Oakland County New Stormwater Standards

Stakeholder Rollout Meeting

April 20, 2021

WRC
WATER RESOURCES COMMISSIONER
Jim Nash

o RSSCC Collaboration Team
- o Oakland County WRC
- o Macomb County Public Works
- o Wayne County ESD
- o Livingston County Drain Office

- o OHM Advisors
- o Environmental Engineers, Inc.
- o Drummond Carpenter
- o HRC

Post Construction Stormwater Ordinance

Program Updates

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GOALS OF STORMWATER PROGRAM

o Ensure consistent and straightforward standards that meet permit requirements

o Improved water quality, channel and infrastructure protection

o Promote volume reducing low impact development (LID) measures

o Ensure long-term operation and maintenance of stormwater systems

o Promote consistent stormwater reporting, tracking and mapping

…By the numbers

✓ 3,288 miles of freshwater coastline

✓ 11,000 inland lakes
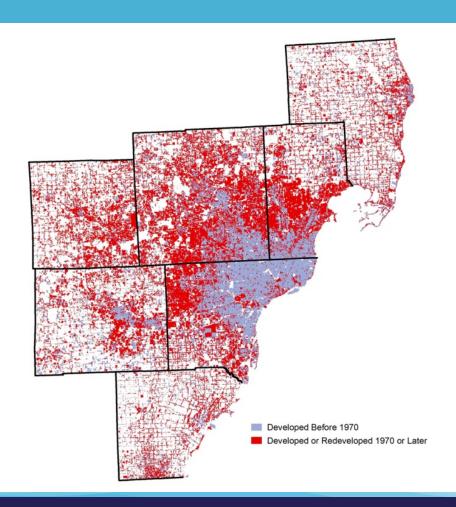
✓ 75,000 miles of river

✓ 6,300,000 acres of wetlands

Developed Before 1970
Developed or Redeveloped 1970 or Later

Southeast Michigan Urbanization

o Comply with NPDES MS4 permit requirements

o Address new requirements of combined sewer system permits

o Ensure program is reflective of current conditions and technology

o Simple Rules

o Streamline review process

o Consistency between counties

REGIONAL STORMWATER STANDARDS COORDINATION COMMITTEE (RSSCC) GOALS

o Develop a set or clear, consistent implementable, enforceable rules

o RSSCC consists of stormwater experts across SE Michigan, both in the public and private sectors. These professionals know how the site plan design and review process works

o On-going collaboration to review standards and provide regional guidance

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Balance economic realities with environmental protection

Rules should-

○ Be implementable

○ Meet or exceed the EGLE MS4 permit guidance for Channel Protection

○ Address EGLE combined sewer system permit requirements

○ Be consistent

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Rules should-

o Protect public health, safety and welfare

o Encourage redevelopment

o Put all counties, municipalities, and developers on a level playing field

o Support economic realities

o Encourage efficient investment in water quality and flood control

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Direct Connections to:

o A designated County Drain (in or out of MS4 regulated area)

o Or through County parks or property

o A County combined sewer (*encouraged*)

NOT OCWRC JURISIDICTION:
- **Local stormwater systems that are not a direct connection to a County-owned or operated system**
- **Road Commission of Oakland County**

○ All development and redevelopment projects with construction activity greater than or equal to 1-acre

○ Some local jurisdictions may choose a lower threshold for development size

KEY STORMWATER RULE COMPONENTS

Water Quality Control

- 1.0-inch storm
- Reduce TSS by 80% or limit concentration to 80 mg/L

Channel Protection Volume Control

- Infiltrate site runoff from the 1.3-inch storm

Rate Control

- Channel Protection: 1.9-inch storm, extended detention (48-hours)
- Flood Control: 100-year storm; variable release rate and storage curve

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CPVC   1.3 inches

Applies to all regulated sites to the Maximum Extent Practicable (MEP)

Alternative approach to 2-yr / 24-hr volume control in EGLE permit guidance document

CPRC   1.9 inches

Applies to all regulated sites; also serves as an alternative method to address volume control

