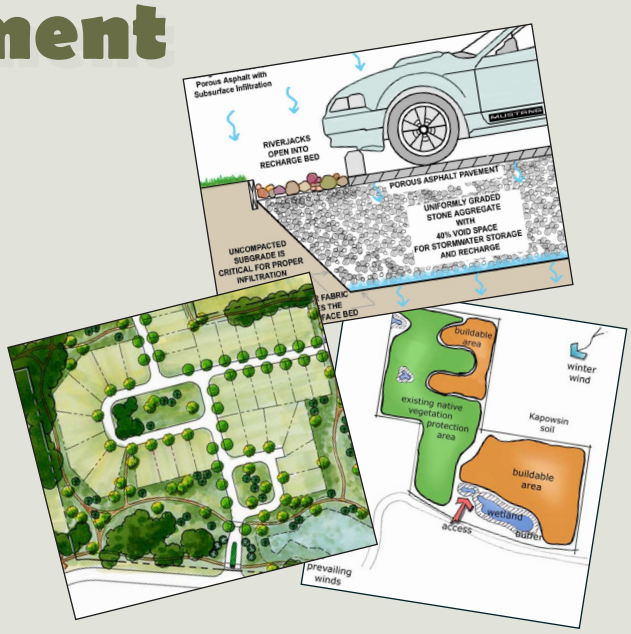
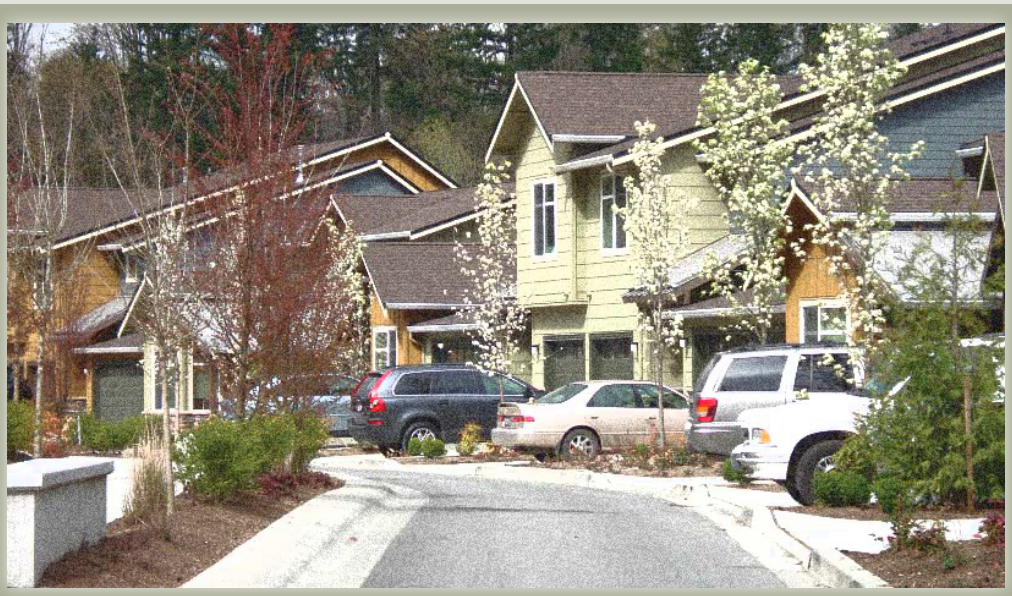
Low Impact Development Code Revisions

2015

Olympia



"Making LID the preferred and commonly-used approach to site development"



olympiawa.gov/lidcodes

City of Olympia | Capital of Washington State
P.O. Box 1967, Olympia, WA 98507-1967
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August 21, 2015

Dear Interested Parties,

Thank you for your interest in the City of Olympia's draft evaluation of low impact development (LID) techniques. We encourage you to review the information provided in this document and offer your thoughts.

This booklet contains several summaries and 22 individual papers, each addressing a low impact development technique. Draft recommendations are provided for each technique on how to incorporate LID into Olympia codes and standards.

This work effort sets the stage for the City to adopt and implement new techniques for low impact development in 2016. Olympia has a long history with low impact development and other environmentally-sensitive development practices. Our community is an early implementer of growth management practices, natural resource protection regulations, and low impact development techniques.

With our community history in mind, our recommendations for low impact code revisions represent refinements to current practices. We can take additional steps forward as our city grows.

Our recommendations are as follows:

Proposed Regulatory Revisions

- Require more regulatory oversight of site grading with the intent of better situating new buildings within naturally-occurring terrain.
- Require the use of native or other well-adapted vegetation in landscaped and open space areas. Expand requirements so that open space areas' native vegetation and soils are better preserved in more multifamily and commercial developments.
- Modify current regulations to better facilitate cluster and cottage developments. Better support new trends and innovation in housing types.
- Reduce allowable impervious surface coverage on individual parcels by 5%. However, allow permeable pavements to be used in order to offset the reduction.
- Increase the diameter of center planter islands in cul-de-sacs while maintaining the same outside diameter of the street, so that overall impervious street surface is reduced.
- Reduce single family driveway widths from 24 feet to 20 feet wide.
- Allow bioretention in the publicly-owned planter strips to treat street runoff in new developments. The technique can provide water treatment and some infiltration. However, due to the prevalence of poorly-infiltrating soils in Olympia, large stormwater ponds will still be needed. Ensuring maintenance of the bioretention systems will need to be resolved.
- Better facilitate the use of landscaping areas in commercial development for stormwater management.
- Better define requirements for infiltrating roof runoff onsite, including the use of rain gardens.
- Facilitate and encourage the use of permeable pavements on private property (e.g., parking lots, sidewalks, driveways). Continue to install permeable public sidewalks as feasible throughout the City. Anticipate increased use of permeable pavement in the future as the technology improves.
- Develop incentives for the use of green roofs, rainwater reuse, and LID building foundations.

August 21, 2015
Low Impact Development Review

Proposed Administrative Changes

- Revise various code language and definitions to better communicate and support LID implementation.
- Adopt new Drainage Design and Erosion Control Manual to align with WDOE expectations. Modify State regulations to better address Olympia-specific soils and weather conditions.
- Require site assessment of new developments for feasibility of LID implementation early in the development review process.
- Incorporate LID construction inspection needs into City procedures.
- Develop a City stormwater maintenance manual to address the needs of LID facilities.
- Incorporate permitting processes for LID techniques into City codes in order to eliminate or reduce the need for LID-related variances, deviations, and exceptions.

Regulations <u>Not</u> Proposed For Changes

- Maintain current street widths. Narrow streets have already been implemented in Olympia.
- Keep block spacing standards. Current regulations support transportation goals for a connected street system, while providing some flexibility based on environmental constraints.
- Require sidewalks on both sides of the street. Sidewalk networks are important to the urban neighborhoods and alternative transportation modes. However, based on environmental needs, Olympia does allow one-sided sidewalks in certain residential zoning districts.
- Continue to allow the infiltration of stormwater in underground systems. The systems are commonly used under parking lots in commercial and multifamily developments.

Staff are preparing the draft municipal code language that can implement the changes. With your input, the evaluation and recommendations will change in the months to come. This work will continue over the winter of 2015-2016.

We welcome your critical review of our evaluation. Staff can be reached at:

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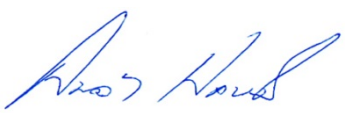
Sincerely,



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LOW IMPACT DEVELOPMENT OVERVIEW

WHAT IS LOW IMPACT DEVELOPMENT (LID)?

Also referred to as "green stormwater infrastructure", low impact development is an approach to land development that works with nature to manage rainwater as close to where it falls as possible. Smaller scale, dispersed stormwater infiltration areas on a site more closely mimic how water would move through an undisturbed, forested ecosystem.

In practice, low impact development includes such structural best management practices (BMPs) as permeable pavements, green roofs, bioretention and rain gardens, as well as LID development principles like maximum impervious surface standards and native vegetation requirements.

WHY UPDATE OLYMPIA DEVELOPMENT CODES FOR LID?

Stormwater runoff has been found to be a leading contributor of pollution to Puget Sound. Low impact development has been identified as an approach to site development that can help minimize the effects of development on the health of the environment.

Acknowledging this, the Washington Department of Ecology included provisions in the 2013-2018 Western Washington Phase II Municipal Stormwater Permit (Permit) that requires revisions to the City's codes and standards to make low impact development the "preferred and commonly-used approach to site development".

Olympia's development codes include the Engineering Design and Development Standards (EDDS), the Drainage Design and Erosion Control Manual for Olympia (DDECM), and portions of the Olympia Municipal Code (OMC). These three documents have been reviewed for opportunities to strengthen or add LID provisions and are presented as an integrated LID code update package.

HOW WILL THE CODE UPDATES BE ACCOMPLISHED?

The Permit specifies that the code evaluations and process should be consistent with the guidance document prepared by Puget Sound Partnership titled Integrating LID into Local Codes: A Guidebook for Local Governments. The guidebook outlines a six step code revision process that begins with choosing a project team, continues through a comprehensive code analysis and revisions, and ends with code adoption by elected officials.

City staff reviewed existing codes and standards for potential barriers to and opportunities for further support of LID techniques. Twenty-two issue papers were developed to document staff's findings. The issue papers are further summarized in papers on the following five LID topics: 1) Reducing site disturbance, 2) Minimizing impervious area on sites, 3) Minimizing impervious area for streets, 4) Increasing water quality treatment and infiltration, and 5) Procedures, process and codes.

A workgroup comprised of sixteen local development professionals reviewed staff's issue papers for technical feasibility and implications. Olympia's Utility Advisory Committee (UAC), composed of volunteers appointed by the City Council, will study the issues during fall 2015 before making a recommendation to the Planning Commission and City Council at the end of the year. LID supportive codes and standards will be adopted by the Council and in effect mid-2016, prior to the December 31, 2016 Ecology permit deadline.

WHAT IS OLYMPIA'S EXPERIENCE WITH LID?

The Olympia Public Works Department started installing structural LID techniques more than fifteen years ago. For example, in 2007, City Council approved direction for the department on the use of permeable pavements. One of the City's first projects and most commonly utilized installation since then has been pervious sidewalks. Currently, Olympia has more than four miles of pervious sidewalk scattered throughout the City. Staff has developed a map depicting some of the types and locations of LID installations located throughout the City.

Over the years, the City's zoning code and development standards have been updated to increasingly incorporate low impact development-friendly regulations. For example, Olympia reduced street lane widths in 2006 to some of the narrowest in the state. In addition, the City adopted a unique zoning district and associated set of mandatory LID regulations within a highly sensitive watershed, Green Cove, for the purpose of preventing further damage to aquatic habitat from urban development. A comprehensive set of policy revisions covering development density, impervious surface coverage, lot size, open space/tree retention, street design, block sizes, parking sidewalks and stormwater management requirements were enacted.

Within the context of fostering urban-scale land use, Olympia always seeks to promote environmentally-sensitive development. More detail on Olympia's experience with and use of LID techniques is described in the LID issue papers.

WHAT ARE SOME OF THE CHALLENGES TO IMPLEMENTING LID?

Change is rarely easy or without complication. The following overarching hurdles confront our community in implementing LID:

Challenging in an urban setting- Space constraints on dense urban lots make it more difficult to accommodate stormwater infiltration on site compared to a rural setting.

Competing community objectives- Often there are trade-offs between transportation, stormwater, and community planning objectives. For example, while transportation planning may favor larger cul-de-sacs to easily facilitate solid waste truck turnaround, stormwater planning may support smaller cul-de-sacs in order to reduce impervious surface. An overarching emphasis on stormwater infiltration on site could have unintended consequences. For example higher costs or larger lots could push development to the city outskirts or out of the urban area.

Moves stormwater design to the initial stage of the project design process- Costly investigation of site soils, groundwater levels and native vegetation will be required as a first step of project design, often before a property owner knows if the project is viable.

Changes construction processes and sequencing- LID techniques require the infiltrative capacity of site soils be preserved and not compacted during construction. Therefore necessitating changes to the traditional practices and sequencing of construction.

Changes to long-term maintenance- Vegetated LID systems require different types of maintenance than traditional stormwater infrastructure. Similarly, pervious pavements can clog at varying rates based on traffic loading, nearby trees, etc. City crews, as well as property owners, will need to monitor and perform maintenance regularly to preserve functionality and prevent future flooding. Maintenance costs associated with stormwater management could increase.

Requires a shift in how property owners can use their land- Rain gardens and bioretention cells require regular maintenance over time and may conflict with how a property owner would like to use their property.

Unknown costs and life cycles- While some preliminary data exist, LID techniques are often site-specific. It is difficult to generalize costs and long-term life cycles of LID techniques as they are scaled up to a much larger and more widespread level.

The benefits and challenges of low impact development will continue to be evaluated by staff, technical experts, and City Council and its citizen advisory committees. Community discussion is anticipated in early 2016. Specific code revisions will be consider by City Council in mid-2016.

LID Elements

Low Impact Development Overview

Group 1: Reducing Site Disturbance

- Element 1: Minimize Site Disturbance
- Element 2: Retain and Plant Native Vegetation

Group 2: Minimize Impervious Area – Sites

- Element 3: Zoning Bulk and Dimensional Standards
- Element 4: Restrict Maximum Impervious Surface Coverage
- Element 5: Reduce Impervious Surface Associated with On-site Parking

Group 3: Minimize Impervious Area – Street

- Element 6: Minimize Size of Cul-de-Sacs
- Element 7: Minimize Street Width
- Element 8: Increase Block Spacing
- Element 9: Require Sidewalks on Only One Side of Street Where Appropriate
- Element 10: Minimize Driveway Surface

Group 4: Increased Infiltration

- Element 11: Bioretention Street Section
- Element 12: Stormwater Use of Landscaping
- Element 13: Downspout Infiltration Systems
- Element 14: Permeable Paving
- Element 15: Impervious Pavement with Underdrains

Group 5: Procedures, Process and Codes

- Element 16: Definitions
- Element 17: Adopt a New Drainage Design and Erosion Control Manual (DDECM)
- Element 18: LID Site Assessment
- Element 19: Pre and During Construction Inspections
- Element 20: Maintenance Standards and Inspections
- Element 21: Variances, Deviations and Exceptions

Element 22: Green Roofs, Rainwater Reuse, LID Foundations

Reducing Site Disturbance

Elements	
1	2
Minimize Site Disturbance	*Retain and Plant Native Vegetation*

Two of the LID elements under consideration for implementation by the City of Olympia focus on reducing site disturbance. These elements include:

- Element 1 (Minimize Site Disturbance)
- Element 2 (Retain and Plant Native Vegetation)

These elements share a similar objective, as well as similar benefits and challenges. Specific information to each element is found in the issue paper for that element. The following is a summary of similar themes found with the elements aimed at reducing site disturbance.

Updating codes to require using native vegetation in planting areas is relatively straightforward and feasible to implement (Element 2).

OBJECTIVE

The primary objective of these elements is to preserve a site's natural hydrology by minimizing soil disturbance, avoiding compaction, and preserving natural vegetation.

BENEFITS OF REDUCING SITE DISTURBANCE

According to the *Low Impact Development Technical Guidance Manual*, the conservation and use of on-site native soil and vegetation for stormwater management is a central principle of low impact development design. Protecting these natural features achieves three goals: it maintains stormwater storage, infiltration and evaporation; it provides potential dispersion areas for stormwater; and it and maintains natural hydrologic processes. Protection of native forests can provide additional benefits such as providing critical habitat buffers, open space and recreation opportunities. The two elements under consideration (3 and 4) would result in a reduction of site disturbance.

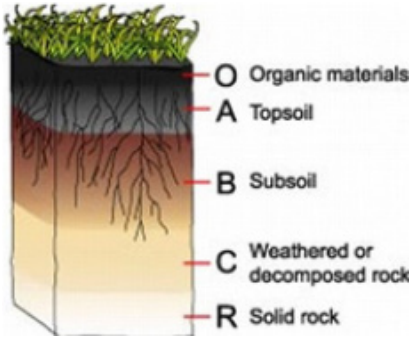
The conservation and use of native on-site soil and vegetation for stormwater is a central principle of LID design (Element 2).

HURDLES TO IMPLEMENTATION

While the benefits related to minimizing site disturbance are universal to the elements under consideration, the hurdles are often unique to the specific element. Some of the hurdles to implementing the elements include:

- Increased Site Planning Needed – Preserving native vegetation areas and limiting impacts to the terrain requires careful, early planning. Grading design for LID sites tends to be more complicated than traditional design. Disconnecting impervious areas, and preserving natural vegetation and terrain result in greater grading considerations and more complicated designs, especially on sites where there is a lot of slope or change of topography across the site.
- Small Site Challenges – In keeping with the tenets of the Washington State Growth Management Act, Olympia's residential design standards have been updated over the past two decades to require small lot sizes. Placing buildings and related infrastructure (driveways, walkways, utilities, etc.) on a small developable site leaves less area for retaining native vegetation and limits the ability to work with existing terrain and minimize site disturbance.

Minimizing site disturbance must be balanced with other criteria, including ADA accessibility, cut/ fill balancing and parking lot slopes (Element 1).



A comprehensive site profile would allow for better site planning and minimize disturbances, but will also increase development costs.

- Construction Challenges/Costs – The developed area of the site is where the contractor typically stores materials, locates the job site trailer, allows worker parking, etc. Creating smaller areas of site disturbance and native vegetation preservation areas limits the areas for these activities and complicates access around the site. Each of these challenges can increase construction costs.
- Increased Design Costs – Incorporating native plant retention into a project's site design requires specialized knowledge and highly trained team of designers, engineers and other professionals early and throughout the site design process. These experts analyze site soils, drainage, and existing vegetation factors, all which increase front end design and review.

OPTIONS

A variety of options were considered in relation to implementation of each element. The following options were selected for implementation:

Element 1 (Minimize Site Disturbance)

- Grading permit exemptions would be limited by reducing exemption thresholds such as within 10 feet of a structure instead of 30 feet as it stated within current code. This will increase the amount of projects that require a grading permit and will provide greater scrutiny to grading efforts. In addition, codes will be updated to require that grading be restricted such that it works with the natural terrain. This will limit cuts and fills and overall slope changes within the project boundary and will preserve drainage patterns and some of the existing site hydrology.

Element 2 (Retain and Plant Native Vegetation)

- Update current regulations to promote retention of native vegetation and planting of new native plants. Expand requirements for tree tracts to multi-family and commercial developments. The City code has requirements for some tree preservation and encourages the use of native plantings but these requirements do no extend to understory and soil preservation and the use of native plantings is not a requirement.

SUMMARY

The City of Olympia has limited restrictions on grading on a site as long as requirements for tree preservation, protection of critical areas, shoreline restrictions, and the recommendations of the geotechnical report are met. Similarly, the City has some requirements for tree preservation but the understory is not similarly protected and native plantings are not required.

Retention of native soils and plants is essential to preservation of a site's existing hydrology and is a necessary practice for successful low impact development. More widespread use of these LID elements can be accomplished by incorporating recommended changes to City codes and/or policies that reduce site disturbance and provide more preservation of native vegetation and soils.

SCJ ALLIANCE
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Olympia

LID ELEMENT #1: MINIMIZE SITE DISTURBANCE

OBJECTIVE

Preserve a site's natural hydrology, ecological integrity and infiltrative capabilities by minimizing soil compaction caused by grading, cutting and filling.

RELATED ELEMENTS

Element 2 Retain and Plant Native Vegetation
Element 22 LID Foundations

TRADITIONAL SITE DEVELOPMENT TECHNIQUES

Traditional grading cut and fill involves reshaping a development site that has uneven or steep topography or easily erodible soils to planned grades which stabilizes slopes and decreases runoff velocity. This provides more suitable topography for buildings, facilities, and other land uses and helps to control surface runoff, soil erosion, and sedimentation during and after construction. Before grading activities begin, a construction site operator must make decisions regarding the steepness of cut-and-fill slopes and how the slopes will be protected from runoff, stabilized and maintained. However, this technique often results in compacted soils, diminished top soil and micro-organisms, and the native soils are often replaced by engineered soils which have less capacity to infiltrate and store water. When vegetated buffers are removed, the chances for offsite transport of sediments and other pollutants are increased.

"Minimizing site disturbance as a primary strategy to control erosion reduces the extent of grading, retains vegetation cover, and is the most cost-efficient and effective method for controlling sediment yield (Corish, 1995)."

Low Impact Development Technical Guidance Manual for Puget Sound, Puget Sound Action Team and Washington State University Extension Pierce County, 2005).

CODES AND STANDARDS REVIEWED

Drainage Design and Erosion Control Manual (DDECM) Volumes 2 and 3
Olympia Municipal Code (OMC) Section 16.48
Olympia Muncipal Code (OMC) Section 16.60
Comprehensive Plan Natural Environment Section

BENEFITS OF MINIMIZING SITE DISTURBANCE

Key elements of using low impact development techniques for clearing and grading include preserving natural terrain and minimizing site disturbance to allow pre-development hydrologic processes to continue once construction is complete. Minimizing site disturbance also:

- preserves existing vegetation
- soils and habitat
- minimizes soil compaction, and
- reduces erosion and sedimentation potential during construction.

When an undisturbed temporary or permanent buffer zone is maintained during the grading operation, it acts as a low-cost sediment control measure that helps reduce runoff and offsite sedimentation. When natural site contours are retained during construction, the lowest elevation of the site acts as a protected stormwater outlet before storm drains or other construction outlets are installed. Additional low impact techniques that can help minimize site disturbance, including (Element 2) Retain and Plant Native Vegetation, (Element 4) Restrict Maximum Impervious Surface Coverage, and (Element 5) Reduce Impervious Surfaces Associated with On-Street Parking are covered in other memos. In order to attain the benefits of LID, development activities such as clearing and grading should be carefully considered during the pre-submittal, design and construction phases to retain the function of those attributes.

OLYMPIA CODE ANALYSIS

Clearing and grading activities are primarily regulated by OMC 16.48 and also by OMC 18.32, OMC 18.36, and OMC 16.60. Most of these regulations are focused on prevention of erosion and siltation, public safety, or location of grading.

The recent update of the Comprehensive Plan (Natural Environment section) includes two polices addressing site disturbance through Olympia's planning, regulatory, and management processes. The first policy (PN 1.5) seeks to preserve the existing topography on a portion of a new development site, integrate existing contours into the project design, and minimize the use of grading and other large-scale land disturbances. The second policy (PN 1.7) seeks to limit hillside development to site designs that incorporate and conform to the existing topography, and minimize the effect on existing hydrology. Current City regulations regarding grading do not yet reflect these polices.

Current regulations do not encourage grading that considers the natural terrain.

Currently, grading activities of less than 50 cubic yards are generally exempt from permit requirements. OMC 16.48.050 also exempts from review agriculture-related clearing, the area within 30 feet of any structure, and up to 20,000 square feet for clearing and grading associated with single-family or duplex construction. Projects that require approval of the site plan review committee or Hearings Examiner do require review of the grading design, but the review does not include an evaluation of cuts and fills or quantity of grading.

OMC 16.60 requires a tree removal permit for undeveloped properties. Tree removal permits only allow tree removal as part of a development permit, through a conversion option harvest on a limited basis, or as part of a forest practice permit which then puts a moratorium on future development for 10 years. There are also allowed exemptions from these requirements. On developing properties, current City practice allows clearing and grading of new lots concurrently with construction of subdivision improvements such as streets and utilities. Seventy-five percent of the required trees for a subdivision must be within set-aside tree tracts. This permits the remainder of the property to be cleared and graded. The remaining trees required can be planted along streets and when new homes are built.

As long as requirements for tree preservation, protection of critical areas, shoreline restrictions, and the recommendations of the geotechnical report are met, there are no restrictions on grading within the allowed development area.

HURDLES TO MINIMIZING SITE DISTURBANCES

Changing City regulations to minimize site disturbance by limiting clearing and grading could present the following challenges:

Shift in Site Grading Approach - There are typically four main drivers for grading from the developer perspective: site balancing, parking lot slopes, stormwater flow and Americans with Disabilities Act (ADA) considerations. In order to reduce construction costs, a balanced site (where the amount of cut is equal to the amount of fill) is preferred by developers. Parking lot slopes typically have rules of thumb to ensure movement of stormwater while balancing maneuverability and practical elements associated with the use on the property. Stormwater also needs to flow to avoid standing water and parking lot ponding. Ensuring site accessibility and meeting the requirements of the ADA guidelines are also paramount.

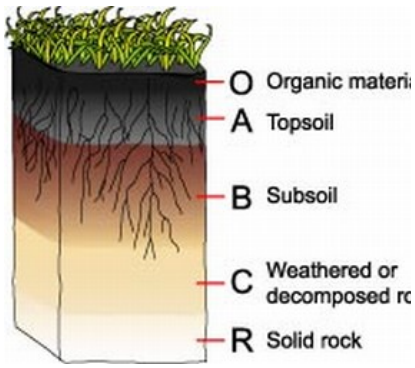
Minimizing site disturbances must be balanced with other criteria, including ADA accessibility, cut/fill balancing and parking lot slopes.

With a shift of focus to minimizing site disturbances, the main drivers of grading will change. For commercial sites, ADA accessibility, stormwater flow and parking lot design will still be paramount, but a design that works with the natural terrain and soils and that minimizes cut and fill activities will also be a key consideration. This approach to grading may increase the need for retaining walls, limit the building area and result in sites that do not have balanced cuts and fills. This would result in increased construction costs. Construction costs would also increase as standard grading methods may not be possible: if areas of development are discontinuous and existing vegetation preservation is required, the mass grading techniques currently employed by contractors may not be feasible and new grading approaches more sensitive to unique site features will be needed.

Grading Design Costs/Duration – Grading design for LID sites tends to be more complicated than traditional design. Discontinuous impervious areas, areas of natural vegetation preservation, and creating a design that works with the natural terrain result in more consideration to grading and more complicated designs, especially on sites where there is a lot of slope or change of topography across the site. This complexity of design will result in higher design costs and longer design duration as complex designs typically require more iterations of design and greater internal review for quality assurance.

Change to Geotechnical Reports – In order to minimize site disturbance, it is critical to have a thorough understanding of site soils. The type of soils on-site will influence where buildings are placed, where infiltration facilities are located, and even which areas should be preserved for natural vegetation. Therefore, a comprehensive profile of site soils is needed to efficiently lay out the site and understand where specific activities should occur. Current practices for preparation of geotechnical reports do not address this need.

For development in the City of Olympia there are typically two focuses for geotechnical reports: estimating the on-site soil's ability to support structures (buildings, paving, etc.), and infiltrative capability of soil for stormwater management. The soil testing is typically targeted based on the site plan, and soil pits are limited to the minimum necessary because they are expensive to dig. Soil pits are generally limited to the areas where buildings and infiltrative facilities are proposed, based on the site layout, with some additional pits dug to establish a general idea of soils outside of those areas. Further pits are generally dug only if poor soils are found in the original locations. A true, comprehensive profile of the on-site soils is not conducted.



A comprehensive site soil profile would allow for better site planning and minimize disturbances, but will increase development costs.

For soils testing on small sites, the current approach might work and a sufficient soil profile could be determined. However, on large sites, the current soil testing approach does not likely result in a comprehensive understanding of site soils. Therefore, planned improvements or areas of tree retention could be planned in areas that are not well suited to that purpose. For instance, a stormwater management facility could be planned in an area where the infiltration was acceptable but an area where the soils drain much better could be missed and planned for placement of fill over good infiltrative soils.

In order to minimize site disturbance, the approach to geotechnical testing and analysis would require change. A preliminary, comprehensive testing program and development of a site soil profile would need to occur prior to the development of the site plan. Per (Element 18) LID Site Assessment, this profile would be developed as part of the LID feasibility and would increase up front project costs.

Once the soil profile is developed, the site plan could be prepared based on findings. Areas of soils that have poor infiltration but have good structural support would be where structures are placed and areas of soils that are good for infiltration would be where stormwater facilities are placed. Once the site plan is developed, a more targeted soil testing could occur to establish design parameters of the soil such as infiltration rates and bearing capacity only in the areas where this information is needed. This approach would ensure that the site layout compliments site soils and could serve to limit site disturbances to where they should occur. Geotechnical

reports prepared in this manner would be more expensive and would take more time than the current methodology.

Small Sites – On small sites, restrictions to on site disturbances can be especially problematic. By the time the requirements of the municipal code are met (setbacks, required densities, critical area buffers, etc.), nearly all of the available area might be slated for development. Limiting grading could create the need for retaining walls for sites with steeper slopes or undulating topography.

LID elements such as infiltration require protection to avoid compaction, further limiting maneuverability on sites during construction.

Construction Challenges – In addition to limiting the ability to mass grade a site, there could be other challenges during construction. The developed area of the site is where the contractor typically stores materials, locates the job site trailer, allows worker parking, etc. Creating smaller areas of site disturbance also limits the areas for these activities. In addition, access around the site might be limited as areas of development could be discontinuous and separated by preservation areas. Further, an LID project will typically have more areas where infiltration is proposed, further limiting maneuverability as these areas need to be protected from compaction.

Specialized Building Design – Working with site terrain, especially on sites with large changes in topography, may create the need for non-traditional building types such as split-level buildings or exposed foundations. It could also result in specialized design for each building at a site as each residential lot or area of a commercial site would be different. Builders often work from prototype buildings to reduce costs and increase efficiency. It is likely that prototype use would be limited, especially on sites with more natural changes in terrain. Therefore, construction costs would increase with the need for specialized designs. In addition, construction durations would also be increased as efficiencies learned over repetition of construction would not occur as frequently.

AVAILABLE LID TECHNIQUES

There are other innovative LID techniques that can lessen the impact of clearing and grading, including:

- stockpile topsoil during construction and replace topsoil after construction
- design smaller building envelopes
- implement minimal foundation excavation techniques
- construct foundation designs that fit the building into the land rather than reshaping the land to fit the building

- deep-till and loosen soils compacted during site grading to restore their natural infiltration capacity for areas intended for stormwater management and infiltration or not required to have a structural capacity
- clearing, grading and heavy construction activity should occur during the driest months of the year to avoid erosion and sediment yield from equipment activity.

OPTIONS CONSIDERED

The options considered are as follows:

- Option 1: No change.
- Option 2: Reduce grading permit exemption level thresholds of OMC 16.48 to:
    - Within 10 (instead of 30) feet of structures
    - 7,000 (instead of 20,000) square feet
    - Less than 10 cubic yards (instead of 50 cubic yards)
- Option 3: Expand regulations in OMC 16.48 to address need for site grading activities to follow existing terrain.

ANALYSIS

Minimizing site disturbance is essential for successful implementation of LID. Thoughtful site planning that locates development in poor soil areas and works with natural terrain maximizes potential for infiltration.

If no change to code is made (Option 1), other LID elements such as Element 2: Retain and Plant Native Vegetation, Element 4: Restrict Maximum Impervious Coverage, and Element 5: Reduce Impervious Surfaces Associated with On-Site Parking could serve to minimize site disturbance. However, grading to work with the existing terrain and soils would not be addressed.

