

Low-Impact Development and Habitat Protection: New Regulations, Overcoming Hurdles to Implementation, Case Studies, and Resources

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Low Impact Development

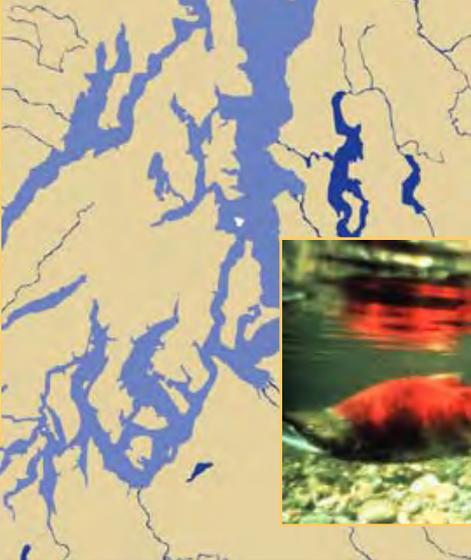
An innovative, ecosystem-based approach to land development and stormwater management

Why We Need Low Impact Development



To better protect our:

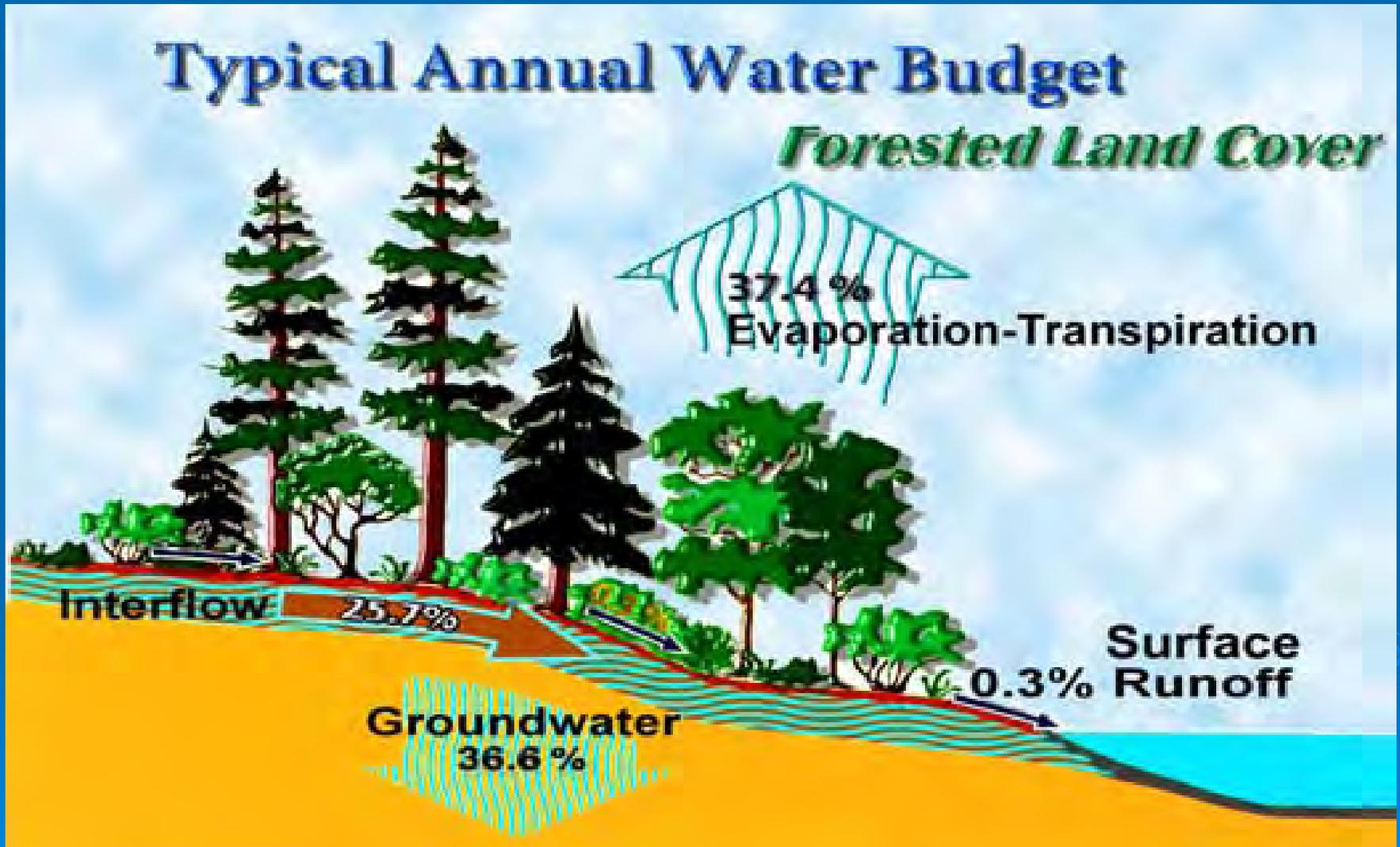
- Streams
- Fish and wildlife habitat
- Watershed hydrology
- Drinking water
- Water quality



