PLANNING FOR FUTURE DEVELOPMENT:
A FRAMEWORK TO GUIDE ON-SITE STORMWATER MANAGEMENT IN CLEVELAND

2018 ONE WATER TECHNICAL CONFERENCE | AUGUST 29, 2018

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The **Opportunity Corridor Development: On-Site Stormwater Management Strategy** is a planning study led by the Northeast Ohio Regional Sewer District with input from the City of Cleveland, City Planning Commission, and the Greater Cleveland Partnership.
PLANNING STUDY GOALS

1. Identify desired **future development** types within the Study Area;

2. Develop recommendations for **on-site stormwater management strategies**;

3. Provide planning-level guidance for complying with stormwater management **regulations**.

**AUDIENCE**
- Development Community
- City of Cleveland
- NEORSD
Summary Report Outline

- Woodland Village Conceptual Development Plan
  Burten, Bell, Carr Development, City of Cleveland, City Architecture, BFR Partners

- Friendship Village Conceptual Development Plan
  Burten, Bell, Carr Development, City of Cleveland, City Architecture, BFR Partners

- Ward 5 Forgotten Triangle Master Plan
  Burten, Bell, Carr Development and the Urban Design Center of Northeast Ohio

- Ward 5 Kinsman Union Master Plan
  Burten, Bell, Carr Development and the Urban Design Center of Northeast Ohio

- Ward 5 Central Neighborhoods Master Plan
  Burten, Bell, Carr Development and the Urban Design Center of Northeast Ohio

- Connecting Cleveland 2020 Citywide Plan
  City of Cleveland

- Fairfax Strategic Investment Plan
  Fairfax Renaissance Development Corporation, Urban Design Associates

- Kinsman Master Plan
  Burten, Bell, Carr Development

- Central Master Plan
  Burten, Bell, Carr Development

- Fairfax Strategic Investment Plan
  Fairfax Renaissance Development Corporation, Urban Design Associates

- Cleveland Central Choice Transformation Plan
  Cuyahoga Metropolitan Housing Authority, City Architecture

- Thrive 105-93 Corridor Study
  City of Cleveland, AECOM

- East 79th Street Corridor Study
  City of Cleveland, NOACA, City Architecture, WSP

- Vibrant NEO 2040 Regional Vision, Were Should We Go Together?
  Northeast Ohio Sustainable Communities Consortium Initiative

- Innovation Square Fairfax Neighborhood Plan
  Fairfax Renaissance Development Corporation, City Architecture


- East Woodland Estates-Phase 1
  City Architecture

- Garden Valley Homes Estate
  Cuyahoga Metropolitan Housing Authority

- Urban Agriculture Innovation Zone
  Burten, Bell, Carr Development

- St. Hyacinth Transit Oriented Development Study
  Slavic Village Development, McKnight Associates

- Building Stronger Neighborhoods, Kinsman & Central Neighborhood Plan
  Burten, Bell, Carr Development

- Cleveland Opportunity Corridor Brownfields Area Wide Plan
  City of Cleveland, US EPA, City Architecture, Partners Environmental Consulting

- Color Code Legend:
  MASTER PLAN  SITE DEVELOPMENT PLAN  STRATEGIC PLAN  COMPREHENSIVE PLAN
On-Site Stormwater Management Regulations

Chapter 541—Sewer Connections and Sewer Use Code

Guidelines for Review and Approval

Regulatory Context
On-Site Stormwater Management Regulations

Northeast Ohio Regional Sewer District
Submittal Requirements for Connections to the Combined Sewer System

Rainwater and Land Development
Ohio’s Standards for Stormwater Management
Land Development and Urban Storm Protection

Ohio Department of Natural Resources
Division of Soil and Water Conservation

Opportunity Corridor Development: On-Site Stormwater Management Strategy
Summary Report Overview

- SEP 2015: 4 Stakeholder Meetings
- JUN 2016: 1 City of Cleveland Meeting
- AUG 2016: 1 NEORSD External Advisory Committee Meeting
- MAR 2017: 1 East Design Review Committee Meeting
- APR 2017
- OCT 2017

OPPORTUNITY CORRIDOR DEVELOPMENT: ON-SITE STORMWATER MANAGEMENT STRATEGY
- NEORSD Regulations (Title IV)
- City of Cleveland Regulations (§ 514)
- City of Cleveland Regulations (§ 3116)
- Compliance Flowcharts
- Stormwater Fee Credits
Regulatory Context

**Diagram:**
- **NO**:
  - On-site SCMs are not required.
  - Show $q_{out} = q_{in}$.

- **YES**:
  - Design on-site SCMs that provide storage volume to ensure no increase in peak flow.
  - Argued requirements for connections to the combined sewer system.
  - Show $q_{out} = q_{in}$.

