



# Watershed Protection Ordinance (WPO)

## Stakeholder Meeting:

### Hydrology, Part 1

May 17, 2013

# Meeting Agenda

11:00- 11:10  
[10 min.]

**Arrivals & Introductions**

11:10- 12:00  
[50 min]

**Staff Presentation**

12:00- 12:10  
[10 min.]

**Break**

12:10- 12:45  
[35 min.]

**Stakeholder Discussion**

12:45- 1:00  
[15 min.]

**Wrap-Up**

# Meeting Objectives

- **Report feedback captured**
- **Define terms**
- **Benchmark current regulations**
- **Chart course for improvements**

# Stakeholder Phase 1 Feedback

- Emphasize maintenance of **pre-development hydrology**, use **volume-based hydrologic** approach, and require **LID** approach to development/stormwater management
- CoA **Green Stormwater Infrastructure** initiatives have not gone far enough
- Integrate water conservation and stormwater management efforts

# Additional Guidance per Imagine Austin

- Develop best management practices for green infrastructure as part of “complete street” design guidelines. **GSI**
- Incentivize appropriately-scaled and located green [stormwater] infrastructure. **GSI**
- Develop a regulatory framework to incentivize Low Impact Development (LID) features. **LID**

# Definitions

- **Low Impact Development**
- **Green Infrastructure**
- **Pre-Development Hydrology**
- **Volume-Based Hydrology**

# Definitions

## **LID / Low Impact Development**

LID is an **approach to land development** and, in this context, refers primarily to watershed management techniques that “can maintain or restore a watershed's hydrologic regime by fundamentally changing conventional site design to create an environmentally and hydrologically functional landscape that mimics natural hydrologic functions.” (Prince George’s County, 1999)



# Definitions

## GSI / Green Stormwater Infrastructure

GSI is the name for the **toolbox of Best Management Practices** that “reduces impacts from built environments using landscape features and engineered systems that mimic natural processes to provide flow-rate attenuation, volume reduction, and water quality improvement.” (COA, GIT Charter, 2011)



# Definitions

## Pre-Development Hydrology

In its most literal sense, this means that

**post-development rainfall/runoff conditions must match pre-development conditions**

Examples:

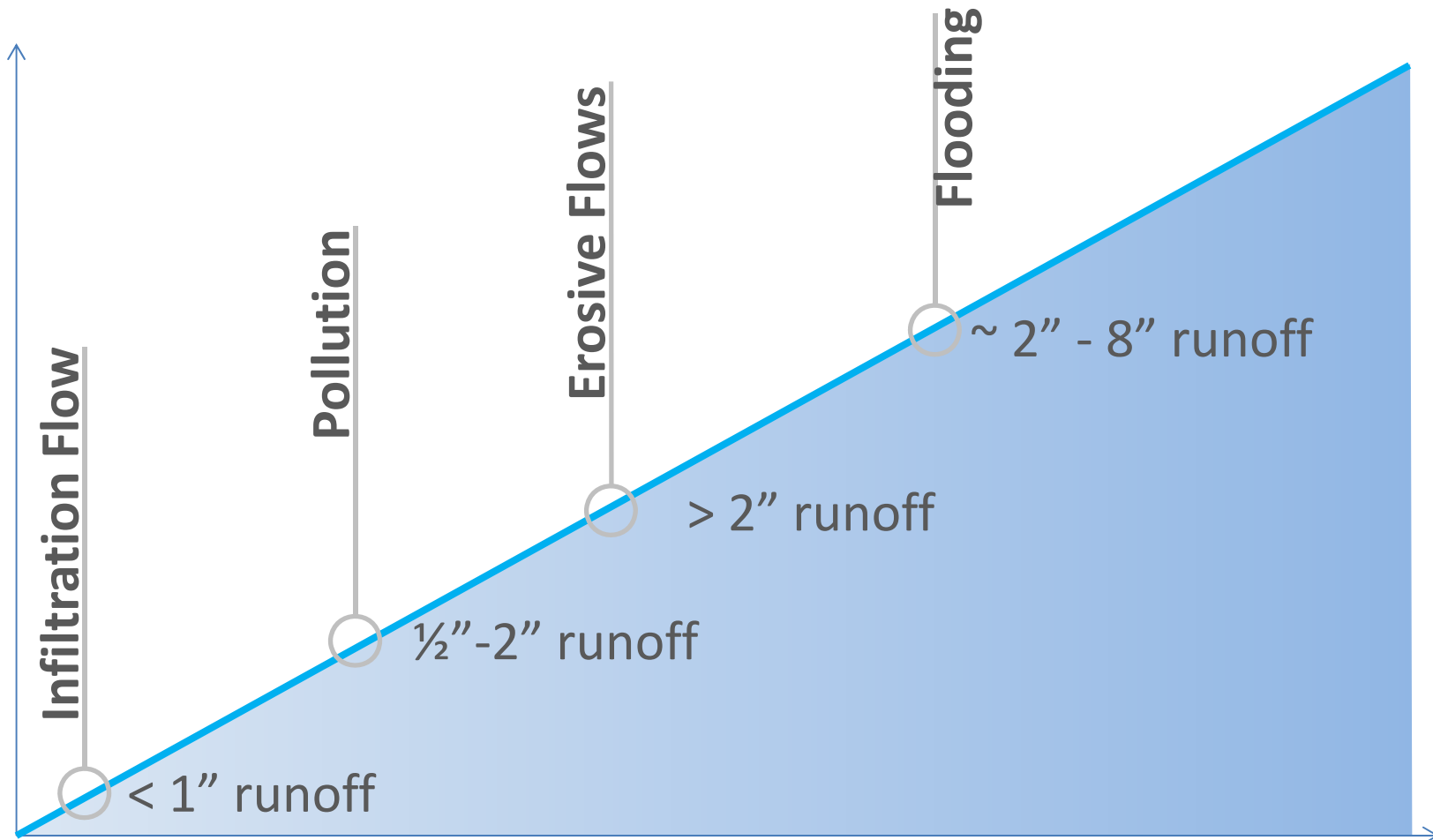
- Runoff volume, runoff rate, runoff temps, infiltration rates/volumes, runoff duration → baseflow duration, water chemistry, runoff patterns (overland vs. concentrated)
- Challenging to achieve with any level of development and difficult to quantify baseline levels and prescriptive measures to ensure performance (how much infiltration ensures stream baseflow and spring/seep discharge?)

