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State of Washington

Stormwater Management Manual for Eastern Washington (SWMMEW)

WELCOME

MuniCon
April 24, 2019

https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMEW/2019SWMMEW.htm

Thanks to

- 2019 SWMMEW Steering Committee
- Ecology Reviewers
- Consultants
  - Herrera Environmental Consultants
  - Robin Kirshbaum, Inc.

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Status of SWMMEW

Released for use Feb 20, 2019

Jurisdictions Adopt Manual by December 21, 2021

Used by Municipal, Industrial, Construction, Sand & Gravel, and other Permittees

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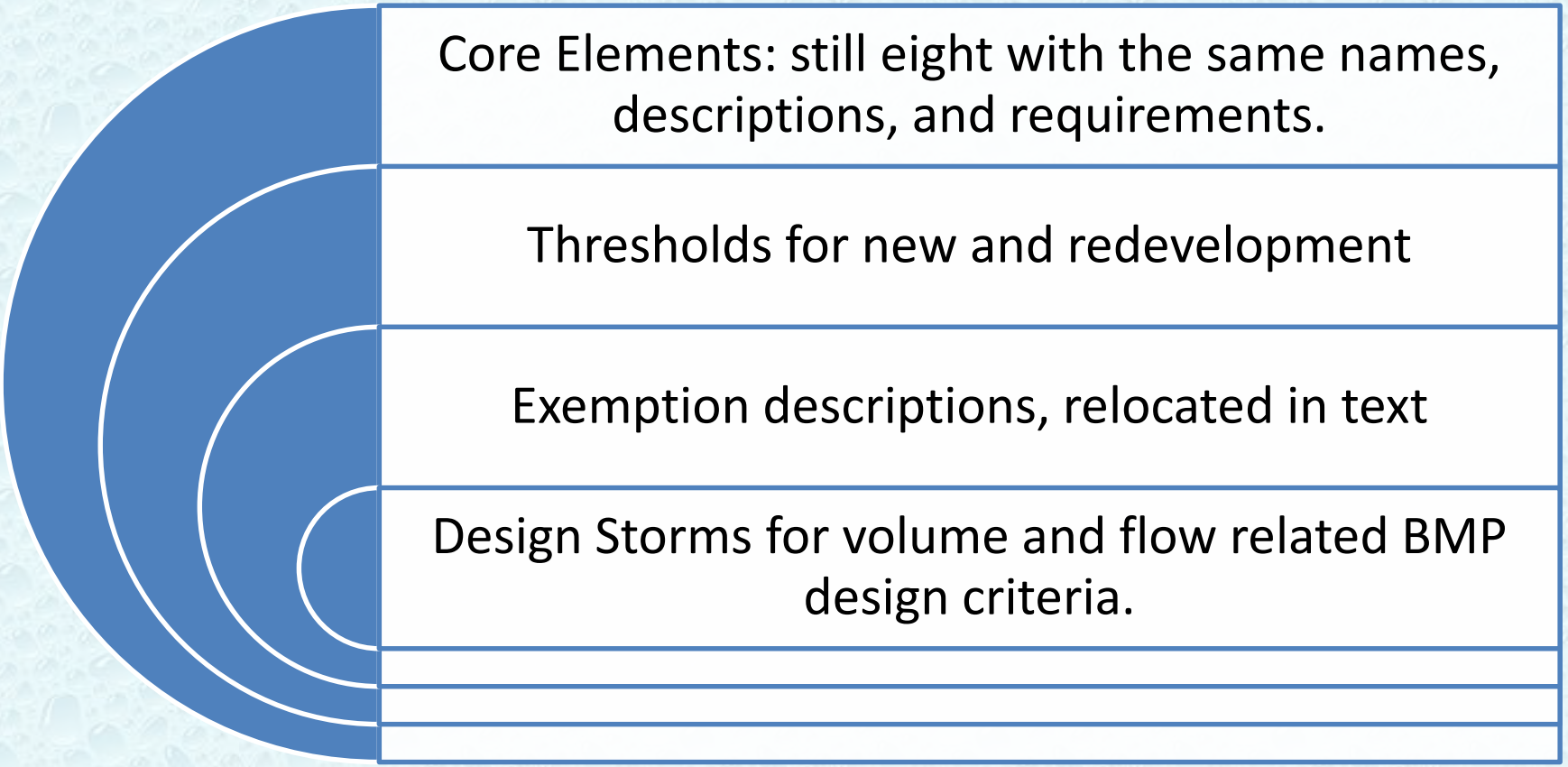
What hasn't changed



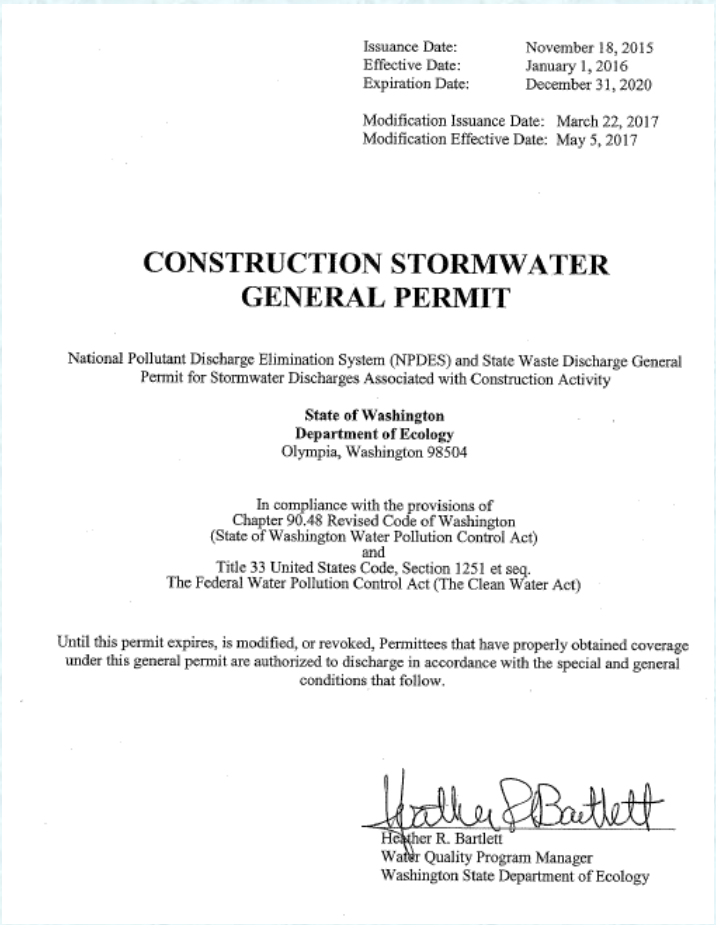
What hasn't changed

- Runoff treatment and flow control BMP design criteria
  - Edited dispersion design criteria, per EWSG direction
  - Added a significant amount of new BMP design criteria for the BMPs incorporated from the LID Manual.
- Precipitation maps (Section 4.4). Moving the mapping from the errata to the manual

What has changed

- Revised text throughout document
  - Correct typos and errors
  - Eliminate redundancies
- Moved items from text to Appendices
  - Hyetographs
  - Plant Lists for Eastern WA
  - LID Guidelines from LID Manual
- Glossary
  - New Definitions
  - Moved definitions out of CE 5

Match Construction Permit



Issuance Date: November 18, 2015
Effective Date: January 1, 2016
Expiration Date: December 31, 2020

Modification Issuance Date: March 22, 2017
Modification Effective Date: May 5, 2017

CONSTRUCTION STORMWATER GENERAL PERMIT

National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Stormwater Discharges Associated with Construction Activity

State of Washington
Department of Ecology
Olympia, Washington 98504

In compliance with the provisions of
Chapter 90.48 Revised Code of Washington
(State of Washington Water Pollution Control Act)
and
Title 33 United States Code, Section 1251 et seq.
The Federal Water Pollution Control Act (The Clean Water Act)

Until this permit expires, is modified, or revoked, Permittees that have properly obtained coverage under this general permit are authorized to discharge in accordance with the special and general conditions that follow.

Heather R. Bartlett
Water Quality Program Manager
Washington State Department of Ecology

- Edited updates to Elements
- Added Element 13
- Added and edited BMPs

Added table of Pros and Cons for infiltration calculation techniques

Table 6.3: Infiltration Testing and Evaluation Methods

Borehole percolation test (e.g., California Test 750; U.S. EPA, 1980): **Field test method originally developed for sizing septic systems that involves installation of a small-diameter (e.g., 6-inch) borehole and casing (e.g., slotted pipe or well screen), filling with clean water, and collecting measurements during a constant-head and drawdown period.**		
Advantages • Short-duration test (minimum of 1 hour, maximum of 1.5 hours) • Low cost and relatively easy to implement • Multiple tests can be performed at the same time • Preliminary assessment when performed in conjunction with grain-size distribution correlations • Can test material at depth without excavating	**Disadvantages** • Saturates a small amount of soil at the test location (i.e., small in scale) • May require multiple borings in areas with variable soils • Measures short-term infiltration rate; correction factors need to be applied for long-term (design) infiltration rates • Does not work well for areas with interbedded fine-grained sediments and/or changes in hydraulic conductivity below the tested area • May underestimate infiltration rate when drilling process creates borehole skin effect (i.e., smearing of sidewalls)	**Applicability** Infiltration BMP design
Large-scale pilot infiltration test (PIT): **Field test method involving an excavated test pit with a bottom surface area of approximately 100 square feet (sf). Involves filling with clean water and measuring water level during a constant-head and drawdown period.**		
Advantages • Larger-scale test that reduces scale error associated with site heterogeneity • Sufficient infiltration period to promote adequate soil presoaking and a stabilized infiltration rate	**Disadvantages** • Requires significantly greater effort, time, and space than small-scale infiltration tests (borehole percolation test or double-ring infiltrometer) • Logistical constraints (e.g., little or no water for testing, depth of the proposed infiltration system, difficult access, etc.) • Difficult to provide a water source to maintain a	**Applicability** • Infiltration BMP design • Large-scale permeable pavement installations where the stormwater from adjacent impervious surfaces is directed to the permeable pavement surface (high hydraulic load)

Consolidated Site Suitability Criteria (SSC) in one location

- SSC-1 Setback Criteria
- SSC-2 Ground Water Protection Areas
- SSC-3 High Vehicle Traffic Areas
- SSC-4 Soil Infiltration Rate/Drawdown Time
- SSC-5 Depth to Bedrock, Ground Water Table, or Impermeable Layer
- SSC-6 Soil Physical and Chemical Suitability for Treatment
- SSC-7 Seepage Analysis and Control
- SSC-8 Cold Climate and Impact of Roadway Deicing Chemicals
- SSC-9 Previously Contaminated Soils or Unstable Soils

Design Storm Calculation Description Table

Table 4.1: Comparison of Hydrologic Analysis Methods for Runoff Treatment and Flow Control BMP Design