Option 2 (reduce exemption thresholds) would reduce the scale of projects exempted from grading permits while still allowing exemptions for small scale projects. This option increases the number of projects required to get a grading permit, but does not put limitations on the how or where the grading can occur because current regulations do not address how a site is graded. Grading to limit impacts to existing terrain is not currently a requirement.

Option 3 (expand grading regulations) addresses the need for current codes (OMC 16.48, EDDS, DDECM) to be updated to address grading as it relates to natural terrain and soils. Grading requirements to work with existing terrain and soils would be established as none are present in current codes. Currently, grading requirements only limit location of grading activities and require the reduction of erosion and siltation. Grading within allowed development envelopes (areas outside of critical area buffers, tree preservation areas, etc.) has no restriction. How a site is graded and the depth of grading is not addressed. A developer can choose to cut and fill to any depth, change the direction of slopes, and completely alter the site terrain. The only limits to the grading are the requirements specified in the geotechnical analysis. Grading methodologies are similarly unlimited and can include mass grading.

Option 3 would develop restrictions on grading to better work with the natural terrain. Restrictions on grading methodologies might also be considered. This option would fully implement an LID approach to grading and would come with the challenges addressed above. Examples of potential grading restrictions could be: limits to the allowed amount of feet of vertical change (cuts and fills should not exceed some specified amount); limits to allowed alterations of existing slopes to a specified percentage; or there could be a requirement to preserve natural drainage patterns. Existing guidance on LID (such as from the *LID Technical Guidance Manual for Puget Sound*) does not provide direction on limitations to depth of grading or slope change restrictions. The standard is to work with natural terrain. Requiring that existing drainage patterns be preserved could provide specificity.

RECOMMENDATION

Staff recommends Options 2 and 3. Option 2 will reduce the number of projects exempted from grading approval. Option 3 will require that grading work with the natural terrain. Together these options will better preserve existing site hydrology. Code language reflecting this approach will be fully developed as the LID code revision process progresses.

LID ELEMENT #2: RETAIN AND PLANT NATIVE VEGETATION

OBJECTIVE

Provide stormwater flow control via interception, transpiration, and increased infiltration associated with the natural functions of native vegetation and soils. Additional environmental benefits include improved air quality, carbon sequestration, reduced heat island effect, reduced irrigation, pollutant removal, and habitat preservation or formation.

CONSIDERATIONS

For this memorandum it is assumed that native vegetation encompasses both those species that occur naturally, but also those that are well adapted to current and anticipated environmental conditions in Olympia. Allowing adapted plants promotes greater diversity and allows for more creativity with a greater plant palette to select from.

RELATED ELEMENTS

Element 1 Minimize Site Disturbance
Element 4 Restrict Maximum Impervious Surface Coverage

TRADITIONAL SITE DEVELOPMENT TECHNIQUES

Unless prevented by regulations (critical area restrictions, tree tract requirements, shoreline, conservation areas, etc.), sites are typically cleared of all vegetation in preparation for development activity. Preserving areas of natural vegetation on-site may limit the density that can be developed, constrain the maneuverability of large, heavy equipment around the site and restrict both on-site and adjacent property construction activities, especially site grading operations. Therefore, unless required to, developers will not typically preserve much, if any, natural site vegetation. Developers also do not always prioritize the use of native plantings in landscaping of sites, and instead landscape to meet code requirements, to achieve a specific aesthetic, or to use readily available plant materials.

CODES AND STANDARDS REVIEWED

Olympia Municipal Code (OMC) 16.60 (Tree Protection & Replacement), 18.32 (Critical Areas), 18.36 (Landscaping & Screening)
Drainage Design and Erosion Control Manual (DDECM) Volumes 3 and 5
2014 Comprehensive Plan

> "Mature native vegetation and soil are necessary to maintain watershed hydrology, stable stream channels, wetland hydro-periods, and healthy aquatic systems... (and) are also the most cost-effective and efficient tools for managing stormwater quantity and quality."
>
> Puget Sound Partnership: Low Impact Development Technical Guidance Manual for Puget Sound December 2012

BENEFITS OF RETAINING AND PLANTING NATIVE VEGETATION

According to the Puget Sound Partnership *Low Impact Development Technical Guidance Manual*, the conservation and use of on-site native soil and vegetation for stormwater management is a central principle of low impact development design. Protecting these natural features achieves three goals: it reduces total impervious area; it maintains stormwater storage, infiltration and evaporation; and it provides potential dispersion areas for stormwater and maintains natural hydrologic processes. Protection of native forests can provide additional benefits such as providing critical habitat buffers, open space and recreation opportunities.

OLYMPIA CODE ANALYSIS

The retention of native vegetation on new and existing development sites is currently achieved through regulations requiring the preservation of critical areas and associated buffers (OMC 18.32). Regulations addressing tree protection and replacement (OMC 16.60) are also a means to preserve some existing mature trees; however, the requirements specifically do not extend to protecting the critical understory vegetation.

Areas of intact native vegetation could be protected by prohibiting any activities within a tree tract that would potentially damage the trees' critical root zones; however, it is not an explicit regulatory requirement in OMC 16.60 or the primary intent of the ordinance. Trees are also not necessarily required to be protected in stands (or tracts) in multi-family or commercial projects; instead, trees are often retained individually, which is more difficult than, and often not as successful as, preserving trees in existing stands.

Other mandatory landscaping standards encourage native vegetation, but do not require it. The DDECM indicates in Volume 3, Section 3.2 that native vegetation is preferred for landscaping of stormwater ponds. Retention of native vegetation for stormwater flow control is not a significant element of the existing Landscaping Code (OMC 18.36). Landscaping, as required in OMC 18.36, is primarily required to provide visual and physical buffers between uses and to reduce or improve aesthetic impacts from new development.

HURDLES TO RETAINING AND PLANTING NATIVE VEGETATION

The retention and planting of native vegetation is encouraged in almost all cases of new development. The assumption is that it will be suitable to regional climate conditions and subsequently require less maintenance in terms of labor, water and chemicals (fertilizers and pesticides). However voluntary and successful retention or planting of native vegetation can be difficult to achieve, especially in the following:

> **Small Sites.** Due to the City's required implementation the policies of the Washington State Growth Management Act, Olympia's residential design standards have been updated over the past two decades to require small lot sizes. Placing buildings and related infrastructure (driveways, walkways, utilities, etc.) on a small developable site leaves less area for retaining native vegetation. Attempts to preserve native soils and vegetation on small sites have resulted in small, marginally vegetated set asides. These areas are often not viewed as amenities by

residents. As a result, they are not protected and maintained. They tend to disappear in favor of other uses. Small, infill sites in existing neighborhoods are also problematic.

Retention of native vegetation for stormwater flow control is not a significant element of the existing Landscaping Code (OMC 18.36).

Tree tracts are required for subdivisions comprised of four lots or greater because retaining mature, native trees on small sites is particularly challenging, isolating trees that once grew as a stand can expose the remaining trees to conditions that they have not had time to adapt to, severely weakening or killing the tree and creating a hazardous condition. Mature native trees also require extensive protected areas around the base of the tree to prevent compaction of the critical root zone. Damage from compaction or regrading beyond just a couple inches in depth will destroy the tree's roots and cause severe weakening or death.

Development Investment and Cost. Incorporating native plant retention into a project's site design requires specialized knowledge and analysis of site soils, drainage, climate and other factors, as well as the ability to apply this analysis to a design that is physically, aesthetically and economically viable.

This requires engaging a highly trained team of designers, engineers and other professionals early and throughout the site design process. The team can then identify and address potential areas of conflict in advance of the City's land use review process, or be prepared to adapt and address issues quickly in collaboration with City staff during the permit review process. Currently requirements are often addressed piecemeal or only after having been highlighted by City staff.

There may be a higher cost at the beginning of the process to acquire this level of expertise, continuity, and responsiveness; however, it can result in a site design that meets the City's regulations with reduced potential for delays or requests for revisions.

Site Design. Considering all factors impacting site design thoroughly and early on is critical to successful native vegetation retention. Applicants will need to take into consideration existing site characteristics when determining where to allocate preserved native vegetation. Currently, the City requires a Tree Plan be submitted with nearly all Land Use

Plants native to this region are accustomed to growing in specific environmental conditions, so it is critical to understand those conditions to avoid significantly impacting or destroying them during the construction phase of a project.

Applications, as well as identification of all critical areas and critical area buffers. Retention areas for native vegetation would potentially be in addition to these already existing requirements.Similar to the process for identifying where there are viable and mature trees suitable for preservation, the site design needs to reconcile the areas to be developed with suitable areas for native vegetation. This requires an in-depth analysis and understanding of existing site conditions. For example, the existing soils may be in poor condition or not conducive to supporting native shrubs or trees without extensive remediation or amendments. Due to previous activity on some sites, the existing vegetation may be sparse, of poor quality, or predominantly comprised of invasive species. Similarly, grading and clearing in one area may adversely affect hydrology patterns in another, resulting in conditions unsuitable for native vegetation.

Lastly, site design would also need to address potential future conflicts with other desirable activities that require space or solar access, such as urban gardening, children's play structures, and siting for solar power.

Implementation. To fully realize the benefits intended through preserving or planting native vegetation, the vegetation that is preserved or planted needs to become established and remain viable in the long-term. Significant attention needs to be paid to determining suitable plant species, protecting or installing the vegetation correctly, and ensuring proper on-going management.

Plant Selection

Plants native to this region are accustomed to growing in specific environmental conditions, so it is critical to understand these conditions and to avoid significantly impacting or destroying them during the construction phases of a project. Changes in drainage patterns, soil compaction, or exposure to wind and sun can make some native plant communities less likely to survive throughout construction, or will greatly increase their vulnerability to invasive species, pests and diseases.

There have also been significant challenges in implementing the mandatory subdivision and individual parcel LID requirements.

Climate change in the Pacific Northwest will likely cause warmer winters with more rainfall, and hotter summers, as well as more extreme storms and drought. These are not the conditions native vegetation necessarily evolved under and will increase stress on plant communities. Plants need to be selected that have shown an ability to either thrive in or adapt to changing climate conditions in the future.

Plant Protection

Mature trees are often lost during the construction process due to a lack of proper or effective protection. Fencing may be installed initially, but over time its level of effectiveness is diminished if the project manager is not held accountable for its condition. Native vegetation, if not protected properly and in particular in constricted constructions areas on small lots, will be destroyed during construction.

Long-term Maintenance

Retained and planted areas of native vegetation are vulnerable to whole host of threats during establishment or following construction. Most critical is whether or not the area is properly maintained. "Natural" areas are no longer natural in the sense that they will thrive on their own; continual management is necessary to prevent native vegetation area from being diminished or lost entirely. There may be less interest or community will to pay for the cost of on-going maintenance or to ensure that the maintenance that is done is appropriate when an area appears more natural and is not appreciated for its ecological function by the end user. Very often, native vegetation will be maintained the same as a formal landscape, with hedge trimmers and a lawnmower.

Lastly, development will likely increase the perimeter length, or edge, of retained vegetation areas, and create soil disturbance. Both allow for greater and quicker establishment of invasive plants, which decrease the aesthetic appeal of the site. Their removal and replacement with native plants can be time-consuming and significantly increase maintenance costs. However, if not addressed, many of the benefits of the preserved area are slowly lost over time.

Tree Retention. Existing exemptions for tree removal permits may prevent native tree retention in the long term. OMC 16.60.040 includes many exemptions to tree protection requirements. Trees under 6 inch DBH, trees on developed single-family lots where tree density is maintained, and trees on developed property (up to 6 trees per acre per 12 month period) are exempt and may be removed without a permit. Harvesting with a Forest Practice Permit is also exempted which can include total removal of a forest from a parcel.

Special Considerations. For areas of natural vegetation to be established, preserved, and managed, those responsible for ensuring compliance during permitting and construction, and those responsible for the long-term management of these areas need to understand and become champions for the community-wide benefits they provide. The likelihood of this continues to evolve in our community, and there are still some outstanding cultural belief systems that shape what many property owners desire for the landscapes they exercise control over.

Property owners expect to have freedom of choice on how to use their property. Requiring the retention and maintenance of native vegetation areas in perpetuity contradict this expectation, and may be resisted or ignored by property owners.

Native trees, shrubs, and groundcovers can be perceived as messy, weedy and unkempt. Their natural growing forms may be perceived to block light or visibility, creating dark, dangerous, and unsafe conditions. Their seeds, leaves, or berries may be a maintenance issue.

Also, relative to grassy lawns, areas with native vegetation may have limited passive uses, preventing desirable active recreation. Areas with a significant understory left intact don't allow for throwing a frisbee or playing soccer. In some cases, natural areas can also become too highly used by dog-walkers, people cutting through, BMX bikes, or mountain bikes. Over-use by some activities can compact the soils and destroy the understory vegetation.

The City of Olympia provides education and technical assistance to property owners regarding native vegetation and open space protection, but regulatory enforcement on the issue is challenging and ineffective.

Updating codes to require using native vegetation in planting areas is relatively straightforward and feasible to implement.

OPTIONS CONSIDERED

Option 1: No change to the existing regulations; native vegetation is preserved and planted in tree tracts (as it applies to trees only in residential subdivisions), shorelines, critical areas, and critical areas buffers. Provide ongoing education and technical assistance.

Option 2: Update codes requiring that native plants be used when landscaping is required and when revegetating the open space area. Expand the requirements for preservation of native vegetation and soils in designated areas or tracts to include all multi-family and some commercial developments (as appropriate by existing commercial zoning districts).

Option 3: Expand the amount of area required as preserved natural vegetation within new development sites. Establish a percentage of the site to be retained in natural vegetation based on a variety of factors. For example, current low impact development regulations for Olympia's Green Cove basin result in the protection of approximately 60% of the overall development plat. The Green Cove regulations were established approximately 15 years ago in acknowledgement of the unique environmental attributes of the basin. Given growth management practices and Olympia's goal of creating relatively dense land uses, the feasibility of applying those regulations to other areas of the City is limited. However, other less rigorous preservation requirements could be required.

ANALYSIS

A study done by City of Olympia staff in 2011 cited that many cities are opting for an approach to LID that incorporates a mix of both voluntary and regulatory tools to implement changes; however, results have shown a greater impact is realized through regulation. All of the options noted above for retaining and planting native vegetation emphasize a regulatory approach; the question is to what *extent* do we regulate retention of native vegetation?

The conservation and use of native on-site soil and vegetation for stormwater is a central principle of LID design.

A significant emphasis of native vegetation retention for LID is mature tree retention. Option 1 (no change) continues implementing Olympia's existing tree preservation and replacement requirements, which have been in place for nearly three decades, in addition to protections for critical areas. Both requirements have preserved some level of native vegetated areas in both residential and commercial developments. Changing landscape practices are evident in our community (e.g. more native species, less pesticide, herbicide and fertilize use, increasing compost use).

Option 2 (require native plants where landscaping required) acknowledges that there are areas where the current regulations may be readily expanded for greater effectiveness in preserving and planting specifically native vegetation. OMC 16.60 (Tree Protection & Replacement) can be revised to preserve soils and understory vegetation, and to include soil and vegetation preservation areas in multi-family and some commercial projects. Credit towards landscaping requirements can be expanded to stormwater treatment areas, and all landscaped areas shall be comprised of preserved or planted native vegetation.

These requirements would be relatively straightforward and feasible to implement as the areas impacted are already required to be set aside by an existing regulatory mechanism. The requirements would also continue to be implemented primarily by the development community and City staff on property that will either be deeded to the City as right-of-way or owned or maintained by an association, and not individual homeowners.

The short-term and long-term effectiveness of Option 2 would require improved and expanded training for private developers, construction companies, and City staff to ensure proposed vegetation is site-appropriate and protected or planted properly during construction. There will also need to an improved system for ensuring plant survival and establishment after the initial growing season. Education will be critical for ensuring parties responsible for future on-going maintenance of protected areas are doing so correctly, consistently, and in perpetuity.

Option 3 (expand requirements for vegetation preservation) references a level of tree and vegetation preservation that is currently applied only to Green Cove's Residential Low-Impact (RLI) zoning district. A 1998 study of the Green Cove Creek Basin completed jointly by the City of Olympia and Thurston County found that there was more that could and should be done to protect this environmentally

sensitive watershed within the City and Urban Growth Area (UGA). The study's findings resulted in the adoption of a special Green Cove zoning district, which through tree preservation regulations results in approximately 60% of a new development site in the basin be set aside as preserved area. Not coincidentally, wetlands are prevalent and large in the basin, and can be used to meet the 60% set aside. Wetlands are also protected by the City's Critical Area Ordinance. The 60% set aside is consistent with current stormwater full dispersion techniques outline in Ecology's stormwater manual.

Vegetation set asides less than 60% could be implemented in other areas of the City. However, the implications of mandating increased natural vegetation protection on developed sites are substantial. City goals and policies emphasize the importance of relatively dense land uses for our community. Increasing vegetation protection on a broad basis would require extensively revisiting our expectations for future land use.

RECOMMENDATION

Staff recommends Option 2. Staff recommends that all areas under which the City currently requires landscaping or the allocation of open space be appropriately landscaped with preserved or planted native vegetation, and that the requirement for native vegetation and soil protection areas be extended to all multi-family and some commercial development where appropriate.

Minimize Impervious Area – Site

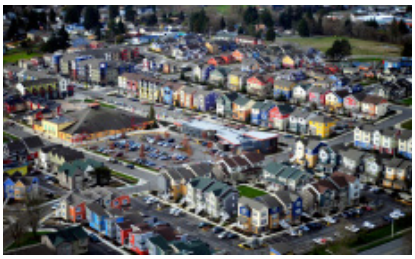
Elements		
3	4	5
Zoning Bulk and Dimension Standards	*Restrict Maximum Impervious Surface Coverage*	*Reduce Impervious Surface Associated with On-site Parking*

Three of the LID elements under consideration focus on the reduction of impervious area on a site (areas outside of public right-of-way).

These elements include:

- Element 3 (Zoning Bulk and Dimension Standards)
- Element 4 (Restrict Maximum Impervious Surface Coverage)
- Element 5 (Reduce Impervious Surface Associated with On-site Parking)

These elements share the same objective and result in similar benefits and implementation challenges. Specific information to each element is found in the issue paper for that element. The following is a summary of similar themes that can be found with the elements aimed at minimizing impervious area on a site.



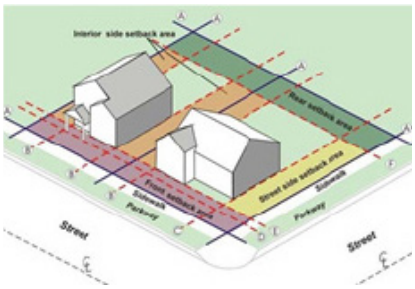
Urban Residential and Commercial developments typically have extensive impervious surfaces. The current limits on impervious area coverage in Olympia City codes are the result of many years of gradual adjustments.

OBJECTIVE

The shared objective of these elements is to minimize the amount of impervious surfaces on development sites in order to maintain natural hydrologic functions and maximize infiltration.

BENEFITS OF MINIMIZING IMPERVIOUS AREA ON A SITE

Development standards with high impervious surface allowances result in larger volumes of stormwater runoff. Restricting impervious surface helps reduce stormwater runoff and can result in more pervious areas for infiltration. A key component of low impact design is to mimic the pre-disturbance hydrologic processes of infiltration, filtration and storage. None of these processes occur on impervious areas. By limiting impervious surfaces, more area is retained where natural infiltration processes can be replicated. Restricting impervious area also aids in achieving other desired outcomes such as preserving native vegetation and minimizing site disturbance.



Reduction of front building setbacks for single family residential projects will not likely result in any change in building placement unless maximum setbacks are imposed (Element 3).

HURDLES TO IMPLEMENTATION

While the benefits related to increasing infiltration are universal to the elements under consideration, the hurdles are often unique to the specific element. Some of the hurdles to implementing the elements include:

- Single Family Lots have certain minimum requirements expected by homeowners, including driveways of sufficient size to park cars outside of the garage. Further limits to driveway size, allowed parking or other standards could result in lots that are not marketable.
- City codes are also based on national standards, local studies, and other best management practices refined through local considerations.

Reducing the impervious surfaces associated with on-site parking allows opportunities for increased green space for infiltration, and opportunities to retain mature trees that facilitate evapotranspiration.

OPTIONS

A variety of options were considered in relation to implementation of each element. The following options are recommended:

Element 9 (Zoning Bulk and Dimension Standards)

- For single family developments, the City will develop incentives to encourage clustered housing. Clustering, which allows higher density development on a portion of the site in exchange for leaving another area of the site undeveloped, is already allowed within City code but is rarely used. This practice can both reduce impervious area and help with preserving native vegetation.

Element 10 (Restrict Maximum Impervious Surface Coverage)

- The City will review the impervious area limits established within each zoning district and determine where reductions can be made. Developers will be allowed to exceed these new maximum impervious coverage limits when permeable paving is used.

Element 18 (Reduce Impervious Surface On-site Parking)

- A number of small adjustments can be made to Olympia's parking standards. In particular, parking stall requirements and parking lot dimensional standards can be updated based on the most recent studies, a minimum percentage of compact stalls can be required in parking lots, and a requirement that when a parking increase variance is granted that the new stalls use permeable paving could be added.

SUMMARY

The City of Olympia already incorporates many LID strategies to limit the amount of impervious area on a site including:

- Maximum impervious areas coverage limits by zoning district
- Building coverage limits by zoning district
- Open space and tree tract requirements
- Small building setbacks (typically 0-20 feet)
- Parking thresholds that require a special review and approval process to exceed

Given this, the new requirements to incorporate Department of Ecology Low Impact Development elements can be accomplished by providing incentives for LID strategies already allowed by code but not widely used and by incorporating further clarity in code language to promote the use of permeable pavement. In addition, the City will look to make minor changes in the maximum allowed impervious area thresholds by zoning district.

SCJ ALLIANCE
CONSULTING SERVICES

Olympia

LID ELEMENT #3: ZONING BULK AND DIMENSION STANDARDS

OBJECTIVE

Incorporate flexibility for setbacks and heights, allow clustering of buildings, and minimize building footprints as an approach to maintain natural hydrologic functions, native vegetation and green space.

CONSIDERATIONS

For this memorandum, it was assumed that bulk and dimensional standard modifications would only be considered for single family and multi-family residential projects.

RELATED ELEMENTS

Element 1 Minimize Site Disturbance
Element 2 Retain and Plant Native Vegetation

TRADITIONAL SITE DEVELOPMENT TECHNIQUES

The layout of a project is influenced by many factors including the bulk and dimensional standards of the site zoning. A developer will typically maximize developable area based on the maximum and minimum requirements of the zoning such as setbacks, height limits, maximum building coverage, etc. The goal is usually to maximize square footages for commercial development and lot or unit count for residential projects.

"Front yard setbacks can extend driveway length and increase the impervious coverage of the lot. Side yard setbacks and wide frontages increase the total road length and overall impervious coverage."

Department of Ecology Low Impact Development Code Update and Integration

CODES AND STANDARDS REVIEWED

Olympia Municipal Code (OMC) Section 18.04.080 and Table 4.04 (residential districts development standards)
OMC 18.05.080 and Table 5.04 (residential and commercial development standards for village zonings)
2014 Comprehensive Plan

BENEFITS OF USING LOW IMPACT DESIGN

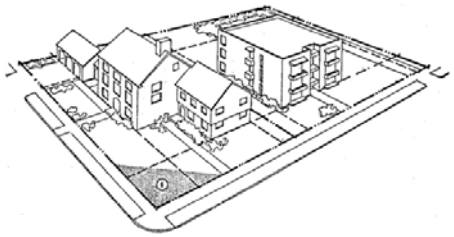
Modifying zoning bulk and dimensional standards can have a large impact on site layout. For instance, if building height limits are increased, builders could build vertically instead of horizontally, which leads to smaller footprints and could reduce impervious surface coverage on a site. By increasing zoning bulk and dimensional limits (building heights) and decreasing others (building coverage limits, setbacks), site development could be flexibly designed to meet project goals while still providing layouts that reduce the total building footprint and increase clustering. For instance a reduced front setback could reduce driveway lengths and corresponding impervious area. Reduced building footprints provide more

opportunity for natural site hydrology to be preserved and low impact design elements to be implemented. Open spaces can be increased while maintaining development densities.

OLYMPIA CODE ANALYSIS

Bulk and dimensional standards are addressed in the OMC within the design standards for the zoning district types. Each zoning district has development standards for setbacks, building height limits, open space requirements, maximum impervious surface coverage limits, minimum lot dimensions, and other requirements. The current zoning standards are a result of many years of adjustments and consensus building. They help stabilize the real estate market and provide predictable patterns of development.

The current zoning standards are a result of many years of consensus building.



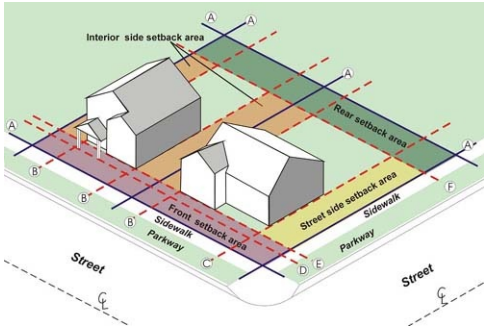
Olympia's Comprehensive Plan includes coordinated building heights and view protection goals.

HURDLES TO IMPLEMENTATION

Modifications to the zoning bulk and dimensional standards could present the following challenges:

Building Height Increases Don't Sufficiently Offset Reduced Building Coverage Limits – Reductions in standards such as building coverages can be mitigated by allowing for taller buildings to achieve desired square footages or unit counts. In theory this could be effective, but in practice it may not have widespread application. Increases in building height limits would be applicable for multi-family projects. However, taller buildings are typically more expensive to construct due to requirements for elevators, special building materials, fire exiting and suppression, etc.

Reduction of front building setbacks for single family residential projects will not likely result in any change in building placement unless maximum setbacks are imposed.



Single family residential projects have similar challenges. Two-story buildings are currently the norm for new single family homes in order to meet market targets for square footages, density requirements and the limits of site coverage in the city code. Three-story single family residential construction is not a typical style and may meet consumer resistance.

Building Placement (Single Family Projects) – Reduction of front building setbacks for single family residential projects are not likely to result in much change in building placement unless maximum setbacks are imposed. The main drivers of the building layout at the front of a typical single family lot are parking space in the driveway, building floor plans and utility easements. Where alleys are not provided, driveways with a minimum 20-foot length are desirable to accommodate vehicle parking that avoids conflicts with sidewalk use. Many homeowners use their garages for storage or work space, or own more cars than fit in the garage. This results in regular use of the driveway for parking. On-street parking can provide an alternative for homeowners, but parking on individual lots is generally preferred by residents.

Residential lots often have a 10-foot utility easement across the front yard for power, phone, and cable services. In order to provide a homeowner with a front yard that is not entirely encumbered by this easement, additional yard space is desired. Further, the 10-foot easement space can include above ground utility fixtures such as pull boxes and transformers.

Current Code Already Incorporates Some LID Standards– The requirements in OMC 18.04.080 and18.05.080 and their associated development standards tables already incorporate many of the standards of low impact design. Setbacks are typically 20 feet or less and are as small as zero in certain zoning districts. Building coverage limits are typically 50% or less for residential zones. Further, unlike many other cities, the City of Olympia has maximum development coverage or maximum impervious coverage limits in most zones. These limits both encourage dense development and limit site coverage.

Olympia requires that open space to be provided in certain developments. It also collects impact fees for neighborhood parks and open space.

Current Open Space Requirements	
Residential Low Impact (RLI) zone	Tree tract – approx. 60% of site
Other single-family subdivisions	Tree tract – approx. 10% of site
Chambers Basin R-4 zone	Drainage dispersion tract – 65% of site
Cottage housing	Open space tract – 450 sq. ft. per unit
Manufactured Housing Park	Open space tract – 500 sq. ft. per unit
Multi-family housing	Up to 30% of site depending on zone – must include ‘useable’ space
Environmentally sensitive area	Up to 20% open space may be required in addition to critical areas and buffers
Open space impact fee	Land acquisition funding for Olympia Parks, Arts, and Recreation Department

OPTIONS CONSIDERED

Single Family Residential

- Option 1: No Change. Maintain current code limits.
- Option 2: Require a percentage open space to be preserved as native (or at least pervious) for RLI, R4, R4-8 and R6-12 zonings.
- Option 3: Modify clustering options such as for environmentally sensitive area protections (OMC 18.04.080(F) and cottage housing to provide more incentives to use these options.

Multi-Family Residential

- Option 1: No Change. Maintain current code limits.
- Option 2: Increase open space requirement by a percentage for multifamily projects with commensurate reduction in allowed building coverage. An increase in building height limits could also be implemented to offset building coverage reduction impacts.

ANALYSIS

Reducing zoning bulk and dimensional standards can be an effective tool in minimizing the footprint of a development. However, reductions in footprints are only beneficial if accompanied by an increase in pervious soil. Therefore, the options have focused on increasing the perviousness of a site through increases in pervious open space. If only the building coverage limits are reduced there is no guarantee that the site pervious area will be increased without further, additional requirements. Focusing on open space achieves the increased perviousness that is desired.

Single Family Residential Analysis

Option 1 (no change) retains the status quo. The current OMC already has limited front setbacks and restrictive limits on building coverage for residential zones; and options for clustering.

Implementation of Option 2 (require increased open space) would institute increased open space requirements for residential zones that either do not contain them or have only limited application. This will require updates to OMC 18.04.080 and Table 4.04. Open space limits could be modified to require a percentage of open space for RLI, R-4, R4-8 and R6-12 zones. This open space would be in addition to tree tracts, be set aside within a subdivision (not on a per lot basis), and must either be maintained as native vegetation or can be landscaped. This area will be required to remain pervious and uncompacted to allow for infiltration. This area would be set aside as a separate tract or lot with requirements regarding perviousness specified within the recorded plat.

Because this open space is contained in a separate tract with specified requirements, its preservation is more likely to be maintained.

Option 3 (increase clustering through incentives) would require development of an incentive program. Incentives would need to be compelling enough to overcome perceived obstacles to clustering.

Multi-family Analysis

Option 1 (no change) retains the status quo. The current OMC already has limited front setbacks and restrictive limits on building coverage for multi-family residential zones.

Option 2 (increase open space multi-family), would increase open space requirements for multi family zoning districts and reduce building coverage limits. Changes to OMC Section 18.04.080 and Table 4.04 would be needed to incorporate this change. Option 2 would increase site perviousness and provide more area for infiltration. Requirements would be needed to preserve perviousness and infiltrative capabilities of open space areas. Allowing for increased building heights could offset impacts to overall allowed building square footages.

RECOMMENDATION (SINGLE FAMILY)

Staff recommends Option 3. Option 3 would incentivize the use of the clustering option already present in City code. Clustering provides for increased open space, infiltration and preservation of natural vegetation.

Option 1 would not increase pervious area on sites over what is currently allowed. Option 2 reduces the developable area of the site and could create problems meeting density requirements.

