Department of Ecology – Water Quality Program
Development of Low Impact Development (LID) Standards for the Municipal Stormwater General Permits

Technical Advisory Committee Meeting #1
November 2, 2009 – WSU-Puyallup Allmendinger Center, 10:00 – 3:00
MEETING SUMMARY

Goal of the Meeting: This was the first meeting for the Technical Advisory Group (TAC). The purpose of the meeting was to begin discussion of a working definition for LID, the goals of LID, and LID techniques and development principles.

AGENDA

Introductions and Agenda Review

Ecology thoughts on permit requirements based on performance standards and related Committee input

- Relationship of: LID Goals – Implementation Scales – Performance Standards by Land Use types – Applicable LID Techniques and Principles (discussion of Ecology draft diagram)

The definition of Low Impact Development

- The ultimate goal of LID— overall objectives

LID Techniques and Development Principles that can be used to achieve overall objectives

- What functions do they provide?
- Which apply to the site/subdivision scale, which to basin/watershed scale?
- Approach for upcoming discussion of barriers, feasibility, performance standards

Next Meeting — Agenda and preparation

ATTENDEES

A list of attendees is provided at the end of this meeting summary.

TRANSCRIPTION OF FLIP-CHART NOTES

The meeting summary provided here is a transcription of the flip-chart notes taken by Kate Snider during the meeting. This does not provide a full documentation of the dialogue, but provides a record of the primary input received from the attendees.

PERMIT REQUIREMENTS BASED ON PERFORMANCE STANDARDS

Ed O'Brien provided a summary of Ecology's thoughts on how LID could be implemented in the new permitting process through performance standards. This followed the chart distributed in advance materials.

Ecology suggests that the municipal stormwater permits could incorporate hydrology-related performance standards that municipalities adopt and enforce for new development and redevelopment. The permit could also require revision of local development-related codes and rules for incorporation of LID principles.

Different performance standards could be set for differing land use types and densities. Performance standards would be set in consideration of: 1) the feasibility of LID techniques and principles for the development type and site; and 2) time frames for adoption and implementation of LID techniques/updated development standards by local governments. The standards could become more stringent over time.

Examples of Performance Standards include:

Hydrologic options such as:
- Criteria based on a flow duration curve; or
- A minimum reduction in detention pond

Site options such as:
- A reduction in volume of runoff.

Committee Discussion of Performance Standards as Permit Requirements

- Are current modeling tools accurate enough to model typical hydrology rather than peak flows? Accurate enough to set performance requirements based on the model?
- How would we verify the performance relative to various performance standards?
- Performance standards would need to be relatively easy to implement and monitor
- Western Washington Hydrologic Model and the concept of 'predevelopment runoff calculations' has flaws
- Performance standards should match real predevelopment runoff which in most cases is zero
- Be careful with a volume based standard for urban and redevelopment conditions
- Need to be careful with the different divisions of land use types used to define performance standards
- The AHBL work had more divisions for types of land use and performance standards. It comes down to how much LID is required for these different categories
- How much LID at different scales and at different densities should be required?
- PSP used a sliding scale

- Western Washington Stormwater Manual approach assumes that if the developer uses the identified BMPs then the requirements are met – this is very different than meeting a performance standard – conundrum
- Would have to quantify the effects of the BMPs to meet set performance standards
- Presumes we can figure out how each technique should be modeled to figure out how it meets performance standard
- Much clearer for developer to follow the design guidelines in the Puget Sound LID guidance manual
- Design guidance is critical
- Also need to allow for innovation
- Could address innovation and changing practices by updating the LID manual periodically
- Consider both alternatives – either follow the design guidance or implement individual monitoring relative to performance standard
- Prefer updating design guidance frequently so individuals don't have to monitor
- If Ecology doesn't do guidelines then municipalities will need to do them
- It would be better if a smarter broader group develops design guidelines and expectations for performance of BMPs
- Multiple models are available and can inform what performance standards are feasible for different LID functions
- There is a lot of good modeling/monitoring information available – both predevelopment and post development
- Information is available regarding the performance of different techniques (Herrera and WSU can provide)
- Have a system that provides for needs of both parties wanting development standards and BMPs to implement, and more sophisticated clients who can monitor
- Industry and Port perspective – discharge to non-flow control water bodies has not been discussed. Treatment requirements of industrial permits for water quality may require more than LID
- LID likely applied in concert with traditional stormwater controls for larger events

DEFINITION OF LID AND GOALS OF LID

The materials provided in advance of the meeting included examples of definitions of LID and LID goals used by other organizations. The summary below documents the input provided by committee members and the public attendees.