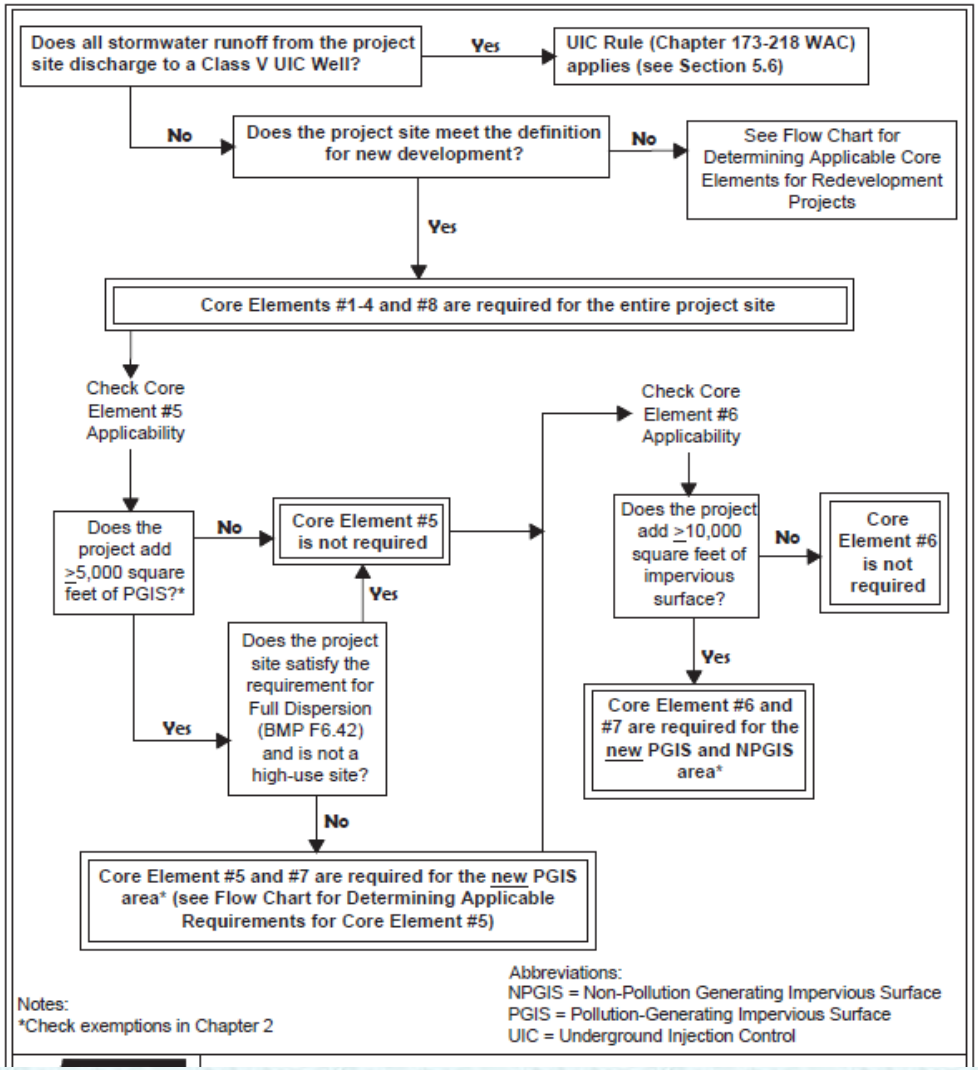
Method	Description	Advantages	Disadvantages	Applicability
Soil Conservation Service (SCS) hydrograph	Single-event hydrograph method that involves routing a proposed development hydrograph and rainfall distribution through a BMP to compare against allowable release rates.	Commercially available computer programs	Some SCS hydrograph models such as TR-55 are restricted to 24-hour hyetographs and will not allow the regional and short-duration storm hyetographs developed for eastern Washington.	• Flow control BMPs (required) • Peak flow rates and runoff volumes for runoff treatment BMPs (allowed)
Santa Barbara Urban Hydrograph (SBUH)		• Commercially available computer programs • Most accurate for small basins (< 100 acres)	• Not accurate for large basins (≥ 100 acres) where ground water flow can be a major contributor to the total flow • Should not be used for basins > 1,000 acres	
Soil Conservation Service (SCS) curve number (CN) equations	Estimate total runoff volume based on precipitation depth and CN. Typically used in conjunction with a single-event hydrograph method (SCS hydrograph or SBUH).	• Does not require use of a computer program; can be determined using a calculator • Commonly used for small and large basins	• Is not linked to a rainfall distribution (only precipitation depth) • Selection of CN is inherently subjective and may require adjustment for high ground water, shallow bedrock, soil compacted by heavy equipment, etc. • Method origins are from large rural basins	Runoff volumes for runoff treatment BMPs (based on SCS hydrograph method)
Level-pool routing method	Method to route a hydrograph through an existing retention/detention BMP or closed depression. Typically used in conjunction with a single-event hydrograph method (SCS or SBUH).	Commercially available computer programs	None identified	Flow control BMPs (required)
Rational Method	Calculation based on Q = CIA, where: • Q = runoff (cfs)	• Does not require use of a computer program; can be determined using a	• Precipitation intensity is variable and does not fall at a constant rate	• Flow-rate-based treatment BMPs
	• C = runoff coefficient based on land cover and slope • I = rainfall intensity (inches/hour) • A = contributing area (acres)	calculator • Most accurate for small basins (< 100 acres) and developed conditions with large areas of impervious surface (e.g., pavement, rooftops)	• Not accurate for large basins (≥ 100 acres) since the effects of infiltration are often not properly accounted for • Should not be used for basins > 1,000 acres	(allowed) • Used for biofiltration swale, oil and water separator, and drywell sizing • Used for conveyance system sizing
Modified Rational Method (Bowstring Method)	This method is used to estimate storage requirements for a given design storm using a series of hydrographs for different storm durations.	Produces a peak flow rate and runoff volume (compared to peak flow rate only for the Rational Method)	• May underestimate the required storage volume for any given storm event • Limited to contributing areas < 20 acres with generally uniform surface cover and topography	Peak flow rates and runoff volumes
Water Budget Method	This method uses average monthly precipitation and pan evaporation values to estimate the net stormwater runoff volume increase during a 2-year cycle.	Accounts for seasonal variations in precipitation, pan evaporation, and antecedent runoff conditions	• May be difficult to account for imported water sources (e.g., irrigation, septic systems, natural springs, foundation drains, dewatering wells, etc.) • May be difficult to account for ground water seepage	Evaporation pond design
Other hydrograph models	Peer-reviewed methods and supported by local data	Varies	Varies	Varies

Source Control BMPs

- Added new Source Control BMPs
- Apply to permits other than Municipal
  - Boat Yard
  - Industrial
  - Sand and Gravel
- Commercial/Industrial Projects

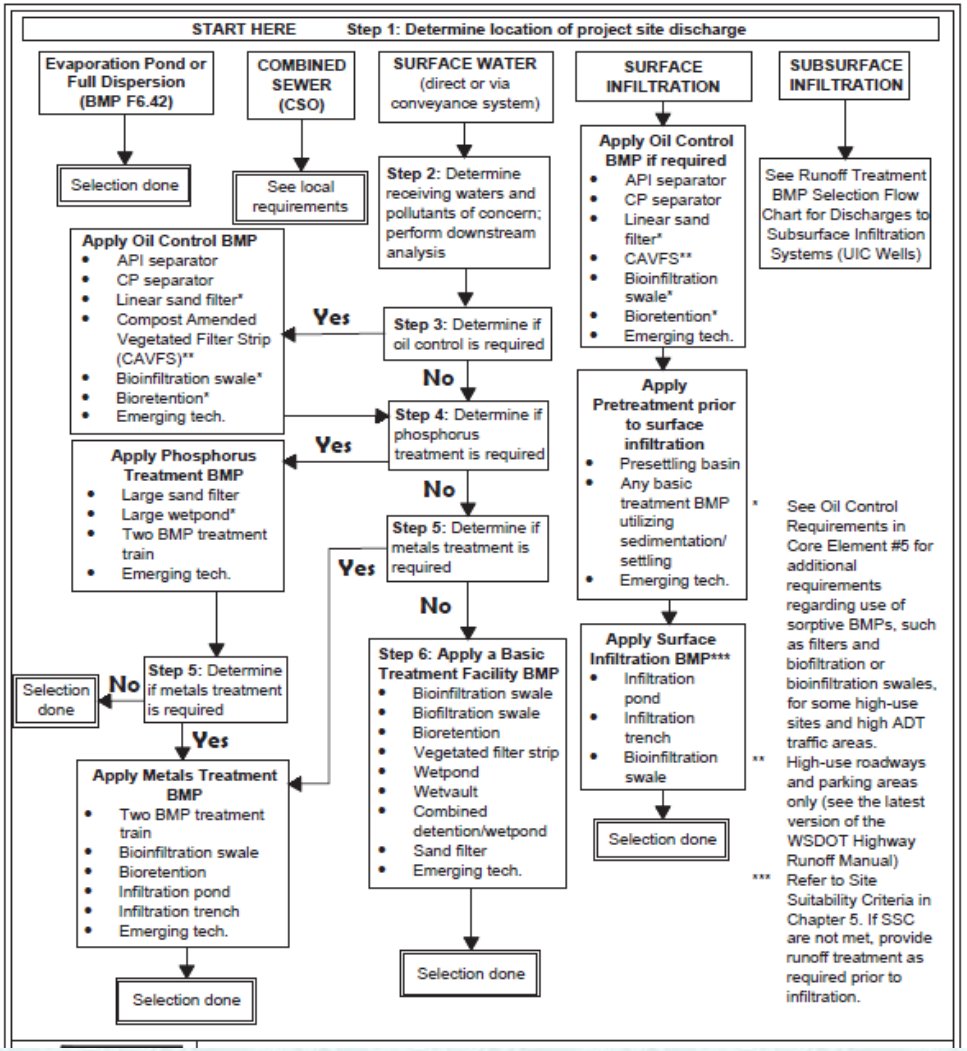
New Development Flow Charts

Figure 2.1: Flow Chart for Determining Applicable Core Elements for New Development Projects

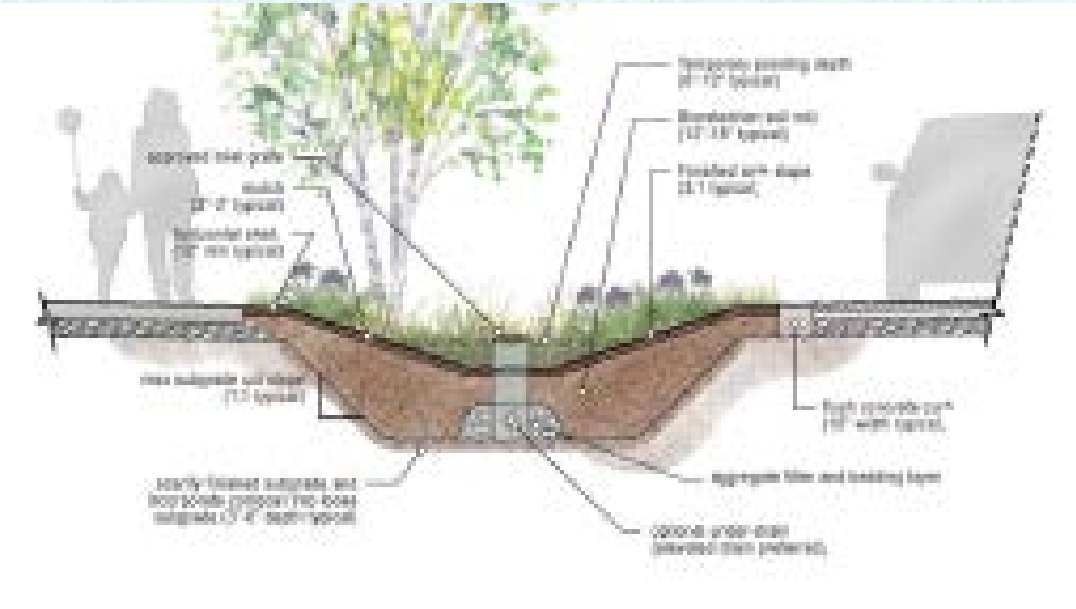


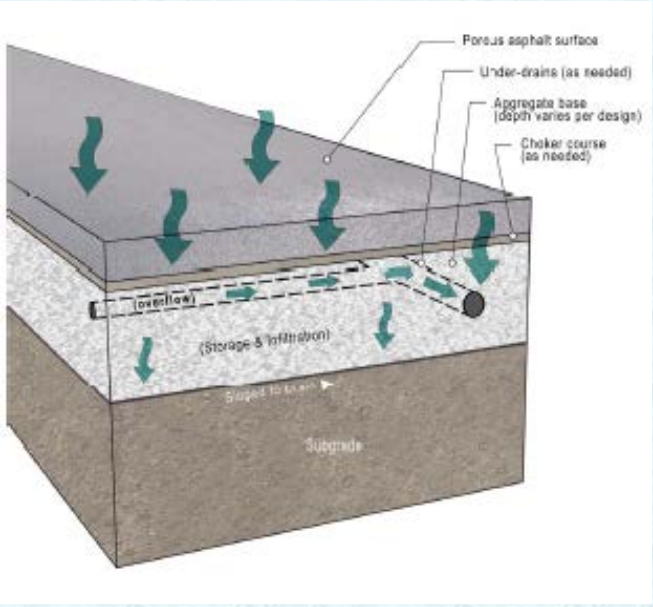
Modified BMP Selection Flow Chart

Figure 5.1: Runoff Treatment BMP Selection Flow Chart



Bioretention and Permeable Pavement added to typical BMPs in Chapter 7.





Screening Criteria for Some BMPs

Conditions that make proposed BMP infeasible or inefficient (for example)

- Shallow Groundwater levels
- Contaminated Soils
- Where infiltrating water would threaten existing below grade basements
- Where infiltrating water would threaten shoreline structures
- Within 50 feet from the top of slopes that are > 20% and > 10 feet of vertical relief

Flow control BMPs from LID

- Rain Water Harvesting
- Trees
- Vegetated Roofs
- Minimal Excavation Foundations

