Central California Municipal Regulatory Update Assistance Program

[MRUAP]

SESSION TWO

WEBINAR PROTOCOL:

- If you have feedback, please use the icon pull down menu in the lower left hand corner of your screen. It looks like a figure of someone wanting to hold his/her hand up.
- To see a larger version of the presentation, select the "fill screen" button on the lower right corner of the whiteboard. You can toggle between full and regular screen size
- Questions can be posed in the chat box

Questions may not be answered during the live webinar, but we will be keeping a complete list of questions that will be responded to afterwards

Copies of the presentation with notes will be made available by Darla Inglis after the session

objective

The MRUAP TRAINING SERIES is intended to:

Provide staff of local jurisdictions with the tools to:

review,

revise, and

present regulatory language addressing hydromodification control practices for consideration and adoption by their elected officials.

INTRODUCTION

recap

SESSION ONE

- Hydromodification Control and LID
- Project Road Map
- Topics for Updates to Codes and Standards
- Wrap Up

INTRODUCTION

overview

SESSION TWO

- Gap Analysis Report
- Developing Draft Regulatory Language and Standards
- Developing/Assembling Documentation to Support the Adoption Phase
- Integrating Maintenance & Enforcement into Development Controls
- Wrap Up

INTRODUCTION

roles & resources

AHBL

has assisted nearly 40 Phase II NPDES communities integrate hydromodification control standards and LID into local codes and regulations.

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The Central Coast Regional Water Quality Control Board

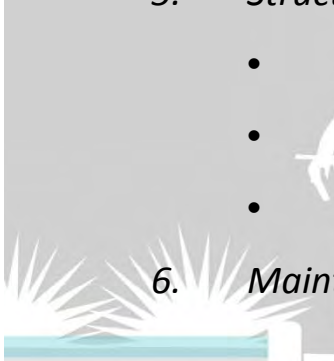
The UC Davis Extension, LID Initiative

INTRODUCTION

objective

SESSION TWO is intended to discuss the "heavy lifting" involving updating your codes and standards including:

1. *Regulatory language hindrances*
2. *Hydromodification control requirements (performed under Joint Effort)*
3. *Applicability and Exemptions/Feasibility Criteria (performed under Joint Effort)*
4. *Non-Structural Practices*
   - *Site Assessment*
   - *Clustering*
5. *Structural Practices/Design Specifications*
   - *Landscaping and vegetation*
   - *Streets*
   - *Parking Lots*
6. *Maintenance*



SECTION ONE

prepare a GAP ANALYSIS REPORT

objective

1. ***Regulatory language hindrances***
2. *Hydromodification control requirements (performed under Joint Effort)*
3. *Applicability and Exemptions/Feasibility Criteria (performed under Joint Effort)*
4. *Non-Structural Practices*
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prepare a GAP ANALYSIS REPORT

objective

The intent of this section is to provide local jurisdictions with a background into how other jurisdictions have ***evaluated*** *their codes and regulations.*

prepare a GAP ANALYSIS REPORT

objective

Preparation of a gap analysis can serve as an important tool in identifying and prioritizing the wide array of codes and standards that may need to be amended or prepared in order to integrate hydromodification control standards and LID into a jurisdiction's development controls.

- *Illustrate how codes are analyzed for impediments to the integration of hydromodification control and LID standards*
- *How the gap analysis tool can be used for future code amendments*

prepare a GAP ANALYSIS REPORT

benefits

The value of analyzing the gaps between existing codes & standards and the goals of hydromodification control and LID:

- **IDENTIFYING KEY PROVISIONS** in existing regulatory codes, standards and general plan that may conflict or pose impediments to the adoptions of hydromodification control measures.

prepare a GAP ANALYSIS REPORT

benefits

The value of analyzing the gaps between existing codes & standards and the goals of hydromodification control and LID:

- Ascertaining amendments and/or new chapters that could be developed to **FILL GAPS** in the existing code and meet project objectives.

prepare a GAP ANALYSIS REPORT

benefits

The value of analyzing the gaps between existing codes & standards and the goals of hydromodification control and LID:

- **PRIORITIZING** those elements in the engineering, planning, and building codes and standards that represent the greatest opportunities for achieving the hydromodification control standards = “best bang for the buck”

prepare a GAP ANALYSIS REPORT

topics

Topics that should be analyzed when performing a gap analysis:

- Landscaping, native soil preservation, street landscaping, etc.
- Impervious surface standards (minimizing)
- Bulk and dimensional standards
- Clearing and grading standards
- Engineering and road standards
- Parking
- Design guidelines/standards
- Stormwater management

prepare a GAP ANALYSIS REPORT

GAP ANALYSIS EXAMPLES - ONE

Code Reference	Category: Consideration	LID Aspect	Description	LID Hindrances and Opportunities
13.10.040	**LID BMPs**	Runoff quality, flow and volume control	In 13.10.040, Newcastle adopts the 1998 King County Surface Water Design Manual and subsequent amendments as the surface water design manual for the city.	Chapter 5 of the 2009 King County manual introduces the concept of LID. The King County manual includes a number of LID strategies for flow control, but includes only 1 LID option for stormwater quality control (biofiltration). Assuming Newcastle has favorable soil conditions for bioinfiltration, it would help if Newcastle could add code recommendations/allowances/requirements for bioinfiltration for stormwater quality control.
13.10.060, 13.10.070	**General application of LID**	Runoff quality, flow and volume control	These Newcastle codes address drainage review thresholds and requirements, and also references the 1999 Draft Washington State Department of Ecology's Stormwater Management Manual.	Overall the requirements are good. The 2005 DOE manual is the most current and better supports LID approaches than the 1999 draft DOE manual. References to the 1999 Draft DOE manual should be updated or indicate "as amended".
13.10.080	**General application of LID**	Runoff quality, flow and volume control	This code addresses the concept of special drainage requirements in erosion hazard areas or in areas that drain directly to Lake Washington.	Indirectly, this code generally supports the concept of LID. If Newcastle develops specific LID recommendations or requirements, they should be referenced in this code. For AHBL's code review, it would be helpful to have a copy of the map showing the special drainage requirement areas.
13.15.010	**Fees**	LID incentives	This code states that parcel owners shall pay fees for stormwater service, whether the property is occupied or vacant.	Depending on how LID requirements are structured in Newcastle, there may be opportunity to provide fee-based incentives for LID projects.
15.10	**LID BMP: Pin Foundations**	Runoff volume control	The code adopts the international building code	Current code does not preclude use of pin foundations. Code revisions that explicitly include pin foundations would better support the LID approach.
15.75.060	**LID BMP: Vegetated Roofs**	Runoff flow and volume control	This code provides roof and ground snow load requirements	The code is not a hindrance to LID, but if Newcastle wants to encourage use of vegetated roofs, the load requirements may need to be increased. Extensive vegetated roofs generally require an additional 15-40 lbs/sq ft load capacity. Intensive vegetated roofs require around 150- 200-lbs/sq ft, depending on planned use activities and landscaping.
17.40.040	**General application of LID**	Site planning, native vegetation preservation, minimize total imperviousness, runoff volume, flow, and quality control	This code establishes the permit process and standards for planned unit developments (PUDs)	This is an excellent resource for the City of Newcastle in establishing a LID approach. The existing code generally supports the concept of LID. It could be used as the basis of a stand-alone LID chapter for both residential, mixed-used, and commercial development.
17.40.050	**Site Planning in general**	Clustered development, minimize total imperviousness	This code states that there are no minimum site areas required for PUDs	This code supports LID site planning approaches.
17.40.060(B)1	**Site Planning: Minimize curb & gutter**	Minimize total imperviousness, runoff volume and flow control	This code allows applicants to request a modification of NMC 17.40.090 for PUD project applications. NMC 17.40.090 describes minimum street design standards which in most cases require curb and gutter	Curb and gutter concentrates surface flows, increasing effective imperviousness. Where possible, runoff should be dispersed to open areas, or diverted to infiltration facilities. Where infiltration is not possible, runoff should be diverted to biofiltration areas for water quality treatment before final disposal to the storm sewer system. Requiring applicants to request modifications to standard curb and gutter requirements can be a subtle hindrance to LID. It is preferable to provide separate LID standards that can be used without obtaining special approval.

GAP ANALYSIS EXAMPLES - ONE

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GAP ANALYSIS EXAMPLES - ONE

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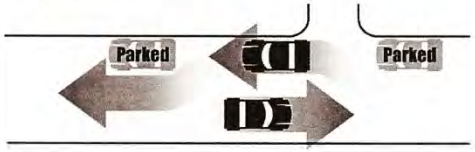
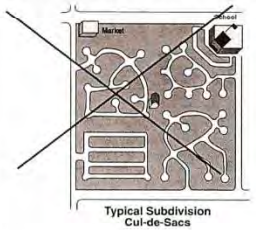
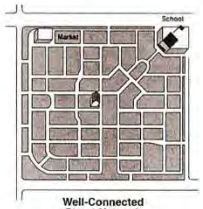
GAP ANALYSIS EXAMPLES - TWO

LID DEVELOPMENT FEATURES REVIEW

Development Feature Criteria	Standard	Opportunity to Improve
Street Width		
Is the minimum pavement width allowed for streets in low density residential developments that have less than 500 daily trips (ADT) between 18 and 22 feet? Narrow streets reduce the amount of impervious cover, thereby reducing the volume and rate of runoff generated from the street. Area gained by narrowing street can be used for stormwater treatment and/or absorption.		
At higher densities, are parking lanes also allowed to serve as traffic lanes? Allow one shared travel lane (about 14 feet in width) to serve traffic flowing in both directions in low volume single family residential neighborhoods.  Driveways typically provide gaps in parking adequate to serve as pull-outs, but additional parking restrictions may be required.		
Street Length		
Do street layout standards promote the most efficient street layouts that reduce overall street lengths?  Typical Subdivision Cul-de-Sacs  Well-Connected Street Network		

GAP ANALYSIS EXAMPLES - TWO

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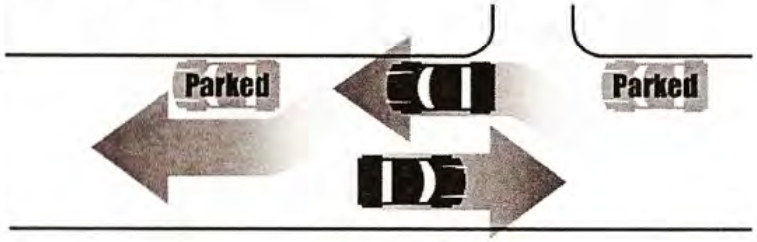
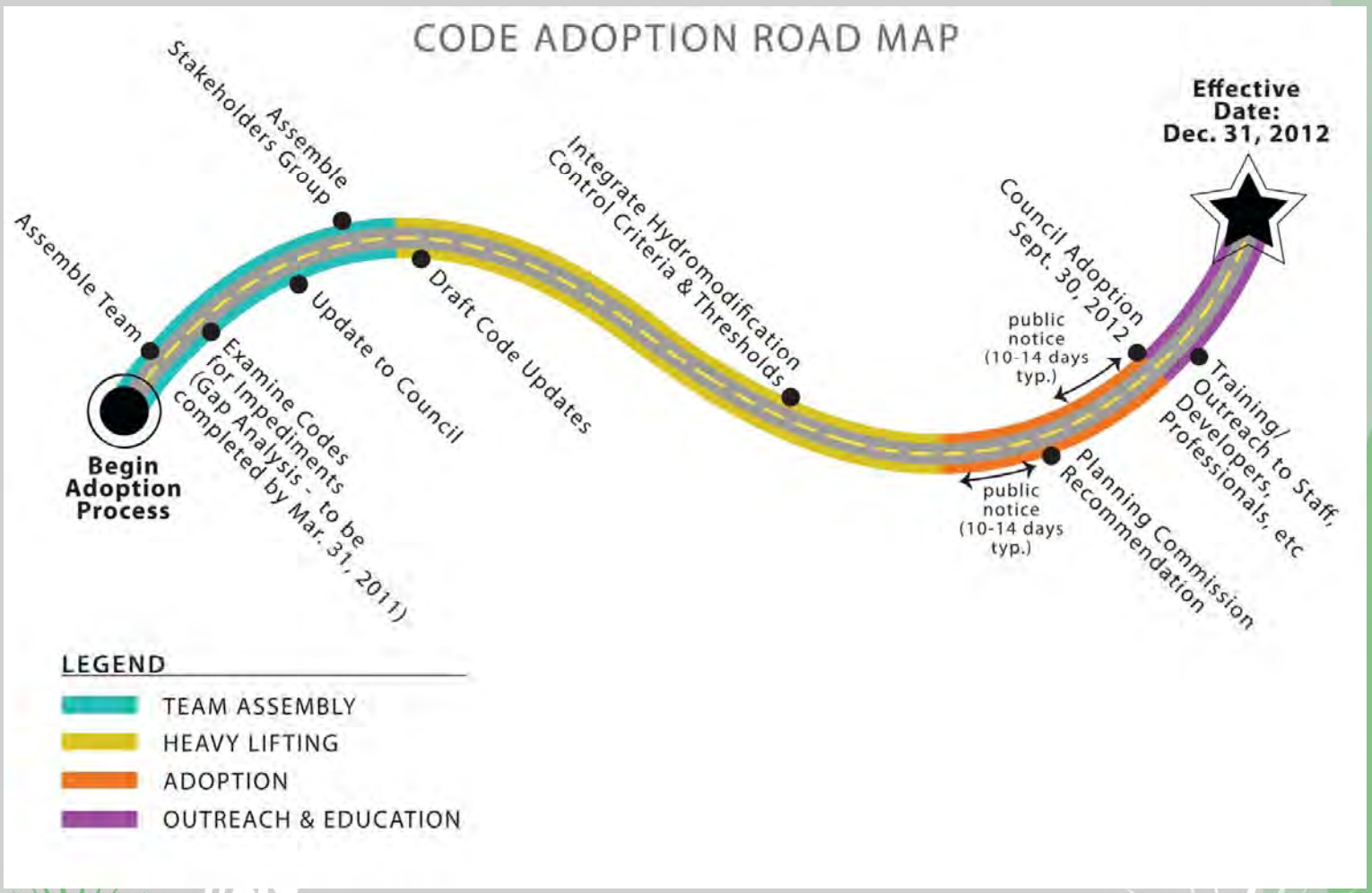
At higher densities, are parking lanes also allowed to serve as traffic lanes? Allow one shared travel lane (about 14 feet in width) to serve traffic flowing in both directions in low volume single family residential neighborhoods.  Driveways typically provide gaps in parking adequate to serve as pull-outs, but additional parking restrictions may be required.	