To reduce infrastructure costs

To make our communities more attractive

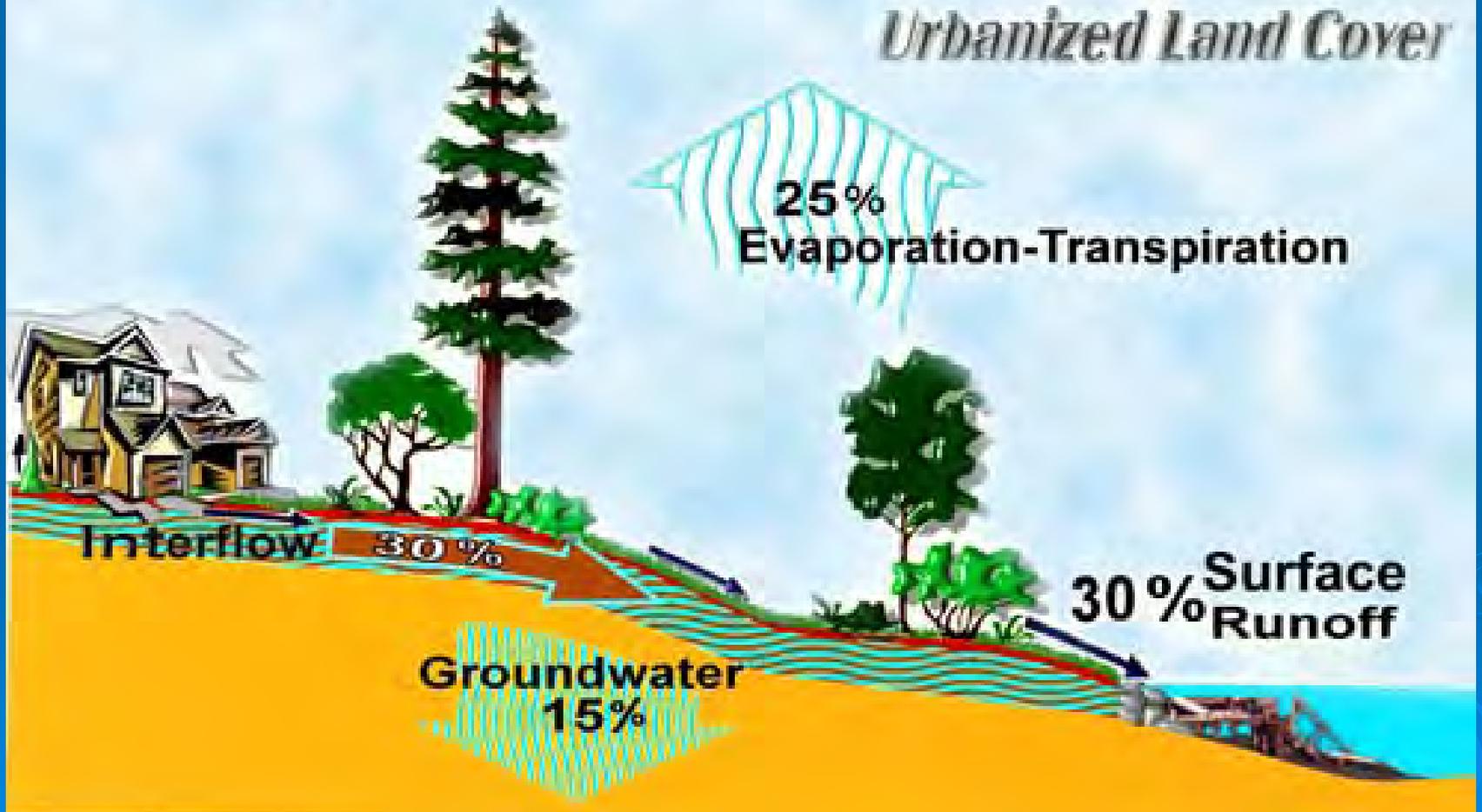
Natural Conditions



Developed Conditions

Typical Annual Water Budget

Urbanized Land Cover



Summary

- Development and stormwater runoff have degraded streams, fish habitat and water quality in Puget Sound.
- LID is a new approach to land development and stormwater management that helps protect water resources and watershed hydrology.
- We're gaining a better understanding of how LID can be used to protect the environment, reduce costs and make our communities more attractive.

A CHANGE IN THINKING

- 2001 PUGET SOUND LID CONFERENCE
- 2003 KC BUILT GREEN/LID DEMO. ORD.
- 2005 PUGET SOUND LID MANUAL
- SCIENTISTS CALL FOR LID IN PSP
- APPEAL OF NPDES PERMIT – REQUIRE THE USE OF LID “AS FEASIBLE”