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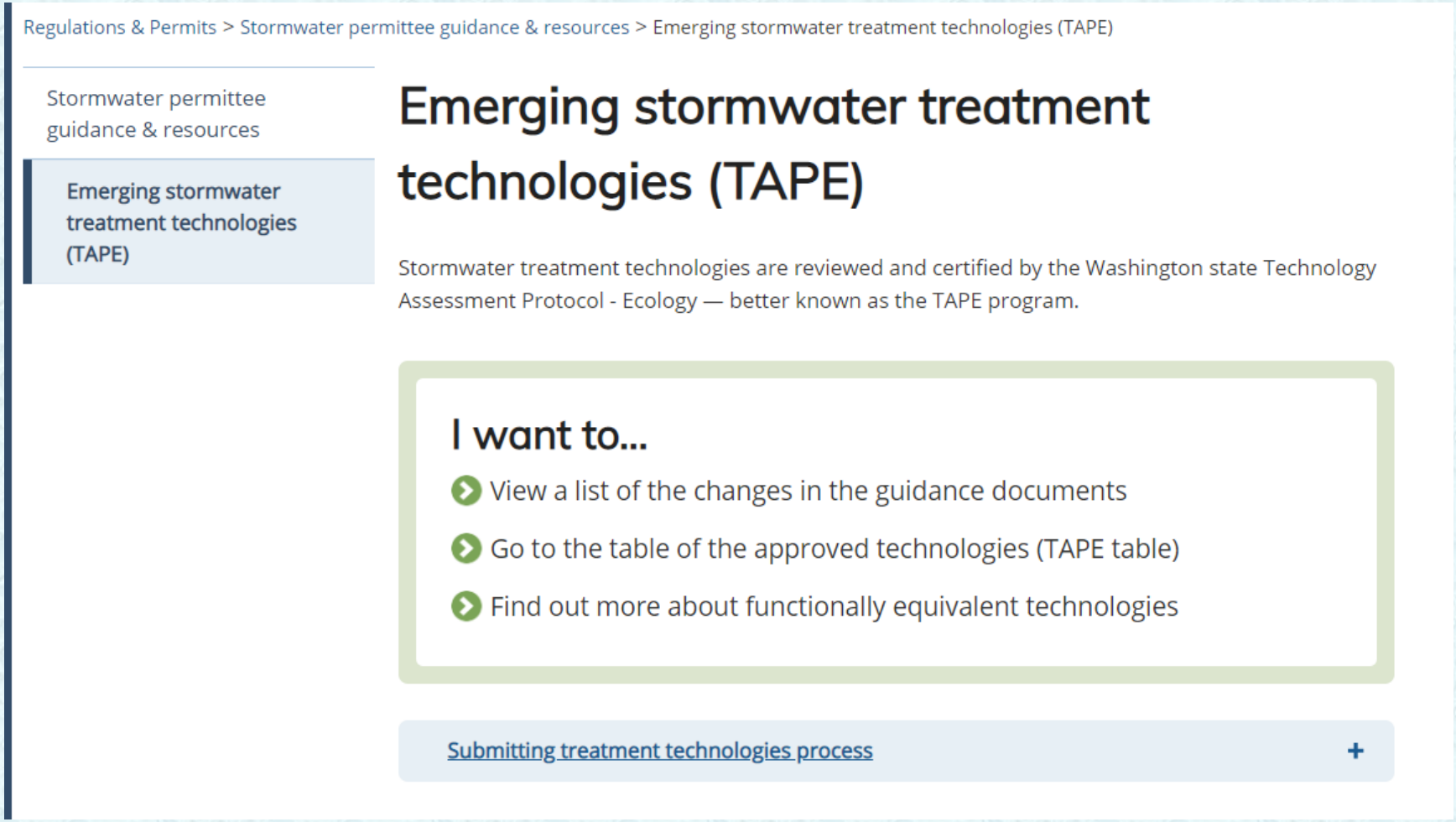
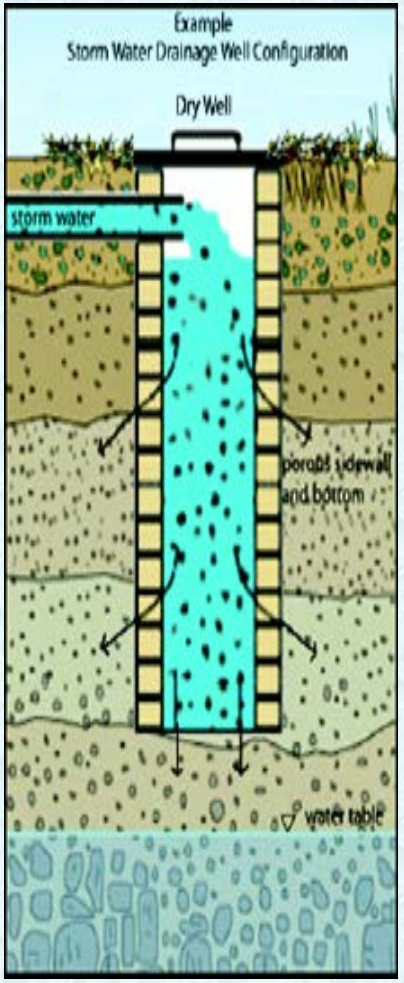
Emerging Stormwater Treatment references Website



UICs

- Clarification on when UIC Rules apply
  - Rewrote Chapter 5.6



UIC Well Edits

- Updated vadose zone treatment capacity tables
  - Specifies field tested saturated hydraulic conductivity
- Increased treatment for pollutant loading/ treatment capacity combinations
  - Adds two-stage drywell where there used to be no treatment
- Prohibition of UIC wells in public water supply well sanitary control areas
  - Protection of drinking water

UIC Well Edits

More specifics for deep UIC well requirements

- Infiltration testing
- Vadose zone attenuation analysis
- Well seal and sealing off perched zones
- State waste discharge permit considered on a site-by-site basis

UIC Well Edits

Added drinking Water well section requirements to the deep UIC well section

Maintenance for deep drywells - cleanout choices exist. Bail, air or suction

Appeal UIC rule authorizations to the Pollution Control Hearings Board or superior court under Administrative Procedures Act

UIC Well Edits

Notification of UIC well proposals

- Require UIC registration submittal at least 30 days prior to construction.
- UIC proponent of deep injection well proposals located in well head protection area should notify/consult with water purveyor in design phase.
- Ecology online search tool updated to list pending UIC well sites/proposed UIC wells.

Appeal UIC rule authorizations to the Pollution Control Hearings Board or superior court under Administrative Procedures Act

Why add UIC to SWMMEW?

Ecology recognized that there is confusion between UIC rule requirements and the requirements in the Manuals

Try to better clarify when a designer should use the UIC guidance and when to use the requirements from the Manuals.

Industrial permits refer to the Stormwater Management Manual for guidance and if someone is using a UIC for flow control, they may need to follow the UIC rule.

Eliminate separate UIC Guidance Manual

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Questions?

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Stormwater Management in Washington State

National Pollutant Discharge Elimination System (NPDES) Stormwater Permit Program or the

Underground Injection Control (UIC) Program

UIC vs NPDES

The two programs overlap.

- The UIC program borrows the design, construction, operation, and maintenance BMPs from the Stormwater Program to fulfill the AKART requirements of the UIC rule.

On-Site Requirements (S5.B.5)

(2) Permittees shall require projects approved under S5.B.5 to retain runoff generated on-site for, at a minimum, the 10-year, 24-hour rainfall event or a local equivalent. Permittees may meet this requirement using on-site or regional stormwater facilities.

Section S2.A.1
Municipal Stormwater General Permits

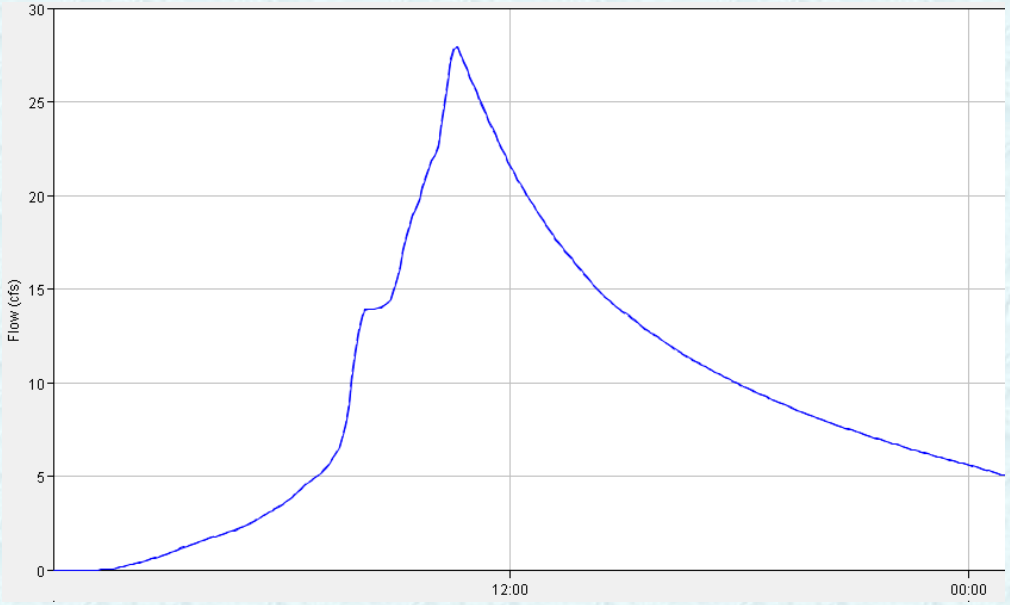
Discharges to ground waters of the state through facilities regulated under the Underground Injection Control (UIC) program, chapter 173-218 WAC, are not authorized under this Permit.

SWMMEW 5.6.4

- The MS4 Permit does not authorize stormwater discharges to/from UIC wells unless the overflow or discharge from a UIC well drains to a NPDES municipal separated storm sewer system (MS4). In those cases, the MS4 Permit does authorize the discharge and the conditions of the MS4 Permit directly apply. For example, if a UIC well is designed to infiltrate the 10-year storm and route larger storms to the MS4, then the requirements of the MS4 Permit apply to the well.

What Constitutes "No Discharge to MS4"

- 100-year, 3-hour *and*
- 100-year, 72-hour storm
- Local jurisdiction use ordinances/regulations to govern need for UIC submittals



Municipal UICs

- Design, construct, operate, and maintain new UIC wells according to guidance in SWMMEW
- Conduct a well assessment for each existing UIC
- Create a Stormwater Site Plan for the area served by each municipal UIC well

Well Assessment

- Evaluate potential risks through identification of
  - Land use
  - Local geology
  - Depth of ground water
  - If UIC is located in GWPA
- Assessing if well is a potential threat to GW

Incorporation of UICs into SWMP

- Implement and include the following activities in the SWMP:
  - Register all UIC wells (new and existing)
  - Design, construct, operate, and maintain new UIC wells according to guidance in SWMMEW
  - Operate and maintain existing UIC wells according to guidance in SWMMEW

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Questions?

Project Evaluation Flow

Using SWMMEW

- Project of some kind that will require stormwater controls
  - Exemptions
  - Site Evaluation Process
  - UIC Determination
  - Determine runoff treatment and flow control requirements

Assumptions

- Project Sites > 1 acre
  - All Permittees shall implement and enforce a program to address post-construction stormwater runoff to the MS4 from new development and redevelopment projects that disturb one acre or more, and from projects of less than one acre that are part of a larger common plan of development or sale. (S5.B.5)
- No minimum area for UICs
  - Jurisdictions need to include regulations in ordinances to deal with smaller projects that use UIC

Is Stormwater Design Required?

- Exemptions
- Local Exceptions/Variances
  - Criteria for granting, public notice requirements, and record-keeping for annual reporting
- Thresholds (3 nested sets of thresholds)
  - Regulatory threshold for triggering local drainage review
  - Project thresholds to apply the Core Elements
  - Project thresholds to require a treatment or flow control facility

Exemptions

- Full Exemptions
  - Forest Practices
  - Commercial Agriculture
  - Road and Parking Area Preservation/Maintenance
- Partial Exemptions (CE 1 and 2)
  - Underground Utility Projects
  - Safety Improvement Projects
  - Road and Parking Area Preservation/Maintenance

Road and Parking Area Preservation/Maintenance (1/2)

Exempt

- Pothole,
- Square cut patching,
- Crack sealing,
- Resurfacing with in-kind material,
- Overlaying asphalt or concrete with BST,
- Shoulder grading,
- Reshaping/regrading drainage systems,
- Vegetation maintenance

Road and Parking Area Preservation/Maintenance (2/2)

Partially Exempt

- Removing and replacing of concrete or asphalt to base course or subgrade or lower without expanding or improving the impervious surfaces
- Repairing roadway base or subgrade
- Overlaying gravel with BST or overlaying BST with Asphalt without expanding the area of coverage
  - Applies for ADT < 7,500 (urban road) or 15,000 on rural road, freeway, or limited access highway
  - Parking with < 40 trip ends/1,000 sq ft building or 100 total trip ends

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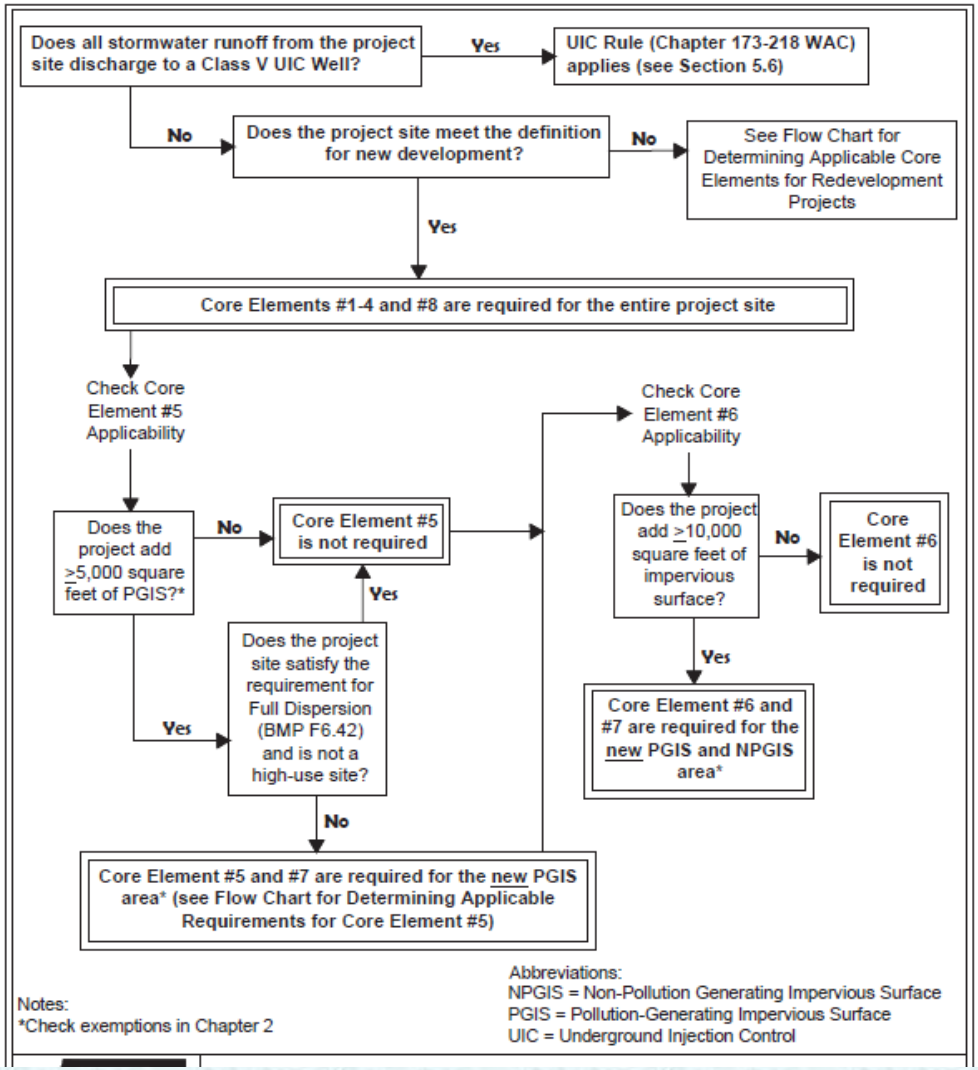
Site Evaluation