RECOMMENDATION (MULTI-FAMILY RESIDENTIAL)

Staff recommends Option 1. Current City code already has limitations on zoning bulk and dimension standards for multi-family projects including maximum impervious surface limits of 70-75% and open space requirements of 25-30%.

Option 2 would increase open space requirements for multi-family projects. Density requirements can be tough to achieve with current open space requirements of multi-family districts.

LID ELEMENT #4: RESTRICT MAXIMUM IMPERVIOUS SURFACE COVERAGE

OBJECTIVE

Minimize the amount of impervious surfaces in developments in order to maximize infiltration.

CONSIDERATIONS

For this element paper, it is assumed that impervious area reductions can be achieved by imposing limits on impervious surface coverage for a project site. This paper does not address methods of creating pervious hardscapes that would have otherwise been designed as impervious – such as parking lots, driveways, patios, and other hard surface features. Low Impact Development methods in permeable pavements, preservation of native vegetation, and utilizing landscaping areas for stormwater management are addressed in separate elements.

"The intent of revisions shall be to make LID the preferred and commonly-used approach to site development. The revisions shall be designed to minimize impervious surfaces, native vegetation loss, and stormwater runoff in all types of development situations."

Western Washington Phase II Municipal Stormwater Permit August 2013

RELATED ELEMENTS

Element 5 Reduce Impervious Surface Associated with On-Site Parking
Element 14 Permeable Paving

TRADITIONAL SITE DEVELOPMENT TECHNIQUES

Market forces, the Growth Management Act, and associated requirements for urban densities have resulted in residential lots becoming increasingly small. Typical new single family lots in Olympia range from 4,000-7,000 square feet. The impervious cover on a single family lot is also increased by patios, driveways, and a myriad of other uses. As a result of trends toward rising motor vehicle ownership, small lots and large homes, the impervious coverage of a typical new residential lot in Olympia is more than half the lot area.

Commercial lots are also developed with extensive impervious surfaces. With the rising cost of land, building square footages are often maximized. These buildings also need sufficient parking. The result is most commercial developments construct the maximum possible allowed impervious area, often 80-90% of the site.

Similarly, industrial developments typically have very little pervious surface other than minimum required landscape areas. It is common for industrial developments to have large buildings and parking lots that need to meet specific functional goals or circulation requirements for heavy equipment or deliveries.

CODES AND STANDARDS REVIEWED

Olympia Municipal Code (OMC) Section 18.04.080 and Table 4.04 (residential districts development standards)
OMC 18.05.080 and Table 5.04 (commercial development standards for village zonings)
OMC 18.06.100 and Table 6.02 (commercial development standards)
OMC 18.08.100 and Table 8.02 (industrial development standards)

BENEFITS OF RESTRICTING MAXIMUM IMPERVIOUS SURFACE COVERAGE

Development standards with high impervious surface allowances result in large volumes of stormwater runoff. Restricting impervious surface allowances helps to reduce runoff and can result in more landscape areas or pervious areas for infiltration and retention of stormwater. A key component of low impact design is to mimic the pre-disturbance hydrologic processes of infiltration, filtration, and storage. None of these processes occur on impervious areas. By limiting impervious surfaces, more area is provided for natural hydrologic processes. Restricting impervious area also promotes other desired outcomes such as increasing the use of permeable paving, retention of native vegetation, and minimizing site disturbance. For these reasons, limiting impervious surfaces is one of the three main goals of low impact development.

OLYMPIA CODE ANALYSIS

Impervious area coverage is addressed in the OMC within the design standards for the zoning district types: residential, commercial, and industrial. Each zoning district has limits on impervious coverage addressed in design standard tables. The current limits of City zoning are the result of many years of balancing competing interests. Some limits are based on traditional health-based "light and air" (access to sun and air by not allowing buildings to be too close or limiting building heights) provisions of zoning.

The current limits impervious area coverage in City codes are the result of many years of gradual adjustments.

HURDLES TO IMPLEMENTING LID

Increased restrictions on impervious area could present the following challenges:

Increased Limits on Impervious Surfaces May Conflict with Other Goals - Numerous state, regional and local planning policies discourage sprawl by guiding development to urban areas. The urban core is intended to be densely developed, which is compatible with generous impervious area coverage limits. Land at the urban core is more expensive than land in outlying areas because of urban amenities, infrastructure and limited supply. The higher cost for acquisition is offset because development can be more densely developed. Property values and sales prices are also higher nearer the urban core. If the ability to be more densely developed is

removed, development may shift to areas where land is less expensive or where higher impervious surface coverage is allowed. Some development may no longer be feasible within restricted areas. The City has an obligation through the Growth Management Act to accept growth and discourage sprawl.

In some cases, limits on allowed lot coverages could be offset by increasing allowed height of buildings. However, multistory building form is not compatible with all end user needs. Some types of development have traditionally been located in a single story building. Therefore, this offset would only be beneficial to limited building types.

Difficulty Meeting Unit/Lot Count Requirements (Residential Projects) – Reducing the maximum allowed impervious coverages in the current code could create both known and unknown consequences. A large reduction in the impervious allowances for multi-family residential projects could make density requirements of the underlying zoning difficult to achieve. Careful consideration of potential impacts to other areas of the code is needed when reducing allowed impervious area coverage.

Residential zoning districts typically have a required minimum and maximum lot or unit count. As an example, Olympia's single family R 4-8 zoning requires that a minimum of 5 lots and a maximum of 7 lots per acre be developed. Because "undevelopable" areas are not included, for a 20 acre parcel, this can equate to a required lot count of less than 80 lots to almost 100. This zoning currently has allowed impervious area coverages of 55-70% depending on housing unit type (single family detached, townhomes, etc.). With the roads, sidewalks, and other impervious infrastructure associated with subdivision development, the current limitations on allowed impervious areas for these districts already make achieving low impact development difficult.

Urban Residential and Commercial developments typically have extensive impervious surfaces.

Multifamily projects could solve density problems by adding stories to buildings. However, proposed increases to height limits, as stated previously, have not been easy to accomplish. Neighborhood residents often object to loss of light and privacy, view blockage, and increases in noise. Taller buildings are also generally more expensive to build due to special building materials needed to support taller structures as well as requirements for elevators and other building code imposed safety features.

Enforcement – Once sites go through the initial permitting and construction process, maintenance activities or minor improvements are often done outside of City review. A single family owner can create a concrete patio for enjoyment of their backyard without City approval. Areas paved with pervious materials may be covered with impervious surfaces during normal maintenance without City knowledge. Therefore, exceeding the impervious limits in the codes could happen on commercial and residential projects with no City oversight, especially in the years following final occupancy. In order to prevent this, additional permitting, education and/or inspections would be needed by the City to ensure that impervious area limits are not exceeded throughout the life of a development project.

Conversion to Permeable Hardscapes – A method of reducing effective impervious surface on a site is the replacement of conventional concrete or pavements with a permeable paving solution such as porous concrete, permeable asphalt, or interlocking permeable paving stones. These LID methods are acceptable on-site measures for reducing impervious areas and promote retention and infiltration of stormwater onsite, but they also come with increased installation and construction costs. Considerable attention to long term maintenance is necessary, and the life cycle of these systems is generally not as long as conventional, non-permeable pavements. Because these permeable pavement solutions are not feasible for every site, they are not examined here as a method for reducing maximum impervious surface coverage.

OPTIONS CONSIDERED

Assumptions/Background

The following factors are considered:

- There are two distinct categories that need to be addressed separately - single family residential and all other projects (multifamily, commercial, industrial).
- Because of its proximity to Budd Inlet, most of downtown is exempted from stormwater quantity control requirements and would, therefore, be exempt from LID flow standard implementation.
- Small redevelopment projects could also be exempted from impervious surface limit restrictions. Small redevelopment projects could be defined as those that only trigger minimum requirements 1 through 5 in Olympia Drainage Design and Erosion Control Manual (DDECM). Developments that would meet this threshold are those that add less than 5,000 square feet of new

Downtown should be considered for exemption from impervious surface restrictions.

impervious surfaces or convert less than ¾ acre of native vegetation to lawn or landscaped areas or convert less than 2.5 acres or native vegetation to pasture. In addition, small projects must not have a combined area of new and replaced impervious surfaces that exceed 50% of the existing impervious surfaces.

Options

- Option 1: Keep current code limits with no change.
- Option 2: Set new impervious coverage limits on a project wide basis for all new subdivisions.
- Option 3: Reduce onsite impervious surface limits by a percentage. Maximum impervious surface limits would vary by zoning designation.

ANALYSIS

Minimizing impervious surfaces is one of the three main goals of the Department of Ecology Phase II NPDES permit. Minimizing increases in impervious surfaces can aid in achieving other LID goals such as minimizing site disturbance and retaining native vegetation. Therefore, this element is particularly critical for successful LID implementation.

Impervious area coverage limits would be modified at the subdivision level.

Option 1 (no change):

Single Family Residential

Option 1 will retain the status quo within single family residential zones, as the City of Olympia has already established impervious area limits there. However with no change proposed, no reductions in impervious areas would be expected.

Multi-Family/Commercial/Industrial

Option 1 will keep the status quo for multi-family, commercial, and industrial sites. Some adjacent cities actually have lower limits than Olympia. For instance in the City of Lacey, some commercial zoning districts only allow 70% coverage compared to the 85% allowed for many of Olympia's commercial zones.

Option 2 (limits on a subdivision/project basis)

Single Family Residential

Option 2 for single family residential will require updates to OMC 18.04.080 and Table 4.04. Impervious area coverage limits would be modified at the subdivision level rather than on individual lots. When the subdivision or short plat is recorded, it would include information documenting how it complies with the impervious area coverage limitation. Each lot would show the maximum amount of square footage allocated to impervious surface.

In the long-term, ensuring compliance with impervious surface limits that are specific to each lot can be challenging. Olympia tried this approach in a subdivision named Devon Place. Staff found that although the restriction appeared on the face of the recorded subdivision plat – it was difficult to explain to home owners that their property was subject to special restrictions and they sometimes could not make the same improvements, such as building additions, that were allowed on neighboring lots.

Multi-Family/Commercial/Industrial

Option 2 (reduce limits on a project basis) would require updates to OMC 18.040.080, 18.05.080, 18.06.100, 18.08.100 and associated design tables. Impervious area coverage limits would be modified at the commercial short plat or binding site plan level. When the development is recorded, it would include information documenting how it complies with the impervious area coverage limitation. Each project would show the maximum amount of square footage allocated to impervious surface. It is anticipated that similar problems that occurred with single family projects (Devon Place) may also occur with commercial developments.

Option 3 (reduce limits by a percentage)

Single Family Residential

Option 3 will also require updates to OMC 18.04.080 and Table 4.04. The City of Olympia already has impervious area limits on single family residential zonings. The limits vary by district, but 55% is a typical limit. Impervious coverage limits that fall below current values could impact the value of lots as developers would be limited on development options. Impervious surface reductions of 5%-10% are contemplated. However, installing pervious surface would maintain options.

Multi-Family/Commercial/Industrial

Implementation of Option 3 to reduce allowed impervious surface coverage in all zones would require updates of OMC 18.04.080, 18.05.080, 18.06.100, 18.08.100, and associated design standard tables. However, current development coverage limits could be achieved as long as the additional percentage of development coverage is constructed using permeable paving. It is suggested that some type of exemption or allowance be made for sites where soils do not support use of permeable paving. Code updates would address the reduction in impervious, exemptions that might be allowed, and the development coverage allowed when using permeable paving. As with single family residential development, a 5%-10% reduction in impervious surface coverage is being considered.

For both Options 2 and 3, building height limits may need to be examined. If stricter impervious area limits are imposed, the same level of development on a site could not be achieved without increasing allowed heights.

STAFF RECOMMENDATION

Staff recommends Option 3. This option will reduce the amount of impervious surface while still allowing for similar development coverages by providing options for permeable pavements.

Option 1 will achieve no change in impervious area coverage. Option 2 has not been tested with commercial projects but the City's experience with single family has shown that this can be problematic with end user property owners.

LID ELEMENT #5: REDUCE IMPERVIOUS SURFACE ASSOCIATED WITH ON-SITE PARKING

OBJECTIVE

Minimize the amount of impervious surfaces assoicated with surface parking lots.

CONSIDERATIONS

This element is closely related to Element 10 (Restrict Impervious Surface Coverage) and will have many of the same benefits and drawbacks. This paper focuses on reductions in parking lot impervious area. Impervious areas associated with parking can be reduced by either reducing the amount of parking or by reducing the size of parking spaces and drive aisles.

The driveway portion of a parking lot from the edge of the right-of-way to the building or parking area is not considered in this paper. This area is discussed as part of Element 17 (Minimize Driveway Surface).

"There may be language within codes and standards that discourages or prohibits LID strategies. For example, existing lot setback, street width standards, parking requirements, and density standards may lead to excessive impervious surface coverage.

Low Impact Development Technical Guidance Manual for Puget Sound, Puget Sound (2012)

RELATED ELEMENTS

Element 4 Restrict Maximum Impervious Surface Coverage
Element 14 Permeable Paving
Element 15 Impervious Pavement with Underdrains
Element 10 Minimize Driveway Surface

TRADITIONAL APPROACH TO PARKING

The amount of parking required on a project site is dictated by OMC 18.38 (Parking & Loading) which specifies a target number of parking and loading spaces for each type of development within the City. The number of parking spaces is based on the use and its size, which roughly correlates to the number of anticipated staff and customers or residents, expected to use parking. In some cases, developers will indicate that the code required parking is inconsistent with the needs of their project and a parking study will be performed to establish a project specific demand for parking. Most studies justify reductions in parking spaces, but occasionally parking studies are performed to increase parking over code requirements. In Olympia these increases are usually for churches, schools and medical offices.

CODES AND STANDARDS REVIEWED

Olympia Municipal Code (OMC) Section 18.38 (Parking and Loading)

BENEFITS OF REDUCING IMPERVIOUS SURFACES ASSOCIATED WITH ON-SITE PARKING

The benefits related to reducing the impervious surfaces associated with on-site parking are the same as those with Element 4 (Restrict Maximum Impervious Surface Coverage). Reducing impervious area allows opportunities for increasing green space that can be used for infiltration, water quality treatment, and opportunities to retain mature trees that facilitate interception of rainfall and evapotranspiration.

OLYMPIA CODE ANALYSIS

Parking requirements are located in OMC 18.38. The parking code specifies:

- Required parking ratios by use,
- Variance procedures for varying from the ratios,
- Disabled parking requirements,
- Shared parking options, and
- Parking lot design standards including dimensioning.

Specified parking ratios for various land uses are not absolute; variance criteria allow for administrative increases and decreases of 10% to 40% or more. Targets are reduced by 10% in high density areas. To minimize the numbers of spaces, the City also offers a variety of options for sharing parking. The current code allows reductions for parking on adjacent streets, sharing of parking, and up to 30% of required parking to be composed of smaller "compact" spaces.

The current parking ratios within the Olympia are based on nationwide and local demand studies.

HURDLES TO REDUCING IMPERVIOUS AREAS ASSOCIATED WITH PARKING

Many of the challenges associated with reducing impervious area in parking lots are similar to the challenges of Element 4 (Restrict Maximum Impervious Surface Coverage) including conflicts with other codes and enforcement. In addition, this element presents the following challenges:

Current Parking Ratios Are Based On Estimated Parking Demand – The current parking ratios within the City of Olympia code are based on nationwide and local demand studies done over 20 years ago. In general, the "targets" are based on the 85th percentile of demand, i.e., that 15% of the time when there may be insufficient on-site parking. Given that the parking ratios in the current code are based on estimated demand, restricting the allowed parking ratios may result in some sites having insufficient parking. On-site parking shortages can lead to overflow problems, such as parking outside approved parking spaces, or in objectionable neighboring locations such as on streets in residential areas. The insufficiency of parking could also have economic impacts to the associated development including lower property values, or as a worst case scenario, financial failure of the development if tenants refuse to locate on sites that do not have sufficient parking to support their needs.

Current Parking Lot Dimensions Are Standard – The current City of Olympia parking lot design standards including parking stall width/length and drive aisle width requirements are based on what is needed to accommodate standard passenger vehicles. Reducing the dimensions of parking spaces or drive aisles could lead to functional problems – spaces that are too narrow do not allow for passengers to easily exit the vehicle and could lead to increased damage from car doors bumping into vehicles parked in adjacent spaces. Drive aisles that are too narrow can create maneuverability problems for drivers entering or exiting the space. Reducing parking stall or aisle dimensions or providing unusual parking configurations can both confuse and frustrate the driving public, and sometimes leads to a vehicle using two spaces.

OPTIONS CONSIDERED

We have focused the options for this element on reducing the impervious footprint of parking. Other LID techniques address the potential of using permeable pavements.

- Option 1: No change.
- Option 2: Amend codes to modify minimum and maximum parking ratios and dimensional standards, consistent with the most recent NPA and ITE (respectively) guidance.
- Option 3: Modify parking variance requirements to require use of permeable surfacing, where feasible, for parking in excess of target number.
- Option 4: Modify parking variance criteria to more readily allow reductions in the number of spaces.
- Option 5: Increase the percentage of small stall parking allowed for compact vehicles.
- Option 6: Require a minimum percentage of small (compact) stalls.

Reducing parking stall or aisle dimensions or providing unusual parking configurations can both confuse and frustrate the driving public and could result in more vehicle collisions.

ANALYSIS

Minimizing impervious surfaces is one of the three main goals of the Department of Ecology LID mandate. Parking lots constitute one of the largest drivers of impervious surface on new development sites.

Option 1 (no change) would maintain the status quo. City of Olympia code currently provides controls on allowed parking. The parking ratios within the code are based on nationwide studies and local information, although this information is over twenty years old. The "targets" for the number of spaces combined with the variance process provide substantial flexibility, especially for reducing the number of spaces. OMC 18.38 allows 30% of parking to be compact, i.e. smaller than standard sizes. Although

there would be no change with Option 1, current practice in Olympia already incorporates many of the strategies suggested by the Department of Ecology to avoid excessive parking.

Implementation of Option 2 (modify parking ratios and dimensional standards) would update Olympia's parking space numbers and dimensional standards to reflect more recent studies from the National Parking Association (NPA) and the Institute of Transportation Engineers (ITE). However, such an update might also lead to recommendations for additional spaces with some land uses.

The NPA publication "The Dimensions of Parking" published in 2010 suggests the following:

- Parking stall widths should be based on both the space needed for door opening as well as the expected turnover of the space. Low turnover spaces can be narrower than high turnover spaces. High turnover spaces should have a 9 foot width and low turnover spaces can be as small as 8.25 to 8.5 feet.
- Stall length and drive aisle width should be considered together. Because the typical vehicle is smaller than the dimensions of the parking stall, the actual resulting width of the drive aisle is wider if you include the unused stall length. Overall the recommended total width of a parking bay for 90 degree parking is 59 feet, which includes 18 foot stalls and a 23 foot drive aisle.

Therefore, implementation of Option 2 would require updates of OMC 18.38 to provide variable parking width dimensions based on stall turnover and modified drive aisle widths. Modifications to the required parking stall dimensions in 18.38.220 would also be required. The current City parking bay for 90 degree parking is 61 feet. Modification to the NPA standards would reduce this to 59 feet, eliminating 2 feet of impervious area from the aisle.

The dimensions per the NPA assume that the portion of the parking stall that is not occupied by the vehicle is actually drive aisle. This makes sense in concept but not always in application. Some vehicles are much longer than standard. Further, not all drivers pull forward to the front of the stall and often leave space at the front of the stall instead of at the rear. Therefore the reductions to the NPA standards could result in parking lots with maneuvering problems for large vehicles and potentially emergency vehicles.

Option 3 (parking increases to be permeable paving): Adding a permeable paving requirement for increases in parking would minimize impervious surfaces associated with "extra" parking. However, in many cases such increases already are pervious as a result of land use zoning impervious surface limits.

Option 4 (modifying parking variance requirements for reducing parking): Modifying the criteria for decreasing parking spaces could remove a barrier to allowing fewer parking stalls. The current approval process becomes more onerous as the reduction request gets bigger. For example, reductions of over 20% can only be granted where transit service is available. This option in practice would only minimally result in reduced impervious surfact.

Option 5 (increase compact stall allowance) would allow, but not require, a greater percentage of compact stalls. This option increases the allowed upper limit for compact stall construction. The current limit is 30%. With standard development practices, a change of the upper limit may not be well implemented. Typically compact stalls are only proposed on developments where site space is constrained and smaller parking spaces are needed to meet parking code requirements. However, increasing the upper limit for compact stalls could reduce impervious area.

Option 6 would require that at least a certain percentage of stalls are compact dimensions. This would require all proposed development to construct a specified percentage of compact parking stalls. Compact spaces are almost 25 percent smaller than standard parking spaces, so requiring more compact spaces in new parking lots could make a measurable reduction in impervious area associated with parking lots. A variance procedure would address uses with large vehicles where the use of compact stalls may not be appropriate.

RECOMMENDATION

Staff recommends Options 2, 3 and 6. These options result in a reduction of impervious area associated with on-site parking.

Option 1 would not result in any change in impervious area associated with parking lots. Parking variances are not difficult to obtain in the City of Olympia with sufficient justification and support. If the variance criteria are relaxed as with Option 4, it could result in uses that have insufficient parking. Option 5 could result in small decreases in impervious area but could also create maneuvering issues for large vehicles and potentially emergency vehicles.

Minimize Impervious Area – Street

Elements				
6	7	8	9	10
Minimize Size of Cul-de-Sacs	*Minimize Street Width*	*Increase Block Spacing*	*Require Sidewalks on Only One Side of Street Where Appropriate*	*Minimize Driveway Surface*

Five of the LID elements under consideration for implementation by the City of Olympia focus on the reduction of impervious area within streets. These elements include:

- Element 6 (Minimize Size of Cul-de-Sacs)
- Element 7 (Minimize Street Width)
- Element 8 (Increase Block Spacing)
- Element 9 (Require Sidewalks on Only One Side of the Street Where Appropriate)
- Element 10 (Minimize Driveway Surface)

These elements share the same objective and result in similar benefits and challenges. Specific information to each element is found in the issue paper for that element. The following is a summary of the elements, each which are aimed at minimizing impervious area on a street.

The City of Olympia was an early adopter of LID street standards (Element 7).

While increasing block spacing allows opportunities for increased green space for infiltration and opportunities to retain mature trees that facilitate evapotranspiration, it would not be in concert with most of the transportation goals in the City of Olympia Comprehensive Plan (Element 8).

OBJECTIVE

The shared objective of these elements is to minimize the amount of impervious surfaces associated with streets in order to maintain natural hydrologic functions and maximize infiltration.

BENEFITS OF MINIMIZING IMPERVIOUS AREA ON A STREET

A key component of low impact design is to mimic the pre-disturbance hydrologic processes of infiltration, filtration and storage. Streets with high impervious surface allowances result in larger volumes of stormwater runoff. When impervious surfaces are limited, it helps reduce stormwater runoff and can result in more landscape areas or pervious areas for infiltration.

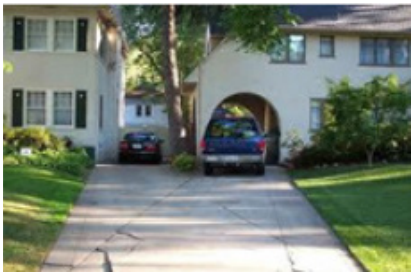
HURDLES TO IMPLEMENTATION

While the benefits related to increasing infiltration are universal to the elements under consideration, the hurdles are often unique to the specific element. Some of the hurdles to implementing the elements include:

- Proposed code modifications to achieve the desired LID element conflict with other City code objectives. For example, the goals and objectives of the Transportation chapter of the Comprehensive Plan include providing streets that encourage walking and other modes of transportation. Practices such as constructing sidewalks on only one side of the street or creating large blocks can be contrary to those goals.
- Current City standards already incorporate many LID concepts including:
  - Minimal Lane Widths – In 2006 the City reduced lane widths and street sections for many of the standard street sections. This included reducing local access street width from 26 feet to 20 feet. The current lane widths are the minimum that is necessary for safe road design.
  - Cul-de-sacs – The standard City cul-de-sac already includes a center planter island. This reduces the impervious area associated with cul-de-sac paving.

Olympia strives to be a walkable community. While providing sidewalks on only one side of the street would reduce impervious surface area, it could also reduce the City's walkability (Element 9).

Reducing the impervious surfaces associated with driveways would increase opportunities for infiltration, but any changes to reduce the allowed driveway width from the edge of the street to the garage would also create potential design challenges for homes with wider garages (Element 10).



Shared driveways - one way to reduce impervious surfaces associated with driveways - are already allowed within the City of Olympia (Element 10).

- Block Spacing – The City reviewed block spacing in 1988, 1994 and 2006. The current block spacing is the minimum necessary to meet the goals of the Comprehensive Plan and provide a safe street network.
- Permeable Paving – The City allows permeable paving to be used for sidewalks and paths within City right-of-way.

Therefore, only minor changes, or sometimes no change, to City codes are needed to incorporate LID concepts.

OPTIONS

A variety of options were considered for each element. The following options are recommended:

Element 6 (Minimize Size of Cul-de-Sacs and Other Turn Arounds)

- The center planter island will increase its radius size from 17 to 22 feet.

Element 7 (Minimize Street Width)

- No code changes are proposed to incorporate this element. The City has already minimized street widths and further width reductions could compromise safety.

Element 8 (Increase Block Spacing)

- No changes are proposed for this element. The City has already determined that the current block spacing is necessary for transportation and urban design needs of the City.

Element 9 (Require Sidewalks on Only One Side of Street Where Appropriate)

- No changes are proposed for this element. The drawbacks and challenges with not building sidewalks on both sides of the street are contrary to other goals and objectives of the City. The City already requires pervious paving where feasible for sidewalks.

Element 10 (Minimize Driveway Surface)

- Single family driveway widths will be reduced from 24 feet to 20 feet. Residential driveways are the most common driveway type and reductions to their width has the most impact to impervious area reductions. Wider driveways will be allowed but only if the extra width is constructed of pervious materials.

SUMMARY

City code already incorporates many LID strategies to limit the amount of impervious area within streets including:

- Minimal lane widths
- Use of center islands in cul-de-sacs
- Use of permeable paving for sidewalks where feasible

Given that the City of Olympia code already incorporates these strategies, substantial changes are not needed to achieve the requirements of the Department of Ecology. The recommended changes in code in each of the five elements are proposed in order to achieve further LID compliance.

SCJ ALLIANCE
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Olympia

LID ELEMENT #6: MINIMIZE SIZE OF CUL-DE-SACS

OBJECTIVE

Minimize the amount of impervious surface associated with cul-de-sacs.

CONSIDERATIONS

The City of Olympia has recently performed field-testing to determine the minimum acceptable cul-de-sac radius for adequate maneuverability of fire and solid waste vehicles. The information garnered from the field testing was used in preparation of this memorandum and development of potential options.

Current City regulations limit the use of cul-de-sacs to local access streets. In addition, subject to specific criteria City codes offer a "private access lane" (multi-private driveway) alternative to dead end streets. Such private access lanes require smaller turn-arounds and sometimes utilize pervious pavement. In general, cul-de-sac use in Olympia is limited. Given this limited allowance for cul-de-sac use, a further limitation on where cul-de-sacs may be constructed was not examined.

"Dead end streets with excessive turn around area (particularly cul-de-sacs) can needlessly increase impervious area. In general, dead end or cul-de-sac streets should be discouraged; however, a number of alternatives are available where topography or other site specific conditions suggest this road design."

Low Impact Development Technica Guidance Manual for Puget Sound (2012)

RELATED ELEMENTS

Element 4 Restrict Maximum Impervious Surface Coverage

TRADITIONAL APPROACH TO CUL-DE-SAC SIZE AND USE

Cul-de-sac size is controlled by the turning needs of fire trucks, buses, moving vans, solid waste trucks and similar large vehicles. It is important that in emergency situations fire trucks can maneuver without the need to back up. In addition, solid waste trucks need to be able to sufficiently maneuver within cul-de-sacs to operate and pick up solid waste containers.

CODES AND STANDARDS REVIEWED

Engineering Design and Development Standards (EDDS) Chapter 4 and 9 and Standard Plan 4-5
City of Olympia Comprehensive Plan Transportation Section, December 2014
Olympia Municipal Code (OMC) Chapter 16.32
International Fire Code (IFC)

BENEFITS OF REDUCING IMPERVIOUS SURFACES ASSOCIATED WITH CUL-DE-SACS

Many of the benefits related to reducing the impervious surfaces associated with cul-de-sacs are the same as those of Element 4 (Restrict Maximum Impervious Surface Coverage). Reduced impervious area

allows opportunities for increased green space that when used for stormwater management enhances infiltration, can provide water quality treatment, and increased opportunities to plant trees that facilitate transpiration, evaporation, and interception of rainfall.

OLYMPIA CODE ANALYSIS

The Transportation Chapter of the City of Olympia Comprehensive Plan states that the City's street network should be well connected. The Comprehensive Plan establishes a vision for a dense grid of local access and collector streets to provide motorists with multiple ways to enter and exit neighborhoods instead of using arterial streets for neighborhood trips. Use of cul-de-sacs is limited to local access streets and is allowed only when prior development patterns and topographic and environmental constraints permit no other option.

The design requirements for cul-de-sacs are specified in Chapter 4 and 9 and in standard plan 4-5 of the EDDS. The standards specify that cul-de-sacs must have a 47 foot outside radius and must contain a center planter with a 17 foot radius. The center planter island is specified to be a pervious area that contains trees, landscaping ground cover, or low growing plants.

RESULTS OF CITY FIELD TEST

The biggest hurdle to modifying the dimensions of a cul-de-sac is identifying a size that accommodates the maneuvering room needed by both emergency vehicles and solid waste trucks. The City of Olympia performed field testing to determine what modifications, if any, could be made to the current cul-de-sac dimensional requirements. These tests demonstrated that the current requirement for an outside radius of 47 feet could not be modified, but the center planter island radius could be increased by 5 feet, from 17 feet to 22 feet. This increased center planter island radius reduces the impervious area of each future cul-de-sac by about 600 square feet over the current design standards.

The biggest hurdle to modifying the dimensions of a cul-de-sac is finding a modified size that still accommodates the necessary maneuvering room of both emergency vehicles and solid waste trucks.

The radius change does require a modification in current practice for solid waste container placement to allow sufficient maneuvering space for the solid waste vehicles. It is current practice for residents to place their solid waste containers within the cul-de-sac paved area. In order for a larger center island radius to be supported, the solid waste containers would need to be placed outside of the cul-de-sac paving behind the curb.

The center island of a cul-de-sac could potentially be used for stormwater management in the form of a bioretention cell. There are no barriers in the current City code that would discourage use of the center island for stormwater management as long as the proposed design meets the requirements of the City stormwater manual (DDECM).

OPTIONS CONSIDERED

The following options were considered.

- Option 1: No change.
- Option 2: Increase cul-de-sac center planter island radius to 22 feet.

ANALYSIS

Minimizing impervious surfaces is one of the three main goals of the Department of Ecology Phase II NPDES permit. Reducing the impervious area associated with cul-de-sacs could assist in meeting this goal.