SECTION TWO

drafting regulatory
LANGUAGE & STANDARDS

objective



drafting regulatory LANGUAGE & STANDARDS

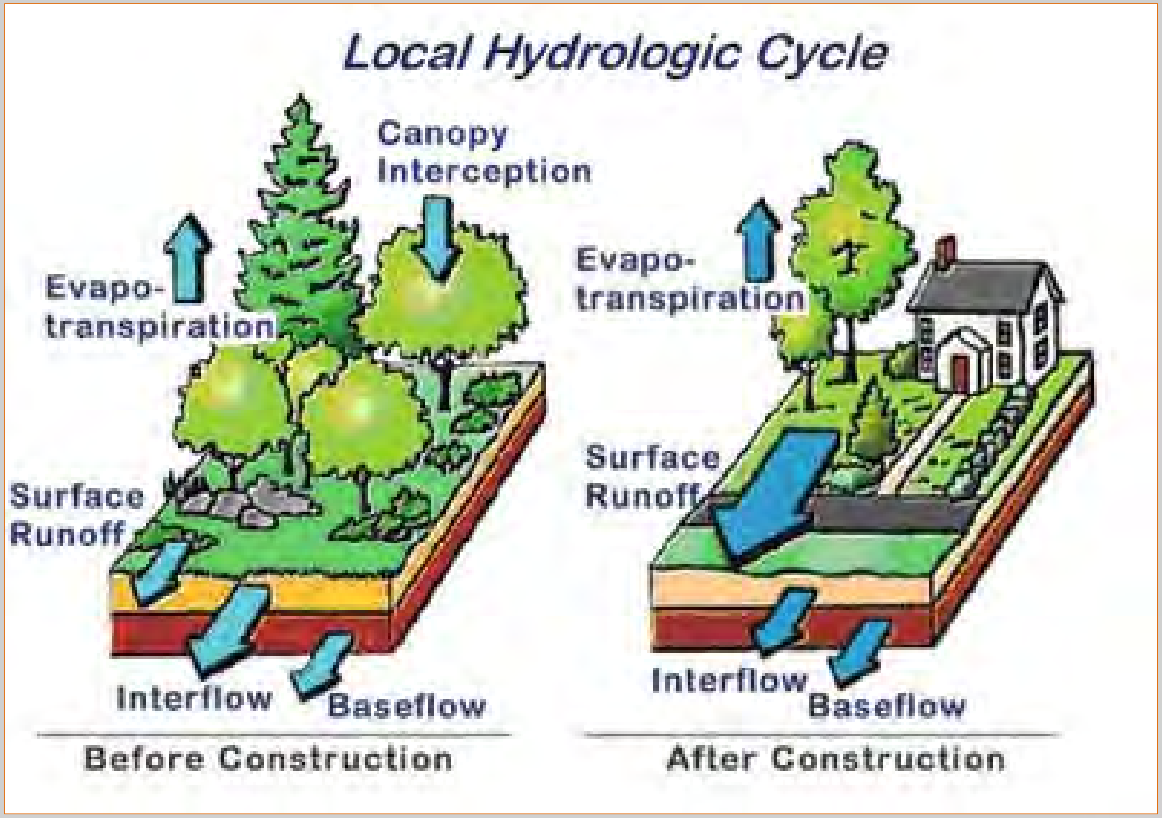
objective

The intent of this section is to show examples that other jurisdictions have adopted to integrate hydromodification control and LID practices into codes and standards.

drafting regulatory
LANGUAGE & STANDARDS

objective

Impending NPDES Permit requirements will address post-construction stormwater runoff impacts from new and redevelopment.



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criteria & applicability

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criteria & applicability

Hydromodification control criteria and applicability will be set forth from the Joint Effort that you are currently participating in. The hydromodification control criteria and applicability will address:

- *Design criteria* (e.g., size of storm event that must be managed)
- *Applicability criteria* for large projects, small projects, redevelopment proposals, expansions, etc.
- *Feasibility* of using LID practices versus standard urban stormwater management practices (SUSMPs)

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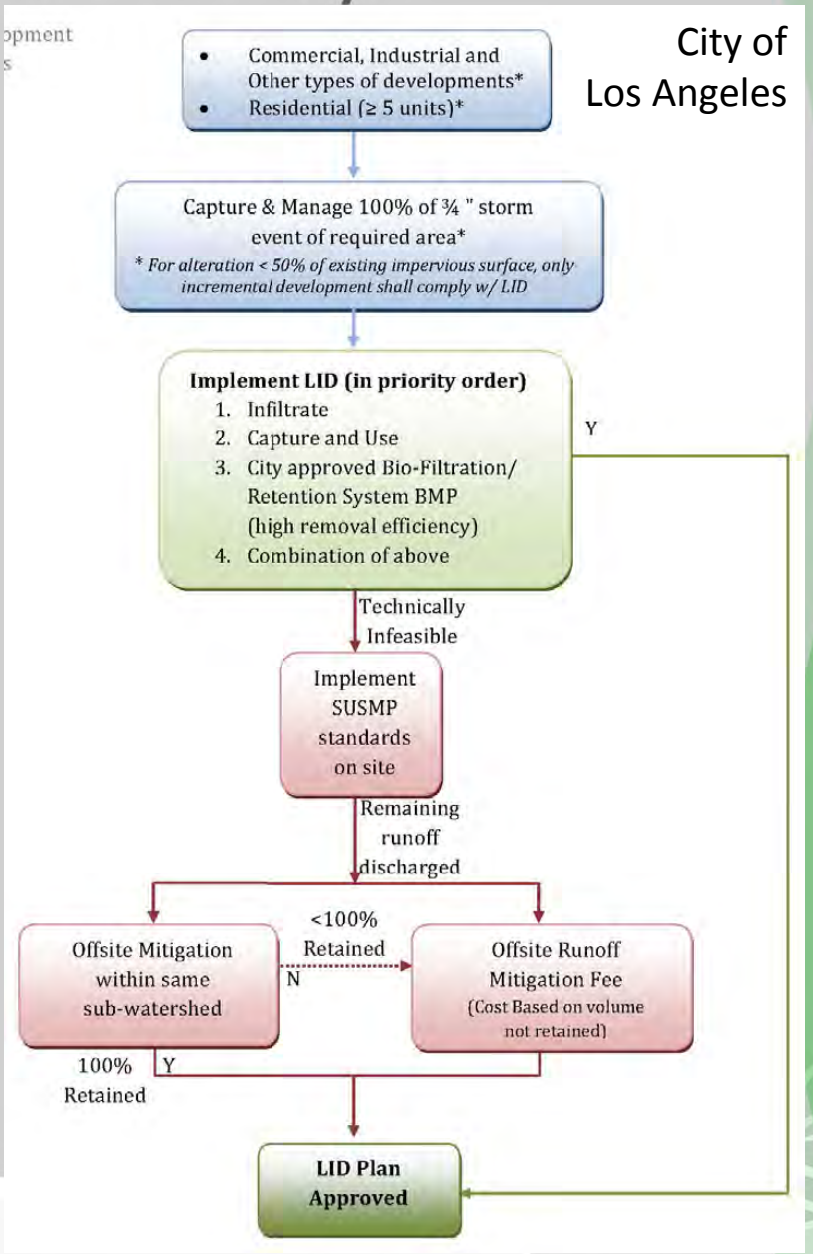
criteria & applicability

What hydromodification control practices look like from a regulatory perspective:



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criteria & applicability

City of Los Angeles – Criteria

3. The Site shall be designed to manage and capture stormwater runoff, in priority order of infiltration, evapotranspiration, capture and use, and/or treated through high removal efficiency biofiltration/biotreatment system of all of the runoff on site to the maximum extent feasible. The high removal efficiency biofiltration/biotreatment system shall comply with the standards and requirements of the LID Section of the Development Best Management Practices Handbook. A LID Plan shall be prepared to comply with the following:

    i. Stormwater runoff will be infiltrated, evapotranspired, captured and used, and/or treated through high removal efficiency Best Management Practices, onsite, through stormwater management techniques allowed pursuant to the LID Section of the Development Best Management Practices Handbook. The onsite stormwater management techniques must be properly sized, at a minimum, to infiltrate, evapotranspire, store for use, and/or treat through high removal efficiency biofiltration/biotreatment system, without any storm water runoff leaving the site to the maximum extent feasible, for at least the volume of water produced by the quality design storm event that results from:

criteria & applicability

(a) The 85th percentile 24-hour runoff event determined as the maximized capture stormwater volume for the area using a 48 to 72-hour draw down time, from the formula recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998); or

(b) The volume of annual runoff based on unit basin storage water quality volume, to achieve 80 percent or more volume treatment by the method recommended in the California Stormwater Best Management Practices Handbook – Industrial/Commercial, (2003); or

(c) The volume of runoff produced from a 0.75-inch storm event.

drafting regulatory LANGUAGE & STANDARDS

criteria & applicability

Ventura County – Goals

The core LID requirements in the Ventura County LID Permit are to:

1. Mimic pre-development runoff
2. Limit effective impervious area (EIA) to 5% for new development and up to 30% for redevelopment (where 5% is not feasible or off-site mitigation is used).
3. If 5% EIA is not feasible, the project must reduce %EIA to as close to 5% as feasible, and no more than 30% of the total project area.
4. Off-site mitigation is required for the volume of stormwater from the design storm that that cannot be retained on-site within the 5% EIA limitations.
5. Any design storm volume runoff from the impervious area of the site needs to be treated.

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criteria & applicability

Ventura County – Design Storm

The current Ventura County Storm Water Quality Urban Impact Mitigation Plan (SQUIMP) is used in the new permit. The new permit uses runoff volume:

- 85th percentile 24-hour runoff event using a 48 to 72-hour draw down time, or
- Runoff based on unit basin storage volume per 2002 Technical Guidance Manual, or
- Runoff from 0.75-inch storm

The applicant can choose one of the above listed methods, but must demonstrate how it is applied in LID retention volume and post-construction BMP sizing calculations.

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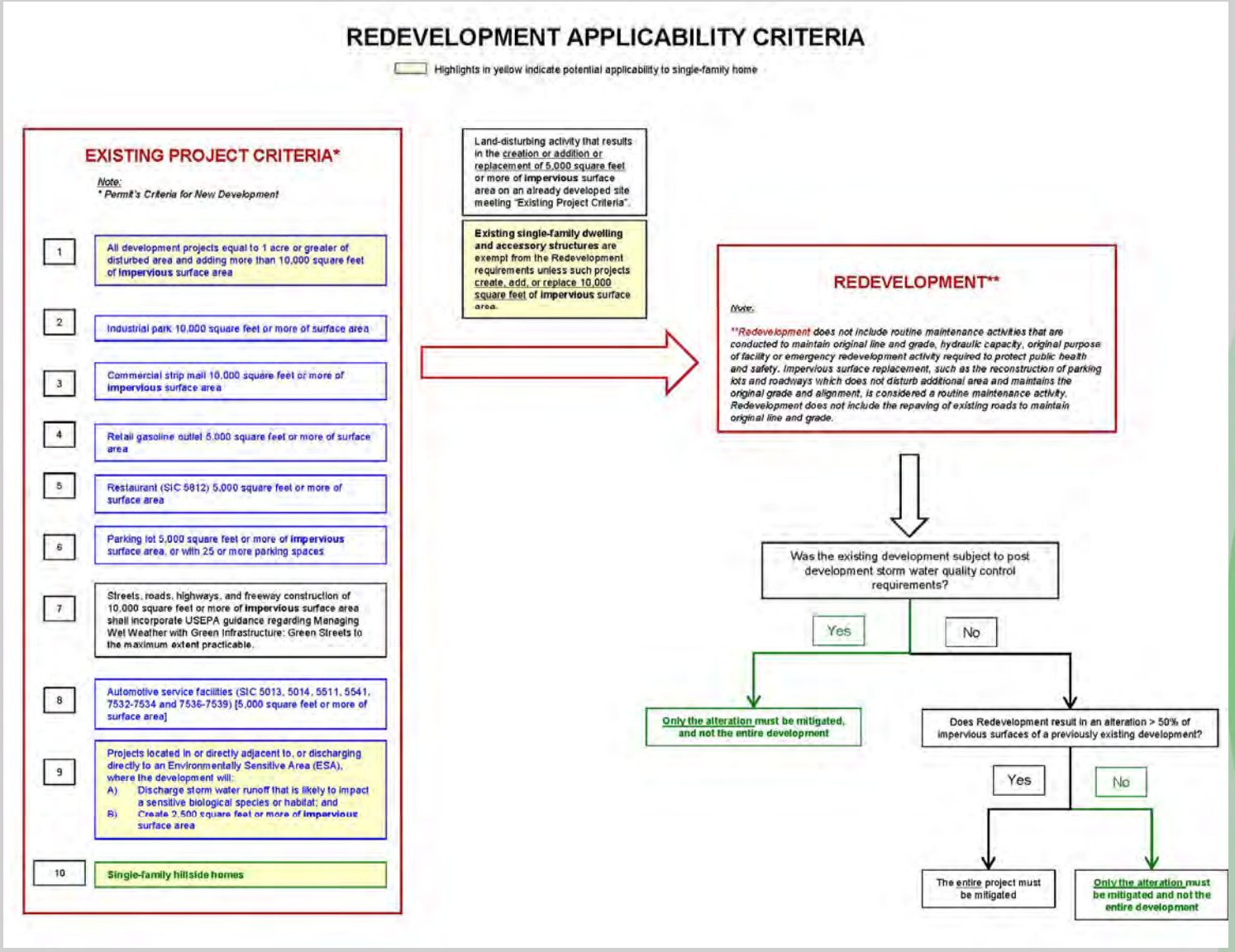
criteria & applicability

VENTURA COUNTY - APPLICABILITY



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criteria & applicability

Feasibility for the use of LID practices rather than standard urban stormwater management practices (SUMSPs) or off-site practices are typically also addressed.

Technical feasibility is one criteria that is included in the criteria of all jurisdictions, however, other factors are sometimes also included such as how hydromodification control practices may correlate with other urban design plans.

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criteria & applicability

Los Angeles – Feasibility "Off-Ramps"

4. When the onsite LID requirements are technically infeasible, partially or fully, as defined in the LID Section of the Development Best Management Handbook, the infeasibility shall be demonstrated in the submitted LID plan, shall be consistent with other City requirements, and shall be reviewed in consultation with the Department of Building and Safety. The technical infeasibility may result from conditions, that may include, but are not limited to:

   - Locations where seasonal high groundwater is within 10 feet of surface grade;
   - Locations within 100 feet of a groundwater well used for drinking water;
   - Brownfield Development sites or other locations where pollutant mobilization is a documented concern;

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criteria & applicability

Los Angeles – Feasibility "Off-Ramps" (continued)

- Locations with potential geotechnical hazards;
- Locations with impermeable soil type as indicated in applicable soils and geotechnical reports; and
- Other site or implementation constraints identified in the LID Section of the Development Best Management Practices Handbook.

5. If partial or complete onsite compliance of any type is technically infeasible, the project Site and LID Plan shall be required to comply with, at a minimum, all applicable Standard Urban Stormwater Mitigation Plan (SUSMP) requirements in order to maximize onsite compliance. For the remaining runoff that cannot feasibly be managed onsite, provide one or a combination of the following…….