- Topography
- Native soil infiltration rate
- Native soil composition
- Depth to Groundwater
- Downstream collection system
- Project site layout

New Development Flow Charts

Figure 2.1: Flow Chart for Determining Applicable Core Elements for New Development Projects



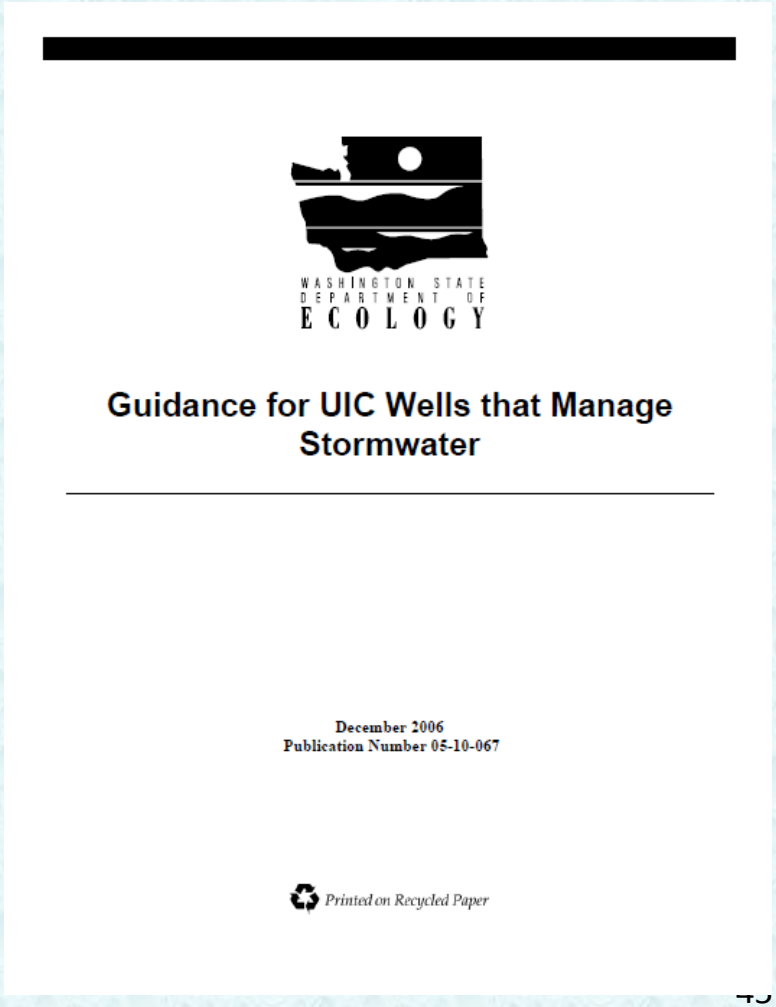
UIC Tradeoffs

- No 1-acre threshold as with Municipal Permit
- No thresholds or minimum disturbed area for UICs
- Retain all runoff on-site (100-yr storm)
- Treat and infiltrate ALL runoff

Guidance in Chapter 5.6 in the SWMMEW

UIC Rule

- 173-218 WAC Underground Injection Control Program
- Guidance Manual Developed in 2006


WASHINGTON STATE DEPARTMENT OF ECOLOGY

Guidance for UIC Wells that Manage Stormwater

December 2006
Publication Number 05-10-067

Printed on Recycled Paper

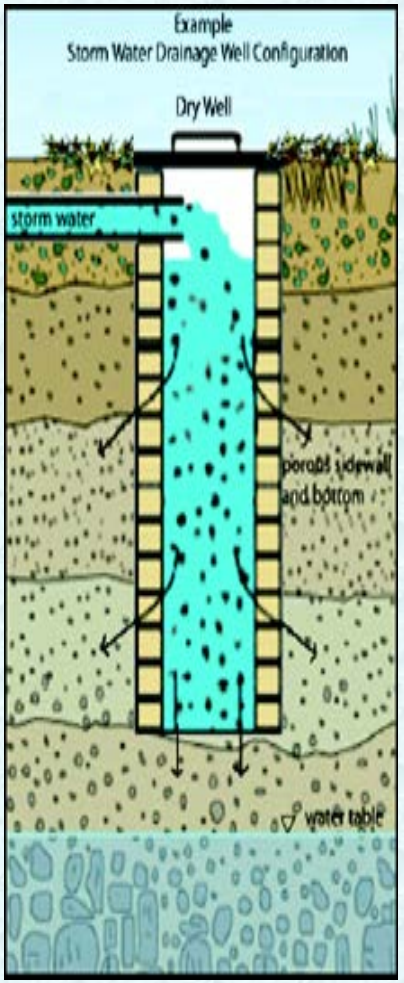
Meet the rule requirements = **Rule Authorization**:

- Register UIC wells with Ecology
  - New wells- before use, design phase
  - Older/existing wells should be registered ASAP
- Groundwater protection - Apply **A**ll, **K**nown, **A**vailable and **R**easonable methods of prevention, control and **T**reatment (AKART). Stormwater BMPs are considered AKART.
- If the 2 requirements are not met, then a state waste discharge permit is required to operate the well.

Protect Groundwater Quality

- Separation between the UIC well base and the top of the groundwater table
- BMPs - Stormwater treatment, source control
- UIC program prohibited discharges
- Meet local ordinances
- UIC registration – includes site questions to determine if UIC rule requirements are met

- UIC wells are manmade structures used to discharge fluids from the ground surface into the subsurface.
  - A bored, drilled, or driven shaft whose depth is greater than the largest surface dimension; or
  - A dug hole whose depth is greater than the largest surface dimension; or
  - An improved sinkhole; which is a natural crevice that has been modified by man, or
  - A subsurface fluid distribution system which includes an assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute fluids below the surface of the ground



UIC Examples

- Drywells
- Drain Fields
- Infiltration trenches with perforated pipe
- Storm chamber system with the intent to infiltrate
- French Drains

Examples that are not UIC

- Buried pipe and/or tile networks that serve to collect water and discharge that water to a conveyance system and to surface water
- Surface infiltration basins and flow dispersion stormwater facilities.
- Infiltration trenches without perforated pipe or a similar mechanism

How UIC Treatment is determined

- Land Use Evaluation/ Pollutant Loading
  - Low to high. Based on average daily traffic.
- Vadose Zone treatment evaluation
  - High to none treatment – depends on geologic material type, saturated hydraulic conductivity, adsorption, CEC and thickness above water table. If thickness is less than required – No treatment available
- Use pollutant load and vadose zone classification to determine level of treatment Specific BMPs from stormwater manuals

Table 5.6.2 – Vadose Zone Treatment Capacity [a,b]

Treatment Capacity Classification and Required Minimum Thickness [a]	Description and Required Characteristics of the Vadose Zone Layer [c,d]

HIGH
A minimum thickness of 5 feet
	Meets all of the following characteristics:
	• Materials with median grain size < 0.125 mm
	• Having a sand to silt/clay ratio of < 1:1 and sand plus gravel < 50%
	• Field-tested saturated hydraulic conductivity < 2.4 in/hr at the bottom elevation of the proposed BMP
	• Materials with CEC of ≥ 5 milliequivalents CEC/100 g dry soils, and a minimum of 1% organic content, ≥ 18-inch minimum thickness
	• Typical geotechnical descriptive words for appropriate soils:
	  ○ Lean, fat, or elastic clay
	  ○ Sandy or silty clay
	  ○ Silt
	  ○ Clayey or sandy silt
	  ○ Sandy loam or loamy sand
	  ○ Silt/clay with interbedded sand
	  ○ Well-compacted, poorly sorted materials
	This category generally includes till, hardpan, caliche, and loess.

MEDIUM
A minimum thickness of 10 feet
	Meets all of the following characteristics:
	• Materials with average grain size 0.125 to 4 mm
	• Having a sand to silt/clay ratio from 1:1 and 9:1 and percent sand > percent gravel
	• Field-tested saturated hydraulic conductivity between 2.4 in/hr and 6 in/hr at the bottom elevation of the proposed BMP
	• Materials between 2 and 5 milliequivalents CEC/100 g dry soils, and a minimum of 0.5% to 1% organic content,
	• Typical geotechnical descriptive words for appropriate soils:
	  ○ Fine, medium, or coarse sand
	  ○ Sand with interbedded clay and/or silt
	  ○ Poorly compacted, poorly sorted materials
	This category includes most some alluvium and outwash deposits.

Table 5.6.3 Pollutant Loading Classifications for Solids, Metals, and Oil in Stormwater Runoff Directed to UIC Wells [a,b]

Classification	Areas Contributing Runoff to the UIC Well
Insignificant	• Impervious surfaces not subject to motorized vehicle traffic or application of sand or deicing chemicals • Unmaintained open space

Low	• Parking areas with < 40 total trip ends per 1,000 square feet (sf) of gross building area and < 100 total trip ends (if you exceed either threshold, move to the Medium Classification)
	• Other land uses with similar traffic/use characteristics (e.g., most residential parking and employee-only parking areas for small office parks or other commercial buildings)
	• **Inside Urban Growth Management Areas**
	  ○ Fully controlled and partially controlled limited access highways with ADT < 15,000
	  ○ Other roads with ADT < 7,500 vehicles
	• **Outside Urban Growth Management Areas**
	  ○ All roads with ADT < 15,000 vehicles

Medium	• Parking areas with between 40 and 100 trip ends per 1,000 square feet (sf) of gross building area and between 100 and 300 total trip ends (if you exceed either threshold, move to the High Classification)
	• Primary access points for high-density residential apartments
	• Intersections controlled by traffic signals that do not meet the definition of a high-density intersection (see the Glossary)
	• Transit center bus stops
	• **Inside Urban Growth Management Areas**
	  ○ Fully controlled and partially controlled limited access highways with ADT between 15,000 and 30,000 vehicles
	  ○ Other roads with ADT between 7,500 and 30,000 vehicles
	• **Outside Urban Growth Management Areas**
	  ○ All roads with ADT between 15,000 and 30,000 vehicles

High	• High use sites ○ Includes roads with ADT > 30,000 vehicles • On street parking areas of municipal streets in commercial and industrial areas • Highway rest areas • Other land uses with similar traffic/use characteristics (e.g., commercial buildings with a frequent turnover of visitors, such as grocery stores, shopping malls, restaurants, drive through services, etc.)

Notes:

Table 5.6.4 Treatment Required for Solids, Oil, and Metals

Treatment Capacity / Pollutant Loading	High	Medium	Low	None
Insignificant	Two-stage drywell[a]	Two-stage drywell[a]	Two-stage drywell[a]	Two-stage drywell[a]
Low	Two-stage drywell[a]	Pretreatment[b]	Pretreatment[b]	Remove solids[c]
Medium	Pretreatment[b]	Remove solids[c]	Remove solids[c]	Remove solids[c]
High	Remove oil[d]	Remove oil[d]	Remove oil and solids[c,d]	Remove oil and solids[c,d]

Permittee Responsibilities

- UICs not part of Municipal Permit
- Publicly owned UIC
  - Well Assessment
  - O&M, O&E
  - Construction SWPPP
  - SMP
- Ordinances

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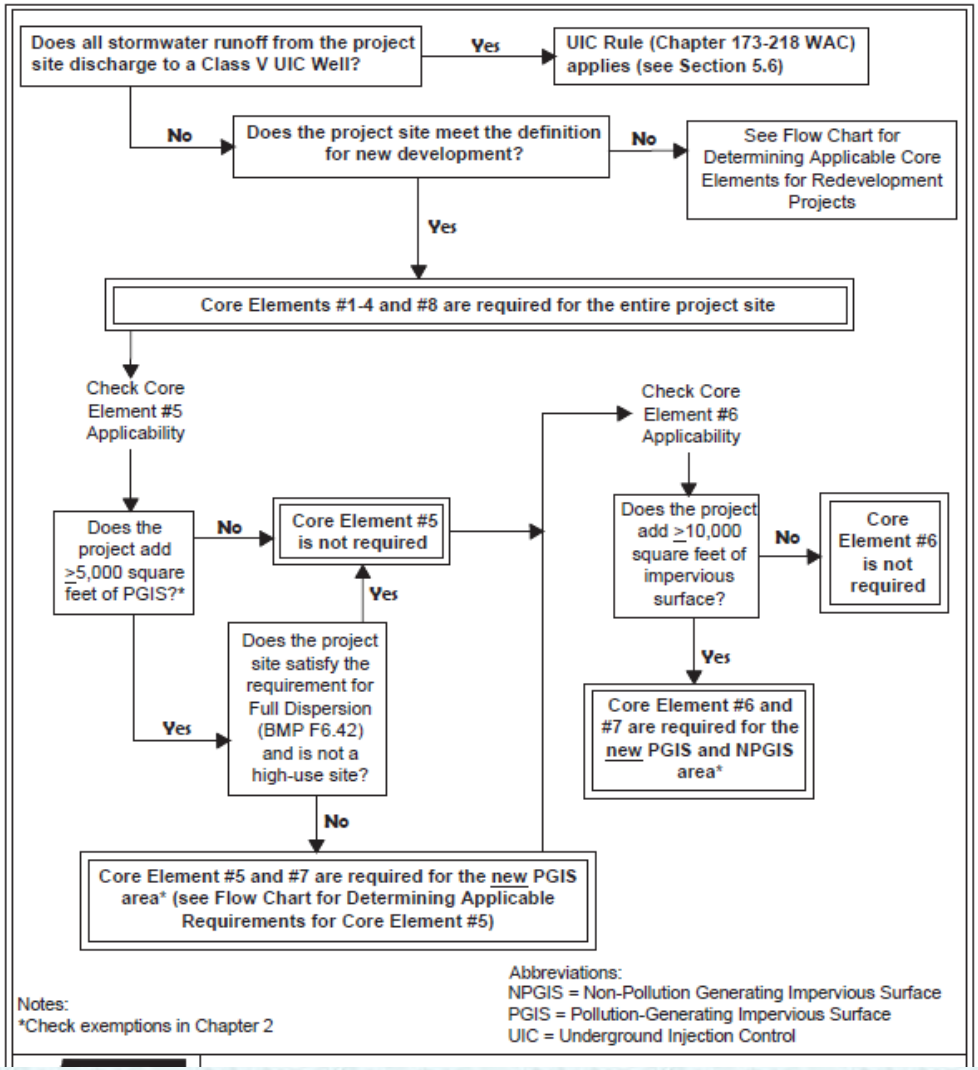
Questions?