48-hour extended detention for runoff volume from a 1.9-inch rain event

CPVC = Channel Protection Volume Control

CPRC = Channel Protection Rate Control

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Exceptions

- Soil infiltration rate is less than 0.24 inches/hour

- Prevailing groundwater is within 2 vertical feet of the bottom of infiltration BMP

- Contaminated soils on site (i.e. 'hot spots')

When CPVC cannot be met, CPRC serves as an alternative method

ADVANTAGES OF CPVC STANDARD

- Applying 1.3-inch infiltration standard to redevelopment provides a major benefit
    - Annual runoff volume reduced by up to 90%
    - Reduces flashiness in receiving streams
- Standardization across all developments; increases likelihood of widespread adoption
- Allowance for underdrain in tighter soils makes infiltration BMPs more attractive to designers
- Simplified calculations reduce design barriers and encourage proliferation of infiltration BMPs

KEY NEW RULES - CPRC

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What is it for?

- Addresses peak flow control for the 2-yr / 24-hr storm; discharge over a 48-hour period (a.k.a. extended detention)

- Why 1.9 inches?
  - 2-yr/24-hr storm is ~2.35 inches
  - Even under pre-settlement conditions (Type A/B soils), runoff still occurs (~0.4-inch)
  - 1.9 inches ensures 2-yr/24-hr peak flow control on all sites

- Same standard for redevelopment sites; this rule will significantly reduce peak flows and address stream flashiness

- Less reliance on the curve number method

- Newer equations guarantee BMP volumes are attained

- Makes site plan design and review more efficient

CPVC Volume (infiltration BMPs)

$$V_{CP-R} = 4{,}719 * C * A$$

CPRC Volume (part of detention pond)

$$V_{ED} = 6{,}897 * C * A$$

C = runoff coefficient
A = regulated drainage area (acres)

Flood Control Rules

New Equations

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- Allowable peak flow limit of 0.20 cfs/acre

- Yrjanainen Method

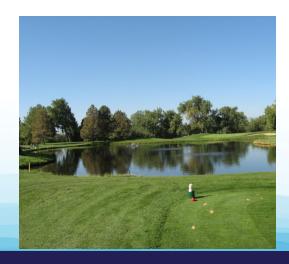- Old equations out of date based on changes to rainfall depths and intensities

(Orifice Outlet)

Frequency Of Storm	Rainfall Intensity	Storage Time Equation	Storage Volume Equation
1 Year	$\dfrac{72}{T+25}$ *	$T=-25+\sqrt{\dfrac{2700.0}{Q_o}}$	$V_s=\dfrac{4320T}{T+25}-40Q_oT$
5 Year	$\dfrac{145}{T+25}$	$T=-25+\sqrt{\dfrac{5437.5}{Q_o}}$	$V_s=\dfrac{8700T}{T+25}-40Q_oT$
10 Year	$\dfrac{175}{T+25}$	$T=-25+\sqrt{\dfrac{6562.5}{Q_o}}$	$V_s=\dfrac{10500T}{T+25}-40Q_oT$
25 Year	$\dfrac{215}{T+25}$	$T=-25+\sqrt{\dfrac{8062.5}{Q_o}}$	$V_s=\dfrac{12900T}{T+25}-40Q_oT$
50 Year	$\dfrac{245}{T+25}$	$T=-25+\sqrt{\dfrac{9187.5}{Q_o}}$	$V_s=\dfrac{14700T}{T+25}-40Q_oT$
100 Year	$\dfrac{275}{T+25}$	$T=-25+\sqrt{\dfrac{10312.5}{Q_o}}$	$V_s=\dfrac{16500T}{T+25}-40Q_oT$

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PROPOSED STANDARDS

- Variable release rate (0.15 to 1.0 cfs/acre)

- Updated to reflect current climate data (NOAA Atlas 14)

- Credit infiltration (CPVC) volume against flood control volume (with ceiling at CPRC)