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criteria & applicability

Ventura County – Feasibility "Off-Ramps"

4.E.III.2.a To encourage smart growth and infill development of existing urban centers where on-site compliance with post-construction requirements may be technically infeasible, the permittees may allow projects that are unable to meet the Integrated Water Quality/Flow Reduction/Resources Management Criteria in subpart 4.E.III.1, above, to comply with this permit through the alternative compliance measures described in subpart 4.E.III.2.c, below:

Language is similar then to City of Los Angeles

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integration of BMPs

1. *Regulatory language hindrances*
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integration of BMPs

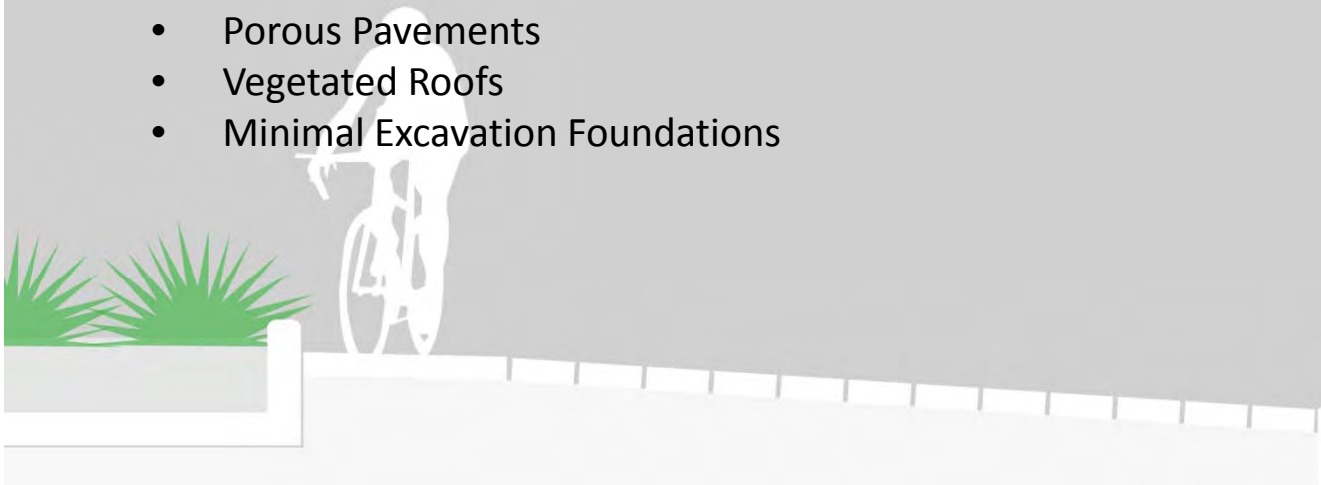
Integration of Structural and Non-Structural Practices

Non-Structural Practices

- Site Design/Lot Layout
- Minimizing Site Disturbance
- Maintaining Vegetated Areas
- Road Design (minimizing impervious surfaces through road width)

Structural Practices

- Bioretention
  - Bioretention design
  - Curb design
  - Curb extensions
- Soil Amendment Specifications/Bioretention Soil Mix Specifications
- Porous Pavements
- Vegetated Roofs
- Minimal Excavation Foundations



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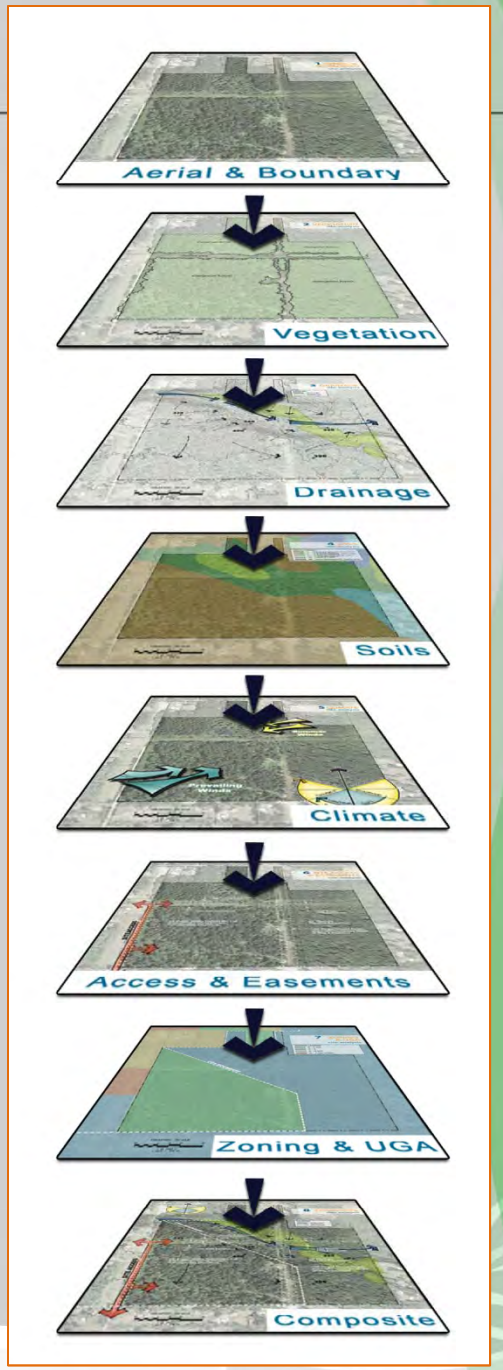
integration of BMPs

Methods of various jurisdictions to integrate the need for a site assessment/composite site analysis into local development controls:



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LANGUAGE & STANDARDS

methods

SITE ANALYSIS

14.94.150 Site assessment.

LID site design is intended to complement the predevelopment conditions on the site. The development context shall be established by an initial site assessment consistent with the requirements of this section. The initial inventory and assessment process will provide the baseline information necessary to design strategies that preserve natural resources, preserve areas most appropriate to evaporate, transpire, and infiltrate stormwater, and achieve the goal of maintaining pre-development natural hydrologic conditions on the site. The assessment will result in a series of maps identifying streams, lakes, wetlands, and buffers; steep slopes, and other hazard areas; significant wildlife habitat areas; and permeable soils offering the best available infiltration potential. Maps can be combined as hard copies or as GIS layers to delineate the best areas to direct development. Designated development areas, which will contain all impervious surfaces and landscaped areas on the site, should be configured to minimize soil and vegetation disturbance, buffer critical areas, and take advantage of a site's natural stormwater processing capabilities. Designated development area boundaries shall be delineated on site plans and identified on the site during site preparation and construction. Areas outside of the designated development area envelope shall be designated Native Vegetation Areas or reserve areas.

The site assessment shall be a component of the project submittal. The site assessment shall include, at a minimum, the following:

(a) A survey prepared by a registered land surveyor or registered civil engineer showing existing public and private development, including utility infrastructure, on and adjacent to the site, major and minor hydrologic features, including seeps, springs, closed depression areas, drainage swales, and contours as follows:

(1) Up to 10 percent slopes, two-foot contours.

(2) Over 10 percent to less than 20 percent slopes, five-foot contours.

(3) Twenty percent or greater slopes, 10-foot contours.

(4) Spot elevations shall be at 25 foot intervals.

(b) Location of all existing lot lines, lease areas and easements, and the location of all proposed lot lines, lease areas, and easements.

(c) A soils report prepared by a licensed geotechnical engineer or licensed engineering geologist. The report shall identify:

(1) Underlying soils on the site utilizing soil pits and soil grain analysis to assess infiltration capability on site. The frequency and distribution of soil pits shall be adequate to direct placement of the roads and structures away from soils that can most effectively infiltrate stormwater.

(2) Topologic features that may act as natural stormwater storage or conveyance and underlying soils that provide opportunities for storage and partial infiltration.

(3) Depth to groundwater.

(4) Geologic hazard areas and associated buffer requirements as defined in 14.88 (VI) LSMC.

(d) A survey of existing native vegetation cover by a licensed landscape architect, arborist, qualified biologist identifying any forest areas on the site, species and condition of ground cover and shrub layer, and tree species, and canopy cover.

(e) A survey of wildlife habitat by a qualified biologist.

(f) A streams, wetland, and water body survey and classification report by a qualified biologist showing

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methods

SITE ANALYSIS (CONTINUED)

interest in the property included in the LID project and a legal description that describes the exterior boundary of the LID project and lists all encumbrances affecting land within the LID project.

(b) A statement that confirms the ownership or control of the land within the boundaries of the proposed LID project and the nature of the applicant's interest in the same and the owners. If the development area has multiple owners, then all owners of record shall consent in writing to the LID project review process.

(c) Description of the proposed LID project including:

1. Project narrative showing how the project fulfills the overall goals and each purpose statement in Section 14.94.010;
2. Total gross area of the site;
3. Total project area (total gross site area minus total reserve area);
4. Total area of designated development area;
5. Total area of Native Vegetation Area;
6. Total units proposed;
7. Proposed number of dwelling units by type;
8. Conventional impervious surface assumptions used for volume reduction calculations;
9. Maximum impervious surface proposed for each lot;
10. Lot sizes and dimensions;
11. Total area of impervious surfacing;
12. Proposed ownership of land areas within the LID project both during and after construction;
13. Gross density of dwelling units;
14. Requested dimensional modifications;
15. Development schedule indicating the approximate date when construction of the LID project or stages of the LID project can be expected to begin and be completed.

(d) Copy of all existing deeds, restrictive covenants, or other legal restrictions which apply to the project site. The applicant may submit a copy of any proposed restrictive covenants that have been drafted.

(e) The names and addresses of all property owners within 300 feet of the site taken from the latest equalized tax roles.

(f) Preliminary drainage report as described in the Lake Stevens site development standards. The report should clearly state the assumed conventional storage volume and LID storage volume in the introduction.

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methods

SITE ANALYSIS (CONTINUED)

14.94.170 Site plan and supporting maps and graphics.

An initial site plan and any supporting graphics, narrative descriptions and maps to show existing conditions and major details of the proposed LID project. The initial site plan and supporting graphics and maps in combination shall provide a level of detail appropriate to the scale of the project and sufficient to demonstrate how the project complies with the provisions of this chapter.

(a) Proposed name of the development, north point, scale, date and address, and telephone number of the preparer of the site plan/supporting maps.

(b) All information included in the site assessment in Section 14.94.170 LSMC, should be provided at a legible scale appropriate to the area covered by the proposal at the discretion of the administrator.

(c) Designated development areas.

(d) Native Vegetation Areas.

(e) Reserve areas.

(f) Areas of disturbed soils to be amended.

(g) The existing and proposed circulation system of arterial, collector and/or local streets, including right-of-way street widths, off-street parking areas, and major points of access to public rights-of-way (including major point of ingress and egress to the development). Notations of proposed ownership, public or private, shall be included where appropriate.

(h) Location and width of existing and proposed sidewalks and trails.

(i) Proposed lots and dimensions.

(j) For residential structures, provide the types and number of residential units in each structure or the range of residential structures proposed together with the range of the type and number of units per structure.

(k) For nonresidential buildings, the gross floor area of each building.

(l) The location and square footage or approximate location and square footage or acreage of all areas of all areas to be conveyed, dedicated or reserved as common open spaces, public parks, recreational areas, school sites, and similar public and semi-public uses with notations of proposed ownership included where appropriate.

(m) Landscaping and open space improvements plan or concept.

(n) The proposed treatment of the perimeter of the LID project, including materials and techniques used such as screens, fences and walls.

(o) The location of existing and proposed utilities including sanitary sewers, water lines and storm drainage facilities intended to serve the development.

(p) Existing zoning and Comprehensive Plan boundaries for the site and adjacent property.

(q) Information of contiguous properties within 300 feet of the proposed LID project including:

- i. Existing and, if known, proposed land use and streets; and
- ii. Existing structures excluding accessory buildings, ownership, tracts and unique natural features of the landscape, if readily accessible.

(r) A vicinity map showing the location of the site and its relationship to surrounding areas, including existing streets, major physiographic and cultural features such as railroads, lakes, streams, shorelines, schools, parks or other prominent features.

(s) Landscape plan including a tree planting plan for Native Vegetation Areas.

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integration of BMPs

1. *Regulatory language hindrances*
2. *Hydromodification control requirements (performed under Joint Effort)*
3. *Applicability and Exemptions/Feasibility Criteria (performed under Joint Effort)*
4. *Non-Structural Practices*
   - *Site Assessment*
   - *Clustering*
5. ***Structural Practices/Design Specifications***
   - ***Landscaping and vegetation***
   - ***Streets***
   - ***Parking Lots***
6. *Maintenance*

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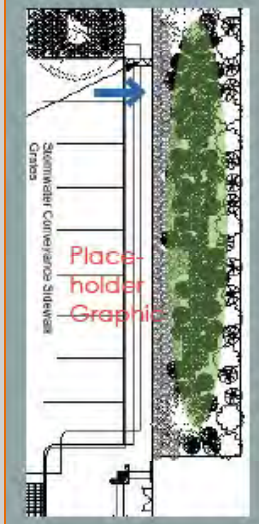
PLANT LISTS

A Sample Project

Plant selection, layout and quantities can be determined by following the bioretention swale example below. For this project, a developer is installing a 300' long bioretention swale along one edge of a parking lot.



Plant Quantities Worksheet

Swale Dimensions: 100' x 14'

Zone A: **640 SF** (Bottom of Swale 80' x 8')
Zone B: **760 SF** (Sideslopes approximately 3' wide surrounding bottom)

Plant	On-center Spacing*	Area/plant	Total Area Quantity**	% Cover	Adjusted % Quantity
Zone A	**640**				
Blue Rush	18"	1.950	328	40%	131
Soft Rush	2'6"	5.425	118	40%	47
Douglas Iris	2'	3.460	185	20%	37
				100%	
Zone B	**760**				
California Fuchsia	3'	7.800	97	30%	29
Dymondia	1'	0.870	874	10%	87
Deer Grass	4'	13.840	55	60%	33
				100%	

*Spacing shown is triangular
**If only this plant were used for Zone A (Zone Area/Area per plant)

On-center Spacing (triangular)	Area Per Plant (Divide)
1'	0.870
18"	1.950
2'	3.460
2' 6"	5.425
3'	7.800
4'	13.840
5'	21.650
6'	31.200

Additional Resources

Perhaps where we would list the various botanical gardens and native plant website resources?

- Cal Poly Leaning Pine Arboretum
  www.website.org
- Santa Barbara Botanical Garden
  www.website.org
- San Luis Obispo Bontanical Garden
  www.website.org
- Monterey resource
  www.website.org

Other Resources to include?

- California Native Plant Society
  www.website.org
- Regional and State (continued)
  www.theodorepayne.org

Other Resources to include?

LEGAL DISCLAIMER: This Technical Assistance Memo (TAM) is intended as guidance only and should not be used as a substitute for site specific design and engineering. Applicants are responsible for compliance with all code and rule requirements, whether or not described in this TAM.

UC Davis Extension LID Initiative

E2 inc.

Central California Coast
Technical Assistance Memo (TAM)

LID Plant Guidance for Bioretention

Low Impact Development

Plants specially selected for use with low impact development (LID) systems provide function. Under um exeros nim niatie dit, quis doluptatet acilisl euisi.nullan utpat. Duis amcon verosting ea alisUnder um exeros nim niatie dit, quis uipit, sequat inim dit velestrud do odipit in eseUnder um exeros nim niatie dit, quis doluptatet acilisl euisi.nullan utpat. Duis amcon verosting ea alisl iriuscinDiam, sequipit, sequadoluptatet acilisl euisi.nullan utpat. Duis amcon verosting ea alisl iriuscinDiam, sequipit, sequat inim dit velestrud do odipit in esectet loborer ipit luptatue deliquating ecte tat alis aliquis do odolorer in ulla feugue te. I iriuscinDiam, sequipit, sequat inim dit velestrud do odipit in esectet loborer ipit luptatue deliquating ecte tat alis aliquis do odolorer in ulla feugue te.

This Technical Assistance Memo (TAM) provides plant selection guidance for the most common bioretention features, such as swales, flow-through planters and raingardens. Under um exeros nim niatie dit, quis doluptatet acilisl euisi.nullan utpat. Duis amcon verosting ea alisl iriuscinDiam, sequipit, sequat inim dit velestrud do odipit in eseUnder um exeros nim niatie dit, quis doluptatet acilisl euisi.nullan utpat. Duis amcon verosting ea alisl iriuscinDiam, sequipit, sequat inim dit velestrud do odipit in esectet loborer ipit luptatue duipit, sequat inim dit velestrud do odipit in eseUnder um exeros nim niatie dit, quis doluptatet acilisl euisi.nullan utpat. Duis amcon verosting ea alisl iriuscinDiam, sequipit, sequaeliquating ecte tat alis aliquis do odolorer in ulla feugue te. ctet loborer ipit luptatue deliquating ecte tat alis aliquis do odolorer in ulla feugue te.

The intent of this TAM is to offer designers, municipalities, developers and homeowners with examples of plant palettes and strategies they can easily use to design and construct regionally appropriate bioretention planting areas. The plants proposed here were selected because they met multiple criteria including an ability to tolerate or thrive in wet and drought conditions, availability for purchase at plant nurseries, low maintenance characteristics and non-invasive nature. Although most of the plants on this list are California native species, there are also some non-native species included. These non-natives were screened to exclude potentially invasive species and are included because they possess beneficial characteristics for use in bioretention facilities, are readily available and they serve to broaden the plant palette available for LID projects.

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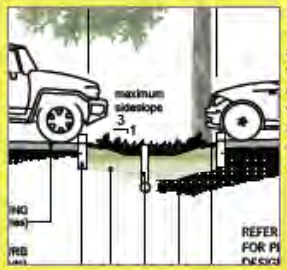
PLANT LISTS

Bioretention Facility Types

Bioretention facilities can be configured in nearly any shape. They work by detaining runoff in a surface reservoir, filtering it through plant roots and a biologically active soil mix and when feasible infiltrating it into the ground. Where native soils are less permeable or when constructed as part of a building, an underdrain conveys treated runoff to the approved storm drain or surface drainage system.