# Definitions

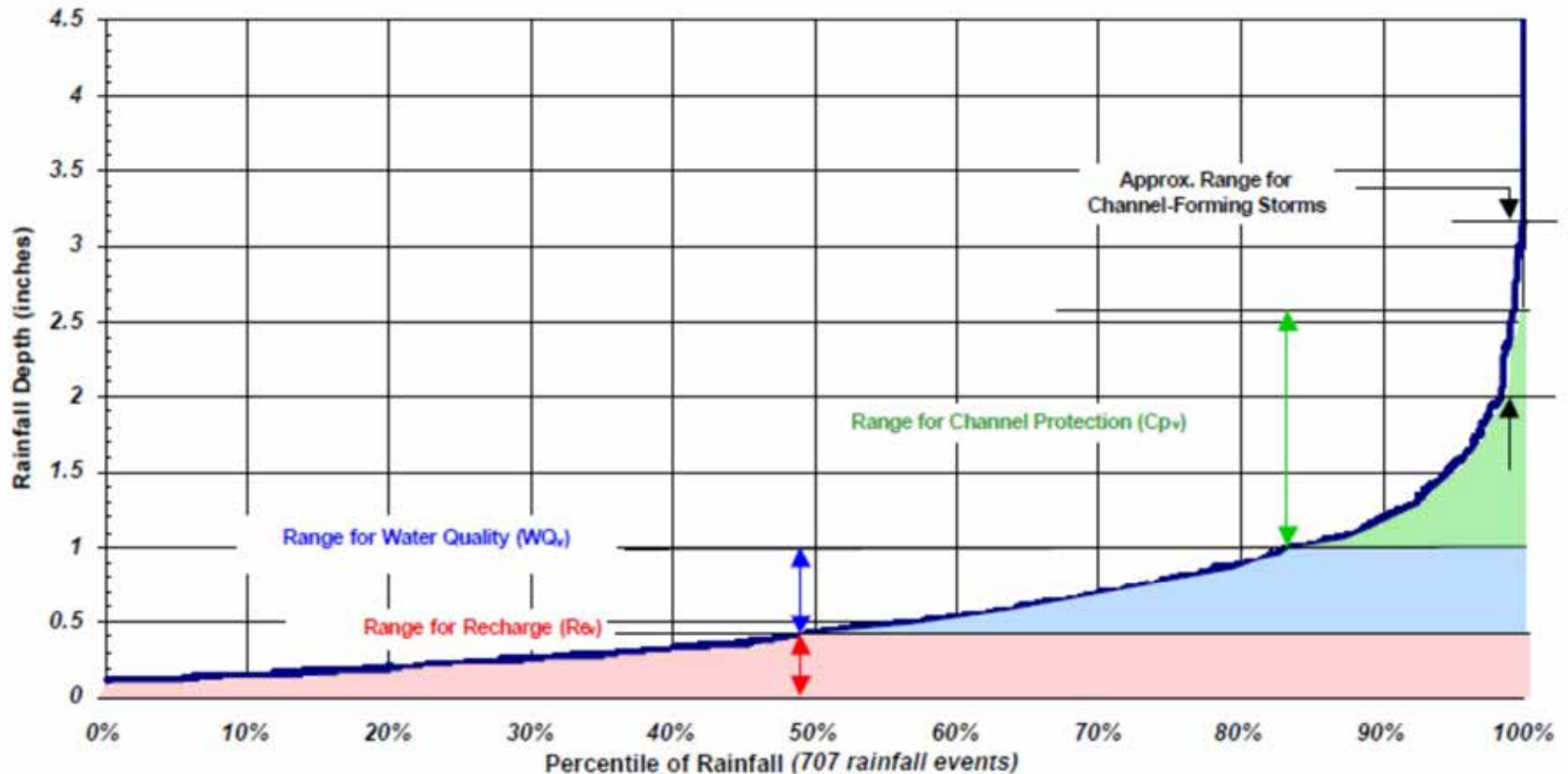
## Volume-Based Hydrology

Approach to stormwater management that emphasizes controlling the excess volume of runoff due to urban development, as opposed to other elements like peak flow, velocity, event mean concentration, or temperature.