- **Submit Plans & Calcs**

**Graph:**
- Peak discharge rate (cubic feet per second)
- Pre-development vs. post-development
- 6-month, 1-year, 2-year, 5-year, 10-year, 25-year, 50-year, 100-year

Legend:
- **< 5-year, 24-hour**
- **> 5-year, 24-hour**

**Text:**
- Opportunity Corridor Development: On-Site Stormwater Management Strategy
### Regulatory Context

<table>
<thead>
<tr>
<th>Area Name</th>
<th>NE-1</th>
</tr>
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<tbody>
<tr>
<td>Scenario</td>
<td>Proposed</td>
</tr>
<tr>
<td>Rain Event</td>
<td>5-year, 24-hour</td>
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</table>

#### RESULTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Rainfall depth (inches)</td>
<td>2.92</td>
</tr>
<tr>
<td>Total Area (acres)</td>
<td>3.68</td>
</tr>
<tr>
<td>Runoff Volume (gallons)</td>
<td>268,811</td>
</tr>
<tr>
<td>Peak Discharge (cfs)</td>
<td>13.15</td>
</tr>
</tbody>
</table>

#### HYDROLOGIC GROUP D

<table>
<thead>
<tr>
<th>Land Cover Type</th>
<th>Area (acres)</th>
<th>CN</th>
<th>Product</th>
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<tbody>
<tr>
<td>IMPERVIOUS: Paved parking lots, roofs, driveways, etc.</td>
<td>3.68</td>
<td>98</td>
<td>361</td>
</tr>
<tr>
<td>OPEN SPACE: Good condition (grass cover &gt;75%)</td>
<td>0.00</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3.68</strong></td>
<td><strong>361</strong></td>
<td></td>
</tr>
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</table>

#### PEAK FLOW RATE

<table>
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<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>( T_c ) (Time of Concentration, hours)</td>
<td>0.17</td>
</tr>
<tr>
<td>( I_a ) (Initial Abstraction, inches)</td>
<td>0.062</td>
</tr>
<tr>
<td>( I_a / P ) (inches/hour)</td>
<td>0.02</td>
</tr>
<tr>
<td>( Q_u ) (Unit Peak Discharge, csm/inch)</td>
<td>850</td>
</tr>
</tbody>
</table>
Level of service (LOS) was defined as the hydraulic grade line (HGL) being within the crown of the pipe. If the crown of the pipe was exceeded, then the HGL must be a minimum of ten feet from the surface.
STORMWATER CONTROL MEASURES

- Surface, Subsurface, and Above-ground Management Strategies
- Construction Cost Resources
- Maintenance Requirements Resources
BIORETENTION

Bioretention refers to a surface depression with engineered soil, stone layers, and specialized plants. While maintenance requirements are often higher than traditional extended detention, bioretention provides greater water quality benefits and improved aesthetics. Bioretention can range in size from large detention basins to small planters integrated within parking lots.

**SYSTEM COMPONENTS**

Components of bioretention (Figure 3-2) include native soil, bioretention soil, and filter and aggregate storage layers. Typical depths of the soil, filter, and aggregate storage layers are 24 inches, 8 inches, and 12 inches, respectively; however, depths of the filter and aggregate storage layer can vary depending on storage needs and site constraints.

An overflow structure regulates flows from the bioretention system to downstream sewer systems. A subsurface underdrain system, with clean-out, is typically connected to the overflow structure when infiltration into native soils is not feasible. Filter materials—such as, for example, a concrete curb flush with the ground surface—can be included to separate bioretention areas from the adjacent landscape.

**SPATIAL CONSIDERATIONS**

Bioretention can take the form of a bioretention basin or a biocell. Biocells are most suitable within open space, open areas, or integrated with an adjacent area. Biocells can serve as green roofs, or linear swales, or bioretention basins on swales or small parking areas, or diversion of building downspouts. Figures 3-3 through 3-7 show examples of bioretention.

**MATERIALS**

- **Bioretention soil** reduces nutrient, heavy metal contaminants, and provide habitat
- **Headwall** discharges runoff area nonpoint source pollution
- **Filter layer** prevents clogging and underdrain from fine particles (depth = 6 inches)
- **Underdrain** provides residence time, storage and controls stormwater runoff peak flow rates
- **Building toe** drains stormwater from approaches infrastructure
- **Native plants** reduce nutrient, heavy metal contaminants and provide habitat
- **Aggregate layer** provides runoff storage of bioretention swale (minimum depth = 12 inches)

The geometry of bioretention is flexible and usually depends on the unique site characteristics: for example, existing topography, proximity to buildings or roadways, or existing utilities. Incorporate appropriate setbacks from building foundations and property lines, and avoid conflict with the groundwater table.

**DESIGN CONSIDERATIONS**

Stormwater runoff is conveyed to bioretention via overland flow through curb cuts and adjacent pervious pavements, or through a daylight connection to upstream storm sewer infrastructure. In all scenarios, sufficient green space protection, erosion control, and flow spreading measures are required.

The typical ratio of bioretention surface area to industrial drainage area is 1.15:1, or one square foot of bioretention surface area would manage the stormwater runoff from 13 square feet of drainage area. Similar ratios can range between 1.5:1 and 2.0:1 depending on spatial constraints and the land cover characteristics of the upstream drainage area. A minimum bioretention area size of 0.25 acres is used to fully capture and treat the Ohio EMIs water quality volume, which is the stormwater runoff generated during the 0.75-inch rain event.
IMPLEMENTATION

- Planning Recommendations
- Inventory of Existing Drainage Facilities and Collections Systems
- Examples for Integration of On-Site Stormwater Management
FUTURE LAND COVER IS BASED ON INFORMATION CONTAINED IN PLANNING DOCUMENTS PRODUCED BY THE CLEVELAND CITY PLANNING COMMISSION, NEIGHBORHOOD COMMUNITY DEVELOPMENT CORPORATIONS, AND OTHER STAKEHOLDERS.
Final Summary Report Anticipated in December 2017
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