1-4). Mark these areas clearly on site maps with specific prohibitions for disturbance and dumping.

As part of the Stormwater Pollution Prevention Plan (see 3-Star Requirements), physically delineate sensitive site areas as off-limits, both on plans and onsite using high visibility fencing. Establish maintenance and education programs (Action Item 4-2) to ensure that barriers remain intact throughout the construction phase of the project and that all contractors and subcontractors are apprized of the off-limits areas.

considerations: Clustering housing (Action Item 2-22) simplifies critical areas protection by distancing construction activities. Prioritize leaving lowlands, wetlands, and other sensitive areas intact and undisturbed beyond code (Action Item 2-3). Maintaining the existing topography of the site (Action Items 2-5 and 2-28) can reduce or eliminate the need to transport topsoil or subsoil. This can also save money and reduce the need for construction-phase erosion and sedimentation controls and post-construction soil amendment and restoration activities.

A thorough Stormwater Pollution Prevention Plan will specify the protection of lowlands and wetlands. Take care to not let limitations on the export of fill material (Action Item 3-5) to result in pressures to fill lowlands with surplus soils.

resources:

The Center for Watershed protection:
www.cwp.org/

Washington State Dept. of Ecology
wetlands delineation information:
www.ecy.wa.gov/programs/sea/wetlands/delineation.html



Action Item Rationale:

Dumping material of any kind harms established vegetation and can inhibit the hydrologic function of the site, which in turn threatens water quality, degrades wildlife habitat, and can lead to flooding. It may also be illegal.

Leaving pristine lowland and wetland areas intact helps drain stormwater away from developed portions of the site, reducing the likelihood of property damage. Undisturbed areas also act as site amenities, enhancing biodiversity and potentially increasing property values.



SITE/WATER

what: Successful construction stormwater pollution prevention requires three elements: installation, maintenance, and monitoring.

To meet the requirements of this Action Item, provide evidence of the development and implementation of a maintenance section to the project's Stormwater Pollution Prevention Plan.

how: Develop and follow a plan for regular maintenance of all temporary erosion and sedimentation control (TESC) practices. Typically, a worker is assigned to:

- Inspect all measures regularly and immediately if more than ½ inch of rain falls in a 24-hour period. See Action Item 3-27 for more on stormwater quality.
- Make sure all flagging and fencing of protected areas remains highly visible. Re-cover and/or seal exposed or injured tree roots.
- Repair any tears or breaches in soil stockpile covers.
- Remove sediment from the base of silt fences, from sediment traps when at no more than 50% of capacity, and from check dams when it reaches one-half of the original dam height.
- Maintain the specified thickness of compost applications.
- Wash construction entrances, top dress with additional stone, re-work, and compact as necessary.
- Restrict construction traffic to stabilized entrances.
- Replace clogged filters on stormwater inlets. For stone filter systems, replace clogged gravel with fresh stone. Keep inlets clear.

At the end of the project, permanently stabilize all disturbed soils.



MATERIALS

Include TESC information in the builder orientation (see 3-Star Requirements), and coordinate site-level activities with those at the community level.

All sites over one acre are required by code to establish a Pollution Prevention Team, including a Certified Erosion and Sedimentation Control Lead.

considerations: Start with prevention: avoid disturbing existing native soils wherever possible. Maintaining existing vegetation (Action Item 2-25), protection of sensitive areas (Action Item 2-3), and following existing topography (Action Item 3-5) all help reduce the total disturbed acreage. A variety of LID strategies reduce the need for erosion control—see the *Low Impact Development Technical Guidance Manual for Puget Sound*.

The Stormwater Pollution Prevention Plan (see 3-Star Requirements) should list maintenance protocols. Water quality monitoring (Action Item 3-27) can identify invisible failures to TESC elements, triggering action.

The Salmon-Safe® standard (5-Star Required Action, p. 34) includes a model construction-phase stormwater management program as an appendix.

resources:

EPA BMP database:
BMP Inspection and Maintenance:
www.cfpub.epa.gov/npdes/stormwater/menuofbmps/
(use search function to locate inspection and maintenance BMPs)

Construction Stormwater General Permit information:
www.ecy.wa.gov/programs/wq/stormwater/construction/
(for projects disturbing one or more acres of land)

3-Star Required Action

Optimally maintain all temporary erosion control elements



Action Item Rationale:

Poor maintenance of stormwater pollution prevention measures can negatively impact water quality and bring the site into non-compliance with stormwater code.

3-Star Required Action

Provide a comprehensive recycling plan for community and facility areas



what: A comprehensive recycling plan provides contextual information on a community's expected waste generation tonnages, establishes strategies for enhancing recycling rates, and sets goals mid- and long-term recycling rates in the community over time.

To comply with this requirement, develop a comprehensive recycling plan for community and facility areas in coordination with maintenance staff and/or waste, recycling and compostable materials haulers.

In the plan, estimate the tonnage of overall waste generated, set recycling goals for specific types of materials, identify recycling and waste management systems and contractors, and outline specifications and contract language to optimize recycling efforts.

how: Work with municipal or county waste reduction and recycling specialists to develop a comprehensive waste reduction and recycling strategy for common facilities and for the community overall. King County maintains extensive information online (see *Resources*). Approach municipal solid waste, recycling, and composting as a unified system to help design a fully integrated approach to waste management.

considerations: Community recycling systems that allow at least as many recycling options as those available to private residences (see Action Item 4-3) helps maximize recycling and reduce the contamination rate by creating commonalities between the two programs.

resources:
King County waste reduction and recycling information for businesses:
www.your.kingcounty.gov/solidwaste/business/index.asp

Snohomish County waste reduction and recycling information:
www1.co.snohomish.wa.us/Departments/Public_WorksDivisions/SolidWaste



Action Item Rationale:

A comprehensive recycling plan for common areas helps reduce community waste disposal costs. Recycling services are nearly universally cheaper per ton than disposal services.

In addition, public place recycling educates residents about available recycling services, helping reinforce resource conservation habits at home.

3-Star Required Action

Create a Stormwater Pollution Prevention Plan



Action Item Rationale:

According to the Washington State Department of Ecology, one-third of all water pollution in the state is caused by polluted stormwater.

Stormwater pollution prevention is required by code. However, prevention plans can be cursory in scope and poorly implemented—meaning that although the letter of the law (reporting) may be followed, the intended outcome (stormwater protection) suffers.



what: A Stormwater Pollution Prevention Plan (SWPPP) is a comprehensive strategy for reducing stormwater pollution resulting from construction activities. It is required on sites of over one acre in size by the federal National Pollutant Discharge Elimination System (NPDES) regulations and the Washington State Department of Ecology's Construction Stormwater General Permit.

To achieve this required Action Item, the community developer must demonstrate that the SWPPP has been submitted in accordance with state and local requirements. For sites under one acre in size, this Action Item requires that the project either create a formal plan as outlined above, OR that a Certified Erosion and Sedimentation Control Lead be onsite to manage, monitor and log erosion and sediment control activities and outcomes.

how: The Washington State Department of Ecology maintains a SWPPP template. See *Resources*. Use this template to develop the project's SWPPP. Train contractors and subs about the SWPPP and best management practices associated with pollution prevention to ensure the plan is followed successfully. While Ecology has specialists on staff to help projects through the SWPPP process, it may be helpful to hire a qualified professional for the development of the SWPPP and any educational efforts.

considerations: Several BUILT GREEN Action Items complement the creation of a SWPPP and enhance protection of stormwater overall. These include:

- 3-Star requirement: Optimally maintain all temporary erosion control practices
- 3-26: Supplement permanent flow-control measures with necessary temporary controls
- 3-27: Test waterways near or in development during construction

resources:

King County Stormwater Pollution Prevention Manual:
www.kingcounty.gov/environment/waterandland/stormwater.aspx
 (click on *Stormwater Pollution Prevention Manual*)

King County Surface Water Design Manual, Appendix D: Erosion and Sediment Control Standards
www.kingcounty.gov/environment/waterandland/stormwater.aspx
 (click on *2009 Surface Water Design Manual*)

Washington Department of Ecology information on the Construction Stormwater General Permit required of projects clearing one acre of land or more, including a SWPPP template with example text.:
www.ecy.wa.gov/programs/wq/stormwater/construction/

4-Star Required Action

Attend a BUILT GREEN approved workshop within the 12 months prior to certification



what: BUILT GREEN-approved workshops provide critical information on achieving BUILT GREEN Community certification. The qualifying workshops currently include the *Introduction to BUILT GREEN* workshop, and sessions conducted at the BUILT GREEN Annual Conference.

To meet the requirements of this Action Item, at least one primary member from the developer team must attend a minimum of one BUILT GREEN workshop within twelve months prior to submitting the project for certification.

how: Look for upcoming BUILT GREEN workshops by visiting the BUILT GREEN website (see *Resources*). For workshops that have not been pre-approved by BUILT GREEN, contact BUILT GREEN to determine whether the workshop(s) meet the intent of this requirement.

The annual BUILT GREEN Conference offers a diverse set of educational opportunities, from introductory-level trainings to in-depth advanced workshops, developed with the intention of expanding the skill set of our region's builders. Visit the BUILT GREEN Conference website (see *Resources*) for details.

considerations: Use information gleaned from BUILT GREEN workshops to create trainings (Action Item 3-34) and educational materials, such as builder's guides (Action Item 4-2), for builders in the development.

resources:
BUILT GREEN Conference:
www.builtgreenconference.com

BUILT GREEN:
www.builtgreen.net

Master Builders Association:
www.mba-ks.com/
(click on *Classes and Events*)

Northwest EcoBuilding Guild:
www.ecobuilding.org
(click on *Classes and Workshops*)



Action Item Rationale:

Green building is a dynamic field. To keep current, developers, builders and design professionals benefit by pursuing ongoing professional development in the form of green building trainings and workshops.

Workshops give participants an opportunity to learn about new and long-standing green building technologies, designs and strategies, and allow for hands-on training and exposure to invaluable lessons learned from practitioners.



what: An *Integrated Design Process* (IDP) brings a multidisciplinary team of environmental planners, biologists, architects, landscape architects, engineers, construction professionals, maintenance staff works together throughout the design process to develop and optimize a project. IDP aims to break down the traditional silos and sequential process associated with traditional design, capturing synergies and identifying potential pitfalls.

A hallmark of IDP is the *design charrette* (see 4-Star Requirements). Charettes are strategic design meetings held as early as possible in the design process (certainly before Schematic Design) that engage architectural, engineering, construction and maintenance professionals in identifying and agreeing upon project goals and priorities. Charettes offer the opportunity to bring design and construction players into alignment, generate and evaluate new ideas, and to identify, up front, potential challenges and solutions.

To achieve this Action Item, the project must conduct at least one charrette during Project Planning/Discovery/Conceptual Design and one during Schematic Design. The first charrette needs to occur as early as possible in the process, once critical site and programming information is available to inform brainstorming and goal setting.

how: A successful charrette requires a skilled facilitator, proper planning, and the active participation of key project players. Hiring a professional charrette facilitator helps ensure the process will run smoothly and effectively. Local and regional green building consulting firms often have experienced charrette facilitators on staff. Ask for descriptions and outcomes of the charrettes potential consultants have facilitated, and references to confirm client satisfaction.

Alternatively, the architectural prime on the project may conduct the charrette—provided the firm can demonstrate experience in leading such exercises. Including team members with an understanding of integrated design helps keep the concepts front and center.

considerations: Sustainable design approaches require integrated thinking. Many of the Action Items within the BUILT GREEN checklist are interrelated; IDP can help weave them together.

Charettes beyond the minimum required in this prerequisite bring additional value to the project, including charettes for homebuilders (Action Item 4-1).

resources:

See the *Built Green and Integrated Design* section of this Handbook (p. 13).

Whole Building Design Guide features a section on IDP:
www.wbdg.org/design/engage_process.php

The Integrative Design Guide to Green Building
 by 7group and Bill Reed
 (Wiley, 2009)

4-Star Required Action

Use an Integrated Design Process, including at least one charrette for each phase



Action Item Rationale:

The segmented nature of the conventional design process can leave significant opportunities unrealized and introduce challenges as well. The integrated design process can help identify and avoid costly mistakes in design and construction.

The intent of a design charrette is to establish and agree upon sustainable design priorities and objectives; produce champions for those priorities and to help ensure follow-through; and to establish and reinforce communication channels to facilitate project success.

5-Star Required Action

Earn Salmon-Safe Certification or equivalent



what: Portland, Oregon-based nonprofit Salmon-Safe manages a stable of environmental certification programs for farms, vineyards, campuses, residential developments and other land uses. Salmon-Safe Communities designation certifies a project for its efforts in reducing the development's impact on habitat and water quality, and the subsequent strain on our Pacific Northwest native salmon runs. Salmon-Safe encourages a holistic approach to residential development using best practices for aquatic habitat identification, evaluation and protection.

To meet the requirements of this Action Item, communities seeking 5-Star BUILT GREEN Community certification must earn Salmon-Safe Communities certification, or demonstrate that practices followed meet or exceed Salmon-Safe standards.

BUILT GREEN will evaluate equivalency on a case-by-case basis. Equivalency must show achievement of intent and functional performance at a level equal to Salmon-Safe Certification.

how: Achieving Salmon-Safe certification entails gathering site information; employing best design, construction and maintenance practices; and submitting documentation for review and approval.

Only a subset of potential project sites is eligible for Salmon-Safe certification. Contact Salmon-Safe early in the process of examining potential development sites to determine if they meet eligibility criteria. Review the *Salmon-Safe Certification Standards for Residential Development* (see *Resources*) for its requirements.



Conduct a habitat assessment and species inventory for the site (Action Item 2-60) to discover essential information on the current status of the site with respect to native species, including salmon.

Look for design and construction professionals well-versed in LID practices. Several regional design and planning firms have deep experience with cutting-edge LID techniques, and can impart their practical knowledge on projects rather than expending billable hours getting up to speed on the latest approaches.

considerations: Salmon-Safe is deeply embedded in the concepts of Low Impact Development; Action Items related to LID (e.g., Action Items 2-22, cluster development and 2-26, preserving existing native vegetation) are helpful in attaining Salmon-Safe Certification and vice versa. Similarly, elements of a Stormwater Pollution Prevention Plan (see 3-Star Requirements) will also support the pursuit of Salmon-Safe certification.

Selecting the right site in the first place lays the groundwork for a Salmon-Safe community. Conduct habitat assessments and biological site analyses during the site selection phase (Action Item 1-4) using the Salmon-Safe site selection criteria to identify sites with fewest sensitive areas.

resources:

Salmon-Safe certification for residential developments:
www.salmonsafe.org/getcertified/residential-development

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php



Action Item Rationale:

Developments that protect salmon also protect the health of waterways, and are beneficial to humans, pets, and wildlife as well.

Salmon are considered an indicator species: their health signals the vitality of the larger ecosystem on which they depend.

According to the Wild Salmon Center, global wild salmon fisheries generated \$3 billion in personal income in 2007; this natural resource represents a critical economic pillar of the Pacific Northwest.

SITE SELECTION

Careful site selection is a major factor in a development's environmental performance. The preferred green development site will be connected to essential infrastructure, provide easy access to daily necessities and amenities, and encourage transportation alternatives, including walking, bicycling, and mass transit.

Ideally, the property selected will be an infill or previously developed site, offering the opportunity for habitat and soils restoration while allowing residents to live close to where they work and shop. And it will be free from flood and landslide hazards, sensitive habitat, and agricultural or other resource lands (unless these are earmarked for permanent preservation and development is targeted for other portions of the site).

In other words, it's not simply "location, location, location;" it's the presence—and absence—of important site attributes.

Action Item 1-1

Redevelop and restore existing brownfield sites

Points: 2



what: The US Environmental Protection Agency defines *brownfields* as “abandoned, idled, or underused sites where expansion or redevelopment is complicated by real or perceived environmental contamination.”

For the purposes this Action Item, the term brownfield is intended to be expansive, applying to sites that meet the general definition above, rather than a definition restricted to only those areas designated as Federal Superfund sites.

This broader definition includes the redevelopment and restoration of abandoned or underutilized commercial sites, or rural industrial lands meeting the ASTM standards for Phase II Environmental Site Assessments (see *Resources*).

While land use laws in Washington encourage redevelopment in urban areas, contamination can still inhibit the reuse of brownfield sites. Many of these sites remain undeveloped due to liability or marketability concerns and uncertain or cumbersome regulatory requirements.

To earn points under this Action Item, the developer must show that:

- All or a portion of the site qualifies under the definitions set forth in ASTM E1903-11 or its most recent equivalent,
- and
- That the contamination has been properly remediated for the protection of human health and environmental function.

how: Remediation costs associated with restoring contaminated sites can be substantial. To most fully capture opportunities with brownfields, the remediation and development processes must be addressed at a project’s feasibility study stage. Work with environmental consultants, architects, appraisers, attorneys, and others to identify the nature and extent of the contamination, likely clean-up requirements, development potential, liability, and market value.

The Department of Ecology and local government representatives can help identify brownfield sites, clarify liability, define clean-up options, assist with accessing funding or financing opportunities, and work with permitting for cleanup and redevelopment projects. (See the list of contacts under *Resources*.)

Ask about incentives including grant-funded local government site remediation, infrastructure upgrades, low-interest loans, loan guarantees, and job training. Local municipalities and landowners are often willing to part with brownfield properties for a below-market purchase price.

Local universities, research nonprofits, or businesses may be interested in partnering to test new site remediation methods, offsetting restoration costs and enhancing the project. For example, a university may be testing natural cleanup methods, such as bioremediation and phytoremediation.



Action Item Rationale:

Brownfields are often situated on prime development land. Former industrial lands are commonly connected to, or within easy access of, existing power, water, and wastewater infrastructure (see Action Item 1-8).

In recent years, the regulatory and business climate towards developing brownfields has improved. Government initiatives help defray cleanup and redevelopment costs. Better integration of planning, environmental review, and permit coordination, along with an increased focus on future land use is stimulating this market.

Action Item 1-1

considerations: Using an Integrated Design Process and conducting one or more design charrettes (see 4-Star Requirements) can help identify and map out the interdependencies present in brownfield redevelopment, and help ensure they work in concert with other aspects of a green community.

Depending on the type and extent of contamination, a brownfield site may preclude certain green building practices, such as restoring onsite stormwater infiltration (Action Item Action Items 2-1 and 2-2). Clustering homes (Action Item 2-22) or targeting nonresidential land uses for contaminated portions of a site can make it easier to deal with specific contamination “hot spots.”

Due to previous zoning as industrial lands, brownfield sites are often prime locations for rezoning as mixed-use developments (Action Item 2-36). Brownfield sites also often have existing connectivity to water and sewer infrastructure (Action Item 1-8), and are previously developed sites near urban centers (Action Item 1-2).

Cleanup of contamination will likely involve specialized professions and equipment, and can significantly extend the development time line; plan accordingly.

resources:

ASTM standard for Phase II Environmental Site Assessments (ASTM E1903-11):
www.astm.org/Standards/E1903.htm

King County Brownfields Program:
www.your.kingcounty.gov/solidwaste/brownfields/index.asp

Washington Dept. of Ecology Brownfields information:
www.ecy.wa.gov/programs/tcp/brownfields/brownfields_hp.html

National Brownfield Association:
www.brownfieldassociation.org

Action Item 1-2

Develop on a previously developed infill site near urban centers

Points: 5



what: *Infill sites* consist of existing residential, commercial, and industrial areas, and vacant lands that have been historically occupied by structures.

To qualify for points under this Action Item, the site must have some impervious surface and existing site infrastructure, and must be located near urban centers. Partially developed parcels are eligible. In addition, the project is expected to restore any damaged sites. Restoration may be included as a condition of the community's development permit.

how: Many residential neighborhoods, new and old, have been built out at densities less than allowed by land use code. Moreover, land use changes over time present development opportunities, as do smaller, irregularly shaped, or steeply sloped lots, which are often passed over in the first wave of construction.

Certain infill areas are more conducive to community-scale build-out. Brownfield sites (Action Item 1-1) tend to be larger and therefore more suitable. Government surplus properties (including decommissioned schools) are often prime candidates for residential and mixed-use development. Securing such lands can be a time-intensive, multi-year process; take this into account when establishing a development time line.

Work with the appropriate building department(s) to address any existing code constraints, such as prescribed setbacks, minimum square footage, or unnecessarily large minimum lot sizes.

Cluster homes (Action Item 2-22) on infill sites to both increase density and retain open space for wildlife and recreation. Community developments with smaller overall footprints, such as cohousing (Action Item 2-38), may have an easier time finding suitable infill plots.

considerations: Locating a project on previously developed land often also means the project is primed to take advantage of existing infrastructure (Action Item 1-8) and is close to existing services (Action Item 1-7). In addition, the land may qualify as a brownfield site (Action Item 1-1).

Infill sites may pose development challenges in terms of steep slopes, proximity to wetlands or other critical areas or the presence of valuable stands of mature trees or other vegetation (Action Item 2-41). Infill sites may also present opportunities for reforestation, reconnecting wildlife corridors (Action Item 2-24), and reducing habitat fragmentation.

The following Action Items can benefit from the selection of an infill site near urban centers:

- 1-3: Locate to maximize access to non-motorized and mass transit
- 1-5: Choose site with no environmentally critical areas

resources:

See Action Item 1-1.

Municipal Research and Services Center of Washington: "Infill Development: Completing the Community Fabric." www.mrsc.org/subjects/planning/infilldev.aspx



Action Item Rationale:

Redeveloping and restoring infill sites encourages people to live where public services such as sewer and water, roads and public transit, schools, and emergency services already exist.

These sites provide greater efficiency in infrastructure use and reduce average resident vehicle miles traveled. Communities near urban centers can more easily offer the residents the advantage of mass transit options.



what: Proximity to transit alternatives is a strong determinant of whether residents opt to use those services. When selecting the site for a new community, note its access to mass transit, bicycle and pedestrian transportation choices.

Developers are encouraged to create *Transit Oriented Developments*, or TODs. The techniques in this Action Item are elements of a TOD.

To earn points under this Action Item, select a site that meets one or both of the following criteria (points are additive):

- Within ½ mile walking distance of transit station (light rail, bus rapid transit)
5 points
- Pedestrian paths and dedicated bike lanes provided to transit location(s)
3 points

how: Strictly speaking, TODs exist within a ¼ - ½ mile radius of transit stations. Build around an existing or proposed service line, and make sure the development's density plan will support frequent and timely bus or other transit trips. Also include contiguous sidewalks/walkways, locate transit stops in the highest density areas, and prioritize access for seniors and others with special needs. Ensure that transit routes have direct, safe, and easy access for pedestrians and bicycles, since convenience encourages use.

Locate TODs near commercial and/or government service buildings. (See *Considerations* for related Action Items.)

The aim is to create a Complete Streets development (Action Item 2-27) that balances car traffic with transit riders who use and enjoy the transit center area. The City of Redmond's Town Center provides a good example: high-density multifamily complexes within walking distance to a transit center, nearby employment, including City Hall a regional medical center and convenient shopping.

considerations: Creating a walkable neighborhood (Action Item 2-27) complements connection to the larger community. See also supporting Action Items 1-7: Locate within ½ mile of essential services and 2-40: Provide community amenities. Ensure that pedestrians and cyclists from the development are able to safely and easily reach those services.

resources:
The Center for Transit Oriented Development:
www.ctod.org

Sustainable and Resilient Communities: A Comprehensive Action Plan for Towns, Cities, and Regions
by Stephen Coyle
(Wiley, 2011)

Action Item 1-3

Locate to maximize access to non-motorized and mass transit

Points: 3-8



Action Item Rationale:

Lack of convenient public transit increases car use (automobiles are used to make 95% of daily trips). Households with access to mass transit and non-motorized transportation options can often downsize from two cars to one, or even dispense with car ownership altogether, significantly reducing household expenses. This also reduces a community's carbon footprint.

In addition to providing an alternative to the automobile, effective transit-oriented developments offer a mix of services around the transit center, providing a new set of opportunities to activate and invigorate neighborhoods.

Action Item 1-4

Prepare a historical biological site analysis and habitat inventory for all sites

Points: 8



what: A *site analysis and habitat inventory* gathers information on a site's biota and habitat, and identifies and maps environmentally sensitive areas and associated buffers. It will determine if there is adequate physical space to locate development on a subject site, and if the development yield will meet project goals.

To achieve points for this Action Item, a qualified professional must complete a biological site analysis and habitat inventory for each potential site, and the analysis must be used to assist in final site selection.

how: Hire a professional habitat biologist to conduct the surveys.

Results may reveal site limitations that tip the scales toward or away from a particular piece of land. Sometimes, sites are so problematic it is best to seek alternative locations. It is always more costly to discover site issues late in the process. This is particularly important today considering the ramifications of the Endangered Species Act (ESA) 4(d) rule related to protecting salmon.

considerations: Information from such an analysis will serve as invaluable data to inform an Integrated Design Process (see 4-Star Requirements) and when conducting design charrettes .

Create an analysis and inventory that can be built on once a final decision is made on site selection (see Action Item 2-60: Conduct pre-development site studies). Taken together, these site studies provide invaluable information for making informed design decisions related to Action Items throughout the BUILT GREEN Communities Checklist.

Salmon-Safe's (5-Star Required Action Item) inventory and assessment elements (Stage 1) include assessments for aquatic, wetland, riparian and non-riparian lands on the development site.

resources:

Salmon-Safe:
www.salmonsafe.org



Action Item Rationale:

Often, the biggest hurdle to project success is overcoming development assumptions based on the site's zoning rather than actual site characteristics. Zoning codes indicate a site's maximum development density.

Project planners may presume that they will be allowed to construct at maximum densities, and base financial feasibility on this.

Actual development density is more often limited by site conditions. A site analysis and inventory is a useful tool to avoid this common pitfall and optimize use of the site.



SITE/WATER

what: *Environmentally Critical Areas* (ECAs) commonly include flood prone and aquifer recharge zones; wetlands, fish and wildlife protection areas; and geologic hazards (e.g., steep slope, landslide, and soil liquefaction areas). ECAs are identified by local code. For the purposes of this Action Item, ECAs include all areas defined as Critical Areas by King and Snohomish Counties as applicable to the project location, and any additional lands as identified by relevant municipal code.

To earn points under this Action Item, the development site must be free from areas designated as environmentally critical by the above authorities.

how: During the site selection phase, research potential sites for the presence of ECAs using data from the governing jurisdiction. GIS layers showing ECAs are a common feature of jurisdictional land use datasets. Map ECAs in conjunction with habitat assessment mapping activities (Action Item 1-4) to develop a more robust picture of site assets and limitations.

considerations: Urban infill (Action Item 1-2) or brownfield sites (Action Item 1-1) are less likely to contain certain types of environmentally critical areas than greenfield sites far from urban centers (e.g., prime habitat, or riparian zones). However, sites with remaining infill potential are often marginal land that was passed over during previous rounds of development due to steep slopes and other potential hazards.



MATERIALS

Building form and massing decisions are best made after considering multiple variables, including proximity to critical areas, presence of trees and other landscape and habitat elements, passive solar design, and photovoltaic and solar hot water system design. Balance all of these factors when determining the optimal building forms, massing, and orientations.

Sites with ECAs can pursue other Action Items that support sensitive areas (e.g., Action Items 2-24 and 2-25), open space planning (Action Items 2-23), and vegetation (Action Items 2-26).

resources:

Permitting agencies maintain maps and GIS layers showing critical areas on sites.

King County Critical Areas Ordinance: www.kingcounty.gov/property/permits/codes/CAO.aspx

Snohomish County Critical Areas Code references: www1.co.snohomish.wa.us/Departments/PDS/Divisions/Permitting/Environmental_CAR/

Action Item 1-5

Choose a site with no environmentally critical areas

Points: 5



Action Item Rationale:

Sites free of critical areas enjoy a broader range of development opportunities and experience fewer costs associated with mitigation activities.

Avoiding development in ECAs can also reduce the risk of damage to property in the event of flood, earthquake, or landslide.

More generally, leaving ECAs undeveloped preserves sensitive ecosystems, including wetlands and waterways.

Action Item 1-6

Do not convert “resource lands,” agricultural land or forest

Points: 5



what: For the purposes of this Action Item, *resource lands* are defined as lands currently or potentially serving agricultural uses including land identified by the American Farmland Trust as Prime Agricultural Land, and lands managed for forest products.

To earn points for this Action Item, the development must either:

- Be free of lands that fit the resource lands definition, agricultural land or forest,
or
- Leave undeveloped in perpetuity (via a conservation or agricultural easement or other legally binding mechanism) any portion of the site that fits this definition.

how: During the site selection process, examine potential sites for existence of any of the above categories of land.

During the design phase on projects that include such lands, develop set-aside and preservation arrangements.

considerations: Conducting a biological analysis and inventory (Action Item 1-4) will help identify any existing valuable resource lands.

Preserving existing native soils (Action Item 2-25), vegetation (Action Item 2-26), and tree canopy (Action Item 2-41) are key components of Low Impact Development. A Salmon-Safe Community (5-Star Required Action Item) benefits from retaining existing resource lands. And grouping homes on the site (Action Item 2-22) can help facilitate the preservation of resource lands by reducing the development footprint.

resources:

American Farmland Trust:
www.farmland.org/

King County Transfer of development rights (TDR) program:
www.kingcounty.gov/environment/stewardship/sustainable-building/transfer-development-rights.aspx

US Forest Service information on Ecosystem Services:
www.fs.fed.us/ecosystemservices/

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php



Action Item Rationale:

Nature provides a wide variety of ecosystem services: outputs and processes on which humans depend. Examples include forests and native soils that clean and detain stormwater and absorb atmospheric carbon and pollutants, and wetlands that buffer storm surges and provide habitat for wildlife.

In lands stripped of ecological function, humans must construct expensive infrastructural approximations to compensate for the loss. Many jurisdictions are learning that it is more cost-effective to retain these natural assets than it is to attempt to provide infrastructure to replace their functions.



what: For the purposes of this Action Item, *essential services* include the following:

- Bank or credit union
- Grocery store/supermarket
- Municipal or county building
- School
- Daycare
- Health clinic, doctor's office or hospital
- Pharmacy/drugstore
- Restaurant or café

To earn points for this Action Item, locate the community within ½ mile (measured by walking distance) of at least three of the services listed above.

how: During the site selection phase, conduct an analysis to determine which potential sites offer the best array of services within easy walking distance. GIS-based tools, such as Esri's Business Analyst, help identify locations with access to services.

considerations: Selecting an infill site (Action Item 1-2) greatly facilitates access to existing essential services. Depending on the location and configuration of the land associated with the community, clustering homes (Action Item 2-22) closer to the services can also help achieve this Action Item. Creating a mixed-use community opens up the opportunity to add essential services that have been historically lacking in the community (Action Item 2-35).

resources:
Washington Dept. of Transportation Walkable Communities information:
www.wsdot.wa.gov/LocalPrograms/Planning/Walkable.htm

Walkable and Livable Communities Institute:
www.walklive.org/

Esri Business Analyst:
www.esri.com/software/businessanalyst

Action Item 1-7

Locate within ½ mile of essential services

Points: 5



Action Item Rationale:

Proximity to essential services encourages walking and bicycling, reducing a community's overall energy use and carbon footprint.

Additionally, it encourages the use of local businesses, keeping more dollars in the local economy, thereby increasing community resilience.

Research shows that communities with good access to services such as grocery stores experience a lower average incidence of obesity and better overall health outcomes for residents.

Action Item 1-8

Locate the community to be served by existing water or wastewater infrastructure

Points: 4



what: Service by water and wastewater infrastructure entails adjacent-to-site access to water and sewer lines.

To earn points under this Action Item, water and wastewater infrastructure sized to accommodate the added demand estimated by the new community must be currently available on at least one boundary of the community.

how: During the site selection phase, confirm the availability and capacities of these basic services to the site: work with the local permitting agency and water and wastewater utilities to determine the extent and location of said services.

considerations: Infill sites (Action Item 1-2) and sites near essential services (Action Item 1-7) are much more likely to have easy access to existing water and wastewater infrastructure.

Whether or not the site has access to existing water and wastewater infrastructure, rainwater harvest (Action Item 2-9), onsite greywater reuse (Action Item 2-19), and wastewater treatment (Action Item 2-17) can improve the community's overall environmental performance by reducing reliance on large, centralized systems.

resources:

Contact the local utility provider or use online resources from the local permitting authorities to determine the availability of water and wastewater infrastructure.



Action Item Rationale:

Selecting a site with access to existing water and wastewater infrastructure reduces the material and financial expenditure related to its development, leverages existing resources, and reduces the energy impact of water and wastewater pumping and transport.



what: Not all approaches to site selection that enhance the environmental or public health performance of a community are listed in the BUILT GREEN Communities Checklist. Others may garner the project additional points through this Innovation Action Item.

Innovations can earn between 1 and 10 points, depending on the level of benefit anticipated from the action.

To be considered for these points, prepare a description of the innovation in terms of its process, design, and outcome; its expected environmental or human health benefits; and the number of points proposed. Submit proposals to the BUILT GREEN Director for consideration.

how: First, find the innovation. Begin by reviewing existing BUILT GREEN Action Items, to understand the challenges that green approaches aim to address. Brainstorm novel ways of meeting those challenges more effectively or efficiently given project specifics and the sites being considered for development.

Analyze prospective sites for traits or features that will result in substantive sustainability benefit not already identified in existing site selection Action Items. For example, are there sites with existing buildings or physical structures that could be repurposed as community buildings? Materials reuse is a green development benefit. Or, a site degraded by invasive plant species could be chosen specifically for extensive restoration.

Explore a variety of sources for ideas. It's good business practice to follow other projects and firms to keep current on new strategies and approaches. Green building periodicals often spotlight new approaches and techniques. Government and non-profit research can also offer innovations. See *Resources* for examples.

Next, verify the innovation. Once prospective the action is identified, review the existing Action Items within BUILT GREEN to determine if the innovation is already included. If not, research to determine its relative environmental or human health benefit, and identify existing Action Items that produce similar outcomes. Consider the relative value of the innovation in comparison to other Action Items in BUILT GREEN to estimate a defensible point value.

Finally, submit the innovation for review. Send in the prepared report to the BUILT GREEN Executive Director. Verify the project is registered before submitting; and include a date for response.

considerations: Innovative approaches can come from any corner of a development project and can be related to just about any Action Item in BUILT GREEN. Review the Action Item list to determine if or which actions are enhanced or facilitated by selecting a particular site. Add these criteria to site selection considerations, and where appropriate, to other community plans or information (see Action Item 4-24).

resources: A variety of organizations explore new approaches to green building and sustainability issues. The following constitute a far-from-exhaustive list:

US Dept. of Energy's National Renewable Energy Laboratory:
www.nrel.gov/

Center for Neighborhood Technology:
www.cnt.org/

University of Washington Green Futures Research and Design Lab:
www.greenfutures.washington.edu/

Environmental Building News:
www.buildinggreen.com

Action Item 1-9

Extra credit for innovation

Points: 1-10



Action Item Rationale:

Best practices are continuously emerging with respect to green communities.

Innovative features create test cases to replicate on other projects when the results are successful. Such innovations advance the sustainable development movement.

SITE DESIGN + TRANSPORTATION

Sustainable site design aims to achieve community goals related to stormwater management and quality, open space, habitat and tree canopy preservation and restoration, and other aspects of Low Impact Development.

Site design also sets the stage for energy efficiency and renewable energy use through building massing and orientation and infrastructure establishment. Housing mix and affordability, water conservation, light pollution reduction and other desirable social and environmental outcomes of sustainable development are also identified and planned during site design.

Mobility and transportation issues are important to address at this phase, to best integrate the community with the surrounding network and encourage use of non-motorized and mass transit.

Action Item 2-1

Design to achieve no more than 10% effective impervious surface area

Points: 15



what: *Effective impervious surface* is the human-created impervious surface area that drains to water bodies via stormwater infrastructure. A primary goal of LID is to reduce effective impervious surface to as close to zero as possible (i.e., disconnecting from the larger municipal stormwater infrastructure system and infiltrating all stormwater onsite).

To earn points under this Action Item, show that the community's design achieves an effective impervious surface area of 10% or less, using professionally accepted calculations and techniques.

This percentage must be verified by a qualified individual or firm (e.g., civil engineer, landscape architect, geotechnical expert, or municipal or county stormwater management staff).

how: Effective impervious surface areas are reduced by redirecting a portion or all of the stormwater generated by them to onsite infiltration facilities. By contrast, *total impervious area* aggregates all human-made impervious surfaces, regardless of connectivity to the stormwater system.

Minimizing total impervious surface and effective impervious surface percentages go hand-in-hand: fewer square feet of total impervious surface facilitates management of the community's remaining impervious surface stormwater burden.

Work with a qualified landscape architecture firm with LID-related civil engineering expertise to develop a stormwater management master plan for the community. Refer to the *Low Impact Development Technical Guidance Manual for Puget Sound* for design strategies and technical information (see *Resources*).

The design goal of 10% or less effective impervious surface can be achieved through a wide variety of technologies and design approaches. A design customized to the site's particulars, including topography, soils types, tree canopy, and vegetation will yield the most effective approach.

Avoid situations where one impervious surface drains onto another, since this magnifies stormwater runoff problems. A paved driveway, for example, should not drain directly onto a paved street.



Action Item Rationale:

Effective impervious surface proportions greater than 10% degrade the quality of fish habitat and wetlands. Minimizing effective impervious surface area allows soils and vegetation to receive and treat stormwater and facilitates groundwater recharge.

With less effective impervious surface, the velocity and quantity of surface water is decreased, pollutant load on local waterways is reduced, and the burden on municipal stormwater management systems and its associated costs are ameliorated. In addition, reducing effective impervious surfaces can simplify and downsize site-built stormwater systems, decreasing overall construction costs.

Action Item 2-1

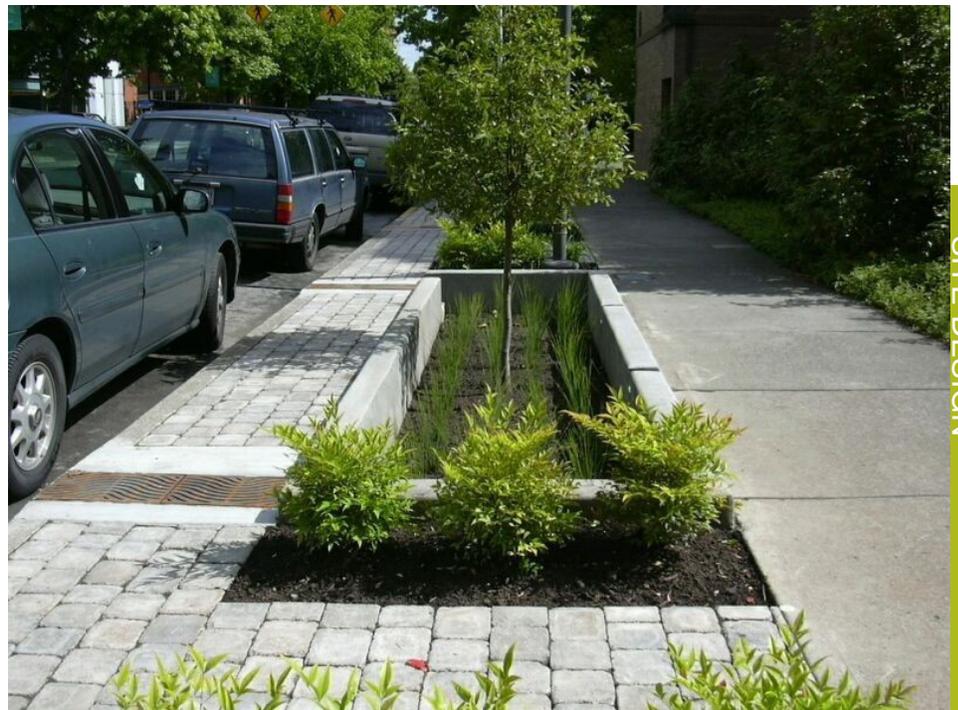
considerations: This Action Item can be considered a backup plan if the project's attempt at meeting the goal of 100% infiltration (Action Item 2-2) is not met. Minimize total impervious surface through narrower streets, smaller building footprints, pervious paving materials (Action Item 2-31), and green roofs (Action Item 2-7).

With the remaining stormwater, consider placing rainwater harvest (Action Item 2-9) and/or infiltration technologies including rain gardens (Action Item 2-8) or dry wells and other infiltration systems (Action Item 2-12) between the stormwater source and the community's stormwater conveyance system. To cleanse stormwater, use filter strips (Action Item 2-6) and constructed wetlands (Action Item 2-15) prior to infiltration.

resources:

See the Action Item 2-2 for related resources.

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php



SITE DESIGN

Bioretention consists of cells of organic-rich soils engineered to cleanse and retain stormwater runoff onsite, reducing a project's effective impervious surface. This bioretention planter receives stormwater from the adjoining street.

Image: Curtis Hinman, sourced from the Low Impact Development Technical Guidance Manual for Puget Sound.

Action Item 2-2

Infiltrate 100%
of stormwater onsite

Points: 30



what: *Low Impact Development (LID)* defines an approach to site design and planning based in preserving or restoring the watershed's hydrologic function to pre-development conditions using natural stormwater management techniques. LID employs a combination of tree cover, innovative engineering, alternative products, pollution prevention, and integrated stormwater management practices to control runoff volume, recharge groundwater, and protect stream resources and water quality.

Current science supports the basic standard of LID, which is to preserve and maintain 65% of the native forest floor and design the effective impervious surface close to zero in order to prevent adverse impacts on the watershed, streams, and riparian habitat.

To earn points under this Action Item, the entire community must achieve 100% infiltration of stormwater (i.e., attain zero effective impervious surface area).

how: LID relies on many distributed, small-scale, interconnected and multi-functional elements to eliminate overland flow and maximize infiltration of stormwater onsite. As such it requires the cooperation of all builders in the development: 100% infiltration will likely entail installing green stormwater infrastructure elements at the dwelling level. Work with the project architect and landscape architect to develop a comprehensive and integrated stormwater management approach.

Start by setting the goal of 100% infiltration early on in the design and planning process. Allow time for assembling the necessary skills for the design and construction teams, and for approaching permitting agencies to discuss innovative approaches that may require regulatory review and approval.

Next, make planning-level design decisions regarding open space and home placement, identification of protected areas, narrower streets, greener and smaller parking lots, extended and continuous stream buffers, and natural stormwater management practices (see separate Action Items throughout the checklist).

Achieving pre-development hydrologic function requires elimination of the site's effective impervious area. Residential LID practices include retaining natural features and vegetation, preserving and improving soil structure and function, limiting lot disturbance, disconnecting and minimizing impervious surfaces, and requiring ongoing maintenance of systems.

See *Considerations*, below, for a list of LID-related practices that earn points in BUILT GREEN. Given the large number of strategies that combine to create a low-impact development, consider hiring or including on the design team a qualified landscape architecture or integrated design firm with civil engineering capabilities and specific, applied expertise in LID.

LID techniques vary significantly in terms of cost and ease of implementation. To accomplish infiltration on poor soils, common in the Puget Sound basin, runoff must reach the water management system in close proximity to where it falls as precipitation. Decentralized systems are more effective at accomplishing this goal.



Action Item Rationale:

Comparative studies find that projects using a fully integrated low-impact approach can reduce related design and construction costs by roughly 25% compared to conventional site development. Projects demonstrating advanced LID approaches may also be eligible for facilitated or expedited permitting from certain jurisdictions in King and Snohomish counties.

Properly designed LID elements can enhance the aesthetics of a community as well.

Keeping stormwater onsite is a key factor in protecting Puget Sound streams and waterways.

Action Item 2-2

considerations: Not all sites are appropriate for full infiltration: some soils are not suitable for infiltration due to soil instability or limited infiltration rate.

The following Action Items (and others) contribute toward 100% infiltration:

- 2-7: Green roofs
- 2-8: Rain gardens or bioswales
- 2-9: Rainwater harvest
- 2-10: Bioretention in parking lots
- 2-12: Infiltration systems
- 2-15: Constructed wetlands
- 2-30: Reduce impervious surfaces in paving applications
- 2-31: Porous paving
- 2-41: Create/preserve tree canopy
- Salmon Safe certification (see 4-Star Required Action Item)

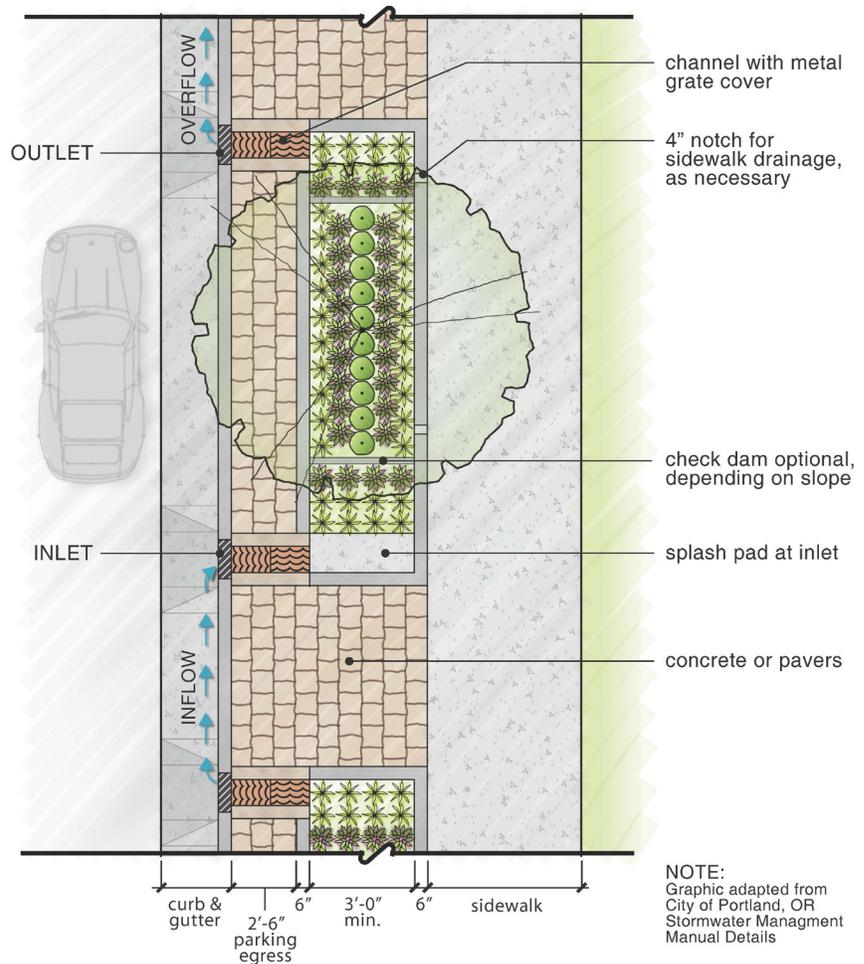
resources:

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

Washington Stormwater Center's
 WSU Puyallup Low Impact
 Development Research Program
www.wastormwatercenter.org/low-impact/

King County DDES Bulletin 55: "Green Building and Low Impact Development" describes services provided by King County to accomplish LID:
www.your.kingcounty.gov/ddes/acrobat/cib/55.pdf

King County Surface Water Design Manual includes AutoCAD DWG format drawings of stormwater management best practice elements:
www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx



Retaining 100% of stormwater onsite requires a carefully interconnected series of strategies to eliminate effective impervious surface, including directing stormwater from the development's streets and parking lots into bioretention.