- MANY ORDINANCES AND DEMO PROJECTS IN REGION

KC FC BMP Requirement

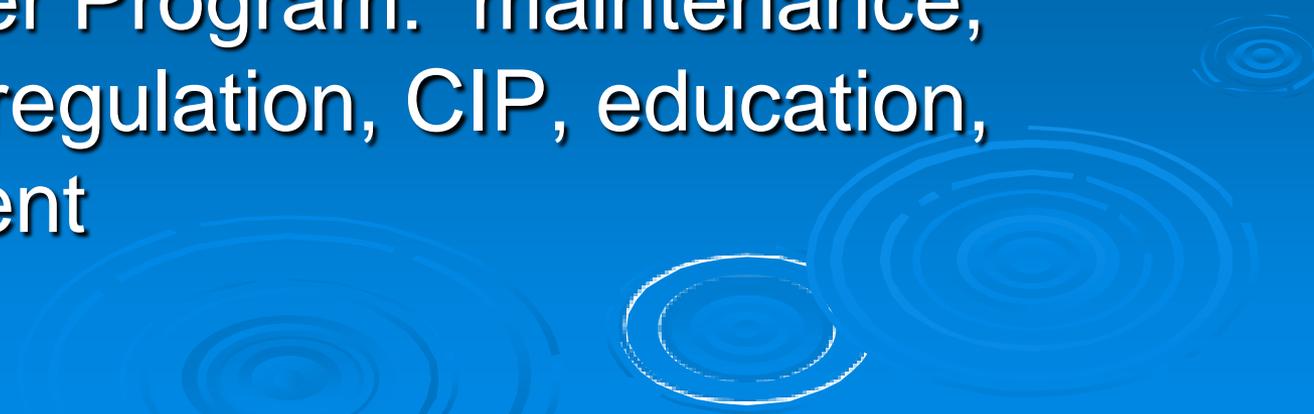
- FC BMPs (a.k.a. Low Impact Development BMPs) required in addition to and in the absence of FC facilities on most developments.
- FC BMPs include measures for increasing retention and/or infiltration of rainwater and minimizing developed surfaces and runoff.
- Requirement based on project type
- Facility sizing credits given for FC BMPs.

Flow Control BMPs

Desired Outcomes

- Maximize opportunities to infiltrate and/or retain runoff from developed surfaces.
- Minimize increases in overland flow volume (bad runoff) that results in flashy stream conditions and extended low flows in winter.
- Minimize losses in groundwater recharge critical to water supply and summer base flows in streams.