Committee Input – LID Definition and Goals

- Curtis and Tracy provided an additional handout of possible definitions of LID that they developed.
    - Low-impact development is a stormwater management strategy that emphasizes conservation and use of on-site natural features, site planning and distributed stormwater management practices that are integrated into the project design to more closely mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID strategies can be applied to new development, redevelopment, urban retrofits, and infrastructure improvements to protect aquatic resources.
    - Low –impact development is a stormwater management strategy that uses the integration of site design and planning techniques emphasizing conservation and use of on-site systems and practices to more closely mimic pre-development hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID strategies can be applied to new development, redevelopment, urban retrofits, infrastructure improvements and revitalization projects to protect aquatic resources.
- Conservation and use of onsite natural features
    - Emphasizing conservation
    - For both site and basin scale
- Site planning and distributed stormwater management
    - Adjacent to where the stormwater is generated
    - How change with increased impervious % (urban areas and redevelopment)?
    - Does ‘redevelopment’ need a different LID definition
- Integrated into Project Design
- ”More closely mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration” – this is what is most important
    - Mimic natural process of that location, specific to the site
    - Stormwater management strategy
    - Important to address both site scale and basin scale
- What does ‘more closely mimic’ mean?
    - Is it the percentage of infiltration versus evapotranspiration?
    - The change in percentage of infiltration affects streamflow. Cannot shift dramatically from evapotranspiration and infiltration without affecting streamflow. Reference to the work of Derek Booth in the late 1990s
- Most important issue is – how does the project match natural hydrologic flows?
- Can one definition cover all issues or are different definitions for site/subdivision scale and basin scale?

- Suggest two different definitions because there is only so much you can do at the site/subdivision scale. Different techniques are under consideration for the different scales
- It's important to be explicit at both scales. First generic, then more specific when applied at site/subdivision scale
- Should the definition include the term 'more closely mimic' or just 'mimic'? Some believe it is impossible to actually 'mimic' natural hydrologic function. We can promote it but not truly match (for example: it's not possible for a developed area to mimic the transpiration percentage of a forested area)
- Possible term for the definition -- 'strive to mimic'
- The amount possible to really mimic in performance standard may vary by basin versus site scale and with land use type
- There are concerns regarding the potential to implement LID at the basin scale…should basin goals flow down into site/subdivision requirements?
- Clarify that all BMPs don't have to meet all of the goals
- Account for water reuse and infiltration facilities, etc
- There are projects that have been constructed and have achieved the goal of "mimicking natural hydrologic function" if the existing pre-development conditions are well defined
- The flow control discussion is not separable from water quality. The only way to achieve water quality is to greatly reduce the quantity of water discharged
- Water quality is part of the goal of LID
- Providing the treatment function without hydrologic function is not LID.
- Do sites that discharge to flow control exempt waters require LID for water quality outcome? The committee needs to discuss receiving waters that are exempt from flow control requirements
- Concerned regarding the reference to modeling in the LID Goal statement, and that it may be impossible to meet the goal "maintain and enhance"
- Goal – focus on the site hydrology, water quality as additional benefit
- Need to define separate requirements by density or zoning definitions?
- Concerned about distinction between low and high density areas – need to be looking at aggressive standards. There are opportunities to meet very high standards within the Urban Growth Area
- Basin planning - has to be a jurisdictional planning effort, not in a development permit. Need to better understand relationship with GMA
- Use a mix of techniques. Consider offsite solutions within basin for urban areas, so that goals are met for basin