Image courtesy of AHBL, sourced from the Low Impact Development Technical Guidance Manual for Puget Sound.

Action Item 2-3

Design to protect sensitive areas beyond code

Points: 4



what: For the purposes of this Action Item, *sensitive areas* is defined as all critical and environmentally critical areas as categorized by local permitting and development agencies and all areas determined by the site habitat assessment and wildlife inventory (Action Item 1-4) to be wildlife habitat.

To earn points for this Action Item, the community's design must show protection of these areas beyond code minimums.

how: Use the habitat analysis and inventory (See Action Item 1-4) to identify all the ecologically sensitive areas, including related waters, wetland, streams, slopes, bluffs, groundwater recharge areas, and aquifers.

Numerous strategies help preserve and protect sensitive areas on a site, including establishing stricter limits to site disturbance, preserving trees and existing soils, and removing invasive species and those competing with native vegetation.

Since numerous federal, state and local laws affect the use and protection of wetlands and other critical areas and there is variation in local regulations, contact the building department to determine code requirements applicable to the project.

Strategies to protect beyond code should be informed by the nature of the critical area and existing site conditions. Protection beyond code includes both construction-phase BMPs and permanent landscape and building features.

considerations: Sites containing significant ecologically sensitive areas are likely to trigger Critical Areas Ordinances. Set these areas and associated maximum buffers aside as open space (see Action Items 1-6, 2-3, 2-23, 2-25, 2-26, and 2-61). This will also improve hydrologic function and preserve existing vegetation and habitat.

On properties with bluffs or other areas prone to landslide or erosion, consult with a hydrologist and/or civil engineer prior to designing for stormwater infiltration. Systems that detain water on site but do not infiltrate (e.g., stormwater planters or constructed wetlands) may be preferable. Cluster development (Action Item 2-22) in the least environmentally sensitive parts of the site.

resources:

The Municipal Research and Services Center of Washington maintains a list of links to Critical Areas Ordinances throughout the state:
www.mrsc.org/Subjects/Environment/criticalpg.aspx

Seattle Department of Planning and Development's *Green Shorelines* manual provides low-impact strategies for reducing shoreline armoring, reestablishing habitat and restoring lake frontage:
www.seattle.gov/dpd/Planning/Green_Shorelines/Overview/

King County's Northwest Native Plant Guide includes landscape design examples for steep slopes and marine properties, among others:
www.green.kingcounty.gov/Go-Native/Index.aspx

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php



Action Item Rationale:

Performing beyond code is a common theme in green building. By going beyond code to protect environmentally critical areas, a project builds in added levels of assurance that sensitive areas will truly be respected and preserved.

Designing to avoid impact on sensitive areas can also reduce permitting delays and associated development expense.



what: For the purposes of this Action Item, sensitive areas include wetlands, lowlands, and habitat areas identified via a biological inventory (Action Items 1-4 and 2-60) or ecologist's evaluation, and/or lands designated by local the local jurisdiction as critical areas. Restoration to pre-development conditions requires three elements:

- A comprehensive site assessment
- Creation of a restoration plan by an ecologist or other qualified expert
- Completion of identified restoration activities

To earn points under this Action Item, all impacted sensitive areas must be restored to the best practical approximation of the site's pre-development conditions.

how: Beyond the requirement outlined by code for soils rehabilitation, a qualified professional can best determine the scope of restoration activities. In many cases, this will be an ecologist or wetlands biologist. However, a variety of sensitive areas are potentially impacted by development activities. Secure the services of the appropriate professionals as needed.

Start restoration activities with the proper knowledge by conducting a comprehensive site assessment and habitat inventory (Action Item 2-60). Once this information has been assembled, a restoration plan developed by a qualified expert will identify the necessary soil remediation activities, plant selection, and other factors required for restoration.

When undertaking a restoration project, hiring the right contractors is essential. Look for individuals with demonstrated experience in restoration activities. Eliminate guesswork during construction with clear and detailed specifications and appropriate site signage.

considerations: Salmon-Safe certification (see Required Action Items) aims to approximate pre-development conditions on a site. Depending on existing conditions, enhanced soil amendment (Action Item 3-11), and the reestablishment of native plant species (Action Items 3-22 and 3-23) help bring a site back to a pre-development functional state.

resources:

Stream Habitat Restoration Guidelines by Michelle Cramer, Ed. (Washington Department of Fish and Wildlife, 2012)
www.wdfw.wa.gov/publications/01374/

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

Action Item 2-4

If sensitive areas are impacted, restore to pre-development conditions

Points: 3



Action Item Rationale:

A site's pre-development state is considered the ideal in terms of ecological function.

Restoration activities help ensure that the most sensitive portions of a site regain health and vitality.

Action Item 2-5

Design site to minimize disturbance of original topography

Points: 3



what: *Disturbance of original topography* is defined as grading or otherwise altering topography of areas of the site that have not been previously developed or altered.

To earn points under this Action Item, the developer must minimize grading operations through strategic roadway design, building placement and massing activities.

how: Minimizing grading is a design consideration made early in the project's design process. Placement of buildings, density of development, size of homes, roads and parking, and other factors will all play a part in determining the total percentage of the existing site that requires disturbance.

A small percentage of a forest in a watershed can be cleared with minimal impact to streams. Disturbing more than 40% of the soil at one time or clearing more than 30% of existing native vegetation requires extra measures to protect adjacent, upstream, and downstream properties from the adverse effects of increased runoff (consult your local permitting authority).

Prioritize the preservation of sensitive areas near streams and wetlands.

considerations: Phasing grading can help reduce erosion (Action Item 3-1). Maintaining existing undisturbed lands is a classic Low Impact Development strategy (Action Items 2-1, 2-2, and 2-61). It also facilitates attaining Salmon-Safe certification (5-Star Required Action Item). Designing streets to conform to the site's natural topography (Action Item 2-28) is a subset of this Action Item. Cluster development (Action Item 2-22) in such a way as to avoid the need for extensive grading activities.

resources:

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

Salmon-Safe:
www.salmonsafe.org



Action Item Rationale:

Maximizing undisturbed elements of the site is an important Low Impact Development strategy.

Benefits include reduced site development costs, simpler stormwater code compliance, protection of surface and ground water, and preservation of existing natural habitat.



what: *Vegetative filter strips* are planted areas designed to slow and treat surface-flowing stormwater runoff. Placed adjacent to the downhill slope of impervious surface areas, filter strips can act as one component of an integrated stormwater management strategy.

To earn points for this Action Item, use filter strips to separate impervious surfaces throughout the development, including parking areas, along walkways, around common area buildings, and adjacent to all other paved surfaces. Points awarded for this Action Item are based on the percentage of paved surfaces featuring filter strips on the downhill side of the surface.

% of all paved surfaces	Points
25-50	2
51-100	5

how: Much of the research, design and maintenance information on vegetative filter strips focuses on agricultural applications. Filter strips are mainly used to capture and treat surface-flowing stormwater, removing suspended solids, hydrocarbons and pesticides.

Filter strips serve little to no infiltration function, and so must be coupled with bioretention or other detention methods to reduce a site's effective impervious surface. Work with a civil engineer versed in practices to design an integrated stormwater treatment and detention system.

According to US EPA, proper design is essential to the function of vegetative filter strips. Pay particular attention to grading techniques. Avoid curbs, unless one-foot minimum curb cuts are provided at least every ten feet to allow stormwater to flow from paved surfaces onto filter strips. Design so that paved surfaces lay at the same grade as the vegetated filter strip, and slope them slightly (no more than 5%) downhill away from the paved surfaces. Native vegetation or additional adapted vegetative groundcover can be used if planted densely enough to avoid channelizing and erosion.

considerations: Filter strips are but one tool for managing stormwater quality and quantity. Low Impact Development offers a suite of approaches to combine with vegetative filter strips to create an integrated onsite stormwater management infrastructure.

Filter strips can drain into rain gardens (Action Item 2-8) or infiltration basins (Action Item 2-11) to keep stormwater onsite. Minimizing impervious surfaces in street designs (Action Item 2-30), using pervious paving options (Action Item 2-31), bioretention for parking lot runoff (Action Item 2-10), green roofs on common area buildings (Action Item 2-7) and amending soils with compost (Action Item 3-11) help dramatically reduce overland flow of stormwater.

resources:
 EPA stormwater BMPs
www.cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm
 (search using the term *Vegetated Filter Strip*)

Action Item 2-6

Use filter strips to separate impervious areas

Points: 2-5



Action Item Rationale:

Vegetative filter strips between roads, parking areas, and other ground-related impervious surfaces help capture and retain pollutants, such as hydrocarbons and heavy metals, picked up by stormwater. This cleansing function helps protect surface and groundwater.

Action Item 2-7

Use green roofs on common area buildings to reduce impervious surfaces

Points: 10



what: A *green roof* is an assemblage of elements: a synthetic waterproof membrane protecting the roof structure, a drainage layer, filter fabric and/or a root barrier, and a layer of soil-like growing medium (usually 2-6 inches) with specific plant species adapted to the extremes of a rooftop environment. Parking structures and some heavy-duty commercial buildings may support thicker (6 inches or more) layers of growing medium. Green roofs may be integral to the roof, where the growing medium is planted with starts to fill out over time, or installed on top of a roofing membrane in vegetated modules.

To earn points under this Action Item, install green roofs on 10% or more of the total roof area of all common buildings within the community.

how: Green roof design and installation requires structural engineering input, landscaping expertise for plant selection and growing medium specification, and roofing expertise to specify and install the waterproofing membrane. Look for roofing contractors with demonstrated experience in green roof installation.

Green roofs require special architectural detailing and engineering to ensure durability and structural support. Even shallow green roofs can represent additional roof loads of about 15 pounds per square foot, and must be engineered accordingly. Retrofitting an existing roof for a green roof application will likely require structural reinforcement for both roof load and building shear strength. Green roof systems are best suited for low-slope roofs (slope of 1:12 minimum, 4:12 maximum).

considerations: Given the Puget Sound's dry late summer period, a green roof may require irrigation even after the establishment period. Be aware of this potential water demand working at odds with the community's water conservation goals.

According to a recent study by the Portland Bureau of Environmental Services, the economic benefit of green roofs is realized over an extended time period (20-40 years, i.e., over the lifetime of the installation)—not accounting for public and environmental benefits.



Action Item Rationale:

Excessive stormwater runoff scours local creeks and waterways, damaging aquatic habitat. Heated stormwater runoff from hot roofs can also damage native vegetation and stream habitat. Well-designed green roofs can detain a significant amount of roof-generated stormwater, and their significantly cooler surfaces moderate stormwater temperatures.

Heat absorbed by conventional roofing surfaces can amplify urban ambient temperatures, increasing energy needed to cool buildings, and/or decreasing comfort. Green roofs offer a significantly cooler roof surface, helping avoid these problems, while also helping solar panels operate more efficiently.

Action Item 2-7

Green roofs are an attractive strategy for stormwater retention (Action Item 2-2). Combine green roofs with other stormwater management technologies, like rain gardens/bioretention (Action Items 2-8, 2-10 and 2-11) to further reduce stormwater leaving the site.

Rainwater harvest (Action Item 2-9) may be challenging to combine with green roofs; rain picking up tannins while percolating through a green roof's growing medium can discolor water and make it inappropriate for toilet flushing, water features, or other purposes where water aesthetics play a part.

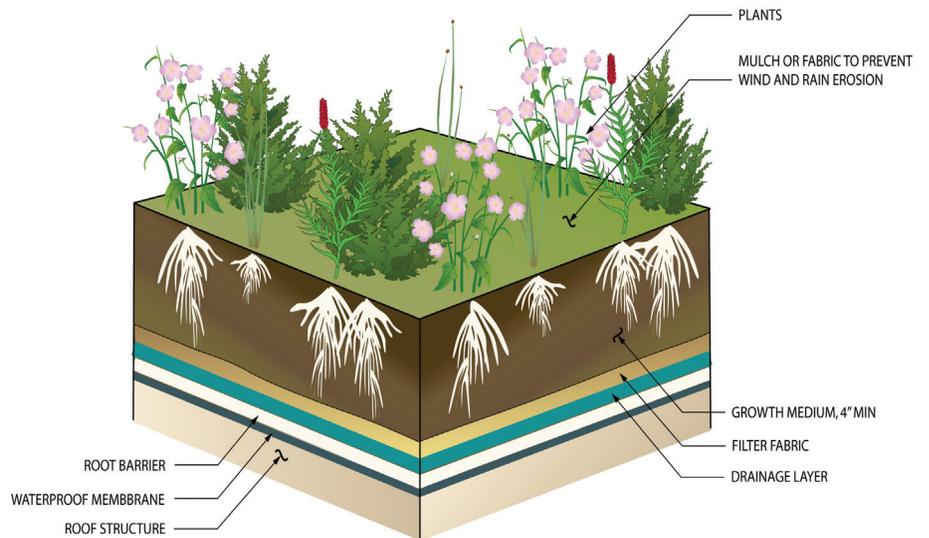
A green roof's surface cooling function can help optimize the performance of roof-mounted photovoltaic systems. However, such green roof/solar combinations require solar modules installed on elevated racks rather than flush-mounted to the roof surface.

resources:

Greenroofs.com provides green roof information and resources, including a directory of green roof professionals and suppliers:

www.greenroofs.com

Planting Green Roofs and Living Walls
by Nigel Dunnett and Noel Kingsbury
(Timber Press: 2008).



A typical green roof section.

Image courtesy of City of Seattle, Seattle Public Utilities.

Action Item 2-8

Use rain gardens
or bioswales

Points: 5



what: *Rain gardens* are engineered landscape features consisting of an excavated area refilled with heavily compost-amended soils and planted with a select variety of moisture-tolerant plant species. Rain gardens are open to the subsoil beneath, which must have an infiltration rate of at least ½ inch per hour to properly function as green stormwater infrastructure. Fitted with overflows for large storm events, rain gardens are designed to receive, detain, clean, and infiltrate stormwater runoff from adjacent impervious areas (e.g., parking lots, roadways, or roofs).

Bioswales are similar to rain gardens in terms of stormwater capture and treatment, organic-rich soils and plantings, and infiltration functions, but are designed to convey stormwater. Bioswales may contain sand filters and check dams to slow stormwater flow and assist with filtration and infiltration .

Rain gardens and bioswales are key elements of Low Impact Development, and can be used individually or in tandem with other stormwater management techniques.

To earn points under this Action Item, the development must install rain gardens and/or bioswales engineered to cleanse and detain at least 50% of stormwater runoff generated by roads, parking lots and common area buildings throughout the community.

how: As with all parts of a community's stormwater management system, rain gardens and bioswales require design and sizing by a qualified civil engineer or landscape architect. First, evaluate a site's infiltration capacity, especially sites located near environmentally critical areas or with unstable soils. Pacific Northwest soils can vary dramatically even within a single site; test soils and infiltration rates at each rain garden location. Multiple rain gardens and/or swales distributed throughout the site more closely mimic the site's natural hydrologic function compared to one or a few large installations.

The Puget Sound Partnership's *Low Impact Development Technical Guidance Manual for Puget Sound* (see *Resources*) outlines strategies for infiltrating stormwater onsite and conducting hydrologic analysis. In addition, Seattle Public Utilities' Green Stormwater Infrastructure website contains specifications, presentations, and descriptions of cutting-edge area projects, including Seattle's High Point redevelopment (see *Resources*).



Action Item Rationale:

Benefits of infiltrating stormwater onsite include local aquifer recharge, slowing and cleansing stormwater, reducing stream scouring and attendant habitat damage, and alleviating burdens on public stormwater management systems.

Installation costs for rain gardens and bioswales can be significantly less than conventional stormwater detention facilities.

Action Item 2-8

considerations: Rain gardens and bioswales are important for retaining most (Action Item 2-1) or all (Action Item 2-2) stormwater onsite. Compact building footprints, fewer paved surfaces (Action Item 2-30), and rainwater harvest (Action Item 2-9) limit stormwater generation in the first place, allowing for a downsizing of total bioretention capacity.

resources:

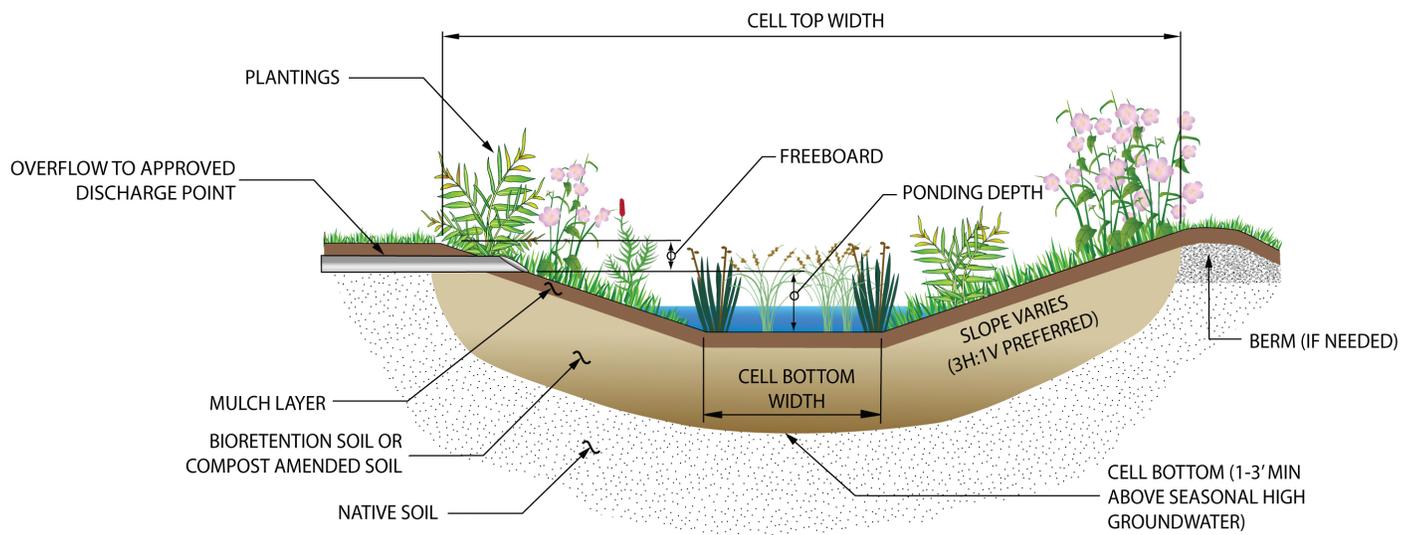
Stormwater Management Manual for Western Washington, Volume V
www.fortress.wa.gov/ecy/publications/publications/1210030part5.pdf
(BMP T 5.14A: Rain Gardens; BMP T 5.14B: Bioswales)

EPA info on bioretention:
cfpub.epa.gov/npdes/stormwater/menuofbmps/

Snohomish County Rain Garden Coalition information:
raingarden.wsu.edu/Snohomish.html

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

Seattle Public Utilities' Green Stormwater Infrastructure:
www.seattle.gov/util/
(click on *About SPU*, then *Drainage and Sewer System*).



Typical bioretention or rain garden section.

Image courtesy of City of Seattle, Seattle Public Utilities.

Action Item 2-9

Rainwater catchment/
harvesting for at least 50%
of: site irrigation, sewage
conveyance, potable water

Points: 5-20



what: *Rainwater harvest systems* provide site-sourced water for a variety of water demands depending on the system, including landscape irrigation, non-potable indoor water use (toilet flushing; clothes washing) and even potable water supply. Collecting rainwater requires a harvesting area (usually roof surface), cistern for water storage, filtration depending on end use, and pipes and pumps as needed to convey and pressurize water.

In order to earn points under this Action Item, the developer must design a rainwater harvest system that supplies, on an annual average basis, 50% of the modeled water demand for site irrigation, sewage conveyance and/or potable water use for all buildings and landscapes within the community. Points for this Action Item are additive, up to a total of 20.

Water application	Points
Landscape irrigation	10
Toilet/urinal flushing	5
Potable water use	5

how: Designing and constructing a rainwater harvest system at the community scale is complex. If the design team lacks applied experience designing such systems, seek additional consulting expertise.

The first step in designing a cost-effective rainwater catchment system is to minimize water demand, since cistern capacity is one of the more expensive components of a system. Properly preparing soils (Action Item 3-11), smart plant selection (Action Item 3-15), advanced landscape irrigation practices (Action Items 3-19, 3-20), reduce the landscaping water budget. Water-efficient fixtures and appliances help reduce water demand indoors, should a community pursue rainwater harvest for potable water use.

Size cisterns for the intended water use, seasonal rainfall variability, and catchment area, and couple with appropriate overflow devices. High-capacity cisterns are required for landscape use through the Puget Sound's dry late-summer months.

Cisterns can be made of precast or site-poured concrete, ferrocement, stone, or prefabricated metal, plastic, or fiberglass. Use only watertight materials for a cistern, and opaque materials for above ground systems to discourage algae. Systems designed for potable water use must use cisterns approved by the National Sanitation Foundation for potable water storage.

Cisterns can be placed either above or below grade. For large cisterns, work with a structural engineer to ensure the storage tank does not load onto nearby structures' foundations. Below-grade cisterns tend to be more expensive than above-grade ones due to excavation costs. However, when land is at a premium, underground cisterns can free space.



Action Item Rationale:

The Puget Sound area's dry summers strain regional water supplies, and with global warming impacts including reduced snow pack, future supplies will be further limited. Enhancing supply through onsite rainwater catchment and use helps reduce this demand.

Such systems can also reduce environmental and energy impacts associated with potable water treatment and distribution.

Moreover, if properly designed, a rainwater collection system can serve double duty by helping detain and slowly release stormwater during storm events

Action Item 2-9

Use nonreactive and leach-free roofing materials (e.g., powder-coated steel) when using roofs as catchment areas. Avoid zinc galvanized ridge caps, copper flashing, or copper wires for moss prevention: zinc and copper leaches into rainwater and can accumulate on plant material, as well as posing a toxic hazard to aquatic life. Similarly, water collected from asphalt composition roofs is best avoided on plantings grown for human consumption.

Provide an overflow route for all rainwater catchment devices to divert excess flows away from buildings and in such a manner as to avoid impact to downstream properties. Ideally, direct overflow into a bioretention (Action Item 2-8) or other infiltration system (Action Item 2-12).

Size gutters and downspouts for the roof footprint area and rainfall intensity. Install easily accessible screening or roof washers to filter leaves, debris, and sediment. Portable water systems will require additional health department approved filtration and treatment systems.

Rainwater harvest systems that use captured water for year-round uses such as toilet flushing (Action Item 2-9) offer added stormwater management capacity. Cisterns in seasonal applications like landscape irrigation can function as detention facilities if the cistern is outfitted with a release valve to drain slowly during the rainy season. The valve can then be closed during the irrigation months, returning the cistern to its storage function.

considerations: Direct overflow from cisterns into rain gardens (see Action Item 2-8) or other infiltration area, or stormwater planter if infiltration is inadvisable. Consider the interaction between a greywater irrigation system (Action Item 2-19) or reclaimed water system (Action Item 2-20) and harvested rainwater for irrigation. Contributions from a variety of sources need careful balancing to prevent system damage during peak rain events.

resources:

Washington Department of Ecology's rainwater harvest information:
www.ecy.wa.gov/programs/wr/hq/rwh.html

The Texas Water Development Board's *Texas Manual on Rainwater Harvesting* is a comprehensive resource on rainwater harvest, including selecting and sizing cisterns:
www.twdb.state.tx.us/iwt/Rainwater.asp

American Rainwater Catchment Systems Association (ARCOSA) offers resources and a business directory of firms specializing in rainwater harvest:
www.arcosa.org

Action Item 2-10

Provide stormwater treatment for parking lots/traffic island runoff using bioretention

Points: 4



what: *Bioretention* is a process of retaining stormwater onsite with the use of landscape depressions (or cells) filled with compost-amended soils and water-loving vegetation. Rain gardens, bioswales, and stormwater planters are examples.

To earn points under this Action Item, design all parking lots and traffic islands with bioretention areas sized to accept runoff from the impervious surface associated with these structures.

Note: parking lots and traffic islands finished with pervious paving material installed in accordance with Action Item 2-31 are exempt from the requirements of this Action Item. Only projects with some amount of impervious parking lot or traffic island surface area are eligible to pursue points under this Action Item.

how: Reduce the impervious surface from parking lots early in the design phase by minimizing parking (Action Items 2-55, 2-56, and 2-57), and by locating the community near amenities such as mass transit (Action Item 1-3). Consult with a qualified civil engineer or landscape architect to determine the sizing, design, and function of bioretention for parking lots. Design elements that facilitate infiltration and minimize effective impervious surface of parking lots (e.g., pervious paving) reduce the need for and sizing of stormwater treatment facilities.

The Seattle Department of Planning and Development Code Tip #515: Green Parking Lots describes low-impact parking lot design approaches, including bioretention. Additionally, the *Low Impact Development Technical Guidance Manual* includes design guidance on green parking lots and bioretention (see *Resources*).

considerations: Action Item 2-8 (Use rain gardens or bioswales) is closely related to this Action Item. Filter strips (Action Item 2-6), are also often used in concert with bioretention. Installing pervious paving (Action Item 2-31) in parking lots also reduces the sizing requirements of stormwater facilities.

resources:
City of Seattle DPD Code Tip #515:
Green Parking Lots:
www.seattle.gov/dpd/cams

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

See Action Item 2-8 for additional information on bioretention via rain gardens and bioswales.



Action Item Rationale:

Retaining stormwater onsite is a classic Low Impact Development approach, providing multiple benefits including protecting regional streams and water bodies and reducing the burden on stormwater infrastructure.

Onsite green stormwater infrastructure techniques can reduce the overall development cost of stormwater management. According to the City of Seattle, a green parking lot approach not only costs less to install than a conventional parking lot design with water quality filters, the annual maintenance costs are also lower.



what: Bioretention employs engineered depressions in the landscape that contain compost-rich soil mixes (called Bioretention Soil Media, or BSM) intended to maximize stormwater treatment and infiltration. Planted with vegetation adapted to the periodically inundated environment of the rain garden, these depressions pond with water during storm events. The collected water slowly infiltrates into the subsoils below. Any overflow is routed to the stormwater system. Bioretention is a primary strategy for reducing effective impervious surface (Action Items 2-1, 2-2) on a project.

To earn points under this Action Item, the developer must demonstrate, via engineering calculations, that the installed rain garden infrastructure results in a 40% or better reduction in the cubic feet of stormwater detention required on the project.

how: Use the intent to detain stormwater onsite with rain gardens to inform the drainage design of parking lots (Action Item 2-10), roads, and other impervious surfaces. This entails canting surfaces to guide stormwater toward the rain gardens, and providing curb cuts and other methods to allow stormwater from these surfaces to access the rain garden. See the *Low Impact Development Technical Guidance Manual for Puget Sound* for design strategies (see *Resources*). Chapter 6, “Integrated Management Practices,” provides detailed design guidance on bioretention.

Bioretention cells require physical space that must be accommodated and integrated into the overall landscape plan and the community’s stormwater management system. Cell size, location and BSM mix should be engineered in response to the stormwater load, and calculated by a civil engineer or qualified landscape architect. Design for placement during the schematic design phase in response to roads, roofs and other impervious surfaces.

Check with the local stormwater utility to determine whether stormwater reduction credits, rebates, or other incentives are available for the implementation of bioretention strategies.

considerations:

Reducing effective impervious surface to 10% (Action Item 2-1) and zero (Action Item 2-2) are the logical next steps beyond the requirements of this Action Item. Rain gardens are a common complement to rainwater harvest systems (Action Item 2-9), where bioretention helps manage excess flow from cisterns.

resources:

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

Seattle Public Utilities
Green Stormwater Infrastructure:
www.seattle.gov/util/greeninfrastructure

WSU Extension—Snohomish County
Rain Garden information:
www.raingarden.wsu.edu/

Action Item 2-11

Use bioretention or rain gardens to reduce cubic feet of stormwater detention by 40%

Points: 10



Action Item Rationale:

Stormwater management development costs can be reduced by using bioretention instead of conventional stormwater retention and detention techniques.

In addition to their infiltration and stormwater protection benefits, properly designed rain gardens can be a significant aesthetic addition in the landscape.

Action Item 2-12

Use infiltration system for surface water runoff

Points: 1-5



what: *Infiltration basins* are shallow landscape depressions designed to accept stormwater runoff from adjacent areas. The basin is constructed to maximize infiltration into underlying soils, and equipped with an overflow outlet to manage excess stormwater during large rain events. Infiltration basins provide similar infiltration function as bioretention, but lack the detention and filtration capacities provided by the plants and engineered compost-soil mixes present in bioretention.

For this Action Item, 1 point is awarded for each installed infiltration/treatment basin, up to 5 points.

how: Develop an integrated site water management system that includes a series of stormwater management facilities. Prioritize green stormwater infrastructure elements—rain gardens/bioretention, green roofs, compost-amended soils, etc.—over conventional, less effective ponds, vaults, and boxes. An infiltration system that utilizes a variety of facilities distributed across the site is more effective at approximating the site's natural hydrologic function.

Work with a civil engineer or qualified landscape architect to determine the location and volume of infiltration basins.

considerations: Infiltration systems can be downsized if used in conjunction with technologies that reduce runoff from impervious surfaces, such as green roofs (Action Item 2-7) and pervious paving (Action Item 2-31). Note that bioretention (Action Item 2-8) is superior to standard infiltration system strategies in that it provides added cleansing and detention function.

Take into account that soil types, previous land use, topography, and basin design and construction significantly affect infiltration rates. Infiltration may not be advised in areas with poorly-draining, unstable or contaminated soils.

resources:

US EPA NPDES Stormwater Best Management Practices: Infiltration Basins
www.cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm
(click on *Post-Construction Stormwater Management*)



Action Item Rationale:

Allowing stormwater to infiltrate onsite helps restore the natural hydrological function of a site, and can assist in aquifer recharge.



SITE/WATER



ENERGY



HEALTH

what: Since stormwater treatment is required by the governing jurisdiction, this Action Item awards points to developers who use nature-based methods to meet or exceed those standards. Nature-based methods use biological processes to filter and cleanse stormwater, largely plant and microbial actions as opposed to mechanical methods such as oil separators and filter fabrics.

Methods eligible under this Action Item include the following:

- Constructed wetlands/stormwater wetlands (see Action Item 2-15).
- Vegetated swales/grassed swales (see Action Item 2-8) in the street right-of-way.
- Vegetated filter strips (see Action Item 2-6).
- Compost biofilters for vault systems in areas with space limitations such as high-density developments (see *How*).
- Modular units (see *How*).
- Sand filters (see *How*).

To earn the point associated with this Action Item, the community must employ one or more nature-based method described above, or equivalent. The point for this Action Item is in addition to points earned from other Action Items outlining specific nature-based stormwater treatment methods.

Note that detention ponds are not eligible under this Action Item. While detention ponds meet current state and county standards for stormwater detention, the water released from the ponds does not meet water quality standards.

how: An effective nature-based treatment system for stormwater often consists of several methods selected in response to the site's specific stormwater attributes, landscape design, development density, and soil profile. For example, filter strips may be placed in areas with low volumes of relatively clean runoff or areas lacking the physical space for a constructed wetland. Knowledge of stormwater treatment options is necessary to create a truly integrated and optimized system.

The following describes briefly different methods of natural stormwater treatment.

- *Compost biofilters:* An alternative to the conventional empty "stormwater box," compost biofilter systems consist of a concrete vault that houses rechargeable cartridges filled with specially produced compost. As stormwater passes through the cartridges, pollutants are absorbed and stormwater is released into a conveyance system. This system requires less land area, operates effectively with much lower hydraulic gradients, and for small sites, typically produces more consistent results than do swales or detention ponds.
- *Modular units:* The StormTreat[®] system and other off-the-shelf, proprietary modular units simplify engineering by providing a known level of stormwater treatment per unit.
- *Sand filters:* In areas where receiving waters are sensitive to nutrient loading, sand filtration may be preferred over a compost-based method. Consisting of a dual chamber design (one chamber for settling large particles and one for sand filtration), these systems can be useful on sites with limited available treatment area.

Action Item 2-13

Meet treatment standards using nature-based methods

Points: 1



Action Item Rationale:

Nature-based water treatment methods can better self-sustain and require less frequent maintenance than mechanical means such as oil separators. Depending on the methods chosen, they may cost significantly less to develop than conventional methods.

Nature-based methods can also provide better aesthetic benefit than conventional treatment methods.

Action Item 2-13

Stormwater treatment using natural methods is no less of an engineering task than systems using mechanical methods. Consult with a civil engineer or qualified landscape architect to design and specify such systems. Then develop a treatment approach in conjunction with other associated LID techniques.

While these nature-based systems frequently require less maintenance than mechanical systems, proper maintenance is still essential to ongoing function. Develop an operations and maintenance plan and schedule along with the design (Action Item 4-18), and train maintenance staff to ensure proper functioning.

considerations:

Treatment of stormwater exiting a site is rendered moot if LID techniques have achieved 100% onsite infiltration (Action Item 2-2). (Exceptions include pretreatment prior to infiltration for areas such as parking lots that may pick up hydrocarbons, heavy metals and other contaminants.) Projects providing onsite treatment are eligible to receive the point for this Action Item.

LID techniques cleanse and retain stormwater onsite, minimizing effective impervious surface. The following Action Items outline ways to reduce or eliminate the volume of stormwater leaving the site, and therefore the amount requiring treatment:

- 2-31: Pervious paving
- 2-9: Rainwater harvest systems
- 2-8: Rain gardens/bioretenion
- 2-12: Infiltration systems
- 3-12: Soil scarification
- 3-11: Amending soils with compost
- 2-41: Retaining tree cover
- 2-61: Retaining native soils

Use organic and nontoxic landscape maintenance practices (Action Item 4-14) to keep stormwater cleaner as well.

resources:

For more information on the above technologies, review the US EPA's NPDES Stormwater Best Management Practices fact sheets:

www.cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm
(use the Search function with the terms *stormwater wetland*, *grassed swale*, *vegetated filter strip*, and *sand and organic filters*).

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php



what: Storm sewer inlets often drain directly, untreated, to streams or waterways. They are exclusively for stormwater; it is illegal to dump waste materials (e.g., paints, automotive fluids, or landscape wastes such as fallen leaves) into stormwater systems. Stenciling educates residents through a visual reminder that storm sewer inlets connect to area waterways.

To earn points under this Action Item, mark all public-access storm drains with stenciling, medallions, or weatherproof signage stating: “Dump no waste—drains to [stream/lake/Puget Sound].”

how: The local drainage utility or municipal engineering department often has free stencils for use within the community and on rights-of-way. Alternatively, custom stenciling can help reinforce community identity and branding. Combining visuals and text helps drive home the message: the City of Seattle stenciling includes salmon imagery to reinforce the connection between waste dumping and negative impacts on aquatic wildlife.

considerations: Marking storm drains is one of a suite of activities to prompt community members and visitors to engage in environmentally preferable behaviors. Other examples include recycling (Action Items 2-53, 4-3), coexisting with wildlife (Action Item 4-22), pest management (Action Item 4-14), and natural lawn and garden care.

resources: King County Water and Land Division offers storm drain stenciling resources: www.kingcounty.gov/environment/wlr.aspx as does Snohomish County: www1.co.snohomish.wa.us (search for *Storm Drain Stenciling*).

Fostering Sustainable Behavior by Doug MacKenzie-Mohr (New Society Publishers: 2011). This classic text describes the “community-based social marketing” approach to environmental behavior change, including the use of visual reminders, or prompts.

Action Item 2-14

Clearly label all storm inlets with stenciling to remind residents about proper stormwater protection

Points: 1



Action Item Rationale:

Using storm drains for disposing of wastes—or foreign material of any kind—can harm the downstream ecosystem.

Research shows that “prompts,” or reminders, including stenciling and signage, are effective in helping community members adopt and maintain environmentally preferable behaviors.

Action Item 2-15

Use constructed wetlands for stormwater storage and detention

Points: 8



what: *Constructed wetlands* mimic the structure and function of natural wetlands to accomplish water treatment goals. Constructed wetlands differ from natural wetlands and bioretention cells in that they most often include an impermeable liner to impede infiltration and are therefore intended primarily for treatment. Stormwater is introduced into the resulting cells, which flows through a planted growing medium. Microbes, plant roots and associated symbiotic organisms break down hydrocarbons, nitrates and other pollutants and bind to heavy metals present in the stormwater. After completing this biofiltration process, the treated stormwater is released through an outlet pipe.

To earn points under this Action Item, design and install constructed wetland elements capable of detaining and treating at least 25% of the stormwater runoff generated by the community's impervious surfaces.

how: Constructed wetlands are engineered structures containing a careful mix of growing medium and plant species. As such, civil engineering, landscape architecture and wetlands biologist expertise may be needed to optimize the wetland design.

Develop detailed construction drawings and specifications to ensure proper construction. In addition, establish a clear maintenance schedule and plan to help optimally maintain this element of infrastructure over time. The US EPA maintains extensive information on large-scale constructed wetlands, including design and performance data.

Begin by reducing the total and effective impervious surface area (Action Items 2-1, 2-2) to lessen the amount of stormwater requiring treatment, subsequently downsizing the capacity, physical footprint, and cost of the constructed wetland. Install constructed wetlands upland and away from any natural wetlands on the site, so as to not damage or disrupt the natural wetland functions.

considerations: Constructed wetlands can be part of an integrated stormwater detention and treatment strategy including Low Impact Development techniques. Minimizing impervious surfaces (Action Item 2-30), using pervious paving (Action Item 2-31), installing green roofs (Action Item 2-7), and employing rainwater harvest (Action Item 2-9), and bioretention/rain gardens (Action Items 2-8) all help create a holistic green stormwater infrastructure.

Constructed wetlands attract wildlife and provide habitat. Design for human-wildlife interaction (Action Item 4-22) and recreational access. Natural landscape maintenance practices (Action Item 4-14) reduce contaminant burden in stormwater. Constructed wetlands also present a public education opportunity; include them in the community's interpretive signage (Action Item 4-16).

resources:

US EPA

Constructed Wetlands information:
www.water.epa.gov/type/wetlands/restore/cwetlands.cfm

Treatment Wetlands

by R. Kadlec and R. Knight
(Lewis Publishers, 2004)



Action Item Rationale:

Constructed wetlands offer cost-effective stormwater treatment, superior treatment results compared to most mechanical systems, and the capacity to manage a wide range of stormwater volumes.

In addition, constructed wetlands provide aesthetic benefits and provide wildlife habitat.



Action Item 2-16

Design retention pond to be a public amenity

Points: 2

what: Retention ponds are a conventional stormwater storage and detention technique approved by local permitting agencies. However, a Washington State water quality monitoring program report confirms that while detention ponds met detention standards, the water released from the ponds does not meet water quality standards. BUILT GREEN communities installing retention ponds must ensure that stormwater leaving the site meets water quality standards by employing onsite treatment systems. (See Action Item 2-13: Meet treatment standards using nature-based methods.)

To earn points for this Action Item, the community’s retention ponds must provide aesthetic and recreational benefit.

Factors for consideration include:

- *Slope:* Gradual slopes may allow for increased access around the pond by reducing or eliminating the need for fencing.
- *Vegetation:* Include vegetation optimized for the various environments created by a retention pond, from wetland marsh to fast-draining upland soils. Landscape to frame views of the water body from homes and public space.
- *Habitat enhancement:* Include native species, snags and woody debris (Action Item 3-24), and topographical features in the landscape plan (Action Item 2-5) to attract wildlife.
- *Access:* Incorporate safe resident access in the form of trails and bridges.
- *Recreational enhancements:* Add benches, picnic tables, and public vantage points to encourage use while maintaining public safety.

how: Low Impact Developments prioritize onsite infiltration over detention. Create an integrated onsite stormwater treatment and management system and include detention only if other, more natural facilities are insufficient.

Seattle’s High Point neighborhood used naturalistic plantings and stonework to transform its detention pond into a valuable landscape feature, orienting homes near the pond to take advantage of the enhanced open space and views. Work with a qualified professional (civil engineer and/or landscape architect) with applied experience in detention pond design. Multidisciplinary firms are more likely to be well versed in the engineering and aesthetic/human benefits elements of detention pond design and construction.

considerations: Explore natural treatment methods, such as constructed wetlands (Action Item 2-15), bioretention/rain gardens (Action Item 2-8), and filter strips (Action Item 2-6) to compensate for the lack of treatment function with detention ponds. Onsite infiltration and bioretention also contribute to downsizing detention requirements (Action Item 2-11) on a site. Use natural landscaping practices (Action Item 4-14) to protect stormwater from contaminants.

resources: The City of Seattle’s *Green Shorelines* guide includes a list of native plants adapted to shoreline conditions: www.seattle.gov/dpd/Planning/Green_Shorelines/Overview/



Action Item Rationale:

Transforming an infrastructure element into a landscape feature can change a site liability into an asset. Aesthetic water features can increase property values.

Water features also attract and support wildlife, enhancing habitat and offering an opportunity for bird watching, picnics, and other recreational activities.

Action Item 2-17

Onsite wastewater treatment
beyond septic systems

Points: 25



what: *Onsite wastewater treatment systems* are engineered structures using mechanical and natural biological processes to treat sewage to tertiary standards at the source. Various technologies are used, often in combination, to manage and treat both greywater and blackwater.

The intent of this Action Item is onsite treatment of blackwater (sewage waste), as opposed to greywater—see Action Items 2-18, 2-19, and 3-20).

To earn points under this Action Item, the community must employ a wastewater treatment system (other than septic systems) to treat a minimum of 50% of the blackwater generated by the community.

Acceptable systems include composting toilets, Living Machines®, and membrane bioreactors (see *How* for information).

how: Onsite wastewater treatment options beyond conventional septic systems take a variety of forms, including the following technologies, either individually or in combination:

Composting Toilets

These facilities transform human waste into fertilizer via a series of decomposition chambers. Some systems require electricity, while passive systems are completely self-sufficient. Depending on the system, the composting chamber may be integral to each toilet, or several toilets within one home or building may supply a larger, centralized chamber. They are a partial solution to treatment, since they are limited to toilet-generated waste.

Living Machines®

These systems employ a series of 4 or more tanks through which wastewater flows. With each tank, a new set of specially chosen organisms helps break down the waste. The first tank holds bacteria, algae, snails, and amphipods. Subsequent tanks include plants, mollusks, and fish. Processed water, often meeting tertiary treatment standards, may be released into a drain field or cycled back to toilets for flushing. Living Machine systems require specialized design, engineering, construction and maintenance.

Membrane Bioreactor Systems

In urban developments and communities with very limited space, a Membrane Bioreactor (MBR) wastewater treatment system may be more practical than a Living Machine and/or composting toilets. MBRs combine membrane mechanical filtration with biological processes to treat water to tertiary standards and beyond. Used primarily in industrial applications, MBR systems have potential in high-density residential contexts as well.

The technologies represented above entail vastly different applications and construction techniques. Hire a qualified professional with demonstrated experience in the creation, selection and installation of an onsite wastewater treatment system best suited to the project.



Action Item Rationale:

Failed septic systems contribute to the nutrient loading of Puget Sound, causing stress to aquatic ecosystems, while centralized wastewater treatment systems consume significant amounts of energy and chemicals, and adding capacity and upgrades can be extremely costly.

Advanced onsite wastewater treatment technologies can result in long-term operational savings for the community and present larger environmental benefits and cost savings for the region.

Action Item 2-17

considerations: Onsite wastewater treatment may compete for space with onsite stormwater management. Free up land for space-intensive onsite water and wastewater management systems by increasing the development's density (Action Item 2-21), clustering housing (Action Item 2-22), and/or using a cohousing development model (Action Item 2-38).

Evaluate integrating onsite wastewater treatment systems with greywater irrigation systems (Action Item 3-20) as well.

resources:

US EPA offers fact sheets on wastewater treatment technologies: www.water.epa.gov/scitech/wastetech/mtbfact.cfm (scroll to *Water Efficiency* for information on composting toilets; scroll to *Wastewater Technology Fact Sheet* for Living Machine and membrane bioreactor fact sheets).

Composting Toilets: The Composting Toilet System Book
by D. Del Porto and C. Steinfeld.
(EcoWaters Books, 2000)

Action Item 2-18

Install greywater infrastructure at community scale

Points: 10



what: *Greywater* is wastewater from domestic indoor water uses other than toilet flushing (blackwater). The Washington State Department of Health defines two categories of greywater: *light greywater* (wastewater from bathroom sinks, showers and baths, and clothes washers) and *dark greywater* (wastewater from kitchen sinks and dishwashers, non-laundry utility sinks, and wastewater that combines flows from these sources with those from light greywater sources).

Greywater infrastructure typically consists of storage tanks, filtration, pumps, and subsurface irrigation pipes installed to deliver greywater to the root zone of plants, where plants and microbes absorb nutrients.

To earn points under this Action Item, install the infrastructure needed to collect and distribute greywater from both community buildings and private residences.

how: Designing, installing and maintaining greywater infrastructure requires engineering expertise to ensure optimal operation of the system at startup and over time. The permitting process can also be complex. Hire a qualified professional to develop plans and specifications for the greywater system, and communicate intentions to permitting authorities early in the project planning phase.

Washington Department of Health maintains detailed requirements for different types of greywater systems (see *Resources*). Such systems will likely require a large amount of land to serve as receiving area for subsurface irrigation. Alternatively, an engineered biofiltration system similar to a Living Machine (see Action Item 2-17) may be suitable.

considerations: Diverting greywater from sewage conveyance may introduce challenges in terms of conveying the remaining blackwater through sewage pipes (especially with low-flow toilets), which are designed and sloped for higher flow rates. Consider also the use of natural on-site sewage treatment, such as composting toilets (Action Item 2-17).