MORE THAN THE MANUAL

- Critical Area Protection: streams, wetlands, shorelines, CARAs, erosion
 - Zoning
 - Soil amendment
 - Clearing Limits
 - Stormwater Program: maintenance, planning, regulation, CIP, education, enforcement
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MANUAL REQUIREMENTS

- Constructed Facilities: pipes, swales, ponds, vaults
- LID BMPs: reduced impervious surface, rain gardens, green roofs, pervious pavement, forest retention, dispersion, infiltration, rainwater harvesting
- Pollution Prevention BMPs: structural source control, spill prevention, limiting pollutant use

How the Manual is Structured

- **CHAPTER 1 DRAINAGE REVIEW AND REQUIREMENTS**
- **CHAPTER 2 DRAINAGE PLAN SUBMITTAL**
- **CHAPTER 3 HYDROLOGIC ANALYSIS & DESIGN**
- **CHAPTER 4 CONVEYANCE SYSTEM ANALYSIS & DESIGN**
- **CHAPTER 5 FLOW CONTROL DESIGN**
- **CHAPTER 6 WATER QUALITY DESIGN**
- **APPENDICES:**
- **A Maintenance Standards**
- **B Master Drainage Plans**
- **C Small Project Drainage Requirements**
- **D Erosion and Sediment Control Standards**
- **REFERENCE MATERIALS**

CHAPTER 1: DRAINAGE REVIEW AND REQUIREMENTS

- When is drainage review required?
- There must be a permit or approval required and thresholds must be exceeded.

When is drainage review required?

- **Drainage review required if the project has or exceeds any one of the following:**
 - 2000 square feet of new and or replaced impervious surface,
 - 7000 square feet or more of land disturbing activity,
 - construct or modify a drainage pipe/ditch that is 12 inches or more in size/depth, or receives surface and storm water runoff from a drainage pipe/ditch that is 12 inches or more in size/depth,
 - The project contains or is adjacent to a flood hazard area,
 - The project is located within a Critical Drainage Area,
 - The project is a redevelopment project proposing \$100,000 or more of improvements to an existing high use site, or
 - The project is a redevelopment project on a single- or multiple-parcel site in which the total of new plus replaced impervious surface is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation and frontage improvements) exceeds 50% of the assessed value of the existing site improvements.

Drainage Review Thresholds and Types

➤ Small Project Drainage Review

- ✓ Required for single family and ag projects adding more than 2000 square feet of new and replaced impervious AND
- ✓ No more than 10,000 square feet of total impervious surface and no more than 2500 square feet of new pervious surface or 5,000 square feet of total impervious surface and no more than 35,000 square feet of new pervious surface, OR
- ✓ Formula for larger sites

➤ Targeted Drainage Review

- ✓ Projects subject to this type of drainage review are typically Small Project Drainage Review proposals or other small projects that have site-specific or project-specific drainage concerns that must be addressed by a civil engineer or engineering review staff.

➤ Full Drainage Review

- ✓ Projects that don't qualify for small project review

➤ Large Project Drainage Review

- ✓ Projects that propose to add more than 50 acres of impervious surface or include more than 50 acres of a Critical Aquifer Recharge Area

Core Requirements

- Core Reqmt #1: Discharge at the Natural Location
 - Core Reqmt #2: Offsite Analysis
 - Core Reqmt #3: Flow Control
 - Core Reqmt #4: Conveyance System
 - Core Reqmt #5: Erosion and Sediment Control
 - Core Reqmt #6: Maintenance and Operations
 - Core Reqmt #7: Financial Guarantees and Liability
 - Core Reqmt #8: Water Quality
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Special Requirements

- Special Reqmt #1: Other Adopted Area-Specific Requirements
- Special Reqmt #2: Flood Hazard Area Delineation
- Special Reqmt #3: Flood Protection Facilities
- Special Reqmt #4: Source Control
- Special Reqmt #5: Oil Control

CHAPTER 2: DRAINAGE PLAN SUBMITTAL

- This Chapter has seen little change since 1998
- Spells out requirements for Technical Information Reports and Plans



CHAPTER 3: HYDROLOGIC ANALYSIS & DESIGN

- Manual uses KCRTS continuous model
- Facility sizing dictated by Core #3: map and problem mitigation
 - ✓ Basic - conveyance protection
 - ✓ Conservation - stream protection
 - ✓ Flood Problem - specific areas

CHAPTER 4: CONVEYANCE SYSTEM ANALYSIS & DESIGN

- This Chapter has had very little change since the 1998 KC SWDM
- Includes design of pipe systems, open channels, outfalls and floodplain analysis



CHAPTER 5: FLOW CONTROL DESIGN

- Sizing requirement per Core #3
- Sizing method in Chapter 3
- Facility type is selected by applicant
- Design Details including material specs, control structure design and maintenance access requirements
- ***Flow Control BMP requirement***