Municipal Permit New/Redevelopment Review

New Development Flow Charts

Figure 2.1: Flow Chart for Determining Applicable Core Elements for New Development Projects



Required Core Elements for New Development

- All New Development projects must comply with:
  - Core Elements 1, 2, 3, 4, and 8
- If threshold of CE 5 exceeded, add CE 5 and 7 (5,000 sq ft effective PGIS)
- If threshold of CE 6 exceeded, add CE 6 and 7 (10,000 sq ft new impervious)

Required Core Elements for Redevelopment

- New impervious surfaces meet New Development Requirements
- Replaced Impervious > 5,000 sq ft PGIS
  - CE 2 and 3 apply to entire site
  - CE 1, 4, 7, and 8 apply to replaced impervious surfaces

Required Core Elements for Redevelopment

- Replaced Impervious > 5,000 sq ft PGIS
  - CE 5 applies to replaced PGIS area if …
    - Commercial/Industrial site
    - TMDL in receiving waters
    - "High Use Site"
    - Various ADT and trip end criteria
  - CE 6 applies to all replaced impervious surfaces at the site if required by state, federal, or local jurisdictions based on flooding studies or habitat assessments

CE 1: Preparation of a Stormwater Site Plan (SSP)

Suggested SSP Format

1. Collect and Analyze Information on Existing Conditions
2. Determine Applicable Core Elements
3. Prepare a Permanent Stormwater Control Plan
4. Prepare a Construction Stormwater Pollution Prevention Plan (SWPPP)

Prepare a Downstream Analysis (optional)

CE 2: Construction Stormwater Pollution Prevention

- 13 Elements to SWPPP (Construction Permit)
- Thresholds requiring this CE
  - All New Development Projects
  - Re-development:
    - All new impervious
    - All replaced impervious if > 5,000 sq ft replaced impervious. Apply to entire site.

Low Erosivity Waiver

- In Permit, not in SWMMEW
  - Projects disturbing < 5 acres
  - R factor <5 using approved calculator
    - http://ei.tamu.edu/
    - http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm
  - Construction Period
    - June 15 to Oct 15 mean annual precipitation >= 12”
    - No limit mean annual precipitation < 12”

Low Erosivity Waiver

- Site not a "Significant Contributor of Pollution"
- No planned construction activities that will result in non-stormwater discharge
- Waiver allowed by local jurisdiction
- Notification to local jurisdiction before beginning construction activities
- Provide erosion and sediment controls to prevent violations of water quality standards

CE 3: Source Control of Pollution

- Chapter 8
- Prevent stormwater from coming into contact with pollutants
- Applicable and Recommended Operational & Structural BMPs for Commercial /Industrial Projects

CE 3: Source Control of Pollution

- Introduced in Section 2.2.3, Detailed BMPs in Chapter 8
- Prevent stormwater from coming into contact with pollutants
- ~~Applicable~~ Mandatory and Recommended Operational & Structural BMPs for Commercial /Industrial Projects

CE 4: Preservation of Natural Drainage Systems (1/2)

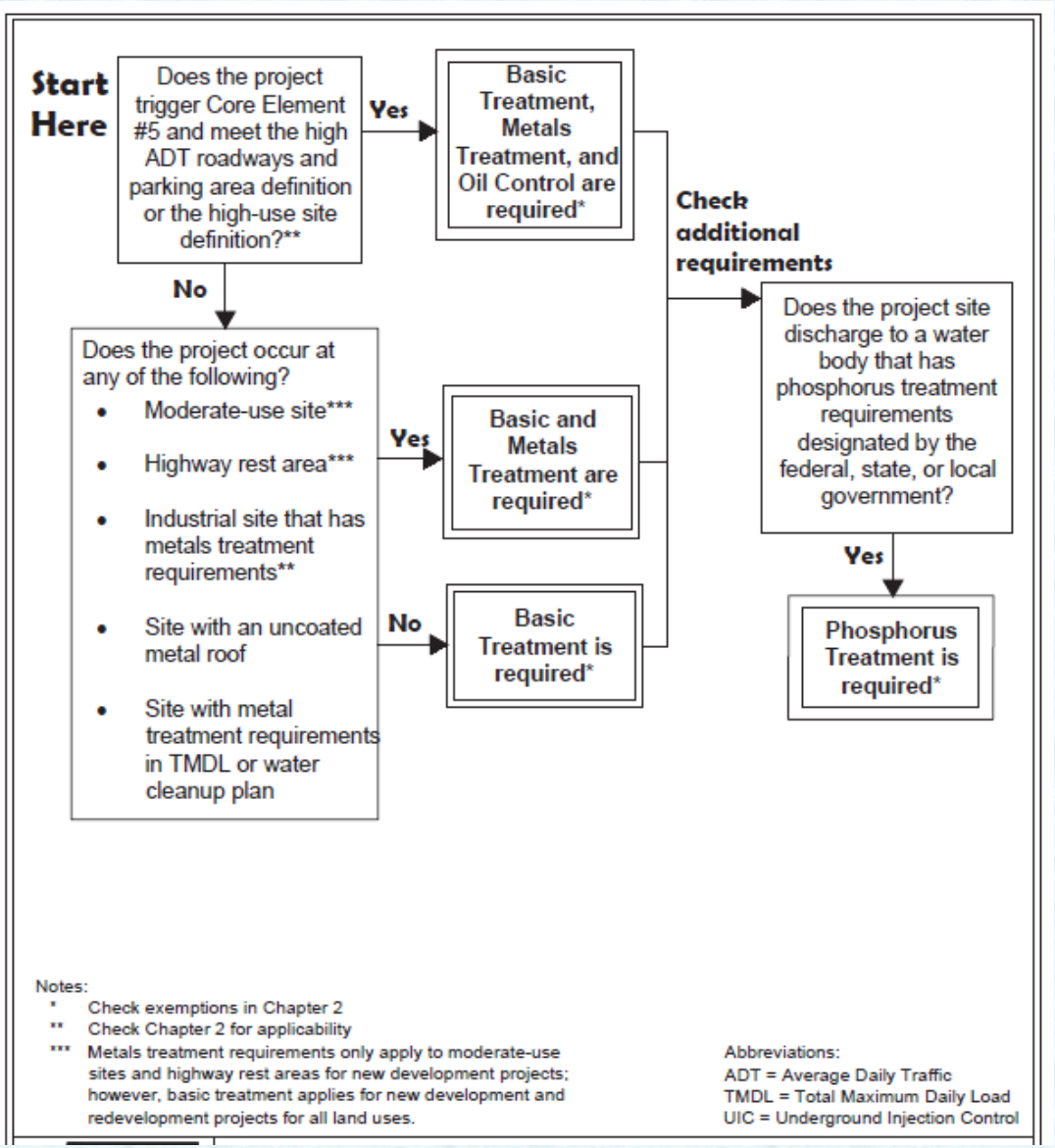
- Introduced in Section 2.2.4
- Preserve and utilize natural drainage systems to the fullest extent
- Discharge stormwater "in the same manner at the same location, and at the same flow rate and volume as under the conditions that existed prior to development."

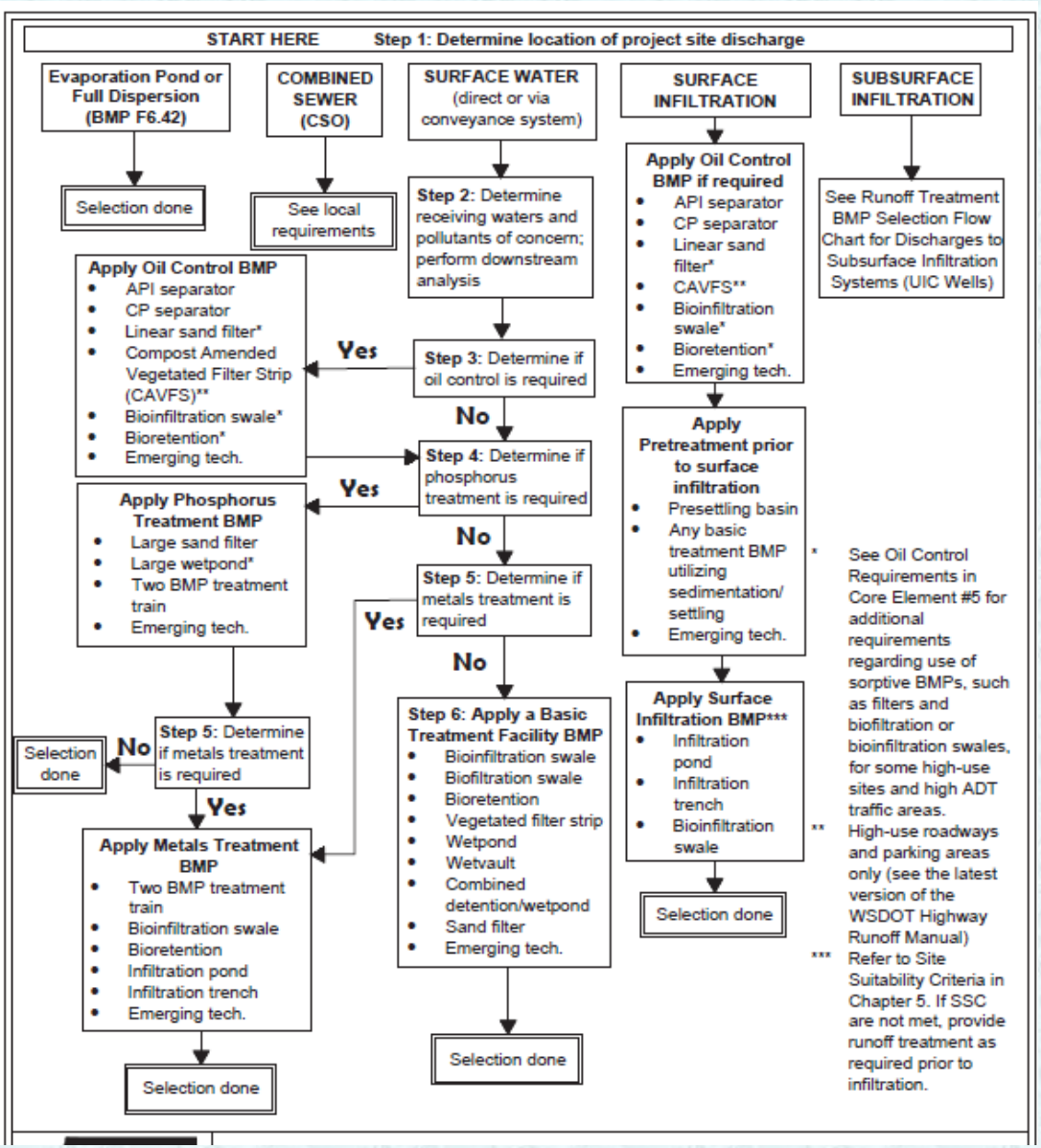
CE 4: Preservation of Natural Drainage Systems (2/2)

- Priority list for Discharge of Excess Stormwater
  1. Maintain dispersed sheet flow
  2. Infiltrate on-site
  3. Infiltrate off-site
  4. Discharge to existing ditch networks
  5. Discharge to Wetlands (if allowed)
  6. Discharge to existing private or municipality-owned stormwater systems (if allowed)
  7. Evaporate on-site or off-site
  8. Create new outfall for discharge to surface waters

CE 5: Runoff Treatment (1/3)

- Threshold: all projects creating > 5,000 sq ft PGIS must provide Basic Treatment, unless
  - Discharge to a qualified UIC facility
  - Satisfies full dispersion
- Goal to treat 90% of annual runoff
- If using infiltration for treatment need to meet Site Suitability Criteria (SSC)
- May need to treat for Metals, Phosphorus, or oil


Start Here
Does the project trigger Core Element #5 and meet the high ADT roadways and parking area definition or the high-use site definition?**
Yes
Basic Treatment, Metals Treatment, and Oil Control are required*
No
Does the project occur at any of the following?
• Moderate-use site***
• Highway rest area***
• Industrial site that has metals treatment requirements**
• Site with an uncoated metal roof
• Site with metal treatment requirements in TMDL or water cleanup plan
Yes
Basic and Metals Treatment are required*
No
Basic Treatment is required*
Check additional requirements
Does the project site discharge to a water body that has phosphorus treatment requirements designated by the federal, state, or local government?
Yes
Phosphorus Treatment is required*
Notes:
* Check exemptions in Chapter 2
** Check Chapter 2 for applicability
*** Metals treatment requirements only apply to moderate-use sites and highway rest areas for new development projects; however, basic treatment applies for new development and redevelopment projects for all land uses.
Abbreviations:
ADT = Average Daily Traffic
TMDL = Total Maximum Daily Load
UIC = Underground Injection Control