Harvested rainwater (Action Item 2-9) is categorized as greywater by many jurisdictions. Using this source for toilet flushing and clothes washing is permitted in King County and can further reduce a development's environmental footprint.

Greywater irrigation fields require plant selections customized to survive wetter conditions and higher concentrations of salts. This can contraindicate the use of drought-tolerant species (Action Item 3-9).

Occupant and/or maintenance staff education (Action Items 4-15, 4-19) helps ensure proper function of greywater systems (e.g., information on the appropriate type of detergents to use to avoid excessive salt buildup in the drainfield soils).

resources:

See Action Item 2-19 for resources related to greywater.

Washington State Department of Health greywater information:
www.doh.wa.gov/ehp/ts/ww/greywater/greywater.htm



Action Item Rationale:

Conventional wastewater treatment practices are energy intensive and require substantial investments in infrastructure.

Onsite or distributed wastewater treatment can ease burdens on existing wastewater treatment facilities and reduce the need to add costly capacity to these systems.



what: See Action Item 2-18 for the Washington State Department of Health’s definition of greywater.

In most cases, current Washington State health code requires greywater treatment systems utilize subsurface irrigation. Alternatively, a more technically complex, above-ground system of treatment chambers (e.g., a Living Machine) can be installed. Greywater reuse at the dwelling or building level also includes systems that capture, filter, and recycle water from sinks for toilet flushing.

To earn points under this Action Item, install a system meeting the specifications set by the Washington State Department of Health for onsite greywater treatment capable of treating a percentage of greywater generated by the community’s common buildings or entire community, and utilize the resulting treated greywater within the community.

There are two levels of performance under this Action Item:

- Treat at least 90% of greywater generated by common buildings: 5 points.
- Treat at least 90% of greywater generated by the entire community: 10 points.

how: Site soil types, drainage patterns and hydrological considerations all inform the design of greywater systems that utilize subsurface irrigation for dispersal and treatment. Hiring a qualified professional (civil engineer, etc.) to design an onsite greywater treatment system, and following the specifications outlined by the Washington State Department of Health for such systems, will ensure an installation meets both environmental and public health objectives.

considerations: Installing greywater infrastructure at the community scale (Action Item 2-18) is a prerequisite to onsite greywater reuse. Homes that utilize onsite harvested rainwater for toilet flushing and/or clothes washing (Action Item 2-9) present greywater reuse implications that will need to be addressed holistically during the water/wastewater system design phase.

Greywater systems involving subsurface irrigation should be designed to be compatible with Low Impact Development techniques that rely on stormwater infiltration.

Such systems should also take into consideration the fact that greywater irrigation satisfies a portion of a landscape’s water budget, meaning that less (or no) potable water is needed for irrigation, and/or that certain drought-tolerant plants (Action Item 3-9) may be overwatered.

Water-efficient fixtures can reduce the volume of greywater generated in the first place, reducing system size requirements.

resources:
 WA Department of Health onsite greywater information:
www.doh.wa.gov/CommunityandEnvironment/WastewaterManagement/GreywaterReuse.aspx

Action Item 2-19

Onsite greywater generation and use

Points: 5-10



Action Item Rationale:

See Action Item 2-18.

Action Item 2-20

Use reclaimed water or industrial wastewater from offsite

Points: 5



what: Non-potable water from industrial and wastewater treatment processes can be used for a variety of commercial and landscape purposes, including watering ornamental and edible crops, irrigating golf courses and other recreational fields, and enhancing wetlands by increasing in-stream flows. As of 2013, reclaimed water from the Brightwater treatment facility is available for use in parts of King and Snohomish counties (see *Resources*).

To earn points under this Action Item, the community must enter into a long-term (five year minimum) agreement with the local water utility or other purveyor to supply reclaimed wastewater, reused industrial water or its equivalent (approved by the BUILT GREEN Director).

how: Use of reclaimed water requires additional infrastructure in the form of pipes dedicated to and clearly marked for non-potable water distribution. Early in the design process, determine the availability of reclaimed water sources for the project, and if a commitment is made to use such resources, incorporate the necessary infrastructure into the design and budget of the project.

Access to reclaimed water will depend on the project's geographic location. For a map of the current service area for reclaimed water from King County's Wastewater Treatment Division, see *Resources*.

considerations: This Action Item presents an alternative to capturing rainwater for landscape use (Action Item 2-9), although the two are not mutually exclusive. In fact, using a reclaimed water source from offsite can help supplement a rainwater catchment system on-site, given that our dry Pacific Northwest summers mean all but the largest cisterns lack the capacity to provide water through extended dry spells. Onsite greywater reuse systems (Item 2-19) may also lower demand for supplemental water from reclaimed sources. Analyze both supply and demand of various existing and potential water resources and determine accordingly.

resources:

King County Reclaimed Water Program information:
www.kingcounty.gov/environment/wastewater/ResourceRecovery/ReWater.aspx

USEPA 2012 *Guidelines for Water Reuse*
www.waterreuseguidelines.org



Action Item Rationale:

Using potable water for non-consumption purposes is both expensive and inefficient. Industrial water reuse takes a normally discarded waste treatment or industrial process byproduct and puts it to productive use.



what: Preserving our natural environment in an era of population growth and migration depends in part on using land more efficiently. One way to do this is to increase housing density by building more compactly, limiting our encroachment on natural areas.

To earn points under this Action Item, achieve a development density of:

Density (units/acre)	Points
9-14	3
15-26	6
27-40	9
41-60	12
61+	15

Note: to qualify for this credit, the project must be located within a jurisdiction's Urban Growth Boundary.

how: Higher densities can be achieved by various means (see *Considerations*). As with all residential development, massing and other form variables promote community and livability. The intent is not to create developments with smaller lots while allowing disproportionately large houses. New Urbanist principles and design ideas help facilitate vibrant, community-focused compact developments (see *Resources*).

Density often does entail designing smaller lots, but also varying housing types (Action Item 2-36), and/ or clustering homes (Action Item 2-22). Housing density and variety can increase unit affordability (Action Item 2-37).

considerations: Often, neighbors oppose higher density projects due to concerns associated with increased traffic congestion, impact on community services, and other quality-of-life concerns. Good design and inclusive processes can help allay these concerns. Hosting an eco-charrette (see 4-Star Requirements and Action Item 4-1) and including all affected constituencies is one way to help the community voice concerns and desires early on, and garner potential project support.

Depending on the project's current zoning, it may be necessary to apply for a rezone to achieve greater density. Additional points are available in BUILT GREEN for applying for land use changes that increase the environmental performance of the community (Action Item 4-20), and innovative land use approaches may garner BUILT GREEN innovation points (Action Item 2-62).

In exchange for higher density, a developer can offer more open space, preserve forest or farmland, or enhance lowland stream buffers. (See Action Items 2-23, 2-25, and the 3-Star Requirement to protect sensitive areas beyond code.)

resources:
Center for Housing Policy:
Information on up-zoning:
www.housingpolicy.org/toolbox/strategy/policies/rezoning.html?tierid=80

Transit-Oriented Communities:
A Blueprint for Washington State
www.gglo.com/insight/blueprint.aspx

Action Item 2-21

Design site to maximize density

Points: 3-15



Action Item Rationale:

Density facilitates walkable communities with convenient services and allows for viable mass transit.

It can also provide more affordable housing when compact and/or multifamily units are included. This creates a community with more diversity and vitality.

Action Item 2-22

Cluster homes onsite

Points: 5



what: On some sites, creative lot division and site planning may allow for clustering homes. *Cluster development* refers to configuring lots to focus development on a portion of the site.

This approach preserves or creates usable open space, and protects with conservation easements otherwise developable but ecologically valuable or sensitive land (see Action Item 2-3: Design to protect sensitive areas beyond code). This approach is also called *Open Space Development*.

To earn points for this Action Item, the community's final design must result in a reduced average and total distance between dwelling units when compared to a standard housing distribution scheme, and in a net reduction in total impervious surface compared to conventional development spacing.

how: Decide to cluster homes very early in the masterplanning design phase. The *Low Impact Development Technical Guidance Manual for Puget Sound* (see *Resources*) cites examples of cluster development, which helps maintain portions of the development in their natural state. Evaluate the site for the most valuable and/or sensitive habitat areas, focusing development elsewhere. Work with planners experienced in LID to optimize the design.

Jurisdictional land use restrictions may currently inhibit or preclude certain approaches to cluster housing by dictating minimum lot sizes. Cottage housing ordinances are one zoning mechanism that can help facilitate cluster housing. Research the age of the current restriction and explore opportunities with the local building department to use the project as a demonstration ordinance (Action Item 4-20) for innovative approaches to residential development.



Action Item Rationale:

Clustering homes can provide the opportunity to establish wildlife corridors in undeveloped portions of the site, restore biodiversity by maintaining habitat for wildlife, and in some cases, reap financial benefits in the form of transfer of development rights.

The resulting open space can also afford views, privacy, and recreational space for residents—amenities shown to increase property values.

Clustered homes can encourage walking and reduce the need to drive, resulting in community energy conservation and public health benefits.

Action Item 2-22

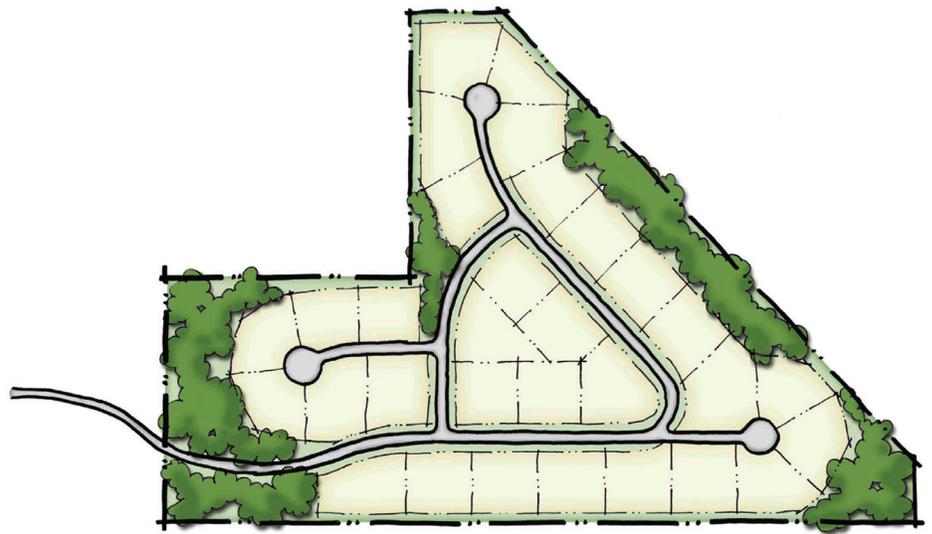
considerations: Clustering homes is a classic Low Impact Development strategy. Clustering facilitates the preservation of trees and vegetation (Action Item 2-26), helps protect existing soils (Action Item 2-25), and can make it easier to preserve sensitive areas on the site (Action Item 2-3). It also can create or enhance wildlife corridors (Action Item 2-24) and make it easier to orient building lots for solar access (Action Item 2-48).

Additionally, clustering can increase opportunities for community-scale green infrastructure like onsite greywater treatment (Action Item 2-19), constructed wetlands (Action Item 2-15) or community heat/power, as well as P-Patches (Action Item 4-7), community gathering space, and other community amenities (Action Item 2-40).

resources:

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

Puget Sound Regional Council
Toolkit topic: Cluster Development:
www.psrc.org/growth/hip/alltools/cluster/



Upper image: Conventional development patterns offer uniform lot sizes, sacrificing retained vegetation and open space for larger private lots.

Lower image: Clustering homes on smaller lots allows for community open space and preserved vegetation.

Images courtesy of AHBL, sourced from the Low Impact Development Technical Guidance Manual for Puget Sound.



Action Item 2-23

Preserve and/or create
usable open spaces
beyond code

Points: 3-5



what: This Action Item awards points to developers for mitigating the impact of development by either onsite or offsite open space preservation.

Usable open space, for the purposes of this Action Item, is defined as publicly accessible space with recreational, aesthetic and/or environmental function. Any green or planted roof space being counted toward open space totals must allow free public access.

To earn points under this Action Item, create permanent usable open space:

Onsite	5 points
Offsite	3 points

Developments required by code to include open space must exceed the code minimum by 10% onsite. If no code minimums exist, devote at least 10% of the total site area to usable open space. Alternatively, contribute an equivalent amount of acreage toward a regional park (through jurisdictional mitigation or cash payment plan) to be established and maintained by the county or city in which the development is located. Offsite open space must be in close proximity to community services, businesses and accessible by public transportation.

how: Establish specific percentage goals for open space and massing of developed land within the community during the project's early design phase. Include habitat preservation/creation, recreation, agricultural production and stormwater management functions as design goals as appropriate. New Urbanism (see *Resources*) design principles can inform strategies that foster useful and community-enhancing open space as well. Ensure that all parks have easy pedestrian and/or transit access.

Orienting homes and buildings toward open space provides more "eyes" to observe the area, enhancing safety. As such, it is important to ensure that dwelling units feature easy access to the open space. Property values tend to be higher for lots adjacent to open green space.

Ideally, provide 1- to 2-acre attached parks at the center of each neighborhood, and smaller pocket parks within a two-minute walk of all residences. For attached parks in commercial areas, provide adjacent wide sidewalks so businesses can help activate the space with seating, sidewalk sales, and other outdoor events and activities.

Ensure long-term protection of open space through conservation easements and other legal mechanisms. Open space maintenance is often managed through a homeowner's association or other legal entity. Make long-term arrangements for maintenance (see Action Item 4-18, *Prepare a landscape operations and maintenance plan*). If maintenance funds are limited or undetermined, leaving open spaces in a natural state supports both passive and active uses.



Action Item Rationale:

Open space left in its natural state offers habitat, surface water management and flood control. Additionally, open space can perform important heat mitigation, air cleansing, and carbon sequestration functions.

Open space builds community by creating places for socializing and recreation. It can also feature fields, trails and other recreational amenities, which add value to a community and its properties.

Open space can also act as a buffer between residential and nonresidential uses or between areas of differing density.

Action Item 2-23

considerations: Clustering housing (Action Item 2-22) and preserving existing vegetation (Action Item 2-26) and tree canopy (Action Item 2-41) are ways to create usable open space for residents. Open space can also serve as natural habitat in general and wildlife corridors (Action Item 2-24) in particular.

Consider registering open space with a habitat certification program. Building with increased density (Action Item 2-21) on a portion of the site can meet project unit sales goals while providing open space. Publicly accessible green roof space (Action Item 2-7) on common area buildings can be counted toward this Action Item.

Limit clearing and grading of trees and native vegetation to the minimum amount required to build lots, allow access to utilities and site amenities including parks, and provide fire protection. (See Action Item 2-26.)

If preserving open space off-site, select areas that contribute to preserving and establishing wildlife corridors. These corridors connect reserves of wildlife habitat and can increase the effective amount of available habitat for migratory animals and those with large home ranges (see Action Item 2-24 for more on wildlife corridors and reducing habitat fragmentation). Check with the mitigation program or local authorities to determine appropriate areas.

resources:

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

State of MA Smart Growth/
Smart Energy Toolkit:
Open Space Residential Design:
www.mass.gov/envir/smart_growth_toolkit/pages/mod-osrd.html

Green Neighborhoods: Open Space Residential Design in Massachusetts:
www.greenneighborhoods.org/

Beginning with Habitat:
Open Space Planning:
www.beginningwithhabitat.org/toolbox/osp4.html

Designing Open Space Subdivisions: A Practical Step-by-Step Approach.
by Randall Arendt
(Natural Lands Trust, 1994)

Action Item 2-24

Maintain or enhance wildlife corridors and connectivity to open space near the site

Points: 15



what: *Wildlife corridors*, also called *dispersal corridors* or *landscape linkages*, are linear parcels of land connecting larger areas of wildlife habitat left fragmented by development. The linkages allow for wildlife movement between fragments. The intent of this Action Item is to design specifically for interconnectedness of native species habitat.

To earn points under this Action Item, the community developer must:

- Produce a thorough wildlife assessment and inventory for the land comprising the community (see Action Item 1-4 and 2-60) and research adjacent land for habitat and linkages.
- Create a development plan showing creation, preservation or extension and maintenance of existing wildlife corridors, or the establishment of new corridors.
- Implement the plan, including permanently excluding from development the identified habitat corridor(s) with appropriate legal mechanisms.

how: First identify and map sensitive wildlife habitat and any preexisting corridors on the site, as well as adjacent habitat lands or corridors (see Action Item 2-60). A thorough habitat assessment and inventory helps identify the most valuable and/or vulnerable parts of the site for protection. An evaluation of areas to preserve as wildlife corridors is a logical add-on to an assessment and inventory scope of work. Some migratory paths are used only seasonally.

Obtain guidance from the State Department of Fish and Wildlife or Conservation Northwest (see *Resources*), and consider hiring an ecologist or other professional to conduct the evaluation and develop the plan. Set aside as much area as feasible, including buffer zones or setbacks from high use areas and wildlife hazards such as roadways. Techniques for connectivity include habitat bridges and tunnels (see Action Item 2-43), and the areas to designate for preservation include wetlands, riparian areas, forests, and steep slopes.

Avoiding development of greenfields (Action Items 1-1, 1-2) is a primary strategy for reducing habitat fragmentation. Conduct a thorough evaluation of potential sites for development, and avoid those most likely to result in habitat disruption from development. Prioritize land adjacent to other developments with existing wildlife corridors and/or habitat, with the goal of expanding those corridors to forge regional connectivity.



Action Item Rationale:

Continuous, large tracts of habitat are critical for many species. Habitat fragmentation increases the likelihood of species extinction by limiting or eliminating migration for seasonal, forage, breeding, or safety reasons. Wildlife corridors reconnect previously fragmented habitat, resulting in a more robust ecology. Humans are part of a greater ecology of life; protecting this balance directly benefits the health of our species as well.

Wildlife corridors provide aesthetic enjoyment, wetland and native species habitat, and watershed protection. They also help provide well-defined edges to communities, and can elevate the property values of nearby homes.

Action Item 2-24

considerations: Clustering homes (Action Item 2-22) can facilitate the creation of wildlife corridors and/or open space near the site.

LID goals related to protecting sensitive and undeveloped areas on a site work in concert with habitat connectivity, as does preserving lowlands and areas with mature vegetated soils (Action Item 2-25).

Couple corridor creation with plans for human-wildlife interaction (Action Item 4-22).

Enhance corridors by providing tree canopy (Action Item 2-41), vegetative layers (Action Item 3-23), native forage (Action Item 3-22), and large woody debris (Action Item 3-24), as appropriate.

resources:

Conservation Northwest focuses mainly on large-scale habitat fragmentation issues primarily created by road and highway development, but also addresses habitat connectivity loss caused by residential development:

www.conservationnw.org/what-we-do/connectivity

“Principles of Wildlife Corridor Design” by Monica Bond (Center for Biological Diversity, 2003):
www.biologicaldiversity.org/publications/papers/wild-corridors.pdf

Corridor Design includes conceptual resources, GIS tools and case studies:
www.corridor-design.org

Western Governors’ Association
Wildlife Corridors Initiative:
www.westgov.org/initiatives/wildlife

Action Item 2-25

Preserve a percentage of lowlands and areas with mature vegetated soils

Points: 3-10



what: Lowlands consist of floodplains, riparian zones, and areas with small streams and associated wetlands. In the Puget Sound, these areas are generally critical spawning and rearing habitat for several species of salmon. Mature vegetated soils include undisturbed forestland, undergrowth, meadowlands, and long-established landscaped areas.

To earn points under this Action Item, the community developer must preserve a percentage of the combined total of both lowland areas and areas with mature vegetated soils. Make calculations of the percentage with information from the community's site assessment and habitat inventory (Action Items 1-4 and 2-60).

% preserved	Points
20-29	3
30-39	4
40-49	5
50+	10

how: Use US Geological Survey maps and city or county GIS data along with information obtained during the site analysis and habitat inventory to identify lowlands and areas with mature vegetated soils. For more detailed information, conduct a pre-development site study (Action Item 2-60).

From this analysis, determine the total acreage of combined lowland and mature vegetated area within the community's perimeter. Using that total and the final lot distribution and design for the community, calculate the percentage preserved.

If the design team lacks the requisite knowledge to conduct an inventory and calculate preserved area, consult with an ecologist or other qualified professional.

Consult the Salmon-Safe Residential Development standards (see *Resources*) for best practices in preserving and protecting riparian habitat, including inventorying and assessing existing conditions and using the site planning and site design phases to ensure protection of these site features.

considerations: Preserving a percentage of existing vegetation (Action Item 2-26), clustering homes on site (Action Item 2-22), maintaining wildlife corridors (Action Item 2-24), and creating onsite open space beyond code (Action Item 2-23) can all encourage the preservation of lowlands and soils.

resources: Chapter 4 of the *Low Impact Development Technical Guidance Manual for Puget Sound* focuses on protection of soils, vegetation and forests:
www.psp.wa.gov/LID_manual.php

Salmon Safe Certification for Residential Development:
www.salmonsafe.org



Action Item Rationale:

Leaving lowlands and vegetated areas undisturbed preserves wildlife habitat, absorbs stormwater, and avoids erosion of exposed soils.

Preservation can also reduce development costs related to stormwater management infrastructure and post-development soil improvements required by stormwater code.

Riparian zones moderate environmental conditions in stream ecosystems. For instance, shading keeps streams cool, and downed trees and branches provide habitat.



SITE/WATER

what: Existing native vegetation is a site amenity to be preserved wherever possible during a development project site, so limit clearing and grading at any site to the minimum amount required to build lots, allow access, and provide fire protection. Existing native vegetation refers to all indigenous plants, understory, shrubs and trees and their associated soils located on the site prior to development activities.

To earn points under this Action Item, preserve a percentage of the site's existing native vegetation:

Percentage	Points
30 - 49	4
50 - 64	8
65+	10

Calculations are exclusive of lot sites.

Use the following calculation to determine percentage preserved:

$$(a-b) / a$$

Where:

a = total square feet of existing native vegetation

b = total square feet of native vegetation removed by development

Note: areas qualifying as preserved, existing native vegetation must be cleared of all invasive plant species, as identified on the King County or Snohomish County noxious weed list, as appropriate (see *Resources*).



MATERIALS

how: Begin preservation activities by thoroughly mapping existing site conditions. Use the site assessment and habitat inventory process (Action Items 1-4 and 2-60) to set baseline information from which the project team can both prioritize the preservation of critical habitat, and also provides the denominator for calculating the percentage preserved for this Action Item.

Use the site assessment and habitat inventory process to inform all preservation and rehabilitation plans. It is generally best to preserve existing vegetation in place rather than replanting. Wherever practical, develop community open space, street rights-of-way, parking lot islands, and other landscaped areas in ways that allow the retention of natural vegetation. Preserve stands of trees; this helps provide protection from blowdowns and a functioning understory. The intent of this item is to go beyond retaining or replanting individual trees.

During site preparation:

- Clear only actual areas required for roadways and other infrastructure, parking areas, and common area building foundations. (See Action Item 3-1.)
- Do not clear lot sites. While lot sites are excluded from calculations for this Action Item, leaving them vegetated until home construction avoids leaving soils exposed to erosion.
- Clearly mark areas to be graded on plans and field stake, fence, or flag the site. (See Action Item 3-3.)
- Identify or flag preserved buffers, open spaces, and setbacks from streams, wetlands, and steep slopes as indicated on plat maps.
- Fence critical areas, including tree root zones (minimum area includes three feet beyond a tree's drip line) and lowlands/wetlands, to prevent soil compaction or filling.

Action Item 2-26

Preserve a percentage of existing native vegetation

Points: 4-10



Action Item Rationale:

Native vegetation is adapted to the Pacific Northwest's rainy winters and dry summers, acidic and/or poor soils, and to endemic pests, meaning that it will thrive with little maintenance or irrigation.

Retaining existing native vegetation and associated soils in a landscape provides excellent erosion, sediment, dust, and pollution control.

Preserving existing vegetation in place can also reduce development costs. Areas left undisturbed are exempt from stormwater code soil improvement requirements.

Action Item 2-26

- Never park or operate heavy equipment or store heavy materials under trees, and restrict their use to within 40 feet of building and structure perimeters (see Action Item 3-25).
- Post signage on mature trees indicating their monetary value and set penalties in contracts for tree damage caused by contractors.
- Review site areas to be graded with the excavation crew to ensure compliance with the preservation plan.
- If trees only (not understory) are designated for protection, hand clearing of the understory will help protect tree roots.
- Check grading operations frequently to prevent damage to marked areas.

considerations: Preserving trees in clusters or stands increases tree survival rates, enhances neighborhood quality, strengthens habitat, and can provide usable open space (see Action Item 2-23). Prioritize the preservation of vegetated areas that provide habitat connectivity (see Action Item 2-24).

Replant or donate vegetation that must be cleared (Action Item 3-30), maintaining large woody debris onsite for habitat enhancement (Action Item 3-24), or grinding woody material onsite for reuse (Action Item 3-28) wherever feasible.

resources:

Chapter 4 of the *Low Impact Development Technical Guidance Manual for Puget Sound*

describes vegetation preservation strategies:
www.psp.wa.gov/LID_manual.php

The Salmon-Safe Certification Standards for Residential Development provide guidance on protecting existing native vegetation, from assessment and planning through design, construction and maintenance.

www.salmonsafe.org/getcertified/residential-development

The Building Soil website outlines the soils requirements in the Washington State stormwater code and describes how areas left undisturbed are exempt from soils enhancement standards:
www.buildingsoil.org

King County Noxious Weeds List:
www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds.aspx

Snohomish County Noxious Weeds List:
www1.co.snohomish.wa.us/Departments/Public_Works/Divisions/Road_Maint/Noxious_Weeds/weeds_list.htm



Action Item 2-27

Design for Complete Streets

Points: 20

what: *Complete Streets* are designed to facilitate safe use by multiple modes of transportation and a wide variety of user ages and abilities. It is a holistic approach to street-related public safety, accessibility and transportation design.

To earn points for this Action Item, demonstrate a full integration of Complete Streets elements, sourced from the City of Tacoma’s *Residential Complete Streets Design Guidelines* (see *Resources*). Demonstrate the project’s approach by creating an annotated overlay of the auto, bicycle and pedestrian facilities to accompany both the project’s master planning and construction documents.

how: Hire a transportation consultant experienced in Complete Streets to assist in the transportation plan. Provide a clear hierarchy of street and sidewalk types corresponding to the intensity of development. Craft a community design strategy linking the design of the public realm (streets, sidewalks, open space) with the design of the private realm (buildings, homes).

Various neighborhoods throughout King and Snohomish counties have employed elements of Complete Streets, e.g., curb bulbs and traffic circles. Reducing street widths by allowing parking on both sides also slows traffic. Narrow residential streets with intermittent on-street parking may require a driver to slow down or pull over to let an oncoming driver pass. These streets are typically well liked by residents, as they reduce automobile speeds.

Various cities have adopted Complete Streets policies; check with the project’s jurisdiction to determine whether assistance or resources are available. The jurisdiction may have received federal funding for Safe Routes to School (see *Resources*, below), which uses a Complete Streets approach.

considerations: Some Complete Streets strategies, such as narrower street design, also help reduce overall impervious surface (Action Item 2-30). Vegetated areas between motorized and non-motorized forms of traffic can increase safety and can be used for bioretention (Action Item 2-8) or filter strips (Action Item 2-5) to cleanse and detain stormwater runoff. Traffic calming elements can serve as green stormwater infrastructure elements (Action Item 2-29). Streets following a site’s natural topography (Action Item 2-28) can also calm traffic.

resources:
Creating Walkable Communities:
A Guide for Local Governments
www.bikewalk.org/ncbw_pubs.php

Complete Streets
www.completestreets.org

WA DOT Safe Routes to School:
www.wsdot.wa.gov/LocalPrograms/SafeRoutes/

WA DOT Walkable Communities:
www.wsdot.wa.gov/LocalPrograms/Planning/Walkable.htm

Tacoma’s *Complete Streets Design Guidelines*
www.cms.cityoftacoma.org/Planning/CompleteStreets/Residential_Guidelines_Final.pdf



Action Item Rationale:

Complete Streets designs make streets safer for drivers, bicyclists, and pedestrians. They promote social equity by incorporating Universal Design principles, making streets more welcoming to people of all ages and abilities.

By encouraging non-motorized transport, Complete Streets can reduce a community’s carbon footprint.

Active residents using human-powered transportation options also help promote public health and reduce obesity.

Action Item 2-28

Design streets to conform to natural terrain

Points: 5



what: Traditional grid street patterns create straight line-of-sight roads. Streets that conform to a site's existing terrain often provide shorter sight lines, helping calm traffic, and provide other benefits, including reduced earthwork-related development costs.

To achieve points under this Action Item, 80% of the streets within the community must follow the existing natural topography of the site.

how: The Center for Watershed Protection, a nationally recognized organization promoting environmental protection through good site design, recommends a curvilinear street pattern to follow site topography and avoid sensitive environmental areas.

Work with the project's civil engineers to maximize the use of existing topography for streets. See *Considerations* for additional BUILT GREEN Action Items that can help a community achieve these points. Creating narrower streets (Action Item 2-30) may facilitate terrain-conforming designs, while reducing overall impervious surface.

considerations: Public safety is paramount when it comes to street design. Use caution where topography will create inordinately steep grades or blind corners. Generally, shorter lines of sight and nonlinear street patterns reduce average driving speeds, part of a Complete Streets approach (Action Item 2-27). When grading is required, aim to balance roadway cut and fill (see Action Item 3-5) and minimize import of fill or export of excess earth. Clustering homes (Action Item 2-22) such that the areas of exceptionally uneven terrain are left permanently undeveloped (Action Item 2-61), so that streets follow the remaining, more even, surfaces.

resources:

The Greenroads Rating System is an environmental certification program for road projects:
www.greenroads.org/

Low Impact Development Technical Guidance Manual for Puget Sound includes information on curvilinear street patterns and narrower road designs:
www.psp.wa.gov/LID_manual.php



Action Item Rationale:

Streets matched to existing topography reduce up-front costs by simplifying road system engineering and earthwork. This yields several benefits, such as reduced grading and its associated erosion and compaction problems, maintaining existing flow channels, and maintaining existing hydrologic function.

In addition, curvilinear street patterns are shown to reduce average traffic speeds, increasing safety for pedestrians, bicyclists, and motorists, and often contribute to street aesthetics.



SITE/WATER

what: *Traffic calming devices* are a suite of street design tools aimed at reducing the speed and/or volume of automobile traffic. Common traffic calming techniques include speed bumps, traffic circles, narrower streets, curb bulb-outs, chicanes (s-shaped curves in the road created by alternating parking or extending curbs into the roadway) and changes in paving materials.

To earn points under this Action Item, the community demonstrate integration of vegetated areas or other innovative community features into a minimum of 25% of the installed traffic-calming elements.

Vegetation and other innovative features can take a variety of forms. If the action is adding vegetation, prioritize using native plant species, or plants that provide community benefit, like fruit or nut trees. Other innovative features that pair well with traffic calming include pervious paving materials (Action Item 2-31) rain gardens and bioswales (Action Item 2-8), public amenities such as benches, art installations and information kiosks, and interpretive signage (Action Item 4-16). Features that improve walkability, and enhance social interaction are also encouraged.

how: Integrate traffic calming approaches with other Complete Streets strategies (Action Item 2-27). Traffic calming techniques are most effective when applied consistently throughout the community. This helps set a new behavioral norm for both driver and pedestrian, and introduces social equity into the program by evenly distributing installations throughout the community.



HEALTH

Where possible, involve the community in selecting and designing features to increase neighborhood identity and sense of ownership in public space. For example, include the public or future residents in the project's design charrette.

The nonprofit City Repair (see *Resources*) paints colorful designs on the paving to alert drivers and slow traffic at intersections. The City of Portland created legislation (Ordinance No. 175937) to establish a permitting process for such projects. While City Repair focuses on retrofitting existing streets, the inclusive, community-driven approach is applicable to new developments as well.

considerations: Streets that follow a site's natural topography (Action Item 2-28) often calm traffic, since they are less likely to be straight and wide. Narrowing streets (Action Item 2-30) also helps reduce traffic speed. Note that cul-de-sacs are generally discouraged for community connectivity and impervious-surface-creation reasons, even though they are considered a traffic calming technique. Where cul-de-sacs are included, provide connectivity with bike and footpaths (Action Item 2-45), and use the cul-de-sac designs that reduce impervious surface listed in Action Item 2-30.

resources:
Creating Walkable Communities:
A Guide for Local Governments:
www.bikewalk.org/ncbw_pubs.php
(See Section 4 for information on traffic calming.)

City Repair:
www.cityrepair.org/



MATERIALS

Action Item 2-29

Integrate vegetated areas or innovative community features into any traffic calming devices

Points: 5



Action Item Rationale:

By reducing average automobile speeds and overall traffic volumes, traffic calming enhances pedestrian and bicycle safety. In addition, encouraging pedestrian and bicyclist activity produces public health benefits, including reduced incidence of obesity.

It can also lower a community's carbon footprint by creating streets designed to welcome non-motorized transportation.

Action Item 2-30

Minimize impervious surfaces in street design

Points: 4-18



what: Conventional paving materials are by nature impervious. The Center for Watershed Protection estimates that 65% of the total impervious surface in the United States is street, parking lot or driveway. Various street design strategies can reduce this percentage.

To earn points for this Action Item, employ the following strategies, meeting the percentage minimum (by surface area) in the category. Points are additive.

Strategy	% min.	Points
Shared driveways	75	4
Vegetated center islands in cul-de-sacs	75	4
Streets; rights-of-way narrower than code	90	10

To determine the community's percentage for each of the strategies above, calculate the total square footage of paved surface that applies to each category and the square footage meeting the design strategy listed. Determine the percentage by placing the former in the denominator and the latter in the numerator.

Example 1: The amount of shared driveways in the community is 4,800 ft², and the amount of individual driveways is 1,800 ft². The calculation to determine the percentage of driveway devoted to shared usage is:

$$4,800 \div (4,800 + 1,800) = 0.857, \text{ or } 86\%.$$

This project is eligible to receive 4 points.

Example 2: A community's total street surface is 142,550 ft². Of that, 136,920 ft² is street narrower than code. $136,920 \div 142,550 = 0.96$, or 96%. This project is eligible to receive 10 points. If Examples 1 and 2 are the same development, it is eligible to receive 14 points under this Action Item.

how: Research conducted by the City of Portland shows that street widths can be dramatically narrowed with no loss of function. Field tests also revealed that the space needed for emergency vehicles was less than assumed. “

Shared driveways: Make the decision to design for shared driveways early in the design process, as plats are established. Shared driveways usually require an easement between two properties, with each property surrendering approximately five feet of property to establish the driveway. Shared driveways can be especially effective in cluster development designs (Action Item 2-22).

Maximize environmental benefit on shared driveways by reducing impervious surface (Action Item 2-30) with a “Hollywood drive” or pervious paving. Design landscaping to maximize visibility and avoid potential collisions between vehicles on shared driveways.

Cul-de-sacs: By design, residential cul-de-sacs typically create large impervious surface areas and should be avoided. Instead of cul-de-sacs, the *Low Impact Development Technical Guidance Manual for Puget Sound* recommends the use of curvilinear street patterns known as hybrid designs or open space roads. Where through streets are difficult or impractical, use alternatives to conventional cul-de-sacs. These include 40 foot radius cul-de-sacs with a landscaped center featuring bioretention; 30 foot radius cul de sacs; and hammerhead designs. See the *Low Impact Development Technical Guidance Manual* for more information (see *Resources*). Enhance community connectivity by providing connective paths where cul-de-sacs exist (Action Item 2-45).



Action Item Rationale:

Impervious surfaces concentrate and contaminate stormwater runoff, damaging water quality, creating erosion and harming aquatic habitat. Paved surfaces also contribute to the urban heat island effect, which can increase a community's energy expenses and introduce heat-related public health problems.

“Skinny” streets and shared driveways use land more wisely, generally cost less to build, and offer a friendlier environment for pedestrians and residents. Vegetated center islands can create a neighborhood amenity out of an infrastructure element, and can serve a stormwater management function as well.

Action Item 2-30

Narrower street widths: Design residential streets to the minimum required pavement width needed to support travel lanes, on-street parking, and emergency, maintenance, and service vehicle access. For instance, use 18-25 foot wide driving surface, edge-to-edge, instead of 36 foot wide and 50 foot wide rights-of-way (ROW) instead of 60 feet (or whatever minimum is acceptable by code). Base widths on anticipated traffic volumes. Obtaining a variance for street widths may require significant work with local code officials. Start early to accommodate the additional time this may require. This Action Item awards significant points in recognition of the extra effort needed to work with city or county code officials to improve existing road standards.

Narrower ROW: Specify widths reflecting the minimum required to accommodate the travel-way, the sidewalk, and vegetated open channels. The Center for Watershed Protection recommends placing utilities and storm drains within the paved sections of the right-of-way wherever feasible to lessen the ROW's width requirement and increase vegetation. In some cases, this strategy is not appropriate, for instance, if stormwater is to be conveyed by swales alongside the road (see below). Where practicable, use permeable pavement options to help reduce impervious surfaces (Action Item 2-31). Certain types of permeable pavement (e.g., interlocking pavers) allow access to buried utilities without destroying paving materials—a maintenance benefit.

Various methods can reduce the impervious surface associated with cul-de-sac construction.

Image courtesy of AHBL, sourced from the Low Impact Development Technical Guidance Manual for Puget Sound.

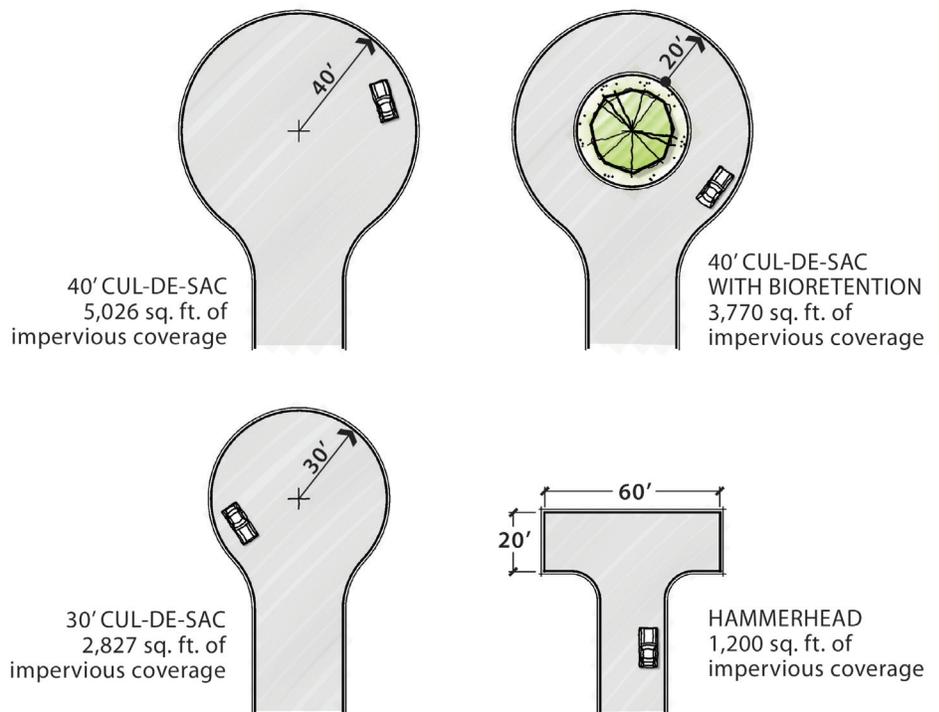
considerations: Reducing total impervious surface is a central LID strategy. Complement the reduction in road-related total impervious surface with bioretention (Action Item 2-8), rainwater harvest (Action Item 2-9), green roofs (Action Item 2-7), and other building-related stormwater abatement activities.

Reducing or eliminating cul-de-sac designs is another strategy for reducing impervious surface, and also enhances connected, walkable communities. Curvilinear street patterns can more effectively follow a site's natural topography (Action Item 2-28).

resources:

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

Low Impact Development Center:
Green Streets information:
www.lowimpactdevelopment.org/greenstreets/background.htm



Action Item 2-31

Use porous paving options for:

- a) streets
- b) parking
- c) paths

Points: 5-15



what: *Porous paving* materials allow water to pass through their surface layers into aggregate reservoirs and subsoils beneath while retaining a strong, walkable or driveable surface. Porous paving options take several forms, including the following.

Pervious concrete and asphalt. These poured-in-place materials are similar to their impervious counterparts, except that fines are left out of the aggregate mix. Cement or asphalt binds the remaining larger aggregate together, leaving voids throughout the material that makes it permeable. Pervious concrete has significantly more void space, durability and first cost than porous asphalt.

Pervious pavers. These are either (1) solid, interlocking precast concrete units designed with voids that are filled with gravel or growing medium and plant material, or (2) precast aggregate squares or ‘bricks’ with voids throughout, laid in place much like flagstones and installed in strips in impervious pavement. The voids allow stormwater to pass through. For the purposes of this Action Item, pavers are considered pervious if they have a calculated void area of at least 20%.

Plastic grid systems. Structural plastic modules are available that allow grass or gravel areas to serve as parking, driving, or pedestrian surfaces without resulting in compaction of grass roots or the sub-base layer. Grasspave® and Gravelpave® are brands of commercial products.

Porous paving materials rely on proper installation, an aggregate reservoir layer and sufficiently permeable subsoils.

To be eligible for this Action Item, subsoils under porous paving installations must have a demonstrated infiltration rate of 0.5 inch per hour or more using an accepted methodology (e.g., ASTM 2434).

Install porous paving materials for a minimum percentage of total square footage per category of surface for the following hardscape elements (points are additive):

Element	% min.	Points
Streets	10	5
Parking	20	5
Sidewalks and paths	25	5

Note: conventional gravel driveways or parking areas do not count toward the pervious fraction of square footages for this Action Item, as they are rendered effectively impervious by vehicle traffic. Properly prepared crushed stone footpaths *can* be counted toward the sidewalks and paths percentage for this Action Item.

how: Standard specifications for pervious concrete and asphalt mixes are readily available, as is information on service life and maintenance. The City of Seattle and Seattle Housing Authority provide valuable design guidance in association with green stormwater infrastructure projects like High Point, where pervious concrete and Gravelpave were used in various applications. See *Resources*.

Different applications call for different types of pervious paving:

- Porous concrete, and to a lesser extent porous asphalt, can be used for roads, sidewalks, and many other applications. For best results, specify installation by a certified technician. The National Ready Mix Concrete Association maintains a NRMCA Pervious Concrete Contractor Certification program with various designations (Technician, Installer, and Craftsman).



Action Item Rationale:

Pervious paving allows stormwater to infiltrate, helping maintain a site’s natural hydrology and protecting local waterways.

Additionally, pervious paving surfaces can reduce the standing water hazard associated with standard concrete and asphalt.

Maintenance savings are also realized with some types of porous paving. For example, pervious concrete boasts a long service life, and many pavers can be reused, avoiding demolition waste inherent to poured-in-place surfaces.

Finally, pervious paving allows air and water to more easily access the roots of adjacent trees, supporting plant health.

Action Item 2-31

- For parking and high use bicycle and pedestrian areas, plan for porous concrete or asphalt, or pervious paver systems designed for bicycle traffic.
- For lightly used pedestrian paths, options include non-compacted gravel, crushed stone, or pavers on an appropriate subbase to facilitate infiltration. Bear in mind accessibility, safety, and liability issues presented by loose stone and unevenly paved surfaces: persons of limited mobility may find these difficult to navigate.
- For fire lanes, overflow parking, and other areas of intermittent vehicle use, precast concrete pavers (e.g., TurfStone) and plastic grid systems (e.g., Grasspave) allow these spaces to be grassed.

The Washington Aggregate and Concrete Association maintains specifications (see *Resources*) for pervious paving materials. Maintenance (see Action Item 4-18) will ensure stormwater management performance over time.

Note that pervious concrete and especially porous asphalt can easily clog with silt during construction. Wait until construction is substantially complete and soils are stabilized before installing, or provide protection to the pervious surfaces with filter fabric or plywood sheeting.

considerations: Minimize paved surfaces in the first place (Action Item 2-30) to set the stage for using pervious paving on a proportionally larger amount of the remaining paved areas. Integrate pervious paving alternatives with other green stormwater infrastructure strategies (Action Items 2-1 and 2-2).

resources:

King County Transportation information on porous concrete: www.kingcounty.gov/transportation/kcdot/Roads/Environment.aspx (click on *Porous Concrete*)

Water Environment Research Foundation information on porous pavement: www.werf.org/liveablecommunities/toolbox/porous.htm

Washington Aggregates and Concrete Association pervious paving information: www.washingtonconcrete.org/sustainability/pervious-pavement/

National Ready Mix Concrete Association's Pervious Concrete Contractor Certification Program: www.nrmca.org/education/certifications/pervious_contractor.htm

The City of Seattle maintains detailed information on the High Point project's strategies, including drawings and specifications for porous concrete roads and sidewalks. Visit www.seattle.gov/util/About_SPU/index.asp (click on *Drainage and Sewer System*, then *Green Stormwater Infrastructure*, then *Completed GSI Projects*).

The Low Impact Development Center's specification for interlocking permeable pavers: www.lowimpactdevelopment.org/epa03/pavespec.htm

ASTM 2434: Standard Test Method for Permeability of Granular Soils: www.astm.org/Standards/D2434.htm

Action Item 2-32

Use recycled content materials for paving

Points: 4



what: Recycled content materials include both *post-consumer* waste materials (materials diverted from residential waste collection) and *post-industrial* materials (waste generated from manufacturing and other industrial processes). An example of post-consumer waste is bottle glass collected through residential curbside recycling programs. Examples of post-industrial waste include fly ash, which is a byproduct of coal-fired power production, and blast furnace slag, a byproduct of steel production.

To earn points for this Action Item, show that the combined recycled content of materials used for paving, base course, and subbase constitutes at least 10% of the total tonnage of material used for these purposes.

how: Set clear recycled content materials goals early in the project and contact suppliers to determine availability.

Include requirements for recycled content in the standard specifications for paving materials used in the project. Recycled content is usually described in terms of percentage by weight of the total product.