F/C FACILITY TYPES

➤ Detention:

- Ponds
- Tanks
- Vaults

➤ Infiltration:

- Ponds
- Tanks
- Vaults
- Trenches



CHAPTER 6: WATER QUALITY FACILITY DESIGN

- Based on land use and downstream resources
- Select from a variety of facility designs



OVERALL WQ STRATEGY

- **Core #8 WQ facility requirements**
 - **Special #4 Source control**
Requires use of SPPM
 - **Special #5 Oil control at High Use**
 - **Core #5 Erosion & Sediment**
 - **Core #4 Spill control (FROP T);
Ditch/Channel lining**
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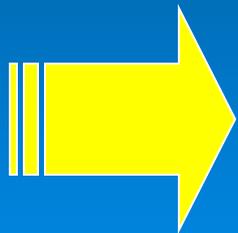
The WQ Menu

- **Basic**
- **Enhanced Basic**
- **Sensitive Lake Protection**
- **Sphagnum Bog Protection**
- **High Use**



Menu Goals

- **Basic: 80% TSS removal**
- **Enhanced Basic: 50% Total Zinc**
- **Sensitive lake: 50% TP**
- **Bog: < 10 mg/L alkalinity**
50% TP, 40% N, pH <6
- **High Use: <10 mg/L TPH / no sheen**



Applied to WQ flow or volume, average pollutant concentrations

Overview Of Water Quality Facility Types

- **Biofiltration Facility Designs**
 - Basic Biofiltration Swales
 - Wet Biofiltration Swales
 - Continuous Inflow Biofiltration Swales
 - Basic Filter Strips Narrow Area Filter Strips
- **Wetpool Facility Designs**
 - Wetponds — Basic and Large
 - Wetvaults
 - Stormwater Wetlands
 - Combined Detention and Wetpool Facilities
- **Media Filtration Facility Designs**
 - Sand Filters — Basic and Large
 - Sand Filter Vaults
 - Linear Sand Filters
 - StormFilter
- **Oil Control Facility Designs**
 - Catch Basin Inserts
 - Oil/Water Separators

Overview of Flow Control BMPs

Appendix C

- Applied to parcels
- Small lot requirements: < 22,000 square feet
- Large lot low impervious: >22,000 square feet, <45% impervious
- Large lot high impervious: >22,000 square feet, >45% impervious

Overview of Flow Control BMPs

Appendix C

- Full Dispersion
 - Full Infiltration
 - Limited Infiltration
 - Basic Dispersion
 - Rain Garden
 - Permeable Pavement
 - Rainwater Harvesting
 - Vegetated Roof
 - Reduced Impervious Surface Credit
 - Native Growth Retention Credit
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MANUAL AVAILABLE

- ONLINE AT:
<http://www.kingcounty.gov/environment/waterland/stormwater/documents/surface-water-design-manual.aspx>
- PRINTED COPIES MAY BE PURCHASED AT WLRD 201 S JACKSON AND DDES IN RENTON OR ORDERED BY CALLING 206-296-1973

Overview of the Stormwater Pollution Prevention Manual

- Provides detailed information for businesses, residents, managers and owners
- Describes required actions to reduce the contamination of stormwater, surface water and groundwater.
- Chapter I describes what is expected of the property owner, business/agency owner, or manager and provides a beginning point on the use of this manual.
- Chapter II provides information on how water becomes polluted and the effects of pollutants on water quality.
- Chapter III describes stormwater BMPs that are required for various commercial, industrial, public and multifamily residential activities.
- Chapter IV describes stormwater BMPs for single family residential.
- Chapter V provides detailed information on how to implement many stormwater BMPs.
- Chapter VI provides information on other programs or services that can provide assistance in implementing the BMPs. This manual works in a modular format so that property owners only receive the information that is pertinent to their site. The activity sheets located in Chapter III (business activities) and Chapter IV (single family residential activities) can be downloaded separately at <http://www.kingcounty.gov/environment/waterandland/stormwater/documents/pollution-prevention-manual.aspx>

What's new with LID?

Latest development in NPDES Permit LID requirement

- LID technical and policy groups formed.
- Intent is to determine feasibility and recommend new standard.
- Several meetings have taken place.
- Final meeting in June.
- Ecology to write draft standards for public review.
- Requirement to go in 2012 NPDES Permit

Questions and Answers

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