- Water quality is a benefit. LID techniques used solely for water quality are LID techniques and should be part of LID
- We have the ability to meet zero discharge – actual site conditions will determine
- Need to define "higher density"
- Instead of different performance standards for different land uses and densities, we could have one standard with different feasibility criteria
- Consider starting with high standard and provide flexibility downward using feasibility and timeline for code adoption
- Constraints for selection of building and landscape materials to reduce release of toxic substances
- Look at raw and redeveloped sites equally – should be encouraging redevelopment rather than new

Public Input – LID Definition and Goals

- Phase 2 permittee - concerned about the definition at the basin scale. Requirements must be passed thru – each basin opportunities and conditions are very different. Would different performance standards be set for different basins?
- "More closely mimic" – eliminate the word "More" – unclear what comparing to, not necessary to be comparative
- Definition and goals of LID should consider cost and/or feasibility component in the definition
- Should be able to use to use traditional water quality treatment at non-flow controlled discharges, if better. Many locations infiltration not possible due to land use, contaminated soils, etc
- The existing ecological value of watersheds today are different from basin to basin. Unless specific requirements are set for each basin, then how do we set any requirements at the basin level? We can't use King County as model. We need to understand the resources we are protecting for each basin
- Add ancillary benefits to the definition, for example the water quality benefit
- A better explanation of "mimic" is needed
- Don't exclude other BMPs that provide LID functions

LID TECHNIQUES AND DEVELOPMENT PRINCIPLES

The materials provided in advance of the meeting included a compilation of LID Techniques and Development Principles at both the site-subdivision scale and the basin scale. The summary below documents the input provided by committee members and the public attendees.

Committee Input

- Are centralized infiltration facilities LID?
- There should be an order of preference
- The City of Seattle Green Infrastructure program has defined a hierarchy between green and traditional stormwater management
    - Regional infiltration facilities are not in the 'green' category
    - Requires use of those green techniques that have a higher level of reliability to maximum extent feasible
- Consider the role of underground injection rules
- Is digging down into more permeable layers to increase infiltration appropriate to meet high impact development goals?
- Add preservation of vegetation and soil structure as a technique
- PSP has captured native vegetation as 'dispersion' function
- Techniques = engineered system vs. development principle
- Maintain existing vegetation is important– could be basin scale overall or project scale measurement. Require preservation or restoration of a certain percentage of natural vegetation
- Site planning and development principles are primary tools
- Flow control vs Water Quality treatment:
    - Does bioretention with an underdrain discharging to stormdrain meet LID goals?
    - (that should be called biofiltration)
    - How much infiltration is required for LID?
- Consider including bioretention with flow control devices, such as high level overflow – achieves infiltration goal
- Does mimic 'as close as possible to natural function' mean maximum infiltration?
- Sites with glacial till can mimic existing conditions, without much infiltration
- Propose allowing no overland flows to water bodies
- Use LID where feasible – when not feasible go to other systems (the green infrastructure hierarchy concept)
- Don't eliminate potential use LID for water quality alone
- There may be land use or locations where infiltration doesn't make sense but water quality benefits before discharge do
- Performance standard is hydrology based although water quality is an additional benefit
- Hydrologic standard - flow based or volume based?
- Standards different for industrial vs non-industrial developments

- Development principles are actions municipalities could take to remove barriers to LID
- Don't just reduce impervious surface but also to disconnect impervious surface from conveyance and discharge
- Development Principles –
    - Much more difficult to implement
    - Elected official concerns - If considering road and development standards, higher officials will need to be brought in
- "Vegetated Channels for Conveyance": Conveyance is not priority in new greenfields development, but when conveyance is required, vegetated channels for conveyance are preferred
- Flexibility with zoning and building types – clustered housing/townhome complex etc. housing types and building heights flexibility to facilitate LID
- Preferentially locate detention ponds in areas with the best soils
- Add tree planting and retaining vegetation to LID techniques
- Add infiltration trenches to LID techniques
- Clarify prioritization of use of different techniques
- Clarify different requirements for development and redevelopment