Cul-de-sac built to current City of Olympia Standards.

Option 1 (no change) would maintain the status quo. This would not result in any reduction of impervious area. However, the current cul-de-sac size has been proven effective for emergency vehicle and solid waste vehicles maneuverability and function. Although the City did perform testing to determine whether these vehicles could maneuver in a smaller area, ability to make these movements can be dependent on the experience of the vehicle driver and other factors, and requires changes to solid waste collection procedures. However, the changes are not so substantial as to be a major obstacle to implementation of revised cul-de-sac design standards.

Implementation of Option 2 (increase center planter island radius to 22) will require updates to EDDS Chapter 4 and 9 as well as Standard Plan 4-5. For cul-de-sacs, this option will increase the green space within the cul-de-sac which will require additional plantings and result in a commensurate increase in maintenance requirements. Given the more constrained travel lane, more no-parking enforcement may be needed. Because sidewalks often border the cul-de-sac edge, it will also require a change in practice for placement of solid waste containers to behind the curb of the cul-de-sac. The modified cul-de-sac and tee turnarounds designs will need to include specific provisions for placement of solid waste containers – usually at the "throat" of the cul-de-sac. As cul-de-sacs with the new configuration are constructed, special notice will need to be provided to residents so that they properly place their solid waste containers.

RECOMMENDATION

Staff recommends Option 2. Option 2 reduces impervious area and maintains the ability to use the center cul-de-sac island for stormwater management.

Olympia

SCJ ALLIANCE
CONSULTING SERVICES

LID ELEMENT #7: MINIMIZE STREET WIDTH

OBJECTIVE

Minimize the amount of impervious surfaces associated with street paving.

CONSIDERATIONS

In 2006 the City of Olympia reduced required street widths to the minimum necessary to maintain function and safety. Further width reductions are not practical. The following is a discussion of previous City actions.

RELATED ELEMENTS

Element 4: Restrict Maximum Impervious Surface Coverage

TRADITIONAL APPROACH TO STREET WIDTHS

Street geometry, including width, is based on the functional requirements of the street and the expected traffic volumes. Widths are based on national standards provided by the American Association of State Highway and Transportation Officials (AASHTO) and the Institute of Transportation Engineers (ITE). The primary consideration for street widths is the safe and efficient movement of vehicles, bicycles, pedestrians, transit uses and larger vehicles such as emergency vehicles and solid waste trucks.

> "Total and effective impervious area can be significantly reduced by determining specific traffic, parking and emergency vehicle access needs and designing for the narrowest width capable of meeting those requirements."
>
> *Low impact Development Technical Guidance Manual for Puget Sound (2012)*

CODES AND STANDARDS REVIEWED

Engineering Design and Development Standards (EDDS) Chapter 4 (Transportation) and 9 (Green Cove Standards)

BENEFITS OF REDUCING STREET WIDTH

The benefits of reducing impervious surfaces associated with street widths are the same as those addressed in Element 4 (Restrict Maximum Impervious Surface Coverage). Avoiding construction of streets that are wider than necessary minimizes the amount of native soil converted to impervious surface. Restricting impervious surface helps to reduce stormwater runoff and results in more vegetated land cover. A key component of low impact design is to mimic the pre-disturbance hydrologic processes of infiltration, filtration, and storage. Increased green space allows opportunities to retain mature trees that intercept rainfall and facilitate evapotranspiration.

OLYMPIA CODE ANALYSIS

In general, Section 4B.020 of the EDDS addresses design standards for streets. Pavement and right-of-way width depend upon the street function, technically referred to as street classification. The classifications and associated geometry standards are provided in the standard drawings 4-2A-K1. Chapter 9 of the EDDS includes special street standards adopted to protect the hydrology of the Green Cove Basin.

CURRENT STREET WIDTHS IN THE CITY OF OLYMPIA

In 2006, the City of Olympia conducted a review of lane and street widths. A formal committee was formed that included representatives from the following City departments and other entities: Public Works, Fire, Police, Community Planning and Development, Parks, InterCity Transit, Thurston County Roads and Transportation Services, Olympia Planning Commission, Bicycle Pedestrian Advisory Committee, and community members. The results of the committee's study are as follows:

In 2006, the City of Olympia conducted a review of lane and street widths.

Arterials and Major Collectors – The standard lane width for arterials and major collectors in the City of Olympia was 11 feet. The City reduced the standard width to 10 feet with an allowed deviation to 11 feet for specific situations such as:

- High frequency transit routes
- High frequency truck traffic
- Unique street alignment
- Skewed intersections
- Lanes adjacent to a curb
- Two-way center turn lanes
- Left-turn lanes

These deviations are allowed to address the concerns such as:

- Solid waste trucks are 9.5 feet with mirrors. InterCity Transit buses and fire trucks are 10.5 feet with mirrors. These larger vehicles require wider lane widths to avoid problems such as truck mirrors being hit by other large/wide vehicles on streets with narrow lane widths.
- A 10 foot lane can cause large vehicles to encroach into the adjacent auto lane, bike lane or impose on sidewalk pedestrians immediately adjacent to the travel lane.

Neighborhood Collectors – Neighborhood collector streets had similar lane width modifications, 11 foot lanes to 10 foot lanes with a 7 foot parking lane.

Local Access Streets – The standard width for a two-way local access street in the City was 25 feet. The City reduced the standard width to 20 feet. In addition to reducing impervious area, the narrower standard encourages slow speeds and improves safety although it can result in more contact between parked and moving vehicles. The 20 foot width accommodates 2-way traffic as well as emergency vehicles, buses and solid waste vehicles by means of "queuing" (on-coming vehicles take turns).

Eighteen feet wide local access streets are required in the city's Green Cove Basin. The narrow street requirement was adopted in 2001 as part of a comprehensive low impact development approach for this basin. The 18-foot streets are challenging for residential, as well as emergency and solid waste vehicles. Driveway entry and exits can be difficult. Review of this street width in 2006 suggested its use be limited.

The committee concluded that the street widths adopted in 2006 are the minimum allowable to maintain street function and safety. Therefore, street lane widths in the City of Olympia are already consistent with LID and further modification is not advised. In fact, the Department of Ecology cites Olympia's street width standards as a model for low impact development.

OPTIONS CONSIDERED

The following was considered:

- Option 1: Keep current standards – no change

ANALYSIS

The City of Olympia was an early adopter of LID street standards. Street widths were reduced by between two and five feet in 2006, to the minimum allowable to maintain efficient and safe streets.

Additional changes to the design of streets to enhance stormwater management are addressed in Element 11, Bioretention Street Section.

The City of Olympia was an early adopter of LID street standards.

LID ELEMENT #8: INCREASE STREET BLOCK SPACING

OBJECTIVE

Minimize the amount of impervious surfaces associated with streets resulting from block spacing requirements.

BACKGROUND

The City of Olympia regulations (Engineering Design & Development Standards 2.040.B) define maximum street block spacing standards. With the exception of the Chambers Basin (R4CB) (which allows larger block perimeters of up to 5,300 feet), block perimeters are restricted to a maximum of between 1,800 and 2,200 feet in residential and commercial zones. These block configurations result in development served by a network of closely spaced blocks that facilitate route choices for motorists, enhanced emergency response, and more inviting conditions for walking and pedestrians. Tight block spacing results in more streets but these streets tend to be narrow compared to bigger blocks and their associated wider streets.

"A well-connected road or path network has many short links, numerous intersections, and minimal dead ends. As connectivity increases, travel distances decrease and route options increase, allowing more direct travel between destinations, create a more accessible and resilient system."

TDM Encyclopedia –Roadway Connectivity – Creating more connected roadway and pathway networks

CONSIDERATIONS

This paper focuses on issues specifically related to an increase in street block spacing. Impervious area associated with development within each block is addressed in separate papers including: Element 1 (Minimize Site Disturbance), Element 2 (Retain and Plant Native Vegetation), Element 3 (Zoning and Bulk Standards), Element 5 (Reduce Impervious Surface Associated with On-site Parking), Element Element 12 (Stormwater Use of Landscaping), and Element 14 (Require Permeable Pavement Where Feasible).

RELATED ELEMENTS

Element 4: Restrict Maximum Impervious Surface Coverage

TRADITIONAL APPROACH TO STREET BLOCK SPACING

The focus of street block spacing is connectivity, travel distance, pedestrian and bicycle access, etc. In other words, the focus is on the function of the street network and the street users – vehicles, pedestrians, bicycles, transit and emergency services. The impact of block spacing on imperviousness and its effect on stormwater is typically not a factor in determining block spacing.

CODES AND STANDARDS REVIEWED

- Engineering Design and Development Standards (EDDS) 2.040.B (Streets and Alleys)
- City of Olympia Comprehensive Plan Transportation Section, December 2014

BENEFITS OF INCREASING BLOCK SPACING

Many of the benefits related to reducing the impervious surfaces associated with increased street block spacing are the same as those of Element 4 (Restrict Maximum Impervious Surface Coverage). Reduced impervious area allows opportunities for increased green space that enhances infiltration, and greater opportunities to retain mature trees that facilitate transpiration and evaporation.

OLYMPIA CODE ANALYSIS

Street block spacing requirements are specified in the EDDS in Section 2.040.B.3E. The following spacing is specified:

- Residential zoning districts: Not to exceed a block perimeter of 1,800 feet
- Co-housing: Same as residential districts, but one block may have a perimeter up to 2,200 feet
- R-4 district: Not to exceed a block perimeter of 2,200 feet
- Chambers Basin District (R4CB): Not to exceed 5,300 feet, but must contain a mid-block pathway
- Commercial districts: Not to exceed a block perimeter of 2,200 feet

Modifications to spacing requirements are allowed for the development of facilities such as parks and schools that require a large site uninterrupted by a street. It must be demonstrated that the required street would make the site unviable for the proposed use.

Modifications to block spacing requirements are allowed for development of facilities such as parks and schools that require a large site uninterrupted by a street.

HURDLES TO INCREASING STREET BLOCK SPACING

Increasing street block spacing within the City presents the following challenges:

Benefits of Small Blocks – Small blocks provide many benefits:

- Short, direct routes for all users (vehicles, pedestrians, bicyclists, emergency vehicles, transit)
- Tighter spacing allows streets to be narrow creating a more human-scale street system and contributing to lower vehicle speeds as well as less impervious surface.
- Increased availability of alternative routes in case of street blockages
- Reduced vehicle miles traveled – smaller blocks allow for more direct routes of travel
- Decreased pollution with fewer miles traveled
- Inviting conditions for walking, biking, and transit use resulting in reduced pollution

Drawbacks of Large Blocks - Large blocks have the following drawbacks:

- Fewer streets concentrate traffic and result in the need for more lanes on many streets
- Longer travel distances for vehicles, including emergency vehicles. More driving would result in more potential for water quality contamination.
- Mid-block crossings for pedestrians and bikes which can present safety challenges
- Increased traffic volumes at intersections

Meets One Goal of the Comprehensive Plan at the Expense of Many Other Goals – The transportation section of the City of Olympia Comprehensive Plan includes the following value statements and goals:

- Olympians want a transportation system that can move people and goods through a community safely while conserving energy and with minimal environmental impacts. We want to connect to our homes, businesses and gathering spaces and promote healthy neighborhoods.
- Build streets in a grid pattern of small blocks to allow streets to be narrow and low volume, encourage walking and provide travelers with a choice of routes.
- Use innovative designs to reduce or eliminate runoff.

The goal of providing small blocks, and resulting increase in impervious area, makes the goal of reducing or eliminating stormwater runoff from City streets more difficult to achieve. Most goals specified within the transportation section of the Comprehensive Plan are focused on the functionality of the transportation system, accessibility and safety, efficient delivery of goods and services, and the creation of a well-connected grid system that allows short and direct trips. Increasing block spacing would be inconsistent with most of the transportation goals of the City of Olympia Comprehensive Plan.

Increasing block spacing would not be in concert with most of the transportation goals in the City of Olympia Comprehensive Plan.

OPTIONS CONSIDERED

The following options were considered:

- Option 1: Keep current block spacing standards – no change
- Option 2: Increase block perimeters in residential areas to 2,200 feet

ANALYSIS

Option 1 (no change) would maintain the status quo. A lot of work has been done by the City to establish the current spacing requirements. Updates occurred in 1988, 1994 and 2005. The current block spacing is necessary for a successful transportation system in the City. Increases will continue to be allowed for specific sites with special circumstances. The other transportation goals of the Comprehensive Plan would be maintained including providing alternative routes, efficient movement of goods and services, and increased connectivity.

Implementation of Option 2 (increase block perimeter of residential areas to 2,200 feet) will require updates to EDDS 2.040.B.3E to increase the allowed block perimeter length of residential areas to 2,200 feet. This could have small, incremental changes in the amount of streets and resulting impervious area. However, with fewer streets, there is less connectivity and greater distances to travel. This could increase traffic on some streets and could create the need for additional lanes on collector streets, further reducing the impervious surface reductions achieved by increasing block spacing. If driving increases because of fewer direct routes, so would water quality contamination. Street functionality, connectivity, access and a myriad of other functions served by the street system could be compromised if block spacing is too large.

RECOMMENDATION

Staff recommends Option 1. The City has spent much time and study establishing the current required block spacing. Given this and the goals of the Comprehensive Plan, further reductions are not warranted for the potential limited reduction in impervious area.

LID ELEMENT #9: REQUIRE SIDEWALKS ON ONLY ONE SIDE OF THE STREET

OBJECTIVE

Minimize the amount of impervious surface associated with street sidewalks.

CONSIDERATIONS

Standard practice in the City of Olympia is to construct sidewalks on both sides of new streets. Missing segments of sidewalk on existing streets are installed when possible creating a robust and inviting pedestrian network which is important to long-term transportation planning in our community. Although this memo specifically references reducing impervious area associated with sidewalks by requiring them on only one side of the road, other alternatives to impervious area reduction related to sidewalk construction such as use of permeable paving for sidewalks are also available. Use of permeable pavement for sidewalks is addressed in Element 14 Permeable Paving.

"Studies indicate that pedestrian accident rates are similar in areas with sidewalks on one or both sides of the street. Limited assessments suggest that there is no appreciable market difference between homes with sidewalks on the same side of the street vs. homes with sidewalks on the opposite side of the road. The Americans with Disabilities Act does not require sidewalks on both sides, but rather at least one accessible route from the public streets."

Low Impact Development Technical Guidance Manual for Puget Sound (2012)

RELATED ELEMENTS

Element 4 Restrict Maximum Impervious Surface Coverage

TRADITIONAL APPROACH TO STREET SIDEWALKS

Typically, urban roadway cross sections include sidewalks on both sides of the street. Providing sidewalks on both sides of the roadway is generally thought to encourage and support pedestrian traffic. The presence of sidewalks on both sides of a street is also perceived as being safer as more direct access is provided to properties – homes, businesses, services, public buildings, parks, schools, etc. This direct access reduces pedestrian street crossings, both legal and illegal.

CODES AND STANDARD REVIEWED

Engineering Design and Development Standards (EDDS) Chapter 4
City of Olympia Comprehensive Plan Transportation Section, December 2014

BENEFITS OF REDUCING IMPERVIOUS SURFACES ASSOCIATED WITH SIDEWALKS

Many of the benefits related to reducing the impervious surface associated with sidewalks are the same as those of Element 4 (Restrict Maximum Impervious Surface Coverage). Reduced impervious areas

allow opportunities for increased green space that enhance infiltration, and increased opportunities to retain mature trees that facilitate transpiration and evapotranspiration.

By limiting sidewalks to only one side of the road, the following example reductions in impervious area for various street sections could be achieved:

- 2-lane arterial - 16% impervious area reduction for street section
- 2-lane major collector – 13% impervious area reduction for street section
- Local access street – 17% impervious area reduction for street section

OLYMPIA CODE ANALYSIS

The Transportation Section of the City of Olympia Comprehensive Plan has several goals and policies related to pedestrians. Key Comprehensive Plan goals and policies include:

- All streets are safe and inviting for pedestrians and bicyclists.
- As new streets are built and existing streets are reconstructed, add multimodal features.
- The street network is a well-connected system of small blocks, allowing short, direct trips for pedestrians, bicyclists, transit uses, motorists, and service vehicles.
- System capacity improvements focus on moving people and goods more efficiently, minimizing congestion by replacing car trips with walking, biking and transit trips, and by increasing operational efficiency and reliability.
- A mix of strategies is used to concentrate growth in the city, which both supports and is supported by walking, biking and transit.
- Walking is safe and inviting, and more people walk for transportation.
- Sidewalks make streets safe and inviting for walking. Build all new streets with inviting sidewalks on both sides of the street.

The design requirements for streets are specified in Chapter 4 and 9 of the EDDS and in standard plans 4-2A through L. Typical road sections for the City require sidewalks on both sides of the street. Sidewalk widths vary from 5-10 feet, depending on street type. Exceptions are sometimes granted to allow narrower or no sidewalk to protect streams, wetlands and other critical areas, and adjacent to parks and open space where alternative trails or pathways are provided or not needed.

Many of the goals of the Transportation Section of the Comprehensive Plan highlight making streets safe and inviting for pedestrians.

Additionally, one sided sidewalks are required on local access streets in the Green Cove and Chambers basins. These basins are subject to specific environmentally-derived street standards. Their application is limited.

HURDLES TO REQUIRING SIDEWALKS ON ONLY ONE SIDE OF THE STREET

The challenges to this LID strategy vary by type of road. High volume arterials have different concerns than local access roads. Therefore, we have broken this analysis into two sections.

Arterials and Other Major Roads:

Conflicts with Comprehensive Plan – Many of the goals in the Transportation Chapter of the Comprehensive Plan highlight making streets safe and inviting for pedestrians. One policy specifically states that all new streets should be built with sidewalks on both sides. Therefore, placing sidewalks on only one side of the street would be in direct conflict with the goals and policies of the Comprehensive Plan.

Olympia strives to be a walkable community. Providing sidewalks on only one side of the street could reduce the walkability of Olympia.

Less Direct and Safe Access to Properties – Pedestrians seeking to gain access to properties on both sides of the street need safe crossings. If frequent crossings are not provided, mid-block pedestrian crossings will likely occur. For high volume roads, mid-block pedestrian crossings can be unsafe.

Less Direct and Safe Access to Transit Stops – Transit stops are typically located on both sides of the street. If sidewalks are only constructed on one side of the street one transit stop would not have direct pedestrian access. This could encourage mid-block pedestrian crossings if a crosswalk is not provided in direct proximity to the transit stop. In addition, state requirements for safe walking routes to school and school bus stops are easier to meet with dual sidewalks.

Less Supportive of Walking – Olympia strives to be a walkable community. Safe and inviting sidewalks enhance walkability. Providing sidewalks on only one side of a street could reduce the walkability of Olympia. Providing a wide range of transportation options is a high priority for the City.

Impacts to Available Funding –Many road projects in the City are constructed with the financial assistance of grants from the Transportation Improvement Board (TIB). TIB grant funding is available only to projects that meet the standards of the funding agency, which typically includes sidewalks on both sides of the road. Olympia may not qualify for such grant opportunities if proposed projects do not include sidewalks on both sides of street. Waivers to this requirement can be requested from the TIB, but generally sidewalks on both sides of the street are preferred.

Could Encourage Walking In Street – If sidewalks are not provided on one side of the road, pedestrians may opt to walk on the roadway shoulder rather than cross to where a sidewalk is provided. This practice can be unsafe, especially on high volume streets.

ADA Accessibility – If sidewalks are only on one side of the road, wheel chair access is limited. Accessing facilities on the "no sidewalk" side of a road could be precluded for pedestrians with mobility challenges except when traveling to that destination by vehicle.

Local Access Streets

Local access roads are low volume roads serving largely residential uses. In this setting, mid-block pedestrian crossings are common occurrences which are often encouraged by the placement of central mailbox clusters and requirements to place solid waste receptacles on one side of the road. Therefore, many of the concerns related to placing sidewalk on only one side of high volume roads are not applicable to local access roads. However, limitations on sidewalks do affect ADA accessibility and providing safe walking routes to schools in residential areas. In addition, the value of a house on a "non-sidewalk" side of the road could be diminished as compared to a house with a sidewalk at the front of the house. Residents generally appreciate sidewalks in their front yard.

OPTIONS CONSIDERED

Another consideration to reducing impervious area related to sidewalks is use of permeable paving. The options related to permeable paving for sidewalks are discussed in the memo for Element 14 (Permeable Paving).

The following options are considered:

- Option 1: No change; continue to construct sidewalks on both sides of new streets.
- Option 2: Allow sidewalks to be placed on one side of the street for low pedestrian volume areas with no existing or planned transit routes.

ANALYSIS

Option 1 (no change) would maintain the status quo. Implementation of LID is one of many goals the City must balance. Requiring sidewalks on only one side of the street conflicts with other City goals. Other approaches to LID associated with sidewalks such as construction of pedestrian facilities using permeable paving could achieve the same goal of impervious area reduction without impact to the City's walkability. See Element 14 (Permeable Paving) for more discussion on using permeable paving for sidewalks.

Implementation of Option 2 (allow sidewalks to be placed on one side of the street) will require updates to EDDS road section details. This could be achieved with notations that sidewalks on one side of the road may be approved in specific areas. A specific threshold of pedestrian traffic volumes would be needed to determine when sidewalks on just one side of the road is allowed. In addition, developers

would need to provide expected pedestrian use. Because transit generates pedestrian activity, information regarding existing and planned transit routes would also be needed for the City to determine if the alternative is allowed.

Option 2 would likely have limited applicability and would require additional work for both the developer and the City. This limited applicability would likely result in negligible reductions in impervious surfaces.

RECOMMENDATION

Staff recommends Option 1. The expected reductions in impervious area related to providing sidewalk on one side of the road are not significant enough to outweigh the conflicts this element would create with other City policies and goals. The City of Olympia strives to be walkable. In addition there are other ways to reduce the impervious area associated with sidewalks such as permeable paving. Option 2 would be difficult to regulate and administer, and thresholds would need to be established.

LID ELEMENT #10: MINIMIZE DRIVEWAY SURFACE

OBJECTIVE

Minimize the amount of impervious surface associated with driveways.

CONSIDERATIONS

Reductions in both driveway width and length are potential ways to minimize impervious surface. Permeable paving options for driveways are discussed in Element 14 (Permeable Paving) and are therefore not included here.

For purposes of this memorandum, driveways include the area from the edge of street pavement to the garage for a single family residential home and from the edge of street pavement to the parking area for commercial type uses. The area of the driveway on a commercial facility between the edge of the right-of-way and the parking area is known as the throat length. It should be noted that this "definition" for driveways does not match with City technical codes but is typical of the public understanding of driveway areas.

"As much as 20 percent of impervious cover in a residential subdivision can be attributed to driveways."

Low Impact Development Technical Guidance Manual for Puget Sound (2012)

RELATED ELEMENTS

Element 4 Restrict Maximum Impervious Surface Coverage
Element 5 Reduce Impervious Surface Associated with On-site Parking

TRADITIONAL APPROACH TO DRIVEWAYS

Typically, each parcel is allowed a single driveway. For residential lots, driveways are typically the width of about 2 cars, or 20 feet. Commercial driveways have variable sizes depending on the amount of expected traffic and turning movement restrictions. In the City of Olympia, maximum allowable driveway widths are dependent on the proposed property use and the classification of the street that is accessed. Driveways are usually constructed of concrete or other hard surface.

CODES AND STANDARDS REVIEWED

Engineering Design and Development Standards (EDDS) Chapter 4
Olympia Municipal Code (OMC) Section 18.38 (Parking and Loading)

BENEFITS OF REDUCING IMPERVIOUS SURFACES ASSOCIATED WITH DRIVEWAYS

Many of the benefits related to reducing the impervious surfaces associated with driveways are the same as those of Element 4 – Restrict Maximum Impervious Surface Coverage. Reduced impervious area allows opportunities for increased green space that enhances treatment and infiltration.

OLYMPIA CODE ANALYSIS

A driveway, as defined by this memo (edge of pavement to the building or parking area), is regulated by two different City codes. A driveway *approach* is the area of the driveway within the public right-of-way and is governed by the requirements of the EDDS. The EDDS also regulates some on-site (on private property) area for high volume driveways (the throat length). The rest of the driveway that is between the right-of-way and the building or parking area is regulated by the OMC.

Driveway Approaches

The design requirements for driveway approaches are specified in Chapter 4 of the EDDS and standard details 4-7A through D. Specific design requirements include:

- Driveways are to be constructed of Portland Cement Concrete.
- Joint use driveways servicing adjacent parcels are allowed.
- One driveway is allowed per parcel (adjacent parcels in single ownership are considered a single parcel and allowed one driveway).
- Maximum driveway widths vary by use and type of street and are generally 24 feet for residential, 26 to 30 feet for commercial, and 35 feet for industrial uses.
- High volume access points have specified minimum throat lengths based on the proposed land use.

Driveway from Right-of-Way to Building or Parking

The portion of the driveway on private property is governed by OMC Section 18.38. Specific design requirements include:

- Driveways outside of the right-of-way are referred to as drive aisles and have variable width depending on several factors. Generally the driveway area has a 26 foot minimum width for 2-way traffic.
- The Site Plan Review Committee (SPRC) has the authority to determine the location, width, and manner of approach of a vehicular ingress and egress from a building or parking area to the public street.
- Surfacing must be pavement which can include permeable paving.

Typical Residential Driveway Components

HURDLES TO REDUCING IMPERVIOUS SURFACE AREA BY MINIMIZING DRIVEWEAY SURFACE

This low impact design strategy presents the following challenges:

Residential Driveways Provide Vehicle Storage and Other Functions in Addition to Access – Typical residential driveways are a minimum of 20 feet wide by 20 feet long (outside of public right-of-way). These are the typical dimensions to facilitate direct backing up onto a street from either stall of a 2-car garage, as well as parking for two additional vehicles on a homeowner's parcel. Although it can be argued that parking is provided in the garage, many homeowners use their garages for storage or work space, guest parking, storing of boats and recreational vehicles, or they may simply own more vehicles than fit in the garage. For a large parcel where the length of the driveway is well in excess of 20 feet, a narrower access lane could be provided for the driveway length outside of the 20 feet adjacent to the garage. However, smaller lots are more common, and do not typically have driveway lengths that warrant a variable width.

In addition to access and vehicle storage, residential driveways can also provide other functions such as emergency access or recreation. Homeowners often use driveways for a myriad of other uses such as a basketball court, barbeque spot, and play area for kids.

Although not as common, some residential homes have 3 car garages which require larger driveway widths than 2 car garage homes. Currently, the driveway approach is limited to 24 feet but the driveway outside of the right-of-way has no limitation on width. Driveways may flare out to provide paving in front of each garage bay. Any changes to reduce the allowed width from the edge of the street to the garage would create potential design challenges for homes with wider garages.

High Volume Accesses Require Minimum Throat Length - In order to ensure free flow of traffic on the main street, driveways need to provide sufficient throat length for vehicle queuing within the driveway. The throat length required is based on the proposed use and building size. Reductions in required throat length are allowed in the EDDS for specific situations and locations. General, blanket reductions in throat length to reduce impervious surface area could result in vehicle queuing on the street and traffic congestion.

Two Track Driveways Not Favored – One way to reduce paving associated with driveways is to pave only the portion where the vehicle wheels touch. Two track driveways are permitted in Olympia but are not typical, are more costly to construct, and can be perceived as hard to drive on. Two track driveways also require on-going mowing and potentially other maintenance such as grass replacement. If maintenance is not provided, soil erosion, compaction and sedimentation could result.

Maneuvering Area Reduced – Narrower driveway approaches would require more careful maneuvering when backing out of dead-end driveways. This could result in driving across planter strips, and in vehicles entering streets less safely. For example, focusing on the maneuver could lead a driver to not notice a pedestrian.

OPTIONS CONSIDERED

The following options were considered:

- Option 1: No change.
- Option 2: Reduce single family residential driveway maximum allowed width from 24 to 20 feet.
- Option 3: Reduce one-way access driveway widths specified in EDDS Section 4I.140 - residential uses to 12 feet, commercial uses to 15 feet, and industrial uses to 20 feet.
- Option 4: Establish land use based driveway width maximums.

Shared driveways are already allowed within the City of Olympia.

ANALYSIS

Minimizing impervious surfaces is one of the three main goals of the Department of Ecology Phase II NPDES permit. Reducing the impervious area associated with driveways could assist in meeting this goal.

Option 1 (no change) would maintain the status quo. Olympia already has implemented LID strategies for driveways. Shared driveways are currently allowed for use by adjacent parcels if a written agreement between the parties is recorded as a joint use easement. The City also allows permeable pavement driveways.

Implementation of Option 2 (reduce residential driveway width) will require updates to EDDS section 4I.140 to restrict driveway approaches. It would also require modification to OMC Section 18.38 to define and then restrict the area from the right-of-way to the building (in this case the garage). Given that local access roads have been reduced to a 20 foot width, a commensurate reduction in residential driveway width from 24 to 20 feet is appropriate. Twenty feet will provide sufficient width for both vehicle parking and maneuvering. If wider driveways are desired (such as for 3 car garages), areas outside of the 20 feet could be constructed but only using permeable paving.

For a 33 foot long driveway (13 foot approach plus 20 feet on-site), the impervious area reduction suggested by Option 2 is 132 square feet for one driveway. For a 50 lot plat, this is a reduction of 6,600 square feet of impervious area.

Option 3 (change one-way driveway widths) would require updates to the EDDS Section 4I.140 to restrict driveway approaches. It would also require modification to OMC Section 18.38 to define and then restrict the area from the right-of-way to the building or parking area. One-way access should be approximately ½ the width of a two access driveway. Current standards allow for 24 ft., 30 ft., and 35 ft. driveways for full access residential, commercial, and industrial respectively. One-way access driveways

can be 20 ft., 20 ft., and 25 ft. for residential, commercial and industrial respectively. Therefore, the current code allows about 85% of a full access driveway width for one-way driveways. The proposed reductions would provide about 50-60% of the full access width for a one-way driveway. This should be more than sufficient for most uses. If a specific use requires wider drives, current code already allows for special requests for uses with a volume of oversized trucks.

Option 4 (establish land use based driveway width maximums) would require updates to the EDDS and the Olympia Municipal Code. Currently, driveway width requirements are broken down by residential, commercial and industrial. Therefore, the maximum allowable driveway width for a 100,000 square foot retail store is the same as what is allowed for a 2,000 square foot office. The large retail driveway needs to accommodate large trucks and provide for high volume usage which demands a larger width than a small professional office with limited users and turnover. It is likely that the smaller office will not request a large driveway as it would increase site costs. However, since the code widths are specified as maximums, a larger driveway is not precluded.

RECOMMENDATION

Staff recommends Option 2. Single family driveways are the most common driveways and restrictions on the amount of impervious area associated with these driveways would have the most impact on impervious area reductions. Option 1 would not affect any change. One-way driveways are infrequent so Option 3's impervious area changes would be minimal. Option 4 would require the creation of land use specific driveway widths which largely would only affect commercial uses and would not have a large impact.