# VBH Spectrum of Approaches

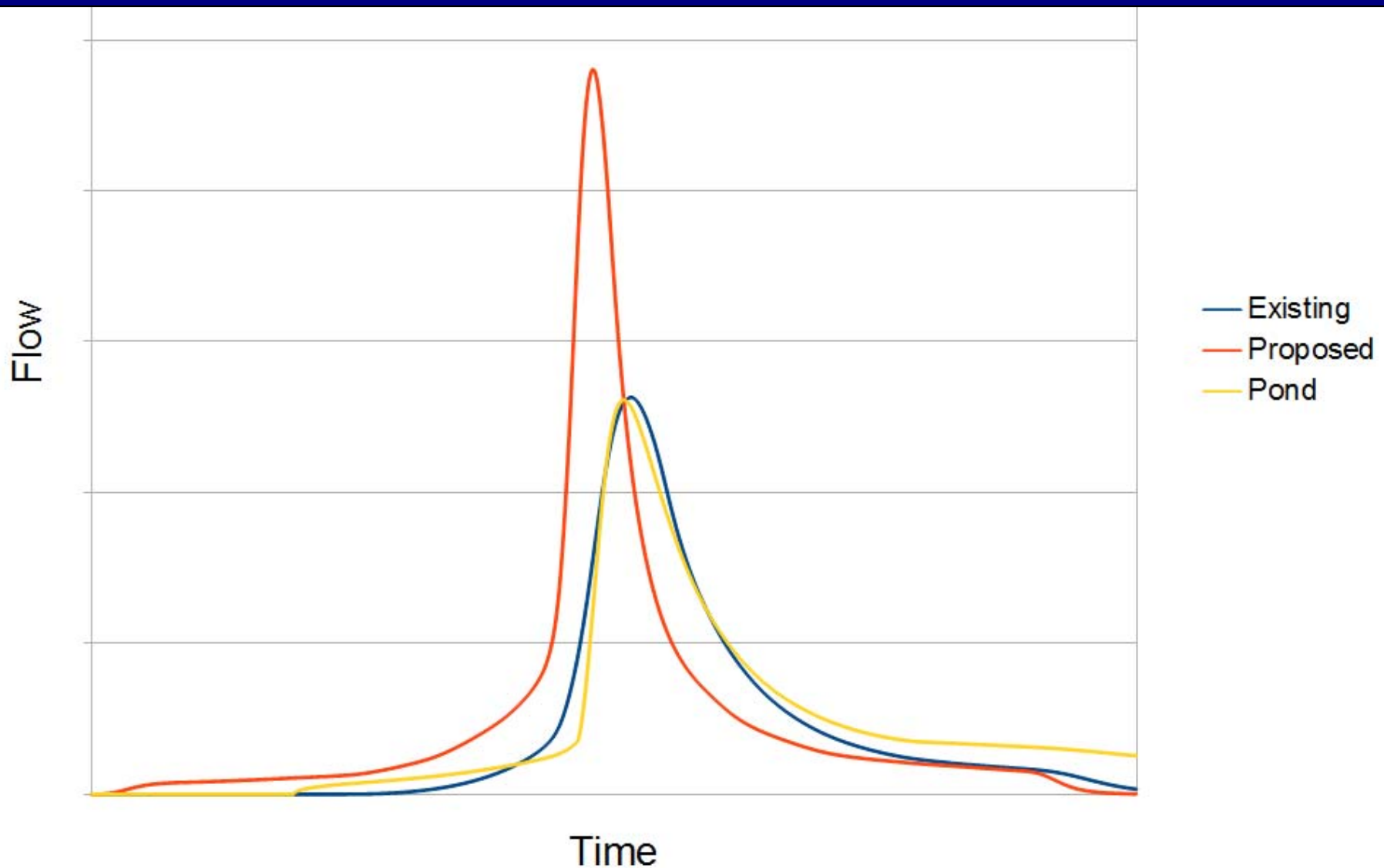


# VBH Spectrum of Approaches

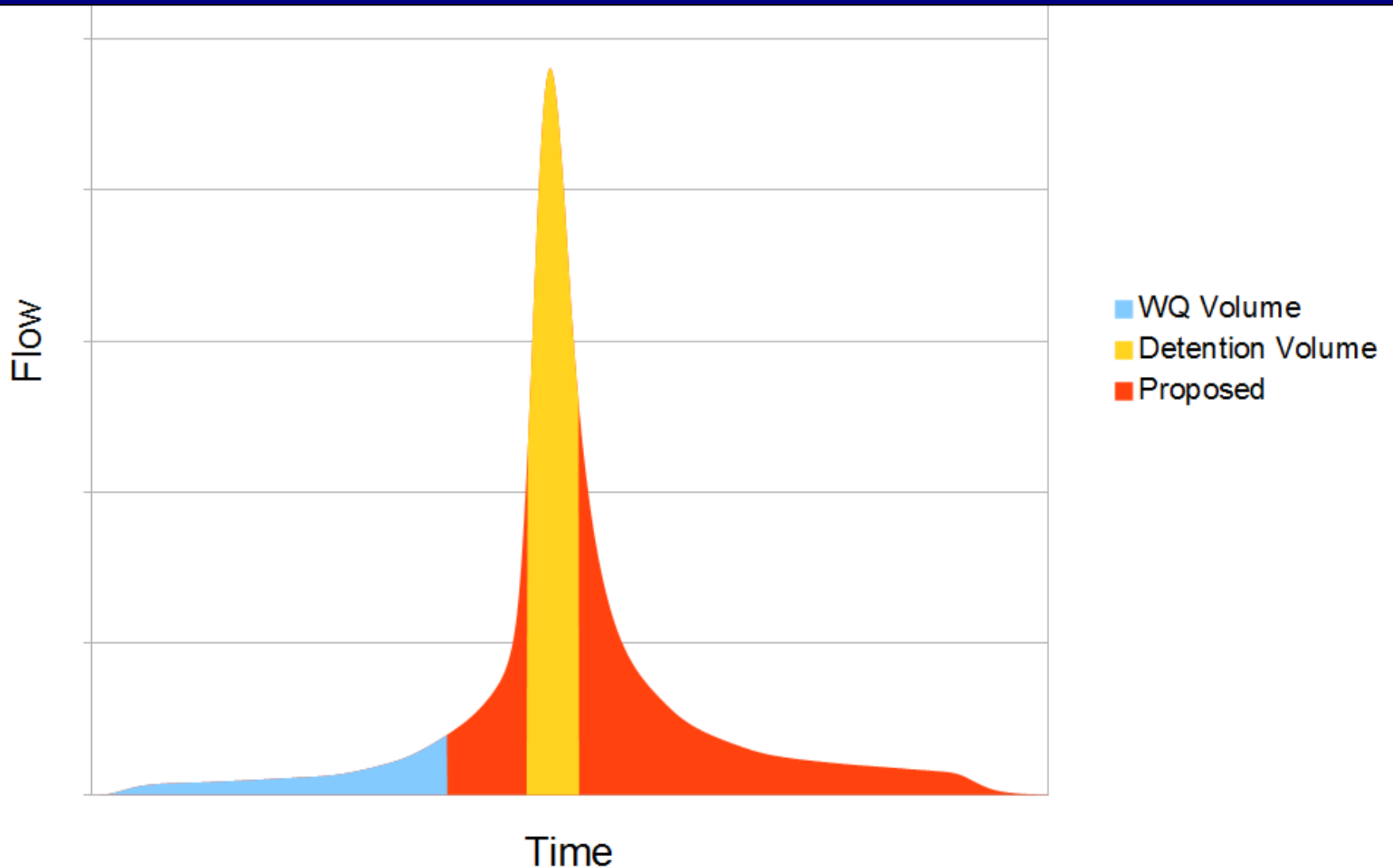


**Figure 1.** Rainfall events captured and treated by the recharge ( $Re_v$ ), water quality ( $WQ_v$ ) and channel protection ( $Cp_v$ ) volumes using 1980 to 1990 rainfall frequency records for Baltimore City