Public Input

- The density of road network and road crossings of streams is a strong indicator of health. Consider planning requirements for road networks and layouts to limit stream crossings
- Describe how to best use modeling to evaluate alternatives
- Make landscape requirements for development integrate stormwater functions to do double-duty
- Consider requirements for spray irrigation from storage pond for evapotranspiration
- Consider principle of offsite mitigation
- Heavy commercial/big box and industrial areas are high use, high pollutant sites - concern about use of porous materials at loading dock type area
- Require intensive development focused areas to promote basin conservation
- Remember that the ruling requires the removal of barriers to facilitate LID
- Development principles should be applied for all developments
- Reduce design speed would help change road standards

PREPARATION FOR NEXT TAC MEETING

- The focus of the next meeting is LID practices that apply to the site/subdivision scale:
    - Identify barriers/constraints to implementation, and discuss ways to remove or reduce them, identify their level of severity
    - Identify criteria for determining feasibility for site/subdivision scale practices – prioritizing those defined as implementable in the near-term
    - Discuss minimum performance standards that could be utilized to set requirements and measure effectiveness

Committee Suggestions:

- Categorize further discussion of techniques and performance standards by land use types and density, development vs. redevelopment
- For each category, discuss barriers, feasibility, performance standards
- Focus on the technical issues that impact feasibility
- Significant time and focus on performance standards is important

Homework and Material to Provide and Review Before Next Meeting

- Develop a working definition of LID for next meeting (homework for Floyd|Snider)
- Have as many options for performance standards as possible out early and available to the committee before the next meeting
- Provide City of Seattle green infrastructure construction guidance. They have defined the maximum extent feasible and green development
- Provide Herrera and WSU info regarding performance of BMPs
    - Curtis will provide slides of summary talking points
- Provide APWA feasibility matrix
- PSP document re: LID barriers
- (these last two items are currently available on Ecology's LID website)
- Committee members should receive these items ahead of time, and review before the meeting. At the meeting, there can be a brief overview and Q&A prior to the working discussion

Attachment 1
Meeting Attendees

Technical Advisory Committee	
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Development of Low Impact Development Standards
Advance Materials for Technical Advisory Committee Meeting #1
November 2, 2009

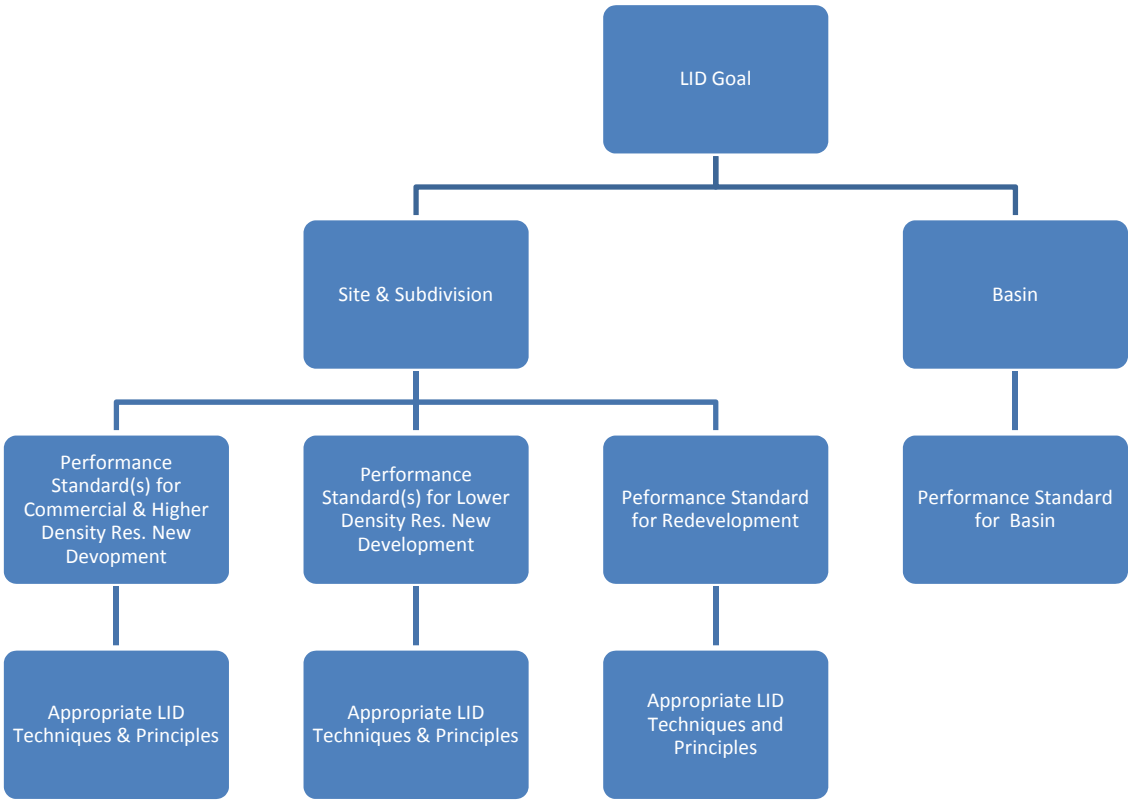
These materials are provided to support Technical Advisory Committee preparation for the November 2 meeting.