Recycled content paving examples:

- *Concrete with fly ash.* Whether pervious or not, concrete itself often has post-industrial content and can be reused as road base once its long service life has passed. Much of today's concrete contains fly ash, a by-product of coal-fired power and industrial plants. The micro-structural properties of fly ash make it a beneficial additive to concrete, as it increases workability and enhances hardening. Fly ash can directly replace a percentage of the Portland cement present in concrete, lowering the overall carbon footprint of the mix.

- *Glass modified asphalt.* Post-consumer crushed glass can substitute a portion of aggregate in asphalt mixes. In general, "glassphalt" has not been extensively used outside of pilot programs, although the resulting surface is suitable for non-highway use.
- *Recycled asphalt.* Old asphalt can be reground and added to new asphalt, and other asphalt-based products like asphaltic roofing shingles can be incorporated at low percentage into hot-mix asphalt.
- *Pervious plastic grid systems.* Gravel-Pave contains recycled plastic. See Action Item 2-31 for more on these systems, suitable for use in driveways and parking areas.

Road base materials can also include recycled content, e.g., recycled crushed concrete, porcelain, and glass cullet.

considerations: Recycling markets can be quite variable, affecting price and availability. Consult with suppliers to determine lead times and cost. Research the source of recycled content as part of life-cycle impacts, as some materials (e.g. fly ash) are sourced globally.

Reducing impervious surfaces for paving overall (Action Item 2-30) makes it easier to reach percentage thresholds in this Action Item. .

resources:

"Using Recycled Industrial Materials in Roadways" factsheet by US EPA: www.epa.gov/wastes/conserve/imr/pdfs/roadways.pdf

Clean Washington Center: "State Specifications for the Use of Glass Cullet as Construction Aggregate" www.cwc.org/gl_bp/gbp4-0106.htm

The Whole Building Design Guide includes model specification language for cast-in-place concrete: www.wbdg.org/references/mou_rc.php



Action Item Rationale:

Specifying recycled content materials spurs demand for recycled materials, helping divert materials from the waste stream.

Additionally, recycled content materials generally require smaller energy inputs than products comprised of virgin stock.



what: Expanses of paving, roofing and other materials absorb the sun's heat and can raise the temperature of built-out areas significantly compared to undeveloped and rural lands. This phenomenon is known as the *urban heat island effect*.

To gain points under this Action Item, show that at least 30% of all paved surfaces meet some combination of the following:

- Consist of “cool-colored” surfaces. Can be achieved through integral paving surface colorants, or surface-applied coatings. Surfaces qualify as cool-colored if they have a solar reflectance (SR) of at least 30.
- Consist of open-cell paving (see Action Item 2-31 for a description of open-cell paving) with a 20 percent minimum void area. Open-cell paving must be planted, or filled with material shown to mitigate pavement temperatures and the Urban Heat Island Effect.
- Be shaded by foliage within 5 years of project completion, using shade modeling conducted by a qualified professional.

how: Specify light colored or pigment-free concrete mixes (concrete without colorants has an initial SR of 30-50, qualifying it as cool-colored), and apply asphalt surface coatings and asphalt emulsion sealers to increase a surface's solar reflectance. Existing asphalt can also be “white-topped,” where a layer of concrete is applied over the asphalt base. Areas programmed for infrequent or light use (fire access, driveways, parking overflow) can be paved with modular plastic grid systems planted with grass (Action Item 2-31) if such systems meet load requirements.

Work with a landscape architect to model shade coverage within five years to determine the placement, species and density of tree cover. Use drought tolerant and native tree species, and factor in maintenance (e.g., autumn leaf removal) and allergenic potential when selecting trees.

considerations: Minimizing paved surface area (Action Item 2-30) in the first place makes it simpler and less costly to manage the remaining paving. Open-cell paving also reduces imperviousness (Action Item 2-31). Green roofs (Action Item 2-7) also help reduce roof-related heat island contribution.

Consider trees' impact on access to sunlight for passive solar on buildings and solar energy installations in general. Coniferous trees are better at intercepting stormwater than deciduous and broad leaf trees. Trees planted to shade pavement can count toward tree canopy coverage (Action Item 2-41).

resources:
EPA: Reducing Urban Heat Islands: Cool Pavements
www.epa.gov/hiri/mitigation/pavements.htm

Lawrence Berkeley Laboratories: Cool Pavements:
www.heatisland.lbl.gov
(click on *Cool Pavements*).

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php
(includes info on pervious paving)

Action Item 2-33

Use 50% light color, open cell, or shaded pavement

Points: 10



Action Item Rationale:

In summer sun, conventional pavements can reach temperatures between 120 and 150 degrees Fahrenheit. These surfaces concentrate heat and result in increased cooling loads and public health problems.

Hot pavement surfaces heat up stormwater, warming receiving waters and damaging the aquatic ecosystem.

Action Item 2-34

Provide alleys for rear access on at least 50% of the dwelling units

Points: 10



what: In many developments, the traditional alley has been replaced by street parking in front of the house in conjunction with a front-facing garage.

To earn points for this Action Item, alleys must provide rear access to a minimum of 50% of the community's dwelling units.



how: Designing for alleys must happen early in the site planning stage. Integrate alley design and placement with Low Impact Development strategies, such as clustering homes (Action Item 2-22) and preservation of existing vegetation and habitat (Action Item 2-26). *The LID Technical Guidance Manual for Puget Sound* (see *Resources*) offers a discussion of alleys and overall street design.



Action Item Rationale:

Relegating the automobile to the back of the house helps front yards, sidewalks and streets become more people-centered and produces more visually interesting street frontages. Some jurisdictions place limitations on the proportion of a home's façade represented by the garage. Rear parking resolves this design challenge.

Additionally, alley drivers travel at slower speeds, increasing safety.

Reduced paving in front of the house frees up space for onsite stormwater management with rain gardens and bioswales in the development.

Action Item 2-34

considerations: Alleys also provide an opportunity to reduce impervious surfaces since their lower load requirements allow them to be paved with a wider variety of porous materials (Action Item 2-31). They also provide an opportunity to significantly reduce street pavement widths and therefore total paved surface (see Action Item 2-30) and/or introduce traffic calming elements (Action Item 2-29), or both.

Alleys free up extra landscaping space along streets fronting the house, increasing room for rain gardens and bioretention (Action Item 2-8), and/or bicycle lanes and other Complete Streets (Action Item 2-27) improvements.

resources:

Seattle Integrated Alley Handbook: Activating Alleys for a Lively City is a study by the University of Washington Green Futures Design and Research Laboratory, uses six existing Seattle alleys as case studies for creating active alley spaces: www.greenfutures.washington.edu/research.php (scroll to *Completed Research*)

Low Impact Development Technical Guidance Manual for Puget Sound offers information on street design, including alleys, in Chapter 3: Site Planning and Layout: www.psp.wa.gov/LID_manual.php

Action Item 2-35

80% of dwelling units within
½ mile walking distance
of community services

Points: 10



what: Create a community with easy pedestrian access to community services: commercial, retail, education, recreation and personal development.

To earn points for this Action Item, provide evidence that 80% of the dwelling units within the community are within ½ mile walking distance of a minimum of *five* of the following services and amenities spanning *at least three* of the following categories:

Food

- Grocery store / bodega
- Year-round produce stand / farmer's market
- Bakery
- Café / coffee shop
- Restaurant

Retail / Finance

- Bank / credit union
- Clothing / shoes
- Home furnishings / stationery / gifts
- Hardware store
- Barber shop/hair salon
- Cleaner / laundromat

Health / Personal Care

- Hospital / primary care clinic
- Health care specialists
- Dentist
- Optometrist
- Pharmacy
- Massage therapist/chiropractor

Recreation

- Park / play field
- Nature preserve
- Swimming pool
- Gym / health club
- Yoga studio / martial arts

Education / Childcare

- School
- Childcare facility

Other Services

- Place of worship
- Library
- Post office
- Neighborhood service center
- City hall

how: Mixed-use developments range from providing live-work units, to a corner store in a residential area and an apartment near or over retail, to a full-scale community or urban village. Conduct extensive market analysis during the early design phase to determine the potential and viability for various development scenarios. Include an experienced planner in the development of the master plan for mixed-use developments.

Cluster stores, offices, schools, services, and recreation spaces within walking distance of each other (about every half mile) along collector streets in compact neighborhoods. Including services such as childcare, health club facilities, cleaners, or other daily conveniences onsite contributes to overall trip reduction. It also encourages walking or biking. Homebuyers are drawn to mixed-use developments due to the amenities offered. Childcare is a particular draw for working families.



Action Item Rationale:

Collocating various uses and activities allows them to benefit from one another, enhancing economic development by cycling more dollars within the community.

Mixed-use developments offer the option of walking or biking to community amenities or work and focuses bicycle and pedestrian traffic around the neighborhood center. This reduces the community's vehicle miles traveled, saving energy and avoiding pollution.

Action Item 2-35

In the Puget Sound Region, large grocery stores require a significant amount of development space, from a minimum of 75,000 square feet for building and parking, as well as an additional permit. Such stores present the opportunity to build affordable living units (Action Item 2-37) above the retail level. Examples of this approach can be found in the Ballard, University District and Capitol Hill neighborhoods of Seattle.

Placing such a large dedicated space within a development requires a great deal of resources. It may be simpler to include a mini-market, bodega, or a weekly farmer's market (Action Item 4-9). In all cases, work with zoning officials to optimize parking efficiency tailored to the actual features of the development.

Field studies have shown that 300 feet is the maximum length people will walk through a parking lot to reach a desired destination, yet they'll walk three times that distance along an aesthetically interesting street with varied and engaging storefronts. To encourage pedestrian activity, locate parking behind stores in commercial areas and screen vehicles with landscaping. These strategies also reduce noise impact on nearby residents, an important quality-of-life aspect in mixed-use developments. Select other strategies, like sound-resistant windows and well-insulated walls and floors to cancel the effect of noise from commercial areas on nearby residents during project planning stages.

Community acceptance of compact, mixed-use development requires designs that ensure privacy, safety, and aesthetic continuity. Use design standards in tandem with mixed-use zoning to ensure compatibility. Similar massing of buildings, their relationship to the street, common architectural elements, and effective landscape design all contribute to compatibility among building types in a development.

considerations: One or more design charrettes can help reveal the types of services most desired by residents, prospective residents, or neighboring communities. For example, farmers markets (Action Item 4-9) are community amenities that serve multiple purposes.

Use the charrette(s) to inform choices among the many option for synergies in community design. Transit oriented developments (Action Item 1-3) provide easy access to services and amenities. Clustering homes on the site (Action Item 2-22) can provide density needed to make service provision viable. Collocated services can share parking (Action Item 2-55), which also helps reduce a development's impervious area. Enhanced density (Action Item 2-21) makes business and mass transit options more viable.

resources:

Congress for the New Urbanism
"Live/Work/Walk: Removing
Obstacles to Investment"
www.cnu.org/liveworkwalk

Transit Oriented
Development Database:
www.toddata.cnt.org/

EPA Trip Generation Tool
for Mixed-Use Developments:
[www.epa.gov/dced/
mxd_tripgeneration.html](http://www.epa.gov/dced/mxd_tripgeneration.html)

ESRI Business Analyst is a
web-based GIS tool that uses
demographic and business
information to guide the placement
of businesses and services
in a community:
[www.esri.com/
software/businessanalyst](http://www.esri.com/software/businessanalyst)

Action Item 2-36

Provide mix of housing types

Points: 6



what: Single-family homes, duplexes, townhomes, apartments, condominiums, live-work units, and cohousing can all be part of one community.

The intent of this Action Item is to encourage a diverse physical mix of housing types, which brings resilience to a community. Housing diversity also entails creating housing opportunities at various access points along the income spectrum. See Action Item 2-37 for housing affordability.

To earn points under this Action Item, provide at least three different housing types from the above options, with no one housing type comprising more than 70% of the housing mix (measured as a fraction of total square feet of residential occupied space) within the community.

how: Determine land use options early in the process, and explore maximum capabilities of zoning allowances. Apply for Planned Unit Development designation where available; this structure can help make certain housing types, and the inclusion of retail and other community amenities, feasible.

Design standards guide development of compatible building types to ensure privacy, safety, and visual continuity. A general rule of thumb: similar massing of buildings, their orientation to the street, common architectural elements, and effective landscape design all contribute to compatibility between diverse building types. Include buildings that add variety while fitting in with the scale and appearance of the existing neighborhood through building height, roof pitch, and/or materials palette elements. Locate highest density units nearest to collector streets, transit stops, and retail.

considerations: Providing a mix of housing types facilitates the creation of a transit oriented development (Action Item 1-3). Cluster development (Action Item 2-22) can also facilitate a variety of housing types. A mix of housing types can also help increase development density (see Action Item 2-21) along with the opportunity to provide affordable housing choices (Action Item 2-37).

resources:
Congress for the New Urbanism
advocates for walkable urban
environments with a mix of uses
and housing types:
www.cnu.org



Action Item Rationale:

Housing choices allow young and old, individuals and families, and varying income households to find places to live.

Mixed-housing developments offer environmental and social benefits as well: units with shared walls increase energy efficiency, clustering multi-family homes allows for open space, and single-family residences with accessory units provide the flexibility stay in place as family structures change.



Action Item 2-37

Affordable housing

Points: 10-20

what: In general, housing is considered affordable if rent or mortgage expenses consume no more than 30% of a household's income. BUILT GREEN references the Department of Housing and Urban Development's most current Area Median Income (AMI) numbers to establish affordability thresholds for King and Snohomish counties.

For the purposes of this Action Item, BUILT GREEN has defined three levels:

- *Affordable*: units affordable to households earning 80% of AMI
- *Very affordable*: units affordable to households earning 60% of AMI
- *Extremely affordable*: units affordable to households earning 30% AMI

To earn points under this Action Item:

- At least 50% of units meet the *affordable* criteria: 10 points
- At least 30% of units meet the *affordable* criteria, AND at least an additional 10% of units meet the *very affordable* criteria: 15 points
- At least 20% of units meet the *affordable* criteria, AND at least an additional 10% of units meet the *very affordable* criteria, AND at least an additional 5% of units meet the *extremely affordable* criteria: 20 points

Note: a community may apply for only one performance level.

Determine monthly rental rate, or equivalent 30-year fixed monthly mortgage, using the following formula:

$$[(\text{Current HUD AMI for County}) * (\% \text{ of AMI}) * (0.30)] \div 12$$

Note: .30 in the equation references the 30% upper limit on the fraction of income housing consumes. The 12 in the equation converts the yearly dollar amount into a monthly amount.

Example: King County's AMI for 2012 was \$88,000. Therefore, the maximum monthly rate on a unit meeting the "very affordable" definition is: $[(88,000)(0.6)(0.3)]/12$ or \$1,320.

how: Successful affordable housing is integrated into the community, creating a mosaic of housing options and an environment of inclusion. Early in the development process, set affordable housing goals and research opportunities for partnerships and incentives. Nonprofit housing providers may have access to funding streams to help.

Look for architectural firms experienced in affordable housing design and construction. If housing is to be developed by other builders, establish affordability requirements in development agreements.



Action Item Rationale:

According to a 2008 United Way of King County report, nearly one-half of all renters and over one-third of all homeowner households paid more than 30% of their income in housing costs.

The National Low Income Housing Coalition calculated a "Housing Wage" of \$21.12 for King and Snohomish Counties in 2012.

Action Item 2-37

considerations: A mix of housing types (Action Item 2-36) can both enhance affordability and provide visual interest.

Locating the neighborhood near services (Action Item 1-7) and mass transit (Action Item 1-3) can complement affordability by reducing car ownership expenses.

resources:

A Regional Coalition for Housing (East King County):
www.archhousing.org/developers/

King County Housing Finance Program:
www.kingcounty.gov/socialservices/Housing/ServicesAndPrograms/Programs/HousingDevelopment/HousingFinance.aspx

The Housing Consortium of Everett and Snohomish County:
www.housingsnohomish.org/

Snohomish Office of Housing:
www1.co.snohomish.wa.us/Departments/Human_Services/Divisions/OHHCD

National Low Income Housing Coalition:
www.nlihc.org/

Washington Low Income Housing Alliance:
www.wilha.org

Housing Development Consortium:
www.housingconsortium.org



Action Item 2-38

Cohousing

Points: 15

what: Originating in Denmark in the 1980s, *cohousing* combines single-family or multifamily homes with a variety of communally owned and maintained spaces, notably a central building or area for sharing meals and activities. The creation of cohousing is highly participatory, both in the design and construction of the physical buildings and in the organizational structure that governs the community.

Typically, residents directly manage and maintain the homes, community structures, and surrounding landscapes. Legally, cohousing is commonly structured as a condominium association or Planned Unit Development. Homes are often clustered, freeing space for common buildings, open space, recreation, or agricultural purposes. The housing units and community structures frequently feature a variety of green building materials and design elements.

To earn points under this Action Item, a minimum of 50% of the community's housing units must be developed using a cohousing model.

how: The decision to create a cohousing community is best made very early on in the development process. Often, future residents are already identified and involve themselves deeply in design decisions. This engagement-intensive process can take additional time, which should be factored into the development time line..

Legal counsel versed in cohousing-type real estate is advised to navigate the somewhat unconventional ownership arrangement of homes and common property. Financing atypical housing projects may present a challenge as well.

considerations: A variety of low impact development strategies are facilitated by cohousing's grouped housing pattern. This includes cluster development (Action Item 2-22), leaving portions of the site undisturbed (Action Items 2-25, 2-26, and 2-61), added protection to lowlands and wetlands, and creating and maintaining wildlife corridors (Action Item 2-24).

In addition, the fact that future occupants are often involved early in the project planning stages makes cohousing development ideal for participatory processes such as design charrettes. Certain community-scale features, including district energy (Action Item 2-49), rainwater harvest (Action Item 2-9), greywater reuse (Action Items 2-18 and 2-19) and wastewater treatment (Action Item 2-17) may not only appeal, but may be made more feasible given cohousing's physical and organizational structures.

resources:

The Cohousing Association of the United States:
www.cohousing.org

Creating Cohousing: Building Sustainable Communities by Kathryn McCamant and Charles Durrett (New Society Publishers, 2011)



Action Item Rationale:

The compact development pattern of cohousing lends itself in general to Low Impact Development practices, which helps protect local and regional water quantity and quality.

A common thread in cohousing communities is commitment to environmental stewardship and community involvement, two traits also integral to green building.

Action Item 2-39

Provide variable lot sizes to encourage higher density

Points: 5



what: Community developments often offer a single lot size for all homes, resulting in a homogenous development pattern and limiting options to respond to site specifics.

To earn points under this Action Item, develop a lot parceling plan that establishes at least three different lot sizes, with the smallest and largest differing from each other by at least 20 percent.

how: Planning for variable lot sizes will depend on zoning requirements. However, municipalities may allow for a variance for this strategy as part of an overall plan to provide more open space. Begin exploring the potential for variable lot sizes early in the master planning process and early in permit intake.

Focus planning on designing lots with views of protected open spaces to capture the enhanced marketability of view lots. Also determine whether variable lot sizes and configurations can be optimized for solar orientation (Action Item 2-48).

considerations: Smaller lots are better received when they are part of an open space plan (Action Item 2-23). Variable lot sizes can work well with clustering development (Action Item 2-22), cohousing (Action Item 2-38) and with providing a mix of housing types (Action Item 2-36).

resources:

The *Low Impact Development Technical Guidance Manual for Puget Sound* includes information on cluster development and building in response to existing natural features on the site: www.psp.wa.gov/LID_manual.php



Action Item Rationale:

Variable lot sizes facilitate density by allowing smaller lots for individual homes and larger plots of land for multifamily housing. Higher density projects reduce development pressure on other undeveloped land. It also can help make mass transit and local business development viable, creating more walkable communities.

Compared to the “cookie cutter” approach to lot planning, variable lot sizes optimize the site by allowing lot sizes to respond to terrain features (e.g., critical areas, existing forest, etc.).



Action Item 2-40

Provide community amenities

Points: 1-15

what: Community amenities can take a variety of forms, but serve the same intent: to enhance the experience of community members. For the purposes of this Action Item, amenities are defined as facilities and other built elements of the community intended for recreation, social network enhancement, citizen engagement, food production, provision of goods or services, or onsite management of materials or waste.

Points for this Action Item are awarded based on the types of community amenities provided. Facilities must be located onsite, and accessible to all community members. Each installed amenity earns points based on the type or function. Points are additive, up to a cumulative maximum of 15 points.

Type of amenity	Points
Community center	10
Central park, amphitheater and/or plaza	6
Recreational facilities*	4
P-patch; garden plot	3
Community composting facility	1
Tool bank	1
Other community-based shared resources**	1

*Onsite recreational facilities, such as clubhouses, athletic fields, skateboard parks, bike and walking paths, jogging trails, playgrounds, and swimming pools are awarded for each area installed.

**Examples: a publicly accessible historic site, a community kitchen, or shared bicycle storage.

how: Brainstorm during the design charrette phase to determine which amenities provide the most benefit. Community priorities and themes (e.g., active living, multi-generational space, environmental protection) can inspire and inform the programming of community amenities.

Plan facilities that serve multiple purposes to maximize the points under this Action Item and conserve building materials, land, and other resources used in the operation of common buildings. For example, a community center can also feature sports courts, bicycle storage, a community kitchen, tool bank or other amenities.

considerations: Certain types of community space may also count as open space (Action Item 2-23). Smaller individual lot sizes (Action Item 2-39) and/or cluster development (Action Item 2-22) may free up space for amenities.

Well-designed community amenities can serve double-duty by housing onsite solar electric or other alternative heat and energy sources (Action Item 2-50), rainwater harvest (Action Item 2-9), stormwater treatment infrastructure, or housing a farmer's market (Action Item 4-9). A hallmark of cohousing (Action Item 2-38) is shared amenities. Design facilities to green building criteria (Action Item 2-52).

resources:
 The Project for Public Spaces:
www.pps.org/reference/11steps/
 The Pomegranate Center leads processes to create shared space:
www.pomegranatecenter.org/



Action Item Rationale:

Community-accessible amenities provide places for neighbors to come together, building social capital, a sense of belonging, and neighborhood ownership.

Onsite amenities reduce community vehicle miles traveled, as well as increase community interaction leading to safer neighborhoods.

Community amenities can also save resources, by reducing the need for community members to acquire products and services that can be shared with neighbors.

Action Item 2-41

Create or preserve tree canopy based on urban density classification

Points: 10



what: *Tree canopy coverage* refers to the area of the site that is covered by tree branches and leaves. The intent of this Action Item is to retain and/or establish canopy coverage for shading, stormwater, aesthetic, and habitat benefit purposes.

To earn points under this Action Item, the community must show retention or creation (within 30 years of project completion) of tree canopy coverage that meets the following:

Units/Acre = development density
% = Percentage tree canopy coverage

Units/Acre	%
Fewer than 4	50
4-9	40
10-25	33
26+	25

Note: if a development's tree coverage consists of over 50% conifers, it may reduce the above percentages by 5% to reflect conifers' superior stormwater management function.

Note: exclude right-of-way areas when determining tree canopy coverage percentages.

how: Explicit tree preservation goals (including percentage of tree cover) should be established early in the design process and integrated with decisions of home and road placement.

The site inventory (Action Item 1-4) and pre-development site study (Action Item 2-60) should include a complete accounting of existing tree species' locations and approximate ages. Refer to the *Low Impact Development Technical Guidance Manual for Puget Sound* (see *Resources*) for information on creating a thorough site inventory.

Work with a landscape architect or other qualified professional to model percentage canopy coverage in 30 years' time, both preserved and created.

considerations: Preserving vegetation and native soils (Action Items 2-25 and 2-26) goes hand-in-hand with tree canopy preservation. Canopy also raises a project's Green Factor score (Action Item 2-42). During construction, phased grading (Action Item 3-1) will protect trees from damage.

Cluster development (Action Item 2-22) facilitates preservation of large stands of trees, which offer better ecological function than individual specimens. Shading of hard surfaces is one option for achieving points under Action Item 2-33.

When orienting homes for solar access (Action Item 2-48), also consider how trees' mature heights will interact with any passive and active solar strategies planned for homes.

resources:

Low Impact Development Technical Guidance Manual for Puget Sound (Chapter 4):
www.psp.wa.gov/LID_manual.php

American Forests:
www.americanforests.org/

Seattle Green Factor tree list:
www.seattle.gov/dpd/Permits/GreenFactor/GreenFactorTools/



Action Item Rationale:

Tree canopy provides a site with valuable ecosystem functions as well as beauty and character.

Trees, especially conifers, intercept substantial amounts of stormwater, reducing burdens on stormwater management facilities. Trees shade streams, roads, streets, sidewalks and homes, protecting salmon habitat and reducing the urban heat island effect.

In addition, trees capture and store carbon, helping lower a community's carbon footprint, and provide air filtering functions.



Action Item 2-42

Use Green Factor

Points: 5-15

what: The City of Seattle’s *Green Factor* ordinance requires projects within certain development zones to achieve a minimum percentage of landscaping or its functional equivalent. The percentage is calculated using a worksheet supplied by the City. By selecting from a menu of options that increase landscaping or environmental function, a project increases its Green Factor score. The Green Factor establishes different weightings for various green features: large trees are worth more than grass; bonus points are available for rainwater harvest and pervious paving. The project enters the square footage of each type of green element into the worksheet to calculate its Green Factor score.

To earn points under this Action Item, the community must meet or exceed the Green Factor score below that corresponds with the project’s development density.

DD = development density (units/acre)
GF = Green Factor score

DD	GF	Points
5-9	1.00	5
10-25	0.75	10
26+	0.60	15

Note 1: projects with densities fewer than 5 units per acre are not eligible for points under this Action Item.

Note 2: City of Seattle projects must exceed existing Green Factor requirements for their zoning to be eligible for points under this Action Item.

how: Review the Seattle Green Factor scoring protocol (see *Resources*) early in the site planning process to determine strategies. Green Factor is a flexible system that allows for a customized approach based on site variables and developer priorities. Work with a landscape architect with demonstrated experience using the Seattle Green Factor.

The Green Factor’s scoring methodology

allows for dense sites, including multifamily, mixed use and commercial buildings with limited or no ground-related open space to gain points (see *Considerations*).

considerations: Preserving existing vegetation (Action Item 2-26) can help boost a project’s Green Factor score, since preservation is weighted preferentially in the Green Factor scoring sheet. Extensive tree canopy (Action Item 2-41), green roofs (Action Item 2-7), rainwater harvest (Action Item 2-9), water features (Action Item 2-58) and pervious paving (Action Item 2-31) also help a project increase its Green Factor score.

Denser development (Action Item 2-21) will face more challenges attaining a high Green Factor score, but this is accommodated for in the point distributions and score thresholds for this Action Item.

resources:
Seattle Dept. of Planning and Development: Green Factor: www.seattle.gov/dpd/permits/greenfactor/Overview/

American Forests: www.americanforests.org/resources/urbanforests

Center for Watershed Protection: Conserving and Planting Trees: www.cwp.org/documents.html (click on *Urban Watershed Forestry Manual Series*)



Action Item Rationale:

Increasing green elements in a community improves aesthetics, helps cool dense urban environments, and reduces stormwater management burdens.

Green Factor also rewards the preservation of existing trees, and the inclusion of elements with community benefit, including edible landscapes and public water features.

Action Item 2-43

Rural projects of more than 40 homes: conduct a traffic study for wildlife and wildlife crossing aids: culverts, underpasses, overpasses

Points: 15



what: Roadway development often bisects wildlife travel and migratory routes, fragmenting habitat and resulting in road kills. Rural development in particular presents a hazard by fragmenting the diminishing amount of remaining contiguous habitat. *Wildlife traffic studies* provide information on wildlife movement patterns within and through the project, identifying travel routes and the species that use them.

To earn points under this Action Item, complete all of the following:

- Commission a traffic study by a qualified professional to determine hazards posed by existing and proposed roadways in and adjacent to the development. The study must include at least one onsite workshop with one or more trained biologists. The study findings must be compiled in a report.
- Produce a map of the site indicating wildlife movement routes and wildlife/traffic “hot spots.”
- Develop a plan for facilitating safe wildlife movement in any areas identified as problematic, and incorporate this plan into the community’s road and lot design.
- Design and install any crossing aids determined necessary by the study.

Note: to be eligible for this Action Item, the site must be suburban or rural prior to development (with an initial development density of 9 units or fewer per acre), AND must be slated to have 40 or more total units upon build-out.

how: Commission one or more trained biologists to conduct traffic analyses using maps and data from state and federal agencies enhanced by onsite observational studies. Nongovernmental organizations with missions related to wildlife protection, including The Nature Conservancy and American Wildlands, may also provide data and resources.

A site habitat assessment (Action Items 1-4 and 2-60) can be enhanced with study information from trained wildlife biologists revealing wildlife movement patterns on the site. This in turn informs the placement of roads and homes such that interference with wildlife routes is minimized.

Where avoidance is impossible, a variety of crossing aids are available, depending on the species impacted. These can range from culverts for small species such as badgers, to vegetated overpasses for large fauna like brown bears.



Action Item Rationale:

Habitat fragmentation (see Action Item 2-24) is a key factor reducing the resilience of native species. Wildlife crossing aids can dramatically reduce the incidence of road kills and allow wildlife forage and migration.

Crossing aids can also reduce human safety hazards presented by automobile-wildlife collisions.

Action Item 2-43

considerations: Creating variable lot sizes (Action Item 2-39), clustering homes on the site (Action Item 2-22) and retaining existing trees and vegetation (Action Item 2-25) provide the flexibility to avoid developing the more sensitive areas of a site. On tracts of land known to be rich with wildlife, consider permanent land set-asides (2-61).

Traffic calming approaches (Action Item 2-27) can help both humans and wildlife avoid automobile collision hazards.

Plan for human–wildlife interaction (Action Item 4-22), and develop interpretive materials (Action Item 4-16) to educate residents and visitors about wildlife activity. Include this information in the green community guide for residents (Action Item 4-15) as well.

resources:

“Designing to accommodate wildlife, habitat connectivity and safe crossings”
www.environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/

This expansive resource provides information on conducting a wildlife study and designing for various types of crossings.

Washington State Department of Fish and Wildlife:

Comprehensive Wildlife Conservation Strategy:
wdfw.wa.gov/conservation/cwcs/

Priority Habitats and Species map:
wdfw.wa.gov/mapping/phs/

Action Item 2-44

Develop and implement
integrated mobility plan

Points: 30



what: *Integrated mobility* describes a combination of design features and strategies that provide residents with a robust, holistic and interrelated variety of transportation options.

To achieve points under this Action Item, the community must:

1. Develop an integrated mobility plan. The plan must be produced by an urban planner, transportation consultant, or other qualified professional, and address at minimum the following:

- Specific strategies to increase high occupancy vehicle (HOV) use and alternatives to single occupancy vehicle (SOV) use. Creative strategies will provide incentives to encourage the use of HOV and non-motorized modes and facilitate their access.
- Specific strategies to improve pedestrian and bike safety and access. Many Action Items help achieve and preserve a pedestrian-friendly environment. For example, see Action Items 2-27 (Complete Streets), 2-22 (clustering homes on site), 2-21 (design for density), 1-2 (locate community near urban centers), and 1-3 (locate for access to non-motorized and mass transit).
- Alternatives to SOV use for work and play through the allocation of capital funds for making physical site improvements (e.g., a mobility center, footpaths, bicycle storage, or a sheltered carpool waiting area). Monies could be drawn from a transportation mitigation fund if required to offset the development's traffic impacts.

- Measurable performance goals and a plan for evaluating success. Examples of performance goals include: targets for HOV vs. SOV use per capita; reduction of vehicle miles traveled compared to regional averages or a reference community.
- In jurisdictions that require developers to place cash into a transportation mitigation fund, the occupants and community have an opportunity to develop mobility centers and programs.

2. Provide evidence that plan elements have been successfully implemented within the community. Include at least 5 on this list:

- Pedestrian-friendly access routes beyond code.
- Commuter lot near arterials and collector streets.
- Onsite permanent transportation shelters.
- Dedicated bike lanes on streets with speed limits greater than 25 MPH.
- At least one continuous pedestrian route per dwelling connecting to transit opportunity.
- Sidewalks on each side of the street where commercial and/or residential structures occur.
- Planting strips at least 5 feet wide with street trees between sidewalks and curbs along residential streets.



Action Item Rationale:

By encouraging residents to walk, bicycle, and/or use mass transit options, a community lowers its collective greenhouse gas footprint, enhances public health, and can create more livable communities.

An integrated mobility approach helps ensure that the design and infrastructure elements that facilitate mobility function together as a cohesive whole.

Action Item 2-44

how: Developing a truly integrated mobility approach for a community requires careful planning and consideration of how the proposed elements interact. Information on existing conditions, projected population and demographic information is needed to properly plan for optimal mobility. Look for transportation planning professionals or planning firms with demonstrated experience in the integrated mobility approaches being considered for the community.

Dedicate time during the project's design charrettes (see 4-Star Requirements) to identify elements of the integrated mobility plan. Conduct research prior to any charrette to seed discussion of options and solutions.

Urban infill developments offer increased opportunity to achieve ambitious integrated mobility goals compared to suburban developments, due to increased density, proximity to mass transit, access to community amenities, and connectivity to the existing transportation networks.

considerations: All Built Green Action Items related to development patterns, population density, and transportation have bearing on integrated mobility planning. Examples include the proximity of dwelling units to community services (Action Item 2-35), and the connectivity of roads and paths (Action Item 2-55). Community amenities can include bicycle storage and other mobility-enhancing elements (see Action Item 2-40).

resources:

Puget Sound Regional Council transportation information:
www.psrc.org/transportation/

Reconnecting America:
www.reconnectingamerica.org

Washington State Commute Trip Reduction Efficiency Act (2006)
Chapter 468-63 WAC: Commute Trip Reduction Program

The Washington State Dept. of Transportation provides city-by-city information on commute and travel services as part of their commute trip reduction efforts, including cities in King and Snohomish counties. Listings include carpool, vanpool, airports and shuttle services, buses and trains.
www.wsdot.wa.gov/Choices/Northwest/default/#King

Action Item 2-45

If design calls for cul-de-sacs, hammerheads, or other dead ends, connect ends with paths

Points: 1-4



what: Dead ends are streets that terminate without a vehicular outlet.

To earn points under this Action Item, connect the following percentage of dead-ends with paths:

Percentage	Points
25	1
50	2
75	3
100	4

OR:

No dead-ends within development:
4 points

In addition, design the radius of cul-de-sacs to the minimum required to accommodate emergency and maintenance vehicles, and place them no farther than 500 feet from the cul-de-sac entrance.

how: Depending on the size and complexity of the development, work with a transportation planner to optimize the transportation network for multiple modes of travel. Include paths as part of a development's integrated mobility plan (Action Item 2-44).

Avoid dead end streets, and align streets with the larger street network (Action Item 2-46).

considerations: Connectivity is a component of integrated mobility (Action Item 2-44) and designing for Complete Streets (Action Item 2-27).

Where dead-end streets exist, design turn-arounds that minimize impervious surface area (see Action Item 2-30).

resources:

King County Healthscapes information, including the *Land Use, Transportation, Air Quality and Health* study:
www.your.kingcounty.gov/healthscape/publications.aspx



Action Item Rationale:

Increased transportation connectivity results in better access for walkers, bicyclists, and the mobility impaired. A more walkable community reduces vehicle miles traveled and promotes community health.

The King County Land Use, Transportation, Air Quality and Health study (2005) showed, among other benefits, that the more connected a neighborhood's street network, the lower the average resident obesity rates.



what: All communities exist within a larger social and infrastructural context. This Action Item encourages communities to mesh with the surrounding transportation network.

The intent of this measure is to reduce traffic congestion within and around the neighborhood, and optimize the existing transportation infrastructure.

To earn points for this Action Item, connect neighborhoods to/across surrounding collectors and arterials in the following ways:

- Create a continuous network of minor local streets that connect to the surrounding street network at an average of at least every 500 feet (approximately 1/8 mile), and in no instance less frequently than every 600 feet, and
- Create a continuous network of major local streets that connect to the surrounding network at an average of at least every 1320 feet (approximately 1/4 mile).

An exception to the above absolute minimum connectivity requirement of 600 feet is made for areas of the development with sensitive ecological features that will be impacted by the establishment of roads.

Note: Recent research indicates that connectivity indices, which are sometimes used by local governments to evaluate the connectivity of street designs, do not yield consistent information on actual connectivity. Instead, limits on block size and requirements on frequency of connections yields more consistent results (see *Resources*). For this reason, BUILT GREEN uses connectivity frequency as the performance metric in this Action Item.

how: Traffic planners suggest that grid or hybrid pattern street layouts offer the highest level of connectivity and traffic flow. Find a discussion of grid, hybrid, and curvilinear street design and its impact on the amount of impervious surface in the *Low Impact Development Technical Manual for Puget Sound* (see *Resources*).

Consult a transportation planner—preferably one with experience in ecologically sensitive and public health oriented transportation design.

Action Item 2-46

Provide connectivity with surrounding street network

Points: 7



Action Item Rationale:

Connecting minor and major local streets to the surrounding network encourages pedestrian travel and reduces traffic congestion by providing more options for road traffic, helping create integrated mobility (see Action Item 2-44). Enhanced connectivity increases the efficiency and resiliency of the transportation system.

A King County study found that a 5% increase in a neighborhood's walkability resulted in significant benefits, including a 6.5% reduction in per capita miles driven each day; a 5.5% reduction in major air pollutants emitted; a 32% increase per person in time spent being physically active; and a lower community member average body mass index.

Action Item 2-46

considerations: Note that this strategy can conflict with curvilinear street designs (Action Item 2-28). Hybrid street patterns reduce the need for excavation and slow traffic while not necessarily limiting connectivity.

In areas where connecting to the larger transportation infrastructure is impossible or undesirable (e.g., connectivity would adversely impact ecologically sensitive areas), consider pedestrian connectivity (Action Item 2-45). Evaluate the need for wildlife crossings (Action Item 2-43) on large rural sites.

While developing a plan for street connectivity, design to minimize paving in the first place (Action Item 2-30), and incorporate stormwater retention and detention (Action Items 2-8, 2-11) and permeable paving options (Action Item 2-31). Specify recycled content paving materials (Action Item 2-32).

resources:

Low Impact Development Technical Guidance Manual for Puget Sound

See Chapter 3.2 for street patterns and their impacts.
www.psp.wa.gov/LID_manual.php

Planning for Street Connectivity: Getting from Here to There
by Susan Handy et al.
(American Planning Association, 2003)

Pedestrian and Transit-Oriented Design
by Reid Ewing and Keith Bartholomew
(Urban Land Institute, 2013)

King County's HealthScape program:
<http://www.kingcounty.gov/transportation/HealthScape.aspx>



what: The BUILT GREEN program not only certifies communities; it also certifies homes, remodels and multifamily buildings. Similar to the Communities program, these certifications are earned by achieving points via a menu of Action Items. BUILT GREEN's 4-Star level is the second highest in the system.

To earn points under this Action Item, the community must require all builders in the development to certify their homes through the BUILT GREEN program at the 4-Star level or higher. Language reflecting this must be included in the community's development agreements, as applicable.

Market research in King and Snohomish Counties has shown that BUILT GREEN certified homes sell faster and at higher price points than non-certified homes, even in depressed markets, proving the consumer demand is there.

how: Decide early and at what level to pursue this Action Item, and craft language to this effect to add to contractor or builder contracts. Particularly for larger communities with multiple homebuilders, including a BUILT GREEN requirement within the development agreements helps establish expectations and obligations. Community developers are required to provide a BUILT GREEN orientation for builders (see 3-Star Requirements). Increase the likelihood of builders attaining the desired star level for their homes by coupling the requirement with a charrette (Action Item 4-1) and builder training materials (Action Item 4-2).

This level of BUILT GREEN achievement requires the use of third-party verifiers to confirm attainment of various Action Items on the checklist. Communicate to builders that an independent party will be evaluating their actions.

considerations: Many of the Action Items within the BUILT GREEN Communities checklist support the attainment of Action Items within the Homebuilder and Multifamily checklists.

To help contractors within the community be more successful in their BUILT GREEN endeavors, supply training and offer bulk purchasing and other green building services for builders (Action Item 3-34), including hiring BUILT GREEN verifiers.

resources: For more information on BUILT GREEN Homebuilder and Multifamily rating systems, visit www.builtgreen.net.

Action Item 2-47

Require all homes in development to meet BUILT GREEN 4-Star level or higher standards

Points: 15



Action Item Rationale:

Requiring homes to be built to the BUILT GREEN 4-Star standards further enhances the development's environmental and health branding.

While building to the 4-Star level can mean design and construction cost increases, the premiums can typically be justified by consumer demand for energy-efficiency, indoor air quality, and better home performance through durable and low-maintenance materials.

Action Item 2-48

Orient lots for passive solar and solar access

Points: 5-15



what: *Solar access* refers to a property's ability to receive sunlight without obstruction from neighboring properties. Ideal lot orientation for solar access is due south, with the long side of the lot facing south. This orientation allows for a proportionally larger amount of window area on the south side of the home and reduces overheating from the west in summer months.

To earn points under this Action Item, configure the community's building lots to meet the following:

- Elongated along the east-west axis
- Featuring a length-to-width proportion of at least 1.5:1.
- Oriented (long side) within 20 degrees of due south.

Points are awarded based on the percentage of lots within the community meeting all three of these criteria:

Percentage	Points
50	5
80	8
100	15

how: Determine the appropriate orientation to maximize solar benefits for buildings. Use this information to design lot parcels and street layouts.

Passive solar design can be challenging in the Pacific Northwest, since many of our prime views face west or east, toward the Cascades or Puget Sound. Homes are generally oriented to maximize views and face streets. This can result in large expanses of glass facing east and/or west, producing summer overheating. Provide built examples of alternatives for prospective home buyers: optimize model homes for passive solar benefit to provide potential homebuyers the opportunity to experience the benefits of solar orientation.

considerations: Although obstructions in southerly directions reduce passive solar performance, hills or trees to the north of a home can buffer it from winter winds.

Development density (Action Item 2-21) and variable lot sizes (Action Item 2-39) also have impact on lot configuration, as does clustering housing (Action Item 2-22) or using alternative development patterns like cohousing (2-38).

Lots optimized for solar exposure usually result in an east-to-west oriented street grid. Take this into account when determining whether to design streets that conform to the site's existing terrain (Action Item 2-28), and when connecting to the larger road network (Action Item 2-46).

To complement lots oriented for solar, consider covenants that protect individual homes' ability to install rooftop solar arrays (Action Item 4-11).

Lot orientation is the first step in optimizing onsite solar energy. Homebuilder charrettes (Action Item 4-1) and field guides (Action Item 4-2) encourage builders to take advantage of well-oriented lots. For example, hire a passive solar design expert to deliver a presentation to builders at the required BUILT GREEN orientation (see 3-Star Requirements) explaining the mechanics and benefits of passive solar design strategies.

resources:

Building America Best Practices Series: Volume 5 (Marine Climate Zone) describes lot orientation in the Site Planners chapter:
www.eere.energy.gov
 (Key the title into the search field on the home page.)



Action Item Rationale:

Even in the cloudy Pacific Northwest, passive solar design can significantly reduce a home's heating-based energy demand.

Proper lot orientation greatly facilitates both passive solar home design and optimized placement of roof-mounted solar modules.



what: *District energy* refers to utilities that provide heat, cooling, hot water, and/or electricity at the neighborhood or district level. District energy systems can run on conventional fossil fuel stocks or use renewable sources, including biomass, geothermal and solar thermal. They can also be part of combined heat and power (CHP) facilities in which fuel is used to generate electricity and the byproduct heat of combustion supplies district heating.

To earn points under this Action Item, a community must show that at least 50% of the community's modeled energy demand for heating, cooling, and domestic hot water will be supplied by the district energy system.

There are several district energy system types:

- *Conventional district energy systems:* These consist of one or more facilities that produce hot and chilled water (or less commonly, steam) that is then distributed via underground pipes to individual buildings. Such systems can be powered by fossil fuels, renewable energy sources, or a combination thereof. District energy systems have been in use for over a hundred years; new systems have been installed in Europe over the last few decades and are now making headway in the United States and Canadian markets as well.
- *Neighborhood-scale geothermal heat pump systems:* These systems install long loops of pipe into the ground, either horizontally in trenches or vertically in wells, through which water or a mix of water and antifreeze is circulated. Such systems take advantage of the stable subsurface earth temperatures to maximize the efficiency of heat pump technology for water and space heating. The Issaquah zHome project is a local built example of such a system (see *Resources*).

- *Waste heat capture:* in areas with sewer infrastructure, it is possible to install heat exchangers to capture residual heat in wastewater for use in home heating, similar to geothermal heat pumps.

Combined heat and power:

Also called cogeneration, CHP is a highly efficient means of generating heat and electric power from the same energy source. A conventional power plant can lose up to 70% of the energy available in its fuel source as waste heat. CHP captures that heat, resulting in efficiencies as high as 80 percent.

According to the CHP industry association, CHP plants currently represent 12 percent of the generating capacity in North America. However, these plants are usually very large and serve regional power needs. Microturbines are making it feasible to apply CHP on a much smaller scale, such as hospitals, campuses, industrial plants, and neighborhoods.

CHP facilities can be run on fossil fuels (natural gas is most common), municipal solid waste (currently in Europe), or renewable fuels including biogas from composting facilities, dairy operations and food processing facilities, wastewater treatment plants, or wood waste.

Action Item 2-49

Use district energy (includes community geoexchange, geothermal)

Points: 20



Action Item Rationale:

According to the US Department of Energy, district heating can reduce heating costs by 30-50% compared to typical home-based systems.

Savings from combined heat and power systems can be even greater, as they provide essentially free hot water for space heating and domestic hot water. While the up-front cost is high, the long-term payback provides significant value to the community.

Fossil fuel extraction, refining, distribution and use results in significant environmental impacts. District energy's fuel efficiency and/or renewable fuel opportunities reduce these impacts.

Action Item 2-49

how: District heating systems are complex engineering projects and significant infrastructure investments. Hire qualified and experienced firms for system design, specification, and installation.

To date, cogeneration facilities in the United States have been primarily employed in large institutional settings. Given the relative novelty of neighborhood-scale systems in the Pacific Northwest region, it may be challenging to find firms with demonstrated expertise. Look for industry certifications in the selected systems: for example, the International Ground Source Heat Pump association offers accreditation and certification for drillers, installers, and geothermal system designers.

The decision to install a district-scale system must be made early in project planning, since installation of system infrastructure will precede roads and buildings. Integrate the design of waste heat capture systems with stormwater and wastewater conveyance systems.