Bioretention

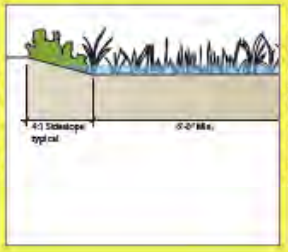


Bioretention Swale: A long narrow depressed planting area with a gradual longitudinal slope that conveys stormwater. In a vegetated swale stormwater is slowed and sediments are filtered out through contact with plants and soil.

Stormwater Planter

Stormwater, or flow-through planters: Enclosed planting areas that treat and detain, but do not allow infiltration into underlying soil. Pollutants are removed as runoff passes through plants, soil and a layer of drain rock. A perforated pipe underdrain runs the length of the planter to convey flows to storm sewer; an overflow outlet conveys flows exceeding the planter's capacity.

Rain Garden

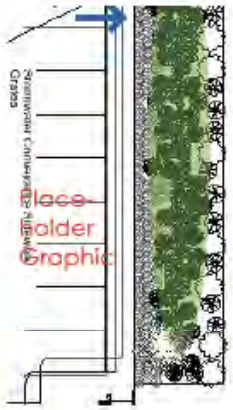


Rain garden/bioretention areas: Shallow, depressed planting areas with flat bottoms that detain, slow and filter stormwater. Where soils are permeable, rain gardens allow for infiltration, however, they can also be designed as flow through structures.

Plants for Bioretention Areas

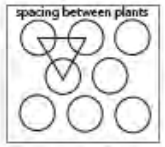
Zone A: Periodic inundation: Area remains inundated following storm events (24 - 72 hours)
Zone A: Periodic inundation: Area remains inundated following storm events (24 - 72 hours)

Common Name	Scientific Name	Bioretention Zone	Height	On-Center Spacing	Notes:	Geographic Zones	Hardiness
Shrubs							
California Wild Rose	*Rosa californica*	A,B	3' - 6'	5'	tolerates a wide variety of soils, seasonal flooding and some drought	all	0° F
California Fuchsia	*Zauschneria species*	B	varies by species	varies by species	tolerates drought, sand, clay and serpentine soils, seasonal flooding, high foot traffic and deer	all	0° F
Perennials							
Yarrow	*Achillea millefolium*	B	1' - 3'	2'	tolerates alkaline soil, sand, clay, seasonal wet conditions, high foot traffic and deer	all	0° F
Dymondia	*Dymondia margaritae**	B	1-2"	1'	spreading groundcover, tolerates moist to dry conditions and some foot traffic	coastal	25-30° F
Beach Strawberry	*Fragaria chiloensis*	B	6"	18"	vigorous spreading groundcover, tolerates wet conditions, but prefers good drainage	all	15° F
Douglas Iris	*Iris douglasiana*	A,B	1.5' -3'	2'	tolerates sand, clay and serpentine soils, seasonal flooding (but not soggy soils) and drought	all, but high mts.	15° F
Showy Penstemon	*Penstemon spectabilis*	B,C	3'	3'	tolerates clay soils, winter wet and drought	all	0-10° F
Grasses and Grass-like Plants							
Blue Gramma Grass	*Bouteloua gracilis*	B	4" - 16"	1'	good lawn substitute, tolerates wide range of growing conditions, foot traffic and mowing	all but n. coast	0° F
Berkeley Sedge, Grey Sedge	*Carex divulsa**	B	12" - 18"	2'	tolerates foot traffic, some drought, full sun, and boggy soils	all	10° F
Clustered Field Sedge	*Carex praegracilis*	A	1'	1'	good lawn substitute, tolerates wide range of growing conditions, foot traffic and mowing	all	10° F
Rough Sedge	*Carex senta*	A	1.5' -3'	2'	tolerates alkaline soil, sand, clay, serpentine, seasonal inundation, high foot traffic and deer	all	10° F
San Diego Sedge	*Carex spissa*	A	2' - 5'	3'	tolerates alkaline soil, clay, serpentine, seasonal inundation, high foot traffic and deer	all	10° F
Soft Rush	*Juncus effusus*	A	2' - 3'	2'6'	tolerates poor drainage, heavy soils	all	10° F
Wire Grass, Blue Rush	*Juncus patens*	A	1' - 2'	18"	tolerates poor drainage, seasonal inundation, drought, shade	all	0° F
Canyon Prince Wild Rye	*Leymus condensatus 'Canyon Prince'*	B	2' - 3'	2'6"	tolerates drought, wet, but not soggy soils	all	10° F
Deer Grass	*Muhlenbergia rigens*	B	4' - 5'	4'	tolerates sandy and clay soils, seasonal inundation	all	0° F



Plant selection, layout and quantities can be determined by following this bioretention swale example. For this project, a developer is installing a 100 foot long bioretention swale along one edge of a parking lot.

The swale is 100 feet long and 14 feet wide. The bottom of the swale is approximately 80 feet long and 8 feet wide and is planted with a combination of Bioretention Zone A species (640 square feet). The sideslopes of the swale are planted with a combination of Bioretention Zone B species (760 square feet). A breakdown of the plants selected and the quantities needed are shown in the Plant Counts Worksheet.



On-center Spacing (triangular)	Area Per Plant (Divide)
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18"	1.950
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2' 6"	5.425
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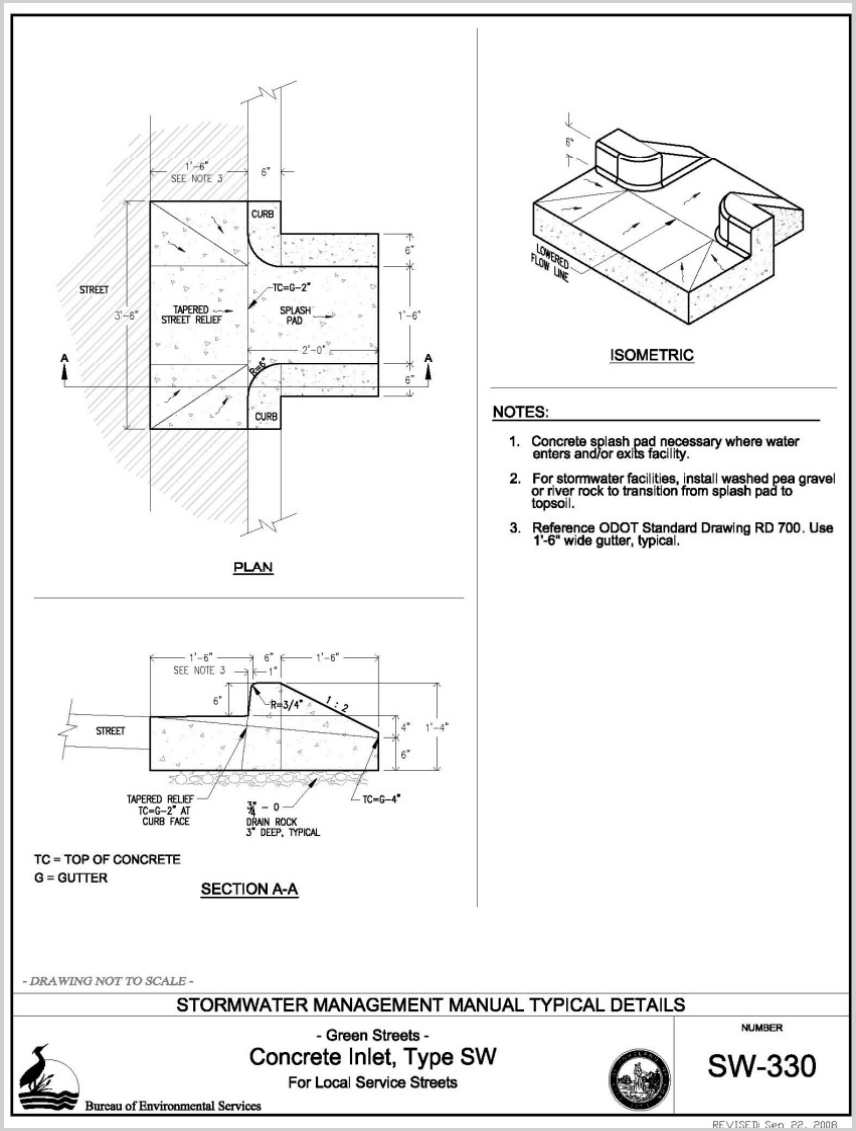
*Spacing shown is triangular
**If only this plant were used for Zone A (Zone Area/Area per plant)

methods

CURB DESIGN



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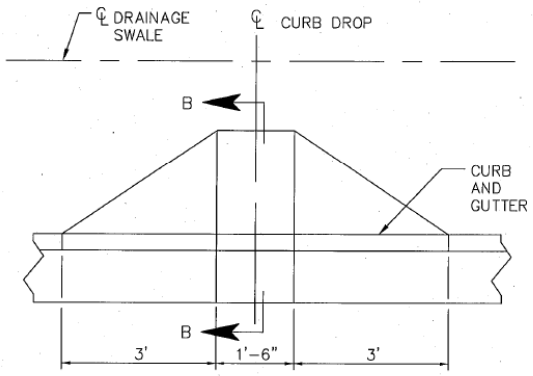
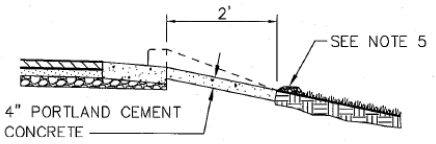
CURB DESIGN



CURB INLET TYPE 1



SECTION B-B

GENERAL NOTES

1. CURB INLET SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C 478AASHTO M 199 & ASTM C 890 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE PROJECT SPECIAL PROVISIONS.
2. TOP SURFACE TO BE BROOM FINISHED.
3. ALL EXTERNAL EDGES NOT LABELED SHALL BE TROWELED WITH 1/4" RADIUS EDGER.
4. INLETS SHOULD BE SPACED CONSISTENT WITH CATCH BASIN SPACING REQUIRED IN THE STORM WATER MANUAL.
5. WHERE CURB INLETS ARE USED, APPROXIMATELY 6 INCHES OF ROCK OR OTHER EROSION PROTECTION MATERIAL SHOULD BE USED TO DISSIPATE ENERGY AND/OR FLOW DISPERSION.
6. PERVIOUS PAVING MAY BE USED FOR INLET WITH CITY APPROVAL.

KENT	CITY OF KENT ENGINEERING DEPARTMENT		
	LID TYPICAL DETAIL CURB & GUTTER INLET		
designed: LD drawn: ER checked: WC APPROVED	SCALE: NTS DATE: 5/20/09 CITY ENGINEER	STANDARD DETAIL	LID 6-6 (c)

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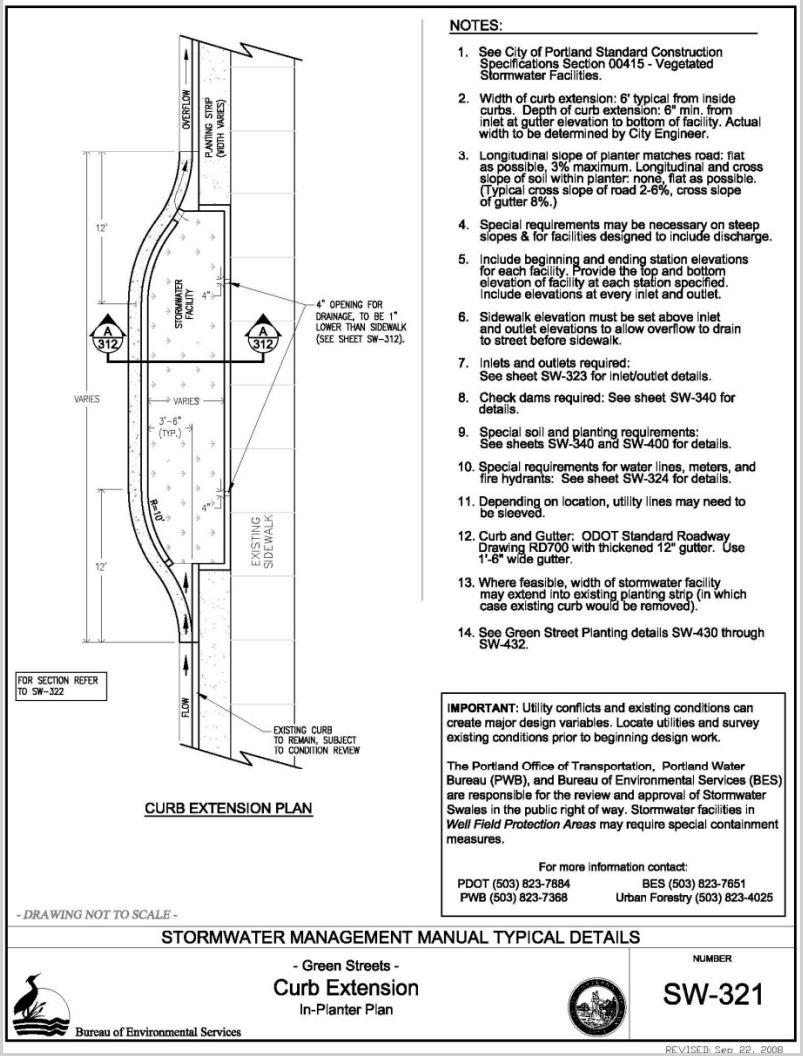
CURB EXTENSIONS



CURB EXTENSION PLAN

NOTES:

1. See City of Portland Standard Construction Specifications Section 00415 - Vegetated Stormwater Facilities.
2. Width of curb extension: 6' typical from inside curbs. Depth of curb extension: 6" min. from inlet at gutter elevation to bottom of facility. Actual width to be determined by City Engineer.
3. Longitudinal slope of planter matches road: flat as possible, 3% maximum. Longitudinal and cross slope of soil within planter: none, flat as possible. (Typical cross slope of road 2-6%, cross slope of gutter 6%.)
4. Special requirements may be necessary on steep slopes & for facilities designed to include discharge.
5. Include beginning and ending station elevations for each facility. Provide the top and bottom elevation of facility at each station specified. Include elevations at every inlet and outlet.
6. Sidewalk elevation must be set above inlet and outlet elevations to allow overflow to drain to street before sidewalk.
7. Inlets and outlets required: See sheet SW-323 for inlet/outlet details.
8. Check dams required: See sheet SW-340 for details.
9. Special soil and planting requirements: See sheets SW-340 and SW-400 for details.
10. Special requirements for water lines, meters, and fire hydrants: See sheet SW-324 for details.
11. Depending on location, utility lines may need to be sleeved.
12. Curb and Gutter: ODOT Standard Roadway Drawing RD700 with thickened 12" gutter. Use 1'-6" wide gutter.
13. Where feasible, width of stormwater facility may extend into existing planting strip (in which case existing curb would be removed).
14. See Green Street Planting details SW-430 through SW-432.

IMPORTANT: Utility conflicts and existing conditions can create major design variables. Locate utilities and survey existing conditions prior to beginning design work.

The Portland Office of Transportation, Portland Water Bureau (PWB), and Bureau of Environmental Services (BES) are responsible for the review and approval of Stormwater Swales in the public right of way. Stormwater facilities in *Well Field Protection Areas* may require special containment measures.