Increased Infiltration

Elements				
11 Bioretention Street Section	12 Stormwater Use of Landscaping	13 Downspout Infiltration Systems	14 Permeable Paving	15 Impervious Pavement with Underdrains

Five of the LID elements focus on increasing the opportunities for infiltration both on a site and within streets. These elements include:

- Element 11 (Bioretention Street Section)
- Element 12 (Stormwater Use of Landscaping)
- Element 13 (Downspout Infiltration Systems)
- Element 14 (Permeable Paving)
- Element 15 (Impervious Pavement with Underdrains)

These elements share the same objective and result in similar benefits and implementation challenges. Specific information to each element is found in the issue paper for that element. The following is a summary of similar themes that can be found with the elements aimed at increasing infiltration.

Areas proposed for infiltration need to be protected from compaction and sediment laden runoff during construction.

Alternative design options will be needed for specific landscape areas to accommodate their use as stormwater management facilities.

Bioretention is a valuable tool for successful implementation of LID (Element 12).

OBJECTIVE

The shared objective of these elements is to improve and increase infiltration of stormwater.

BENEFITS OF INCREASING INFILTRATION

A key component of low impact design is to mimic the pre-disturbance hydrologic processes of infiltration, filtration and storage. For sites with infiltrative soils, LID techniques can result in infiltration across the site or street similar to the pre-disturbance conditions. All five elements under consideration (11, 12, 13, 14 and 15) would result in increased infiltration.

HURDLES TO IMPLEMENTATION

While the benefits related to increasing infiltration are universal to the elements under consideration, the hurdles are often unique to the specific element. Some of the hurdles to implementing the elements include:

- Construction Challenges – Infiltration areas require special protection during construction to prevent compaction and sedimentation. This can require a contractor to use specialized construction sequencing or techniques, which can impact the construction costs and schedule.
- Specialized Design Requirements – When landscape areas also serve as stormwater facilities they require specialized designs and specific plant types that can tolerate wet conditions.
- Site Suitability – In order to infiltrate stormwater, the site must meet certain site suitability criteria. These criteria can be restrictive and can render infiltration infeasible in many locations and applications.
- Maintenance – Many of the elements will require specialized maintenance in order to function over the long term. This specialized maintenance can be more time consuming and expensive.
- Long Term Durability – Many of these elements include new technologies and design strategies that have not been tested with time. Long term maintenance and replacement costs are uncertain.

OPTIONS

A variety of options were evaluated for each element, and the following were selected for implementation:

Element 11 (Bioretention Street Section)

- Update codes and create standard details that incorporate various forms of bioretention into public streets. Allow the use of bioretention within the City right-of-way to meet LID requirements. A project may choose to use bioretention to meet water quality treatment objectives, but water quantity flow control must be achieved with a separate facility.

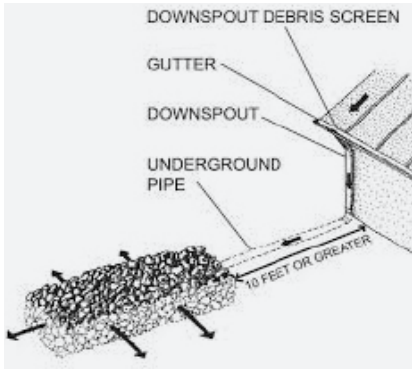
Concave landscape islands can serve dual purposes: visual relief and stormwater infiltration (Element 12).

Element 12 (Stormwater Use of Landscaping)

- Update Section 18.36 of the Olympia Municipal Code to include design alternatives for landscape areas used for stormwater. There is currently no code restriction to using landscaping for stormwater, but there is no guidance in the code on how to achieve the required landscape standards while also using the area for stormwater management. A code update would make the use of landscape areas for stormwater prescriptive and thus more predictable.

Element 13 (Downspout Infiltration Systems)

- Update the City stormwater manual to adopt the requirements of the updated *2012 Department of Ecology stormwater manual* with Olympia specific edits. The City manual allows the use of downspout infiltration systems and updating to include the Department of Ecology requirements will bring the City manual current with the latest design standards and infiltration options.



Typical downspout infiltration system configuration (Element 13).

Element 14 (Permeable Paving)

- Change City codes to allow use of permeable paving without additional approvals or limitations on private property. Current City practices allow the use of permeable paving on private property, but with additional approvals. The removal of this barrier could increase permeable pavement use on private property. The City is already using permeable paving for sidewalks generally, but this would prioritize this practice.

Element 15 (Impervious Pavement with Underdrains)

- No changes are proposed for this element. The use of underdrains is already allowed by City code on private property and has widespread use. The challenges with their use on streets are many and was not recommended.

SUMMARY

Existing codes and development manuals already incorporate many LID strategies that increase infiltration including:

- Use of landscape areas is allowed for stormwater management
- Use of impervious pavement with underdrains
- Use of permeable paving allowed where feasible on private property and for sidewalks in public right-of-way

Given this, the new requirements to incorporate Department of Ecology Low Impact Development elements can be accomplished through further clarity to the current City codes and revisions to code language to eliminate special appraisals for implementing LID.

Increased erosion and sedimentation prevention is needed for permeable paving to prevent plugging and reduction of infiltration (Element 14).

SCJ ALLIANCE
CONSULTING SERVICES

Olympia

LID ELEMENT #11: BIORETENTION STREET SECTION

OBJECTIVE

Improve the infiltration and water quality treatment of street generated runoff.

CONSIDERATIONS

For this memo, roadside bioretention swales are being considered. The term bioretention specifically refers to an integrated stormwater management practice that uses the chemical, biological and physical properties of plants, soil microbes, and the mineral aggregate and organic matter in soils to transform, retain or remove pollutants from stormwater runoff. In addition to water quality treatment, bioretention facilities provide a level of stormwater detention and flow control.

Biofiltration swales are another type of swale used in stormwater management. Biofiltration swales have been employed for decades with varying degrees of success. Biofiltration swales are separate and a distinct best management practice (BMPs) which provide a lesser level of stormwater management than bioretention. Biofiltration swales are not under consideration for this memo, but these best management practices are referenced here for comparison.

RELATED SECTIONS

Element 12 – Stormwater Use of Landscaping
Element 20 – Maintenance standards and inspections

TRADITIONAL STREET STORMWATER MANAGEMENT TECHNIQUES

Historically, runoff generated by streets has been managed in one of two ways depending on whether the street section had curbs or not:

<u>Streets without curbs</u>

For low density development roads without curbs, surface runoff is usually directed to street side ditches or swales that provide stormwater conveyance to a larger pond type facility or receiving water. Swales along streets are often lined with only grass. These swales provide basic water quality treatment and can be maintained with routine mowing – these are called biofiltration swales or sometimes “bioswales”. These common swales and ditches are very different in design and function from bioretention facilities.

> “The term bioretention was created to describe an integrated stormwater management practice that uses the chemical, biological, and physical properties of plants, soi microbes, and the mineral aggregate and organic matter in soils t transform, remove or retain pollutants from stormwater runoff.
>
> Low Impact Development Technical Guidance Manual f Puget Sound December 2012

<u>Streets with curbs</u>

For urban street sections with curb and gutter, runoff is typically collected in catch basins and piped to a pond, or similar stormwater management system, for water quality treatment and flow control. These types of facilities are typically referred to as ‘end of pipe’ stormwater management practices. Concentration of stormwater flows in this manner is contrary to the goals of low impact development design.

CODES AND STANDARDS REVIEWED

Olympia Municipal Code (OMC) Sections 18.36.060 (general landscaping standards)
Engineering Design and Development Standards (EDDS) Chapters 4 & 5
Drainage Design and Erosion Control Manual for Olympia (DDECM) Volumes III & V
Ecology's Stormwater Management Manual for Western Washington, December 2014, Volumes I & V

BENEFITS OF BIORETENTION STREET SECTIONS

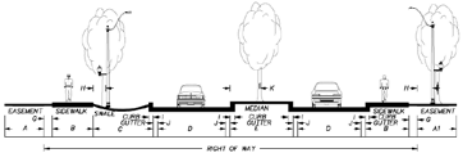
Bioretention systems are engineered facilities designed for specific water quality treatment and flow control objectives. To better replicate natural vegetated and soil infiltration conditions adjacent to urban streets, bioretention facilities can be used to collect and treat the runoff closer to where it is generated rather than concentrating and conveying these flows to another water quality or flow control facility. In some cases, a dedicated storm tract with ponds can be avoided or minimized when using bioretention. Bioretention systems are designed to more closely mimic natural site conditions where healthy soil structure and vegetation promote the infiltration, storage, filtration, and slow the release of stormwater flows. When properly planted, bioretention vegetation aids in the interception of rainfall and transpiration of water vapor to the environment. Bioretention swales and cells – cells being larger, more centrally located facilities than linear swales – include specially designed soil mixes that are the primary media for pollutant removal as water infiltrates downward to the native soil and groundwater.

Previously mentioned traditional approaches to stormwater runoff treatment – such as grass lined biofiltration swales or wetponds – only provide a basic level of runoff treatment suitable for low volume streets or sites with lower pollution potential. Per the DDECM and Ecology's current stormwater management manual, commercial sites or streets with an average daily traffic (ADT) count of more than 7500 vehicles require an enhanced level of treatment. Bioretention facilities fulfill this standard of pollutant removal.

OLYMPIA CODE ANALYSIS

Chapter 4 of the EDDS provides the guidelines for street design within the City of Olympia. City streets are classified by the physical size of the street cross section, their principal uses, and the amount of vehicle traffic using the street. Arterial streets (e.g. Capitol Way, Black Lake Boulevard, Plum Street) and Major Collector streets (e.g. Boulevard Road, Kaiser Road, North Street) have the highest traffic volumes. Smaller streets such as Neighborhood Collectors and Local Access streets serve primarily residential areas and have less vehicle traffic.

The EDDS currently provides optional street sections with swales.



The EDDS currently provide street sections that can incorporate optional swales for the Neighborhood Collector Boulevard, Neighborhood Collector, and Local Access streets. Integration of swales is not provided for other City street sections such as the larger Arterials or Major Collectors.

The current DDECM, Volume V – Runoff Treatment, provides design guidelines for simple biofiltration swales, but lacks current design standards for LID best management practices such as bioretention. City review staff routinely direct designers to the current Ecology manual design guidelines for bioretention specifications. Bioretention systems have been approved by the City on a case by case basis.

Landscaping standards are generally addressed in the OMC Section 18.36. Within this code section, street landscaping is focused on street trees. Section 18.36.060.J addresses landscaping within stormwater ponds and swales but provides no specific guidance. Volumes III & V of the DDECM provides the guidance for planting ponds and biofiltration swales. Bioretention plantings are not addressed in the current DDECM. Maintenance of streetside features including vegetation is assigned in the EDDS, Section 4C.030G – Sidewalks: "Repair, maintenance, and upkeep of the sidewalk and all streetside features, including landscaped areas and trees, is the responsibility of the abutting property owner."

HURDLES TO IMPLEMENTING BIORETENTION STREET SECTIONS

Requiring bioretention for runoff management on city streets could present the following challenges:

Inappropriate In Some Areas – Infiltrating stormwater to underlying native soils with bioretention is not always feasible or appropriate in some areas of the City. Areas with poorly draining soils, high groundwater table or steep slopes, may not be appropriate for infiltration of stormwater. Infeasibility criteria will need to be considered for bioretention facilities in a similar way to other more conventional stormwater infiltration facilities.

Unknown Long Term Durability and Life Cycle Costs – Engineered bioretention systems are a fairly new concept lacking data on long term performance, maintenance and durability. Life cycle costs (costs throughout life of facility including maintenance, repair and replacement costs) are not well understood.

Construction Challenges – Areas proposed for infiltration need to be protected from compaction and sediment-laden runoff during construction. Engineering, construction, and related inspections could be made especially complex given bioretention areas will typically span the length of the roadway project and are integrated into the project landscape rather than being an isolated facility.

Increased/Modified Maintenance Needs – Streetside swales have traditionally been landscaped with grass, where grass was the primary mechanism for pollutant removal. Mowing is the main maintenance requirement for such swales with occasional sediment removal if necessary. Bioretention systems are different in design and function than these simple grassed swales, and they are planted with a variety of vegetation necessary to meet the function of bioretention. Plant maintenance is more complex. In addition, the specialized soil mix will require reconditioning over time.

Bioretention maintenance generally includes:

- Increased inspection of facilities to monitor plant life and soil component function.
- Removal of decomposing vegetation which can release pollutants and clog storm filters or drains.
- Removal of sediments to preserve infiltration capabilities and remove potential contaminants that may be present.
- Removal of blockages from inlet pipes or overflow structures.
- Periodic (2-5 years) infiltration testing to ensure continued functionality of facility.
- Periodic reconditioning or replacement of engineered soil mix (usually at a depth of 2 or more feet).
- Replanting or replacement of vegetation within the bioretention cell.
- Removal of weeds or other undesirable vegetation.
- Irrigation of plantings during the first one to three years of establishment.

In addition, fertilizer and pesticide use is restricted or eliminated in bioretention systems. When a bioretention facility is used for water quality treatment, it is counterproductive to introduce these substances to the facility.

Given the increased complexity of maintenance in bioretention areas, careful consideration should be given to how these areas are managed. While City staff is, or could be, trained to manage bioretention areas and vegetation, it is anticipated that maintenance costs will be higher than for traditional facilities. City staff is developing site-specific maintenance costs for several existing bioretention facilities in Olympia.

Given the increased complexity of maintenance in bioretention areas, careful consideration should be given to how areas are managed.

Where bioretention areas front private property, leaving maintenance of bioretention to adjacent property owners would be more cost-effective for the City, but the facilities would still require continuous monitoring and inspection by City staff to assure proper function. Extensive outreach, education, and community participation in bioretention maintenance would be essential for privately-maintained bioretention facilities to be successful.

Traditional stormwater management facilities are located within protected tracts or easements that clearly delineate the limits of the facility. If bioretention facilities are broken up along a street to many small pieces or placed behind the sidewalk where the city of right of way typically ends, the lack of clear facility limits could lead to mismanagement. If placed behind the sidewalk, property owners may treat the bioretention area as part of their property which could result in improper management, or otherwise render the facility nonfunctioning.

Visibility/Clear Zone – The bioretention areas include plants, trees and grasses that mature to various forms and heights. Careful consideration is needed when selecting vegetation to maintain pedestrian and vehicle visibility, in particular: clear zones at intersections, crosswalks, fire hydrants, street signage and driveways. Consideration is needed both during the original design and planning as well as over the life of the project as plants grow or are replaced.

Utility Conflicts – Current City road sections with optional swales locate the swale in an area between the curb and sidewalk typically referred to as the planter strip. In addition to street trees, planter strips also include street lights, utility services such as water meters, fire hydrants and other underground utilities. Standard details for utility placement in the public right-of-way will need to be modified to address location of these improvements in conjunction with streetside bioretention swales. The City will need to work with private utilities to potentially modify and monitor franchise and master use permits.

Pedestrian Challenges – On roadways with on-street parking, pedestrians leaving their vehicles need access to the sidewalk. Crossing swales, especially when filled with water, is not practical. If on-street parking adjacent to a bioretention facility is allowed, other accommodations should be considered, such as foot bridges or directing pedestrians to breaks in the swale. In addition, pedestrians with disabilities will require a safe and reasonable way to access the sidewalk from their parked vehicle or from an ADA accessible transit vehicle.

Increased Need for Driveway Planning – The road side swale area would be reduced by each driveway that crosses a swale. In dense residential developments, if driveway placement is not planned and managed, the bioretention swale could be rendered so small as to be ineffective. Many small bioretention cells along a street also become an inspection and maintenance issue. In some cases, parking along a city block may also be impacted. On a Local Access street with a 350 foot block length and 14 residential lots and associated driveways, as few as 7 parking spaces might be available along the block.

Increased Right-of-Way Needs – Recent evaluation of current City street standard details by Parametrix (May 2015) determined that roadside bioretention swales could be incorporated within standard street cross sections with little to no additional right-of-way acquisition necessary. However, for street classifications where on-street parking is required, additional right-of-way may be necessary to provide width for safe passage of passengers exiting parked vehicles adjacent to bioretention. Further, maintenance of bioretention swales in the City has historically shown that widths of ten to twelve feet with gentle side slopes are favorable to narrower sections with steeper slopes. These wider sections may require additional right-of-way be dedicated where linear bioretention swales are proposed.

Redundant Stormwater Systems – If bioretention facilities are constructed in an area with poor infiltrative soils or if systems are not intended to meet the flow control standard of the DDECM, an underdrain and overflow system will need to be installed along with a secondary stormwater facility. This would likely be a more conventional facility such as a pond, vault, or infiltration gallery.

Compliance with Ecology Flow Standards – The Ecology stormwater manual and the requirements of the City's Phase II NPDES permit specify that projects meeting certain development thresholds must mitigate stormwater by implementing LID best management practices, water quality treatment, and water quantity control measures. All three standards are not required for every project, and simple application of bioretention to street projects will not meet all these needs in every situation. Analysis of bioretention street swales performed by Parametrix (May 2015) found that street side bioretention would meet the LID performance standard and in some cases the runoff treatment needs, but fail to meet the flow control standard on some streets. This analysis shows that an additional stormwater detention system beyond bioretention would be necessary to meet the flow control requirements, or another LID BMP must be selected during design.

OPTIONS

The bioretention options considered are as follows:

- Option 1: No change to current codes or standard details.
- Option 2: Update codes to not allow bioretention within the public right-of-way. Bioretention may still be used to meet LID requirements, but it must be located in a private easement or separately owned tract.
- Option 3: Update codes and create standard details that incorporate various forms of bioretention into public streets. Allow the use of bioretention within the City right-of-way to meet LID requirements. A project may choose to use bioretention to meet water quality treatment objectives, but water quantity flow control must be achieved with a separate facility.

ANALYSIS

Bioretention is a valuable tool for successful implementation of LID. If designed and constructed properly, use of these systems meets many of the goals of LID including mimicking the pre-disturbance hydrologic processes of infiltration, filtration, and storage. Per the Ecology standards, use of low impact development BMPs on streets must be evaluated in the following order of preference:

1. Full dispersion of street runoff to native vegetation
2. Permeable pavements
3. Bioretention
4. Concentrated flow dispersion to vegetated areas

Bioretention is a valuable tool for successful implementation of LID.

While full dispersion of runoff is highest on this list, it also comes with requirements to maintain 65% of the site in native vegetation and limits effective impervious area to 10% of total site area. These requirements are challenging with Olympia's urban development densities. Permeable pavements are not recommended for use on higher volume public streets. Therefore bioretention is likely the preferred method for meeting Ecology's LID requirements. If bioretention is deemed infeasible using Ecology's

site design criteria, dispersion of concentrated flows from driveways or other pavements through a vegetated area will also meet LID standards. Concentrated flow dispersion requires a minimum fifty foot flow path – making this option difficult for mitigating stormwater from streets within the right-of-way. If all BMPs above are deemed infeasible – a difficult case to make – a project may manage stormwater with traditional methods of treatment and detention.

Option 1

This option would maintain the status quo. Current codes (EDDS and DDECM) do not include sufficient guidance for proper design, implementation and maintenance of bioretention systems adjacent to roadways. The EDDS have an optional swale cross section for some road classifications but lack guidance on swale construction. The DDECM has design requirements for biofiltration swales which are used to incorporate those features into street sections. This option would not meet the LID requirements from Ecology. Use of City street sections that provide no allowance for swales would require a deviation granted by the City Engineer to use bioretention within the right-of-way.

Option 2

Not allowing bioretention within the right-of-way would require that a project either utilize a different low impact development BMP (such as full dispersion) or bioretention facilities be located outside of the right-of-way. This option would require that these facilities be placed in an easement or separate storm tract outside the right of way similar to how ponds and stormwater facilities are sited currently. Identification and delineation of bioretention facilities would be easier and maintenance would be more focused to a specific facility boundary. Maintenance would be the responsibility of the private property owner or development. Bioretention under private ownership would allow the developer to use bioretention to meet the LID requirement, as well as potentially meeting flow control and water quality requirements from Ecology.

Option 3

This option would create standard details for streets to include either bioretention swales or centralized cells – such as intersection and mid-block bulb outs. Bioretention within the right of way could be used for LID compliance and runoff treatment, but flow control and detention of runoff from larger storm events would need to be located in a separate facility such as a pond or subsurface vault. Restricting bioretention use in mitigating large storm events would help assure street and property flooding impacts are reduced or eliminated. This option would also shrink the necessary bioretention facility footprint required within the right of way, and maintenance needs associated with these facilities can also be assumed to be reduced. Because the design of bioretention to meet flow control standards is highly dependent on the infiltration rate of the underlying native soils, bioretention design and construction is a careful practice. This option reduces potential issues with variable site infiltration rates and extensive infiltration testing along a street. While Option 3 would require the design of a separate stormwater detention facility outside the right of way, this secondary facility could potentially be smaller than conventional pond designs since flows into that facility will be attenuated by the upstream bioretention systems.

Allowing bioretention within the right-of-way does present a dilemma in assignment of maintenance for the facility. Stormwater facilities, including drains and pipes, within public right-of-way are typically maintained by the City. Bioretention could be treated the way street landscaping or grass planter strips are maintained, with the responsibility to maintain becoming that of the abutting property owner. Though because of its critical stormwater function, leaving maintenance to private parties may be problematic.

RECOMMENDATION

City Staff recommends Option 3. Bioretention will be encouraged by allowing its use within the public right-of-way.

LID ELEMENT #12: STORMWATER USE OF LANDSCAPING

OBJECTIVE

Increase water quality treatment and infiltration in landscaped areas, particularly parking areas.

CONSIDERATIONS

For this memorandum, it was assumed that landscaping areas used for stormwater management could be bioretention, biofiltration, or simple infiltration areas.

TRADITIONAL LANDSCAPING TECHNIQUES

Landscaping is an important component of traditional site design. Landscaped islands (raised vegetated areas with vertical curbs) are typically interspersed throughout parking lots to provide visual relief and shade or to otherwise soften the appearance of the development. Perimeter landscaping is also used to buffer developments from adjacent sites, add visual interest and create barriers when screening is needed. Landscaping has not traditionally been used as areas for stormwater management, and landscaping codes often discourage this practice because landscaping placed within stormwater management areas often doesn't count toward required landscape area minimums. Code requirements for trees and vegetation, the placement and frequency of use, and preferred type and species can also discourage using landscape areas for stormwater management, as certain types of landscaping are not compatible with inundation of stormwater.

"Concave vegetated surfaces need not be very deep to make a significant contributior to overall surface storage capacity and stormwater quality."

City of Olympia Drainage Design and Erosion Control Manual Volume 5, BMP T5.33 Concave Vegetated Surfaces 2009

CODES AND STANDARDS REVIEWED

Olympia Municipal Code (OMC) Sections 18.36.060 (general landscaping standards), 18.36.180 (parking lot landscaping), and 18.38 (parking lot standards)
Drainage Design and Erosion Control Manual (DDECM) Volume 3&5

BENEFITS OF USING LANDSCAPING FOR STORMWATER MANAGEMENT

A key component of low impact design is to mimic the pre-disturbance hydrologic process of infiltration, filtration and storage. For sites with infiltrative soils, LID techniques can result in infiltration across the site similar to the pre-disturbance conditions. Using landscaping areas for stormwater management provides opportunities for treatment and infiltration throughout the developed site. This decentralized approach is a better approximation of pre-disturbance hydrology than the standard approach of conveying all stormwater to a single facility. The practice of using landscaping areas for stormwater management also allows for dual function of code required landscaping areas.

OLYMPIA CODE ANALYSIS

Landscaping standards are generally addressed in the OMC Section 18.36. Per Section 18.36.180.C.2, Landscaping Islands (Design), parking lot landscape islands are allowed to accommodate stormwater treatment/conveyance practices. Perimeter screening landscape areas may also be used for stormwater management as long as the goals and requirements of the perimeter screening landscape are met. Unfortunately, the planting requirements, especially as they relate to trees, are difficult to meet when combined with stormwater infiltration unless these landscaping areas are larger than would ordinarily be required.

Concave landscape islands can serve dual purposes: visual relief and stormwater infiltration

OMC Section 18.36.100 allows for alternative landscape plans that do not follow the prescriptive requirements of the landscape code. Developers are allowed to vary from the code for reasons such as environmental protection. Development of an alternative plan has more risk to a developer as the City may not approve of the prepared plan. Because of this risk, few developers have attempted use of alternative landscaping plans.

Stormwater use of landscaping is currently allowed in the DDECM. Volume 5 of the DDECM includes Best Management Practice (BMP) T5.33 Concave Vegetated Surfaces. This BMP allows for a landscape surface to have a slightly concave slope to collect stormwater and promote vegetation. This BMP is typically used in conjunction with other BMP's, such as bioretention and biofiltration.

Landscaping of stormwater ponds is also addressed in Section 3.2 (Detention Facilities) of Volume 3 of the DDECM. Per this section, native plants are encouraged. This section also promotes planting trees in naturally-appearing groups rather than evenly-spaced rows. However, grouping of trees may not provide the visual screening desired for perimeter landscaping as per OMC 18.36.

HURDLES TO IMPLEMENTING LID

Encouraging or requiring widespread use of landscape areas for stormwater management could present the following challenges:

Conflicting Goals – Typical landscape areas include:

- Parking Lots: The goal of parking lot island landscaping is to improve the aesthetic aspects of the parking lot and to provide shade through required tree plantings.
- Site Perimeters: The goal of perimeter landscaping varies by type but generally provides visual barriers or separations between uses, especially uses that are not complementary such as residential and commercial.
- Open Space: One of the goals of open space is to provide space for public use. Another is to provide space for long-term growth of vegetation including trees.

Inundation of any of these areas with standing water can create conflict with these goals. Most trees suitable for parking lot islands do not thrive in wet conditions. If plantings for stormwater facilities require grouping of trees, this arrangement might not provide sufficient visual screening required for perimeter landscape areas, nor the envisioned parking lot shading or canopy. In order to use landscape areas for stormwater management, some of the goals and expectations for design of these areas may need adjustment.

Construction Challenges – Areas proposed for infiltration need to be protected from compaction and sediment-laden runoff during construction. As infiltration areas increase within a development, the complexity of construction also increases. Increasing the amount of areas for infiltration could present erosion control and site access challenges.

Areas proposed for infiltration need to be protected from compaction and sediment-laden runoff during construction

Specialized Design Needs – Current landscaping standards were not drafted with stormwater management in mind. To accommodate stormwater runoff and infiltration in landscape areas would require a substantial change in design approach. For example, engineered soils could allow for combination of parking lot tree islands with stormwater infiltration without increasing the size of the island, but only if each island is carefully designed to meet the needs of selected trees. Because of the specialized designs that would be needed, training of both landscape designers and city staff (reviewers and inspectors) would be needed.

Increased/Modified Maintenance Needs – Typical maintenance of site landscaping typically consists of mowing, trimming, fertilizing and weed management. Because the landscape areas will also be stormwater facilities, these maintenance activities also need to include:

- Removal of decomposing vegetation. Decomposing vegetation can release pollutants and clog storm filters or drains.
- Removal of sediments to preserve infiltration capabilities and remove potential contaminants that may be present.
- Protection of trees during maintenance.
- Replacement of any vegetation removed or damaged during maintenance.
- Periodic infiltration testing to ensure continued functionality of facility. Should the infiltration tests show that design rates are not achieved, soil replacement would likely be needed. Replacement of the soil could result in the removal of the existing vegetation.

In addition, fertilizer and pesticide usage would have to be modified given the usage of the landscape area for infiltration to groundwater.

Pedestrian Access – Landscaping areas designed to capture and infiltration stormwater in parking and other vegetated areas will limit convenient pedestrian access. Landscaping areas that are designed to capture water creates the potential for ponded areas to be present during rainstorms – site design needs to incorporate pedestrian crossing facilities across the infiltration areas.

Other Considerations – Landscape areas have many benefits including visual screens, recreation, wildlife habitat, and aesthetic enhancement. Landscaping for stormwater management may not be seen as visually pleasing as standard landscaping, and depending on the depth of water when full, could pose a safety hazard. However, examples of well designed, constructed, and maintained stormwater infiltration areas that are also aesthetically pleasing are available.

OPTIONS CONSIDERED

The options considered are as follows:

- Option 1: Continue to allow the use of landscaping for stormwater per current codes (no change).
- Option 2: Remove barriers within existing codes to use landscaping areas for stormwater management. This would include an update of the landscaping code to include prescriptive requirements for landscaping areas that are to be used for stormwater management. The requirements specified in the landscaping code would be coordinated with landscaping requirements specified in the DDECM (including possible updates to the DDECM to align with new requirements in landscaping code).
- Option 3: Amend landscaping standards to require that a percentage of landscaping areas be used for stormwater management. (This option would also assume that Option 2 is implemented.)

ANALYSIS

Sites are required to have areas set aside for landscaping. Allowing these landscape areas to have a dual purpose as stormwater management facilities is a key element to successful implementation of low impact design. This practice will allow for decentralized management of stormwater and provide for rainfall interception and evapotranspiration by the vegetation. However, in most cases, traditional stormwater facilities such as ponds will still be needed.

Landscape areas used for stormwater management will have increased maintenance requirements.

Option 1 (no change) would keep the status quo. Landscaping is allowed to be used as stormwater management facilities with specific requirements provided by the DDECM. As no code changes are proposed, there will continue to be potential conflicts between landscaping code requirements and the use of landscape areas for stormwater. These conflicts would often lead to developers opting not to use landscape areas for stormwater management.

Implementation of Option 2 (remove barriers) to align the landscaping and stormwater codes would require updates to OMC 18.36. Alternative design options would be needed for specific landscape areas (parking lot islands, perimeter landscaping, etc.) to accommodate their use as stormwater management facilities. This could include use of engineered soils, increases to required square footages or dimensions, or other changes to allow both stormwater and landscaping needs to be met. Some modification might also be needed to DDECM Volume 3 regarding planting of stormwater ponds. If the landscape areas are designed as stormwater facilities, without the additional guidance in modified design requirements, there could be higher potential for plant mortality or failure of the stormwater management component. This option would not include any required use of landscaping for stormwater, but removes some of the barriers that make it difficult.

Alternative design options will be needed for specific landscape areas to accommodate their use as stormwater management facilities.

For Option 3 (require stormwater use of landscaping), it is assumed that Option 2 would also be implemented. Option 3 will require the addition of guidance to OMC 18.36 requiring that a percentage of landscaping area be used for stormwater management. The chosen percentage will be specified and the site designer could choose which areas of landscaping to use for stormwater management. The percentage could vary depending on the zone, development size, or other predetermined threshold. This option will achieve the goal of having at least a portion of the site landscaping used for stormwater management while giving a project the flexibility to determine where to implement it. Some sites would be challenged to provide meaningful stormwater–based landscaping.

RECOMMENDATION

Staff recommends Option 2. The landscaping code does not include guidance on landscaping for areas planned to be inundated with stormwater, which creates barriers to implementation. This option removes code conflicts that make it difficult to design landscape areas to accommodate stormwater while still meeting requirements of OMC 18.36.