Federal and state incentives may be available to help offset the cost of alternative energy systems. Potential funding examples include the US Dept. of Energy Industrial Technologies Program, the US Forest Service Healthy Forest Wood-to-Energy Projects and Woody Biomass Utilization Grants, and Energy Efficiency and Conservation Block Grants. See *Resources* for links.

Examples of district energy in Washington State include Seattle Steam, which converted from a natural gas-fueled system to wood waste fuels in 2009, and the Quillayute Valley School District in Forks, which uses a wood waste boiler system to heat the district's middle school, with plans to expand to the adjacent high school.

Community-scale district systems will require legal and organizational mechanisms to own, manage, and maintain.

Action Item 2-49

considerations: In general, district-scale systems are easier to install in new developments, as they require substantial trenching to lay system infrastructure. Certain infill site developers may find it a challenge to install district systems.

Systems that require extensive grading or alteration of existing topography may run counter to goals to minimize a community's cut-and-fill activities (Action Item 3-5).

Neighborhoods with shared community space may find opportunities for the placement of cogeneration facilities, or community solar thermal or photovoltaic arrays (Action Item 2-50). Clustering dwelling units and/or increasing development density (Action Item 2-22 and 2-21) may lower the infrastructure costs of such systems by reducing the amount of trenching and materials used.

resources:

International District
Energy Association:
www.districtenergy.org

WSU Energy Extension's HEATMAP
district heating simulation software:
[www.energy.wsu.edu/
renewableenergy.aspx](http://www.energy.wsu.edu/renewableenergy.aspx)

BC Climate Action Toolkit: District En-
ergy Systems information:
[www.toolkit.bc.ca/tool/
district-energy-systems](http://www.toolkit.bc.ca/tool/
district-energy-systems)

City of Seattle's Green Building Task
Force: Case Study of Vancouver's
District Heating Program:
[www.seattle.gov/environment/
documents/GBTF_NewBldg_
Vancouver_Heating_Case_Study.pdf](http://www.seattle.gov/environment/
documents/GBTF_NewBldg_
Vancouver_Heating_Case_Study.pdf)

International Ground Source
Heat Pump Association
www.igshpa.okstate.edu

zHome: This leading-edge project in
Issaquah includes information on the
ground-source heat pump system used to
supply heat and domestic hot water.
www.z-home.org/blog/dig-deeper/
(scroll to the *Energy* section).

Action Item 2-50

Use alternative heat and energy sources for community structures

Points: 10



what: The intent of this Action Item is to encourage use of community structures within the development for housing alternative heat and energy production infrastructure (e.g., installing a photovoltaic array or solar hot water system on a co-housing development's common house, or housing a fuel cell in a portion of a mixed use development's recreation center).

For the purposes of this Action Item, *community structures* are defined as built elements within the community that are commonly owned and maintained. Acceptable alternative heat and energy sources include photovoltaic, solar hot water, biomass, geothermal, and fuel cells. Other alternative energy sources may be approved at the discretion of the BUILT GREEN Director.

To earn points under this Action Item, the community must install alternative heat and/or energy sources on or in one or more community structures. The installation must generate enough energy on an annualized basis to displace least 20 percent of the structure's modeled energy load, or 10 percent of the combined energy load of all community structures.

how: Commit to installing alternative energy infrastructure early in the project design process. Work with renewable energy consultants to optimize the alternative energy investment for the project. Site conditions, available space, and other alternative energy project goals feed into the decision making process.

Set aggressive energy conservation goals for the structure and the development overall to make it easier for the installed renewable energy production elements to provide a significant percentage of the building or community's energy demand. See Action Item 2-50 for information and resources related to alternative energy.

The following alternative heat and energy sources are options for Built Green communities:

- *Photovoltaics.* Photovoltaic (PV) modules convert sunlight directly into electricity without pollution or carbon dioxide emissions. Unlike generators, they operate silently and require little maintenance. Once installed, PV produces essentially free electricity to power building functions, feeding excess power back into the utility grid. PV systems are most often installed on rooftop racks and require shade-free sun access. Some PV models are integrated into roofing, fenestration, overhangs, or wall assemblies.
- *Solar thermal systems.* Most solar thermal systems use collectors to heat fluid that is then passed through a heat exchanger for any number of domestic, commercial or industrial hot water uses.
- *Fuel cells.* In principle, a fuel cell operates like a battery, generating electrical current by means of an anode, cathode and intervening membrane. Unlike a battery, a fuel cell does not require recharging, producing energy in the form of electricity as long as fuel is supplied, most often hydrogen. (See Action Item 2-50 for more on fuel cells.) Hydrogen is generated primarily through the process of electrolysis; techniques using algae are also emerging. Hydrogen produced by these renewable means meets the intent of this Action Item.
- *Wind.* Small-scale wind turbines can generate electricity, and a variety of turbines are now on the market. Studies show that building-related wind turbines seldom produce even a fraction of their rated generating capacity. They can also generate nuisance noise, and be harmful to flying wildlife. Research building-related wind options to determine their potential compared to field-tested options.



Action Item Rationale:

Alternative energy sources lower a community's overall carbon footprint and reduce reliance on fossil fuels. By placing alternative energy sources on community structures, a public education benefit is realized.

Additionally, a shared or co-owned alternative energy system can lower the barrier of entry to alternative energy sources, which can be beyond the financial reach of individual homeowners.

Action Item 2-50

- *Geothermal.* See Action Item 2-49 for a description of this technology. Common buildings can take advantage of nearby common space for laying the extensive pipe network associated with geothermal systems.
- *Sustainable harvest biomass.* Wood and cellulosic waste materials can be used as fuel in boilers and generators.

Conservation is almost always cheaper and more cost-effective than producing energy, so look first for ways to reduce the community's energy demand. Work with energy efficiency and renewable energy consultants to determine the most effective way to incorporate energy efficiency and alternative energy into the project. Look for tax rebates and incentives for alternative energy offered at the state and federal levels. Some utilities also offer renewable energy incentives (see *Resources*).

considerations: A community structure (Action Item 2-40) is required to pursue this Action Item.

The structure and layout of the community also plays an important role. For example, cohousing communities (Action Item 2-38) almost always feature community structures. Increasing a community's development density by clustering housing (Action Item 2-22) or providing a variety of housing types (Action Item 2-36) may increase the flexibility afforded the community in terms of installing or using different alternative energy sources.

For solar-based alternative energy systems, consider density and placement of tree canopy (Action Item 2-41) to ensure solar modules remain shade-free as tree canopy expands over time.

resources:

US Dept. of Energy's Energy Efficiency and Renewable Energy information
Includes detailed descriptions of alternative energy sources and technologies:
www.eere.energy.gov

WSU Energy Extension's Renewable Energy portal:
www.energy.wsu.edu/renewableenergy.aspx

The WA Dept. of Revenue offers tax incentives for electricity generated by solar, wind, or anaerobic digester:
www.dor.wa.gov/content/FindTaxesAndRates/TaxIncentives/IncentivePrograms.aspx#Energy

Action Item 2-51

Light pollution reduction

Points: 12



what: In essence, *light pollution* is any human-generated light source that falls on an unintended surface or reflects or is directed into the night sky. Such “light trespass” causes disruption to human or wildlife activity and safety, and can impede night sky viewing. Performance specifications for light pollution reduction are established by the International Dark-Sky Association (IDA).

To earn points under this Action Item, exterior lighting design throughout the community must meet Dark-Sky standards outlined in the IDA/IESNA Model Lighting Ordinance, and all exterior lighting applications must utilize luminaires with the IDA Fixture Seal of Approval (see *Resources*).

how: Have the project architect or a professional lighting designer explicitly outline the project’s light pollution reduction objectives, integrated with any safety and energy efficiency goals for the exterior lighting scheme.

Use the specifications outlined in the IDA/IESNA Model Lighting Ordinance to establish illumination levels for public areas, and create a lighting design that complies with these levels. Find IDA-approved lighting fixtures by visiting the IDA website (see *Resources*).

A common approach to combating light pollution is to reduce exterior “cobra-head” pole light mounting heights from the standard 25 feet to 18 feet. Take both pedestrians and auto traffic into account when exploring lighting options, and design interior and exterior lighting so no direct-beam illumination leaves the site. In general, LED lighting is more directional than other light sources, making for better light trespass control. LED lighting is also significantly more energy efficient, and features a longer service life compared to most other lighting types.

considerations: Complement the light pollution reduction provisions outlined in this Action Item by establishing builders’ guidelines on exterior lighting (Action Item 4-4). Similarly, consider including Dark-Sky goals and information in any builder orientation and training materials developed for the project (Action Item 4-2). Another way to encourage builder adherence to Dark-Sky rules is to coordinate a bulk purchase (Action Item 3-34) of compliant exterior lighting fixtures.

resources:

The International Dark-Sky Association maintains standards for outdoor fixtures, creates model dark sky ordinances, and provides other lighting guidance: www.darksky.org



Action Item Rationale:

Satellite images of the Earth at night show the growing extent of light pollution. Given that it is neither wanted nor beneficial, it represents wasted energy. The International Dark-Sky Association estimates that poorly configured lighting wastes \$2.2 billion annually in the United States alone.

Beyond the monetary cost, light pollution can disrupt the sleep patterns of both wildlife and humans, interfere with wildlife migratory patterns, and reduce professional and hobbyist astronomers’ stargazing opportunities.



what: While BUILT GREEN has focused on residential buildings and developments, other organizations have created systems to certify the environmental performance of commercial and other non-residential building types. Green Globes, LEED™ and the Living Building Challenge are three examples. See *Resources* to learn more about these rating systems.

To earn points under this Action Item, earn certification on each non-residential building in the community representing more than 2,000 square feet of occupied space through one or more approved rating system. Each building must earn at minimum the entry-level certification for the selected rating system. Other green building rating systems meeting the intent of this Action Item may be substituted for the approved programs at the discretion of the BUILT GREEN Director.

Note: communities without nonresidential buildings with more than 2,000 square feet of occupied space are ineligible for this Action Item. Temporary structures of any size are excluded from these requirements.

how: Research the different rating systems (see *Resources*) to determine which makes the most sense for the project. Set goals for the level of certification early in the planning process to help a project capture synergistic opportunities between non-residential buildings and the community's other green certification goals.

When hiring design and construction professionals for the project, look for firms and individuals with demonstrated experience in the chosen certification program. Clearly state certification goals in contract documents, and develop specifications to meet standards represented by credits within the selected certification system.

considerations: Green strategies and designs employed at the community level can help capture points at the building scale. For example, LID techniques used within the community may help a non-residential building gain site and water credits in LEED or Green Globes, or meet the site-related imperatives of the Living Building Challenge. Another example: installing renewable energy systems on community buildings (Action Item 2-50) is a common credit within green building certification systems.

resources:
Green Globes
(The Green Building Initiative):
www.thegbi.org/green-globes/

LEED
(US Green Building Council):
new.usgbc.org/leed/rating-systems

Living Building Challenge
(International Living Future Institute):
www.ilbi.org/lbc

“Green Building Certification System Review,” prepared for the US General Services Administration (2012), compares LEED, Green Globes, and the Living Building Challenge for GSA buildings:
www.gsa.gov/graphics/ogp/Cert_Sys_Review.pdf

Action Item 2-52

Environmental certification of non-residential buildings

Points: 15



Action Item Rationale:

Certifying all buildings in a BUILT GREEN Community under an environmental certification program makes thematic and marketing sense. Prospective homebuyers will expect high performance, environmentally responsible buildings throughout their green community.

Green certified buildings often save energy and water, protect occupant health, and are more durable and of higher quality than their non-certified counterparts.

Action Item 2-53

Provide for community scale recycling and composting

Points: 10



what: Community scale recycling and composting systems address the waste diversion opportunities of common areas within a development, as well as providing infrastructure for all individual and multifamily dwelling units to participate in recycling and composting activities.

To earn points under this Action Item, the community must provide:

- Secure, wildlife and pest-proof storage for recycling and composting (including yard waste and food waste) for all homes and multifamily residences within the community.
- Easily accessible recycling receptacles at all public facilities and common outdoor spaces.
- Compostable materials receptacles at all indoor and outdoor public spaces where food waste is generated.
- Contracts with recycling and composting services for regular pickup of materials generated in community facilities and spaces if not provided by the jurisdiction's solid waste authority.
- Onsite composting facilities and/or backyard composting programs for community organics, including yard waste and food waste if compostable materials pickup is not offered by the jurisdiction's solid waste utility.

how: Early in the design process, identify space convenient for collection, secure storage and unloading of recyclable materials. Encourage proper materials sorting by clearly and uniformly marking collection containers located in all public spaces, particularly outside common area buildings, plazas, and other public spaces.

Space for recyclable materials container storage and unloading is likely required by local code. Seattle Municipal Code maintains specifications for space required for recycling receptacle storage in commercial properties that can be used as a guide for projects (see *Resources*).

Solid waste and recycling specialists from local utilities or King and Snohomish Counties can offer technical assistance or referrals to private businesses specializing in these services.

If contracting with a private waste hauler, note that accepted materials vary between haulers. Research the materials accepted and select the hauler best aligned with the community's recycling and waste prevention plan.

Onsite composting facilities must be carefully designed, maintained and monitored to avoid both pests and odors. Community-scale onsite composting programs can take a variety of forms. The simplest facilities process yard waste only. With proper design or the selection of plug-and-play, pest-proof and self-contained composting systems, food wastes can be included.

King County's onsite food waste composting study examined the efficacy and maintenance intensity of several off-the-shelf onsite systems (see *Resources*).



Action Item Rationale:

Recycling infrastructure facilitates the diversion of useful resources from a community's waste stream. Public space recycling educates residents and visitors, reinforcing recycling activities at home.

Recycling and composting are often more cost effective than disposal.

Composting food and yard waste yields significant benefits in terms of avoided methane production from landfills. As organic material decomposes in the oxygen-starved environment of a landfill, anaerobic bacteria generate methane, a greenhouse gas twenty times more potent than CO₂. And composting onsite yields valuable compost to enhance site soils.

Action Item 2-53

considerations: For composting programs that provide for storage and/or composting of food scraps, be sure to consider human/wildlife interactions (Action Item 4-22) and pest management (Action Item 4-14).

Interpretive signage (Action Item 4-16) can highlight the public space recycling services and goals and act as a prompt to encourage community participation.

resources:

King County recycling info:
your.kingcounty.gov/solidwaste/garbage-recycling/recycling.asp

Snohomish County recycling info:
www1.co.snohomish.wa.us/Departments/Public_Works/
(click on *Solid Waste*, then *Recycling*)

“Using ‘In-Vessel’ Systems to Compost Food Waste Residuals”
by King County, 2004.

This report describes the results of a pilot program in which King County provided different onsite food composting systems to food waste generators.

your.kingcounty.gov/solidwaste/garbage-recycling/onsite.asp

City of Seattle Municipal Code
23.54.040: Solid Waste and Recyclable Materials Storage and Access.

Sets minimum area, access and configuration requirements for individual and shared solid waste and recyclable materials storage. Search for the code language by entering the code section number at clerk.seattle.gov/~public/code1.htm

Action Item 2-54

Provide for community scale
rainwater harvest

Points: 5-20



what: For a description of rainwater harvest, see Action Item 2-9. This Action Item provides points for installing rainwater harvest systems that supply the entire community's landscapes and buildings.

To gain points under this Action Item, the community must show that rainwater harvest systems displace, on an annualized basis, the following percentage of total modeled potable water demand:

Percentage	Points
10	5
20	10
30	15
40	20

how: See Action Item 2-9 for more information on rainwater harvest systems.

Express the intent to include community-scale rainwater harvest systems early in project planning. To save money and capture synergies, such systems should be integrated with onsite stormwater management, plant selection and landscape design, roof sizing, orientation, materials selection, and with building-related water conservation strategies as well.

Community-scale rainwater harvest systems can take a variety of forms. The simplest in terms of permitting and design capture and distribute rainwater for landscape use, since fewer code requirements are levied on such systems. However, systems that provide water for toilet flushing and clothes washing (applications approved by Washington State) allow for year-round productive use of harvested rainwater, and provide stormwater management benefits that some irrigation-only systems lack.

Installing systems during initial construction (which allows for pipes to be laid simultaneously with water, stormwater, or sewer infrastructure) can dramatically reduce costs. Weigh both the environmental and financial benefits of seasonal versus year-round systems.

considerations: Designed correctly, rainwater harvest systems are an integral part of a site's stormwater management strategy, furthering LID goals of maximizing stormwater management onsite (Action Item 2-1) and providing the added benefit of reducing a community's overall potable water use.

Consider including slow-release valves to cisterns to augment stormwater detention benefit during the rainy months, and directing cistern overflow to bioretention facilities (Action Item 2-8).

Native vegetation (Action Item 3-22 and 3-23) and low-water plantings (Action Item 3-15) help reduce overall water demand and open the opportunity to downsize rainwater storage cisterns, reducing development costs.

Importing reclaimed wastewater or industrial water (Action Item 3-20) can supplement harvested rainwater.

resources:

See Action Item 2-9 for resources related to rainwater harvest.



Action Item Rationale:

Onsite rainwater harvest puts stormwater—a potential nuisance—to productive use.

See Action Item 2-9 for the benefits of rainwater harvesting.



Action Item 2-55

Require shared parking for mixed-use developments

Points: 3-10

what: *Shared parking* refers to parking facilities (parking lots or garages) that serve more than one land use, rather than being dedicated to a single office, retailer, or multifamily residential building.

To earn points under this Action Item, dedicate a percentage of total commercial and multifamily parking as shared parking. Points are awarded based on the percentage of total code-required parking designed as shared parking:

Percentage	Points
20	3
30	5
40	7
50	10

Note: this Action Item is applicable only to mixed-use developments. For the purposes of this Action Item, a *mixed-use development* is one that includes both residential and commercial land uses.

This Action Item additionally requires that the areas employing shared parking provide no more parking than the minimum required by code. (See Action Items 2-56 and 2-57 for more on using mandated parking minimums as maximums.)

how: Shared parking requires multiple destinations within easy walking distance of the parking facility or facilities. High density, mixed-use development patterns are most conducive to shared parking. Work with an urban planner or transportation planner to create an optimized shared parking scenario by conducting a parking demand study.

Different land use types proximal to one another provide the ideal opportunity for shared parking, since they represent staggered parking demand. The Victoria Transport Policy Institute's *TDM Encyclopedia* (see *Resources*) cites examples of different land use types generating different peak demands.

Weekday peaks:

- Banks
- Schools
- Medical clinics
- Professional services

Evening peaks

- Auditoriums/meeting halls
- Bars and dance clubs
- Gyms, recreational facilities

Weekend peaks

- Places of worship
- Parks
- Retail shops and malls

Building massing and land use decisions play into the viability and success of approaches to shared parking. In developments with multiple building owners, deed restrictions may be required to allow cross-access to shared parking.



Action Item Rationale:

Shared parking limits the amount of land (and impervious surface area) lost to parking. This beneficially affects stormwater runoff, potentially reducing the size and cost of stormwater management infrastructure, and can open up options for more green space and/or enhanced density.

Shared parking also represents a development and maintenance cost savings.

Action Item 2-55

Codes can sometimes be modified to count on-street parking toward the minimum ratio required. Street parking is also helpful in slowing traffic and provides a buffer between pedestrians and auto traffic. Place employee and customer parking behind buildings to reduce or eliminate the need for parking lots in front of buildings.

considerations: Communities with higher development densities (Action Item 2-21) and those with clustered development patterns (Action Item 2-22) may find it easier to create shared parking, since walking distances are reduced in such developments.

Shared parking can help introduce flexibility in developments aiming to minimize the number of parking spaces available (Action Item 2-57), and provide a rationale for requesting reducing parking below code minimums.

resources:

“Shared Parking in the Portland Metropolitan Area” prepared for Portland METRO by Stein Engineering: www.reconnectingamerica.org/resource-center (type *shared parking portland* into the search bar).

Victoria Transport Policy Institute: www.vtpi.org/tdm/tdm89.htm Includes a description of shared parking.

Shared Parking by Mary Smith (Urban Land Institute, 2005). Provides information on estimating the optimal shared parking design for a mixed-use development.



SITE/WATER

what: Jurisdictions set minimums for parking based on land use classifications. Often developers exceed these minimums, assuming that the additional parking will be viewed as an amenity. A frequent result is unused parking capacity, unnecessary development cost, and excessive impervious surface.

To earn points under this Action Item, the developer must limit the number of parking spaces provided in single family, multifamily and commercial areas to the code minimum.

how: The following approaches are effective in reducing the area a community devotes to parking:

- Work with the project architect, a parking consultant, or transportation planner to optimize parking space amount and location for the code minimum.
- Integrate transit-oriented development (TOD) elements into the community (see *Considerations*) early on to reduce parking demand.
- Plan for parking on one side of the street if streets are narrow. Check to see if code allows on-street parking to count toward required parking; providing on-street parking to absorb guest cars allows these spaces to serve double duty.
- For communities with amenities such as farmers markets (Action Item 4-9) and other periodic events drawing large numbers of attendees, structural grassed areas (Action Item 2-31) can accommodate occasional parking while freeing the land for recreation when not used for cars..
- The *Low Impact Development Technical Guidance Manual* includes parking lot designs that reduce impervious area required per parking space.



MATERIALS

Should jurisdictional parking minimums inhibit a community’s ambitious parking space reduction goals, approach the community’s jurisdiction to create a pilot program for parking space reduction (Action Item 4-20).

considerations: Shared parking arrangements (Action Item 2-55) increase flexibility, helping ensure parking spaces in commercial and mixed-use contexts are put to best use.

TODs make it easier for households to function with fewer cars. Locating the community near transit hubs (Action Item 1-3) and integrating the community’s streets with the surrounding transportation network (Action Item 2-46) can effectively reduce the number of single occupancy vehicle trips.

Mixed-use developments (Action Item 2-36) place services within walking or bicycling distance, reducing the need for automotive travel. Minimizing paved parking areas is a useful for minimizing effective impervious surface (Action Items 2-1 and 2-2).

resources:

See Action Item 2-55 for parking-related resources.

King County Multi-Family Residential Parking Calculator uses current parking data to determine multifamily unit parking needs within King County: www.rightsizeparking.org

Parking Spaces / Community Places: Finding the Balance Through Smart Growth Solutions
www.epa.gov/smartgrowth/parking

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

Action Item 2-56

Use minimum parking requirements as maximums for on-street and off-street parking

Points: 15



Action Item Rationale:

Parking spaces consume potential open space and/or land that could be dedicated to additional housing or community amenities.

Parking creates impervious surfaces, increasing a community’s stormwater runoff burden and damaging water quality.

Action Item 2-57

Write and implement alternative parking plan beyond code to limit surface parking

Points: 7



what: The intent of this Action Item is to reduce the total amount of space allocated to parking, and to optimize the efficiency of that space.

To earn points under this Action Item, the community developer must:

- Write a comprehensive parking plan for the community. This plan should be integrated with the other transportation and environmental planning and design documents, and must address the elements listed in the Puget Sound Regional Council's *Parking Management Plan Checklist* (see *Resources*).
- and
- Implement the plan, resulting in reduced square footage and or number of parking space within the community below the parking minimums established by local code.

Projects receive one point for each 5% reduction below code minimum; maximum of 7 points

Note: this Action Item is additive to Action Item 2-56.

how: See Action Items 2-55 and 2-56 for more information on how to reduce parking in the community.

Work with a transportation or urban planning expert to research and produce a comprehensive parking plan. Ensure integration with other aspects of the community's transportation and environmental goals. Verify with code officials that the plan meets legal requirements.

considerations: See Action Item 2-55 and 2-56 for information on related BUILT GREEN Action Items. Reducing total parking below code minimums may require a variance from local code officials, or creating a demonstration ordinance (Action Item 4-20). This may be achieved through a pilot program with the jurisdiction or a one-time exemption.

resources: See Action Item 2-55 and 2-56 for parking-related resources.

Puget Sound Regional Council
Parking Management Plan Checklist:
www.psrc.org/assets/256/parking.pdf



Action Item Rationale:

See Action Item 2-56 for information on the benefits of reducing parking.

Limiting surface parking can also help combat the urban heat island effect, in which buildings and other human-made surfaces act as heat sinks, elevating local temperatures and increasing summertime cooling demand.



what: For the purposes of this Action Item, water features must comply with the water feature requirements in the Seattle Green Factor; i.e., it must use roof runoff or other site-harvested runoff for 50% of its annual flow, and must have water present in its feature for a minimum of six months of the year.

To earn points under this Action Item, the developer must create one or more water features meeting the above criteria.

Note: this Action Item is applicable only to communities without preexisting natural water features.

how: Work with a civil engineer and/or landscape architect to integrate water feature functions with green stormwater infrastructure goals, road and building layouts, and other elements.

If possible, use harvested rainwater (Action Item 2-9) to supply the system. Overflow from rainwater-fed systems can be channeled into vegetated swales (Action Item 2-8) and/or infiltration systems (Action Item 2-12) for onsite infiltration and detention.

For water conservation purposes, make the water feature self-contained and/or recirculating if the feature does not serve stormwater infiltration or cleansing purposes.

considerations: Depending on the capacity and design of the water feature, it can serve double-duty as a stormwater management feature and assist the community in meeting its detention and infiltration goals (Action Items 2-1 and 2-2).

Seattle's Green Factor (Action Item 2-42) provides points for adding water features to landscapes.

Integrate water feature designs with other wildlife-supporting landscape elements. For example, layer vegetation (Action Item 3-23) and select native plants that also serve as food sources for indigenous species (Action Item 3-22). Anticipate productive ways of dealing with human-wildlife interactions (Action Item 4-22).

resources:

Seattle Green Factor:
www.seattle.gov/dpd/Permits/GreenFactor/

Action Item 2-58

Introduce water features(s) to the site if no natural body of water is present

Points: 3



Action Item Rationale:

Water features attract birds and other wildlife, enhancing habitat and increasing biodiversity.

Water sources can also increase the value of adjoining properties by enhancing views.

Action Item 2-59

For buildings three stories tall or more or that have significant use of glass, use bird friendly building guidelines

Points: 5



what: *Bird-friendly* buildings incorporate building and landscape design elements that reduce the likelihood of bird injuries and deaths from collisions. Such design elements include reduced amounts of façade glass, non-reflective, fritted, and spectrally selective glass, and lighting designs that avoid attracting birds, especially night-migrating species that can be drawn off course by anthropogenic light sources.

To earn points under this Action Item, all buildings with three or more stories within the community and those with significant use of glass must be designed using the American Bird Conservancy's *Bird Friendly Building Design* document.

how: Include bird protection as an objective early in the design process. Use the American Bird Conservancy's *Bird Friendly Building Design* resource to identify design and materials selection strategies known to reduce the incidence of bird collisions. Evaluate these design and materials options in light of other green building strategies. For example, ceramic frit glass coatings can also help reduce unwanted solar gain, and landscape plantings can buffer winds and/or provide shading.

Use the site's habitat assessment and wildlife inventory (Action Items 1-4 and 2-60) to determine types and densities of birds resident to and migrating through the site.

considerations: Actions to reduce or eliminate light trespass and light pollution (Action Item 2-51) can also help reduce building-related bird strike hazards.

Sites designed to attract wildlife (Action Items 3-21, 3-22, 3-23, 3-24) must be particularly careful about avoiding building designs that can harm birds, as most communities that include migratory paths (Action Item 2-24) or that retain trees and other habitat (Action Item 2-41) or leave portions of the site undeveloped (Action Item 2-61).

Some photovoltaic modules are integrated into glazing; such modules could serve bird friendly design purposes, as well as producing onsite renewable energy (Action Item 2-50).

resources:

American Bird Conservancy's *Bird Friendly Building Design*:
www.collisions.abcbirds.org



Action Item Rationale:

The American Bird Conservancy estimates that in excess of one billion birds are killed in collisions with buildings in the US alone each year.

A building's design features influences the frequency and lethality of bird strikes, primarily through fenestration and glazing design and placement. Many of these deaths are preventable by relatively simple design changes.



what: *Pre-development site studies* evaluate the site for a variety of attributes, providing baseline data and contextual information to inform development and design decisions. A wildlife species survey assembles quantitative data on the number and distribution of species on the site. A habitat assessment gathers both quantitative and qualitative information on the geographic location and existing quality of habitat for each species identified as inhabiting portions of the site.

To earn points under this Action Item, conduct a pre-development wildlife inventory and habitat assessment. A certified wildlife biologist or other qualified professional must conduct the survey and produce the report. The assessment must also be conducted prior to designing the community's site plan.

Note: only greenfield and rural sites are eligible to earn points under this Action Item.

how: Select design professionals experienced in habitat assessment processes related to the creation of environmental impact statements and other habitat conservation activities. Most firms well versed in LID will also be trained in habitat assessments. Look for professionals certified through The Wildlife Society's wildlife biologist certification program (see *Resources*).

Specify that the resulting surveys and habitat assessment be compiled into a report that includes map layers delineating habitat and species distributions. Make these assessments part of the project's dataset informing site design and development decisions.

considerations: Site surveys are key components of Low Impact Development and Salmon-Safe certification (see Required Action Items). Use the species inventory and habitat assessment to inform land development and use decisions, like permanently preserving a portion of the site's developable land (Action Item 2-61), determining where to cluster homes for development (Action Item 2-22), locating wildlife corridors (Action Item 2-24), and selecting plant species that provide forage for wildlife (Action Item 3-22), among others.

resources: Salmon Safe provides an example of a habitat assessment for riparian areas: www.salmonsafe.org/getcertified/residential-development

The Wildlife Society's wildlife biologist certification program: www.wildlife.org/certification/program

Action Item 2-60

Conduct pre-development site studies:
wildlife species survey
and habitat assessment

Points: 10



Action Item Rationale:

Understanding a site's existing habitat and wildlife context is critical to minimizing a development's negative impact on those natural assets.

Action Item 2-61

Permanently preserve a percentage of community's developable land

Points: 10-20



what: *Conservation Development* is a land use model that assesses a site for its most ecologically significant lands, preserves these in perpetuity, and clusters development elsewhere on the site. (See Action Item 2-22.)

To earn points under this Action Item, leave undeveloped a percentage of the site, preserving that land in perpetuity using a binding legal mechanism such as a conservation easement or land trust.

% preserved	Points
33-49	10
50-69	15
70+	20

Note 1: When calculating the above percentage, exclude all undevelopable land, and environmentally critical areas. The intent of this Action Item is to preserve developable land.

Note 2: The community's total site area must be a minimum of 25 acres.

how: Make the decision to preserve a significant portion of the site early in project planning, as it influences a project's financials. Using a site species survey and habitat assessment (Action Item 2-60) and the input of wildlife biologists, arborists, and other qualified professionals, determine the most ecologically valuable elements of the site and prioritize these for preservation.

Leaving a significant portion of the site undisturbed can greatly reduce the site's overall impervious surface, shrinking both conventional and green stormwater infrastructure requirements and total site development costs. Work with landscape architects and civil engineers to determine the overall benefit of preservation actions.

considerations: Beyond leaving a portion of the site undeveloped, hallmarks of conservation development include clustering development (Action Item 2-22), providing smaller and/or variable lot sizes (Action Item 2-39), preserving existing native trees and vegetation (Action Items 2-41 and 2-61), and providing open space (Action Item 2-23).

Conservation development can also facilitate wildlife corridor establishment and protection (Action Item 2-24). Communities with significant adjacent wildlands should also plan for human/wildlife interaction (Action Item 4-22).

resources:

King County Transfer of Development Rights program:
www.kingcounty.gov/environment/stewardship/sustainable-building/transfer-development-rights.aspx

UT Austin's Ladybird Johnson Wildflower Center information on Conservation Development includes links to communities across the country employing the Conservation Development model:
www.wildflower.org/consdev/



Action Item Rationale:

Land preservation provides long-term environmental protection of important habitat and ecosystem function. On larger sites with a sufficient percentage of preserved land, the development may be able to avoid the expense of stormwater management infrastructure and counter as well the impacts of habitat fragmentation caused by typical development.

The view and green space assets created by land preservation also benefit the community in terms of increased property values and aesthetic improvements.



Action Item 2-62

Extra credit for innovation

Points: 1-10

what: Not all approaches to site design and transportation that enhance the environmental or public health performance of a community are listed in the BUILT GREEN Communities Checklist. Projects may garner additional points through this Innovation Action Item.

Innovations can earn up to 10 additional points, depending on the level of benefit anticipated from the action.

To be considered for these points, prepare a description of the innovation in terms of its process, design, and outcome; its expected environmental or human health benefits accrued by the innovation; and number of points requested.

how: First, identify the innovation. Use the BUILT GREEN Checklist as a starting point: get to understand the challenges that green approaches aim to address. Then brainstorm novel ways of meeting those challenges more effectively or efficiently given project particulars.

A design charrette (4-Star Requirement) offers an excellent opportunity to identify innovative approaches to site design and transportation. Many existing Action Items specify performance thresholds for achieving points. Where possible, aim for performance substantially in excess of the level listed in the Action Item. Such superior performance may itself garner innovation points.

Explore a variety of sources for ideas. It's a good business practice to follow other green building projects and firms to keep current on new strategies and approaches. Green building periodicals often spotlight new techniques and protocols. Government and nonprofit research can yield effective alternatives to common practice. See *Resources* for examples.

Next, verify the innovation. Once the new action, process, or product has been identified, review the existing Action

Items within BUILT GREEN to determine if the action being considered is already included. If not, conduct research to determine the relative environmental or human health benefit of the action, and identify existing Action Items that produce similar outcomes to use as guides for performance thresholds and point values.

Prepare and submit a proposal to BUILT GREEN. Submit the report to the BUILT GREEN Director. Verify the project is registered before submitting; and suggest a response date.

considerations: Innovative approaches can come from any corner of a project and can be related to just about any Action Item in Built Green. Review the Action Item list to determine if which actions are enhanced or facilitated by selecting a particular site. Add these criteria to your site selection considerations.

resources: A variety of governmental and nonprofit organizations engage in research to develop new approaches to site design and transportation. Examples:

US Dept. of Energy's National Renewable Energy Laboratory:
www.nrel.gov/

Center for Neighborhood Technology:
www.cnt.org/

University of Washington Green Futures Research and Design Lab:
www.greenfutures.washington.edu/

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php

Environmental Building News:
www.buildinggreen.com



Action Item Rationale:

As an evolving field, best practices are continuously emerging with respect to green site design and transportation.

Innovative features prompt test cases that, if successful, can be adopted by other projects. Such innovations advance green development.

CONSTRUCTION OPERATIONS

A development's construction phase offers opportunities to protect soils and waterways with proper erosion and sedimentation control, restore soil health through soil amendment, protect habitat and vegetation with physical barriers and protocols, reduce or eliminate toxics and pollution through careful materials and product selection and proper housekeeping, and help contractors achieve their green building goals through developer assistance and coordination.

Improper follow-through during construction can derail the environmental and health goals set during the design phase. BUILT GREEN includes Action Items to educate and encourage contractors to follow best practices.

Action Item 3-1

Phase grading so that no more than 40% of the site is disturbed at one time

Points: 10



what: *Grading* uses earth-moving equipment to clear land, level sites, and prepare site infrastructure. Typically, an entire site is graded at once to simplify heavy equipment use, even if this practice leaves large amounts of soils exposed and prone to erosion.

To earn points for this Action Item, create a grading schedule and corresponding site maps with grading areas/limits highlighted that demonstrate site disturbance is limited to no more than 40% of the site at any one time.

Note: exclude undevelopable land (critical areas, lands earmarked for permanent preservation, etc.) from percentage calculations.

how: Develop a grading schedule that limits clearing and grading to portions of the site under active development. Map out and then mark all clearing limits prior to the start of grading. (See Action Item 3-3 for more information on marking clearing limits.) Fully communicate the grading schedule and grading limits with all subcontractors involved with earthmoving activities.

Replant and otherwise stabilize exposed soils (e.g., with compost blankets: Action Item 3-7) immediately after grading is completed, and follow best management practices for soils improvement (Action Items 3-11 and 3-12).

considerations: Limiting site disturbance overall by retaining existing trees and vegetation (Action Items 2-41 and 2-61) can facilitate achievement of this Action Item. In addition, avoid grading during wetter months (Action Item 3-2) to prevent stormwater-related problems. Clearly mark areas to be preserved (Action Item 3-3) and those reserved for future grading. Carefully stockpile topsoil (Action Item 3-6) for reuse. Grade to maximize plant salvage, and replant or donate removed vegetation (Action Item 3-30).

resources:

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php



Action Item Rationale:

Phasing grading reduces dust, erosion, and stormwater problems.

Limiting site disturbance can reduce the need for expensive stormwater management and erosion and sedimentation control measures.



what: According to the University of Washington's Climate Impacts Group, the Pacific Northwest receives two-thirds of its annual precipitation between October and March. Prohibiting soils disturbance on the site during the rainiest portions of the year reduces erosion and sedimentation risks.

To earn points under this Action Item, the developer must enact a blanket prohibition on clearing, grading or any other large-scale ground-disturbing activities between October 15 and February 28.

how: Establish the prohibition on clearing and grading early in the project time line, in order to allow contractors and builders to schedule construction activities in alignment with the restrictions. Include clearing and grading restrictions in builders' contracts, and set monetary fines for not following the rules.

considerations: Avoiding soil disturbance during rainy months is especially important on sites with soils that are easily eroded. Use Soil Conservation Surveys (SCS) to identify the engineering properties of site soils. These surveys classify soil types for each county. The surveys are available through the USDA's Natural Resources Conservation Service (see *Resources*).

Practice prevention first: leave large portions of the site permanently preserved (Action Item 2-61), cluster homes in the development (Action Item 2-22), reduce both road widths (Action Item 2-30) and total parking (Action Items 2-56 and 2-57), minimize land clearing (Action Item 2-25), and maintain the site's existing topography (Action Item 2-28).

Phasing grading activities to limit site disturbance at any one time (Action Item 3-1) complements complete prohibition of grading during the rainy season. Educate builders (Action Item 4-2) about the prohibition during the stormwater protection section of builder orientations.

resources:

2012 Stormwater Management Manual for Western Washington Volume 2: Construction Stormwater Pollution Prevention:

www.fortress.wa.gov/ecy/publications/summarypages/1210030.html

US Dept. of Agriculture's Natural Resources Conservation Service. Access soil surveys, including the SoilWeb smart phone app: www.soils.usda.gov

Action Item 3-2

Prohibit clearing or grading during winter months

Points: 5



Action Item Rationale:

Disturbed soils are at grave risk of erosion, stripping the site of valuable topsoil and fouling stormwater and downstream habitat. Even with erosion control measures in place, heavy Pacific Northwest rains can overwhelm safeguards and lead to stormwater pollution, flooding, landslides, and destabilized slopes.

Concluding land clearing and grading activities by late autumn also coordinates replanting activities with the fall rainy season, helping plants establish without supplemental watering.

Action Item 3-3

Clearly mark clearing limits

Points: 3



what: *Clearing limits* delineate areas that will be protected from clearing, grading, or other development modifications. Clearing limits are marked on plans with prominent demarcation lines, and onsite through highly visible fencing, flagging, and staking.

To earn points under this Action Item, all clearing limits must be boldly indicated, both on plans and onsite, to avoid excessive or unintentional clearing and/or compaction. Onsite fencing must meet or exceed the specifications outlined in the Washington State Department of Ecology's Stormwater Management Manual for Western Washington, BMP C103: High Visibility Fence (see *Resources*).

how: Clearly mark areas to be graded on plans, and fence, field stake, or flag onsite. Identify buffers, open spaces, and setbacks from streams, wetlands, and steep slopes to be preserved as indicated on plat maps.

To prevent crushing or burying tree roots, fence or stake tree root zones three feet beyond the trees' drip line at a minimum. Review site areas to be graded with the excavation crew to ensure preservation plan compliance. Post signage on mature trees indicating their value and charge contractors who violate the clearing limits.

considerations: Use information gleaned from the site wildlife inventory and habitat assessment (Action Items 1-4 and 2-60), soils surveys, critical areas maps, and other sources to develop a clear preservation map. Clustering housing (Action Item 2-22) can make the delineation of clearing areas simpler by concentrating development on the site.

Implement a schedule in tandem with site plans showing areas to be disturbed or graded in phases (Action Item 3-1). In areas marked for clearing, save topsoil for reuse (Action Item 3-6), and never dispose of cut material in lowlands or wetlands (3-Star Requirements).

resources:

Stormwater Management Manual for Western Washington, Volume 2: Construction Stormwater Pollution Prevention, pp. 4-6

www.fortress.wa.gov/ecy/publications/publications/1210030.pdf



Action Item Rationale:

Soils and vegetation preservation goals are easily derailed by poor communication between grading subs and builders, resulting in destruction of important wildlife habitat and onsite amenities which increases costs for soil rehabilitation and stormwater pollution prevention activities.

Research has shown that mature trees add significant monetary value to properties; clearly marking protective boundaries around such trees is a low-cost strategy to ensure their health and survival.



SITE/WATER

what: Temporary and permanent stormwater management facilities protect water quality both during construction and during ongoing operations of the buildings, streets and other infrastructure within the community. Conventional stormwater management facilities include detention ponds and basins and storm drains and pipes, whereas green stormwater infrastructure elements feature rain gardens, drainage swales, and even green roofs and porous pavement installations.

To earn points under this Action Item, all temporary and permanent stormwater management infrastructure must be constructed and operational as a first step in grading, and all necessary temporary supplementary protective measures installed for green stormwater infrastructure elements.

Exempt from these requirements are any green stormwater infrastructure elements at risk of damage from construction activities and siltation (e.g., pervious paving, rain gardens). However, the reduced stormwater management capacity they represent must be accounted for by temporary facilities. Should any sensitive green stormwater infrastructure elements need to be installed at the outset of grading, provide additional protective measures to ensure post-construction functionality.

how: Plan for and prioritize stormwater infrastructure when sequencing land clearing and grading activities. Stabilize disturbed soils as soon as possible to minimize fouling of stormwater management facilities.

Follow closely the guidelines set forth in the *Low Impact Development Technical Guidance Manual for Puget Sound* in terms of the construction sequencing of LID facilities. These are outlined in Section 5.4 of the document (see *Resources*).



MATERIALS

considerations: Certain green stormwater infrastructure elements, including pervious paving (Action Item 2-31) and bioretention (Action Item 2-8) can be damaged and even rendered inoperable by siltation from construction activities. Protect these elements by stabilizing upstream soils with compost blankets (Action Item 3-7) and installing silt traps, compost berms, or filter fabric as appropriate. Where practical, install pervious paving materials at risk of siltation late in the construction process. Consult with a civil engineer or landscape architect to establish protective measures.

Minimizing grading activities (Action Item 3-1), prohibiting grading during the rainy season (Action Item 3-2), leaving large portions of the site undisturbed (Action Item 2-61), and retaining existing trees and vegetation (Action Item 2-41) all help reduce the need for enhanced stormwater management facilities in the first place.

resources:

Low Impact Development Technical Guidance Manual for Puget Sound
www.psp.wa.gov/LID_manual.php

Stormwater Management Manual for Western Washington
www.fortress.wa.gov/ecy/publications/publications/1210030.pdf

Action Item 3-4

Construct stormwater management facilities as a first step in grading

Points: 5



Action Item Rationale:

The sooner stormwater management facilities are installed and functional, the sooner they can manage stormwater. This ensures protection of soil and water resources onsite and downstream, and will help avoid the cost and delay of water quality violations.

Action Item 3-5

Balance cut and fill while minimizing import and export of material

Points: 10



what: Typical construction sites import or export significant amounts of topsoil, subsoil, and rock, with the aim of creating a level site to facilitate construction of homes and roads. *Balancing cut and fill* means that excavation materials are used for fill purposes elsewhere onsite.

To earn points under this Action Item, no more than 10% of the total volume or tonnage of graded or excavated material on the site may be exported.

how: Establish goals early in the project that reflect the following prioritization:

- Maintain original topography and soil/vegetative matrix.
- Balance cut and fill onsite.
- Minimize soil and fill material import/export.

Review these goals with landscape architects and civil engineers to encourage proposed designs that are reflective of these priorities. Design firms familiar with low impact development can design lot, building, and road layouts to minimize cut and fill and materials import/export. Section 5.1 of the *Low Impact Development Technical Guidance Manual for Puget Sound* (see *Resources*) provides design techniques to minimize site disturbance.

Creating a Stormwater Pollution Prevention Plan (see 3-Star Requirements) in accordance with Stormwater Code: BMP T5.13 requires the development of a Soil Management Plan, including identifying areas of cut and fill and a determination of the soil amendment needs for those areas post-construction.

considerations: Clustering homes (Action Item 2-22) can reduce the scope of grading, as does maintaining significant portions of the site in its natural state (Action Items 2-26, 2-41, and 2-61) and allowing roads and paths to follow the existing terrain (Action Item 2-28).

During grading, save topsoil and properly store it for reuse (Action Item 3-6).

Regardless of circumstances, never use cut material, or imported material, to fill lowlands or wetlands (see 3-Star Requirements).

resources:

Low Impact Development Technical Guidance Manual for Puget Sound
www.psp.wa.gov/LID_manual.php

2012 Stormwater Management Manual for Western Washington
by Washington Department of Ecology:
www.ecy.wa.gov/programs/wq/stormwater/manual.html

Simplified Site Engineering for Architects and Builders, 11th Edition
by Harry Parker & John MacGuire
(Wiley, 2010)



Action Item Rationale:

Minimizing import and export of materials reduces fuel use and air pollution, and also reduces purchase and disposal costs related to development.

Maintaining a site's original topography, soils and vegetation helps preserve hydrological function, naturally managing and cleansing stormwater.



SITE/WATER

what: *Topsoil* is the humus-rich layer of surface soil that supports most root growth and microbial activity and helps store and filter stormwater.

To earn points for this Action Item, retain all topsoil removed from grading operations for reuse onsite, and protect stored soils from erosion using techniques outlined in BMP T 5.13 in the Washington Stormwater Code.

how: First and foremost, minimize disturbance of existing native soils. Leaving native soils in place, ideally along with vegetation and/or trees, is the most environmentally beneficial approach. Work with a landscape architect versed in soils biology to develop a plan for minimizing native soils disruption and clearly delineate areas where grading is required. Mark clearing limits (Action Item 3-3) with high visibility fencing to minimize the risk of over-clearing.

Where soils must be disturbed, stockpiling topsoils for reuse is a stormwater code BMP (see *Resources*). Saving topsoil requires careful grading that starts with removal and segregation of topsoils from the graded areas. Grading contractors must be educated in soil identification in order to properly isolate topsoil for preservation. Grade subsoils in a separate pass to bring the area to the specified grade.