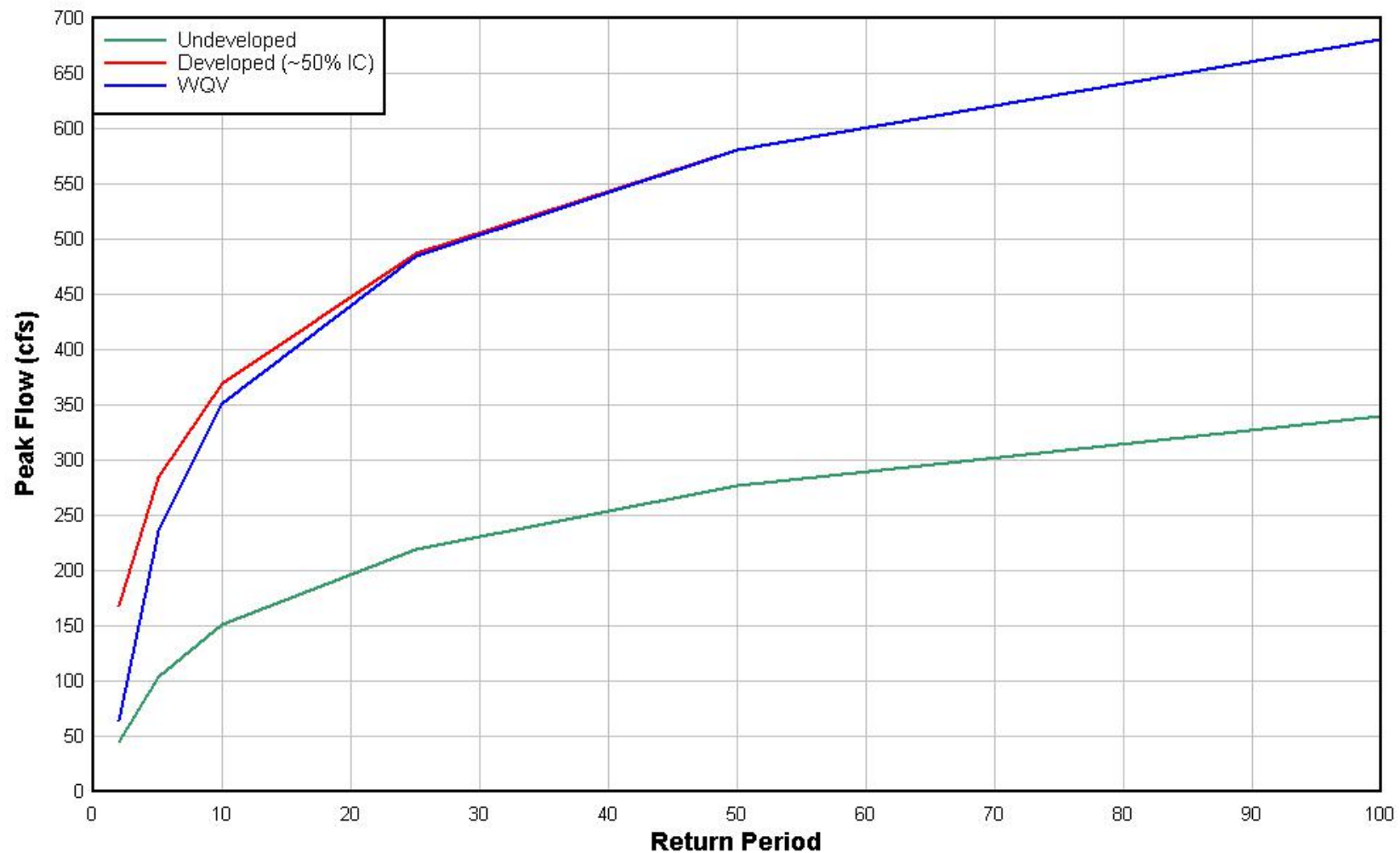
# Runoff Hydrographs



# Simple HMS with Rain Garden Hydrograph



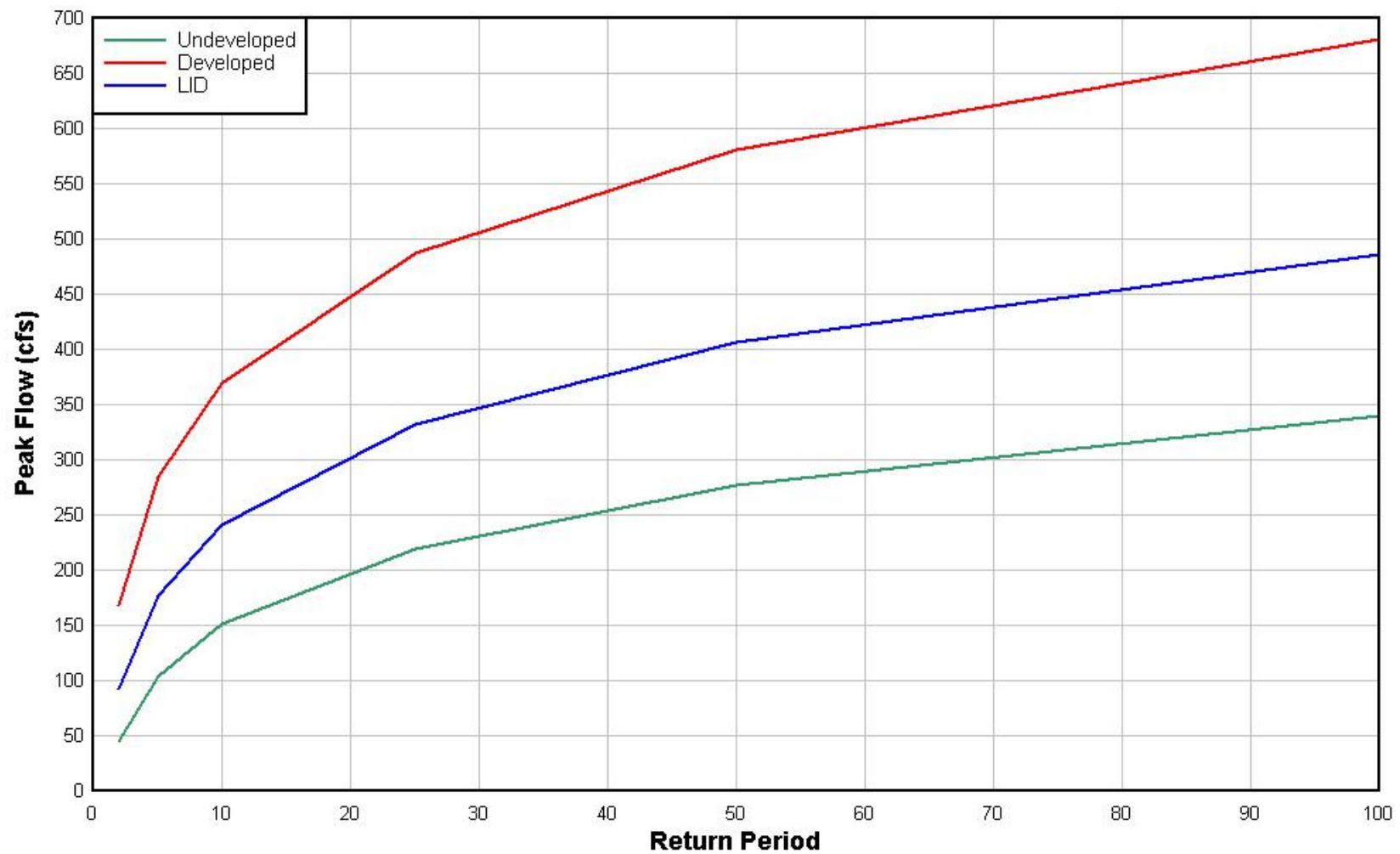
# Changes in Peak Flow Rates $\frac{1}{2}$ " + WQ Volume