Olympia

SCJ ALLIANCE
CONSULTING SERVICES

LID ELEMENT #13: DOWNSPOUT INFILTRATION SYSTEMS

OBJECTIVE

Increase infiltration and reduce effective impervious surfaces through routing roof downspouts to infiltration systems.

CONSIDERATIONS

The City of Olympia requires on-site management of roof runoff through infiltration or dispersion within Minimum Requirement #5 of the Drainage Design and Erosion Control Manual (DDECM). It is assumed that the City will adopt a new DDECM that complies with the 2012 Ecology Stormwater Management Manual for Western Washington (Ecology Manual). The new Manual will include additional roof downspout BMP's and up to date design information for downspout infiltration options. The use and design of rain gardens will also be addressed. Therefore, the options developed have not been focused on whether to allow downspout infiltration systems or specific design options, but rather on considerations related to code adoption.

TRADITIONAL ROOF DRAINAGE SYSTEMS

Prior to adoption of requirements addressing the treatment of stormwater, roof runoff was often allowed to mix with the polluted runoff generated by parking lots and driveways. When water quality treatment requirements were implemented in the early 1990's, separation of roof runoff, which is considered clean water, from the polluted runoff from parking lots and other vehicular areas became common. By preventing the mix of the clean roof runoff with the polluted runoff, the volume of required water quality treatment was minimized.

"As density increases so the percentage of surface flow associated with roof-tops. At the same time, the available area to manage the roof water at the ground level decreases."

Low Impact Development Technical Guidance Manual for Puget Sound, Puget Sound (2012)

The early 1990's also introduced roof downspout Best Management Practices (BMPs). The 1992 Ecology Stormwater Manual included BMP RI.15 Roof Downspout Systems which was an infiltration system specifically for roof runoff. The 1992 Drainage Design and Erosion Control Manual for Olympia also included specific design information for roof drain infiltration, based on the Ecology requirements. Roof drain infiltration has been an ongoing practice in Olympia for many years.

In 2005, Olympia shifted from allowing certain drainage practices regarding roof runoff to requiring roof downspout controls. The required controls included an option for infiltration or dispersion.

CODES AND STANDARDS REVIEWED

Drainage Design and Erosion Control Manual (DDECM)
Volumes 1 and 3
Engineering Design and Development Standards (EDDS)
Standard Details 5-10A1 and 5-10A2

Requirements for handling of roof drainage are specified in the DDECM.

BENEFITS OF ROOF DRAIN INFILTRATION

A key component of low impact design is to mimic the pre-disturbance hydrologic processes of infiltration, filtration and storage. For sites with infiltrative soils, the use of roof drainage infiltration systems achieves these goals. These systems have the added benefit of separating roof runoff (clean water) from polluted runoff from parking lots and similar uses. Using roof drain infiltration methods aids in reducing the overall effective impervious surface coverage for a site. Reductions in effective – or hydraulically connected – areas of impervious surface are an important step in maintaining natural site hydrology necessary in low impact development practices.

OLYMPIA CODE ANALYSIS

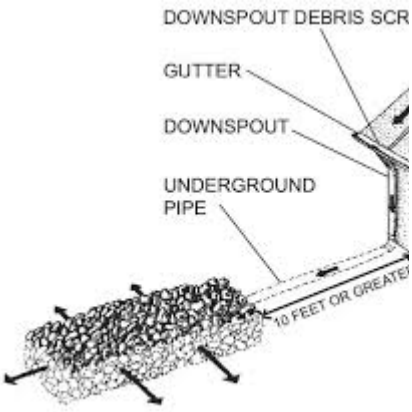
Requirements for handling of roof drainage are specified in the DDECM. Roof downspout controls are specifically identified in Volume 3, Section 3.1 and include downspout infiltration systems and downspout dispersion systems (splash blocks). The requirement for use of downspout control systems is specified in Volume 1 under Minimum Requirement #5, Onsite Stormwater Management.

CITY EXPERIENCE WITH CURRENT SYSTEMS

Roof drainage infiltration systems have been used in the City for many years. Overall the experience has been positive and the systems have proven effective. There are some challenges that should be addressed as part of code updates:

Maintenance – Because downspout infiltration systems are underground, they are often overlooked for regular maintenance. This is especially true of residential downspout infiltration systems where homeowners often aren't aware of the presence of the system on their parcel and its maintenance requirements.

Proximity to Crawlspaces and Basements – Ten foot setbacks from building foundations and basements are required for roof drain infiltration systems. On some lots, setbacks are very limited. In addition, the DDECM requires calculations to demonstrate that saturated areas resulting from roof infiltration will fall one foot below the lowest floor elevation in the building. However, despite these requirements, sometimes infiltration into building spaces occurs. Often this can be linked to poor maintenance and system failure.



Because downspout infiltration systems are underground, they are often overlooked for regular maintenance.

OPTIONS CONSIDERED

- Option 1: Update DDECM to adopt Ecology Manual requirements for roof downspout controls without edit.
- Option 2: Update DDECM to adopt Ecology Manual requirements for roof downspout controls but add Olympia specific edits including: requirements to encourage increased maintenance – possibly adding documentation on plats regarding downspout systems; specific rain garden guidelines based on the *Rain Garden Handbook for Western Washington*; and potentially other modifications based on Olympia experience with roof downspout infiltration systems.

ANALYSIS

Option 1 – This option would update current City practices for roof drainage systems to allow additional roof drainage infiltration options included in the Ecology Manual such as rain gardens. It will also update design requirements to the latest criteria. However, Option 1 would not reflect changes specific to the City of Olympia and would instead adopt the downspout management practices suggested by Ecology in their entirety.

Option 2 – This option would update the DDECM to include current options for roof downspout controls suggested by Ecology, but would also make edits to reflect City of Olympia specific guidance. Roof drain infiltration systems have been in use for a long time in the City with good result, and there have been lessons learned that could be incorporated into the DDECM update. By using the concepts presented in the Ecology Manual and incorporating the ones that will work best in Olympia, more options for managing roof runoff will be available, but the standards will be tailored to the needs of the City.

RECOMMENDATION

Staff recommends Option 2. This option allows for updating requirements for downspout infiltration systems while maintaining and updating Olympia specific edits.

Option 1 updates standards but would not incorporate Olympia specificity.

LID ELEMENT #14: PERMEABLE PAVEMENT

OBJECTIVE

Improve treatment and infiltration through use of permeable paving.

CONSIDERATIONS

The use of permeable pavement has both advantages and limitations as discussed in the memorandum. Olympia has considerable, longstanding experience with permeable pavement. Some installations have been successful; others problematic. The technology continues to evolve and improve.

RELATED ELEMENTS

Element 4 Restrict Maximum Impervious Surface Coverage
Element 5 Reduce Impervious Surface Associated with On-site Parking

TRADITIONAL PAVING TECHNIQUES

Since the days of the Romans, roads and pathways for travel have been hardened. Hardening surfaces allowed roads to be traversable regardless of weather conditions. In modern times, roads are paved with concrete, asphalt and pavers. Use of these materials started with roads and then was expanded to sidewalks, paths, driveways, and parking lots. Although the utilization of these surfaces has allowed travel ways to be traversable year round, it creates the need to manage stormwater. Impervious materials create runoff that must be managed to avoid flooding and reduce contamination associated with the collection of pollutants. Pavement associated with roads, sidewalks, and parking lots occupies approximately twice the space of buildings in our communities. Therefore, eliminating or reducing the runoff from hard surfaces greatly improves both the quality and quantity of storm runoff.

"Permeable paving surfaces are an important integrated management practice within the LID approach and can be designed to accommodate pedestrian, bicycle, and auto traffic while allowing infiltration, treatment and storage of stormwater."

Low Impact Development Technical Guidance Manual for Puget Sound, Puget Sound (2012)

In the City of Olympia, the current surfacing components include curb and gutter, traditional asphalt and concrete, catch basin and pipe systems for stormwater conveyance and ponds for stormwater management. The City has been working to use permeable paving on City projects for over 10 years, primarily for sidewalks. Various products and applications have been used. Private development has also used permeable pavements, typically in parking lots. Overall results have been mixed in terms of durability and effectiveness. However through their experience with these projects, the City has learned about specific product effectiveness. This experience can inform future code requirements.

CODES AND STANDARDS REVIEWED

Drainage Design and Erosion Control Manual (DDECM) Volumes 3 & 5
Engineering Design and Development Standards (EDDS) 4B.160
Olympia Municipal Code (OMC) Section 18.38.220.A.4

BENEFITS OF USING PERMEABLE PAVING

One of the primary premises of low impact design is to mimic the pre-disturbance hydrologic process of infiltration, filtration and storage. For sites with infiltrative soils, permeable paving achieves all of these goals. Rather than collecting runoff and conveying it away, rainwater that hits pervious paving is treated and infiltrated in place. This is a much closer approximation of the pre-development hydrologic process (how runoff is processed on undeveloped land) than traditional stormwater methods. Pervious pavements also increase recharge of groundwater.

In some applications, use of permeable paving can also reduce initial construction costs. Although permeable paving construction costs are usually higher than impervious costs, stormwater construction costs can be lower because catch basin, pipe and pond systems can be minimized. Traditional systems cannot be completely eliminated because emergency overflow systems are required. In general, the construction and cost implications of permeable paving are site specific.

OLYMPIA CODE ANALYSIS

Road, driveway, sidewalk, and pathway surfaces are generally addressed in Chapter 4 of the EDDS. Section 4B.160 addresses surfacing requirements. Per this code section, sidewalks and bikeways have the option to be constructed of pervious concrete materials but only with approval of the City Engineer. Permeable paving options are not offered for the roadway or the driveway within the public right of way (between the street and edge of sidewalk) surfacing. Private driveways are allowed to be constructed of permeable surfacing.

Permeable paving options are not offered for public roadway surfacing under current regulations.

Parking lot surfacing is addressed in OMC Section 18.38.220.A.4. Pervious surfacing is allowed only in limited applications (overflow parking) or in other applications with approval of the Site Plan Review Committee (SPRC). The SPRC has routinely allowed 100% permeable parking lots.

Permeable/porous pavements are a Best Management Practice allowed within Volume 5 of the DDECM. Specific allowed applications are not addressed and the DDECM defers to local codes as explained above. Criteria are provided for when use of permeable paving is suitable or unsuitable. The criteria for feasibility or infeasibility are not exhaustive in the current DDECM. Examples of suitable applications include parking lots, low-speed residential roads, residential driveways, and sidewalks. Examples of unsuitable applications are slopes greater than 5% for pervious asphalt and 10% for pervious concrete, infiltration rates less than 0.25 inches per hour, and areas where the depth to bedrock or groundwater is less than 3 feet.

The current Department of Ecology Manual also includes a requirement that a redundant stormwater conveyance system be provided. This redundant system shall be designed to provide adequate conveyance as if the paving were impervious. This is a financially challenging requirement.

The City's sidewalk program installs pervious paving on a regular basis unless site conditions make it infeasible. The first pervious concrete sidewalk was constructed along North Street east of Henderson Boulevard in 1999. The City currently has seven miles of pervious concrete sidewalk.

In summary, current regulations allow permeable paving in limited applications within City right-of-way but then only with approval from the City Engineer. On private land, the City has allowed permeable paving where feasible and with approval from the SPRC.

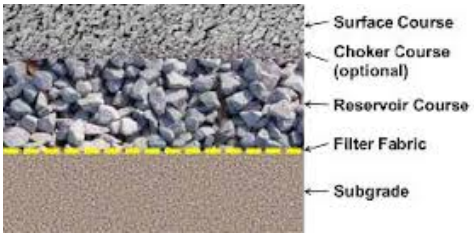
HURDLES TO IMPLEMENTING PERMEABLE PAVING

Encouraging or requiring widespread use of permeable paving presents the following challenges:

Uncertain Long Term Durability – Use of permeable surfaces has not been widespread, especially pervious concrete and asphalt. It is a fairly new technology. Therefore, the expected life span and overall durability of the products is not well-understood. However, City experience has shown that pervious concrete appears to be more durable than pervious asphalt. Sites that have used pervious paving options have had issues of raveling and structural failure. In some cases, this is due to poor design or construction. Regardless, these structural failures have not bolstered the confidence of private developers or public agencies to use permeable paving options. Failures are common, ongoing, and typical of growing pains of a new technology. Failures must be reconstructed, typically at considerable unanticipated public cost.

Increased Long Term Maintenance – Permeable paving is only effective if its perviousness is preserved. Therefore, plugging from sediment and moss must be prevented. To remove sediments, permeable paving requires regular cleaning through suction. Periodic testing to ensure preservation of infiltration capabilities is also needed. Therefore, maintenance costs for permeable paving is higher than for standard pavements.

In addition, the life of a traditional pavement is typically extended by the City using chip seal, an inexpensive surface treatment that extends the life of an aging pavement. Chip sealing would not be possible with permeable paving.



Typical Pervious Pavement Section

Infeasible in Many Locations – The current DOE Drainage Manual Section (Volume 5 BMP T5.15) on permeable paving includes a list of infeasibility criteria. Assuming that the updated DDECM will include a similar list, applications of permeable paving will be limited by these criteria. Permeable paving is a great LID tool but its feasibility is limited.

Some limiting factors include:

- Infiltration capability of soils
- Depth to groundwater
- Slope of site
- Adjacency to sensitive areas such as landfills, steep slopes, land slide hazard areas, drinking water well, etc.
- High volume of traffic and heavy vehicles

Construction Challenges – Construction of a permeable paving facility such as a parking lot requires different construction practices from standard paving including:

- Permeable paving should be completed late in the project to prevent plugging during construction activities. Traditional paving occurs early in a project schedule in order to help with site management, erosion control and to provide stable surfaces for heavy equipment movement and storage of construction materials. Paving also helps protect natural soil structure in adjacent areas, a key objective in low impact development. Early paving is not possible with permeable paving as construction activities generate sediment to the street and plug the permeability. Additionally, heavy equipment and trucks working in the tight constraints of construction sites can structurally damage the paved section.
- The subgrade cannot be compacted (or compaction should be limited) so infiltration capabilities are preserved. Construction traffic must be limited on subgrade; excavation to subgrade should not be completed until ready to pave.
- Increased erosion and sedimentation prevention – runoff from abutting areas with loose soil or similar erodible materials must be kept away from permeable pavement areas in order to prevent plugging and reduction of infiltration. Adjacent landscaped areas need to be stabilized prior to paving.
- Maintenance and repair of underground utilities will be challenging. This will require cuts into the permeable paving and then subsequent patching. Small patch areas could be constructed of traditional pavement materials but larger removals will require repaving with permeable materials.
- Experience has shown that the concrete industry is challenged to provide appropriate crushed aggregates to achieve the desired strength and surface smoothness. Finding suitable materials has been difficult for both private and public contractors.

Increased erosion and sedimentation prevention is needed for permeable paving to prevent plugging and reduction of infiltration.

In addition, many contractors are not familiar with permeable paving construction techniques. Poor installation can result.

Standard Specifications Needed – In order to ensure more uniformity in design, production, installation, inspection and success of these systems, standard specifications are needed. Like others, the City struggles to provide industry standards for these systems. Effective standards are being investigated and developed by the pavement industry with aid of engineers, materials professionals, and municipalities in western Washington.

Inspection and Enforcement – Because permeable paving is both a pavement and a stormwater management facility, it requires regular inspection and monitoring to ensure continued functionality. Inspection is also needed to ensure permeable pavement is not resurfaced, either inadvertently or intentionally, with traditional materials. If violations occur, enforcement will be challenging.

OPTIONS

The options considered are as follows:

- Option 1: Continue to allow the limited use of permeable pavement (no change).
- Option 2: Change City codes to allow use of permeable pavements without additional approvals or limitations on private property, excluding private and limited access roads. Emphasize the use of permeable paving for public sidewalks and shared-use paths, as well as residential driveways and walkways.
- Option 3: Require use of permeable pavements for all hard surfaces where feasible, excluding roadway surfaces.

ANALYSIS

Permeable pavements are a valuable tool for successful implementation of LID. Since permeable paving is a new technology with uncertain durability and longevity and increased maintenance costs and requirements, it is not recommended that permeable paving be used for roadway surfacing at this time. Roadways are also vulnerable to hazardous spills and higher levels of pollutants which could result in groundwater contamination. Therefore, permeable paving for roadways (public or private) is not proposed as part of any option.

Option 1 (no change) will keep the status quo. Pervious pavements will be allowed in limited areas and will require additional approvals from the Site Plan Review Committee or City Engineer. Current regulation does not encourage the use of pervious paving.

To implement Option 2 (change codes to allow permeable pavement on private property and in public right-of-way for specific applications), several code sections will require modification. The EDDS will require amendment to allow and prioritize permeable paving on sidewalks and require permeable paving on residential driveways. OMC 18.38 will require amendment to allow permeable paving beyond just in parking lot overflow areas. All updates should specify permeable pavement usage only where

feasible. In application, the City is already allowing the use of permeable paving for 100% of parking surfaces on private property. The OMC code updates would make code language consistent with City practice. Clarification should also be provided to the DDECM Volume 5 BMP 5.15 per current DOE standards including the requirement for an overflow system.

Option 2 removes barriers to the use of permeable pavements but will likely only affect its use on public rights-of-way and private residential driveways (excluding driveway approaches that are located within the right-of-way). Removing barriers to the use of permeable paving for private property is not likely to appreciably increase its use by developers at this time. Private developers typically consider the use of pervious pavement when traditional stormwater techniques are challenging and/or expensive. As permeable paving can be more costly both in installation and maintenance and the long term durability is unknown, private developers typically will not use permeable pavement.

Option 3 (require permeable paving wherever feasible) would require that permeable pavement be used everywhere that the infeasibility criteria are not met, excluding roadways. In order to implement this Option, the EDDS and OMC 18.38 would require amendment to specify that permeable paving is required for parking lots, sidewalks, bikeways, and residential driveways.

Option 3 may or may not increase the use of permeable pavement for private projects. Given the infeasibility criteria, it is likely that most private projects could opt out if so desired. The increase in use for public projects would largely be the same as Option 2.

The current risks associated with permeable paving are relatively high, but could decrease in the foreseeable future as the technology advances. Regardless of the preferred option, the City needs to stay current with the technology and be prepared to support the expanded use of permeable pavements.

RECOMMENDATION

Staff recommends Option 2. Option 2 may provide increased use of permeable paving in the City of Olympia through removal of code barriers to its usage. Option 2 removes current code barriers to usage and prioritizes usage in public rights-of-way for sidewalks and shared-use paths, but not for vehicle lanes. It can be achieved with minor code changes to the OMC and EDDS. Removal of barriers, however, does not necessarily mean increased usage, especially on private property.

Option 1 does not expand the use of permeable paving. Option 3 would require extensive use of permeable pavement at a time when the technology is not fully developed. Public and private risks would be high.

LID ELEMENT #15: IMPERVIOUS PAVEMENT WITH UNDERDRAINS

OBJECTIVE

Promote stormwater infiltration through use of underdrains beneath impervious pavement.

CONSIDERATIONS

For the purposes of this element, only new construction has been analyzed.

RELATED ELEMENTS

Element 11 Bioretention Street Section
Element 14 Permeable Pavement

TRADITIONAL STORMWATER MANAGEMENT WITH IMPERVIOUS PAVING

Stormwater infiltration facilities located beneath pavements are commonly used to manage runoff on commercial, industrial and multifamily projects where space is at a premium. Underground stormwater systems, most often located under parking areas, are a space efficient solution. When on-site soils provide good infiltration, infiltration galleries or trenches are typically used, and the design and function of these systems are well established. Use of under-pavement infiltration is not common practice for roadways.

> "Pavements contribute to increased peak flow, flow durations, and associated physical habitat degradation of streams and wetlands. Effective management of stormwater quality and quantity from paved surfaces is, therefore, critical for improving fresh and marine water conditions in Puget Sound."
>
> *Low Impact Development Technical Guidance Manual for Puget Sound, Puget Sound (2012)*

CODES AND STANDARDS REVIEWED

Drainage Design and Erosion Control Manual (DDECM) Volumes 3 & 5
Engineering Design and Development Standards (EDDS) Chapter 4 & 5
Olympia Municipal Code (OMC) Section 18.38.220 (parking design standards)

BENEFITS OF USING UNDERDRAINS BELOW IMPERVIOUS PAVING

Infiltrating under impervious paving accomplishes the goal of distributing the area of infiltration across a larger area compared to isolated stormwater ponds and infiltration facilities. Using this technique achieves an infiltration pattern similar to that of pervious pavement, and can be achieved without the challenges and risks that are associated with use of permeable paving systems (see Element 14 for a discussion of these challenges).

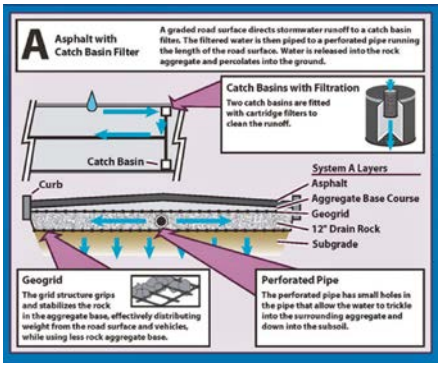
OLYMPIA CODE ANALYSIS

Paved surfaces typically consist of roadways, driveways, sidewalks, paths, and parking lots. These paved surfaces are placed both on private property and within public right-of-way.

Road, driveway, sidewalk, and pathway design are generally addressed in Chapter 4 of the EDDS. Stormwater design guidelines are addressed in Chapter 5 of the EDDS. Use of underdrain infiltration systems beneath roadway pavement is not specifically prohibited within the EDDS; however, it is inconsistent with street section details and standards.

Parking lot design is discussed in OMC Section 18.38.220. Drainage for parking lots is addressed in the DDECM and EDDS. In application, the City routinely approves under pavement infiltration systems for parking lots, most frequently on smaller parcels and infill lots with commercial uses.

The design requirements for infiltration systems under parking lots are discussed in both Volume 3 and Volume 5 of the DDECM. Per the manual, infiltration systems may be placed under impervious surfaces.



Current regulations for parking lot design do not specifically address the use of under pavement infiltration. In practice, these systems are routinely approved by the City under parking lots. Decatur Street in Olympia is a demonstration project for this technique under streets.

The City has no standards for required structural capacity of street sections with infiltration galleries.

In summary, current regulations for roadway and parking lot design do not specifically address the use of under pavement infiltration. In practice, these systems are routinely approved by the City under parking lots on private property. Design standards for infiltration systems are present in current codes.

HURDLES TO USE OF PAVEMENT WITH UNDERDRAINS

The use of under pavement infiltration systems presents the following challenges:

Higher Cost Than Standard Systems – Under pavement drainage systems are more expensive to construct than above ground systems. Above ground systems typically are composed of a surface pond that is created by excavating native soils and a series of catch basins and pipes that route runoff to the pond. Under pavement drainage systems are most often installed beneath parking lots. They require the use of catch basins and pipes to collect runoff, as well as many large rock filled pipes that are installed several feet below the final surface. In addition, an overflow contingency plan is also required. The construction costs of the extra materials and excavating large areas for installation of the perforated pipes and drain rock can be quite costly and are usually installed when space is a factor - primarily on commercial and industrial sites and occasionally for multi-family projects.

Larger than Above Ground Systems – Most under pavement infiltration systems are constructed of rock and pipe. The volume available for stormwater storage is within the voids between the rock and within the pipe. To achieve the same storage volume as an open pond, the underground facilities typically are much larger.

Long Term Maintenance/Replacement – Underground infiltration systems are inherently difficult to maintain due to lack of access. Per the DDECM, access ports are required for on-going maintenance activities but access is still fairly limited. Maintenance activities typically cost more than maintenance of above ground systems and could require reconstruction of the roadway.

Should a system begin to plug and not provide the design infiltration rate, a partial or even complete replacement is often the only viable option. The expense of this replacement includes the cost of removing the improvements (usually parking lot) above the facility, excavating to expose the system, making the necessary repairs, and replacing the improvements once repairs are complete. Given the costs and inconveniences, requiring long-term maintenance is challenging.

Site Suitability Criteria – The DDECM Volume 3 Section 3.36 includes site suitability criteria for design of infiltration systems. These include:

- Setbacks – Ensures that infiltration facilities are setback a sufficient distance from sensitive areas such as wells, septic tanks, building foundations, and steep slopes.
- Ground Water Protection – Ensures the preservation of aquifers and wellhead protection zones.
- High Vehicle Traffic Areas – Specifies additional pollutant removal needed for industrial and high vehicle traffic areas.
- Contingency Planning – Requires a back-up plan in case design infiltration rates are lower than expected.
- Infiltration Rates/Drawdown Time – Provides criteria for infiltration facilities that are providing stormwater treatment and determination of design infiltration rates.
- Soil Physical and Chemical Suitability for Treatment – Criteria to ensure that the soils will support this use.

Should a system begin to clog and not provide the design infiltration rate, typically a partial or even complete replacement is the only viable option.

Utility Conflicts – The space under roadways is typically used for utility corridors (water, sewer, power, and communication lines). Placement of stormwater facilities beneath roadways can create conflicts with these utilities and compete for limited space. In some instances stormwater systems could be placed beneath the utilities but this may have limited feasibility. Maintenance of existing utilities would be more complex and cost more.

Construction Challenges – Areas proposed for infiltration need to be protected from compaction and sediment-laden runoff during construction. Construction sequencing and erosion control need to be carefully planned to ensure areas planned for infiltration are not compacted or clogged. Additionally, the design depth of the under pavement infiltration facility needs to ensure that the compaction necessary for the pavement does not impact or compact the stormwater facility below.

Inspection and Enforcement – Underground systems with limited access are difficult to inspect and ensure on-going functionality. Because they are located out of sight, they are less likely to be maintained regularly. Problems with system functionality are often not caught until flooding occurs.

OPTIONS

The options considered are as follows:

- Option 1: Keep codes as is (no change).
- Option 2: Allow under streets where feasible (private or public).

ANALYSIS

Option 1 would keep the status quo. The result would be continued use of under pavement infiltration, largely under parking lots where space is at a premium. For projects where space is not a factor, above ground systems will likely continue to be preferred given the lower cost of construction and maintenance for these facilities.

Option 2 would require additions to either Chapter 4 or 5 of the EDDS to address allowance of drainage facilities below streets. Specific language would be needed to address where under pavement drainage is and is not allowed. A cross reference to the DDECM would also be beneficial. The DDECM discusses design requirements and feasibility criteria for infiltration systems.

Option 2 would likely result in some level of increased use of under pavement infiltration. Under pavement infiltration would allow maximum flexibility for street stormwater management system design. System design can balance the requirements for right-of-way acquisition or dedication. However, risks, uncertainties, conflicts, and long-term maintenance implications are relatively high at this time.

RECOMMENDATION

Staff recommends Option 1. The City already allows use of under pavement infiltration under parking lots and other on-site hardscapes. Therefore, current City code already encourages this LID practice where it is most appropriate and feasible.

Placement of under pavement infiltration systems under streets has too many risks and conflicts to be feasible.

PROCEDURES, PROCESS AND CODES

Elements					
16 Definitions	17 Adopt New DDECM	18 LID Site Assessment	19 Pre and During Construction Inspections	20 Maintenance Standards/ Inspections	21 Variances, Deviations and Exceptions

The DDECM, EDDS and OMC all define impervious surface differently. For successful implementation of LID, the most current definitions of terms are needed (Element 16).

Six of the Low Impact Development elements focus on incorporation of LID through procedure, process and code changes. These elements include:

- Element 16 (Definitions)
- Element 17 (Adopt New DDECM)
- Element 18 (LID Site Assessment)
- Element 19 (Pre and During Construction Inspections)
- Element 20 (Maintenance Standards/Inspections)
- Element 21 (Variances, Deviations and Exceptions)

Specific information to each element is found in the issue paper for that element. The following is a summary of similar themes that can be found within the elements aimed at making procedure, process or code changes to facilitate implementation of LID.

OBJECTIVE

The specific objective for each element is unique but the overall outcome is the same. Implementation of these elements will help to provide consistency and clarity for the design, review procedure and process, and the post construction requirements of LID facilities.

The City must update the current DDECM to be in compliance with the Municipal NPDES stormwater permit (Element 17).

BENEFITS OF PROCEDURES, PROCESS AND CODES

The six elements under consideration (16, 17, 18, 19, 20 and 21) would result in better consistency and clarity of City code and procedural and process requirements for LID design implementation. Clarity and consistency can result in more use of LID systems and more successful long term function of installed facilities.

HURDLES TO IMPLEMENTATION

In general, each procedure, process and code component will require administrative rewrites or procedural revisions to more fully implement LID. Additional challenges to incorporating LID are largely unique to the specific element under analysis and individual issue papers should be referenced for more information.

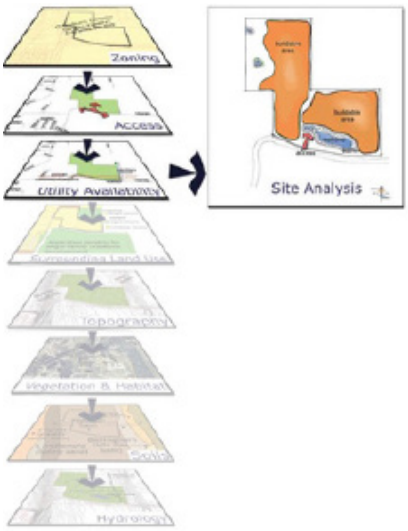
Highlighting the LID elements of a project and the inspection needs of those elements, before and during construction, should be a top priority of implementing LID (Element 19).

OPTIONS

A variety of options were considered for each element. The following options are recommended:

Element 16 (Definitions)

- Definitions common to DDECM and other City codes will be aligned where practical. Currently there are many terms that are used in City codes and the definitions of these terms vary. This can lead to confusion and inconsistencies. Aligning the definitions where possible would alleviate some of this confusion.



Current development process focuses on zoning, access and utilities before considering hydrologic function.

LID development focuses on understanding a site's hydrological functions and creating a development plan that preserves those functions (Element 18).

Proper maintenance of LID facilities is essential to their proper function. In order to provide proper maintenance, the City needs to provide maintenance guidance (Element 20).

Element 17 (Adopt New DDECM)

- Updating the *Drainage Design and Erosion Control Manual* (DDECM) to be equivalent to the current Department of Ecology stormwater manual is not optional, but how compliance is achieved is up to each jurisdiction. In the past, the City has updated (using the DOE manual as the foundation) and has incorporated Olympia specific information. This has often resulted in an Olympia code which is stricter than the DOE code. The City will follow this same procedure for the currently required code update.

Element 18 (LID Site Assessment)

- Site assessments will be required prior to the submittal of a site plan review application for a project. Performing these assessments early in a site planning process will result in less redesign work and better inclusion of LID techniques.

Element 19 (Pre and During Construction Inspections)

- LID systems require specialized inspections to ensure proper installation and protection during construction. Many LID elements are sensitive to sediment intrusion and soil compaction, so more frequent and targeted inspections will likely be necessary. The City will update their current inspection manuals and procedures to include the specialized information necessary for LID systems.