Protect stockpiled topsoil from erosion, preferably by covering with mulch or compost (Action Item 3-7), until ready for reuse. Surround all stockpiles with a compost berm (or at a minimum a silt fence properly installed with troughs).



MATERIALS

Inspect regularly for proper coverage or signs of erosion, especially after storm events resulting in 1/2 inch or more of precipitation within a 24 hour period. Include this inspection protocol in the project's erosion and sedimentation facility maintenance plan (see Three-Star Requirements). Screen topsoil to loosen soil structure and remove debris before reuse. Topsoils are ideal for use in planting beds and other landscaped areas.

considerations: Retaining native topsoil onsite reduces the need for import or export of grading materials (Action Item 3-5). Clearly marking areas to be left undisturbed (Action Item 3-3) helps avoid unintentional land clearing. Never dispose of materials, including topsoils, in lowlands or wetlands (see Three-Star Requirements).

resources: The NPDES National Menu of Stormwater Best Management Practices includes a BMP on land grading: www.cfpub.epa.gov/npdes/stormwater/menuofbmps/ (search using the term *Land Grading*)

Stockpiling existing native soil for reuse onsite is one of the approved options for meeting the requirements of BMP T5.13 in the State Stormwater Code: www.ecy.wa.gov/programs/wq/stormwater/manual.html

Building Soil: Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13, available at www.soilsforsalmon.org

Action Item 3-6

Retain native topsoil onsite and protect stockpiles from erosion

Points: 5



Action Item Rationale:

Native topsoil is created over time on a specific site and is therefore adapted to it. Imported topsoil will not offer the same nutrient structure, disease resistance, beneficial microbes, or hydrologic capabilities as native soil.

Retaining native topsoil is also a best practice for soils management; portions of projects that retain native soil in place are exempt from the compost amendment requirements in the Stormwater Code.

Action Item 3-7

Use compost or related material to stabilize disturbed slopes

Points: 3



what: Compost is decomposed and cured plant matter commonly used to enhance a soil's nutrient content and structure. It also serves as an effective erosion control medium. A uniform layer of compost (usually 2-4 inches) used to stabilize exposed soils is often called a compost blanket, and listed by the US EPA as an erosion control best management practice.

To earn points under this Action Item, all disturbed slopes within the community must be:

- Stabilized within 3 days of disturbance between March 1 and October 14, and within 24 hours of disturbance between October 15 and February 28.
- Maintained in a properly stabilized state, inspected regularly and after rain events, until permanently stabilized.
- Stabilized with compost from a Department of Ecology approved composting facility and meeting Department of Ecology compost specifications (see *Resources*). Alternative materials, such as hog fuel or straw, may be used upon approval of an erosion and sedimentation control expert; applicants must provide evidence that the alternative method confers equal or better benefits than compost in terms of both slope stabilization and erosion control. Any alternative materials must be shown to be free of residual pesticides, herbicides, heavy metals or other toxins.

how: Apply compost to cover the entire exposed soil surface, extending approximately 3 feet over the top of the slope or meshing into existing vegetation.

Compost containing a range of particle sizes (½" or greater variability) produces a more stable mat. Avoid very coarse compost on slopes slated for landscaping or seeding.

considerations: The compost depth will vary depending upon slope, soil type, and compost characteristics. As a rule of thumb, however, a 3 to 4 inch layer is effective on slopes of up to 45 percent.

To avoid the need to stabilize disturbed slopes, preserve portions of the site from development (Action Item 2-61), and keep development and land clearing activities away from critical areas (Action Items 2-3 and 2-25).

Compost used for stabilization can be reused onsite as a soil amendment (Action Items 3-11 and 3-12). This eliminates waste, and reduces the cost of soil improvement. If using non-composted chipped woody debris for slope stabilization, avoid tilling these materials into the soil. Wood chips deplete soil nitrogen during decomposition. Confirm that composts and any other materials used for slope stabilization are free of pesticide residues and heavy metal contaminants.

Replant disturbed slopes with water wise native species (Action Items 3-15, 3-22, and 3-23).

resources:

"Erosion Control with Compost"
www.buildingsoil.org/tools/Erosion_Control.pdf

EPA's NPDES BMPs.
www.cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm
(click on *Construction* and scroll down to *compost blankets*)

Permitted composting facilities:
www.ecy.wa.gov/programs/swfa/organics/soil.html



Action Item Rationale:

Soil erosion on construction sites is a significant contributor to water quality problems.

Compost can outperform conventional slope stabilization methods in terms of erosion control. Using compost avoids the application of synthetic erosion control substances and materials, and can be reused as a soil amendment.



what: Silt fences are a conventional construction sedimentation control tool. Studies indicate that compost-based methods are more effective at filtering and retaining silt from stormwater. Several compost-based methods are used for sedimentation control: compost filter berms, and compost tubes and socks. Compost filter berms are elongated mounds of composted material. Compost tubes and socks are cylindrical lengths of fabric filled with compost.

To earn points under this Action Item, use any one or a combination of compost filter berms, compost tubes and socks in place of standard silt fences and/or straw or coir filled tubing.

how: Design compost filter berms, tubes and socks into the project's Stormwater Pollution Prevention Plan (see 3-Star Requirements). Develop the design in conjunction with the project's Certified Erosion and Sediment Control Lead, landscape architect, and/or other qualified experts. Specifications for the construction of erosion and sediment control elements must meet the US EPA's NPDES list of Stormwater BMPs (see *Resources*).

US EPA recommends that compost berms be trapezoidal in shape, and twice as wide as they are tall. Compost blower equipment can simplify installation.



considerations: Reduce the need for sedimentation control in general by minimizing disturbance of the site's original topography (Action Item 2-5). Combine compost berms, tubes and socks with compost-based erosion control blankets on slopes (Action Item 3-7) and other disturbed areas.

resources:
"Erosion Control with Compost"
fact sheet:
www.buildingsoil.org

EPA's National Menu of Stormwater Management Best Practices:
cfpub.epa.gov/npdes/stormwater/menuofbmps/
(search for *Compost Filter Berms*).

Action Item 3-8

Use compost filter berms, tubes, and socks in place of silt fences

Points: 5



Action Item Rationale:

Beyond compost's superior silt capturing ability, compost berms, tubes and socks last longer than silt fences, which can require replacement every six months and can fail when filter fabric becomes clogged.

Another benefit: at the end of a project, the compost can be incorporated into the soil, reducing disposal costs and helping meet post-construction soil quality requirements (Action Item 3-11).

Compost socks can be supplemented rather than replaced when they become slow to filter, simplifying maintenance.

Action Item 3-9

Landscape common areas with plants that will not need supplemental watering once established

Points: 5



what: The Puget Sound region experiences highly variable seasonal precipitation levels: two-thirds of our annual rainfall occurs between October and March. Our plants need to withstand wet feet throughout the winter, and drought conditions in middle and late summer.

To earn points under this Action Item, install a landscaping scheme throughout the community's common areas that will not need supplemental watering after establishment. (Establishment typically takes 2-3 years.) For the purposes of this Action Item, acceptable plant species include those included on King County's Native Plant Guide list, those on the Saving Water Partnership's *Plant List*, "Wet Winter/Dry Summer Plants" section, and other water-wise species as approved by a qualified landscaping professional.

Note: plantings in rain gardens/bioswales, those fed by greywater irrigation, and naturally year-round or seasonally wet areas are exempt from the species list requirements of this Action Item.

how: Early in the landscape design, establish the intent to create a water-wise landscape meeting the criteria of this Action Item. Integrate the low water use goals of the common area landscaping with the green stormwater infrastructure plans, greywater reuse, rainwater harvest, habitat preservation and enhancement, forage, fruit and nut production, and other objectives for the community's landscape. Look for landscape architects with demonstrated experience in water-wise, low maintenance, pesticide-free landscapes.

considerations: Precipitation varies significantly between the Puget Sound lowlands and the Cascade foothills, and urban developments and site microclimates can dramatically affect plant palettes.

Most native plant species (Action Items 3-22 and 3-23), adapted to local precipitation patterns, fare well without supplemental watering once established. Compost-amended soils (Action Item 3-11) hold moisture longer, reducing watering needs. Water-wise landscaping also helps reduce the capacity of rainwater harvest cisterns (Action Items 2-9 and 3-20) slated for irrigation, reducing overall costs.

resources:

King County Native Plant Guide:

[www.green.kingcounty.gov/](http://www.green.kingcounty.gov/GoNative/Index.aspx)

[GoNative/Index.aspx](http://www.green.kingcounty.gov/GoNative/Index.aspx)

Also includes sample landscape plans for various site conditions.

Saving Water Partnership's *Plant List*:

[www.savingwater.org/](http://www.savingwater.org/docs/plantlist.pdf)

[docs/plantlist.pdf](http://www.savingwater.org/docs/plantlist.pdf)

Great Plant Picks is a service of the Elisabeth C. Miller Botanical Garden that provides a list of proven plant selections for Pacific Northwest gardens, arranged by sun exposure, drought tolerance, soil types, and other factors:

www.greatplantpicks.org



Action Item Rationale:

According to the Saving Water Partnership, lawn and garden watering constitutes 40% of our regional summer water demand—right when our regional water supplies are most strained.

Designing a water-wise landscape saves not only water, but also the energy and other resources needed to pump and treat that water.

Both drought-stressed and overwatered plants are also more prone to disease, potentially increasing pesticide use and incurring added maintenance and replacement costs.



what: Typical *turf grass* is a grass species mix optimized for a particular region and climate. In the Pacific Northwest, the recommended mix is tall fescue and perennial ryegrass types.

To earn points under this Action Item, limit or eliminate the water and resource demand of turf grass in all common areas within the community in one of the following ways:

- Install the low water turf mix specified in the 2012 Stormwater Manual, Vol. II, p. 4-16 (see *How*, below) or a turf type shown to require 70% less irrigation than conventional turf mixes: 5 points
- No turf grass in landscaped common areas: 10 points

Note: low growing, drought tolerant, non-grass turf alternatives are exempt from these requirements and count toward elimination of turf grass.

how: Work with a landscape architect to reduce the amount of lawn versus perennial plants and trees. If lawn-like areas are desired, “eco-turf” or “ecology lawn” grass alternatives: mixes of water-wise, low-growing wildflowers and other perennials (e.g., yarrow, clover, English daisy, and chamomile) can endure foot traffic. The resulting meadow-like landscape can provide both recreational area and wildlife habitat. See *Resources* for more on meadow landscaping approaches.

If turf is desired or required for portions of the common areas, choose the right type or grass planted in the right place. Successful turf areas receive full sun and nitrogen-rich, pH-balanced soils. If planting turf grass, use the low water use turf mix specified by the 2012 Washington Dept. of Ecology *Stormwater Manual, Volume II* (98% purity, 90% minimum germination rate):

Species	% by weight
Dwarf tall fescue <i>Festuca arundinacea</i> var.	45
Dwarf perennial rye (Barclay) <i>Lolium perenne</i> var. Barclay	30
Red fescue <i>Festuca rubra</i>	20
Colonial bentgrass <i>Agrostis tenuis</i>	5

Fertilize turf grass no more than twice a year (once in May and once in autumn) and if fertilized, it use only organic, slow-release products suggested for the turf mix. The more conventional grass mix listed above can be interplanted with new varieties of “microclover” that fix atmospheric nitrogen, feeding the soil and reducing or eliminating fertilizer needs.

considerations: Maintaining more of the site in a wooded or natural state (Action Item 2-41) means less formally landscaped area, including turf. If turf is desired for recreational purposes, make the space flexible for other activities, such as farmer’s markets (Action Item 4-9).

Consider subsurface irrigation with grey-water (Action Items 2-18, 2-19, and 3-20) or harvested rainwater (Action Item 2-9) if irrigation is required.

resources:
 Saving Water Partnership
www.savingwater.org
 Ladybird Johnson Wildflower Center
 info on creating meadows:
www.wildflower.org/howto/show.php?id=5&frontpage=true

Action Item 3-10

Limit or eliminate turf grass in common areas

Points: 5-10



Action Item Rationale:

Turf grasses often require copious amounts of water, fertilizers, herbicides and pesticides to remain presentable.

Lacking the biodiversity of other landscape planting approaches, turf is of little value as habitat for native animal and insect species, and is prone to pests and disease.

Compared to other landscaping approaches, turf also provides scant benefit in terms of stormwater treatment and infiltration, and incurs significant financial and environmental maintenance costs.

Action Item 3-11

Amend disturbed soil to a depth of 10 to 12 inches to restore soil environmental functions

Points: 15



what: *Soil amendment* entails mixing existing site soils with composted material to increase the soil's organic content.

To earn points under this Action Item, all cleared or graded areas subject to soil quality enhancements per Washington State Department of Ecology's BMP T5.13: Post-Construction Soil Quality and Depth shall meet all design guidelines outlined in BMP T5.13, AND increase the amended topsoil layer from the specified 8 inches to 10-12 inches. See *Resources* for a link to the referenced standard.

how: Preserve existing soils and vegetation where possible, including restricting the use of heavy equipment that can compact soils (see Action Item 3-25). This is especially important to prevent root damage to trees retained on the site.

Work with a qualified landscape architect or soils expert to identify the ideal soil mixes for plant cultivation and stormwater management functions.

Areas requiring grading must follow all procedures outlined in BMP T5.13, including:

- Removing and stockpiling the existing topsoil and duff layers for reuse.
- Having existing soil tested by a reputable soil lab to determine its chemical and physical condition. These labs will provide specific recommendations for optimum soil amendment.
- Using mature, stable compost. Select compost meeting specifications in Ecology's fact sheet, "Buying and Using Compost" (see *Resources*).

- Amending the topsoil layer to 12 inch depth and attaining a composition of 10% organic material by dry weight (5% for areas slated for turf), unless existing tree roots prohibit.
- Scarification and loosening 4 inches of subsoil below the topsoil layer, with some mixing of topsoil and subsoil layers where practicable to reduce stratification. (See Action Item 3-12.)
- A final pH of 6.0-8.0, or equal to that of native undisturbed soil.

considerations: Leaving existing native soil undisturbed avoids the need for extensive soil rehabilitation. Compost used for construction-phase erosion and sedimentation control (Action Items 3-7 and 3-8) can be reused for post-construction soil amendment.

resources:

Soils for Salmon's BMP T5.13 guidelines: www.soilsforsalmon.org/pdf/Soil_BMP_Manual.pdf

Washington State Department of Ecology's compost resources including links to certified composting facilities and the "Buying and Using Compost" fact sheet: www.ecy.wa.gov/programs/swfa/organics/soil.html



Action Item Rationale:

Undisturbed native soil and vegetation provide important stormwater functions including water infiltration, storage, and pollutant and suspended solids capture and neutralization.

These functions are largely lost when topsoil is stripped or compacted. Impacts of this common practice include erosion, damage to streams and wildlife, flooding, water pollution, and reduced groundwater recharge.

Amending disturbed soils helps reestablish their hydrological and environmental functions, and sets the stage for healthier, quicker-to-establish landscapes.



what: Site soils can become compacted during construction activities by heavy machinery and even heavy foot traffic. Loosening compacted soils is known as *scarification* or *decompaction*. This is usually performed mechanically (e.g., with a backhoe, disc harrow, or cultivator). Scarification prepares soils for amendment and helps reestablish soil porosity and infiltration functions.

To earn points under this Action Item, break up all areas of compacted soils in common areas to a minimum depth of 12 inches, measured prior to the addition of compost or other soil amendments, using the technique outlined in BMP T3.15 of the *Stormwater Management Manual for Western Washington* (see *Resources*).

Note: soils containing tree roots, including all areas extending 3 feet beyond tree drip lines, are excluded from the requirements of this Action Item.

how: Work with a landscape architect or soils engineer to determine the optimal process and timing for scarification. Soils can be moist, but not wet—certain soil types (e.g., clayey) can be further compacted by scarification during wet weather.

Decompact and amend soils after heavy equipment use and other risks of compaction of area soils is passed.

The New York Dept. of Environmental Conservation (see *Resources*) recommends a second decompaction after the topsoil layer has been mixed, to re-loosen the subsoils that may have been secondarily compacted by the application and grading of compost and topsoil. This second decompaction also serves to further mix organic material into the subsoil, improving soil structure and function and reducing stratification.

considerations: Avoid compaction in the first place by clearly marking construction limits (Action Item 3-3), limiting heavy equipment use (Action Item 3-25), leaving large portions of the site undisturbed (Action Items 2-25, 2-41) and creating a conservation development (Action Item 2-61).

After decompaction, amend the broken-up soil with compost in compliance with post-development soil standards (Action Item 3-11). Soil rehabilitation is a key element of Low Impact Development.

resources:

Stormwater Management Manual for Western Washington 2012, BMP T3.15
www.ecy.wa.gov/programs/wq/stormwater/manual.html

The Low Impact Development Technical Guidance Manual for Puget Sound. See Section 6.2.2.1, “Developing a soil management plan.”
www.psp.wa.gov/LID_manual.php

“Deep Ripping and Decompaction” by the New York Dept. of Environmental Conservation (2008)
www.dec.ny.gov/docs/water_pdf/infildecom08.pdf

Action Item 3-12

Scarify to 12 inch depth compacted soils in areas that will be returned to vegetation

Points: 7



Action Item Rationale:

Scarification breaks up compacted soils and facilitates the introduction of organic material to restore soil structure and function.

Combined with the addition of organic material to the topsoil layer as needed, scarification sets the stage for healthy plant growth and proper stormwater infiltration.

Action Item 3-13

Mulch landscape beds
with organic material

Points: 5



what: *Mulch* is material applied topically to suppress weed growth, retain moisture and reduce soil erosion around plants. Organic material (often compost or chipped woody debris) makes excellent mulch. Washington State Department of Ecology's *Stormwater Management Manual for Western Washington, Vol. 5: Runoff Treatment BMPs*, BMP T5.13 calls for 2 inches of mulch applied to all planting beds.

To earn points for this Action Item, mulch all common area planting beds with organic material. Compost used as mulch must meet Washington State Department of Ecology specifications (see Action Item 3-7). Follow King County recommendations for different mulching applications:

- *Grade A compost:* appropriate for all mulching applications. Distribute at a depth of 2 to 4 inches.
- *Shredded or chipped wood waste:* Suitable for trees, bushes, and woody plants. Mulch at a depth of 3 to 6 inches (up to 8 inches for large trees)

Note: compost must be kept several inches away from shrub and tree trunks.

how: Consult with a landscape architect or other qualified professional to determine the best type and depth of mulch for each landscape area, and specify on landscape plans.

Non-woody mulches (e.g., compost) are best for annuals. (Vacuuming, shredding, and blowing fall leaves back into planting beds saves work and provides excellent winter weed control.)

Woody mulches, such as wood chips, work best with perennials, trees, and shrubs, especially native plantings.

Mulching with compost is ideal for improving soil structure and function, but less effective at weed suppression when applied thinly. Topping compost mulches with leaves or wood chips helps.

considerations: Some bark mulches leach toxins; avoid these near storm drains or waterways. In general, keep compost several inches away from the bark of tree bases. Direct contact can kill some trees. Mulch thinly (three inches maximum) around rhododendrons, azaleas and other shallow-rooted plants; thicker mulch layers can suffocate these plants.

Thorough mulching elsewhere in the landscape helps retain soil moisture, reducing the need for supplemental watering (Action Item 3-15). Mulches also inhibit weed growth, reducing the need for herbicides (Action Item 4-14). Incorporate a mulching schedule into the community's landscape O+M plan (Action Item 4-18).

resources:

Building Soil provides builder-friendly interpretation of the Washington State post-construction soil quality standards, which include requirements for mulching landscape beds:
www.buildingsoil.org

King County Natural Yard Care information sheet: "Make the Mulch of It." Describes different types of mulch and applications for each:
www.your.kingcounty.gov/solidwaste/naturalyardcare/mulch.asp
(scroll to bottom of page for link to information sheet).



Action Item Rationale:

Organic mulch helps reduce soil erosion as plants establish. If the new landscape isn't already densely planted, mulching is the next best solution to reduce weeds and facilitate weed removal, which in turn minimizes herbicide use.

Mulching also provides additional soil nutrients and increases moisture retention, thereby reducing irrigation amounts and costs.



what: Fertilizers are commonly applied to new landscapes assuming they will hasten plant establishment and increase survival rate. Often, they are unneeded. For the purposes of this Action Item, *natural organic* fertilizers are plant- and animal-based products containing minimum percentages of nitrogen, phosphorus, and potassium, which are slowly released to plant roots.

To earn points under this Action Item, restrict fertilizer use to organic formulations, or avoid fertilizers altogether in common area landscapes.

Action	Points
Use natural organic fertilizer	5
Use no fertilizer	8

how: Start with properly amended soils (Action Item 3-11), and choose hardy plant species and cultivars that will thrive in existing soil conditions. Native plants (Action Items 3-22 and 3-23) are particularly suited to soils with low nutrient content. Work with a landscape architect to select species for each location's sun exposure, water availability, and other microclimatic attributes. Situating the right plant in the right place will eliminate a significant number of issues that may later be compensated for with fertilizers and pesticides.

If using fertilizers, look for natural organic fertilizers with low water solubility and with a nitrogen-phosphorus-potassium ratio of 3N:1P:2K, the recommended formulation for Pacific Northwest landscapes. Trees and shrubs generally do not need added phosphorus or potassium.

Include information on fertilizer limitations or prohibitions in the community's landscape operations and maintenance plan (Action Item 4-18). Limit fertilizer use to the plants that really need it (e.g., turf grasses are often over-fertilized—see Action Item 3-10), when they need it.

Natural organic fertilizers are labeled as such. Due to their slow-release nature, these fertilizers require only infrequent application, usually one to two times per year. If required, fertilize once the active growing season is in full swing (early May) and/or in autumn. Use fertilizers only as directed and never apply more than indicated.

considerations: Proper soil amendment (Action Item 3-11) greatly enhances the ability to go fertilizer-free during a landscape's establishment period. Native plant species (Action Items 3-22 and 3-23) thrive in the unimproved soils of the Pacific Northwest. Mulching new plantings (Action Item 3-13) also helps boost the success rate of landscape beds by reducing competition from weeds and retaining moisture.

resources:
King County Natural Yard Care fact sheet: "Organic Fertilizer: What does it Mean?"
your.kingcounty.gov/solidwaste/naturalyardcare/documents/Organic_fertilizer.pdf

Action Item 3-14

Use natural organic or no fertilizer to establish vegetation in common areas

Points: 5-8



Action Item Rationale:

Soluble, quick-release synthetic fertilizers readily leach into waterways, and can damage long-term plant and soil health. Studies have shown that 62% of the phosphorus entering Lake Sammamish originates in residential areas. The primary sources of this contamination are fertilizers and soil erosion.

Excess nutrients promote algae blooms, which in turn starve lakes and Puget Sound of oxygen and produce toxins, threatening aquatic life. In addition, petrochemical fertilizers are easily tracked into homes and businesses, posing an exposure hazard to humans.

Action Item 3-15

Install landscapes
needing no
supplemental watering

Points: 5



what: *Drought-tolerant* plants are a central element of a water-wise landscape. For the purposes of this Action Item, a plant is considered drought-tolerant if it is able to survive in properly amended soils on no more than one watering per month during the irrigation season.

To earn points under this Action Item, all landscaping throughout the community must be comprised of at least 90% drought-tolerant plant species and cultivars.

Note: rain gardens, bioretention areas and other elements of a community's green stormwater infrastructure system are exempt from this requirement, as are areas of natural water seepage, creek and stream banks, and wetlands, and areas of agricultural production, including P-Patches. These landscape features must be marked on all landscape plans.

how: Establish drought-tolerant landscaping procedures with the builders within the community, and provide information on drought-tolerant species in homebuilder education materials. Work with a landscape architect or the county extension office to develop a list of drought-tolerant plants and/or planting schemes to share with builders as recommended practice.

Make sure no covenants impinge on the ability of builders or homeowners to establish water-wise landscapes (e.g., requirements for a minimum amount of turf grass).



Action Item Rationale:

Landscape irrigation consumes a significant proportion of the region's potable water supply, with demand peaking just as water supplies dwindle. Water-wise landscapes allow our region to continue living within its water budget, rather than acquiring costly new capacity.

Action Item 3-15

considerations: Proper soil amendment (Action Item 3-11) helps ensure soils hold moisture. Using a field guide to educate builders (Action Item 4-2) about drought tolerant plants in particular and water-wise landscaping in general can help ensure that residential landscapes meet the intent of this Action Item.

Include a list of pre-approved drought tolerant plants in the field guide for builders (Action Item 4-2) for ease of reference.

If conducting a planning and design charrette for builders (Action Item 4-1) and attempting to achieve points under this Action Item, consider using a portion of charrette time to develop a unified private property plant palette that integrates water conservation, wildlife habitat (Action Items 3-22 and 3-23), food production, and other related goals.

resources:

See Action Item 3-9 for resources related to drought tolerant gardening.

Action Item 3-16

Use third-party certified wood products for site lumber

Points: 2-10



what: *Third-party certification* entails an independent entity confirming that a set of agreed upon standards has been followed in the growth, harvest and distribution of forest products. Definitions of sustainable harvest vary depending on the certification body (see *How* for details).

This Action Item is worth 2-10 points. For all common projects in the community, achieve a percentage by weight or value of site lumber used in the project (exclusive of salvaged materials) meeting either Tier 1 or Tier 2 criteria (see below).

% Certified	Tier 2	Tier 1
wood		
40	2	4
60	3	6
80	5	10

There are over 50 voluntary forestry standards programs worldwide at the time of this writing. To achieve points for these Action Items, Built Green requires that the wood products selected for the project can be independently certified to meet one of two tiers of criteria outlined below.

Tier 1 certification systems include:

- Independent, third-party audited chain of custody. Chain of custody tracks a forest commodity from its forest of origin to the finished product. Tracking also guarantees that products will not be mixed with non-certified products during processing, manufacturing, distribution, and sale.
- No converting forest to plantation.
- No mass harvest of old growth trees.
- No genetically modified organisms (GMOs) or pesticides.
- Multi-stakeholder governance with transparent decision-making process.
- Rules for control of non-certified components in certified products.
- Supported by leading environmental and social organizations.
- Policy of removal for noncompliance.

Currently, only the Forest Stewardship Council (FSC), a voluntary, market based certification organization, meets Tier 1 requirements. It is one of few programs that require a chain of custody for certification. FSC sets standards for sustainable forestry practices and depends on independent companies for third-party certification of forestlands. It evaluates and monitors certifiers to ensure public credibility.

Tier 2 certification systems include:

- Independently third-party audited chain of custody.
- No conversion of natural forest to plantation.
- No mass harvest of old growth trees.
- Rules for control of non-certified components in certified products.
- Policy of removal for noncompliance.

Currently, no certification systems meet Tier 2 requirements.

The BUILT GREEN Director will evaluate new certifications for Tier 1 or Tier 2 compliance.



Action Item Rationale:

Purchasing certified responsible harvest wood sends a market signal to producers that well-managed forests and the products that come from them have value.

In addition, some certification programs include indigenous rights, worker safety, and living wage standards, helping fulfill social sustainability goals along with environmental performance.

Certified sustainable harvest lumber is available from local producers, meaning that regional economic development can be a third benefit of purchasing certified wood.

Action Item 3-16

how: Some certified products can have longer lead times than conventional wood, or may not be available off-the-shelf. Some certified wood products also carry a cost premium. Find local sources of certified wood through the Northwest Natural Resource Group and the Forest Stewardship Council Marketplace online portal (see *Resources*).

considerations: Communities with large amounts of preserved woodland (Action Items 2-41 and 2-61) may want to consider having the land certified. Contact the Northwest Natural Resource Group for information on small-plot FSC certification.

Include information on certified wood project goals for certified wood use in contractor trainings (Action Item 3-34), the builder's field guide (Action Item 4-2), and in construction documents. Consider telling the story of how the community supports healthy forests through its use of certified wood with interpretive signs (Action Item 4-16).

resources:

The Northwest Natural Resource Group is an association of small and midsize Pacific Northwest regional timberland owners and others that produce FSC certified wood:
www.nnrg.org

Forest Stewardship Council:
www.us.fsc.org/

Forest Stewardship Council Marketplace is a searchable database of FSC certified foresters, manufacturers, and retailers:
www.marketplace.fsc.org

Action Item 3-17

Use recycled content or resource-efficient site accessories

Points: 5



what: *Site accessories* include products that facilitate the use of common area space, including recreational and play equipment, benches, tables and kiosks, outdoor lighting, waste and recycling receptacles, signage, and fences and barriers. Many accessories are now available with post-consumer and post-industrial recycled content. Examples include: parking stops, bollards, bike racks, planters, outdoor furniture, playground surfaces and equipment, light posts, and signposts.

For the purposes of this Action Item, resource efficient products include salvaged and reused materials, products made from renewable materials with a ten-year harvest cycle or less, and others as approved by the BUILT GREEN Director. Examples of rapidly renewable materials include bamboo, some poplar species, and products made from agricultural waste materials, like straw and bagasse.

To earn points under this Action Item, a minimum of 20% of the material constituting all site accessories in common areas must be post-consumer, post-industrial recycled, and/or resource-efficient materials, as determined by aggregate weight. See the *How* section below for an optional calculation method.

how: Look for products with verified recycled content. Independent verification through programs such as Scientific Certification Systems and UL Environment gives credence to manufacturer claims.

Maintain a spreadsheet that lists site accessories, their cumulative weight, and percentage recycled/resource efficient content for each accessory. Divide the total weight of recycled content material by the total weight of all site accessories.

Ascertaining the percentage of rapidly renewable materials in a product may be more difficult than determining the recycled content. Federal and state programs promoting and/or requiring recycled content in publicly purchased materials have been active for many years, and manufacturers have responded by making this information relatively available in the percentage form required by the feds. This is less the case for other green attributes, like rapidly renewable content. Ask suppliers whether they can provide this information prior to purchase.



Action Item Rationale:

According to US EPA, Americans generated approximately 250 million tons of municipal solid waste in 2010, of which only 85 million tons was recycled. To support and increase this number, end markets for recycled-content products must be enhanced.

Manufacturing goods from recycled material reduces demand for raw material extraction, conserving resources and reducing the energy used and waste and pollution created by extracting and refining processes. Similarly, resource-efficient products conserve material and energy resources by nature of their rapidly renewable or salvaged/reused qualities.

Action Item 3-17

considerations: Provide information to builders and contractors on sourcing and specifying recycled content and resource-efficient products during trainings and orientations (Action Item 3-34).

Promote the community's installed environmentally preferable products with information on interpretive signs (Action Item 4-16).

resources:

The US EPA's Comprehensive Procurement Guidelines program's *Product Supplier Directory* lists manufacturers of products meeting the program's recycled content requirements:

www.epa.gov/epawaste/consolve/tools/cpg/directory.htm

California Integrated Waste Management Board recycled content product database:
www.calrecycle.ca.gov/rcp/

SCS Certified Products Database:
www.scs-certified.com/products/

UL Environment's *Sustainable Product Database*:
www.ul.com/environment
(click on *Sustainable Product Database*)

Action Item 3-18

Install no permanent irrigation system

Points: 10



what: For the purposes of this Action Item, an irrigation system is considered permanent if it remains in place after a landscape's establishment period (2 to 3 years).

To earn points under this Action Item, design common area landscapes without permanent irrigation systems fed by potable water. Communities with permanent irrigation systems fed exclusively by reclaimed water (Action Item 2-20), greywater (Action Item 2-19), or site-harvested rainwater (Action Item 2-9) are still eligible to receive points under this Action Item.

Temporary irrigation systems designed to help establish new plants and removed after the establishment period are also exempt from the requirements of this Action Item, but the community's Landscape Operations and Maintenance plan must include scheduling for removal of the temporary system within 3 years of project completion.

how: Make landscape water conservation a design priority from the beginning of the project. Properly amending soils (Action Item 3-11), landscaping with drought-tolerant plants (Action Item 3-9), and reducing or eliminating turf grass (Action Item 3-10) reduces the need for permanent irrigation systems.

If possible, do initial planting in fall. This allows plants to establish during autumn and spring rains, potentially avoiding the need for irrigation until the following summer.

Work with a landscape architect to design a planting scheme that works with the sun, slopes, soils, and other local variables of the site. Visit water-wise demonstration gardens for design ideas. Local examples include Bellevue Botanical Garden, Woodinville Water District, the University of Washington's Center for Urban Horticulture demonstration garden, and Seattle's Bradner Gardens Park.

considerations: Greywater irrigation systems (Action Item 3-20) can be an efficient way of managing a portion of a community's wastewater onsite (Action Items 2-1 and 2-2), and rainwater harvest systems (Action Item 2-9) and use of reclaimed water (Action Item 2-20) can reduce a community's landscape-related potable water demand.

Targeted hand watering or use of soaker hoses and Treegator® style slow-release watering bags during the landscape's establishment period (generally the first 2 to 3 years) can be an efficient way to temporarily irrigate. Even the most water-wise landscapes may require spot watering during exceptionally long dry spells, even after establishment.

resources: Saving Water Partnership provides information on landscape water conservation practices. : www.savingwater.org

"Smart Watering," a brochure in the Saving Water Partnership's *Natural Lawn and Garden* series: www.savingwater.org/outside.htm



Action Item Rationale:

Conserving water leaves more in streams and lakes for wildlife and recreation.

Avoiding permanent irrigation system design and installation reduces up-front development costs, and lowers landscaping operations and maintenance costs.



what: Various innovations in irrigation systems have significantly increased the efficiency of water delivery to plants' root zones.

To earn points under this Action Item, complete the following actions for common area landscaping (points are additive):

- System designed by an irrigation designer certified through a program that has received the EPA WaterSense® label
2 points
- Install WaterSense labeled irrigation controllers
2 points
- System evaluated by an irrigation system auditor* certified through a program that has received the WaterSense label, AND confirm an irrigation efficiency of 0.625 or better
4 points

*Note: the selected auditor must be independent of the individuals or firms contracted to design and/or install the system.

how: Start by designing a water-wise landscape scheme featuring plants needing little or no supplemental watering after establishment (Action Item 3-15). Group plants by water needs to simplify the irrigation design and allow for zones with different irrigation schedules. Where possible, install no permanent irrigation systems (Action Item 3-18). For the remaining irrigated area, work with an EPA WaterSense qualified irrigation professional to design and install the system. Find qualified professionals through the WaterSense program (see *Resources*).

A variety of factors help increase the efficiency of irrigation systems:

System design

- Install systems to minimize runoff, low-head drainage, overspray, or other conditions where irrigation water flows onto adjacent property, non-irrigated areas, or impervious surfaces. Identify and address design challenges posed by slopes, traffic medians, and narrow hydro-zones. Design for easy access to sprinkler heads for inspection and maintenance. Check with local officials to determine system requirements including performance, minimum efficiency standards, and controller features.
- Turf, perennial beds, and shrubs have different watering needs, and even among perennials there is wide variation in irrigation demand. Group plants by water need, and then zone irrigation to match groupings to ensure plants receive exactly the amount they need. Zoning also allows for the installation of multi-cycling systems to customize the timing and frequency of watering.
- Due to manufacturing and disposal impacts related to vinyl (PVC) components, look into specifying polyethylene irrigation tubing and other components.

Action Item 3-19

Install high-efficiency irrigation system where ongoing irrigation is needed

Points: 2-8



Action Item Rationale:

While irrigation systems may save time and labor, poor system design, lack of commissioning, and deferred maintenance result in systems that are inefficient at delivering water when and where plants need it.

Typical systems often waste half of the water they deliver due to evaporation, wind, overspray, and other factors. The most efficient irrigation systems can reduce the wasted water to 30% or less.

Action Item 3-19

Efficient water delivery systems

- *Drip irrigation* is the low-pressure, low-volume application of water to a plant's root zone. This delivery method reduces evaporation and eliminates overspray, and proper scheduling reduces soil moisture fluctuations that can stress plants. Drip systems are easily modified or removed to accommodate changes in a landscape; for landscapes aiming for no permanent irrigation after the establishment period, this type of system may be preferable.
- *Rotary heads* can reduce water wasted to overspray and evaporation by up to 30%.

Advanced irrigation controls

- *Evapotranspiration (ET)-based controllers*. These “smart” controllers use local historical temperature, precipitation, and cloud cover data, combined with a temperature sensor, to create a customized watering schedule.
- *Weather- and moisture-based controllers*. These controls receive daily information from local weather stations to determine the watering schedule.
- *Rain sensors/rainfall shutoff devices*. Sensors are placed in an open area in the landscape, and shut off the irrigation system when a pre-set amount of rain has fallen. They can be inexpensively retrofitted to conventional controllers, or integrated with smart controllers. Rainfall shutoff devices with moisture-sensitive expansion discs (often cork) are considered the most reliable and low-maintenance.

- *Soil moisture sensors*. Monitoring the moisture reaching the root zone of plants in the landscape, these sensors wirelessly or mechanically shut off the controller when the soils are sufficiently moist. A single moisture sensor can be placed in the area of the landscape with highest water needs, or multiple sensors can be distributed to address variation between zones.

considerations: Use site-harvested rainwater (Action Item 2-9) or reclaimed water (Action Item 2-20) to further enhance the environmental performance of efficient irrigation systems.

A drought-tolerant plant palette (Action Item 3-15), compost amended soils (Action Item 3-11), and mulch (Action Item 3-13) will reduce overall demand, potentially reducing the size, complexity, and cost of an irrigation system.

Include system design and maintenance information in the Landscape Operations and Maintenance Plan (Action Item 4-18).

resources:

WaterSense®
www.epa.gov/watersense
(click on *Outdoor*).

Saving Water Partnership
[www.savingwater.org/
outside_watering.htm](http://www.savingwater.org/outside_watering.htm)

The Irrigation Water Management Association has created a series of cards to assist owners of different smart controllers in maximizing the conservation functions of each controller:
www.iwms.org/controller_tips.html

The IWMA also created sprinkler calculators for Seattle and Eastside area landscapes:
www.iwms.org/C_Sprinklers.html



what: For the purposes of this Action Item, *potable water alternatives* include:

- Harvested rainwater
- Greywater
- Reclaimed water

To earn points under this Action Item, earn a minimum of 6 of the available 8 points from Action Item 3-19, AND supply at least 50% of the landscape's water budget, as calculated by a WaterSense partner-certified irrigation professional, with water from at least one potable water alternative source. Systems may use a combination of potable water alternatives to reach the required 50%.

how: Designing both rainwater systems and greywater systems for landscape use requires a set of skills rarely found in one design professional. Depending on the system attributes desired, look for demonstrated expertise in rainwater harvest systems, greywater reuse systems, and irrigation design:

- Rainwater harvest systems: refer to Action Item 2-9.
- Greywater reuse: depending on the source processed, qualifications for greywater systems vary. The Washington Department of Health requires that a licensed on-site sewage system designer or a professional engineer, licensed under 18.43 RCW, design Tier 2 and Tier 3 greywater systems. The Washington Department of Health maintains a list of plants and trees tolerant of greywater irrigation (see *Resources*).
- Reclaimed water: refer to Action Item 2-20.
- Irrigation systems: refer to Action Item 3-20. Look for professionals experienced in irrigation systems that use greywater in particular.

Action Item 3-20

Install high-efficiency irrigation system using potable water alternative

Points: 10



Action Item Rationale:

Alternatives to irrigation with potable water avoid unnecessary water treatment and processing and extends limited drinking water supplies. Each potable water alternative has specific benefits:

- Site harvested rainwater provides stormwater management and is better for plants.
- Greywater is the dominant form of wastewater generated by a home. Reducing sewer flow adds capacity to regional wastewater systems.
- Putting reclaimed water to productive use as irrigation gives a second lease on life to this resource.

Action Item 3-20

considerations: Onsite greywater systems require careful planning, installation and maintenance. For example, greywater drainage fields may overwater low-water use plantings (see Action Item 3-15). Additionally, the amount and composition of pathogens and chemicals present in greywater varies significantly based on the behaviors of the wastewater generator.

To optimize the function of a greywater system, assemble a detailed Operations and Maintenance Manual (Action Item 4-18) for the system, and develop interpretive materials (Action Item 4-16) and a section in the Green Community Guide (Action Item 4-15) to help prompt proper care of the system.

resources:

Chapter 246-274 WAC: Greywater Reuse for Subsurface Irrigation
www.apps.leg.wa.gov/WAC/default.aspx?cite=246-274

“Guidance for Performance, Application, Design, and Operation & Maintenance: Tier Two and Three Greywater Subsurface Irrigation Systems” by Washington State Department of Health
www.doh.wa.gov/Portals/1/Documents/Pubs/337-063.pdf

List of plants suitable for greywater irrigation:
www.doh.wa.gov/CommunityandEnvironment/WastewaterManagement/GreywaterReuse/PlantIrrigation.aspx

King County
Reclaimed Water information:
www.kingcounty.gov/environment/wastewater/ResourceRecovery/ReWater.aspx



what: Land clearing includes the removal of trees, understory plants and topsoil from an area in preparation for development.

To earn points under this Action Item, the project must avoid land-clearing activities on vegetated areas known or anticipated to be wildlife habitat between March and June.

how: Use the site assessment and habitat inventory (Action Items 1-4 and 2-60) to identify sensitive areas and begin early in the project planning to minimize habitat encroachment overall. Cluster development (Action Item 2-22) in such a way that protects sensitive habitat areas, and set aside the most ecologically valuable parts of the site for preservation (Action Item 2-61), where possible.

Ideally, avoid all land clearing during the spring months. If unavoidable, do it strategically. Solicit input from a wildlife expert. Use the results of the pre-development site study (Action Item 2-60) to identify, prioritize, and protect the areas of the site most likely to serve as habitat used for raising young.

considerations: Disturbing soils and vegetation during the Pacific Northwest rainy season (Action Item 3-2) also introduces a variety of problems, most notably water quality issues related to erosion and sedimentation. Increasing no-build zones around critical areas (Action Item 2-3) helps. Prioritize the preservation of critical areas and wildlife corridors (Action Item 2-24). Communities that preserve or encourage native habitat will benefit from preparing for human-wildlife interaction (Action Item 4-22).

resources:

Low Impact Development Technical Guidance Manual for Puget Sound
www.psp.wa.gov/LID_manual.php

Action Item 3-21

Avoid clearing trees and shrubs during March – June to protect wildlife raising young

Points: 3



Action Item Rationale:

Land clearing destroys habitat, and species are often uniquely vulnerable during periods of gestation, brooding and rearing of young. Frequently, young are unable to relocate if their rearing space is disturbed, significantly increasing mortality.

Proximity to wildlife habitat can increase home values. A 2012 study from North Carolina State University showed that homes sited within $\frac{1}{4}$ mile of a wildlife refuge had higher property values than those that were more distant.

Action Item 3-22

Landscape with native plants that provide forage for wildlife

Points: 6



what: Many Pacific Northwest native plants provide forage for wildlife in the form of nuts, seeds, fruit, berries and vegetative material.

To earn points under this Action Item, a minimum of 30% (by mature planted square foot) of the landscaped portion of a community's common area must consist of native plants known to provide sustenance to one or more native bird or mammal species (excluding potential pest wildlife and non-native species).

how: Work with a landscape architect knowledgeable of Northwest native plant and animal species. Aim to have the landscape mimic the habitat of species the community wishes to attract.

Common Pacific Northwest species that provide forage:

- Cascade Oregon-grape
Mahonia nervosa
(Berries attract various wildlife)
- Douglas fir
Pseudotsuga menziesii
(Seeds from cones attract birds, chipmunks, squirrels)
- Salal
Gaultheria shallon
(Berries attract various wildlife)
- Salmonberry
Rubus spectabilis
(Berries attract various wildlife)
- Red columbine
Aquilegia formosa
(Nectar attracts hummingbirds)

considerations: Plant choices have impacts for indigenous and imported pests as well, like deer, raccoons, opossum, rabbits, squirrels, crows and rats. Select plants known to provide forage for preferred species, and keep to a minimum the use of plants that act as lures to pests. Note that backyard or community gardens and P-Patches (Action Item 4-7) are readily poached by opportunistic species, so balance the desire for wildlife protection with thoughtful design of barriers to protect human food crops.

Layering native plants to replicate natural forest foliage levels (Action Item 3-23) couples forage with the safety of cover. Clustering development (Action Item 2-22) opens up opportunities for larger tracts of habitat-friendly landscape, including wildlife corridors (Action Item 2-24). Augment the wildlife-friendly landscaping design with a plan to minimize human-wildlife conflict (Action Item 4-22).

resources:

“Planting is for the Birds!” from Snohomish Conservation District:
www.snohomishcd.org/publications/Planting%20for%20Birds_final.pdf

Washington Native Plant Society:
www.wnps.org

Landscaping with Wildlife in the Pacific Northwest
by Russell Link
(University of Washington Press, 2004)



Action Item Rationale:

Food is a key aspect of habitat. Native animal species rely on ecosystem services to provide the food they need to thrive. Careful selection of plants for the community's landscape can help sustain and attract desired species.



what: *Vertical layering* describes landscape design that mimics the vegetative levels found in a typical woodland environment. From forest floor to canopy, these layers are typically the ground layer, shrub layer, understory canopy, and overstory canopy. Each layer provides food and shelter to different native species. Layering is accomplished by planting groundcovers, shrubs and trees of different heights, referencing the structure and plant species present in local undisturbed woodlands.

To earn points under this Action Item, develop a landscape design for common areas consisting of at least 20% of total common landscape area with all four of the layers mentioned above, and an additional 20% of the total area with at least two of the four layers. Preserved areas featuring vertical layering are eligible.

how: Vertical layering is but one aspect of creating vibrant habitat for native species. Selecting native, drought-tolerant plants (Action Item 3-15), using a diversity of plants, creating habitat edges and transitions, and other factors play into the effectiveness of the landscaping scheme.

Look for a landscape architect with experience in creating habitat for native wildlife, or seek additional expertise in this arena to inform the landscape design. Borrow ideas from nature: look to existing undisturbed areas onsite or locally to find the naturally occurring plant species and their distributions, and replicate these. King County offers a series sample, residential-scale, native landscape plans (see *Resources*).

considerations: Layering can enhance wildlife corridors (Action Item 2-24) by providing cover. Preserving trees (Action Item 2-41) is the best way to create canopy layers. Trees can take decades to reach heights sufficient to create overstory. Preserving both trees and existing understory vegetation (Action Item 3-23) is even better.

Further enhance the ground layer habitat by retaining or introducing large woody debris (Action Item 3-28), such as nurse logs and snags. Select native plant species that provide forage (Action Item 3-22).