For more information contact:
PDOT (503) 823-7884 BES (503) 823-7651
PWB (503) 823-7368 Urban Forestry (503) 823-4025

- DRAWING NOT TO SCALE -

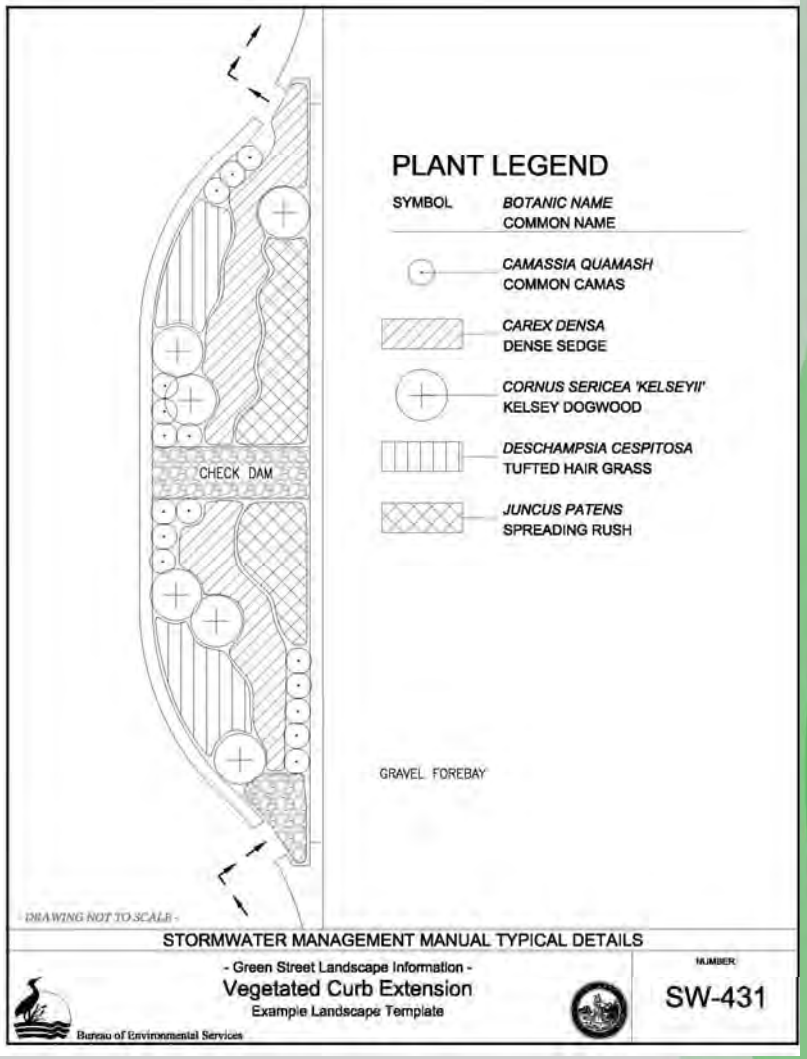
STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Curb Extension
In-Planter Plan

Bureau of Environmental Services

NUMBER SW-321

REVISED: Sep. 22, 2008



- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Street Landscape Information -
Vegetated Curb Extension
Example Landscape Template

Bureau of Environmental Services

NUMBER SW-431

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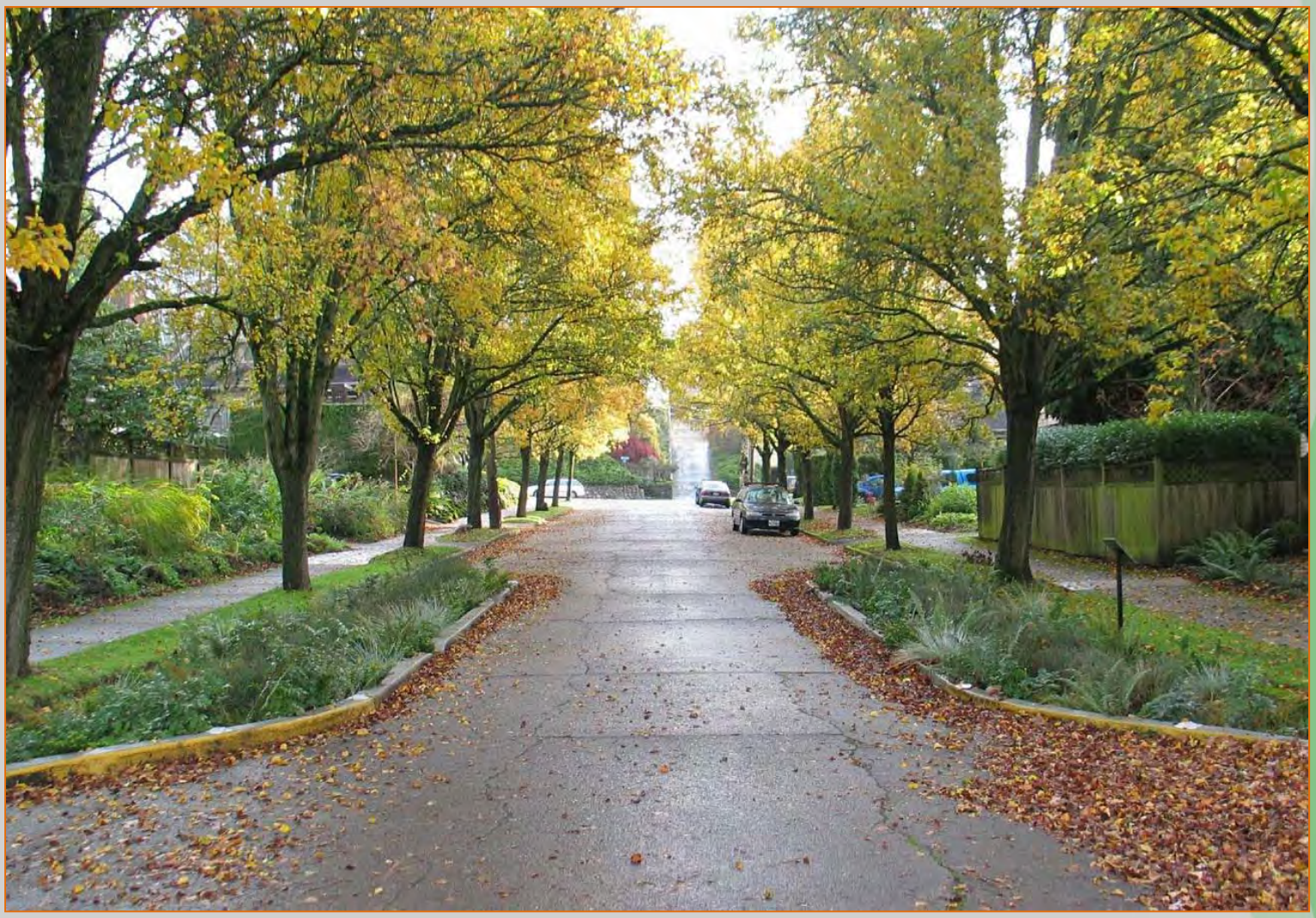
CURB EXTENSIONS



Portland, OR

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CURB EXTENSIONS

Los Angeles, CA

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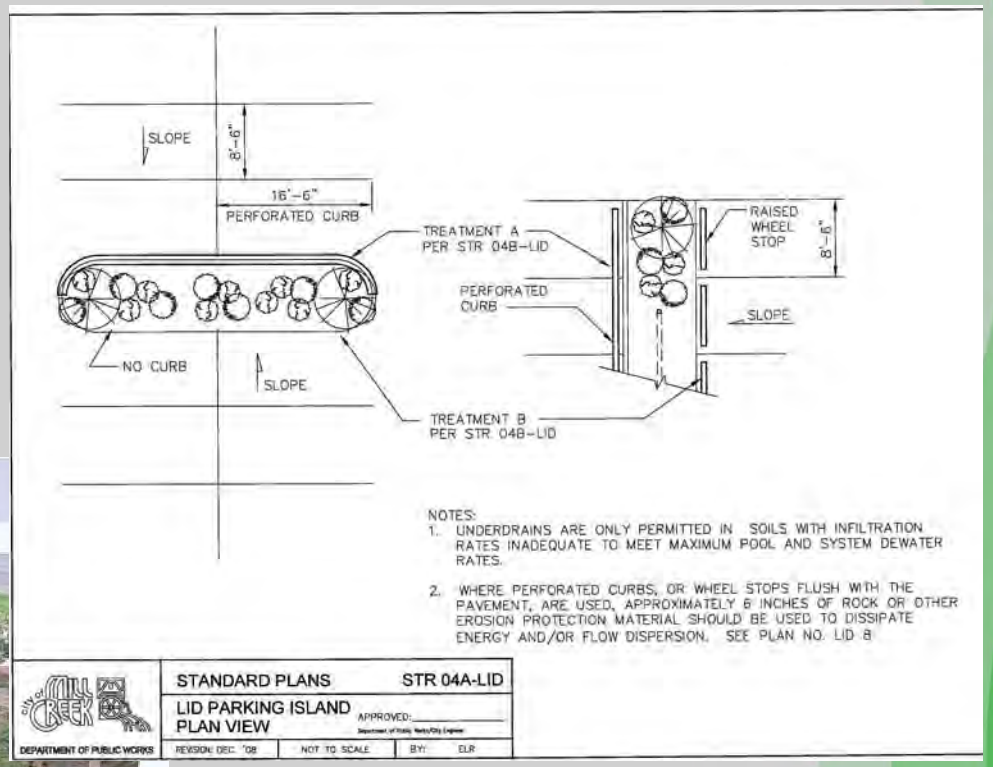
PARKING LOTS – STANDARD DETAILS



Oxnard, CA

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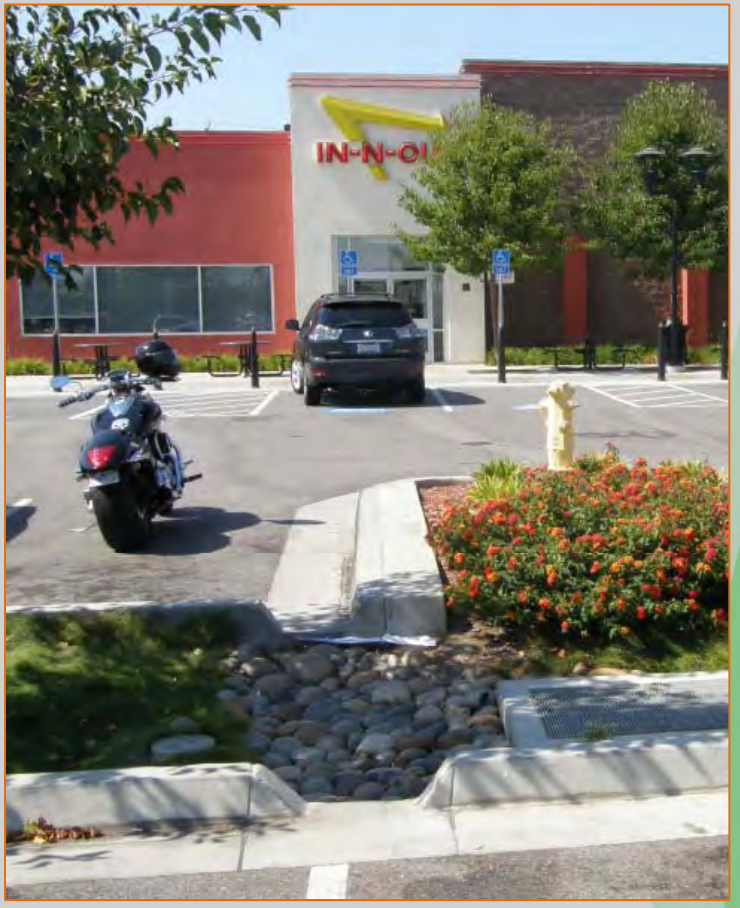
PARKING LOTS

Portland, OR



Fremont, CA

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PARKING LOTS

Downey, CA

Caltrans – San Diego, CA

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PARKING LOTS

Spokane, WA

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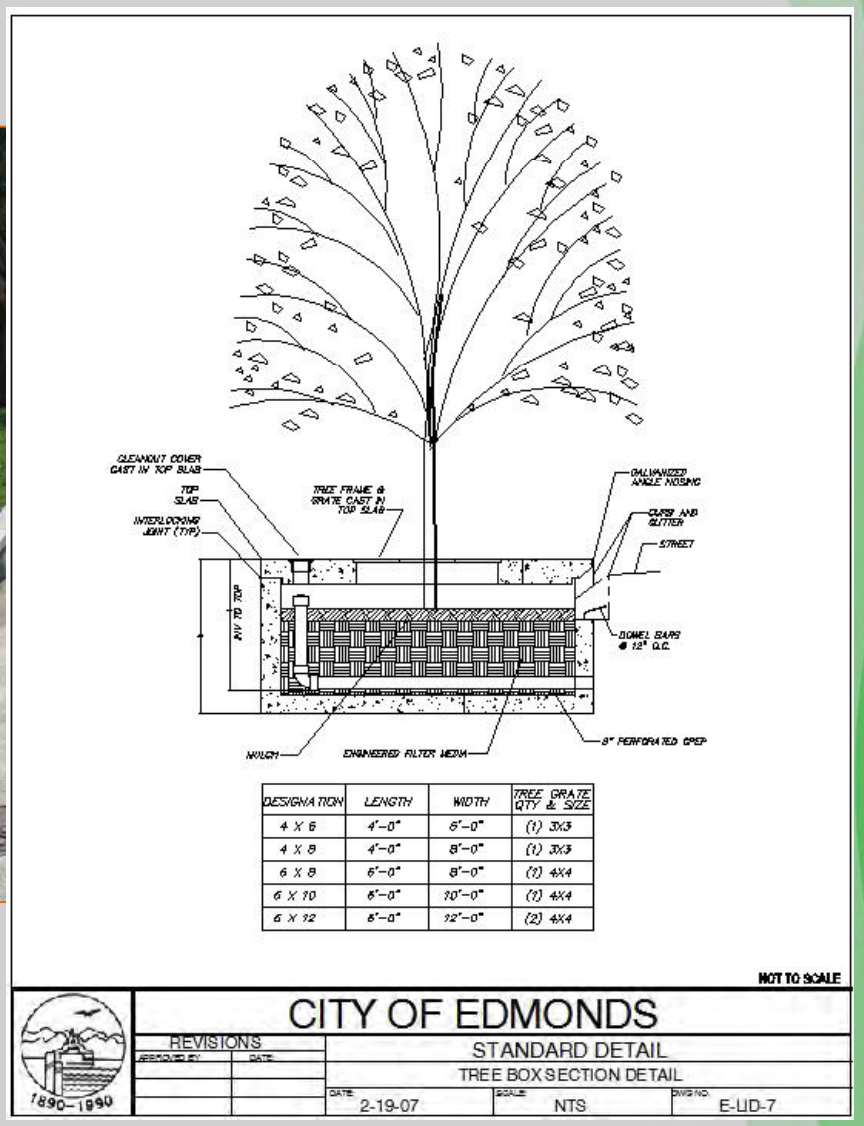
TREE FILTER BOXES