- Provide more realistic flow/storage requirements for smaller sites
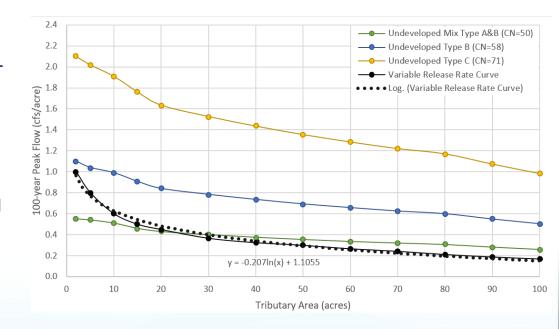
- Recognizes that runoff potential (cfs/acre) is much higher for smaller sites

- 0.15 cfs/acre may be too restrictive for smaller sites

- Set variable release rate

  - 0.15 cfs/acre for sites larger than 100 acres

  - Gradual increase to 1.0 cfs/acre sites 2 acres and smaller

- Allows for a shift in capital from storage to water quality BMPs

Chart legend:
- Undeveloped Mix Type A&B (CN=50)
- Undeveloped Type B (CN=58)
- Undeveloped Type C (CN=71)
- Variable Release Rate Curve
- Log. (Variable Release Rate Curve)

Y-axis: 100-year Peak Flow (cfs/acre)
X-axis: Tributary Area (acres)

$y = -0.207\ln(x) + 1.1055$

Rules still provide for more restrictive release rate if downstream conditions warrant

- Single equation to size detention pond
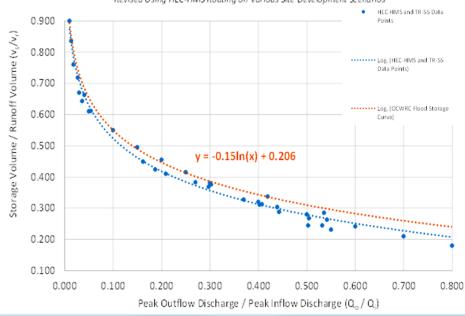
- Based on TR-55 curve

- Verified by hydrologic routing of dozens of hypothetical developments

- Will adapt to changing climate conditions

- Only variables needed:

  - Peak post-development pond inflow

  - Post-development runoff volume

  - Peak allowable discharge

$$y = 0.206 - 0.15\ln(x)$$

Detention Pond Sizing Curve
Adapted from USDA-NRCS, Urban Hydrology for Small Watersheds, TR-55, June 1986
Revised Using HEC-HMS Routing on Various Site Development Scenarios

- HEC-HMS and TR-55 Data Points

- Log. (HEC-HMS and TR-55 Data Points)

- Log. (OCWRC Flood Storage Curve)

$$y = -0.15\ln(x) + 0.206$$

Storage Volume / Runoff Volume (v_s/v_r)

Peak Outflow Discharge / Peak Inflow Discharge (Q_o / Q_i)

o Fewer equations than current method

o Doesn't rely on curve numbers

o Makes site plan design and review more efficient

<u>Allowable Peak Discharge Rate</u>

$$Q_{VRR} \text{ (cfs/acre)} = 1.1055 - 0.206 * \ln(A)$$

$$Q_{100P} = Q_{VRR} * A$$

Gradual increase to 1.0 cfs/acre for sites 2 acres and smaller

<u>100-yr Storage Volume (Detention Pond)</u>

$$V_{100D} = V_{100R} * [0.206 - 0.15 * \ln(Q_{100P}/Q_{100IN})]$$

V_{100D} = 100-yr storage volume
V_{100R} = 100-yr developed runoff volume
Q_{100P} = 100-yr Allowable peak discharge
Q_{100IN} = 100-year peak pond inflow