Element 20 (Maintenance Standards/Inspections)

- LID systems require on-going maintenance to ensure proper function. Olympia will develop a new City of Olympia LID Maintenance Manual.

Element 21(Variances, Deviations and Exceptions)

- The City has robust procedures for varying from the code standard and outlines the justification required in those cases. Currently, some LID systems are reviewed and approved through these procedures. This additional required step in order to install an LID system can serve as an inhibitor to widespread implementation of LID. Rather than modify these procedures, the City will update codes to allow LID systems outright so change procedures are not necessary.

SUMMARY

The City of Olympia will update procedures, processes and codes for successful implementation of LID. These changes include updating the stormwater manual to reflect current Ecology requirements, providing consistent definitions between codes, and updated construction and maintenance inspections. Implementation of these updates will provide consistency and clarity for the design, review procedures and process, and the post construction requirements of LID facilities.

SCJ ALLIANCE
CONSULTING SERVICES

Olympia

LID ELEMENT #16: DEFINITIONS

OBJECTIVE

To provide consistent definitions of low impact development terms through all regulations/codes.

CONSIDERATIONS

This element addresses consistency of definitions. It is not a discussion regarding the definition of terms.

RELATED ELEMENTS

Element 17 Adopt New DDECM

> "Success is neither magical nor mysterious. Success is the natural consequence of consistently applying basic fundamentals."
>
> - *Jim Rohn*

TRADITIONAL APPROACH TO CONSISTENCY WITHIN REGULATIONS AND CODES

Development within the City of Olympia is governed by many codes including the Olympia Municipal Code (OMC), Drainage Design and Erosion Control Manual (DDECM), Engineering Design and Development Standards (EDDS) and other codes. As with any City, these codes were written and adopted at different times, and are also updated on different timelines. Although every effort is made to try and make the codes consistent, sometimes inconsistencies are missed or overlooked.

CODES AND STANDARDS REVIEWED

City of Olympia Drainage Design and Erosion Control Manual (DDECM) Volume 1
Engineering Design and Development Standards (EDDS) Chapter 2
Olympia Municpal Code (OMC) 18.02.180
Department of Ecology 2012 Stormwater Management Manual for Western Washington (Ecology Manual)

BENEFITS OF CONSISTENCY

Consistency between codes helps the City and its community apply regulations with uniformity. Consistency is especially critical with definitions. If a term is defined in multiple codes and the definitions vary between codes, it can be confusing to both City staff trying to implement code requirements as well as the development community in trying to apply the code. When a particular section of code is unclear, the definition section of the code can often help provide clarity. For instance, in determining which requirements of the DDECM apply to a specific project, the amount of land disturbing activity must be determined. Therefore, in order to implement specific requirements of the DDECM, a clear understanding of what is considered a land disturbing activity is needed. When questions arise, it is the definition section that both City staff and developers review to gain clarity.

OLYMPIA CODE ANALYSIS

The DDECM, EDDS, and OMC all include a definition section. Most terms specific to stormwater, including low impact development terms, are only located within the DDECM. OMC 13.16.017 states that the DDECM shall control and prevail over other ordinances, standards, and policies where there is conflict. However, there are many terms that affect low impact development that are defined in multiple locations. For instance impervious surface is defined differently in the DDECM, EDDS and OMC. Understanding what is considered an impervious surface is critical to effective application of LID.

The amount of impervious area on a site affects many aspects of LID. Therefore, understanding what is considered an impervious surface is critical to effective application of LID. The DDECM, EDDS and OMC all define impervious surface differently.

- The DDECM defines impervious surface as – *A hard surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A hard surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater.*

- The OMC defines impervious surface as – *Pavement, including, but not limited to, asphalt, concrete, and compacted gravel, roofs, revetments, and any other man-made surfaces which substantially impede the infiltration of precipitation. Exceptional pavements and other materials may be exempted in whole or in part by the Director.*

- The EDDS defines impervious surface as – *Pavement (compacted gravel and concrete), roofs, revetments, and any other man-made surface that substantially impedes the infiltration of precipitation.*

Based on the definitions of the OMC and EDDS, it is not clear that a compacted earthen area that prevents infiltration of stormwater could be considered impervious area as defined by the DDECM. The amount of impervious area on a site affects many things including project design, stormwater utility rates, permitting fees, and other factors. Although a review of codes for additional term inconsistency was not performed, it is likely there are many terms with inconsistent definitions between codes.

It is also beneficial to be consistent not just with City code but the Ecology manual. For successful implementation of LID, the most current definitions of terms should be used. For instance, the Ecology Manual defines impervious surface as:

- *A non-vegetated surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A non-vegetated surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater.*

For successful implementation of LID, the most current definitions of terms are needed.

The updated definition provides additional specificity over the current DDECM definition of impervious surface. The Ecology Manual also provides definitions for LID terms not currently provided in the DDECM.

HURDLES TO DEFINITION CONSISTENCY

Not Just Olympia - Terms such as impervious area are not limited to local, Olympia codes. There are also state and federal codes that use these terms as well. Achieving local consistency of terms may create inconsistency with codes outside of local codes.

Not That Easy - Codes that affect projects are not limited to the DDECM or EDDS where changes are fairly straight forward. Changing definitions, for instance, in the OMC would require a zoning code change which can be a long process. Other changes are outside of Olympia's sole control. Updating definiitions, for instance, in the Shoreline Regulations would require review and approval from the Department of Ecology. Amending definitions related to flood regulations requires the approval of FEMA.

Some Terms are Tailored for a Specific Regulation – Sometimes definitions are "terms of art", i.e., their meaning is not the common meaning. Instead the meaning may be specific to the regulation. Revising such definitions could have substantive consequences.

OPTIONS CONSIDERED

As discussed in Element 17 (Adopt New DDECM), adoption of the new requirements of the Ecology Manual is not optional. Because definitions are not requirements, it is possible the City could adopt the Ecology Manual requirements but not its definitions. For this memorandum it is assumed the City will adopt the updated 2012 Ecology Manual definitions. It is also assumed that consistency of definitions between codes is desired. Therefore, the options being considered pertain to achieving consistency in how terms are defined within the codes.

- Option 1: Do not update definitions within codes.
- Option 2: Align all definitions common to DDECM and other City codes where practical.
- Option 3: Align definitions within the DDECM. Terms that are defined in both the DDECM and in other codes will only be defined in the DDECM. Definitions of such terms in other codes will refer the reader to the DDECM.

ANALYSIS

Option 1 (No change)- Inconsistencies in definitions will continue between codes. This could lead to confusion and inconsistent application of codes. While this option does not demand additional staff time and thus is the most cost effective in the short term, it could have long term costs associated with inconsistent interpretation of definitions and application of standards. This option puts the City at most risk for potential appeals of decisions or even legal challenges.

Option 2 (Update codes for all cross-over definitions) - This option would require updating the EDDS OMC and to provide consistent definitions for all terms that are present in the DDECM. This option would ensure consistency at the outset as focus would be given to making sure terms are defined in the same manner in all City codes. However, with this option, future definition updates in the DDECM would also require updates of the other City codes. Similarly, future changes to definitions in the OMC or EDDS could result in inconsistencies between these documents and those in the DDECM.

Option 3 (Cross reference definition of terms contained in two or more codes to DDECM). Option 3 would result in each term being defined in only one code document. For terms specific to LID, the DDECM is likely the best location for the definitions. Other codes that contain the same LID terms would refer to the definition in the DDECM. This option provides the best opportunity to avoid the same terms being defined differently across various city regulatory documents. With definitions for terms only contained in one document, future updates to the codes would be less likely to create unintended inconsistencies. For instance, if Impervious Surface is defined in the DDECM, the OMC and EDDS definition sections would contain the term Impervious Surface, but the definition would say “please refer to the DDECM for definition”. This would reduce staff time for future definition updates and

reduce the chances that future changes result in the same term being defined differently within each code.

RECOMMENDATION

Staff recommends Option 2. Consistency between codes will provide clarity and eliminate confusion. This option allows for consistency to be developed but allows definitions to remain within each code. It also recognizes that some inconsistencies may still exist when definitions are serving a specific regulatory purpose. Option 1 would continue to allow inconsistency while Option 3 would be difficult to achieve and maintain.

LID ELEMENT #17: ADOPT NEW DRAINAGE DESIGN AND EROSION CONTROL MANUAL (DDECM) FOR OLYMPIA

OBJECTIVE

To comply with the requirements of the Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) permit through stormwater code modifications incorporating low impact development (LID) techniques.

CONSIDERATIONS

To achieve the objective, the City is planning to update the *Drainage Design and Erosion Control Manual for Olympia* (DDECM). To some extent the City is required to adopt an updated Manual. The purpose of this memorandum is to evaluate options within the range allowed by the State including adopting the Washington State Department of Ecology (Ecology) 2012 Stormwater Management Manual for Western Washington without changes.

"The new Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) general permits require widespread adoption of Low Impact Development (LID) techniques into local development codes. These new practices and codes require significant changes in the way the private development community plans, designs, and builds sites, as well as the way public sector enforces, operates, maintains and inspects stormwater facilities."

Ecology Low Impact Development Code Update and Integration Toolkit July 2014

RELATED ELEMENTS

Element 20 Maintenance Standards and Inspections

CURRENT DDECM

The Washington State Department of Ecology is designated by the U.S. Environmental Protection Agency as the entity responsible for implementing all federal and state water pollution control laws and regulations. Ecology, in turn, charges local agencies (cities and counties) with adopting regulations addressing the management of stormwater, protecting soils from erosion, and other activities that impact water quality. Ecology imposes this requirement through the issuance of National Pollutant Discharge Elimination System (NPDES) stormwater permits. In order to assist local agencies with implementation of required regulations, Ecology has created a Stormwater Management Manual for Western Washington (Ecology Manual) that establishes minimum regulations for management of stormwater. Many jurisdictions, including Olympia, use the Ecology Manual as the basis for drafting their own regulations.

Olympia adopted a stormwater management manual, the Drainage Design and Erosion Control Manual (DDECM), in 1992. Since that time, the DDECM has been updated several times to reflect the most

current guidance from Ecology. The current DDECM was adopted by the City of Olympia in 2009 and was developed to achieve compliance with the 2005 Ecology Manual. Both the current DDECM and 2005 Ecology Manual include LID elements and LID best management practices (BMPs) including standards for permeable paving, biofiltration, flow dispersion, compost amended soils, etc. The Olympia DDECM allows and requires certain low impact development techniques. In addition, Minimum Requirement #5 (On-site Stormwater Management), contained within the City's DDECM emphasizes infiltration and dispersion of stormwater within the boundary of development sites, which is another LID technique. Other City codes outside of the DDECM are also important and effective in implementing low impact techniques.

The current DDECM does not contain the most current information for design and maintenance of LID systems. The 2012 Ecology Manual has revised many of the BMPs (LID and other BMPs) to improve their effectiveness in protecting water quality and to meet the intent of the anti-degradation provisions of the water quality standards. Further, the Ecology Manual includes LID BMPs that are not currently included within the DDECM for such techniques as rain gardens, more comprehensive bioretention application, and rainwater harvesting. The 2012 Ecology Manual mandates LID techniques be used on sites with feasible site conditions. In previous manuals, LID was an option, but never specifically encouraged or required. Ecology has also provided a separate LID maintenance guidance manual. Additional information regarding this document is provided in Element 20(Maintenance Standards and Inspections).

In order to comply with the Municipal NPDES permit, revisions to City code and standards that make low impact the preferred and commonly used approach to site development are required.

CODES AND STANDARDS REVIEWED

2009 City of Olympia Drainage Design and Erosion Control Manual (DDECM)
2012 Department of Ecology Stormwater Management Manual for Western Washington (2012 Ecology Manual)

BENEFITS OF DDECM UPDATE

The 2012 Ecology Manual achieves stricter integration of LID than the current Olympia DDECM. The following are some examples:

- Volume 1 Chapters 2 and 3 – One big change between the current DDECM and the 2012 Ecology Manual is within Minimum Requirement #5. In the current DDECM, Minimum Requirement #5 requires on-site management of stormwater but it does not specify use of LID. The current Ecology Manual has changed Minimum Requirement #5 to an LID requirement. It provides both a prescriptive and a performance standard for LID compliance and requires all projects provide LID compliance, where feasible.

- Volume 3 Chapter 3 – The 2012 Ecology Manual has updated requirements for establishing infiltration rates. It also provides detailed steps and requirements for designing infiltration facilities. Appendices to Volume 3 include guidance for hydrologic modeling of LID features.

- Volume 5 –The 2012 Ecology Manual introduces new LID BMP's and updates the BMP's that were previously included based on more recent research and experience in LID.

Olympia Specific Concerns **–** When the DDECM in 2009 was updated, the City did not simply adopt the 2005 Ecology Manual. Instead, the City crafted its own manual based on the 2005 Ecology Manual and also addressed Olympia-specific concerns. In some areas, the DDECM is more stringent than the 2005 Ecology Manual. As an example, the DDECM expanded the long term infiltration rate verification procedure for infiltration systems beyond what was contained within the Ecology Manual. The DDECM also included a requirement for enhanced treatment in wellhead protection areas, large highways, and commercial projects within ¼ mile of a stream. The City reduced the design infiltration rates allowed by the 2005 Ecology Manual by a factor of 2, creating more conservative design parameters. The DDECM also has more stringent threshold triggers for existing site stormwater system retrofits. In addition, many of the Olympia edits to the previous Ecology Manual were clarifications. It was determined that some of the language in the 2005 Ecology Manual was confusing and open to interpretation. City staff provided clarifying language, often in more plain terms, to ensure proper interpretation of the information.

The City must update the current DDECM to be in compliance with the Municipal NPDES stormwater permit.

The City may consider changes, as discussed above, which provide clarification or implement more stringent rules than those contained within the 2012 Ecology Manual. Requirements that are less rigorous than those contained within the 2012 Ecology Manual are not an option.

OPTIONS CONSIDERED

The City must update the current DDECM to be in compliance with the Municipal NPDES stormwater permit. The City's limited options include:

- Option 1: Adopt the 2012 Ecology Manual with no revisions.
- Option 2: Update the current DDECM to integrate the new requirements of the 2012 Ecology Manual (without revision of new requirements)
- Option 3: Update the current DDECM to integrate the new requirements of the 2012 Ecology Manual with revisions addressing key issues specific to Olympia and providing clarification.

ANALYSIS

Option 1 (Adopt 2012 Ecology Manual with no revision) - The Department of Ecology has prepared a manual to incorporate LID and ensure compliance with the Ecology municipal NPDES stormwater permit. Adoption of this manual in total would ensure compliance with LID. In addition, it is more likely to result in consistency among the many local jurisdictions (assuming local jurisdictions also adopt the 2012 Ecology Manual without revision). However, adoption of the Ecology Manual would lose all Olympia specific additions that were made with the last manual update.

Option 2 (Update DDECM – Add new Ecology Information without edits) – This option would retain the Olympia specific information for manual elements that have not changed. However, it would not allow for Olympic specific information to be added to the new requirements. This can be both limiting and potentially create conflict. For instance if a new design requirement refers to a portion of the manual that has been previously modified by Olympia, the reference may create a conflict or may be confusing.

Option 3 (Update DDECM - Add new Ecology information with edits) – This option would provide the opportunity to both retain Olympia specific information for the manual elements that have not changed and provide opportunity for Olympia specific edits of the new requirements. This option provides the best potential for creating a manual that not only meets the requirement to implement widespread use of LID, but also takes into account Olympia specific concerns. It also provides the most opportunity to provide manual clarifications and avoid confusion and misinterpretation of manual requirements.

RECOMMENDATION

Staff recommends Option 3. Option 3 is the only option that preserves previous work that was performed by the City to provide regional specificity to drainage regulations and allows for similar work to be performed on the new regulations.

LID ELEMENT #18: LID SITE ASSESSMENT

OBJECTIVE

To perform site assessments for LID feasibility early enough in the project design and review to fulfill the intent of low impact development and optimize the use of its techniques.

CONSIDERATIONS

For this memorandum, it is assumed that the requirements of Volume 1, Chapter 3 of the 2012 Washington State Department of Ecology's Stormwater Management Manual for Western Washington (DOE Manual) for site assessments will be adopted as part of the updated Drainage Design and Erosion Control Manual (DDECM). The DOE Manual requirements specify what is required for a site assessment and establishes exemption thresholds. This memo provides a discussion of the timing of the site assessments.

"Comprehensive inventory and assessment of on-site conditions and adjacent off-site conditions are important first steps for designing and implementing a low impact development project. This process provides the information necessary to implement site planning and layout activities by identifying current and estimating predisturbance conditions. Specifically, site hydrology, topography, soils, vegetation and water features are evaluated to identify how the site currently processes stormwater. Roads, lots and structures are aligned, and construction practices are implemented to preserve and utilize these features to retain natural hydrologic function."

Puget Sound Partnership: Low Impact Development, Technical Guidance Manual for Puget Sound, December 2012

RELATED ELEMENTS

Element 17 Adopt New DDECM

TRADITIONAL SITE PLANNING TECHNIQUES

Site planning associated with land development typically establishes building footprints, transportation access, parking layout, utility connections, drainage facilities, and landscape elements. Topography, soils, vegetation and water features on proposed development sites are considered during the project review process. However, most critical decisions regarding project layout and design are made prior to the availability of detailed information regarding these features. The City site plan review process works to ensure that basic development regulations can be met before detailed and costly site characteristics are pursued. Natural hydrology is not a prominent factor in this initial planning process. Consequently, as long as zoning district bulk and dimensional standards, critical area buffers and setbacks, and engineering design and development standards are met, the building envelope and associated improvements are assumed to be appropriate for the site regardless of the hydrologic dynamics.

CODES AND STANDARDS REVIEWED

Olympia Municipal Code (OMC) Section 18.77
Engineering Design and Development Standards (EDDS) Section 3.045
Drainage Design and Erosion Control Manual (DDECM) Volume 1, Chapter 3

BENEFITS OF EARLY SITE ASSESSMENTS

The primary premise of low impact development is to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation, use of on-site natural features, and distributed stormwater management practices. Integrating these features into a project design requires they be a primary consideration in the site planning process. Early site assessments allow site features to be understood early in the process of project development.

BACKGROUND

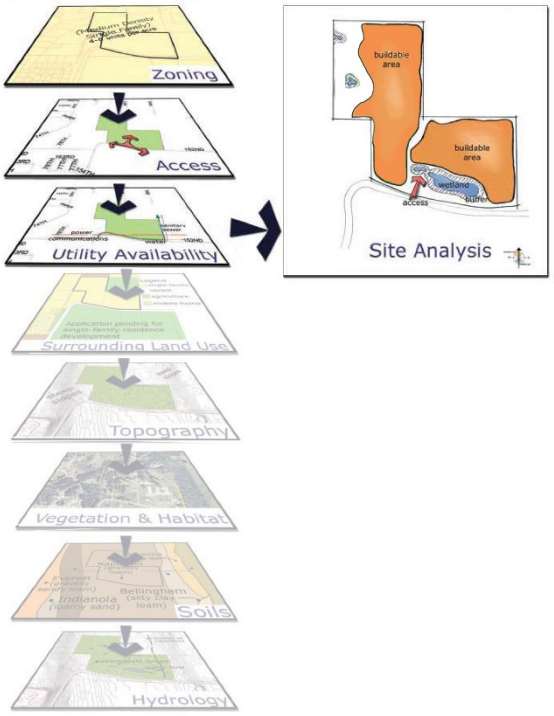
Currently, the primary drivers of site layout and development are the requirements of the zoning code, utility and access availability, and market factors – the needs and desires of the future tenant or purchaser. Project proponents start the development process by evaluating the zoning and development standards to determine whether a project is viable. Typically, very little technical study of the land is done in the preliminary phase of a project.

The City land use review process works to ensure existing development regulations are met, with limited consideration of natural hydrology. Not all land is equally viable for implementation of LID. Soils and the size of parcels are key factors in determining how sites can incorporate LID. Effective LID benefits from soils that readily infiltrate rainfall and runoff. Sites that have glacial till or other low permeability soils benefit from LID techniques that reduce runoff, but cannot infiltrate all runoff on site. Similarly small sites and sites with steep topography will have challenges implementing many of the LID techniques that are land/space intensive. To effectively implement LID, the City and project proponents need to first understand how a parcel can use these development strategies, and which strategies are best applied to what projects.

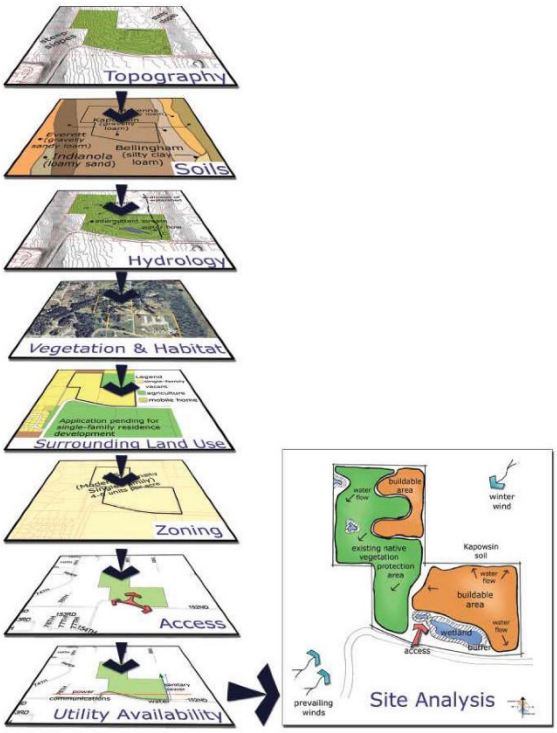
Incorporating LID into the land use review process will require that site characteristics are identified early in the development review process. The analysis needed to determine LID application would be performed prior to submittal of a land use review application to City. With LID, the site planning process will integrate the site assessment findings to produce road and lot configurations that strategically use site features to minimize and isolate impervious surfaces and disperse and infiltrate storm flows. The process requires an initial evaluation that includes:

- A land survey showing existing improvements on the property, topographic features, major and minor hydrologic features, flood hazards, geologic hazards and wellhead protection areas.
- A soils report identifying soil types, infiltration capacity, restrictive layers (if any), and suitability for water quality treatment, and depth to groundwater.
- On projects required to protect native soil and vegetation, a tree and vegetation study identifying vegetation most suitable for preservation.

Currently, project proponents generate conceptual level information that is submitted to the City for an initial review at a presubmission conference. Project proponents are often uncertain as to the viability of a project at this initial stage, and are therefore hesitant to make big investments in technical studies before they are certain these investments are reasonable and in line with the project objectives.



Current development process focuses on zoning, access and utilities before considering hydrologic function



LID development focuses on understanding a site's hydrological functions and creating a development plan that preserves those functions.

HURDLES TO IMPLEMENTATION OF EARLY LID SITE ASSESSMENTS

Changing to an LID focus for site layout and development will present the following challenges:

Increased Up Front Costs – Developers typically want to assess the feasibility of a project with as little upfront costs as possible. Currently, studies like topographic surveys, tree surveys, geotechnical analyses, and stormwater evaluations are not performed until a project is well underway and a site plan already established. The current City process allows for this approach as these studies are not required prior to land use application submittal. In order to effectively review a site plan in the context of LID implementation, information regarding how water and soil interact on a site will be needed. This will increase up front development costs and may influence site selection decisions.

City Review & Coordination Procedures – Once the information regarding existing site conditions, soil types, and trees and vegetation is generated, it must be evaluated to determine a site's suitability for LID. As part of the stormwater site plan (drainage report), a professional will have to evaluate the data and make determinations of the site's feasibility for LID and what best management practices will achieve LID standards for the proposed development. LID site assessment will add cost and time to the development project approval process.

Requirements Vary Parcel to Parcel – Evaluation of each site to determine viability for LID development means that development requirements could vary considerably between parcels that share similar zoning. The density or development coverage achieved on parcels that are not well suited for LID could exceed those required to fully incorporate LID. This could complicate review procedures.

Submittal Requirement Checklists – Each City department maintains checklists of materials required to be submitted for approval of a development. These include the *Application Content Lists* referenced in Olympia Municipal Code Chapter 18.77, the *Plan Checklist* identified in the EDDS, and the *Stormwater Site Plan* analysis requirements in the DDECM. A new checklist, or revisions to one of the City's existing checklists, would be needed to address the LID feasibility requirements.

OPTIONS CONSIDERED

The options considered were as follows:

- Option 1: No change in requirements. LID site assessments will be required only as part of a complete land use review application.
- Option 2: LID site assessments will be required to be submitted after the presubmission conference, but before formal land use review application submittal.

ANALYSIS

As discussed above, establishing an early LID site assessment requirement will result in increased costs imposed prior to project proponents having certainty regarding whether their project concept can be implemented on a particular parcel.

Option #1 (no change) will not require any changes to current City processes. Site assessments will be required per the updated DDECM, but these will be submitted with the stormwater site plan which is submitted as part of complete land use review submittal. It will be up to applicants to perform site assessments early enough in their site planning process to avoid redesign work resulting from later site assessment results. There are many infeasibility criteria for LID design features and applicants may strive to demonstrate infeasibility rather than change a design that is well underway. LID may not be fully incorporated into projects.

Option #2 (require LID site assessments prior to land use review submittal) will require site assessments to be performed prior to formal land use review submittal, likely through requiring a stormwater scoping meeting between the applicants and staff. This will force applicants to perform LID assessments earlier in the site planning process and better ensure that project site designs are created with LID in mind from the beginning.

RECOMMENDATION

Staff recommends Option 2. Option 2 would provide the most potential for sites to be designed to work with site features and maximize implementation of LID. It will reduce the need for redesign work later in the development process.

LID ELEMENT #19: PRE AND DURING CONSTRUCTION INSPECTIONS

OBJECTIVE

To ensure proper installation and function of low impact development (LID) elements through inspection prior to, during and after construction activities.

RELATED ELEMENTS

Element 20 Maintenance Standards and Inspections

CURRENT APPROACH TO CONSTRUCTION INSPECTIONS

Inspectors follow established procedures for inspecting and documenting work being completed under a public works contract or City-issued permit. During the pre-construction conference (pre-con) for the project, special emphasis is usually placed on the installation and maintenance of erosion and sediment control best management practices, and other requirements of the site's construction Stormwater Pollution Prevention Plan (SWPPP) or Erosion and Sediment Control Plan. If the project has federal funding, an additional checklist is used that reviews environmental and adjacent property consideration. Inspection requirements for LID techniques are not specifically called out from other issues; if they are part of the project they are typically addressed in the section of the Pre-Con called "Other Items".

"Protecting native soil and vegetation, minimizing soil compaction, and retaining hydrologic function during the site preparation and construction phases presents some of the most significant challenges within the development process."

Low Impact Development Technical Guidance Manual for Puget Sound, Puget Soun (2012)

For erosion and sediment control (ESC) inspections, inspection and enforcement procedures are outlined in the Erosion and Sediment Control and Inspection and Enforcement Policy. The Phase II Municipal Stormwater Permit requires that the City perform inspections and provide enforcement for infractions.

CODES AND STANDARDS REVIEWED

Engineering Design and Development Standards (EDDS) Chapter 3
Washington State Department of Transportation (WSDOT) Standard Specifications
City of Olympia Stormwater Erosion and Sediment Control Inspection and Enforcement Policy
City of Olympia Construction Inspector Training Manual (Public Projects Only)

BENEFITS OF INSPECTION

In order for LID techniques to be effective, they must be installed correctly. Infiltration facilities need to be protected from compaction and sedimentation. Permeable pavements must be protected from soil,

landscaping materials, and other construction material during all phases of construction. Compost amended soils need to be installed with the correct mix of materials and to the proper depth. Areas designated for preservation of natural vegetation need to be protected from disturbance including removal of soil and/or vegetation. While the contractor has the responsibility for properly installing and protecting LID BMP's during construction, the site inspector helps ensure correct methods are observed and proper installation, protection, and maintenance occurs for the duration of the project.

OLYMPIA CODE AND POLICY ANALYSIS

The requirement for inspections is incorporated into several city codes, including the City of Olympia Engineering Design and Development Standards (EDDS), the Olympia Municipal Code (OMC) and the WSDOT Standard Specifications (adopted into the OMC by reference). These codes typically indicate when inspections are required and for what project types. Inspection procedures are specified within the City of Olympia Stormwater Erosion and Sediment Control Inspection and Enforcement Policy and City of Olympia Construction Inspector Training Manual.

The Construction Inspector Training Manual focuses on inspection procedures and processes. The Stormwater Erosion and Sediment Control and Inspection Policy is similarly focused on procedure, but includes enforcement as well. Specific requirements for inspections of particular types of facilities are not identified in these documents. Inspectors are trained as Certified Erosion Sediment Control Leads.

Access to private properties for inspections is granted by the project permit. Once construction is complete, an operation and maintenance agreement must be signed and recorded between the City and the owner for stormwater facilities. This agreement grants access to the City for inspections to ensure on-going mainenance occurs and stormwater facilities are functioning properly. It also gives the City authority to have maintenance activities performed and then charge the owner for these services if the owner does not perform this work after notification.

Increasing the use of low impact development techniques could result in the increased need for inspection to ensure proper protective measures are observed.

HURDLES TO LID SPECIFIC INSPECTION

This element presents the following challenges:

Increased Frequency and Duration of Inspection – Currently ESC best management practices (BMPs) require inspections prior to construction, during construction and upon completion of construction. It is anticipated that increased use of LID BMPs/ techniques will add a number of additional items to inspection lists, increase the number of required inspections, and make the

inspections longer to conduct. To ensure proper installation of LID facilities, multiple inspections might be needed for the same element to verify correct installation. Ultimately, the number of inspections for sites incorporating LID elements is expected to be higher than a site using standard stormwater practices. This increase in the number of inspections will require additional City and private resources to accommodate. Over time, as LID construction becomes more common and contractors are familiar with the requirements of LID construction, the need for more inspections could diminish.

Increased Need for Enforcement – Enforcement is required when a contractor is not following required procedures. Enforcement, therefore, occurs after improper procedures have occurred, using either a corrective action notice or a stop work notice. Many LID elements are not as effective if improper installation or other enforceable action has occurred. For instance, if an area that is supposed to be preserved as natural vegetation is cleared, that natural area and its associated infiltration benefits cannot be recovered to its original condition. The area can be replanted and compost amended soils placed but this will not provide the same infiltration benefit as a natural, undisturbed area. Also, protecting pervious concrete driveways from becoming storage areas for landscaping materials such as compost or bark can be a challenge. In addition, areas proposed for infiltration may not be suitable for such if compaction of the soil occurs during construction. Mitigation procedures can be implemented but design infiltration rates might not be recoverable. Therefore, in order to protect future LID facility installations, stringent enforcement is needed before damage occurs. Post-infraction enforcement will be more rigorous than currently exercised.

Development of LID Specific Protocols – Given LID features sensitivity to improper installation and maintenance, LID specific protocols for inspection will be required. DOE provides information on both design and maintenance of LID facilities but does not provide guidance on inspection requirements. In order to ensure proper installation of LID BMP's, the City needs to develop inspection protocols including both frequency of inspections as well as features to inspect.