START HERE
Step 1: Determine location of project site discharge
Evaporation Pond or Full Dispersion (BMP F6.42)
COMBINED SEWER (CSO)
SURFACE WATER (direct or via conveyance system)
SURFACE INFILTRATION
SUBSURFACE INFILTRATION
Selection done
See local requirements
Step 2: Determine receiving waters and pollutants of concern; perform downstream analysis
Apply Oil Control BMP if required
API separator
CP separator
Linear sand filter*
CAVFS**
Bioinfiltration swale*
Bioretention*
Emerging tech.
See Runoff Treatment BMP Selection Flow Chart for Discharges to Subsurface Infiltration Systems (UIC Wells)
Apply Oil Control BMP
API separator
CP separator
Linear sand filter*
Compost Amended Vegetated Filter Strip (CAVFS)**
Bioinfiltration swale*
Bioretention*
Emerging tech.
Yes
Step 3: Determine if oil control is required
No
Step 4: Determine if phosphorus treatment is required
Yes
Apply Phosphorus Treatment BMP
Large sand filter
Large wetpond*
Two BMP treatment train
Emerging tech.
No
Step 5: Determine if metals treatment is required
Yes
Apply Pretreatment prior to surface infiltration
Presettling basin
Any basic treatment BMP utilizing sedimentation/ settling
Emerging tech.
Step 5: Determine if metals treatment is required
No
Selection done
Yes
Apply Metals Treatment BMP
Two BMP treatment train
Bioinfiltration swale
Bioretention
Infiltration pond
Infiltration trench
Emerging tech.
Step 6: Apply a Basic Treatment Facility BMP
Bioinfiltration swale
Biofiltration swale
Bioretention
Vegetated filter strip
Wetpond
Wetvault
Combined detention/wetpond
Sand filter
Emerging tech.
Apply Surface Infiltration BMP***
Infiltration pond
Infiltration trench
Bioinfiltration swale
Selection done
Selection done
Selection done
* See Oil Control Requirements in Core Element #5 for additional requirements regarding use of sorptive BMPs, such as filters and biofiltration or bioinfiltration swales, for some high-use sites and high ADT traffic areas.
** High-use roadways and parking areas only (see the latest version of the WSDOT Highway Runoff Manual)
*** Refer to Site Suitability Criteria in Chapter 5. If SSC are not met, provide runoff treatment as required prior to infiltration.

CE 5: Runoff Treatment (2/3)

- Specific Design Storm determination based on types and location of treatment facility
  - Five Methods to determine Design Volume
  - Three Methods to determine Design Flow (preceding detention, or when detention not required)
  - Full 2-year release rate from Detention Facility (downstream detention)

CE 6: Flow Control (1/3)

- Threshold: 10,000 sq ft of total Impervious Surfaces
- Exemptions
  - Disperse without discharge total 25-year runoff volume
  - Discharging to irrigation return flow stream reaches
  - Discharging to Flow Control Exempt Water Bodies
  - Discharge to a wetland with no surface water outlet
  - Flows only during runoff producing event

CE 6: Flow Control (2/3)

- Infiltration is the preferred alternative
- Peak flow rate from Developed site
  - Limit flow to 50% of predeveloped 2-year peak rate and maintain the pre-developed 25-year peak rate
  - Entire 2-year runoff volume from developed site released at no more than 50% of predeveloped 2-year rate
- Multiple options for design storm

What about Conveyance?

- Conveyance is not addressed in the manual.

CE 7: Operation and Maintenance

- Provide O&M Manual for all stormwater facilities and BMPs
- Required if CE 5 or CE 6 are invoked

CE 8: Local Requirements

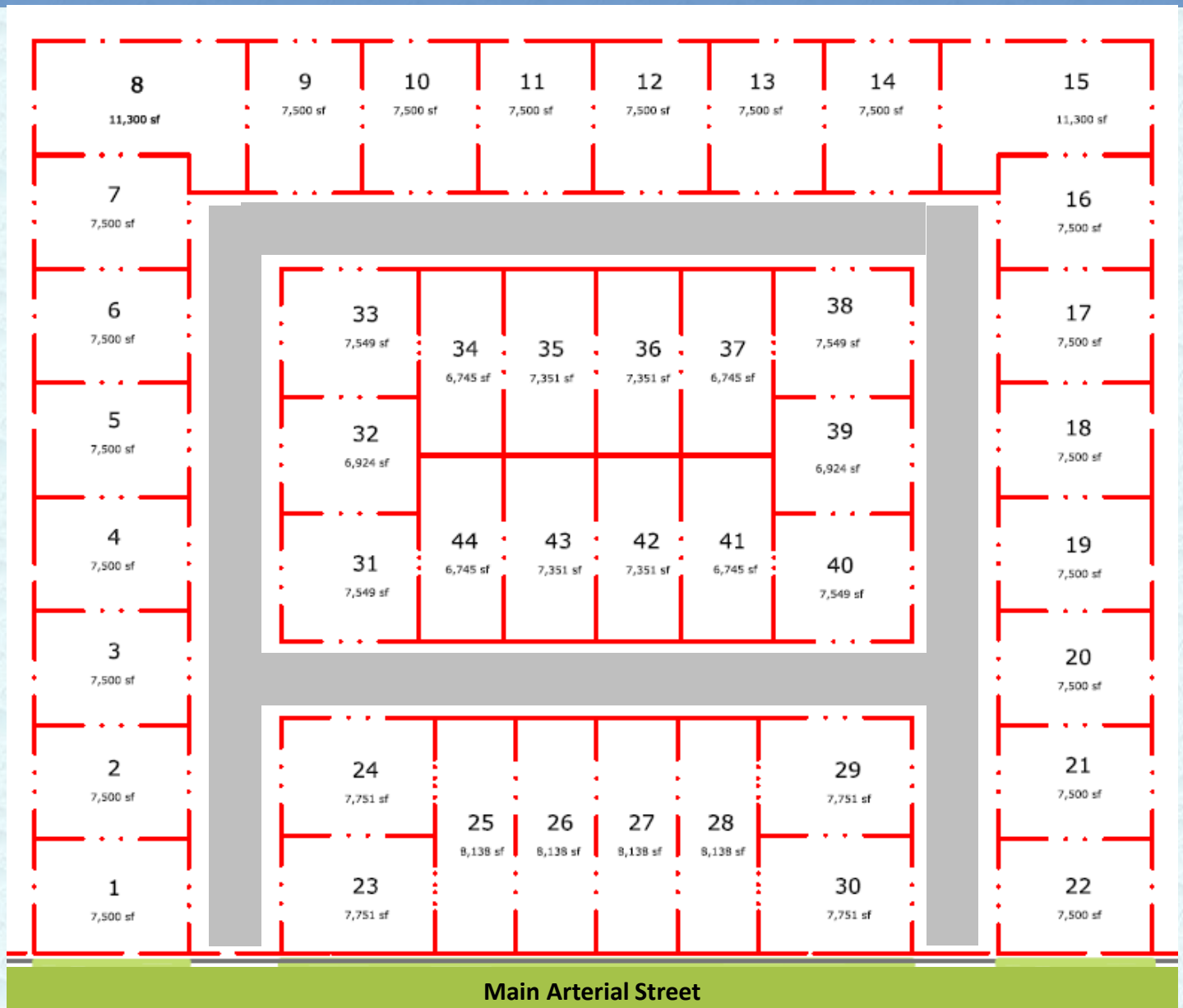
- Not in Permit
- Example local requirements
  - TMDLs
  - Sole-source aquifers
  - Preferred methods for calculating runoff
  - LID requirements
  - Conveyance Design Criteria

DEPARTMENT OF ECOLOGY
State of Washington

Questions?

Example Project

Single Family Residential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6,745 sf
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8,138 sf
28
8,138 sf
29
7,751 sf
23
7,751 sf
30
7,751 sf
Main Arterial Street

Basic Area Calculations

Developed Land Use	Area (sq ft)	CN
Landscaping	179,200	75
Rooftops	124,000	98
Sidewalks/Paths	6,400	98
Driveways	20,350	98
ROW	105,650	98
Total	435,600	88.5

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Geotechnical Report

- Ksat 1.5 in/hr
- Existing soils meet Site Suitability Criteria
- Depth to Groundwater > 7’ from surface
- Assumed Native Soil Infiltration Correction Factors (0.64)

Core Element Option

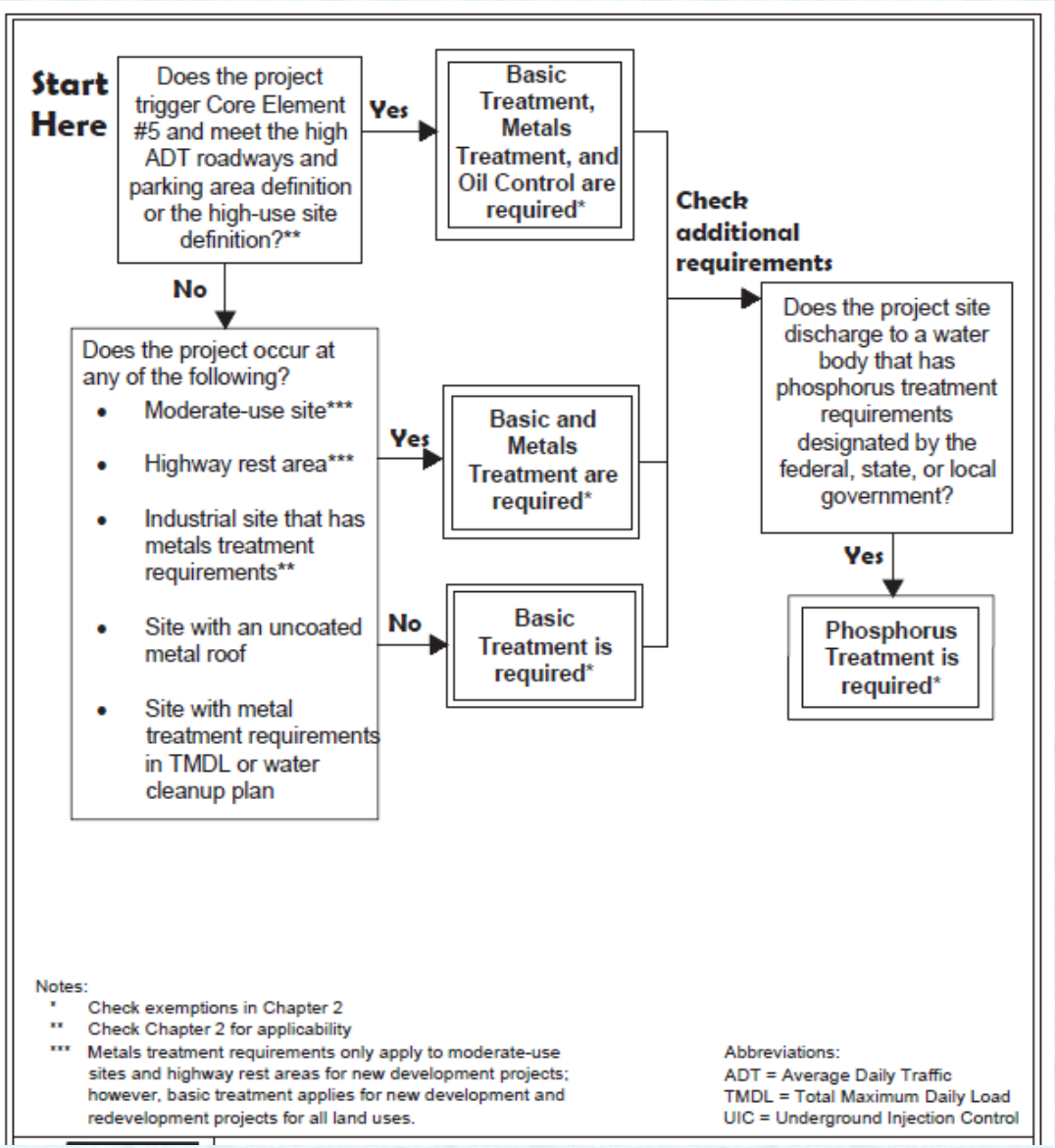
- CE 1, 3, 4, and 8
- CE 2 Construction SWPPP
- CE 5 Evaluate Treatment requirements
- CE 6 Retain 10-yr storm on site, Flow control
- CE 7 O&M Plan
- Design collection, treatment, infiltration

Basic Area Calculations

Developed Land Use	Area (sq ft)	CN
Landscaping	179,200	75
Rooftops	124,000	98
Sidewalks/Paths	6,400	98
Driveways	20,350	98
ROW	105,650	98
Total	435,600	88.5