These are preliminary, draft materials compiled by Ecology, just to stimulate discussion.

1. Ecology's thoughts re: permit requirements based on performance standards
2. Definitions of Low Impact Development
3. Goals of Low Impact Development
4. Preliminary list of site and subdivision scale LID techniques and development principles
5. Preliminary list of basin-scale LID techniques and development principles

Permit Requirements Based on Performance Standards

Ecology suggests that the municipal stormwater permits could incorporate hydrology-related performance standards that municipalities adopt and enforce for new development and redevelopment. The permit could also require revision of all local development-related codes and rules for incorporation of LID principles.



Site and Subdivision Performance Standards may be set in consideration of:

- the feasibility of LID techniques/principles for the development type and site; and
- time frames for adoption and implementation of LID techniques/updated development standards by local governments. The standard may become more stringent over time.

Basin-level Performance Standards may be set in consideration of:

- the amount of existing development
- the beneficial uses that are to be restored and maintained

Definitions of Low Impact Development

1. USEPA: http://www.epa.gov/owow/nps/lid/

   LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product. There are many practices that have been used to adhere to these principles such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrologic and ecological functions. LID has been characterized as a sustainable stormwater practice by the Water Environment Research Foundation and others.

2. LID and “Green Infrastructure"

   Green infrastructure" is a relatively new and flexible term, and it has been used differently in different contexts. However, for the purposes of EPA's efforts to implement the Green Infrastructure Statement of Intent, EPA intends the term "green infrastructure" to generally refer to systems and practices that use or mimic natural processes to infiltrate, evapotranspirate (the return of water to the atmosphere either through evaporation or by plants), or reuse stormwater or runoff on the site where it is generated. Green infrastructure can be used at a wide range of landscape scales in place of, or in addition to, more traditional stormwater control elements to support the principles of LID.

3. Low Impact Development Center: http://www.lowimpactdevelopment.org/

   LID is an ecologically friendly approach to site development and storm water management that aims to mitigate development impacts to land, water, and air. The approach emphasizes the integration of site design and planning techniques that conserve natural systems and hydrologic functions on a site. Specifically, LID aims to:

   - Preserve open space and minimize land disturbance;
   - Protect natural systems and processes (drainage ways, vegetation, soils, sensitive areas);
   - Re-examine the use and sizing of traditional site infrastructure (lots, streets, curbs, gutters, sidewalks) and customize site design to each site;
   - Incorporate natural site elements (wetlands, stream corridors, mature forests) as design elements; and
   - Decentralize and micromanage stormwater at its source.

4. Low Impact Development Center: http://www.lowimpactdevelopment.org/

> "Low Impact Development is a new comprehensive land planning and engineering design approach with a *goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds.* This design approach incorporates strategic planning with micro-management techniques to achieve superior environmental protection, while allowing for development or infrastructure rehabilitation to occur."