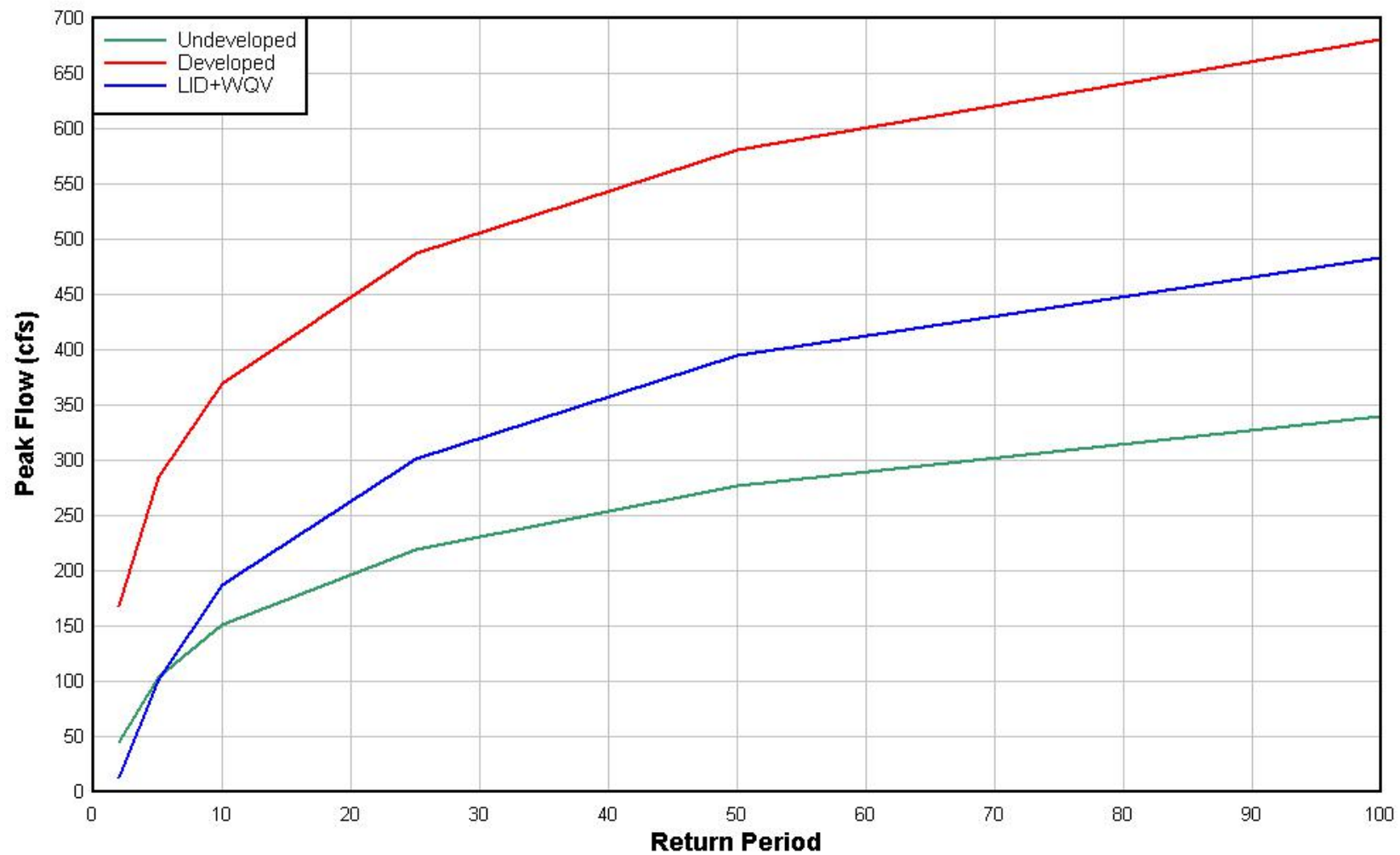


# Changes in Peak Flow Rates

## LID

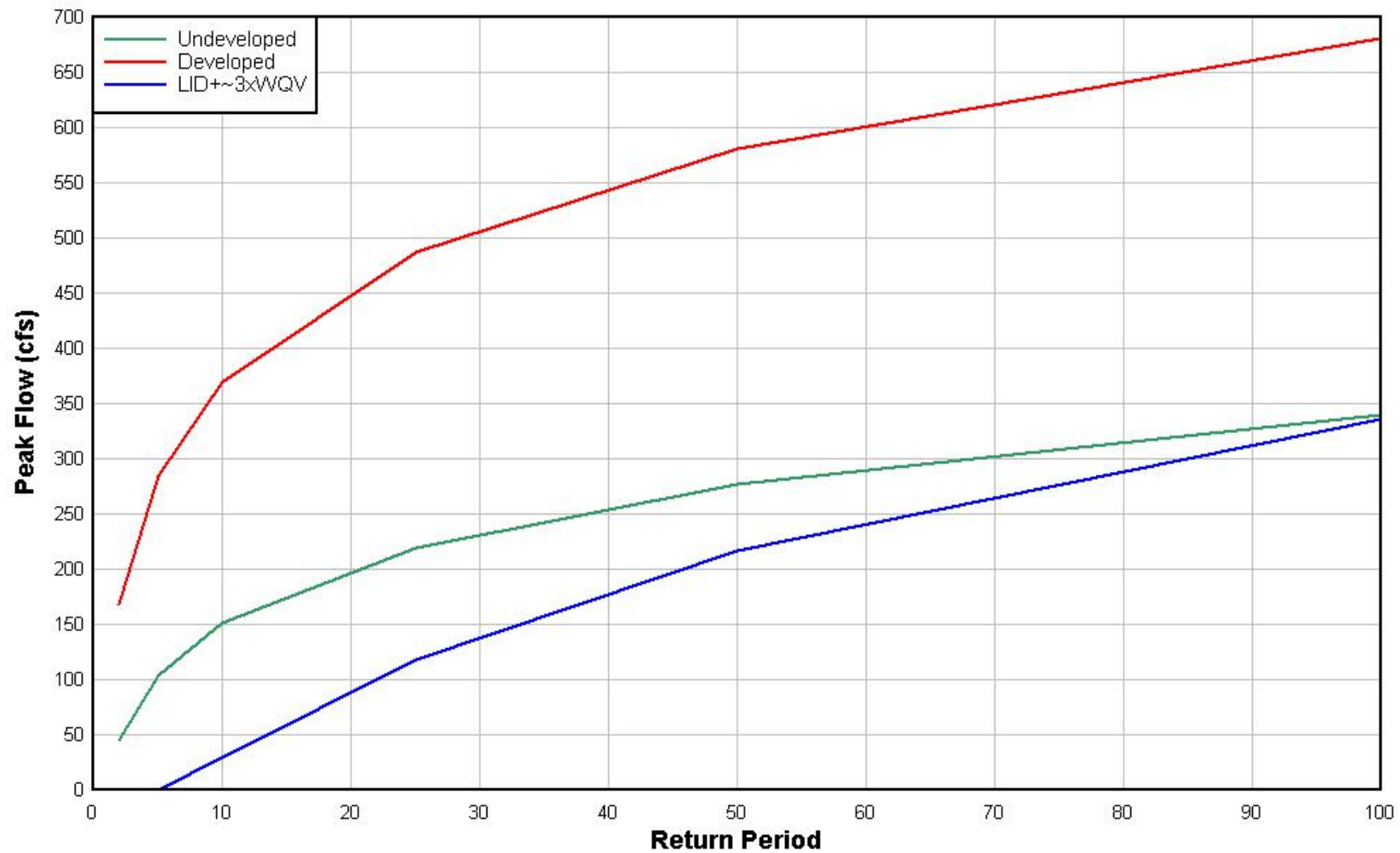


# Changes in Peak Flow Rates LID + WQ Volume

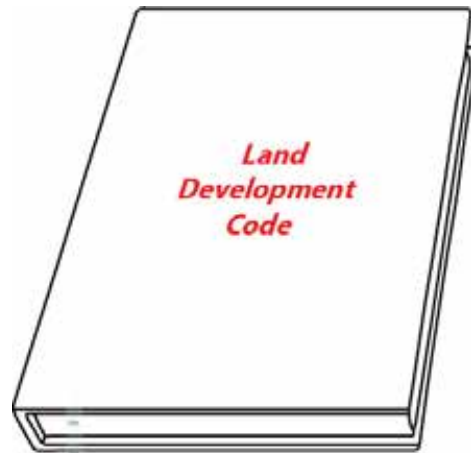


# Changes in Peak Flow Rates

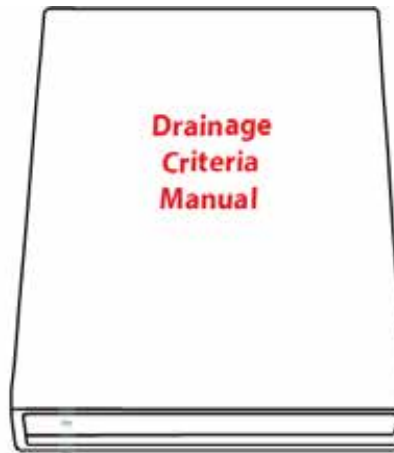
## LID + about 3x WQ Volume



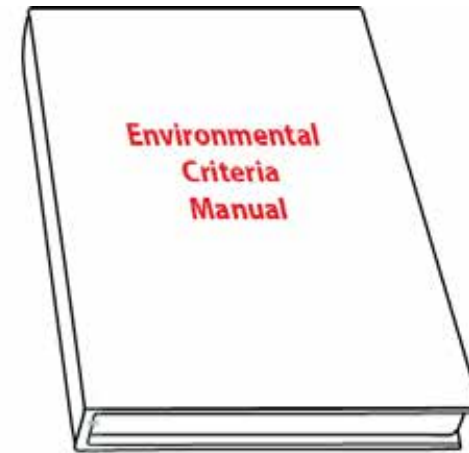
# Criteria and Code References



- Erosion Control 25-7-61
- Impervious Cover Limits 25-8 by Watershed Classification
- Non Degredation for SOS 25-8-514 Article 12
- Water Quality Controls 25-8-211/213



- Detention Requirements 1.2.2
- Erosion Control 1.6.7



- Green Stormwater Controls 1.6.7

# Examples of Existing Regulations that Embody LID, VBH, Pre-Development, GSI

In order to prevent pollution, impervious cover for all such development shall be limited to a maximum of 15 % in the entire recharge zone, 20 % of the contributing zone within the Barton Creek watershed, and 25 % in the remainder of the contributing zone.