Treatment

- PGIS only, no treatment for roof or landscaping
- All BMPs in Manual available
- Treat 90% Average Annual Runoff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No
Does the project occur at any of the following?
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• Highway rest area***
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Yes
Basic and Metals Treatment are required*
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Check additional requirements
Does the project site discharge to a water body that has phosphorus treatment requirements designated by the federal, state, or local government?
Yes
Phosphorus Treatment is required*
Notes:
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*** Metals treatment requirements only apply to moderate-use sites and highway rest areas for new development projects; however, basic treatment applies for new development and redevelopment projects for all land uses.
Abbreviations:
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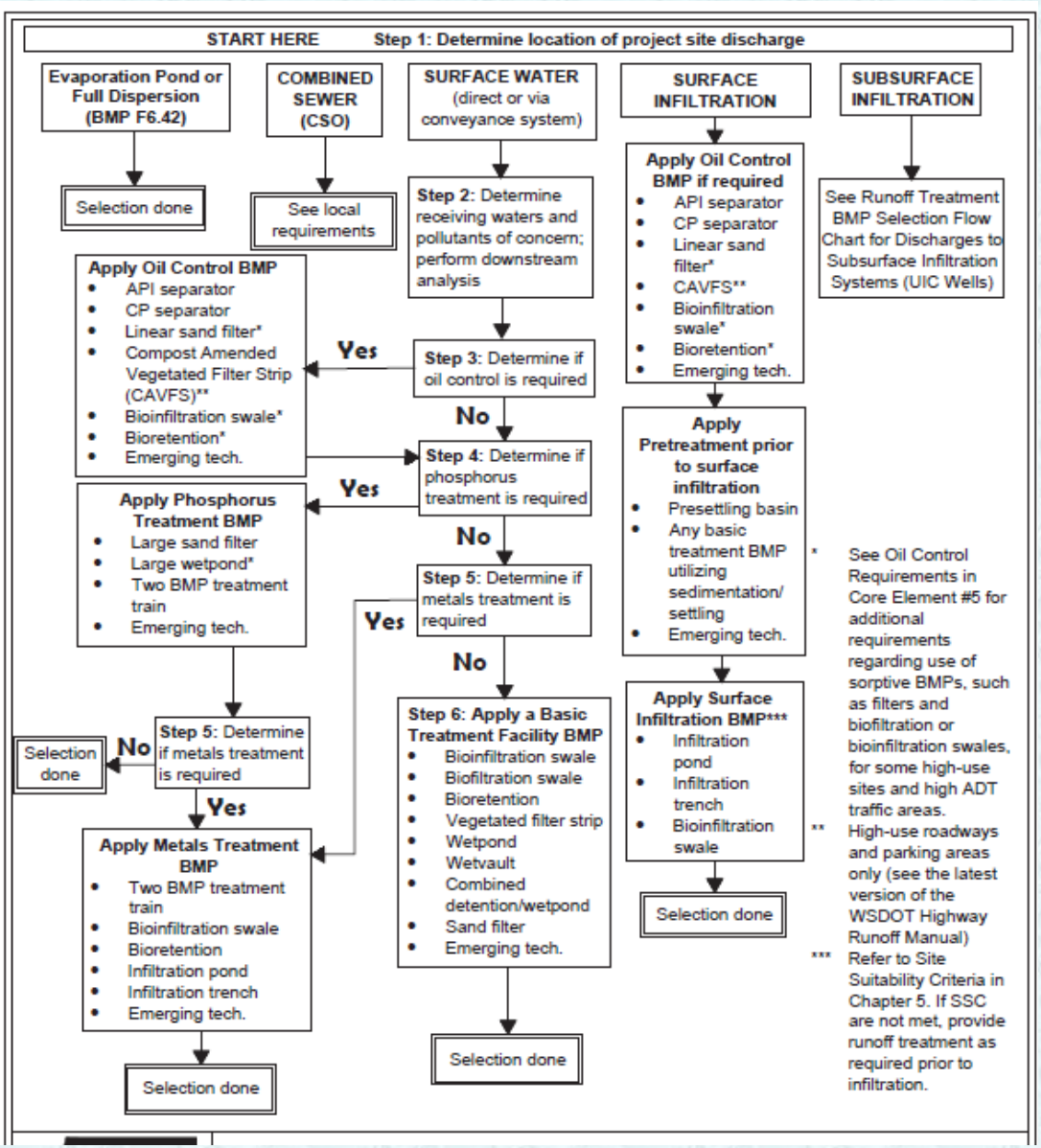
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COMBINED SEWER (CSO)
SURFACE WATER (direct or via conveyance system)
SURFACE INFILTRATION
SUBSURFACE INFILTRATION
Selection done
See local requirements
Step 2: Determine receiving waters and pollutants of concern; perform downstream analysis
Apply Oil Control BMP if required
API separator
CP separator
Linear sand filter*
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Bioinfiltration swale*
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Emerging tech.
See Runoff Treatment BMP Selection Flow Chart for Discharges to Subsurface Infiltration Systems (UIC Wells)
Apply Oil Control BMP
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Yes
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No
Step 4: Determine if phosphorus treatment is required
Yes
Apply Phosphorus Treatment BMP
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Two BMP treatment train
Emerging tech.
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Step 5: Determine if metals treatment is required
Yes
Apply Pretreatment prior to surface infiltration
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Selection done
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* See Oil Control Requirements in Core Element #5 for additional requirements regarding use of sorptive BMPs, such as filters and biofiltration or bioinfiltration swales, for some high-use sites and high ADT traffic areas.
** High-use roadways and parking areas only (see the latest version of the WSDOT Highway Runoff Manual)
*** Refer to Site Suitability Criteria in Chapter 5. If SSC are not met, provide runoff treatment as required prior to infiltration.

Flow Control

- Infiltrate 10-year storm (min)
- Can discharge to MS4
- Max Discharge rate
  - < Half 2-yr flow
  - Match 25-yr flow

O&M

- Need O&M Plan if either CE 6 or 7 triggered

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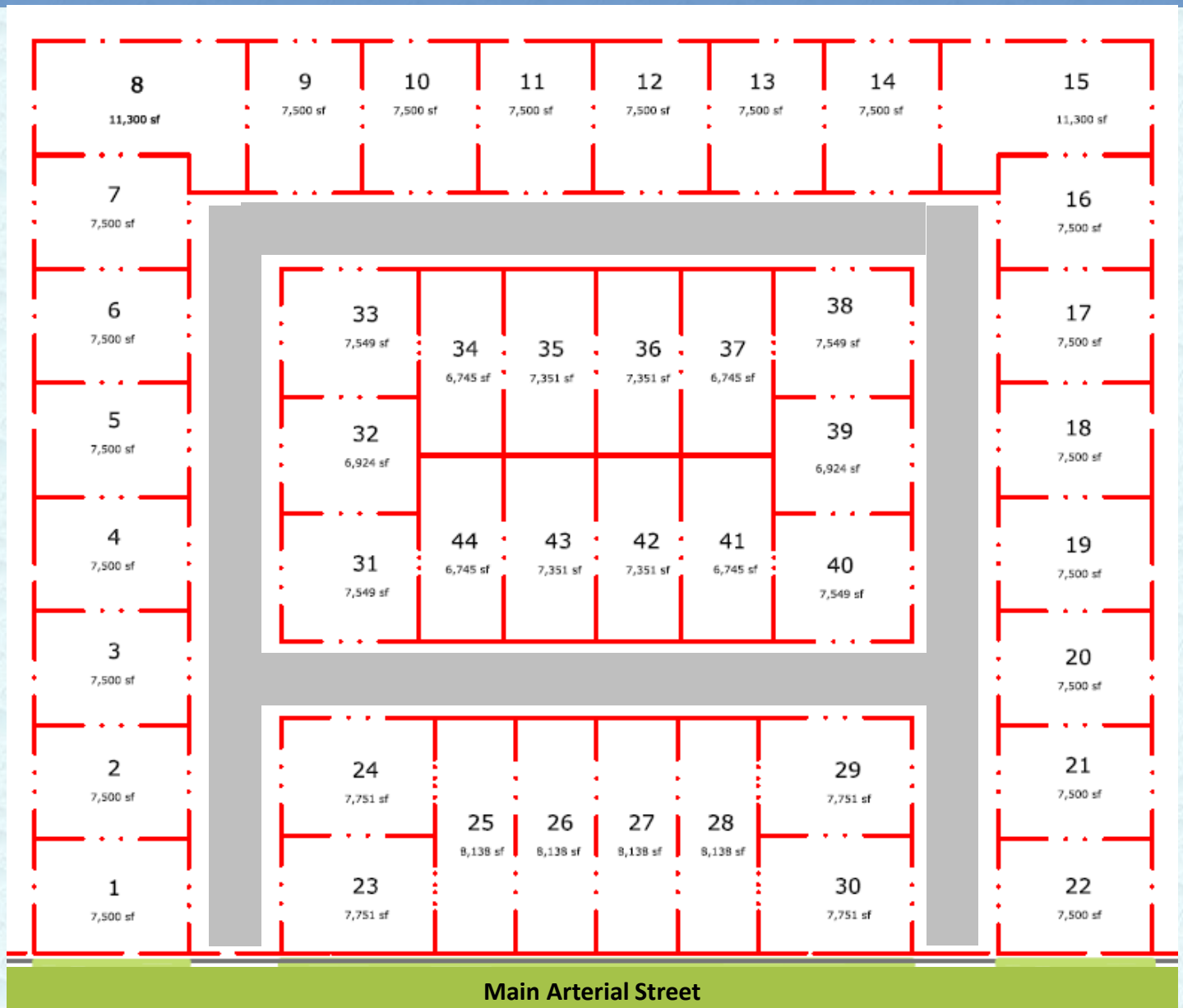
State of Washington

Questions?

UIC Option

- Retain 100-yr storm on site
- Evaluate Land Use and treatment capabilities
- Determine need for treatment pre-infiltration
- Design collection, treatment, infiltration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Main Arterial Street

Table 5.6.2 – Vadose Zone Treatment Capacity [a,b]

Treatment Capacity Classification and Required Minimum Thickness	Description and Required Characteristics of the Vadose Zone Layer [c,d]

HIGH
A minimum thickness of 5 feet
	Meets all of the following characteristics:
	• Materials with median grain size < 0.125 mm
	• Having a sand to silt/clay ratio of < 1:1 and sand plus gravel < 50%
	• Field-tested saturated hydraulic conductivity < 2.4 in/hr at the bottom elevation of the proposed BMP
	• Materials with CEC of ≥ 5 milliequivalents CEC/100 g dry soils, and a minimum of 1% organic content, ≥ 18-inch minimum thickness
	• Typical geotechnical descriptive words for appropriate soils:
	  ○ Lean, fat, or elastic clay
	  ○ Sandy or silty clay
	  ○ Silt
	  ○ Clayey or sandy silt
	  ○ Sandy loam or loamy sand
	  ○ Silt/clay with interbedded sand
	  ○ Well-compacted, poorly sorted materials
	This category generally includes till, hardpan, caliche, and loess.

MEDIUM
A minimum thickness of 10 feet
	Meets all of the following characteristics:
	• Materials with average grain size 0.125 to 4 mm
	• Having a sand to silt/clay ratio from 1:1 and 9:1 and percent sand > percent gravel
	• Field-tested saturated hydraulic conductivity between 2.4 in/hr and 6 in/hr at the bottom elevation of the proposed BMP
	• Materials between 2 and 5 milliequivalents CEC/100 g dry soils, and a minimum of 0.5% to 1% organic content,
	• Typical geotechnical descriptive words for appropriate soils:
	  ○ Fine, medium, or coarse sand
	  ○ Sand with interbedded clay and/or silt
	  ○ Poorly compacted, poorly sorted materials
	This category includes most some alluvium and outwash deposits.

Table 5.6.3 Pollutant Loading Classifications for Solids, Metals, and Oil in Stormwater Runoff Directed to UIC Wells [a,b]

Classification	Areas Contributing Runoff to the UIC Well
Insignificant	• Impervious surfaces not subject to motorized vehicle traffic or application of sand or deicing chemicals • Unmaintained open space

Low	• Parking areas with < 40 total trip ends per 1,000 square feet (sf) of gross building area and < 100 total trip ends (if you exceed either threshold, move to the Medium Classification)
	• Other land uses with similar traffic/use characteristics (e.g., most residential parking and employee-only parking areas for small office parks or other commercial buildings)
	• **Inside Urban Growth Management Areas**
	  ○ Fully controlled and partially controlled limited access highways with ADT < 15,000
	  ○ Other roads with ADT < 7,500 vehicles
	• **Outside Urban Growth Management Areas**
	  ○ All roads with ADT < 15,000 vehicles

Medium	• Parking areas with between 40 and 100 trip ends per 1,000 square feet (sf) of gross building area and between 100 and 300 total trip ends (if you exceed either threshold, move to the High Classification)
	• Primary access points for high-density residential apartments
	• Intersections controlled by traffic signals that do not meet the definition of a high-density intersection (see the Glossary)
	• Transit center bus stops
	• **Inside Urban Growth Management Areas**
	  ○ Fully controlled and partially controlled limited access highways with ADT between 15,000 and 30,000 vehicles
	  ○ Other roads with ADT between 7,500 and 30,000 vehicles
	• **Outside Urban Growth Management Areas**
	  ○ All roads with ADT between 15,000 and 30,000 vehicles

High	• High-use sites ○ Includes roads with ADT > 30,000 vehicles • On-street parking areas of municipal streets in commercial and industrial areas • Highway rest areas • Other land uses with similar traffic/use characteristics (e.g., commercial buildings with a frequent turnover of visitors, such as grocery stores, shopping malls, restaurants, drive-through services, etc.)

Notes:

Table 5.6.4 Treatment Required for Solids, Oil, and Metals

Pollutant Loading / Treatment Capacity	High	Medium	Low	None
Insignificant	Two-stage drywell[a]	Two-stage drywell[a]	Two-stage drywell[a]	Two-stage drywell[a]
Low	Two-stage drywell[a]	Pretreatment[b]	Pretreatment[b]	Remove solids[c]
Medium	Pretreatment[b]	Remove solids[c]	Remove solids[c]	Remove solids[c]
High	Remove oil[d]	Remove oil[d]	Remove oil and solids[c,d]	Remove oil and solids[c,d]

If Additional Treatment Needed before infiltration

- Use BMPs from the SWMMEW
- Follow design criteria just as with CE#5
- No additional Flow Control required

Additional Actions

- Register Wells with Ecology
  - Perform Well Assessment
  - Site-Specific O&M Plan

  or
  - Include areas where UICs installed in SMP

DEPARTMENT OF ECOLOGY
State of Washington

Questions?