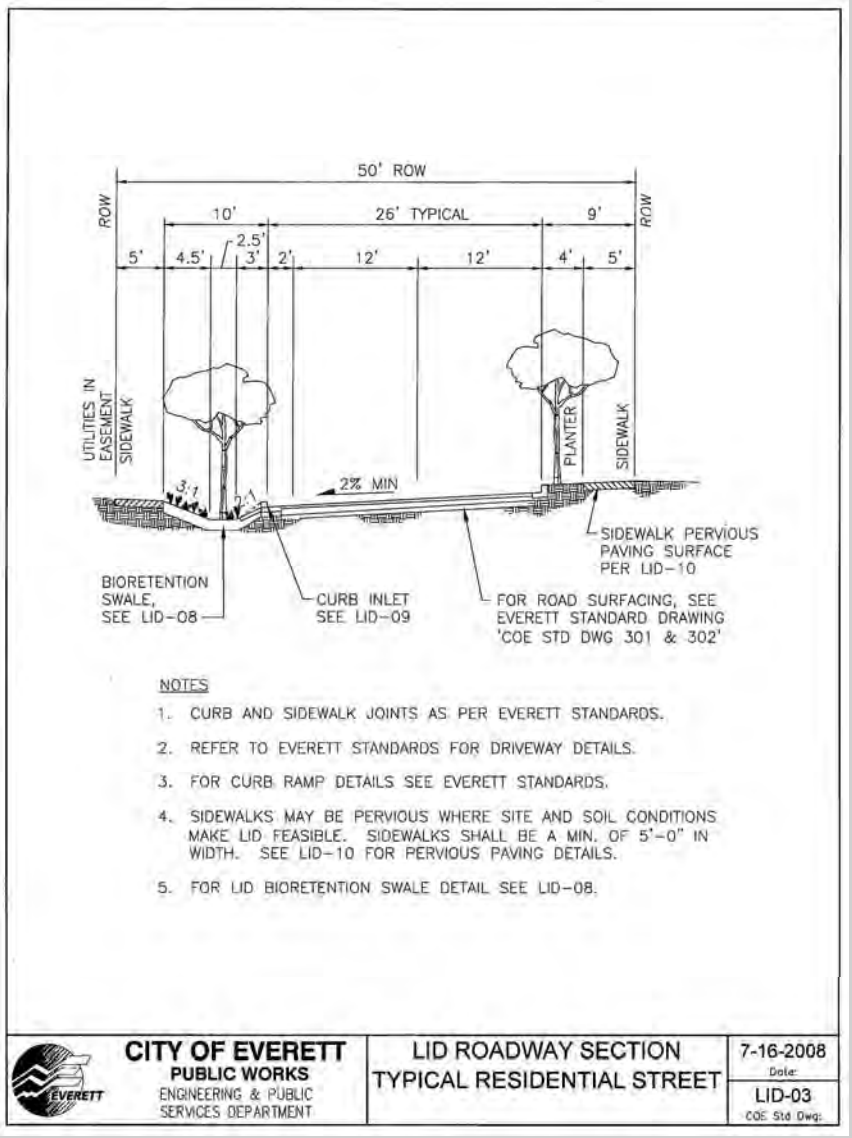
Los Angeles, CA



DESIGNATION	LENGTH	WIDTH	TREE GRATE QTY & SIZE
4 X 6	4'-0"	6'-0"	(1) 3X3
4 X 8	4'-0"	8'-0"	(1) 3X3
6 X 8	6'-0"	8'-0"	(1) 4X4
6 X 10	6'-0"	10'-0"	(1) 4X4
6 X 12	6'-0"	12'-0"	(2) 4X4

methods

STREETS



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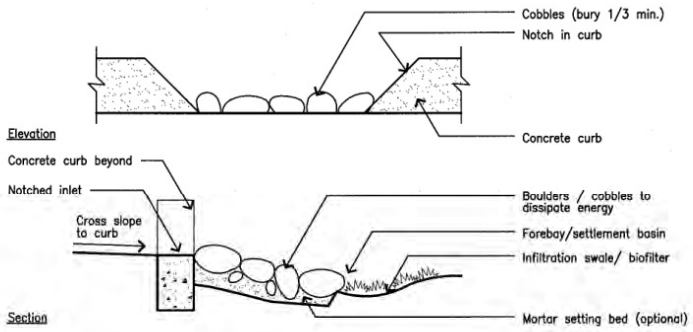
URBAN SWALE DESIGN GUIDANCE

Bay Area Design Guidance Manual

Streets

Urban curb/swale system



Conditions, dimensions, and materials shown are typical. Modifications may be required for proper application, consult qualified professional.

Urban curb/swale systems are a hybrid of standard urban curb and gutter with a more rural or suburban swale drainage system. It provides a rigid pavement edge for vehicle control, street sweeping, and pavement protection, while still allowing surface flow in landscaped areas for stormwater quality protection.

Characteristics

- Runoff travels along the gutter, but instead of being emptied directly into catch basins and underground pipes, it flows into surface swales.
- Stormwater can be directed into swales either through conventional catch basins with outfall to the swale or notches in the curb with flowline leading to the swale.
- Swales remove dissolved pollutants, suspended solids (including heavy metals, nutrients), oil and grease by infiltration.

Applications

- Residential developments, commercial office parks, arterial streets, concave median islands.
- Swale system can run either parallel to roadway or perpendicular to it, depending on topography and adjacent land uses.

Design

- Size curb opening or catch basin for design storm.
- Multiple curb openings closely spaced are better than fewer openings widely spaced because it allows for greater dissipation of flow and pollutants.
- Provide energy dissipators at curb notches or catch basin outfall into swale.
- Provide settlement basin at bottom of energy dissipator to allow for sedimentation before water enters swale.

Maintenance

- Annual removal of built-up sediment in settlement basin may be required.
- Catch basins require periodic cleaning.
- Inspect system prior to rainy season and during or after large storms.

Economics

- Cost savings through elimination of underground storm drain network.
- Cobble-lined curb opening may add marginal cost compared to standard catch basin.
- Swale system requires periodic landscape maintenance.

Examples/resources

- Residential street network, Village Homes subdivision, Davis, CA.
- Dual-drainage system, Folsom, CA.

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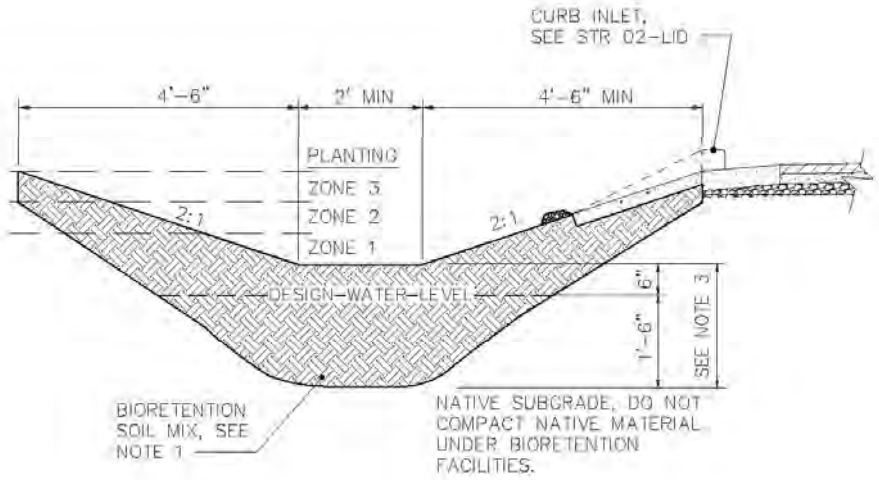
methods

URBAN SWALE DESIGN GUIDANCE



NOTES:

1. BIORETENTION SOIL, COMPOSITION AND pH LEVELS SHALL MEET THE STANDARDS SET FORTH IN THE *LID TECHNICAL GUIDANCE MANUAL FOR PUGET SOUND* (CURRENT EDITION).
2. PLANTING SHALL CONSIST OF NATIVE SPECIES ABLE TO TOLERATE VARIABLE SOIL MOISTURE CONDITIONS, PONDING WATER FLUCTUATIONS, AND VARIABLE SOIL MOISTURE CONTENT. SEE APPENDIX 3 IN THE *LID TECHNICAL GUIDANCE MANUAL FOR PUGET SOUND* (JANUARY 2005, OR AS AMENDED) FOR A "BIORETENTION PLANT LIST".
3. AT LEAST 18 INCHES OF BIORETENTION SOIL MIX IS REQUIRED BELOW THE DESIGN WATER ELEVATION. ABOVE THIS ELEVATION AT LEAST 6 INCHES OF BIORETENTION SOIL MIX IS REQUIRED. COMPACT SUBSOILS MUST BE SCARIFIED AT 4 INCHES BELOW THE AMENDED LAYER.
4. UNDERDRAINS ARE REQUIRED IN SOILS WITH INFILTRATION RATES INADEQUATE TO MEET MAXIMUM POOL AND SYSTEM DEWATER RATES.
5. SEE STR 02-LID FOR CURB INLETS.
6. ZONE 1 PLANTINGS SHOULD BE USED BELOW THE DESIGN WATER ELEVATION.

City of Mill Creek	STANDARD PLANS	STR 05-LID
	LID TYPICAL BIORETENTION SWALE	APPROVED: _____
DEPARTMENT OF PUBLIC WORKS	REVISION: DEC. '08	NOT TO SCALE / BY: ELR

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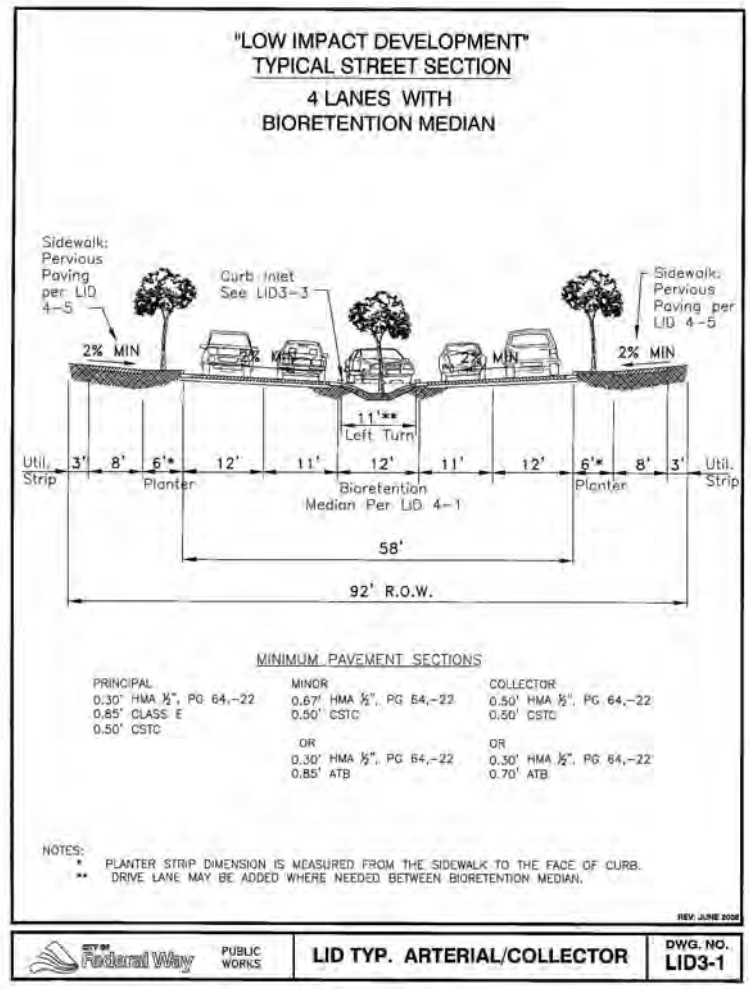
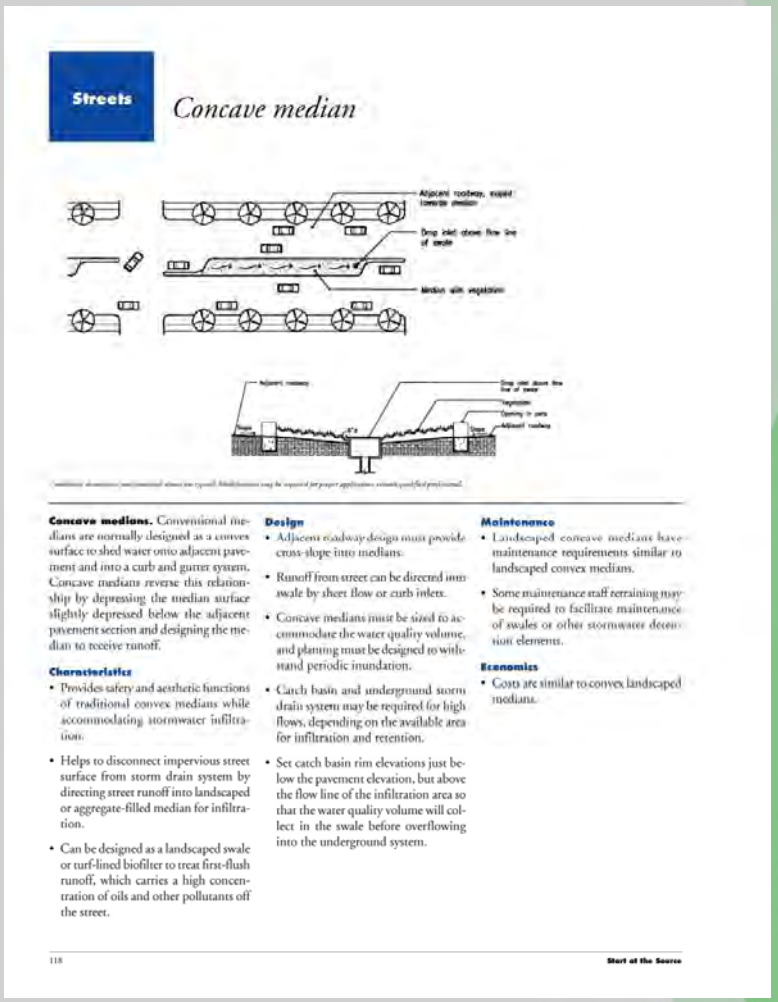
CONCAVE MEDIAN DESIGN GUIDANCE





Bay Area Design Guidance Manual

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CONCAVE MEDIAN EXAMPLE

Downey, CA

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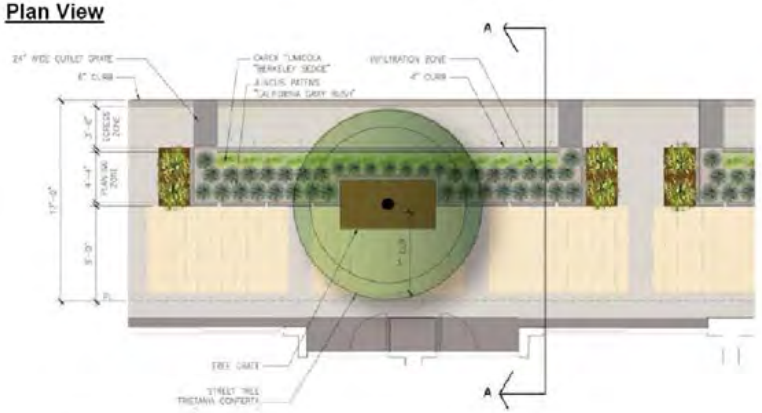
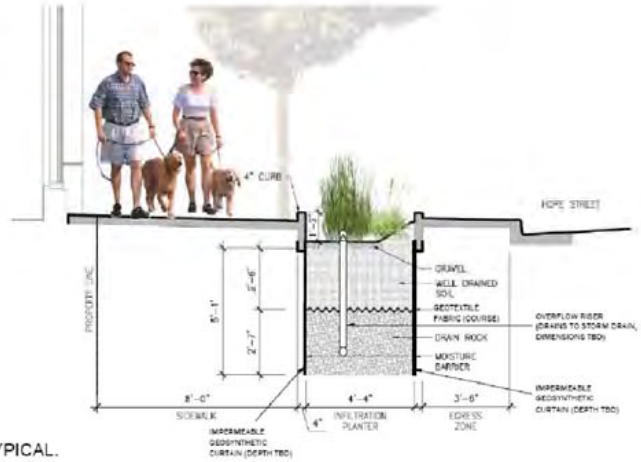
BIORETENTION PLANTER BOX – STANDARD PLAN

Plan View



Profile



ALL DIMENSIONS TYPICAL.
NOT TO SCALE.