Native planting schemes can often thrive with little or no supplemental water (Action Item 3-15) or permanent irrigation systems (Action Item 3-18), and frequently require little or no fertilizer after establishment (Action Item 3-14). Opt for an Integrated Pest Management approach (Action Item 4-14) to reduce or eliminate pesticide use and preserve the beneficial insects on which birds and other native animals depend.

resources:

Washington Dept. of Fish and Wildlife:
Landscape Design for Wildlife:
wdfw.wa.gov/living/landscaping/

King County: Native Plant Landscaping Made Easy: Sample Plans:
green.kingcounty.gov/gonative/plan.aspx?act=list

Washington Native Plant Society
www.wnps.org

King Conservation District Annual Native Bare Root Plant Sale:
www.kingcd.org

Snohomish Conservation District Annual Native Plant Sale:
snohomishcd.org/plant-sale

Landscaping for Wildlife in the Pacific Northwest
by Russell Link
(University of Washington Press, 2004)

Action Item 3-23

Landscape with native trees and plants that provide natural cover for wildlife at different levels (trees, shrubs, ground plants)

Points: 5



Action Item Rationale:

Layering provides habitat for a variety of wildlife species by approximating the native forest structure.

Beyond supporting native species, vertical layering helps increase landscape diversity, making it more robust and resistant to pests and disease. It also provides a naturalistic aesthetic whose appeal increases home marketability.

Action Item 3-24

Maintain or introduce large woody debris onsite (snags, downed logs, stumps)

Points: 5



what: In a forest ecosystem, *woody debris* in the form of downed limbs and trees, stumps, and snags occur naturally over time as trees mature and die, or storms and other events cause damage. Snags are standing dead trees. Large pieces of ground-associated wood, including logs and stumps, constitute the general category of “large woody debris.”

To earn points under this Action Item, common-area landscaping must include, on average, per 20,000 feet:

- At least one snag or piece of large woody debris with a minimum diameter of 20 inches and a minimum length/height of 30 feet, or
- Two snags or pieces of large woody debris with a minimum of 10 inches in diameter and a minimum length/height of 12 feet.

how: Document the site’s existing stock of woody debris during the habitat assessment and wildlife inventory (Action Item 2-60), and mark trees slated for removal in land clearing activities to be retained as woody debris onsite. Work with the landscape architect and specialists (e.g., a woodland biologist) as needed to determine whether existing material can be used in place.

Woody debris from off-site may be available through the municipal or county parks departments.

In Western Washington, Douglas fir and Western red cedar are valuable species in terms of supporting indigenous wildlife as large woody debris or snags. Snags and logs in various states of decay provide the widest variety of shelter and forage opportunities. The Washington Department of Wildlife offers a free, all-weather sign describing the benefits of snags to the public (see *Resources*).

considerations: If maintaining large woody debris onsite is impractical, consider grinding it for reuse onsite (Action Item 3-28) as mulch (Action Item 3-13), temporary erosion control, and/or pathway material.

Incorporate Washington Department of Wildlife information on the benefits of snags into the onsite interpretive materials in the community (Action Item 4-16).

As they decompose, snags may pose a physical hazard in populated areas. Consider public safety along with environmental benefit, and incorporate snag and examination into the community’s landscape operations and maintenance plan (Action Item 4-18).

resources:

“Snags, Coarse Woody Debris, and Wildlife”

www.snohomish.wsu.edu/forestry/documents/SNAGS.pdf

The Wildlife Tree Project from Washington Department of Fish and Wildlife includes information on the benefits of snags and all-weather informational materials to help educate the community: www.wdfw.wa.gov/living/snags/tree_project.pdf.



Action Item Rationale:

Downed trees and limbs are a natural part of forest succession, providing habitat for native species and organic material for soils. In creeks, woody debris helps reduce stream velocity and provides shade and shelter for juvenile fish.

According to the Washington Department of Natural Resources, snags support more than 60 species of cavity-nesting birds and mammals, including use as nesting, perching, and launch sites for many birds.

Benefits to residents include bird watching and other recreational activities, and insect and rodent control.



what: For the purposes of this Action Item, *heavy equipment* refers to all motorized and wheeled or tracked construction machinery.

To earn points under this Action Item, limit the use and movement of heavy equipment to areas within 40 feet of existing or future building, road, parking lot, and other built elements. This boundary must be marked and maintained with high-visibility fencing, staking, or other visual and/or physical barrier.

how: Establish boundaries for heavy equipment on plans and onsite, and communicate those restrictions in contractor trainings. Use high-visibility fencing, such as brightly colored plastic mesh, to delineate borders.

On the job site, identify one entrance and exist for construction equipment, limit all vehicle traffic to designated areas, restrict parking vehicles onsite, and designate turn around area for particularly heavy vehicles (concrete trucks, cranes, etc.) to reduce impact. Enforce these restrictions: create, communicate and post the fine schedule for violations. To protect exposed soils from unnecessary traffic, locate equipment storage and job shack areas for easy access within the construction zone boundaries.

If porous pavement is planned for the driveway, leave that area undisturbed during construction to avoid subsoil compaction. Define boundaries for the construction access road to avoid these and other sensitive areas.

Minimize soil compaction even within zones designated for heavy equipment use. If tight quarters require the use of heavy equipment near trees, heavily mulch (6 to 12 inches) and/or use bridges to protect roots. Apply 4-6 inches of hog fuel or other coarse woody mulch around trees outside the 40-foot zone to provide an added level of protection in the event of contractor error.

Specialized equipment can help with earthmoving while limiting soil compaction and/or navigating tight spaces or steep terrain. Spider excavators, for example, can work around existing trees and on steep slopes. Wide-track bulldozers distribute the machine's weight over a larger surface area, reducing the pressure exerted on soils and lessening subsequent soil compaction. Lighter weight, small-track equipment can be specified for smaller jobs. Section 5.2.4 of the *Low Impact Development Technical Guidance Manual* provides information on equipment selection and use (see *Resources*).

considerations: Clustering development on the site (Action Item 2-22) and specifying other conservation development (Action Item 2-61) and low impact design elements can simplify the job of restricting heavy equipment movement. Restricting equipment use can also help save existing trees and vegetation (Action Item 2-41), enhance preservation of critical areas (Action Item 2-3), and offer protection to wildlife rearing young (Action Item 3-21).

resources:
Low Impact Development Technical Guidance Manual for Puget Sound
www.psp.wa.gov/LID_manual.php

Action Item 3-25

Restrict heavy equipment use to areas within 40ft of building and hard surface areas

Points: 3



Action Item Rationale:

Most tree roots occupy the top 6 to 24 inches of soil, making them prone to compaction and damage from heavy equipment.

Compacted soils absorb less stormwater, are more resistant to plant root penetration, and lack adequate aeration to promote healthy plant roots.

In addition, leaving more of the existing soils undisturbed can reduce costs of complying with the stormwater code, since undisturbed soils are exempt from post-construction soil amendment requirements.

Action Item 3-26

Supplement permanent water flow-control measures with necessary temporary controls

Points: 4



what: The construction phase of development presents a very different stormwater generation and management profile than the finished project. Occasionally, the planned permanent detention and infiltration measures, if installed at the beginning of the project (Action Item 3-4), are sufficient to control construction phase stormwater flows. But often this is not the case.

Construction activities can result in temporarily impervious surfaces and reduced infiltration capacity due to soil compaction. To manage this short-term increase in stormwater flow, projects will need to supplement existing permanent flow control facilities with temporary measures.

To earn points for this Action Item, the project must:

- Have a qualified stormwater or civil engineering professional estimate the additional flow control required and identify the supplemental temporary control structures, and
- As needed, install temporary controls that meet or exceed estimated additional flow, and include inspection and maintenance information in the project's Stormwater Pollution Prevention Plan (SWPPP).

how: Evaluate the need for supplemental stormwater flow control measures, as well as the most effective facilities given conditions during construction. Work with a hydrologist or civil engineer to map out and specify the supplemental flow control elements, and direct their installation to specifications by qualified contractors. Incorporate these supplemental measures into the project's SWPPP (see 3-Star Requirements) and regularly inspect them for proper function.

Follow the guidelines for sequencing construction of green stormwater infrastructure elements described in the *Low Impact Development Technical Guidance Manual for Puget Sound*, Section 5.4 (see *Resources*).

considerations: Installing permanent flow control measures as the first step in grading (Action Item 3-4) helps reduce the need for extensive temporary controls. Note that some green stormwater infrastructure elements, like pervious paving (Action Item 2-31) and rain gardens (Action Items 2-10 and 2-11) can be damaged by construction sedimentation; take care to protect these elements.

Further reduce the need for temporary controls by maximizing the preservation of existing vegetation and soils (Action Item 2-25).

resources:

Stormwater Management Manual for Western Washington
www.ecy.wa.gov/programs/wq/stormwater/manual.html

Low Impact Development Technical Guidance Manual for Puget Sound:
www.psp.wa.gov/LID_manual.php



Action Item Rationale:

Increased stormwater runoff caused by construction-phase impervious surfaces can overwhelm permanent flow control infrastructure, compromising stormwater quality downstream and leading to erosion and flooding onsite. Supplemental controls can be added to accommodate for this short-term increase in flow.

Supplemental controls can also protect green infrastructure elements (e.g., pervious pavement, rain gardens, and drainage swales) from sedimentation, scouring, and other damage during the construction process.



what: Confirming the proper function of stormwater protection best management practices is a simple and effective way to avoid construction stormwater pollution. Waterways near and in the development are at greater risk of increased turbidity and contaminant levels when under construction.

To gain points for this Action Item, all projects of less than one acre must:

(1) Develop a testing plan with the participation of a Certified Erosion and Sediment Control Lead or equivalent stormwater expert that includes:

- Waterway locations to be tested
- Testing frequency (weekly at minimum)
- Testing within 24 hours of any storm event resulting in 1 inch of rain within a 48 hour period) and testing action thresholds
- A Site Inspection Checklist: either a reproduction of the checklist provided in the Washington Dept. of Ecology document, “How to do Stormwater Testing” (see *Resources*) or a customized equivalent
- Parties responsible for testing, and
- A reporting and activity protocol for results exceeding thresholds.

(2) Implement the testing schedule using a Certified Erosion and Sediment Control Lead, and conducting, at minimum, one all-staff training that describes the testing protocol, lists activities to help protect stormwater quality, establishes communication protocols and identifies the responsible parties.

(3) Take action within 48 hours of test results with repair, enhancement, or supplementation of BMPs if test results exceed turbidity or pH parameters outlined in the Stormwater Manual or local standards, whichever is more stringent.

For projects one acre or larger, complete the above AND:

- Revise SWPPP within 5 days as needed
- Remedy identified problems within 24 hours

how: Review “How to do Stormwater Testing” (see *Resources*), which clearly outlines testing procedure best practices.

Work with a stormwater quality expert to develop and implement the construction-related testing and response plan. Integrate the plan into the overall SWPPP (see 3-Star Requirements).

considerations: Stormwater pollution prevention activities (Action Items 3-1, 3-2, 3-7, 3-31, and 3-32, among others) increase the likelihood that a project’s waterways test satisfactorily. Installing enhanced construction-phase flow control (Action Item 3-26) and treatment BMPs provides an additional level of assurance, and installing stormwater management facilities as the first step in grading (Action Item 3-4) reduces the volume of stormwater leaving the site in the first place.

resources:

Stormwater Management Manual for Western Washington

www.ecy.wa.gov/programs/wq/stormwater/manual.html

“How to do Stormwater Testing: a Guide for Construction Sites” by Washington State Dept. of Ecology
www.fortress.wa.gov/ecy/publications/publications/0610020.pdf

Action Item 3-27

Test waterways near or in development during construction

Points: 10



Action Item Rationale:

Water quality testing helps determine whether stormwater best management practices are successful in protecting waterways.

BMPs can fail for a variety of reasons, including improper installation or maintenance and overwhelm due to extreme rain events. Testing serves as a warning system, prompting remedial action.

Action Item 3-28

Reuse all land clearing
woody debris onsite

Points: 6



what: For projects involving land clearing, woody debris can constitute a significant portion of the waste stream. Rather than sending the material off-site to be chipped, composted or used as hog fuel, find a beneficial use for the material onsite as mulch, landscaping element and other applications.

To gain points for this Action Item, all woody debris from land clearing activities must be retained onsite, with no export of large woody material.

Note: material donated to off-site habitat restoration work (Action Item 3-29) is exempt from the requirements of this Action Item. Projects donating woody materials for off-site restoration work are still eligible for points under this Action Item.

how: Minimize land clearing in the first place by preserving existing wooded and native vegetated areas (Action Items 2-41 and 2-25). Cluster development (Action Item 2-22) and conservation development (Action Item 2-61) offer strategies for maintaining existing wild site conditions. Early in the site planning process, establish clear delineations for developed areas.

Evaluate whether existing woody materials can be used as snags or nurse logs (Action Item 3-24) or for aesthetic landscape purposes prior to being ground for mulch.

considerations: Prioritize maintaining existing vegetation. Where tree removal is required for programming or safety reasons, retain that material onsite to provide habitat or, alternatively, donate it for stream and habitat restoration (Action Item 3-29).

If wood waste is ground onsite, use it as weed inhibiting mulch in planting beds (Action Item 3-13). Un-composted wood chips mixed into topsoil can rob soils of nutrients as they decompose. To avoid this, use wood chips only as mulch.

resources:

See Action Item 3-13 for information on using wood chips as mulch material.

See Action Item 3-24 for information on using snags and logs onsite as a habitat enhancement.



Action Item Rationale:

Reusing woody debris onsite reduces waste disposal costs and the need to import woody materials from offsite.

Snags and large woody debris can provide habitat and forage for wildlife. Mulch helps protect soils from erosion, retains moisture, and suppresses weeds.



Action Item 3-29

Deliver large woody debris for salmon habitat restoration projects

Points: 5

what: *Large woody debris* includes logs generated by land clearing and forest maintenance activities. Salmon habitat restoration projects rehabilitate stream and riparian areas degraded by development or other human activities by reintroducing woody debris, replanting native species, and providing shade.

To receive points for this Action Item, the development must:

- Identify the trees for removal and those for preservation in conjunction with the project's pre-development site study (Action Item 2-60);
- Find a suitable restoration project and contact project representatives about receiving the donated material; and
- Successfully deliver the material to the recipient site.

how: Use the pre-development site study to prioritize areas onsite for preservation. Protect such areas from disturbance, unless slated for restoration activities (e.g., invasive species removal). Focus development on the remaining, less environmentally critical, areas of the site. Land clearing activities will likely produce large and small diameter logs, branches, brush, and understory vegetation.

The preferred prioritization for large woody debris is (1) retaining it in its large-diameter state onsite for habitat enhancement (Action Item 3-24), (2) delivering it to off-site habitat restoration (this Action Item), (3) grinding it onsite for mulch and other applications (Action Item 3-28), and (4) sending it to a composting facility.

A variety of city, county and nonprofit organizations conduct stream restorations. See *Resources* for a representative sampling.

Check with the organization accepting the material to determine the preferred size, amount, and other characteristics.

considerations: Maximizing the amount of existing vegetation kept onsite is environmentally preferable to land clearing and vegetation removal, even if vegetation and debris is donated. Replant or donate viable vegetation (Action Item 3-30) removed from cleared land as well.

resources: King/Snohomish County salmon conservation and restoration: www.govlink.org/watersheds/

King County habitat restoration: www.kingcounty.gov/environment/animalsAndPlants/restoration-projects.aspx

King Conservation District: www.kingcd.org

Snohomish Conservation District Streams and Wetlands information: www.snohomishcd.org/streams-plants-and-wetlands



Action Item Rationale:

Putting woody debris to use in restoration projects helps approximate natural woodland habitat and forest succession, which helps create shade and shelter needed for salmon to lay eggs and fry to grow.

If donated to a nonprofit organization, the value of the material may be eligible for tax deductions as a charitable contribution. Donating the material also avoids tipping fees associated with wood waste recycling.

Action Item 3-30

Replant or donate removed vegetation for immediate reuse

Points: 3



what: If carefully removed, plants, shrubs and small trees can often be replanted onsite, or donated to restoration or landscaping projects on other sites.

To gain points for this Action Item, work with the project landscape architect or other relevant party to identify existing vegetation for:

- Maintaining in place, transplanting elsewhere on site, or donating for use on another site, and
- Successfully replanting and/or donating removed vegetation.

Note: invasive and nuisance species (e.g., holly, ivy, and English laurel) are excluded from this Action Item, and are best composted in an approved composting facility rather than replanted or composted onsite. See *Resources* for a link to King County's list of noxious weeds.

how: Carefully remove plants using methods to maximize survival rates, and transplant and/or donate vegetation. For most species in the Pacific Northwest, autumn through early spring is the best time to replant, so long as temperatures are not consistently below freezing. Note, however, that this timing may conflict with project goals to avoid land clearing activities during the Puget Sound rainy months (Action Item 3-2).

Replanting onsite: Identify plants for replanting onsite early in project development. Replant as soon as possible after removal, taking care to keep exposed roots moist and protected from sun and wind. Make sure the soil is properly amended and ready to receive plants. Irrigate plants as needed to establish them.

If immediate replanting is impractical, heel in plants by covering roots with topsoil; apply mulch to keep roots and soils moist. Applying compost directly to plant roots can damage plants.

Donation: Some nurseries and nonprofit groups participate in native plant salvage. Also, local governments sponsor salmon stream restoration projects. County Conservation Districts often accept salvaged native plants. The King County Department of Natural Resources and Snohomish County's Native Plant Salvage Program accept specific plants; King County also offers a Community Native Plant Harvest Program.

considerations: Where possible, maintain existing vegetation in place (Action Item 2-26).

Native plants may be able to be donated to restoration projects along with large woody debris (Action Item 3-29).

Properly amended soils (Action item 3-11) help increase survival rates for transplanted vegetation.

resources: See Action Item 3-29 for habitat restoration programs that may assist in placing surplus native vegetation.

King County Plant Salvage Program
www.kingcounty.gov/environment/stewardship/volunteer/donate-native-plants.aspx

The Royal Horticultural Society provides information on moving trees and shrubs:
www.apps.rhs.org.uk/advice/search/profile.aspx?pid=293

King County Noxious Weed List:
www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/laws/list.aspx



Action Item Rationale:

Salvaging and replanting vegetation saves money on landscaping, and utilizes plants shown to succeed given the site's conditions. Plant reuse also reduces the amount of land clearing debris created during the development process.



Action Item 3-31

Inventory and secure all hazardous materials during construction

Points: 3

what: *Dangerous or hazardous materials* are those listed in or meeting the criteria set by Washington State's dangerous waste regulations (Chapter 173-303, Washington Administrative Code). Construction contractors are legally responsible for tracking, storage, and disposal hazardous materials (see 3-Star Requirements, page 22 for more on disposal of these kinds of wastes).

To earn points under this Action Item, compile a complete inventory of all hazardous materials to be used during the construction process from each of the potentially responsible parties (owner/developer, contractor, subcontractors).

Additionally, conduct the following best practices, if not already in place::

- Secure materials in a dry, weather protected place.
- Store hazardous materials separately from other materials or wastes, to avoid contamination of non-hazardous materials.
- Clearly mark hazardous material storage areas and post storage requirements.
- Store each material according to manufacturers' recommendations.
- Label hazardous waste containers properly to avoid mixing incompatible wastes or contaminating clean materials.
- Maintain the Materials Safety Data Sheet (MSDS) for each product in a visible location accessible to staff, contractors, subs and inspectors.

how: Prevention first: avoid hazardous substances and choose least-toxic alternatives. During the inventory phase, research safer alternatives and share this information with contractors and subs. Include hazardous materials reduction goals in the project's Construction and Demolition Waste Management Plan and in the *General Requirements* section of construction documents.

considerations: Many contractors qualify under Washington law as Small Quantity Generators (SQG) of hazardous waste. A SQG business must meet certain criteria, e.g., generating no more than 220 pounds of hazardous waste monthly and identifying hazardous wastes according to state law. Businesses failing to meet the SQG requirements must become a fully regulated hazardous waste generator, subject to stricter requirements.

Equipment maintenance (Action Item 3-32) can generate a variety of hazardous materials. Securing hazardous construction materials is a requirement of Salmon-Safe certification (see 5-Star Requirements). Hazardous waste minimization and identification of safer product alternatives can be a valuable service provided by the developer (Action Item 3-34).

resources:

King County:
www.lhwmp.org/home/BHW/

Snohomish County:
www1.co.snohomish.wa.us/Departments/Public_Works/Divisions/SolidWaste/Haz_Waste/bushazwaste.htm

Whole Building Design Guide: Construction Waste Management:
www.wbdg.org/resources/cwmgmt.php?r=sustainable

Building Materials: Dangerous Properties of Products in MASTERFORMAT Divisions 7 and 9
by H. Leslie Simmons and Richard J. Lewis, Sr.
(Wiley: 1997)



Action Item Rationale:

Hazardous materials pose a health and safety risk to storm-water quality, workers, and future residents.

Additionally, hazardous materials must be tracked and managed, increasing project costs. Using least-toxic and nontoxic alternatives can reduce or even eliminate expensive management procedures, hazardous waste hauling contracts, and personal protective equipment.

Action Item 3-32

Maintain heavy equipment so as to protect ground and stormwater

Points: 1



what: *Heavy equipment* includes earth moving machinery, cranes and lifts, and drilling and trenching equipment.

The intent of this Action Item is to prevent stormwater quality pollution related to coolant, fuel, oil and metals released into soils or directly to stormwater from heavy equipment on the job site.

To earn the point associated with this Action Item, create and implement a maintenance plan for all heavy equipment onsite, including at minimum:

- A maintenance calendar and list of maintenance procedures for each piece of machinery.
- A policy of off-site equipment washing at a facility with stormwater protection features, or the onsite creation of such a facility.
- A policy of off-site equipment fueling, or the onsite creation of a designated fueling pad with proper containment and safety features.
- Identifying and adopting least-toxic maintenance approaches.

how: For each piece of equipment, follow the maintenance schedule provided by the manufacturer. Follow applicable BMPs outlined in Volume IV of the *Stormwater Manual*: S414—BMPs for Maintenance and Repair of Vehicles and Equipment (see *Resources*). Develop and post a master maintenance schedule listing each piece of equipment onsite, and identify responsible parties for maintenance. Include information on maintenance in staff and contractor training materials.

Prevent oily or other hazardous substances from entering ground, drainage areas, or local bodies of water by:

- Using nontoxic substitutes.
- Handling (mixing, etc) oily or hazardous substances on weather protected and centrally located areas, or in shop.
- Storing oily or hazardous substances in appropriate containers in monitored locations.

Know and practice spill response procedures in advance. Hold all-staff meetings to ensure maintenance and response procedures are disseminated.

Promptly respond to all spills.

considerations: Maintenance and proper inventorying and storage of hazardous materials (Action Item 3-31) are all part of an integrated approach to stormwater pollution prevention. Limiting the operation of heavy equipment to specific areas onsite (Action Item 3-25) can also help reduce the likelihood of spills.

resources:

Stormwater Management Manual for Western Washington, Volume IV, Source Control BMPs
www.fortress.wa.gov/ecy/publications/publications/1210030.pdf
Relevant sections:

- S414: BMPs for Maintenance and Repair of Vehicles and Equipment
- S419: BMPs for Mobile Fueling of Vehicles and Equipment
- S421: BMPs for Parking and Storage of Vehicles and Equipment
- S426: BMPs for Spills of Oil and Hazardous Substances



Action Item Rationale:

Improperly maintained equipment can leak oil, fuel, coolant and other fluids, contaminating stormwater, soils, and groundwater.

It can create dangerous working conditions, shorten equipment life, and void equipment warranties.



what: *Alternative fuels* take several forms, including electric, compressed natural gas (CNG), and biodiesel to operate vehicles and machinery. For the purposes of this Action Item, equipment includes machinery used for site work, building construction, and passenger transport.

Note: corn-based ethanol products are not considered alternative fuel for the purposes of this credit.

To earn points under this Action Item, use alternative fuels to operate site equipment and vehicles:

Action	Points
Use any amount of alternative fuel to power site equipment	3
Use alternative fuel to operate an average of at least 25% of all site equipment	5

how: Specify alternative fuel use in development work contracts. Set targets for total percentage of biofuel use in construction vehicles, and share this information with contractors and subs.

Contractors that use biofuels tend to market the fact, making them relatively easy to find. Biodiesel is readily available from local and regional vendors. Electric and compressed natural gas vehicles are increasingly available as well.

considerations: While biodiesel is a renewable fuel, its production has a varied story to tell. Biodiesel made from waste vegetable oil, especially when sourced locally, is a definite environmental plus (but can be difficult to find and costly). Biodiesel sourced from imported palm oil, however, may actually be worse for the environment and climate change than standard petroleum diesel, due to forestland conversion/deforestation practices that tend to accompany the establishment of palm oil plantations.

Additionally, certain biofuel crops are displacing food production, leading to food price shocks and food scarcity in some developing countries. Therefore, look first for waste vegetable oil-derived biodiesel, and secondarily for biodiesel produced from domestic crops. The science of biofuel evaluation is quickly evolving; see *Resources* for helpful information in choosing responsibly.

Alternative fuel vehicles and equipment can help protect site soils and stormwater from contamination from fuel spills, and simplify equipment maintenance (Action Item 3-32) and hazardous material storage (Action Item 3-31).

resources:

The US EPA Renewable Fuel Standard Program:
www.epa.gov/otaq/fuels/renewablefuels/

Department of Energy's Alternative Fuels Data Center information on biodiesel:
www.afdc.energy.gov/vehicles/diesel.html

Action Item 3-33

Use alternative fuel equipment onsite

Points: 3-5



Action Item Rationale:

Transitioning from a fossil fuel based energy economy to one powered by renewable sources is key to long-term sustainability. Purchasing responsibly produced domestic biofuels is one way to encourage such a change. Additionally, biodiesel is a very low toxicity product, making any potential spills much more benign than petroleum diesel spills.

Electric and compressed natural gas vehicles eliminate the risk of liquid fuel spills, and electric equipment charged by renewable energy sources further reduces environmental impact.

Action Item 3-34

Provide support, education, and resources on green building to builders in development

Points: 5



what: Homebuilders vary in their skills and knowledge regarding green building, and some green building activities are time or cost effective only at larger scales. The intent of this Action Item is to support homebuilders in their efforts to include green features by reducing the functional, financial, and educational barriers to their participation.

To earn points under this Action Item, coordinate or facilitate builders in construction recycling, product purchasing, code or permit processes, or other areas, as approved by the BUILT GREEN Director.

how: Survey builders to find out the assistance they most need. Projects conducting a design charrette (Action Item 4-1) can solicit information from the builders at the charrette. Assistance can take a variety of forms.

Examples of assistance include:

- *Construction recycling coordination.* For instance, organizing wood recycling may require more effort than individual builders are willing to expend on a limited number of homes. If the developer arranges for community-wide wood recycling, then all builders can participate. Providing a single point of collection for recycling also helps individual builders save space and can reduce site disruption and soils compaction.

- *Cooperative purchasing.* Cooperative product purchasing is another opportunity to assist builders. For instance, the developer can require all builders to use ENERGY STAR[®] appliances and arrange for a bulk purchase, increasing bargaining power and driving down unit price. Many green building elements can benefit from bulk purchases, from pervious pavers to sustainable harvest landscape timbers. Bulk purchases can also help establish an aesthetic theme (e.g., a uniform style of rainwater harvest cisterns dotting residential landscapes, or the same type of photovoltaic panels on all buildings).
- *Code/permit facilitation.* Some of the more advanced or unconventional green building approaches will require departures or variances from existing code requirements. Where community goals include aspects that require multiple builders to apply for variances, the developer can help by approaching the permitting authority to address the issue community-wide.



Action Item Rationale:

Coordinating activities can reduce time and cost barriers for builders, increasing the participation rate and resulting in a greener community overall.

Builders often possess variable skills and experience with green building practices. Assistance from the developer can help advance builders along the learning curve, reduce time and cost barriers for builders, and increase their participation rate, resulting in a greener community overall.

Action Item 3-34

- *Green product and technology research.* Typically, builders must individually research building materials, products, technologies, and design approaches for their homes. Developers can assist by prioritizing topical areas that align with the developer's vision and branding for the community, and sharing the results with builders to lower the inherent barrier to information that in-depth research poses. This research may feed into the cooperative purchase of materials or products (see above). Developers can also retain consultant services (e.g., charrettes, building energy modeling, shading studies, construction waste management, green materials selection, integrated project planning, construction process or specification development, etc.) for builders to access as needed.
- *Green building and LID training.* Various training opportunities exist for builders; a developer has the opportunity to craft trainings that meet the overall sustainability goals of the community or to provide specific technical information. See Considerations below for Built Green credits related to builder training.

considerations: Including builders in the initial project design charrette (see 4-Star Requirements) can help align developer and builder expectations, generate exciting community-scale ideas and options, and identify green building champions among the builders and other attendees.

Builder training is another form of assistance the developer can provide to builders, as is the creation of a Builder's Field Guide (Action Item 4-2). A basic builder training/orientation to BUILT GREEN is described in Action Item 4-2.

resources:

The Solarize Guidebook: A Community Guide to Collective Purchasing of Residential PV Systems by Northwest Sustainable Energy for Economic Development. This guidebook, financed by the US Department of Energy, describes different models for community-scale photovoltaic system installations. While targeted to community groups, the document offers important lessons to any organization considering bulk purchase of photovoltaic systems for distribution at the community scale. www.nrel.gov/docs/fy12osti/54738.pdf

King County Construction and Demolition Recycling information: www.your.kingcounty.gov/solidwaste/greenbuilding/construction-demolition.asp

Action Item 3-35

Extra credit for innovation

Points: 1-10



what: Not all approaches to construction operations that enhance the environmental or public health performance of a community are listed in the BUILT GREEN Communities Checklist. Some of these may garner the project additional points through this Innovation Action Item.

Innovations earn between 1 and 10 additional points, depending on the level of benefit anticipated from the action.

To be considered for these points, prepare a description of the innovation in terms of its process, design, and outcome; its expected environmental or human health benefits; and the number of points proposed for the innovation.

how: First, identify the innovation. Begin by using the BUILT GREEN Action Items as starting points, to get to understand the challenges that green approaches aim to address. Then brainstorm novel ways of meeting those challenges more effectively or efficiently given the particulars of the specific project and the methods being considered for the development.

Construction activities offer many opportunities for innovation in sustainable community development. US EPA, Washington State Department of Ecology, and local jurisdictions have identified best management practices for site and water protection during construction. Look to these resources to find the latest approaches to green construction potentially not listed on the Communities Checklist.

Identifying innovations requires research. Generally, sustainability information is scattered among a large number of sources. For example, organic and nontoxic landscaping information can be found on the Seattle Tilth website, while information on alternatives to toxic construction products is available through the Healthy Building Network and the Washington Toxics Coalition (see *Resources*).

It's good business practice to follow other green building projects and firms to keep current on new strategies and approaches. Green building periodicals spotlight new techniques and products. Government and nonprofit research can also yield inspiring and effective alternatives to common practice. See *Resources* for examples.



Action Item Rationale:

As an evolving field, green development best practices are continuously emerging. Innovative features prompt test cases that, if successful, can be adopted by other projects.

Such innovations advance the green building and development movement, resulting in healthier residents, more durable buildings and communities, and a more resilient ecosystem.

Action Item 3-35

Verify the innovation. Once the new action, process, or product has been identified, review the existing Action Items within BUILT GREEN to determine if the action being considered is already included. If not, research to determine its relative environmental or human health benefit.

Assign a point value to the innovation. Look for existing Action Items that produce similar outcomes. Base the number of points to recommend on the points awarded on similar actions or equivalent levels of benefit.

Prepare a proposal for BUILT GREEN. Write a summary describing the innovation, its processes, design elements, intended outcome(s) and its environmental and/or human health benefits. Include the point value recommendation.

Submit the innovation for consideration. Send in the prepared report to the BUILT GREEN Director. Verify the project is registered before submitting the proposal, and suggest a date for response.

considerations: Innovative approaches can come from any corner of a development project and can be related to just about any Action Item in BUILT GREEN. Review the Action Item list to determine if which actions are enhanced or facilitated by using particular construction techniques. Add these criteria to construction documents, the Builder's Field Guide (Action Item 4-2), or other educational events/ items where applicable. See Action Item 4-24 considerations: for a partial list of ideas.

resources:

Washington Toxics Coalition:
www.watoxics.org

Seattle Tilth
www.seattletilth.org

Healthy Building Network
www.healthybuilding.net

*Low Impact Development Technical
Guidance Manual for Puget Sound:*
www.psp.wa.gov/LID_manual.php

Environmental Building News:
www.buildinggreen.com

EDUCATION + COMMUNITY STEWARDSHIP

Sustainable site development sets the stage for a green community, but additional steps help optimize environmental performance and human health.

First, ensure protection of individual lots by encouraging and requiring green construction practices of builders.

Next, review the community's governing documents and revise any language that impedes or prohibits environmental actions by homeowners, or requires environmentally damaging activities.

Finally, promote environmentally responsible behavior through builder and community education and the establishment of green O+M protocols.

Action Item

4-1

Conduct planning and design charrette for builders

Points: 15



what: A *design and planning charrette*, sometimes called an *eco-charrette*, is a facilitated strategy session focused on using stakeholder input to spur innovative ideas about the design of the community.

The development project team organizes the event to present and/or refine overall environmental, social and economic goals, number and types of units, open space plans, and so on. This team or the facilitators invite those that will be building and affected by the project to attend. The facilitation team encourages participation to elicit input and prioritize ideas.

To earn points under this Action Item, the developer must host at least one design charrette for builders, meeting the following:

- It is conducted early in the project (no later than schematic design phase on the earliest structures slated for construction in the community).
- It must be at least one half-day in length.
- At minimum, it must include representation from the developer team, builders, architects, engineers and permitting agencies on the project.

Charrette results and next steps must be written up in a report and distributed to all builders and other relevant parties, including BUILT GREEN to indicate successful completion of this Action Item.

how: Hire a facilitator experienced in the integrated design process and charrette facilitation. Green building consulting firms often have experience with charrette facilitation, and many green design firms house staff trained in charrette facilitation. Look for those who have gone through formal training and/or have demonstrated experience on high-performance projects.

Facilitators can advise the developer on assembling a strategic list of involved and affected parties to attend, which will depend on the current stage of the project. In addition to the designated or prospective builders, the group assembled could include architects, municipal officials, civic group representatives, neighbors, future residents and/or owners, operations and maintenance personnel and at least one or more project detractors. The best project ideas can come from unexpected sources.

The facilitation team assists in building an agenda that contains activities designed to foster collaboration and reveal information, new ideas, priorities, and support for the development. The facilitators can also coalesce the results into a report useful to the design team and other relevant parties.

considerations: A charrette can be a complicated event requiring skill at addressing and resolving conflicting views on the prioritization of goals and design elements, adequately addressing all topics deserving coverage, and ensuring that participants feel included and heard.

The results of a charrette can inform the content of the Builder's Field Guide (Action Item 4-2). Additionally, a charrette can help identify the type of developer assistance desired by builders as a step in satisfying Action Item 3-34. Use that Action Item as a guide when formulating questions to ask builders.

resources:

Integrated Design Process description from the International Institute for a Sustainable Built Environment: www.iisbe.org/download/gbc2005/Other_presentations/IDP_overview.pdf

National Charrette Institute offers training, certification, and RFP language for securing facilitation and charrette services: www.charretteinstitute.org



Action Item Rationale:

Charrettes facilitate the exchange of ideas and offer a place for project participants to learn each other's priorities. Charrettes help identify and resolve problems and differences of understanding and opinion early on, setting the stage for a smoother development process.

Additionally, participatory creative sessions help engender a sense of community and inclusion, and can reduce the likelihood of community opposition to a project.



SITE/WATER



ENERGY



HEALTH



MATERIALS

what: Green development requires a wide variety of skills and knowledge from builders. A *Builder's Field Guide* provides essential information on the environmental priorities of the project and how-tos on best management practices to support the project's BUILT GREEN goals.

This Action Item requires the development and distribution of a Field Guide to all builders in the development. At a minimum, the Field Guide must include:

- A brief description of the key environmental features of the project, such as wildlife corridors, sensitive aquifers, salmon streams, etc. and provide guidance to contractors on ways they can help protect these features.
- Sections on construction waste management, site and water protection, and protocols for any other environmental goals specific to the project.

To align the Field Guide with the community's BUILT GREEN goals, identify specific Action Items that the developer has prioritized.

When applicable, translate the Field Guide into applicable languages for use by contractors and subs.

how: A Field Guide can take multiple forms; given its use in the field, it is suggested to create a binder-style guide that allows the insertion and removal of sections. This lowers production costs and makes the Guide customizable for different audiences and reusable for future projects.

Utilize the content and resources listed in this Handbook to help develop the Builder's Field Guide. Green building consultants, the project architectural team, and other experts can also supply content for the Field Guide.

Frame the language and instruction in the guide to the builder audience. Clear instruction and information on expected outcomes, with checklists, schematics and diagrams to highlight processes and finished product, will speak more directly to builders than dense prose and general statements on green building philosophy.

considerations: Integrate the Field Guide with other Action Items related to builder actions, including LID elements, tree maintenance (Action Item 4-10), lighting (Action Item 2-51), and others throughout the Communities Checklist. The Field Guide offers a strong reinforcement to the builder orientation, and can help provide structure to that orientation (or vice versa).

resources: Washington State University Energy Extension created a Builder's Field Guide for compliance with state residential energy code. The structure and format includes diagrams and descriptive text to assist builders and subs in achieving project directives: www.energy.wsu.edu/BuildingEfficiency/EnergyCode.aspx

Action Item 4-2

Provide a builders' field guide of best management practices

Points: 5



Action Item Rationale:

A Field Guide can act as a concrete reference point for the builders, contractors and trades working in the community, helping coordinate efforts and producing a thread of continuity for the execution of green elements on the project.

Such coordination makes it much more likely that points will be achieved for the BUILT GREEN Action Items pursued on the project.

Action Item 4-3

Require builders to provide homeowners/residents with recycling storage and collection system

Points: 3



what: A recycling storage and collection system can take a variety of forms while meeting the main intents of facilitating individual homes' recycling management and standardizing recycling processes across the development to increase diversion of recyclable materials from household waste streams.

To earn points under this Action Item, the developer must require all builders within the community to provide recycling storage and collection to all housing units. The storage and collection system must be able to manage, at minimum, paper, cardboard, plastic and glass, as well as compostable materials (food waste composting for all units; and yard waste composting for units with private yards).

how: Include requirements for recycling collection and storage space along with other obligatory builder actions. In addition, provide design advice and/or specifications and include the information in builder trainings.

Some general tips to provide builders:

- *Design for flexibility.* Municipal recycling programs can vary in their provision of recycling services over time. Develop a storage and collection system with the flexibility to handle an expanded suite of recyclable materials over time, and to manage both source-separated and commingled recycling. Simple alcoves with space for multiple, varied recycling containers offer the most flexibility.

- *Unify the approach across the community.* Provide an intuitive and uniform collection and storage approach across the community to facilitate participation and community cohesion.
- *Make it easy and convenient.* If garbage and recycling containers are nearby but clearly separated, the risk of contamination is reduced and recycling rates increase. In multifamily units, provide intermittent collection containers to make participation easier for residents.

considerations: This Action Item complements the 3-Star Requirement to provide a comprehensive recycling plan for community and facility areas. Consider community-scale recycling and composting (Action Item 2-53) as part of the overall development design.

Information on recycling space requirements can be included in builder training sessions (Action Item 3-34), the Builder's Field Guide (Action Item 4-2), and/or discussed as an agenda item during the builder charrette (Action Item 4-1), where consensus can be reached among builders to provide a uniform system.

resources:

King County Recycling Information:
www.your.kingcounty.gov/solidwaste/garbage-recycling/recycle-more.asp

Snohomish County Residential Recycling Information:
www1.co.snohomish.wa.us/Departments/Public_Works/Divisions/SolidWaste/Recycling/

Many municipalities also maintain residential recycling information.



Action Item Rationale:

Lack of adequate space for recycling collection and storage can discourage participation. Physical space and containers for recycling are visual reminders to recycle, so recycling becomes the norm and waste diversion rates are maximized.



SITE/WATER



ENERGY



HEALTH

what: Improperly designed or installed lighting can result in light intrusion into neighboring homes and natural areas (light trespass), and allow fugitive light to escape into the night sky (light pollution).

To gain points for this Action Item, develop and distribute guidelines to the community's builders outlining design approaches and product choices that minimize light trespass and light pollution. At their most basic, the guidelines shall address the following:

- Installation of International Dark-Sky Association (IDA) "Fixture Seal of Approval" certified exterior lighting.
- Design and installation of exterior lighting in compliance with the IDA Model Lighting Ordinance, Section V: Residential.

how: Visit the IDA website for compliant lighting lists, a model lighting ordinance, and resources helpful in creating builder guidelines. Work with a lighting designer experienced in preventing light pollution and trespass to develop specific language for the builder guidelines and to assist in creating builder education.

Integrate the guidelines in the form and distribution approach with other builder education materials.

considerations: Action Item 2-51 (Light pollution reduction) complements this Action Item. Consider the energy efficiency of lighting choices in addition to light pollution issues. In the spirit of integrated design, the Builder Guidelines ideally would cover light pollution issues in conjunction with energy efficiency, public safety, as in Crime Prevention Through Environmental Design (see *Resources*), and accessibility issues. Lighting guidelines could be inserted into a builder's best practices field guide (Action Item 4-2).

resources:

International Dark-Sky Association:
www.darksky.org

IDA Practical Guide 3: Residential Lighting primer:
www.darksky.org/assets/documents/PG3-residential-lighting.pdf

Rutgers University's School of Criminal Justice provides information on lighting strategies to reduce crime and enhance public safety:
www.crimeprevention.rutgers.edu/
(click on *Special Topics*, then *Lighting*)

Action Item 4-4

Prepare builders' guidelines on exterior lighting to reduce light pollution and trespass

Points: 2



Action Item Rationale:

Improperly shielded or poorly directed lighting can impair the migratory patterns of birds and the diurnal patterns of wildlife, attract pests, and obscure the night sky from observation. And in general, light falling where it's not needed or wanted represents wasted energy.

Light trespass also represents a safety and neighborliness issue: light pollution can disrupt human sleep patterns, cause a glare hazard for walking or driving, and can even cast shadows that create hiding places for attackers.

Action Item 4-5

Allow laundry clotheslines outside

Points: 1



what: Clotheslines are a time-tested, environmentally friendly approach to drying laundry. Perceived aesthetics issues lead some homeowners' associations to prohibit exterior clotheslines in the community governing documents.

To gain this credit, the community's governing documents must:

- Explicitly allow outdoor clotheslines at residences, and/or
- Be free of language that directly or indirectly inhibits homeowners from installing clotheslines on their property.

how: Review existing covenants, codes, and restrictions (CC&Rs) for language that directly or indirectly (e.g., language prohibiting the installation of posts, arbors, or other structures within view of the street) impedes or prohibits the installation of clotheslines. Modify or remove language as needed.

High quality, off-the-shelf clothesline designs are available. Alternatively, the clothesline can be an architecturally integrated element to the home, fencing, or outbuildings, including unobtrusive retractable designs. Provide information in the Builder's Guide (Action Item 4-2), and consider bulk purchasing (Action Item 3-34) of clotheslines to unify their appearance throughout the community.

considerations: Other CC&R-based restrictions to green building may be present in existing restrictions: conduct a thorough review and/or developing a list of beneficial elements that the community wishes to encourage.

resources:

The Urban Land Institute's "HOA Covenants for Sustainability" provides general information on how homeowner association covenants and restrictions can either inhibit or facilitate a community's sustainability efforts:
www.urbanland.uli.org/Articles/2012/Jan/WeissmanHOA



Action Item Rationale:

Developing initial community governing documents that embrace sustainability principles helps set the stage for a culture of stewardship within the homeowner's association.

Clotheslines are a low-cost, environmentally beneficial technology. Clotheslines reduce a home's energy use and carbon footprint by reducing the need for mechanical clothes drying.



what: Vegetable gardens and greenhouses allow residents to grow produce at home. Unfortunately, a community's governing documents can directly or inadvertently inhibit or prohibit agricultural production through its CC&Rs.

To gain points for this Action Item, a community must expressly allow, in its governing documents (points are additive):

- Vegetable gardens within view of street frontage in individual homes
5 points
- Greenhouses within view of street frontage of individual homes
5 points

how: Include environmental stewardship and sustainability as objectives when developing governing documents. If adapting such documents from previous developments, conduct a comprehensive review to identify explicit and implicit barriers to sustainable activities. Revise covenants and community policies to allow for agricultural land use and greenhouse placement. Look for language prohibiting accessory structures, requiring turf in front yards, or other provisions that may not explicitly prohibit gardening but make it effectively impossible to do so.



Encourage builders to include vegetable garden space in residential landscape plans. If onsite agriculture is desired community-wide, arrange for bulk purchasing of materials (Action Item 3-34) for raised beds (e.g., nontoxic, rot-resistant or recycled plastic lumber, organic topsoil, finished compost) to both reduce costs for builders and help harmonize landscaping elements across properties.

considerations: Developments that allow agricultural production can contribute to economic development by allowing that produce to be sold at a community farmer's market (Action Item 4-9). Lots oriented for solar access (Action Item 2-48) will also be oriented for greenhouse placement. Individual gardening plots can also complement edible landscapes and P-Patches (Action Item 4-7) planted at the community scale.

resources:
HOA Covenants for Sustainability:
www.urbanland.uli.org/Articles/2012/Jan/WeissmanHOA

Action Item 4-6

Allow agriculture including vegetable gardens and greenhouses

Points: 5-10



Action Item Rationale:

Local food production reduces a community's carbon footprint, increases resiliency, and helps reinforce community social fabric. During World War II, backyard "Victory Gardens" provided up to 40% of the nation's produce.

Onsite food production creates economic benefits to homeowners, and environmental and social benefits to the community overall. By reducing the transportation miles involved in getting produce from point of harvest to table, homegrown fruits and vegetables reduce food-related transportation pollution. Fresh produce also provides significant health benefits to the consumer.

Action Item 4-7

Provide P-Patch space for community residents

Points: 10



what: *P-Patch* is a term originating in Seattle, attributed to an abbreviation of Picardo, a local farming family. They consist of common spaces subdivided into individual cultivation plots for residents. A common P-Patch organizational structure includes per-square-foot annual fees for use, rules of conduct and levels of commitment from participants (e.g., a minimum number of hours committed to tending common space), and fertilizer and pesticide use restrictions.