5. Puget Sound Partnership/WSU Pierce County Extension: Low Impact Development Technical Guidance Manual for Puget Sound

> "A stormwater management and land development strategy applied at the parcel and subdivision scale that emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely mimic pre-development hydrologic functions."

Goals of Low Impact Development

1. Section 1.4.1 of the LID Technical Guidance Manual for Puget Sound

   "…to prevent measurable harm to streams, lakes, wetlands, and other natural aquatic systems from commercial, residential, or industrial development sites. The impact to receiving waters (and determining if a project has achieved the above goal) is estimated by hydrologic models and measured by monitoring surface and ground water quality and quantity, and biological health."

2. Washington Dept. of Ecology 1st draft as published in the call for nominations to the LID committees

   Minimal hydrologic changes that do not have an appreciable effect on the natural hydrologic cycle; achievement of surface and ground water quality standards in the receiving waters; maintenance of the designated beneficial uses.

3. Low Impact Development Center

   "…*maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds."*

Preliminary List of Site and Subdivision Scale LID Techniques and Development Principles

LID Techniques from Chapters 6 & 7 of the ***Low Impact Development Technical Guidance Manual for Puget Sound***

- Permeable Pavements
  - Sidewalks and Patios
  - Driveways
  - Roads
- Bioretention/Rain Gardens
  - Site/Shared sites
  - Public Right of Way
- Soil Quality and Depth
- Dispersion
  - Partial dispersion
  - Full dispersion (no surface runoff)
- Reverse slope sidewalks
- Minimal Excavation Foundations
- Vegetated Roofs
  - Extensive
  - Intensive
- Rainwater Harvesting

Development Principles adapted from ***Better Site Design: A Handbook for Changing Development Rules in Your Community***, Center for Watershed Protection

- Residential Streets and Parking Lots
  - Reduced Street Width
  - Reduced Street Length
  - Reduced Right-of-Way Width
  - Less Cul-de-Sac use; reduced radius
  - Vegetated Open Channels for conveyance
  - Maximum Parking Ratio Limits
  - Lower Parking Code Requirements

Parking Lots – reduced stall size, efficient lanes

- Parking Structures and Shared Parking
- Parking Lot Runoff treatment in bioretention, strips, and islands

Lot Development

- Open Space Design with clustered small lots
- Smaller Setbacks and Narrower Frontages
- Sidewalk placement and widths
- Shared Driveways & Alternative surfaces
- Open Space Management

Conservation of Natural Areas

- Create buffers along all perennial streams to include 100-yr floodplain, steep slopes, wetlands
- Stream buffers preserved or restored with native vegetation
- Restrict clearing and grading to building footprint, access routes, and fire protection needs
- Conserve trees & other vegetation by planting additional vegetation, clustering tree areas, promoting native vegetation
- Employ incentives such as density compensation, tax reduction, by-right open space development
- No unmanaged stormwater to wetlands, sole-source aquifers, or sensitive areas

Preliminary List of Basin-Scale LID Techniques and Development Principles

Preliminary list items adapted from Better Site Design: A Handbook for Changing Development Rules in Your Community, and "Effects of Urbanization on Small Streams in the Puget Sound Lowland Ecoregion," May et al, 1997

Limits on total clearing and grading in a basin. Preservation of a high percentage of the basin in native vegetation.

Limits on total effective impervious area

Buffer widths on all streams not just streams regulated by the Shoreline Management Act

Quality stream buffers with mature, native coniferous forest and few road crossings

No development in 100-year floodplain

Protect and enhance headwater wetlands and off-channel riparian wetlands

Replanting of trees and native vegetation

Preference or mandatory use of infiltration systems for concentrated stormwater management

Preferentially locate development on soils with higher infiltration rates

Application of most of Site & Subdivision scale techniques and principles to maximize infiltration and help meet basin targets for native vegetation retention and effective impervious surfaces

Infill and redevelopment encouraged to reduce creation of new impervious surfaces

Basin-scale hydrologic modeling to predict hydrologic changes under various possible development and land management strategies