Modified from: The South Group / GBD Architects Incorporated / Thompson Valvoda & Associates / Ankrom Moisan Associated Architects / ah'be landscape architects

Figure 1-1 **October 2008**	**Typical Alternative Concept** **Infiltration Planter/Bioretention**	

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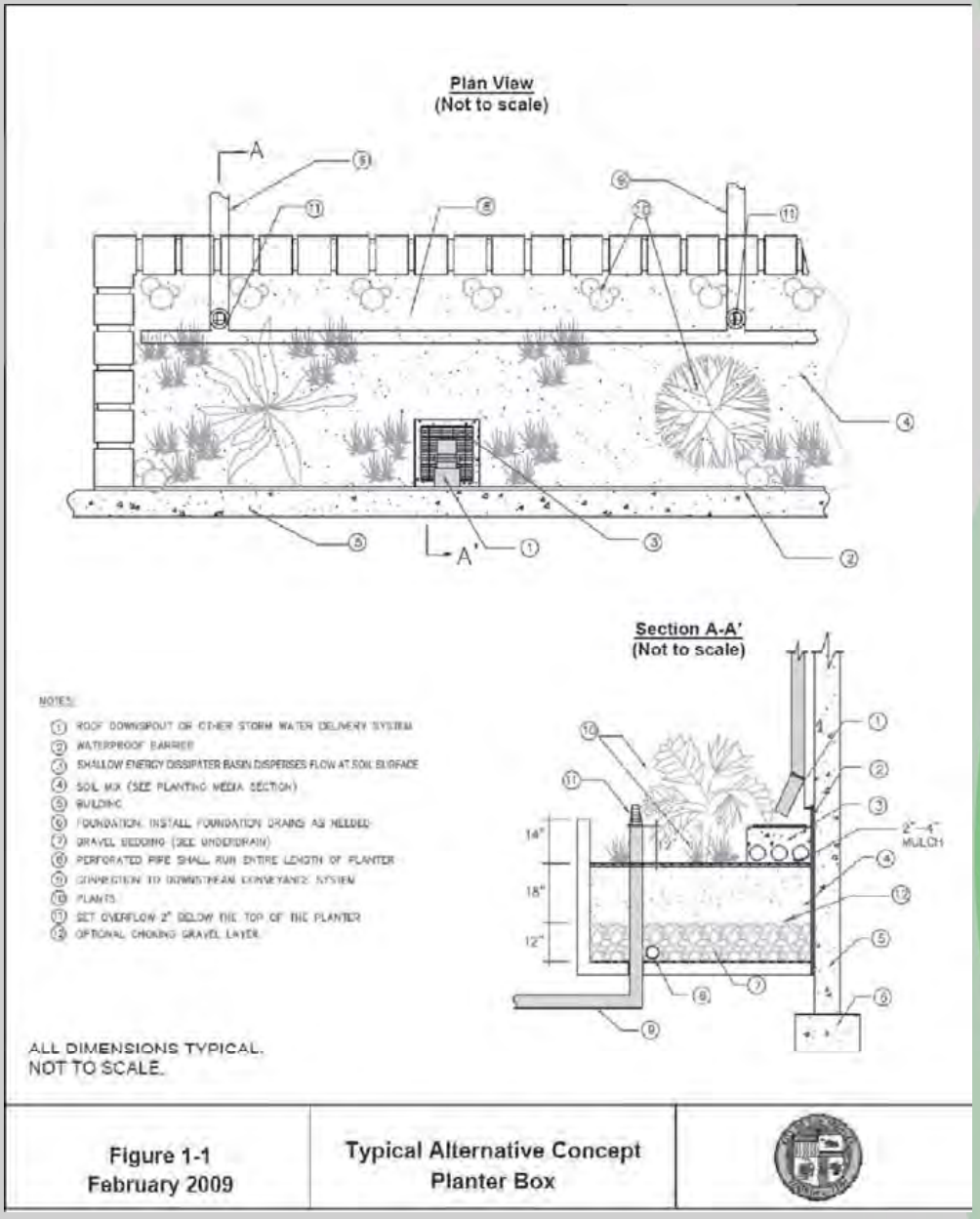
BIORETENTION PLANTER BOX – STANDARD PLAN



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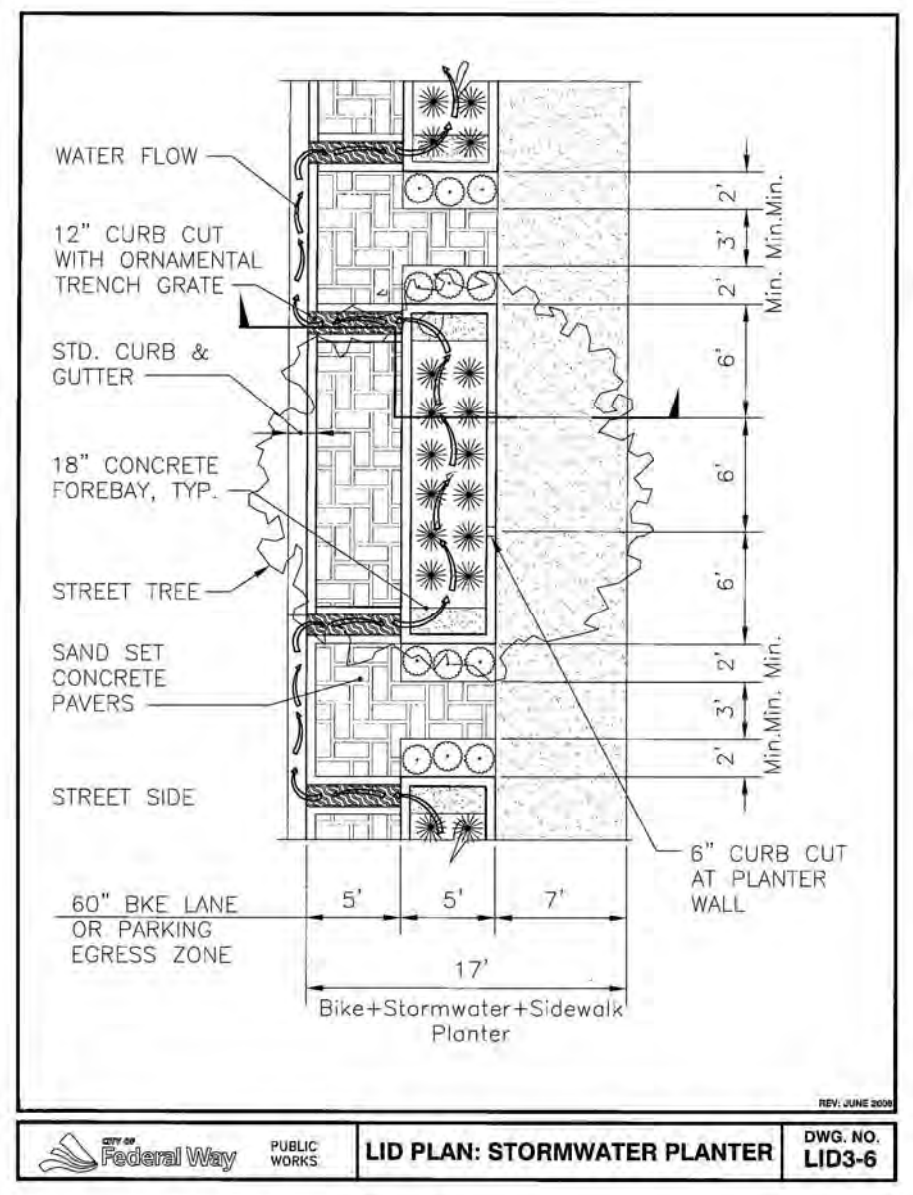
CODE EXAMPLES



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BIORETENTION PLANTER BOX

Los Angeles, CA

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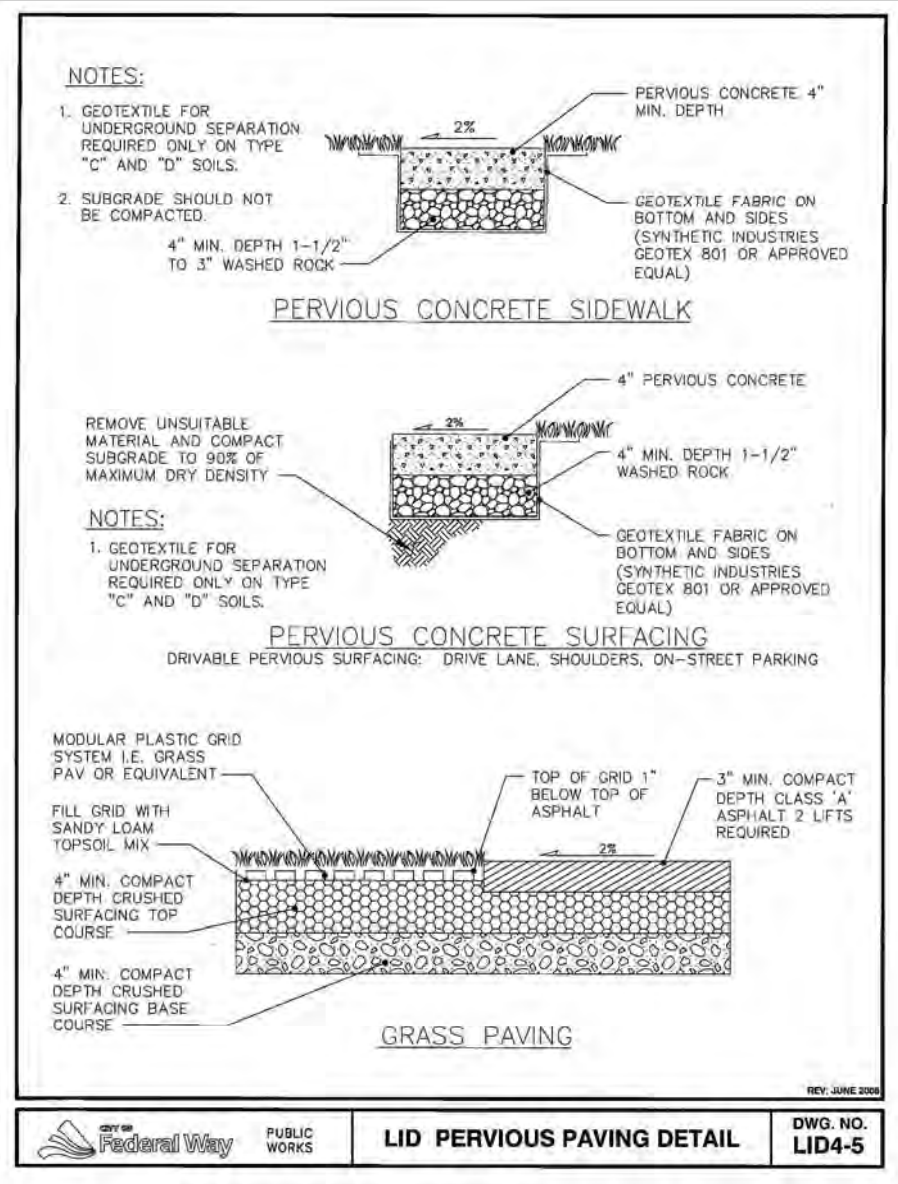
POROUS PAVEMENT DETAILS



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integration of BMPs

1. *Regulatory language hindrances*
2. *Hydromodification control requirements (performed under Joint Effort)*
3. *Applicability and Exemptions/Feasibility Criteria (performed under Joint Effort)*
4. *Non-Structural Practices*
    - *Site Assessment*
    - *Clustering*
5. *Structural Practices/Design Specifications*
    - *Landscaping and vegetation*
    - *Streets*
    - *Parking Lots*
6. ***Maintenance***

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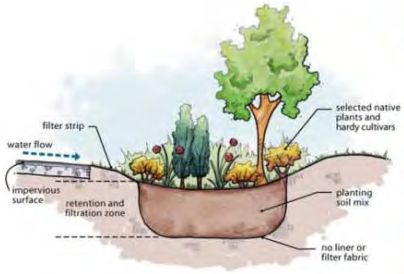
methods

MAINTENANCE PROVISIONS

Maintenance of Low Impact Development Facilities

Revised December, 2008



Prepared by:

WASHINGTON STATE UNIVERSITY
PIERCE COUNTY EXTENSION

AHBL

For:

PugetSoundPartnership
our sound, our community, our chance

drafting regulatory LANGUAGE & STANDARDS

Developed by WSU Extension and AHBL for the Puget Sound Partnership
2008 LID Local Regulation Assistance Project, December 2008

Protection of Low Impact Development IMPs During Construction

Purposes.
Protection of Low impact development (LID) integrated management practices (IMPs) from sediment and compaction requires appropriate construction planning and sequencing to minimize exposure to damaging activities and comprehensive temporary erosion and sediment control. Once installed, LID IMPs are susceptible to sedimentation and compaction until all construction is complete and the project site has been permanently stabilized. Briefing contractors before and during construction, as well as installation of temporary erosion and sediment (TES) controls and protective fencing during all phases of construction is necessary to assure the long-term function of the LID IMPs.

In the event of transitions between construction site management, TES controls and protective fencing shall be installed by the outgoing contractor prior to the transition. A site plan drawing indicating locations of LID IMPs, TES controls and protective fencing shall be provided by the outgoing contractor to the site owner. The site owner shall furnish copies of the site drawing to the incoming contractor. The incoming contractor shall maintain and repair the TES controls as necessary until job completion or subsequent contractor transition. In the event of delays between contractor transitions, it shall be the site owner's responsibility to regularly inspect and repair TES controls. This may be accomplished via contractual agreements with the outgoing contractor.

General Protection Measures.
Storage or staging of construction and landscaping materials and equipment is prohibited on pervious pavements and within vegetated LID IMPs. Pervious pavements, vegetated IMPs, their side slopes and entrance and exit structures shall remain free of all materials and equipment during all phases of construction excluding materials installed for protection purposes.

Access in pervious areas shall be limited or prohibited as follows:

- Vehicular and heavy equipment access over pervious pavement subgrades shall be limited to activities necessary for subgrade preparation and approved by the engineer.
- Vehicular and heavy equipment access over wearing courses is prohibited until pavement is sufficiently cured.
- Vehicular and heavy equipment access through vegetated IMPs is prohibited.
- Pedestrian access into vegetated IMPs shall be limited to necessary activities including subgrade preparation, under-drain, flow entrance and outfall installation and planting operations.
- All other pedestrian access into vegetated IMPs is prohibited unless approved by the Engineer.

Debris, chemicals, sediment or sediment-containing runoff shall not be directed toward pervious pavements. Temporary erosion and sediment controls shall be used to prevent construction or sediment containing runoff from entering vegetated IMPS. Where no practical method to direct sediment laden construction flows away from vegetated BMP's exists, an approved plan for sediment removal, soil rehabilitation, infiltration verification and completion shall be provided by the engineer.

Airborne dust shall not be allowed to deposit or collect on pervious pavements.

SECTION THREE

Integrating Maintenance & Enforcement into DEVELOPMENT CONTROLS

objective

The importance of establishing clear maintenance criteria that can be understood by staff during the preparation of the amendments to the regulatory standards:

- By elected officials for policy purposes such as budgeting
- By applicants making application for new development
- Property owners

Integrating Maintenance & Enforcement into DEVELOPMENT CONTROLS

examples

Maintenance Code Example:

18.72.090 LID features protection and maintenance.

A. All low impact development projects shall record a legal instrument acceptable to the City against the land title to ensure that the low impact development features are protected and maintained.
B. All LID projects shall provide a maintenance plan/program to the City that has been approved by the City, including source control BMPs.
    1. The maintenance plan/program shall address the following:
        a. How all of the elements of the LID system will be maintained, including
            i. Structural and drainage maintenance;
            ii. Vegetation management; and
            iii. Establishment and appropriate long-term irrigation.
        b. The schedule for ongoing maintenance of all LID project facilities.
        c. The responsible party for ongoing maintenance of all LID project facilities.
    2. The agreement must include wording that if all or part of any LID approach ceases to function or is removed, equivalent LID approach(es) must be installed and all other stormwater management requirements met, prior to removal.
    3. Declaration that failure to maintain all LID project facilities as established in the maintenance plan/program may result in the City performing the necessary maintenance and billing the responsible property owner(s) subject to Chapter 18.71 LFPMC.

examples

Performance vs. maintenance standards:

Performance: a warranty that the system operates as it was designed

Maintenance:

- Short Term – ensures that the system becomes established in order to function properly long term
- Long Term – ensures the system continues to operate as it was intended to over time

Integrating Maintenance & Enforcement into DEVELOPMENT CONTROLS

examples

What types of tools exist for ensuring short and long term **performance**? And how might they be integrated into local controls?