To earn points for this Action Item, the development's aggregated P-Patch area must be:

- At least 5 percent of the total developable land within the community, or
- Feature 1 planting bed (minimum size: 100 square feet) per 10 dwelling units.

The P-Patches must be easily accessible to residents and no further than 1000 feet walking distance from residences. For larger communities, this requires multiple locations. In addition to the physical space for the P-Patch, the developer must create a legal structure to retain it in perpetuity for community members. (Residents may maintain P-Patches; if so, a formal management and maintenance structure is required.) Placement of P-Patches in wetlands or other environmentally sensitive or critical areas is prohibited.

how: Early in the community planning process, locate an area or areas for the P-Patch with day-long sun exposure. Incorporate the P-Patch spaces into the overall landscape plan, balancing them with other open space uses including habitat, wildlife corridors, and critical areas. Place P-Patches in easily accessible areas, preferably near other public space to enhance public safety.

The Seattle Department of Neighborhoods pegs the ideal size for a P-Patch at approximately 4,000 square feet, with a minimum plot size of 2,000 square feet, and a maximum slope of 40 percent. Steeply sloped areas require terracing, increasing development costs and introducing accessibility challenges. Select sites for easy delivery of materials (e.g., compost), and include water service. A community tool and storage shed dramatically increases the usability of a P-Patch, as does an adjacent composting area. See *Resources* for a list of design elements to include.

Setting up and running a P-Patch program requires ongoing organization and maintenance. Require residents receiving plots to attend an orientation and submit to common safety and maintenance rules.

considerations: P-Patch produce may be sold at a local farmers' market (Action Item 4-9).

Developments with clustered housing (Action Item 2-22), cohousing communities (Action Item 2-38) and mixed-use developments with multifamily units (Action Item 2-36) can benefit from P-Patch space in that residents with limited or no access to private plots of soil can still garden.

Maintain patches using ecological and nontoxic methods (Action Item 4-14). Consider collocating the P-Patch with at least one community building that can also be used to store tools.

resources:

"How to start a new P-Patch" resource from Seattle Dept. of Neighborhoods: www.seattle.gov/neighborhoods/ppatch/start.htm



Action Item Rationale:

Local food production builds community, increases access to fresh food, spurs economic development and can lower a community's carbon footprint.

P-Patches are a low-cost method of maintaining community space.



Action Item 4-8

Allow small livestock such as chickens and goats

Points: 5

what: For the purposes of this Action Item, *livestock* is defined as animals raised directly for food, or whose products (eggs, milk, fur) are harvested.

To earn points under this Action Item, the community governing documents must explicitly allow residents to raise small livestock, with restrictions no greater than those present in the City of Seattle's Land Use Code (see *Resources*), specifically:

- Up to three small animals per residential single-family lot up to 19,999 square feet; up to four small animals for lots 20,000 square feet and greater, with one additional small animal for each 5,000 square feet beyond 20,000.
- Up to eight domestic fowl.
- Full-sized farm animals: only on lots 20,000 square feet or greater. One per lot; one additional per additional 10,000 square feet.
- Bees: up to 4 hives with no more than 1 swarm per hive.

how: Check the applicable county or municipal code to determine the overall allowances for residential livestock in the community.

Add language to the community's governing documents that explicitly allow the raising and tending of small livestock, including at minimum, the livestock listed above. The community's governing body must formally approve these changes to the CC&Rs.

considerations: Produce, honey, eggs and other products of urban agriculture could be sold within the community through an onsite farmers' market (Action Item 4-9). Variable lot sizes (Action Item 2-39) may facilitate the keeping of livestock.

resources:
Seattle Department of Planning and Development *Client Assistance Memo 244: Urban Agriculture* available at www.seattle.gov/dpd/cams



Action Item Rationale:

Growing consumable goods within the community helps increase community resiliency, can lower a community's carbon footprint, provides educational opportunities for residents, and represents an economic development opportunity.

Action Item 4-9

Provide farmers market space for community including availability of produce and products from within the community

Points: 10-20



what: *Farmers markets* connect independent local growers and preparers of fruits, vegetables, meat, eggs and dairy, baked and canned goods, and other products with end consumers in a marketplace setting. Space is rented or otherwise allocated to individual sellers who conduct transactions directly with buyers. While often held outdoors, such markets can be indoor-outdoor or entirely indoors depending on the available facilities, seasons active, and other factors.

To earn points under this Action Item, the development must dedicate space for farmers markets within the community that is freely available for a minimum of 6 months per year and a frequency of at least 1 day per week. The space must also include potable, hot water and wastewater facilities, publicly accessible restrooms, and waste, recycling, and composting functions. Additional points are available for establishing a fully functioning farmers market in addition to the infrastructural elements listed above.

- Dedicated farmers market space and infrastructure:
10 points,
or
- Dedicated space and infrastructure, AND an active farmers market with community-derived produce and/or products:
20 points

how: Farmers markets require sufficient space for both booths/stalls and shoppers. The most likely location for a farmer's market is often near community buildings within the neighborhood. Determine whether the community buildings can serve double- or triple-duty, accommodating other activities when the space is not being used for markets.

A farmers market is a business endeavor. Creating not only physical market space, but also the infrastructure to encourage the production and consumption of produce and other products from within the community, requires thorough research and planning. Investigate supply (e.g., willingness of local food producers to participate) and demand (likelihood of residents to patronize the market; proximity of other similar markets), as well as the infrastructure needed to support a viable farmers market within the community.



Action Item Rationale:

Providing space for residents and local farmers to offer produce and products reduces miles products and produce must travel to market and the need for residents to travel to purchase groceries.

Farmers markets also provide a community gathering opportunity, enhancing the neighborhood identity and fabric.

By drawing purchasers from outside the community, farmers markets represent economic development potential as well.

Action Item 4-9

considerations: A farmer's market is a significant element and should be considered as early as possible in the design process. Include it as an element of the design charrette (see 4-Star Requirements) so that interdependencies and synergies can be identified.

Integrate planning for P-Patches (Action Item 4-7) with plans for farmer's market space. Fruits, nuts and vegetables grown in common areas within the development could be harvested to provide community revenue.

Minimizing or eliminating the use of petrochemical pesticides and fertilizers (see Action Item 4-14) could go a step further and be certified as organic. Vendors listing their products as organic must be certified by a USDA accredited certifying agency.

resources:

The Rodale Institute:
Starting a Farmers' Market the Right Way:
www.newfarm.rodaleinstitute.org/features/2006/0206/frmmrkt/king.shtml

Washington State University's Small Farms Team includes information on starting a farmers market:
www.smallfarms.wsu.edu/marketing/

Washington State Farmers Market Association:
www.wafarmersmarkets.com

Action Item 4-10

Prohibit tree topping

Points: 2



what: *Topping* is the removal of the growth lead of a tree; often a substantial portion of the tree is removed. Trees are sometimes topped to gain or maintain access to views and for other reasons unrelated to the health of the tree.

This Action Item requires the insertion of language within the community's governing documents that prohibits the topping of trees unless determined a safety hazard by a certified arborist.

how: Avoid the temptation to top trees by considering views and mature heights during landscape design. Select species and locations carefully, anticipating a tree's natural habit and mature height and spread, and those factors' implications for daylight and views, buildings, and power lines and other infrastructure.

When working with existing trees, modify lot placement, configuration and size and consider cluster development approaches (Action Item 2-22) to maintain trees. Orient homes to benefit from existing trees.

Institute a requirement for all trees over a certain diameter (e.g., 12" diameter at breast height) to be examined by a certified arborist prior to cutting or thinning.

considerations: The shading afforded by trees is beneficial in most contexts (see Action Item 2-41), but can compete with a project's passive or active solar objectives, both on private homes and community buildings (Action Item 2-50). Conduct shading studies to determine effects of mature tree plantings on solar access.

resources:

Plant Amnesty: "5 Reasons to Stop Topping Trees:"
www.plantamnesty.org/stopping/5reasons.aspx

International Society of Arboriculture:
www.isa-arbor.com



Action Item Rationale:

Tree topping damages tree health, prompting rapid, weak re-growth, making trees more prone to shear and windfall, and increasing susceptibility to disease and rot. It also results in an unnatural and unattractive tree form

Existing trees, properly situated and pruned, can enhance views by framing specific vistas. Mature, well-formed, healthy trees also provide community benefits in terms of stormwater management and air filtration, and increase property values.



Action Item 4-11

Allow solar panels

Points: 2

what: For the purposes of this Action Item, *solar panels* are defined using the Washington State SSB 5136: “a panel device or system or combination of panel devices or systems that relies on direct sunlight as an energy source.” This includes both *photovoltaic* (solar electric) systems and *solar hot water* systems (Action Item 2-50). Some communities restrict the installation of solar panels on roofs, for aesthetic reasons. CC&Rs are the most common way an HOA prohibits actions perceived to diminish community aesthetics or property values.

To claim points for this Action Item, demonstrate that the community’s governing documents are free of:

- Language specifically restricting the installation of rooftop or ground-related solar panels, and
- General provisions that would effectively prohibit the installation of solar electric and/or solar thermal panels.

The language in the governing documents must exceed (i.e., be less restrictive than) the allowed restrictions outlined in the Revised Code of Washington 64.38.055 (see *How*).

how: RCW 64.38.055 prohibits the restriction of solar panel installation so long as the panels have the relevant industry certifications and meet applicable health and safety standards.

The law allows governing documents to include the following prescriptions:

- Limitations on the installation of solar panels on street-facing roofs to those that conform to the slope of the roof and those whose top edge are parallel to the roof ridge;
- Restrictions on solar panel placement if visible above the roof line;
- Requirements to paint structural supports and any visible conduit or wiring to match roof color;
- Requirements to shield the panels, so long as shielding does not increase the installation cost of the panels or reduce the energy production of the panels by more than ten percent;
- “Other reasonable rules regarding the placement and manner of a solar energy panel.”

Review existing governing documents for elements that explicitly or implicitly restrict the installation of solar panels. Remove any phrasing that may be interpreted as restricting installation, and add language that explicitly allows the installation of panels.

considerations: Installing solar panels on community structures (Action Item 2-50) can help encourage residents to follow suit, and provide an educational opportunity about renewable energy, which can be enhanced with interpretive signs (Action Item 4-16).

In communities with high development density (Action Items 2-21 and 2-39), care must be taken to avoid impinging on the solar access of other units by placement of solar panels.

resources:

Revised Code of Washington,
Title 64, Chapter 38
(Homeowner’s Associations):
www.apps.leg.wa.gov/rcw/



Action Item Rationale:

Solar panels are a key strategy for building- and community-scale energy production. Restricting their application denies homeowners a common path to energy independence and to reducing their carbon footprint.

Action Item

4-12

Allow ENERGY STAR® roofing

Points: 1



SITE/WATER



ENERGY



HEALTH



MATERIALS

what: ENERGY STAR® is a program of the US Department of Energy and US Environmental Protection Agency. ENERGY STAR qualified products are shown to save energy compared to their conventional counterparts.

ENERGY STAR qualified roofing products use special coatings and colors to reflect more of the sun's energy, keeping the roof up to 100 degrees Fahrenheit cooler on sunny days than typical roofing. In some cases, these materials are lighter in coloration than standard materials. Depending on a community's governing document restrictions, the color or profile of ENERGY STAR roofing products may prohibit their installation.

To earn the point under this Action Item, demonstrate that the community's governing documents are free from restrictions (e.g., roof color) that explicitly or in practice prohibit or inhibit ENERGY STAR labeled roofing materials.

how: Review existing governing documents for language that either explicitly or implicitly prohibits the installation of ENERGY STAR qualified roofing products. Eliminate potential ambiguity by expressly creating an allowance for all ENERGY STAR qualified roofing products.

ENERGY STAR qualified roofing materials are listed on the ENERGY STAR website (see *Resources*). Review current performance specifications to develop governing document language that accommodates ENERGY STAR qualified roofing products.

considerations: A building's location and orientation (Action Item 2-48), strategic shading of roofs and hard surfaces (Action Item 2-41), and other factors play into a building's need for mechanical cooling. Green or vegetated roofs (Action Item 2-7) are an alternative to ENERGY STAR qualified roofing materials.

resources:

ENERGY STAR roofing:
www.energystar.gov
 (click on *Find ENERGY STAR Products*)

The Department of Energy's RoofCalc online calculator can help estimate the annual energy savings of installing ENERGY STAR qualified roofing on commercial or residential buildings:
www.roofcalc.com



Action Item Rationale:

According to the US Department of Energy, Americans spend \$40 billion a year to air condition buildings. Cooler roofing surfaces translate into reduced air conditioning load, and in the mild Pacific Northwest climate, can even eliminate the need for air conditioning altogether.

Cool roofs reduce the urban heat island effect, lowering average air temperatures—a public health benefit.

Cool roofs also reduce the temperature of stormwater generated by roof surfaces, helping protect aquatic habitat.



Action Item 4-13

No lawn
watering requirements

Points: 4

what: During periods of low rainfall, many grass species go dormant (i.e., turn brown) without irrigation. Some communities include watering requirements for private residence lawns under the rationale of aesthetics. According to the Lawn Institute, a healthy lawn can survive for at least 3-4 weeks without water. Covenants or restrictions on allowing lawns to go dormant during dry spells result in unneeded water use, often at times when our regional water supplies are most strained.

To earn points under this Action Item, include a provision in the community's governing documents that explicitly allows residents to let their lawns go dormant during the dry season.

how: Develop and insert language in the community's governing documents explicitly outlining a homeowner's right to allow their lawn to go brown during the summer. Demonstrate that other covenants or restrictions that may compel homeowners to water lawns (for example, irrigation requirements) are absent from the governing documents.

considerations: Minimizing the amount of lawn used in landscaping schemes (Action Item 3-10), and focusing on using native and drought-tolerant plant species (Action Item 3-15), helps reduce landscape-related water use.

Ideally, create and promote landscapes that require no supplemental watering after the establishment period (Action Item 3-18) or secondarily, utilize water efficient irrigation (Action Item 3-19) where needed. If irrigation is unavoidable, consider irrigation systems that use potable water alternatives (Action Item 3-20).

Dry lawns can present a fire hazard; provide information to homeowners on restricting open flame outdoors during dry periods. In addition, certain weeds can continue to grow during drier weather, displacing dormant lawn. Inspect for weedy invaders during dry periods.

Extended dry periods can kill dormant grass. See the Lawn Institute (*Resources*, below) for information on proper care for dormant lawns.

resources:

SavingWater.org provides general information on reducing water use indoors and out:
www.savingwater.org

The Lawn Institute:
Let Your Grass Go Dormant:
www.thelawninstitute.org



Action Item Rationale:

Conventional lawns are thirsty landscape elements, requiring substantial amounts of water to remain green during our dry summers.

Allowing lawns to go dormant during the irrigation season can dramatically reduce a community's water demand and reduce strains on regional water supplies.

Action Item 4-14

Promote Integrated Pest Management, rather than pesticides, herbicides, fungicides, or chemical fertilizers

Points: 3-6



what: *Integrated Pest Management* (IPM) is a strategic approach to pest control that minimizes the use of pesticides. It requires an understanding of the pest or pests present, and employs a mix of initiatives to resolve issues, including pest-resistant building materials and design strategies, pest discouraging planting schemes, and nontoxic mechanical and biological controls.

To earn points under this Action Item, the community must implement an IPM-based pest management plan for common areas and landscapes, AND insert language in the community's governing documents for private residences that:

- Expressly permits the use of IPM methods and organic products as an alternative and preferential to chemical pesticides, herbicides, fungicides and chemical fertilizers.
3 points
or
- Expressly permits IPM methods, AND prohibits the use of non-organic methods of landscape maintenance on private properties.
6 points



how: If already developed, examine governing documents for any language requiring use of chemical pesticides and fertilizers for residential landscape maintenance. If present, modify or remove such language. Alternatively, expressly prohibit the use of these products, instead opting for least-toxic organic alternatives.

For common area landscapes, select a professional certified through Washington State University's IPM Certification Program (see *Resources*). This in-depth training provides 30 hours of instruction and hands-on workshops to landscape professionals on IPM strategies, including the development of an IPM plan.

According to the Washington State Department of Ecology, IPM consists of the following elements:

- *Inspection:* determine which pests are present and causing problems.
- *Research:* learn about the identified pests.
- *Monitoring:* keep track of pests; e.g., use sticky traps to track prevalence over time.
- *Choosing best management options:* prioritizing least hazardous methods.
- *Practicing prevention:* keep areas clean and eliminate food sources; create physical barriers to entry and remove hiding places; eliminate leaks and water sources; keep existing plants healthy.
- *Eliminating the pest population:* if preventive measures do not achieve desired results, trapping or biological controls may be needed.

Selective use of pesticides is a last resort in IPM, and least-toxic methods are encouraged.



Action Item Rationale:

Conventional pesticides, herbicides, fungicides and fertilizers pose hazards to humans and the environment.

Choosing nontoxic and least-toxic alternatives protects human health and environmental vitality.

Action Item 4-14

considerations: Native plant species tend to be more resistant to pest problems, and are adapted to Pacific Northwest native soils, minimizing or eliminating the need for fertilizers. Properly amended soils (Action Item 3-11) support more robust plants, which in turn are more resistant to pests and disease.

Include information on IPM in the Green Community Guide for homeowners (Action Item 4-15) to reinforce the implementation of least-toxic pest control practices throughout the development. IPM information can also be included in the Builder's Guide (Action Item 4-2) to encourage builders to set the stage for the IPM approach in residents' landscapes.

resources:

Washington State University IPM information for homes:
www.ecy.wa.gov/programs/swfa/upest/household.html

WSU Extension IPM training, seminars, and certification:
www.ipm.wsu.edu

Washington Toxics Coalition
www.watoxics.org

ProIPM fact sheets:
www.seattle.gov/util/Services/Yard/For_Landscape_Professionals/Integrated_Pest_Management/

Seattle Tilth's Lawn and Garden Hotline:
206.633.0224
www.seattletilth.org/learn/hotline

Action Item 4-15

Prepare a green community guide for residents

Points: 5



what: A *Green Community Guide* provides key information on how homeowners can “walk the talk” of sustainable living in a green community, including care and protection of community-scale green features of the development. The guide serves as a complement to the household-specific BUILT GREEN Homeowner’s Handbook provided to homeowners by the homebuilder.

To earn points for this Action Item, prepare a Green Community Guide that provides green living guidelines and resources related to community-wide sustainability features. The Guide shall, at minimum:

- List the green features throughout the community and ways that homeowners can help care for these elements.
- Identify sensitive and/or protected areas of the community and cite the existing protective use and maintenance covenants of these areas.
- Provide information on natural lawn care, outdoor water conservation, and tips for protecting buffers and wildlife corridors.
- Give an overview of mass transit, bicycling, walking, and other alternative transportation amenities and resources in and near the community.

Other items to include in the Guide are a recommended water-wise plant list (see Action Item 3-15), an overview of the community’s farmers market (Action Item 4-9), P-Patch (Action Item 4-7), and/or other amenities (Action Item 2-40), plus a description of community buildings and spaces and their green features as applicable. Information on the site’s natural history, native species, and other contextual information is also encouraged.

The Green Community Guide may be provided to builders to distribute to homeowners as-is, or modified and branded by each builder. Prominently display it in the sales office, with additional copies available. Alternatively, the Guide may be directly given to residents by the developer. In any event, a distribution process must be in place.

Design the Guide to allow for easy addition of information from homebuilders about the specific green features of the home, or to complement the BUILT GREEN Homeowner’s Handbook.

how: The greener the development, and the more numerous the BUILT GREEN Action Items employed within a development, the more information to be conveyed in the Green Community Guide. Review the list of Action Items pursued on the project, and determine which elements benefit most from additional information conveyed to the homeowner. Often, this is information about proper care and maintenance of the green feature or how elements at the individual property scale interact with or complement community-scale elements.

BUILT GREEN homebuilders are required to provide their homeowners with a Homeowner’s Handbook that focuses on the home’s environmental and health attributes. Coordinate with all builders in the development so that the community-scale handbook can be easily slotted into or integrated with the builder’s Homeowner Handbook. Creating a jointly produced document can reduce guide production costs and unify branding.



Action Item Rationale:

Proper maintenance and operation ensures the function and longevity of green features.

Energy and water savings, along with environmental and human health benefits, are reliant on community stewardship.

Action Item 4-15

considerations: Meshing the Green Community Guide’s contents with the project’s interpretive signage (Action Item 4-16) both in terms of information and graphic design helps reinforce both sets of information and increases the likelihood of occupants successfully maintaining sustainability features.

Providing information on the Integrated Pest Management strategies employed at the community level (Action Item 4-14) can help encourage the use of safer practices on private property as well.

A robust resident orientation based on the Green Community Guide could qualify for innovation points (Action Item 4-24).

resources:

“Practically Easy Landscape Maintenance: A Care Manual for Natural Drainage Systems” by Seattle Public Utilities (2006). This document provides detailed information for proper maintenance of green stormwater infrastructure elements that span rights-of-way and private property, and serves as an example of how a landscape chapter could be structured in a Green Community Handbook.
www.seattle.gov/util/groups/public/@spu/@usm/documents/webcontent/spu02_020021.pdf

High Point Community Natural Drainage and Landscape Maintenance Guidelines for Right-of-Way and Open Space

by SvR Design (2010)
www.seattle.gov/util/groups/public/@spu/@usm/documents/webcontent/spu02_020022.pdf

This document is an example of maintenance guidelines for green stormwater infrastructure elements of the High Point development in Seattle.

Action Item 4-16

Provide interpretive signs highlighting key environmental and other features

Points: 8



what: *Interpretive signs* provide educational information to residents and visitors regarding the design, construction or function and operation of elements within the community and the benefits those elements confer, no tour guide needed. They can identify a feature, or describe its environmental function and maintenance requirements, or provide information on the site's ecosystem, history, or context.

To gain points for this Action Item, the developer must install a minimum of 10 permanent interpretive signs describing key environmental, health, or other sustainability-related features of the development. Signs must be located in public areas and easily accessible by passers-by.

how: Successful interpretive signs are developed as a coherent set, understand the audience, and contain content that both imparts knowledge and inspires action. Interpretive specialists can help develop a robust interpretive program for a community; their services are available through design firms that specialize in educational institutions, zoos, and parks.

Interpretive signs can include a standard set of informational categories (e.g., name of feature, its function, its benefits, care and maintenance, etc.) in order to help the reader follow the information. A general rule for signs is equal proportions text, graphics, and white space.

The level of professional presentation and graphic design quality in interpretive signs reflects the validity of the content and the overall development. Hire a graphic designer if the requisite skills do not reside in-house. Using environmentally preferable materials (e.g., recycled content plastic, or certified sustainably harvested wood) for signage helps reinforce the environmental message.

Interpretive signs can provide additional depth of information by incorporating technologies such as QR codes. Self-guided audio tours, video supplements, and other media can overcome the limitations inherent in static interpretive signage.

considerations: Interpretive signs can be integrated with other operations and maintenance elements of the project, helping reinforce proper resident and maintenance staff actions, such as refraining from using chemical fertilizers and pesticides (Action Item 4-14), and care and maintenance of LID elements.

resources:

Project for Public Spaces:
Signage Guide on how to create effective signage for public space:
www.pps.org/reference/signage_guide/

US Forest Service examples of interpretive signs:
www.fs.fed.us/outdoors/naturewatch/implementation/Interpretive-Signs/index.htm
This site also includes "Interpretive Sign Design," a 25-page primer on developing interpretive signage.



Action Item Rationale:

Creating awareness of special environmental features within a development helps foster a sense of stewardship and an understanding of the interconnectedness of built and natural environments. Interpretive signage can also highlight cultural or historical landmarks, furthering a sense of place.

An interpretive program can also reduce administrative burden on staff or residents by providing the option for self-guided tours or by serving as cues for guides.

Finally, they help reinforce desired behaviors by residents and maintenance staff.



SITE/WATER



ENERGY



HEALTH



MATERIALS

what: Green developers have knowledge, experiences, and project-derived lessons learned to share with the professional community and the public.

To obtain points under this Action Item, participate in or conduct educational events, such as public or professional tours or seminars. Events may be developer-led or created in partnership with local governments, trade associations, or other community or educational groups and hosted by the development.

The content must focus on the green features of the community; educational events may be held onsite or at off-site locations, such as green building conferences, community events, or trade shows.

how: Decide on the focus and message to be conveyed. These can range from demonstrating the LID facilities onsite to formally presenting a case study on the project that emphasizes its green features. Formats for conveying the selected information vary from informal, brown-bag Question and Answer sessions to exhibits at a large public information session.

Include homes or community buildings on existing green tours, such as the Northwest EcoBuilding Guild's Green Home Tour or Solar Washington's Solar Tour (see *Resources*). Piggybacking on existing tours' organizational and promotional infrastructure can reduce the burden of event planning and promotion.

Successful educational events are well planned, extensively promoted, and properly executed. Partner with individuals and organizations to fill any skill gaps present on the developer team, be they presentation abilities, event planning, marketing and promotion, or evaluation. Involve operations and maintenance staff, property managers and others to help increase community participation and attendance.

considerations: Topics chosen for the educational event may dictate their form and venue. For educational events and tours held on site, permanent interpretive signage (Action Item 4-16) can assist docents or tour guides in explaining the project's green features to attendees. Green Community Guides (Action Item 4-15) and Built Green home-builder checklists can also serve as both source information for presentations, and as distribution material.

resources:

The Central Puget Sound Chapter of the Northwest EcoBuilding Guild organizes an annual Green Home Tour: www.ecobuilding.org/guild-chapters/seattle/green-home-tour

Solar Washington's Solar Tour: www.solarwa.org/tour

Action Item 4-17

Provide educational events, including tours or seminars, to promote your green development

Points: 5



Action Item Rationale:

Green building and sustainable community development are rapidly evolving fields, and early adopter green developers undoubtedly have lessons learned and useful experiences to share.

Educational events by BUILT GREEN builders advance the program's mission of enhancing the knowledge of developers, builders and the general public about the benefits of sustainable community development.

Plus, public and professional events effectively market the development to prospective buyers and to identify partners for future developments.

Action Item 4-18

Prepare a landscape operations and maintenance plan

Points: 8



what: A *Landscape Operations and Maintenance Plan* sets forth the activities, schedule, and responsible parties for keeping the community's common landscape and green stormwater infrastructure in good working condition. Specified information also makes continuity in the care of the landscape more likely, given new owners and/ or staff.

To earn points under this Action Item, prepare a common area Landscape Operations and Maintenance Plan. At a minimum, include:

- As-built drawings showing all green stormwater infrastructure elements, irrigation systems, and other designed and engineered elements of the landscape.
- A fully populated Measurable Goal Identification Matrix as outlined by King County GreenTools (see *Resources*) with quantifiable goals, purposes, time frames for inspection/ maintenance, and actions/notes for each landscape element.
- A completed O+M Plan that follows the King County GreenTools O+M Plan template (see *Resources*).

how: See the City of Portland's Stormwater Manual (see *Resources*) for a detailed example of specific maintenance activities to include with various green stormwater infrastructure landscape elements. The firm designing the community's landscape features is well suited to draft the Landscape O+M Plan. Secure a professional with expertise in the strategies employed on the project, including LID, green stormwater infrastructure, water efficient irrigation, Integrated Pest Management, or other relevant areas.

Some O+M considerations for BUILT GREEN-related landscapes:

- *Establish Integrated Pest Management:* Implement IPM as the primary pest control strategy (see Action Item 4-14). Since it requires ongoing observation, it is critical to have the IPM approach outlined in O+M plans.
- *Onsite composting:* Create a schedule for processing and redistributing landscape organic waste material.
- *Constructed wetlands:* Observe for invasive species and damage caused by failing stormwater infrastructure, fertilizer or pesticide-tainted runoff, and other potentially damaging factors.
- *Bioswales/rain gardens* (Action Item 2-8): Monitor outflow for impurities, and practice preventive maintenance by removing invasive and unspecified plants.
- *Parking areas:* Prune vegetation as needed to maintain sight lines and aesthetics.
- *Storm drains and other drainage elements:* The added tree canopy in green developments (Action Item 2-41) and landscaping designed to provide forage for wildlife (Action Item 3-22) can mean a larger amount of vegetative debris in autumn. Keep storm drains clear of leaves and debris, and refresh storm drain stenciling (Action Item 2-14) as needed.
- *Soils:* Avoid soil compaction in vegetated areas by limiting foot and vehicle traffic, and using seasonal applications of mulch (Action Item 3-13) and compost top-dressings.



Action Item Rationale:

Landscapes, especially those incorporating extensive or complex LID strategies, rely on proper maintenance to optimize performance and retain functional benefits and aesthetic appeal.

In addition, the landscape is an investment; ongoing preventive maintenance is far cheaper than infrequent large-scale repair and replacement activity.

Action Item 4-18

- *Porous asphalt and concrete* (Action Item 2-31): Develop a schedule based on industry and installer recommendations for vacuuming surfaces. Brushes and pressure washing are not recommended, as they can drive debris deeper into the drainage medium. Keep under-drains, overflow drains, and edge drains clear.
- *Irrigation systems* (Action Item 3-19): Inspect annually to confirm irrigation efficiency and proper scheduling. Audit the system with a certified irrigation professional every three years. Irrigation systems fed by potable water alternatives (Action Item 3-20) may require different inspection and servicing. Schedule for the removal of temporary irrigation systems once landscapes are established (Action Item 3-18).

The Landscape O&M Plan should also include a calendar with seasonal activities and responsible parties, and an educational component for both homeowners and common area maintenance staff.

considerations: This Action Item is connected to all other landscape-related Action Items on the BUILT GREEN Communities Checklist. Integrate the Landscape O+M Plan with other community O+M plans (Action Item 4-19). Consider developing all community O+M plans concurrently, to capture opportunities to combine training and education. Also, interface the Landscape O+M Plan with residential education regarding the community's LID features listed in interpretive signs (Action Item 4-16) and in the Green Community Guide (Action Item 4-15).

resources:

King County Facilities Green Building Operations and Maintenance Guidelines Handbook
(King County GreenTools, 2010):
www.your.kingcounty.gov/solidwaste/greenbuilding/documents/o-m-guidelines-2011.pdf

Low Impact Development Technical Guidance Manual for Puget Sound
"Appendix 4: Maintenance of Low Impact Development Facilities"
includes a reprint of the Seattle Public Utilities Green Stormwater Operations and Maintenance Manual:
www.psp.wa.gov/LID_manual.php

Action Item 4-19

Prepare an operations and maintenance plan for common area facilities

Points: 5-10



ENERGY



HEALTH



MATERIALS

what: *Operations and Maintenance Plans* specify systems and equipment for maintenance and establish a maintenance schedule and procedures.

To gain points under this Action Item, develop an O&M plan for common area facilities. The plan must include a maintenance schedule and maintenance specifications for all relevant systems and equipment. Base the maintenance schedule on manufacturer recommendations, cross-referenced with current or expected operating and load conditions. Also include adequate training for staff.

Emphasize the commissioned elements of the community's common area facilities, particularly the systems described below. Each Plan must include, at a minimum, the elements outlined in the O+M Plan Template provided in King County's *Green Building O+M Guidelines Handbook* (see *Resources*).

- Building envelope (including exterior walls, roofing, windows and doors)
- HVAC systems (including heating, ventilation, air conditioning, and all controls)
- Electrical systems and lighting (including equipment, appliances, lighting, and all meters, submeters and controls)
- Plumbing and fixtures (including water heaters, solar hot water, water, sewer and stormwater infrastructure, and all meters, submeters and controls)
- District- or community-scale green infrastructure: district heating/district energy, renewable energy, waste management or composting, etc.

Include 1-2 of the systems above:
5 points

Include 3+ of the systems above:
10 points



Action Item Rationale:

Building energy and water performance, and overall longevity of systems, will erode over time without proper maintenance and recommissioning.

District energy, natural wastewater treatment and other advanced systems rely on careful operations, monitoring, and maintenance. Failure to do so can compromise the project's environmental goals.

Action Item 4-19

how: Use the King County *Facilities Green Building Operations and Maintenance Guidelines Handbook* (see *Resources*) to guide the creation or adaptation of each O+M Plan. It may be advisable to hire a consultant versed in green operations and maintenance (e.g., a LEED for Existing Buildings Accredited Professional) to assist in the creation of the O+M Plan and, as a bonus, evaluate certification of the facility. Keep track of the maintenance history and reevaluate maintenance frequency and actions as necessary.

Depending on the size and complexity of the community's facilities, facilities management software or cloud-based services can provide effective tools for setting up and tracking maintenance activities. Computer-Aided Facilities Management and Computerized Maintenance Management Systems can help normalize the O+M process and keep track of activities and outcomes. Depending on the size, number, and complexity of common area buildings and facilities, use ENERGY STAR Portfolio Manager to track energy.

considerations: A large number of Action Items within Built Green interface with the various O+M Plans covered here. Include customized O+M information for innovative green elements and systems that may be unfamiliar to facilities maintenance staff or new hires, including district energy systems (Action Item 2-49), wind and solar power installations, and others.

resources:

Whole Building Design Guide:
Facilities Operations and Maintenance:
www.wbdg.org/om/om.php

King County Facilities *Green Building Operations and Maintenance Guidelines Handbook*:
www.your.kingcounty.gov/solidwaste/greenbuilding/documents/o-m-guidelines-2011.pdf

Information on energy efficient building operations from BetterBricks:
www.betterbricks.com/operations

Action Item 4-20

Work with jurisdiction on demonstration ordinance with environmental benefit

Points: 20



SITE/WATER



ENERGY



HEALTH



MATERIALS

what: *Demonstration or pilot ordinances* provide an avenue for a builder or developer to try approaches currently prohibited or hindered in some way by code. Such pilot ordinances take a variety of forms, including departures from building code (e.g., constructing an unventilated crawl space), land use code (e.g., zoning modification to allow for backyard cottages), or health code (e.g., allowing harvested rainwater to be used for potable purposes).

To gain points under this Action Item, the project must secure approval of a currently prohibited approach that substantively increases the environmental or human health performance of the community, and document that success in such a way that the BUILT GREEN Director can evaluate whether it meets the intent of this Action Item. Documentation must include a written record of the process of creating the demonstration ordinance and a description of the performance monitoring and evaluation criteria used for the project.

how: Approach the jurisdiction as early as practicable with a demonstration proposal. Carefully document the expected environmental and community benefit of the approach, to show that the aim is to provide a larger social benefit, rather than pursue a narrowly defined gain that primarily accrues to the developer or builders.

Green building specialists and leading-edge green architects within the community's jurisdiction are an excellent first point of contact for projects considering out-of-the-box innovations. These specialists usually have deep knowledge of the existing code barriers to advanced green building approaches, and whether other developments have attempted to establish a similar demonstration project.

Code officials' primary concerns will likely be that departure from existing code could present human health and safety issues, or negatively impact the surrounding community aesthetics or property value. Anticipate these concerns: research other jurisdictions' approaches to allowing similar practices in their codes or ordinances, and provide evidence to code officials to show that these negative consequences will not come to pass.

Present a monitoring and evaluation plan to the jurisdiction at the same time as the proposal for the variance, to show the project's intent of acting truly as a demonstration or pilot project.

considerations: Depending on their scope, many Action Items within the BUILT GREEN Communities Checklist (e.g., rainwater harvest [Action Item 2-9], minimizing parking [Action Item 2-57], maximizing development density [Action Item 2-21], etc.), can encounter code barriers. This is true of the Innovation Action Items (1-9, 2-62, 3-35, and 4-24) as well.

resources:

The International Living Future Institute's analysis of code barriers to Living Building Challenge projects: www.ilbi.org/education/reports/SARD

"Breaking down the Barriers: Challenges and Solutions to Code Approval of Green Building" by David Eisenberg et al.: www.dcat.net/resources/breaking_down_barriers.pdf



Action Item Rationale:

Trailblazing developers set the stage for others to follow suit.

Pilot or demonstration projects are real-life proving grounds for new approaches to land use planning or building design and construction. Many such projects result in tangible financial savings, public health benefit, or environmental protection.



SITE/WATER

what: *Low Impact Development* (LID) is a mix of building design, civil engineering and landscape architecture approaches that, in concert, help reduce stormwater and aquatic habitat impacts of development. Like all infrastructure, LID elements must be maintained to function properly. And because they are distributed across a community, often spanning common and private property and integrated into the landscape, residents play an important role in ensuring LID element function.

To earn points under this Action Item, conduct at least 4 of the following:

- Provide detailed information in the Green Community Guide (Action Item 4-15) on the community's LID elements, and describe how activities on private property can affect LID elements throughout the community.
- Display LID maintenance information on interpretive signage (see Action Item 4-16).
- Include seasonal (at least 4 times/year) LID maintenance information in community newsletters, including specific dates describing maintenance activities at or near private properties (e.g., clearing leaves from storm drains; weeding rain gardens).
- Include LID maintenance tips, photos and reminders in social media messaging at least 4 times a year.
- Hold at least 2 free community trainings on LID maintenance annually, tailored to the specific LID approaches employed in the community.
- Create and distribute a standalone brochure describing the community's LID features and maintenance requirements, along with a calendar of maintenance activities for LID elements on private property (e.g., rain gardens, downspout disconnects, rainwater harvest cisterns).



HEALTH

how: LID education can be discussed early in the project, perhaps during the design charrette (see 4-Star Requirements). Exploring the likelihood of a hypothetical resident engaging in protection of LID element functionality may inform the design of the LID element itself.

Compile a list of all LID-related strategies present and planned within the community, and map out their interdependencies and interconnections. Use this inventory as the basis for the education approach.

In general, a multi-pronged educational approach geared toward behavior change will meet with more success than a single element. For example, warning residents to dump no waste into the storm system (see 3-Star Requirements) as a key part of LID maintenance, can be done by well-placed signage (Action Item 4-16), written into a community newsletter, messaged via social media, and discussed in the community's LID training event(s). Maintenance-focused educational pamphlets are useful, but often not sufficient to change behavior.

Including LID maintenance-related elements in the community's governing documents gives additional weight to educational approaches. CC+Rs can also support behavioral change by prohibiting activities that may damage the functionality of the LID elements or by requiring maintenance of private property LID elements.

Action Item 4-21

Educate residents on LID maintenance strategies

Points: 4



Action Item Rationale:

As with most infrastructure, proper maintenance is critical to proper long-term functioning and effectiveness of LID systems.

Many LID strategies use both public space and private property, and therefore require close coordination between maintenance staff, road and sidewalk maintenance, and residential lawn and garden care.

Action Item 4-21

considerations: Integrated Pest Management (Action Item 4-14), organic fertilizers (Action Item 3-14), rain gardens/bioretenention (Action Items 2-8, 2-11), rainwater harvest (Action Item 2-9), tree canopy (Action Item 2-41), and other LID strategies present in the Communities Checklist rely on proper maintenance to optimize performance, and benefit from inclusion in builder trainings, guides, handbooks, and site interpretive materials.

resources:

For the High Point neighborhood in Seattle, Seattle Public Utilities produced the *Practically Easy Landscape Manual*. Targeted at The High Point residents, this document outlines the division of responsibilities for Natural Drainage System elements between residents and the City of Seattle:
www.seattle.gov/util
(type *Practically Easy Landscape* into the search bar).

Seattle Public Utilities also created a two-page Natural Drainage System landscape maintenance calendar and guide, available at the URL above, which can serve as an example for a community.



SITE/WATER

what: Preserved and restored forested, wetland and riparian areas—common elements in green communities—by definition support the presence of wildlife. Especially in greener developments, where presence of migratory and year-round wildlife as a community amenity, human activities like improper food storage, handling of domestic animals etc. can increase the likelihood of undesirable human/animal interaction.

To earn points under this Action Item, incorporate language into the community's governing documents that prompts activities to reduce the likelihood of *human-wildlife conflict* within and adjacent to the development. At a minimum, the documents must address:

- *Waste management.* Improperly secured garbage and compostable materials can draw both wildlife and pests.
- *Domestic and farm animals.* Include requirements for the proper securing of pets and farm animals. Discourage or prohibit free-roaming domestic animals—for their health and safety as well as that of wildlife and pets.
- *Lures.* Include restrictions on storing food outdoors, including use of barbecues and outdoor cooking facilities.

Language should be specific to the wildlife known or expected to be present in the community.



HEALTH

how: A number of CC&Rs can help minimize conflict with wildlife. These include restrictions on storing meat and other food and/or food waste outdoors, and requirements for off-leash domestic animal management.

Educate residents as to their responsibility in avoiding situations that increase the likelihood of undesirable interaction. Including information in the Green Communities Handbook (Action Item 4-15) and in homeowner orientations helps ensure the information is transmitted. Influence and support desired human behaviors through educational and interpretive signage (Action Item 4-16) at waste receptacles and composting sites, and through seasonal reminders (e.g., tips during outdoor barbecue season) via social media and community newsletters or blogs, help reinforce behavior.

considerations: Plants that provide forage (Action Item 3-22) and wildlife corridors (Action Item 2-24) increase the likelihood of wildlife interaction. In addition, onsite composting (Action Item 2-53), P-Patches (Action Item 4-7) and edible landscaping elements in common areas can present lures to wildlife and vermin if improperly designed or maintained.

resources:

Washington Dept. of Fish and Wildlife: "Living with Wildlife:"
www.wdfw.wa.gov/living/

Living with Wildlife in the Pacific Northwest
by Russell Link
(2004, University of Washington Press)

Wild Neighbors: The Humane Approach to Living with Wildlife
by John Hadidian et al.
(2007, Humane Society Press)

Action Item 4-22

Prevent human-wildlife conflict

Points: 3



Action Item Rationale:

Thoughtful, well-written governing documents can reduce the likelihood of human-wildlife conflict through prevention.

This simultaneously protects wildlife and reduces human health hazards. Typical preventive measures also lessen the likelihood of infestation by rats and other pests.

Action Item 4-23

Smoke-free buildings
and community spaces

Points: 10



what: To reduce community exposure to secondhand smoke, prohibit all smoking in buildings and common outdoor areas.

To earn points under this Action Item, develop and implement policy that prohibits smoking in:

- All leased living units and all outdoor spaces within 25 feet of these units.
- All common buildings and all outdoor community spaces.

In addition, lease language must explicitly prohibit smoking in these locations. The no-smoking restriction applies to all owners, tenants, guests, and service staff. In addition, signage must be posted identifying areas that are off-limits to smoking in all common areas.

how: Implement and enforce a no-smoking policy in all common indoor and outdoor spaces, and a 25-foot smoke-free perimeter around the exterior of all residential units.

Include smoking prohibitions in rental and lease agreements. A designated outdoor smoking area can be provided, with basic shelter elements and suitable waste receptacles. The receptacles must be inside the project boundary and may not encroach into public space.

considerations: Many property insurance companies offer a discount for buildings with no-smoking policies. Develop non-smoking language to incorporate into conditions, covenants and restrictions in conjunction with other health-focused CC+Rs, such as restrictions on pesticide use (Action Item 4-14), and environmental elements like allowing clotheslines (Action Item 4-5), vegetable gardening (Action Item 4-6), and solar panels (Action Item 4-11). Create interpretive signage (Action Item 4-16) that informs residents and visitors of the prohibitions and their rationale.

resources:

National Center for Healthy Housing, “Reasons to Explore Smoke-Free Housing” fact sheet:
www.nchh.org/Training/Green-and-Healthy-Housing.aspx

Americans for Non-Smokers’ Rights sample non-smoking policy language:
www.no-smoke.org/homes

American Lung Association, *Air Quality in the Home* includes numerous articles about maintaining a healthy indoor environment:
www.lungusa.org
(choose *Air Quality* at the bottom of the page and then click *Indoor Air Quality*, then *Air Quality in the Home*).

U.S. Environmental Protection Agency, Indoor Air Quality Division features numerous resources related to indoor air quality in homes, including reports and web links:
www.epa.gov/iaq



Action Item Rationale:

Secondhand smoke is a known health risk: the Centers for Disease Control and Prevention warns individuals suffering from heart disease to avoid all indoor spaces that allow smoking, since even short-term exposure increases the risk of heart attack.

Air filtration and ventilation systems may reduce but do not eliminate secondhand smoke health hazards—there is no known safe exposure level.

In addition, smoking significantly increases fire hazard and cleaning and maintenance costs.



SITE/WATER



ENERGY



HEALTH



MATERIALS

what: Not all approaches to environmental education and community stewardship that enhance the environmental or public health performance of a community are listed in the BUILT GREEN Communities Checklist. Some of these approaches may garner the project additional points through this Innovation Action Item.

Innovations earn between 1 and 10 additional points, depending on the level of benefit anticipated from the action.

To be considered for these points, prepare a description of the innovation in terms of its process, design, and outcome, its expected environmental or human health benefits, and the number of points proposed.

how: See Action Item 1-9 for a general description of the development and submittal process for BUILT GREEN innovation points.

Education and community stewardship activities are well suited for innovation. While conservation- and environment-focused brochures, pamphlets and informational videos abound, actual behavior change for environmental protection is harder to come by.

Technological advancement is creating exciting new opportunities for promoting environmental stewardship and community participation in sustainability initiatives. In an age of smart phones, crowd sourcing, wireless data loggers, and social networking, new tools for education and stewardship promotion are ripe for development. Look to innovations in social media, “citizen scientist” projects, and crowd sourcing for data collection for ideas.

These tools can be developed for both community members and maintenance and operations staff.

considerations: Innovative approaches can come from any corner of a development project and can be related to just about any Action Item in BUILT GREEN. Review the Action Item list to determine if which actions are enhanced or facilitated by creation of education and stewardship companion activities.

resources:

A variety of organizations engage in research to improve approaches to environmental education and stewardship. Examples include:

Fostering Sustainable Behavior:

Community-Based Social Marketing:

www.cbsm.com/pages/guide/preface/

This book, database of strategies and consulting organization offers evidence-based approaches to behavior change.

Environmental Building News:
www.buildinggreen.com

Action Item 4-24

Extra credit for innovation

Points: 1-10



Action Item Rationale:

Best practices are continuously emerging with respect to green building. Innovations prompt test cases that, if successful, can be adopted by other projects.

Technological advancement is also creating exciting new opportunities for promoting environmental stewardship and community participation in sustainability initiatives. Disseminating information by adding these new channels to the tried-and-true communication avenues can speed adoption of such innovations, advancing sustainable development.





**MASTER BUILDERS
ASSOCIATION**
of King and Snohomish Counties

355 116th Avenue SE
Bellevue, Washington 98004
t 425.451.7920 / f 425.646.5985
www.builtgreen.net