No exemptions, special exceptions, waivers or variances.

- **SOS Non-Degradation**
  - **Non SOS Water Quality Controls**
  - **Flood Detention Controls**
  - **Stream Erosion Controls**
  - **Impervious Cover Limits**
  - **Green Stormwater Controls**

# Examples of Existing Regulations that Embody LID, VBH, Pre-Development, GSI

A water quality control must capture, isolate, and treat the water draining to the control from the contributing area. The required capture volume is the first one-half inch of runoff and for each 10% increase in impervious cover over 20% of gross site area, an additional one-tenth of an inch of runoff.

- **SOS Non-Degradation**
- ■ **Non SOS Water Quality Controls**
- **Flood Detention Controls**
- **Stream Erosion Controls**
- **Impervious Cover Limits**
- **Green Stormwater Controls**

# Examples of Existing Regulations that Embody LID, VBH, Pre-Development, GSI

Stormwater runoff peak flow rates shall not be increased at any point of discharge from a site for the two (2), ten (10), twenty-five (25) and one hundred (100) year storm frequency events.

Achieved by on-site or off-site storage.

- **SOS Non-Degradation**
- **Non SOS Water Quality Controls**
- **Flood Detention Controls**
- **Stream Erosion Controls**
- **Impervious Cover Limits**
- **Green Stormwater Controls**



# Examples of Existing Regulations that Embody LID, VBH, Pre-Development, GSI

Includes both construction phase E&S and in-stream erosion.

Temporary controls are required for all development until permanent revegetation has been established

A proposed development may provide off-site control of the two-year peak flow with conditions.

- **SOS Non-Degradation**
- **Non SOS Water Quality Controls**
- **Flood Detention Controls**
- **Stream Erosion Controls**
- **Impervious Cover Limits**
- **Green Stormwater Controls**

# Examples of Existing Regulations that Embody LID, VBH, Pre-Development, GSI

Impervious cover limits vary by land use and watershed classification

Impervious cover calculations exclude certain features, such as sidewalks in public ROW, water quality controls, and pools

Zoning also regulates impervious cover –the more restrictive limit governs

- **SOS Non-Degradation**
- **Non SOS Water Quality Controls**
- **Flood Detention Controls**
- **Stream Erosion Controls**
- **Impervious Cover Limits**
- **Green Stormwater Controls**

# Examples of Existing Regulations that Embody LID, VBH, Pre-Development, GSI

The green stormwater infrastructure practices included in this section have been reviewed and approved by the Watershed Protection Department.

## ECM 1.6.7

- Retention/Irrigation Systems
- Vegetative Filter Strip
- Biofiltration
- Rainwater Harvesting
- Porous Pavement
- Rain Garden

- **SOS Non-Degradation**
- **Non SOS Water Quality Controls**
- **Flood Detention Controls**
- **Stream Erosion Controls**
- **Impervious Cover Limits**
- **Green Stormwater Controls**

# Example of Stakeholder Recommendations

- VBH** ■ **Require Infiltration** of a portion of WQ Volume
- GSI** ■ **Rain gardens for single-family residential**
- GSI** ■ **Rain gardens for SOS compliance**
- GSI** ■ **Rainwater harvesting** for conservation & water quality
- VBH** ■ **Rainwater harvesting + green roof irrigation**
- GSI** ■ **Porous pavement** for non-pedestrian surfaces
- VBH** ■ **Flood detention credit** for water quality controls
- LID/  
VBH** ■ **Impervious cover credit** for rainwater harvesting catchment and/or tank areas
- VBH** ■ **Volume Based Flood Detention**

# Chart Course for Improvements

## Identify gaps in performance

- Maintain/ Improve Baseflow
- Maintain/ Restore Springflow
- Integrate Water Conservation

## Develop methodology to implement

- Rethink Impervious Cover
- Facilitate on-site retention and re-use (rainwater harvesting)
- Require/ incent infiltration BMPs

# Chart Course for Improvements

## Develop Methodology for Assessing Performance

- Computer Modeling
- In-stream Monitoring (e.g. , EII)

## Apply to Code and Criteria

# Next Stakeholder Meeting Topics

**May 31**

**Friday**

**Hydrology and Urban Design, Part 2**

*Volume Based Hydrology; Green Infrastructure;*

*Payment-in-lieu of Water Quality; On- and Off-Site Mitigation*



# Adoption Schedule

Council Resolution	January 2011
Stakeholder Meetings: Input	Sep. 2011 – April 2012
Staff develops Draft Ordinance	April – November
Brief the Environmental Board	December 5
Stakeholder Meetings: Draft Ordinance*	Dec. '12 – May 2013
Finalize Ordinance/City Department Review*	June
Boards & Commissions*	July
City Council	August
Travis County Commissioner's Court	Fall

\* City staff also happy to meet with interested groups upon request.

# Contact Information

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<http://www.austintexas.gov/page/watershed-protection-ordinance-0>