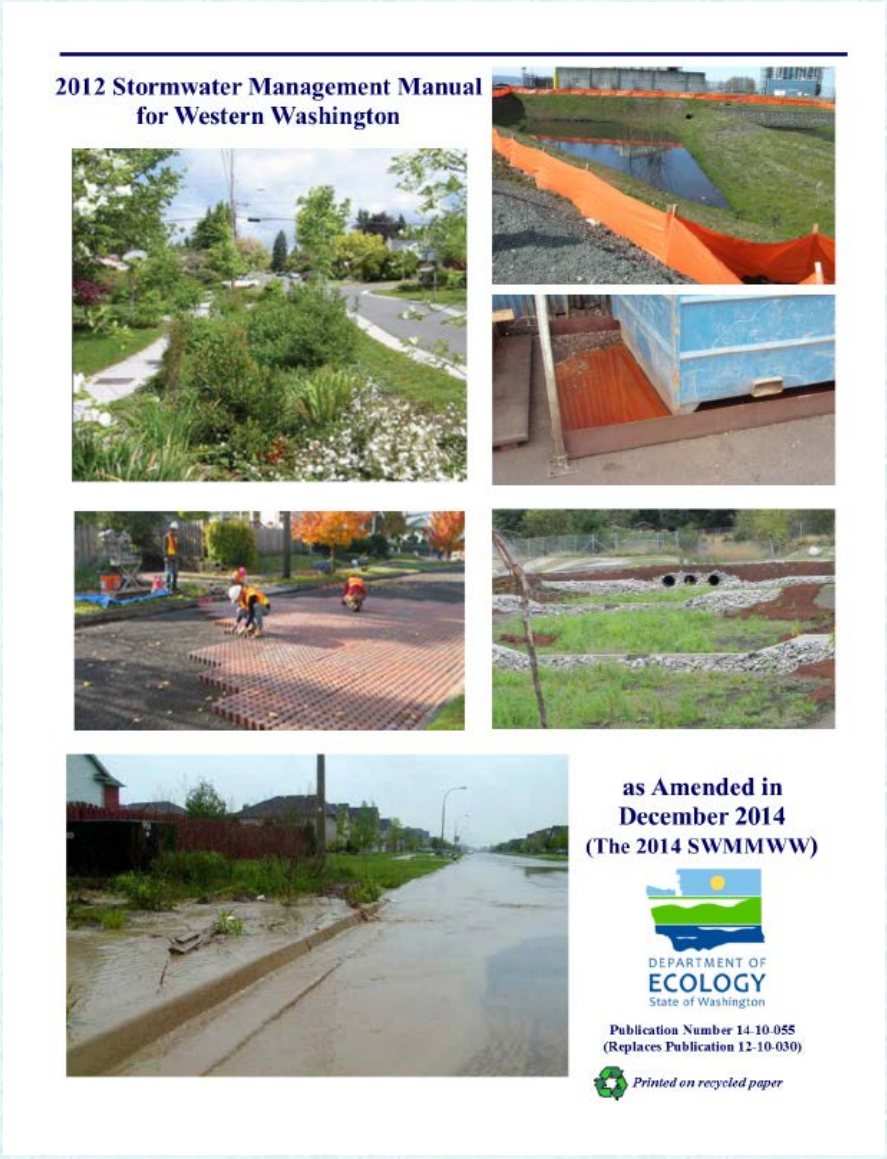
Future Presentations

- May 13, 2019 Wenatchee
- May 28, 2029 Ellensburg
- June 11, 2019 Pullman

- Contact me if you want one in your area

Contact Information

Douglas C. Howie, P.E.
Dept. of Ecology
douglas.howie@ecy.wa.gov
(360) 407-6444



PARKING LOT

Example Project

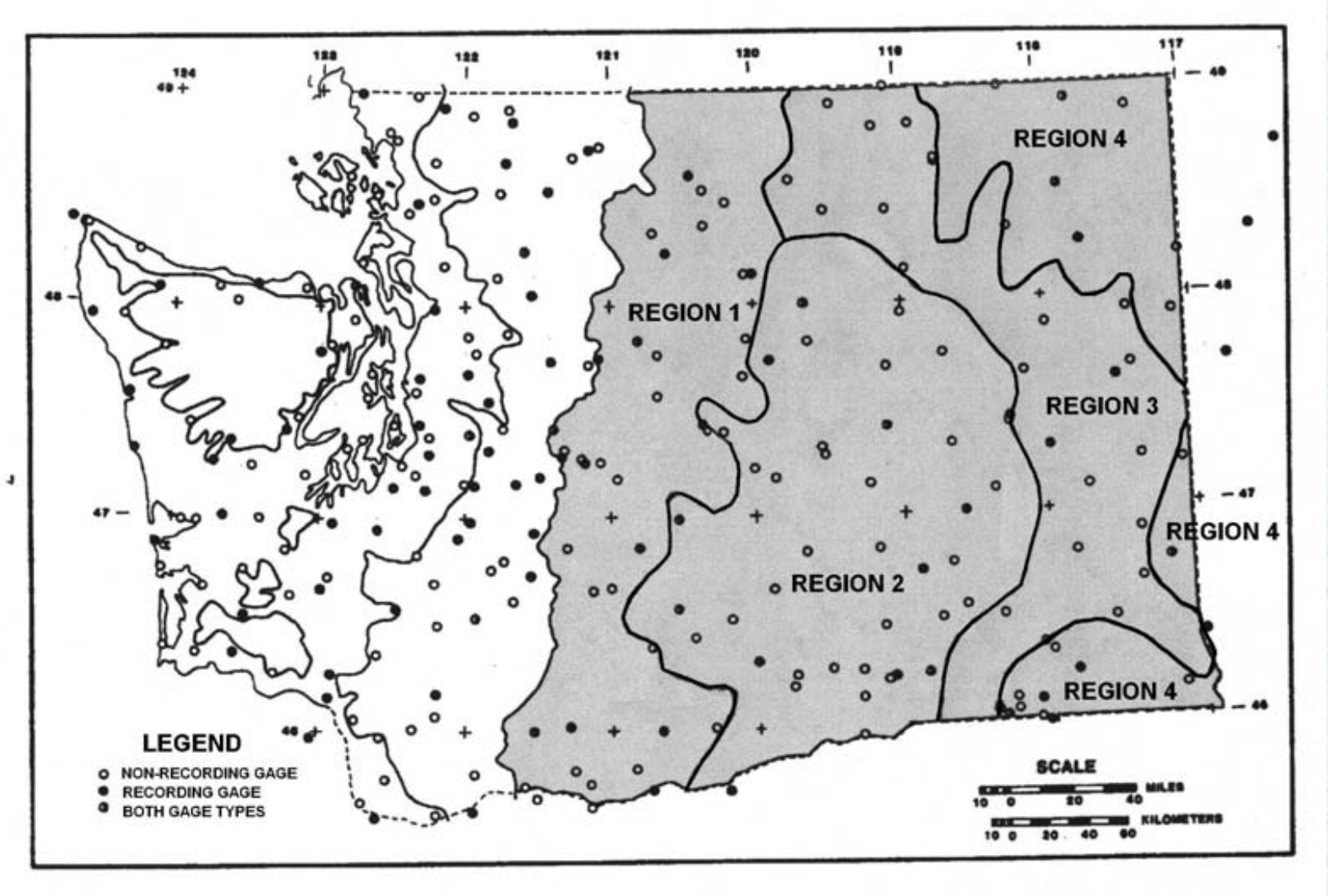
Small Commercial/Industrial

Perforated Pipe
Is it or is it not a UIC?

- Can be used to distribute water for infiltration, or collect water and direct it away from area
- Consideration on direction water moves through perforations
  - Out of pipe: UIC
  - Into pipe: Underdrain

Core Elements in SWMMEW

- Manual has eight Core Elements
- Identify what Core Elements are required for any project later.
- Now just describe each Core Element.


REGION 1
REGION 2
REGION 3
REGION 4
REGION 4
REGION 4
LEGEND
NON-RECORDING GAGE
RECORDING GAGE
BOTH GAGE TYPES
SCALE
MILES
KILOMETERS

CE 6: Flow Control (3/3)

- Design Storm
  - Regional Storm Regions 1 and 4
    - Regional storm is a custom synthetic design storm taken from the long-duration design storm. There is one regional storm for each of the four regions.
    - Hyetograph data for synthetic storm in the Manual Tables 4.2.5 through 4.2.8 (24-, 30-, or 36-hour [depending on Region] by 0.5-hour increments)
  - NRCS Type IA storm Regions 2 and 3
    - Table 4.2.2 Hyetograph (24-hour by 0.1-hour increments)
  - Short Duration storm
    - Table 4.2.4 Hyetograph (180-minutes by 5-minute increments)

Example Project

Small Commercial/Industrial

DEPARTMENT OF ECOLOGY
State of Washington

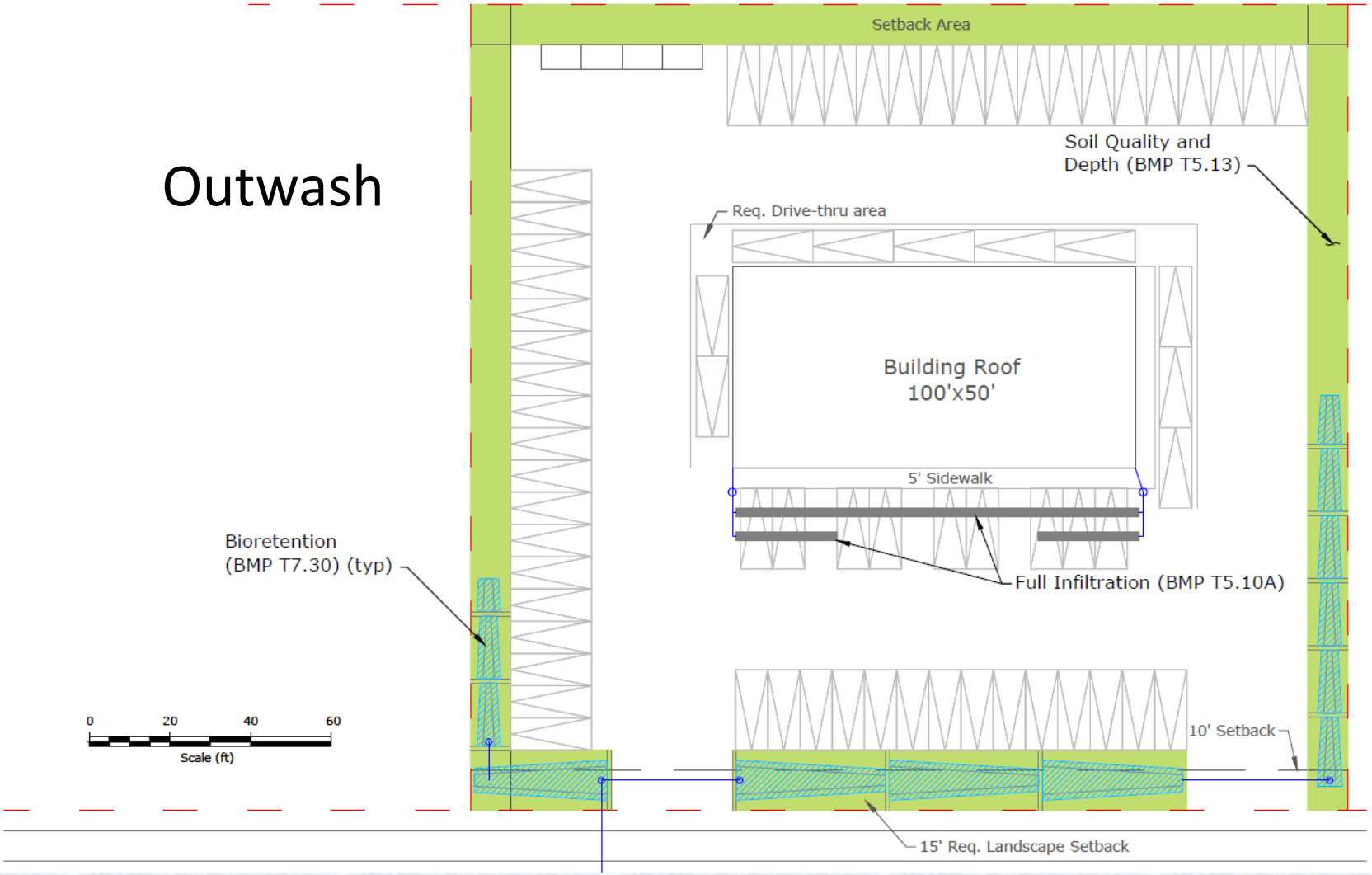
Geotechnical Report

- Infiltration Rate 0.3 in/hr (Till)
- Existing soils meet Site Suitability Criteria
- Depth to Groundwater > 15’ from surface
- Assumed Native Soil Infiltration Correction Factors (0.64)

Basic Area Calculations

Developed Land Use	Area (sq ft)	Area (Acre)
Gross Lot Area		1.0
Building Roof Area	5,000	0.115
Road Area	29,740	0.682
Sidewalk/Path Area	775	0.018
Landscape Area	8,045	0.185
Total Impervious Area	35,515	0.815

Outwash


Setback Area
Soil Quality and
Depth (BMP T5.13)
Req. Drive-thru area
Building Roof
100'x50'
5' Sidewalk
Bioretention
(BMP T7.30) (typ)
Full Infiltration (BMP T5.10A)
0
20
40
60
Scale (ft)
10' Setback
15' Req. Landscape Setback