OPTIONS CONSIDERED

The following options were considered for this element:

- Option 1: Continue to use current inspection manuals and procedures without change.
- Option 2: Revise the current inspection manuals and procedures to recognize specific components related to LID elements of a project. Requirements specified for LID inspection should cover pre-construction inspections and inspections during construction.

ANALYSIS

Proper installation of LID elements is essential to their proper function. Therefore, inspection of these facilities is essential to successful implementation of LID.

Option 1 (no change) would maintain the status quo. As with any new concept, it takes time for designers, contractors and inspectors to fully understand proper design and installation. Current manuals do not highlight LID practices, and therefore any use of these techniques would be up to the individual inspector to review as part of other construction inspections. This could result in inconsistent inspection, enforcement and increased liability.

Implementation of Option 2 (update current manuals to include specific information for LID elements) will require updates to the current inspection manuals, Stormwater Erosion and Sediment Control Inspection and Enforcement Policy and Construction Inspector Training Manual, to include specific language regarding inspection procedures for LID techniques. By highlighting the LID elements of a project and the unique inspection needs of those elements, special attention would be paid during their inspection and could also provide better consistency in inspection and enforcement.

Highlighting the LID elements of a project and the inspection needs of those elements, before and during construction should be a top priority of implementing LID.

Development of LID BMP inspection protocols will be needed including pre-construction inspection requirements and inspection requirements during construction. Protocols will also be needed for post installation protection of LID BMP's as construction continues around facilities that are installed in early construction phases.

RECOMMENDATION

Staff recommends Option 2. Option 2 will ensure that inspection procedures and protocols are updated for LID specific requirements. Option 1 would not provide LID specificity for inspections.

LID ELEMENT #20 : MAINTENANCE STANDARDS & INSPECTIONS

OBJECTIVE

To ensure continued performance of LID stormwater systems through proper and sufficient maintenance.

CONSIDERATIONS

To achieve the objective above, the City is planning to adopt guidelines for maintenance of LID facilities. The purpose of the memorandum is to consider whether or not to adopt the Ecology guideline for LID maintenance (Western Washington Low Impact Development Operation and Maintenance Guidance Document). The discussion below addresses the importance of maintenance and the associated challenges as a demonstration of why maintenance guidelines are necessary. Maintenance needs of LID practices will exceed the maintenance needs for traditional methods of stormwater management.

> "Maintenance of LID facilities is essential to ensure that designed stormwater management performance and other benefits continue over the full life cycle of the installation. Some maintenance agreements and activities associated with LID practices are similar to those performed for conventional stormwater systems; however the scale, location, and the nature of an LID approach will also require new maintenance strategies."
>
> *Low Impact Development Technical Guidance Manual for Puget Sound, Puget Sound*

RELATED ELEMENTS

Element 19 Pre and During Construction Inspections

TRADITIONAL APPROACH TO STORMWATER SYSTEM MAINTENANCE

Maintenance of both public and private projects is subject to specific guidelines provided within the Drainage Design and Erosion Control Manual (DDECM). Maintenance of stormwater management facilities can be challenging. Regular, scheduled maintenance does not always occur with the required frequency. For public facilities, this can be the result of insufficient funding and/or limited staffing to conduct maintenance activities. Some maintenance activities occur with regular frequency, such as cleaning of pipes and catch basins to prevent street flooding. Other maintenance, like pruning plants and trees, requires more rigorous manual labor (staff time intensive) and is usually done on a seasonal or scheduled basis.

For private stormwater facilities, vegetation and stormwater ponds can be challenging to maintain. Underground systems with pipes and catch basins are also challenging. The importance of maintaining these facilities is often not understood by the system owners. Olympia codes (DDECM) contain requirements for recording of stormwater system maintenance agreements. Maintenance agreements

have helped improve understanding of the requirements for maintenance, but often this alone is insufficient to ensure all required maintenance occurs regularly. At times, a failed system or City enforcement action is needed to induce system maintenance.

CODES AND STANDARDS REVIEWED

City of Olympia Drainage Design and Erosion Control Manual (DDECM) Volume 1
Western Washington Low Impact Development Operation and Maintenance Guidance Document (Ecology Maintenance Guidance Document)

BENEFITS OF MAINTENANCE

In order for low impact development techniques to be effective, the LID facilities must be properly maintained. Bioretention facilities require management of the vegetation and periodic replacement of soil media. Infiltration facilities need to be monitored for sediment build-up and continued infiltration and drawdown. Permeable pavements need to be cleaned to prevent clogging. Without proper, on-going maintenance the function and benefits of LID facilities will be diminished or lost. The decentralized nature of LID best management practices can make maintenance difficult.

OLYMPIA CODE ANALYSIS

Currently, the requirements for on-going maintenance of stormwater management systems are specified within the City of Olympia Drainage Design and Erosion Control Manual (DDECM Volume 1 Appendices I-G1-G4). Specific checklists for proper maintenance of a variety of stormwater facilities are provided. For public facilities, these maintenance activities are conducted by City staff. Therefore, the ability to provide proper maintenance for all public stormwater facilities is dependent on sufficient funding and staffing by the City.

The ability to provide proper maintenance for all public stormwater facilities is dependent on sufficient funding and staffing by the City.

For private facilities, the requirement for maintenance is established through a recorded maintenance agreement between the facility owner and the City. This agreement requires that a maintenance program be followed, records of maintenance be maintained, and an annual report be provided to the City. This agreement grants the City access to the private stormwater facilities for on-going inspection and authorizes the City to provide maintenance repair if needed (at owner cost). Therefore, the City also has the responsibility of overseeing and enforcing maintenance of private facilities when maintenance is not being performed. This oversight is also subject to sufficient funding and staffing by the City.

HURDLES TO LID ADDITIONAL MAINTENANCE REQUIREMENTS

This element presents the following challenges:

Specialized Maintenance Requirements – LID stormwater facilities have unique features compared to traditional stormwater systems and can have special requirements which make LID facilities more difficult, expensive, and time consuming to maintain. Specialized training for maintenance might also be necessary. For instance, according to the Ecology Guidance Document, the skills needed to maintain a bioretention facility include: landscaping skills, plant identification skills (the ability to distinguish planted species from weeds and invasive species), erosion control knowledge, and operation of specialized equipment. Further, major maintenance could require involvement of an engineer or landscape architect. The use of fertilizers and herbicides is discouraged.

Specialized training for LID system maintenance might be necessary.

Increased Need for Enforcement – Because proper maintenance of LID facilities is crucial to their function, ensuring regular and proper maintenance occurs is essential. On private property, this will require frequent inspection and stringent enforcement by the City.

Financial Impact to City - The maintenance of LID facilities is expected to require more labor hours, specialized training, and is likely to be more expensive than traditional stormwater systems. In addition, the life cycle costs of LID facilities are not yet well known. Therefore, many of the future costs to the City are uncertain. This uncertainty can make budgeting and financial forecasting difficult.

OPTIONS CONSIDERED

LID facilities have specialized maintenance needs. They will only be effective if the City provides LID specific information on maintenance and subsequently requires its use. The purpose of the options listed below is to discuss whether the City should adopt the already established Ecology Guidance Document with revisions to incorporate Olympia specific requirements or create a new Olympia specific LID maintenance manual, and to determine which City code should include the LID maintenance information.

- Option 1: Adopt Ecology Maintenance Guidance Document as written and edit to be Olympia specific.
- Option 2: Provide select maintenance information from the Ecology Manual as an appendix to the DDECM
- Option 3: Develop new City of Olympia stormwater maintenance manual to address maintenance of LID facilities as well as other traditional stormwater management BMPs.

ANALYSIS

Option 1 (Adopt Ecology Guidance Manual – determine if should be edited). The Department of Ecology has prepared a document for operation and maintenance of the LID facilities. Ecology recommends that Western Washington Municipal Stormwater Permittees (which includes the City of Olympia) use the manual when adopting maintenance standards for their LID BMP facilities. As this manual is written for a broad area (Western Washington), it should be reviewed and edited to address conditions that are unique to Olympia. Much like the previous versions of the DDECM, Olympia has a history of revising guidance documents prepared by Ecology and adding additional requirements specific to concerns of the City.

Proper maintenance of LID facilities is essential to their proper function. In order to provide proper maintenance, the City needs to provide maintenance guidance.

Option 2 (Provide Maintenance Information in DDECM) would incorporate new/additional maintenance language from the Ecology Manual into the DDECM. Stormwater maintenance information is currently included within the DDECM Volume 1 Appendix 1G. This option avoids the potential for confusion of the other options by combining all stormwater maintenance information in the same location. New language regarding types of LID facilities that are not addressed in the current regulations would need to be developed.

Option 3 (Develop new Olympia manual) would require the development of a stormwater operation and maintenance manual specifically for Olympia. This would require staff time to research and write such a manual. Any Olympia specific manual would need to comply with existing Ecology requirements. This approach would likely be costly and could duplicate efforts that have already been conducted by Ecology. However, this Option would provide the greatest opportunity to achieve uniformity and set a standard for maintenance of not only LID stormwater facilities, but also for maintenance of the existing infrastructure.

RECOMMENDATION

Staff recommends Option 3. This option would incorporate the updated guidance from the Ecology Manual and allow creation of a new guidance document for operation and maintenance specific to the needs and goals of the City's Storm & Surface Water Utility.

Olympia

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LID ELEMENT #21: VARIANCES, DEVIATIONS AND EXCEPTIONS

OBJECTIVE

Examine the existing provisions and code that require a variance, deviation, or exception process prior to incorporating LID elements into site design in order to remove barriers and encourage the use of low impact development.

CONSIDERATIONS

This element differs from some other elements in that it addresses a process rather than a design technique. Nearly all aspects of LID could be accommodated in existing City codes either though the elimination of the need for a variance, deviation, or exceptions process (if already required), or through the addition of a specified process to utilize a LID element not currently considered in City code.

Variances apply to proposed changes to requirements of the Olympia Municipal Code (OMC) and follow processes mandated by the State. Deviations are proposed changes to the requirements of the Engineering Design and Development Standards (EDDS). Exceptions are proposed changes to the requirements of the Drainage Design and Erosion Control Manual (DDECM).

"Usually, standards are very prescriptive and do not allow much deviation, which can present barriers to effectively integrating LID into a site. Such standards should be reviewed and modified so the LID approach is used and there is enough flexibility to allow the best design possible.

Integrating LID into Local Codes: A Guidebook for Local Governments, Puget Sound Partnership (2012)

TRADITIONAL APPROACH TO USING VARIANCES, DEVIATIONS AND EXCEPTIONS

Typically, development proposals are designed to meet the prescriptive standards outlined in development regulations. Meeting these requirements allows the project to move forward on a clearly understood timeline and schedule. City staff are experienced at efficiently processing these applications. However, when developments vary from City standards, they can run into unknown delays, design costs and administrative procedures which can impact the project schedule, finished product or financing costs.

Sometimes, flexibility is sought in those cases where site conditions complicate the clear application of the regulation. The codes allow a variance or deviation to the requirements, but have outlined impact, safety, operations, maintenance and aesthetic criteria that must be satisfied before allowing the non-standard practice.

CODES AND STANDARDS REVIEWED

OMC Chapters 17.48, 17.52, 18.66, and 18.72 (variances, under specific conditions)
Engineering Design and Development Standards (EDDS) Section 1.050 (deviations from standards)
Drainage Design and Erosion Control Manual (DDECM) Volume 1 Section 2.8 (Exceptions)

BENEFITS OF USING VARIANCES, DEVIATIONS AND EXCEPTIONS TO ACHIEVE LID

Development regulations are adopted by the City to implement the goals and policies set forth in the Comprehensive Plan. The intent is that these code requirements, applied over time and to similar types of projects, will achieve the quality of life the residents expect. When developments request a modification to this standard, development is proposed to occur in a manner that is not otherwise permitted. While sites can have unique characteristics that make the strict application of the code difficult, modifications from codes and standards should be avoided or minimized whenever possible and therefore the threshold for granting these waivers usually includes some type of hardship due to of the physical attributes of the property site.

Ideally, variances and deviations from codes and standards should be avoided or minimized.

However, having an avenue available to consider exceptions and alternatives can provide flexibility, which can be particularly important when implementing new technology or dealing with unusual or challenging physical site conditions. The current method of using variances (OMC), deviations (EDDS) and exceptions (DDECM) is effective in that it clearly outlines the process and establishes the criteria needed from the applicant in order to gain approval of a changed standard. This allows a project and site specific review of the LID technique and helps the City to balance LID with other priorities. However, a secondary permitting process acts as a disincentive to using LID, as delays can increase development costs and add uncertainty in the outcome.

OLYMPIA CODE ANALYSIS

The OMC has distinct standards that dictate building setbacks, maximum building square footage, density, height, maximum lot coverage or impervious area, and other dimensional or visual elements for each zoning district or roadway type. Allowing flexibility in setback and height limitations, or increased residential densities in exchange for reducing impervious surfaces or managing stormwater on-site beyond what is required, could help facilitate use of LID.

Areas of the OMC that allow significant flexibility are the co-housing and cottage housing provisions, which promote clustering, pedestrian amenities and density bonuses depending on the type and mix of housing on the site. The code also authorizes reductions in lot sizes, setbacks and other dimensions by up to 20% to protect environmentally sensitive areas and preserve open space. These approaches do not require variances or other exceptional approvals.

OMC 17.48 addresses subdivision standards that guide the design of new lots, streets, landscaping, storm drainage and tree preservation. As addressed in other elements, there are numerous opportunities to integrate LID to promote clustering, support greater flexibility for setbacks, and provide guidance on using common open space, recreation areas, and streets in a manner that promotes natural hydrology. Existing OMC Chapter 18.04.080(4) provides density bonuses when certain standards are met.

Tables 1A and 1B outline the existing framework for variances from requirements of the OMC and deviations from requirements in the EDDS, as well as new provisions for exceptions outlined in the 2012 Stormwater Management Manual for Western Washington (SWMMWW):

Table 1A: Overview of Current OMC Regulations

	OMC Variances Title 18 Unified Development Code (18.66)	OMC Variances Title 17 Subdivisions (17.52)
Public Notice	Notice to parcels within 300 feet & public hearing	Notice to parcels within 300 feet & public hearing
Approval Authority	Hearings Examiner	Hearings Examiner (concurrent with hearing and decision on preliminary plat)
Appealable	Yes, to Superior Court	Yes, to Superior Court
Review Criteria	A. Before any variance is granted, the Hearing Examiner shall find that the following circumstances exist: 1. That the proposed variance will not amount to a rezone or constitute a change in the district boundaries shown on the Official Zoning Map; 2. That because of special circumstances relating to the size, shape, topography, location, or surroundings of the subject property the variance is necessary to provide it with use rights and privileges permitted to other properties in the vicinity and in the zone in which the subject property is located; 3. That the special conditions and circumstances do not result from the actions of the applicant; 4. That granting of the variance will not constitute a grant of special privilege inconsistent with the limitation upon uses of other properties in the vicinity and zone in which the property is located; 5. That the granting of the variance will not be materially detrimental to the public welfare or injurious to the property or improvements in the vicinity and zone in which subject property is situated; and 6. That the variance is the minimum variance necessary to provide the rights and privileges described above.	No variance shall be granted which would have the effect of granting a special privilege not shared by other property in the same vicinity. Before granting a variance, the hearing examiner shall determine whether the following conditions apply to the requested variance: A. There are exceptional or extraordinary circumstances or conditions which apply to the land referred to in the application which do not apply generally to lands in the vicinity. These include, but are not limited to, size, shape, topography, location or surroundings. B. The granting of the application is necessary for the preservation and enjoyment of substantial property rights of the petitioner. C. The granting of the application will not, under the circumstances of the particular case, affect adversely the health or safety of persons residing or working in the neighborhood of the property referred to in the application and will not be detrimental to the public welfare or injurious to property or improvements in the neighborhood or adversely affect the comprehensive plan. Provided that, to the extent the variance request pertains to Chapter 18.56, planned residential development, or Chapter 18.57, master planned development, that chapter shall apply.

Table 1B: Overview of Current EDDS and SWMMWW Regulations

	Engineering Design and Development Standards, Deviations (1.050)	Stormwater Management Manual for Western Washington (SWMMWW), 2012 (Dept. of Ecology)
Public Notice	No	Yes
Approval Authority	City Engineer	Drainage Manual Administrator
Appealable	No (Currently Amendment Being Considered to Make Deviations Appealable)	No
Review Criteria	A. The deviation will achieve the intended result with a comparable or superior design and quality of improvement; and B. The deviation will not adversely affect safety or operations; and C. The deviation will not adversely affect maintenance and its associated cost; and D. The deviation will not adversely affect the aesthetic appearance; and E. The deviation will not impact future expansion, development, or redevelopment.	The administrator may grant an exception to the minimum requirements if such application imposes a severe and unexpected economic hardship. To determine whether the application imposes a severe and unexpected economic hardship on the project applicant, the administrator must consider and document - with written findings of fact -the following: • The current (pre-project) use of the site, and how the application of the minimum requirement(s) restricts the proposed use of the site compared to the restrictions that existed prior to the adoption of the minimum requirements; and • The possible remaining uses of the site if the exception were not granted; and • The uses of the site that would have been allowed prior to the adoption of the minimum requirements; and • A comparison of the estimated amount and percentage of value loss as a result of the minimum requirements versus the estimated amount and percentage of value loss as a result of requirements that existed prior to adoption of the minimum requirements; and • The feasibility for the owner to alter the project to apply the minimum requirements. In addition, any exception must meet the following criteria: • The exception will not increase risk to the public health and welfare, nor be injurious to other properties in the vicinity and/or downstream, and to the quality of waters of the state; and • The exception is the least possible exception that could be granted to comply with the intent of the Minimum Requirements.

Currently, these three documents have different ways of handling requests for changes from adopted codes. The City does not have a specified process for combined review of variances and deviations requested for a project, and also does not have review criteria that are specifically related to low impact development.

HURDLES TO USING VARIANCE, EXCEPTIONS AND DEVIATIONS

Variances, exceptions and deviations are intended to be infrequently used processes, not a normal aspect of land use planning or municipal engineering. Using these methods to circumvent the minimum requirements within the code is a significant administrative and public process that should not be considered a routine way to implement a "preferred" design technique that is otherwise using Best Management Practices.

The variance, exception, deviation processes are the result of a well-designed approach that staff and developers have familiarity with, and amending the codes to allow additional changes could upset the balance that has been achieved.

Increasing the use of variances increases design and regulatory costs, can prolong the approval process, and can increase a builder's financing costs. Such a process may require additional design and engineering studies, takes more time, which increases the developer's uncertainty and interest charges, and has inherent risk that the variance may not be granted.

OPTIONS CONSIDERED

- Option 1: No change- The existing variance, deviation and exception processes and provisions are adequate to address requests for variations from standards and codes related to low impact development.
- Option 2: Develop a single variance (OMC), deviation (EDDS) and exception (DDECM) process that would apply to all requests for variances, deviations and/or exceptions that are related to low impact development.
- Option 3: Modify the existing provisions in OMC 18.66 and 17.52, EDDS 1.050, and add new Section 2.8 to the Olympia DDECM so they each include their own variance process and review criteria that accommodates LID-related requests.
- Option 4: Incorporate LID into all codes without the requirement for a variance, exception or deviation application.

Combining the public notice and comment periods is one benefit of a single variance application.

ANALYSIS

Option 1 (no change) does not change the type and criteria for variances, deviations and exceptions currently found in the OMC, EDDS and Stormwater Manual. However, LID techniques are not listed as potential reasons for a modification from standards and therefore developments may not be aware that LID use is a possibility. LID implementation also may not be as effective because the options are not coordinated with other code sections.

Option 2 (single modification process) allows for consideration of LID-based techniques in code and standard modifications into a project by incorporating additional review criteria in the code. This approach follows the State's request to make LID the preferred and commonly-used approach to development. Example criteria that support code and standard modifications for the purposes of achieving LID include:

The modification will result in one or more of the following:

a. Innovative site design;
b. Increased on-site stormwater retention using a variety of vegetation and landscape conditions;
c. Retention or re-creation of original natural habitat conditions over a significant portion of the site;
d. Improved on-site water quality beyond that required by current applicable regulations; or
e. Retention or re-creation of pre-development and/or natural hydrologic conditions, and retention or re-creation of forested watershed conditions.

In addition to including LID review criteria, a single application for all requested variances, deviations and exceptions would allow staff to see the entire package of requested LID-related code and standard modifications together. Combining the public notice process and a single decision by the Hearings Examiner could be included in this option. This approach facilitates a coordinated review of the full picture of code variations to ensure that they will work together. Additionally, this approach is more transparent and ensures that the public will see the full set of code and standard variations at once for a project.

A new code section could be added to OMC 18.66 Variances and Unusual Uses (i.e., 18.66.100) that outlines a unified application, single public notice process and a combined review by the Hearings Examiner. Additionally, the new review criteria as stated above would be included. Code language would be added to OMC 17.52, EDDS 1.050 and the new proposed section 2.8 of the Olympia DDECM to point LID-related requests for code modifications to proposed new section OMC 18.66.100.

A consequence of Option 2 is it elevates what might be an otherwise routine administrative review process into a full public notification process which would eventually include a decision by the Hearings Examiner and corresponding appeal timeframes.

Option 3 (update existing processes for LID requests) would update each section but still require a variance, deviation or exception application as needed. LID elements would still be considered a divergence from the accepted and standard practice. This option would also complicate applications that are now solely an administrative process.

Option 4 (incorporate LID into codes so no modifications needed) would update all sections of the OMC, EDDS and DDECM to incorporate LID elements by practice without the need for a variance or additional administrative review mechanism. Minimum intensity standards and dimensional requirements would have to be adjusted throughout the development code to accommodate the use of LID. This option would demonstrate that LID has been fully interwoven into the code and is considered the normal method of review, conditioning and approval.

RECOMMENDATION

Staff recommends Option 4. Option 4 is preferred because it removes administrative barriers to using LID techniques on sites, recognizing that the use of variances should continue to be the exception rather than the rule. Although there is more upfront work from staff, it is clearer to applicants and the public that this is how LID is accomplished in the City.

Option 1 would result in no change in current practice. Options 2 would create one process for seeking modifications to the OMC, EDDS or DDECM. However, since the variance process is a State mandated process, all modifications would have to follow the current variance process. This would include a public hearing and could overcomplicate simple modification requests. Option 3 would provide LID specificity to the current variance, deviation and exception requests but would not necessarily result in an easier process.

LID ELEMENT #22: GREEN ROOFS, RAINWATER REUSE, LID FOUNDATIONS

OBJECTIVE

New building construction that incorporates LID techniques such as green roofs, rainwater collection and reuse, and low impact foundation design.

CONSIDERATIONS

Green roofs and reuse of rainwater reduce peak flows during storm events by detaining runoff. LID foundations preserve the natural soil profile and hydrologic properties within the footprint of a structure. These three elements are evaluated together because they are elements related to building construction and are distinct from the site development considerations discussed as part of other elements.

When considering potential options related to these elements, mandating their use has not been proposed. Mandating LID techniques in building construction such as use of green roofs, rainwater reuse or LID foundations would require a state-approved amendment of the building code. Although building code amendments by local jurisdictions are possible, they must be supported by special circumstances. Given the nature of the issue, a local amendment may not be supportable. However, the City can support and facilitate these techniques on a case-by-case basis as builders and homeowners seek to use them.

"Vegetated roofs improve energy efficiency and air quality, reduce temperatures and noise in urban areas, improve aesthetics, extend the life of the roof, and reduce stormwater flows."

Low Impact Development Technical Guidance Manual for Puget Sound (2012)

TRADITIONAL APPROACH TO BUILDING CONSTRUCTION

Typical foundations excavate out much of the native soil beneath a building. Most roofs are constructed of hard surfaces and drainage systems that convey roof runoff away from the building to detention and infiltration facilities. The focus of these systems is to create safe, livable buildings. Foundations must provide structural support and seismic protection.

CODES AND STANDARDS REVIEWED

International Building Code (IBC)
International Residential Code (IRC)
Uniform Plumbing Code (UPC)

BENEFITS OF USING GREEN ROOFS, RAINWATER REUSE AND LID FOUNDATIONS

Green roofs and rainwater reuse systems slow roof runoff resulting in reduced peak storm flows. Reducing peak storm flows can help prevent storm flooding. Green roofs have the added benefits of

improving energy efficiency and air quality, reducing temperature and noise in urban areas, and can extend the life of the roof. LID foundation systems (also called minimal excavation foundation systems) limit soil disturbance and allow storm flows to more closely approximate natural shallow subsurface interflow paths.

OLYMPIA CODE ANALYSIS

The design standards for green roofs, rainwater reuse systems and LID foundation systems are governed by building and plumbing codes. The City of Olympia has adopted the International Building Code (IBC), International Residential Code (IRC), and Uniform Plumbing Code (UPC) (as amended by the Washington State Building Code Council and City of Olympia). Green roofs, rainwater reuse systems, and LID foundation systems are currently allowed by these codes. Use of these systems generally requires additional engineering and analysis for approval. For instance, a green roof has a much higher weight than a standard roof. Therefore, a green roof requires greater structural support and requires more engineering, analysis and City review than a standard roof.

Building codes are adopted at the State and local level and include State specific amendments. Individual jurisdictions are allowed to amend building codes based on their unique circumstances. Building codes have a 3 year update and re-adoption cycle. Both the State and jurisdiction specific amendments are typically incorporated as part of the adoption cycle, although off-cycle amendments are also possible. Amendments, such as requiring the use of specific LID techniques must be supported by findings of fact that support the need for the amendment to obtain approval. The City of Olympia has adopted some jurisdiction specific amendments - most recently the City obtained authorization to require residential sprinkler (fire suppression) systems.

A green roof has a much higher weight than a standard roof. Therefore, a green roof requires greater structural support than a standard roof.

The City could propose to adopt the International Green Construction Code (IGCC) which emphasizes sustainable construction practices. Although the IGCC does provide requirements for sustainable design and construction, it does not have specialized requirements for green roofs, rainwater reuse systems, or LID foundations that would make review and approval of these systems simpler than currently adopted City codes.

HURDLES TO USE OF GREEN ROOFS, RAINWATER REUSE, AND LID FOUNDATION SYSTEMS

These low impact design strategies present the following challenges:

Additional Design/Construction Costs – Both green roofs and LID foundations require additional engineering analysis and design beyond what is required for standard roofs and foundations. As

discussed above, green roofs are heavier than standard roofs and require greater structural support. LID foundations are elevated above the soil and hence do not have the support of surrounding soil against lateral movement as with traditional foundations. Given that both green roofs and LID foundations have structural support issues that are not standard, their design and permitting require additional analysis to obtain approval. Rainwater reuse systems, depending on how the rainwater will be reused, often require additional analysis and design as well. If roof runoff is to be reused for internal use in the building (i.e., toilet flushing), then dual plumbing systems are needed with overflows and cross connection protections. In addition, the storage facilities (cisterns, tanks, etc.) for the reuse water can be quite large and heavy. Depending on the facility size, specialized foundation support may be required. Given the additional analysis and design that is required, green roofs, rainwater reuse, and LID foundations are more expensive to design and permit than standard systems.

Green roofs, rainwater reuse, and LID foundations are also typically more expensive to construct than standard systems. Given that these are not standard, materials for their construction are typically more expensive. In addition, as with the case of the rainwater reuse systems, additional materials are needed (dual plumbing requires double the pipe and connections) which also increases cost. Finally, contractors are not typically as familiar with the construction techniques required for non-standard systems which could drive construction costs up.

Rainwater reuse systems often involve pumps, filters and other parts that require regular inspection, maintenance and replacement.

Maintenance – Maintenance requirements for green roofs and rainwater reuse systems are different than the maintenance requirements for standard systems. Maintenance activities are not typically something that can be performed by a homeowner and often require professional assistance. Rainwater reuse systems often involve pumps, filters and other parts that require regular inspection, maintenance and replacement. Green roof systems include structural components, waterproofing, drainage layers, soil substrate, vegetation and drains - all of which require inspection to ensure proper operation throughout the life of the system.

Other Challenges – In addition to the above, the three elements considered have these unique challenges:

Green Roofs

- Roofs are also where HVAC and other equipment are often located. In commercial, multifamily, and industrial settings, green roofs must be designed to provide space required for such equipment.

Rainwater Reuse

- Storage tanks could be subject to setback requirements of the zoning code. For small residential lots, meeting setbacks may be difficult.
- Using collected rainwater for irrigation requires storing large volumes of water. Irrigation is typically needed most during the dry season. In the Pacific Northwest, rainwater is most plentiful during the wet season. Therefore, the limiting factor in the effectiveness of the rainwater to be used for irrigation is the availability of storage. The availability of storage is limited by space and cost.

LID Foundations

- The structural capacity of the underlying soil is a limiting factor. Soils that are susceptible to compaction or movement limit the feasibility of LID foundations. This can be particularly challenging in Olympia where new construction must comply with strict earthquake standards.

OPTIONS CONSIDERED

The following options were considered:

- Option 1: No change.
- Option 2: Provide prescriptive checklists for review and approval of green roofs, rainwater reuse, and LID foundations.
- Option 3: Provide incentives for use of green roofs, rainwater reuse, and LID foundations.

ANALYSIS

Option 1 (no change) would maintain the status quo. Green roofs, rainwater reuse systems, and LID foundations are currently allowed within the City of Olympia. New buildings can be constructed using traditional techniques or may propose to incorporate LID components such as green roofs, rainwater collection and reuse systems, or LID foundations. Additional design and analysis of the building plans is typically required in order to incorporate LID building features, depending on the size and nature of the feature being proposed.

LID Foundation at Clearwater Commons in Bothell.

Option 2 (prescriptive checklist) supports the preparation of prescriptive checklists that, if followed, would simplify City permitting for green roofs, rainwater reuse systems, or LID foundation systems through clarification of requirements. Additional design and analysis would be required over standard systems, but the checklist would clarify the requirements and steps to be followed. Providing clarity regarding the requirements would promote use of these systems.

Option 3 (incentives) would provide incentives to use of green roofs, rainwater reuse, and LID foundations. Incentives could include priority review of permit applications, reduced permit fees or utility rates, etc. Given the cost differences of green roofs, rainwater reuse and LID foundations over standard systems, incentives would need to be enticing enough to offset increased costs. Use of incentives is likely to be the most effective way to increase use of LID building features such as green roofs, rainwater collection and reuse systems and LID foundations. While these systems are valuable and can help reduce the amount of runoff generated by buildings and roof area, limited use of the systems due to the complexity of their construction and maintenance and increased cost of installation, will result in relatively minor reductions in runoff city wide associated with this element.

RECOMMENDATION

Staff recommends Option 3. Current code already allows these systems but they are infrequently constructed. Option 1 would result in no change and Option 2 might clarify the process for approval but likely would not increase usage. Option 3 would allow staff to develop incentives that encourage the use of these systems. An incentive strategy would need to be aligned with budget discussions in 2017.