- Performance Bond
- Approved by certified engineers or other qualified professionals at regular intervals and as needed

How might **maintenance** provisions be integrated into local development controls?

- Permit conditions
- Enforcement procedures

Integrating Maintenance & Enforcement into DEVELOPMENT CONTROLS

examples

What types of educational materials should be prepared for use with property owners after completion of design?

- Maintenance manuals and guidebooks & brochures
- LID Manuals
- Interpretive Signage

Integrating Maintenance & Enforcement into DEVELOPMENT CONTROLS

examples

General Maintenance Guidelines

In addition to providing beauty, the storm garden is specially designed to capture storm flows from the street. Each component is carefully placed to ensure that the storm-water that needs to be treated (the first flush) is collected in the garden, while excess flows continue to the existing storm drain system.

- *Do not block any flows from entering the garden. Low flows and nuisance flows are designed to enter the garden and some areas within the storm garden (especially the first bay) may remain wet for extended periods of time.*
- *It is important that water can freely enter the garden for treatment. The concrete entrance pad and driveways are designed so that they can be swept clean with a broom or scooped clean with a flat shovel. Please remove any sediment build up that can allow water to pond in the driveway. Garbage and sediment cleaned from these areas should be bagged and placed in the trash. Do not place the debris in the street or in the storm garden.*
- *The rock pads are to filter sediments and prevent erosion. Do not remove the rocks and please place them back into the pads if a larger storm causes them to move.*

(continued on back of brochure)

(continued from inside flap)

- *It is important to periodically weed the garden and the rock pads to maintain a healthy garden. Please bag and remove all weeds from the cell.*
- *If a large storm is encountered, the storm gardens are designed to fill up and the extra flow will spill over the dams to the next cell or into the street. Do not block flows on the downstream ends and remove any garbage or debris that may prevent flow from exiting the garden.*
- *Do not move or remove the timber dams. They are carefully placed to maximize water collection and treatment.*

THANK YOU FOR YOUR SUPPORT OF THIS INNOVATIVE PROJECT!

Project brought to you by:

CITY OF SPOKANE

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LINCOLN STREET

BIOINFILTRATION CELL MAINTENANCE GUIDE

Identification

Plant Care

Maintenance

Comb out dead leaves in the spring or cut back to a few inches high in early spring if most leaves don't overwinter. Reddish coloration is normal.

2. *Rudbeckia fulgida* 'Goldsturm' - Goldsturm Black-eyed Susan
If plant appears leggy or floppy, cut back in early summer to encourage compact growth. Cutting back dead flowers will extend bloom period. Divide and replant if a hole develops in the center of a clump.

3. *Salvia* x *sylvestris* 'May Night' - May Night Sage
Deadhead spent blooms throughout the growing season if desired.

4. *Mahonia repens* - Creeping Mahonia
Cut dead branches back to stem. Reddish coloration is normal. Watch for insects.

The project makes use of three different plant palettes, depending upon sun exposure. Use these pictures to determine which palette is on your section of street and follow these simple maintenance guidelines.

Partial Sun / Shade

1. *Hemerocallis* 'Stella d' Oro' - Stella d' Oro Daylily
Comb out dead leaves in the spring or cut back to a few inches high in early spring if most leaves don't overwinter. Deadhead spent blooms throughout the growing season if desired. Cut dead stalks to ground in spring.

2. *Spiraea japonica* 'Little Princess' - Little Princess Japanese Spiraea
Cut back spent flower heads throughout the season.

3. *Festuca glauca* - Blue Fescue
Comb out dead leaves in the spring or cut back to a few inches high in early spring if most leaves don't overwinter.

4. *Mahonia repens* - Creeping Mahonia
See "Full Sun" Guidelines

Full Shade

1. *Hosta fortunei* 'Albo-marginata' - White Variegated Hosta
Comb out dead leaves in the spring or cut back to a few inches high in early spring if most leaves don't overwinter. Transplant and divide hostas in spring or late summer.

2. *Iris missouriensis* - Western Blue Iris
Cut back spent flower heads throughout the season.

3. *Arctostaphylos uva-ursi* - Kinnikinnick
Cut dead patches out as necessary. Reddish coloration is normal.

4. *Mahonia repens* - Creeping Mahonia
See "Full Sun" Guidelines

MAINTENANCE MANUAL

Integrating Maintenance & Enforcement into DEVELOPMENT CONTROLS

examples

EDUCATIONAL HANDOUT/MANUALS

Conservation District of Santa Cruz County

Integrating Maintenance & Enforcement into DEVELOPMENT CONTROLS

examples

INTERPRETIVE SIGNAGE

Integrating Maintenance & Enforcement into DEVELOPMENT CONTROLS

examples

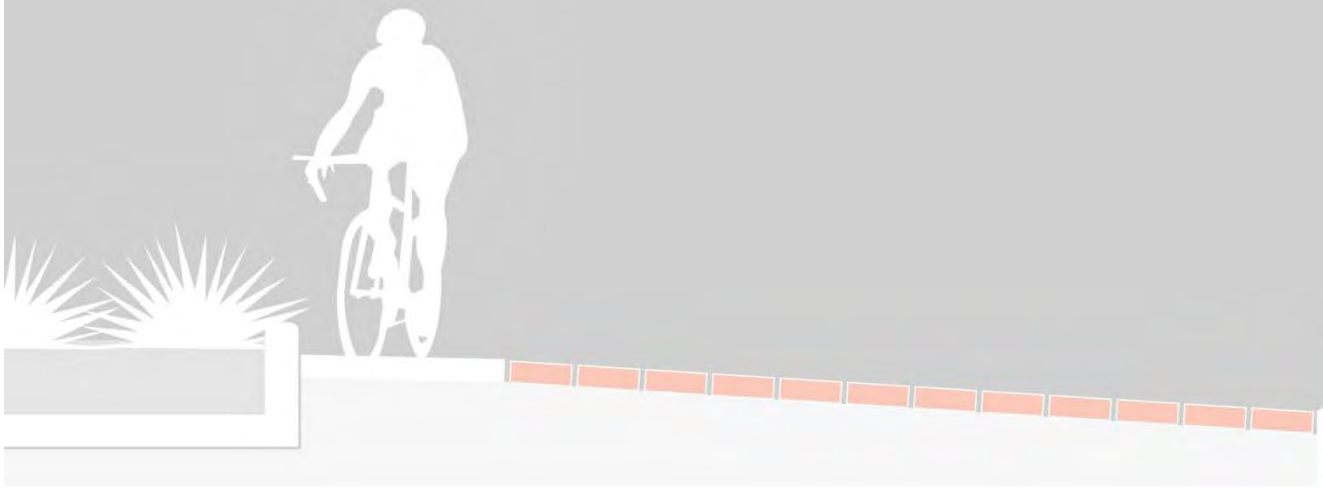
What are the maintenance and educational strategies related to chain of title that should be considered?

- Title Notification
- Easements

Integrating Maintenance & Enforcement into DEVELOPMENT CONTROLS

SECTION FOUR

supporting documentation for the ADOPTION PHASE



objective

The role of studies, pilot projects, and other "findings of fact" that can aid staff during the adoption phase of the regulations and standards.

Solicit feedback as to those external resources that would be most helpful to local staff during the adoption phase.

The adoption of hydromodification control requirements can be a challenging exercise even in the most supportive of legislative settings

supporting documentation for the ADOPTION PHASE

studies and resources

When should external resources be collected?

- Timing of collecting these resources and the value they may hold when working with a stakeholder or other technical working group

supporting documentation for the ADOPTION PHASE

studies and resources

supporting documentation for the ADOPTION PHASE

Studies and resources that have provided support during the adoption phase in jurisdictions that have integrated hydromodification controls into codes:

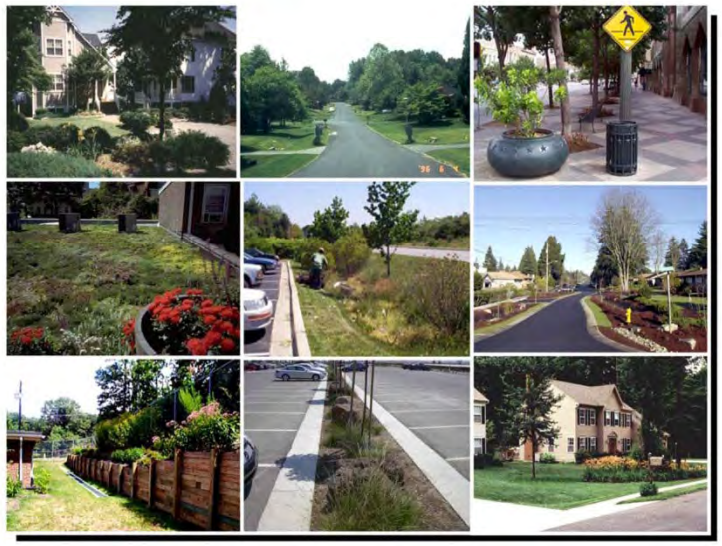
- Cost studies (including capital and maintenance)
- Maintenance procedures (especially important for stakeholders & elected officials
- Listings of nearby practices
- Identification of other areas (preferably in California) that have adopted hydromodification control requirements that include LID.

studies & resources

supporting documentation for the ADOPTION PHASE

COST STUDY

Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices



studies & resources

COST FACT SHEET

NC COOPERATIVE EXTENSION - WATERSHED EDUCATION FOR COMMUNITIES AND OFFICIALS

Low Impact Development - an economic fact sheet

Low Impact Development mimics the natural water cycle of the landscape, reducing the negative impacts of storm water runoff pollution on streams and rivers.

Communities first learning about Low Impact Development (LID) often ask, "Does it cost more than conventional development?"

Decision makers may ask "How can we communicate the costs and benefits of LID to developers and citizens?"

The purpose of this factsheet is to provide basic economic information on Low Impact Development. This simplified overview of a complicated topic is intended to help citizens, developers, and policy-makers have an informed discussion about the costs, benefits, and trade-offs of LID in their community.

The importance of recognizing long-term benefits of LID and those benefits that are not easily monetized are also highlighted.

The factsheet is a summary of information from multiple sources, including some examples of LID economic studies. We are thankful for the original researchers' and writers' time and effort.

Every LID site will have different costs and benefits based on many things including the site itself, the development design, and construction costs. There is a perception that any change to traditional development norms, including new technology will have higher costs and less profit. Numerous examples in this factsheet prove otherwise. In addition, protecting natural ecosystems through sound LID practices provides numerous benefits to communities.

This fact sheet results from a project in Transylvania County, NC. A US Environmental Protection Agency grant provided through the NC Division of Water quality allowed NC Cooperative Extension and other partners to work with the Transylvania Natural Resources Council to involve the community in open discussions about the use of Low Impact Development to allow growth and protect natural resources.

NC State University A&T State University COOPERATIVE EXTENSION
Empowering People • Providing Solutions

supporting documentation for the ADOPTION PHASE

studies & resources

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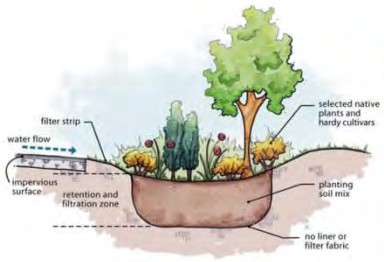
MAINTENANCE MANUAL

Maintenance of Low Impact Development Facilities

Revised December, 2008



Prepared by:

WASHINGTON STATE UNIVERSITY
PIERCE COUNTY EXTENSION

AHBL

For:

PugetSoundPartnership
our sound, our community, our chance

studies & resources

The importance of cataloging local examples that can be found within a few hour drive of the local jurisdiction:

- *Allowing decision makers to* **understand** *what the practices look like in the ground.*
- *Providing* **comparable** *examples so that decision makers understand that the practices are not only applicable and used elsewhere. This will allow decision makers to rest assured that they are not out on a limb adopting untested standards.*

A valuable resource that is continually evolving with new information about hydromodification control and LID practices can be found on the LID portal at the California Stormwater Quality Association website (http://www.casqa.org)

supporting documentation for the ADOPTION PHASE

studies and resources

What materials would you find most useful during the preparation process?

What materials do you anticipate would be most useful during the adoption phase?

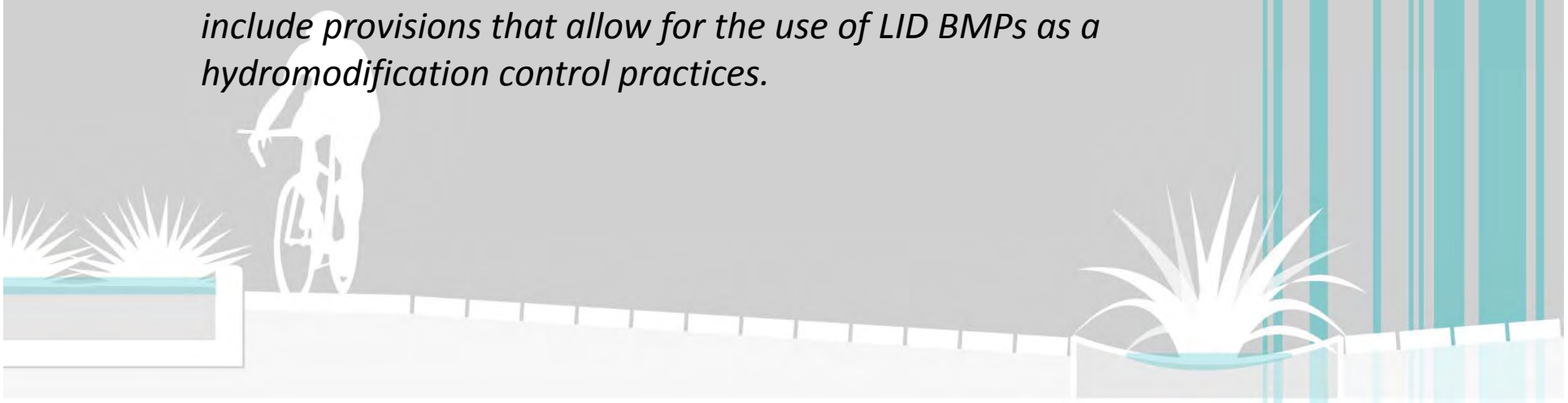
supporting documentation for the ADOPTION PHASE

CONCLUDING REMARKS:

The gap analysis will be an important tool for systematically determining where your heavy lifting should be prioritized.

Other communities, such as San Mateo County and the cities of Los Angeles, Portland, and San Diego (among many) have already modified many of their existing codes and standards, so you can assemble examples from these jurisdictions to save in time and effort. Other excellent examples to draw from can be found from the City of Santa Barbara.

In addition to your code language, engineering details should include provisions that allow for the use of LID BMPs as a hydromodification control practices.



Central California Municipal Regulatory Update Assistance Program
(MRUAP)

SESSION ONE

~~1a:~~	~~Wed~~	~~Jan 12~~	~~2011~~	~~9-11 a.m.~~
~~1b:~~	~~Thu~~	~~Jan 13~~	~~2011~~	~~9-11 a.m.~~
~~1c:~~	~~Tue~~	~~Jan 18~~	~~2011~~	~~9-11 a.m.~~

SESSION TWO

2a:	Thu	Jan 20	2011	9-11 a.m.
2b:	Fri	Jan 21	2011	9-11 a.m.
2c:	Mon	Jan 24	2011	9-11 a.m.

TRAINING PARTICIPANTS:

After the full training is complete, please email Darla Inglis dinglis@ucde.ucdavis.edu with the name and organization (e.g., city, county, university, firm, etc.) of each participant

Central California Municipal Regulatory Update Assistance Program

[MRUAP]

SESSION THREE PREVIEW