EXAMPLE 1- REDEVELOPMENT

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Site Information

o **22-acre parcel**
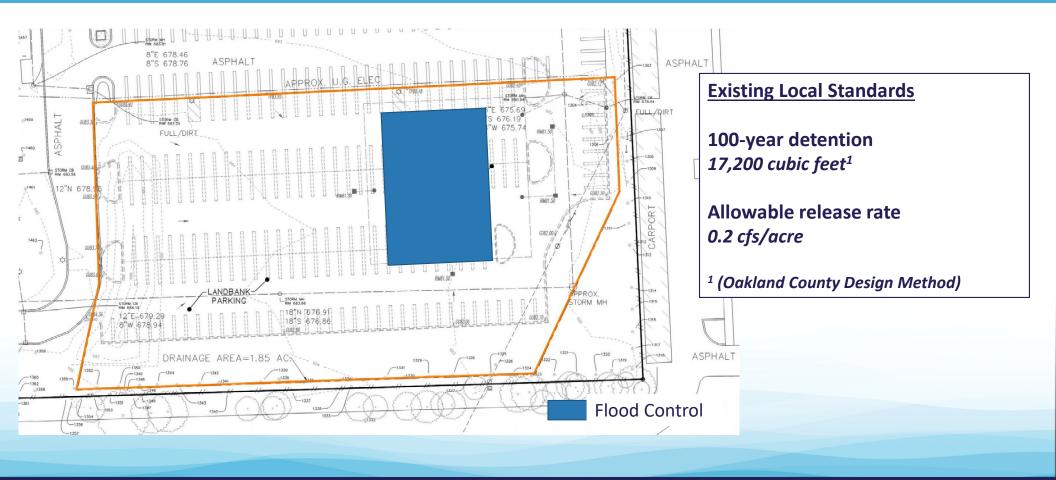
o **1.85 acres of redevelopment**

   o **Green space converted into a parking lot**

o **Runoff Coefficient – 0.74**

EXAMPLE 1 – REDEVELOPMENT


Existing Local Standards

100-year detention
17,200 cubic feet[1]

Allowable release rate
0.2 cfs/acre

[1] (Oakland County Design Method)

Flood Control
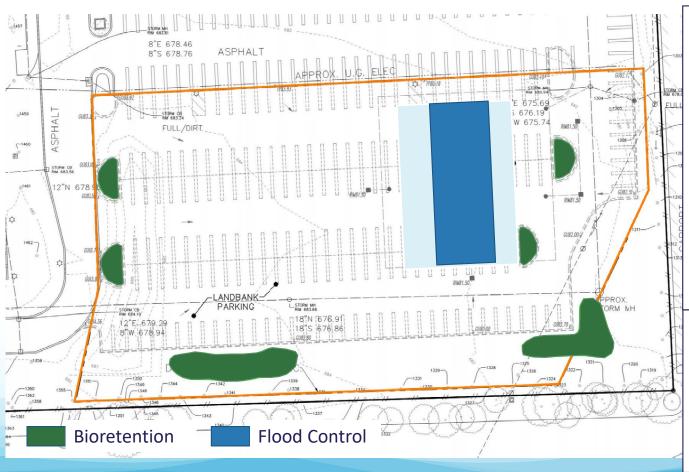
EXAMPLE 1 – REDEVELOPMENT

Proposed OCWRC Standards

Infiltration BMPs *(1.3-inch event)*
6,460 cubic feet

CPRC Volume *(1.9-inch event)*
9,500 cubic feet

100-year detention (5.24-inch event)
11,500 cubic feet
(1 cfs/acre)

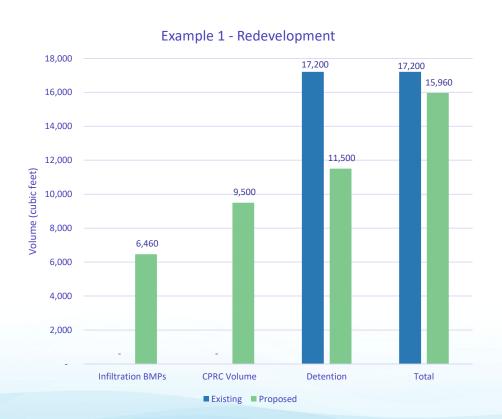**_100-year detention provided:_**
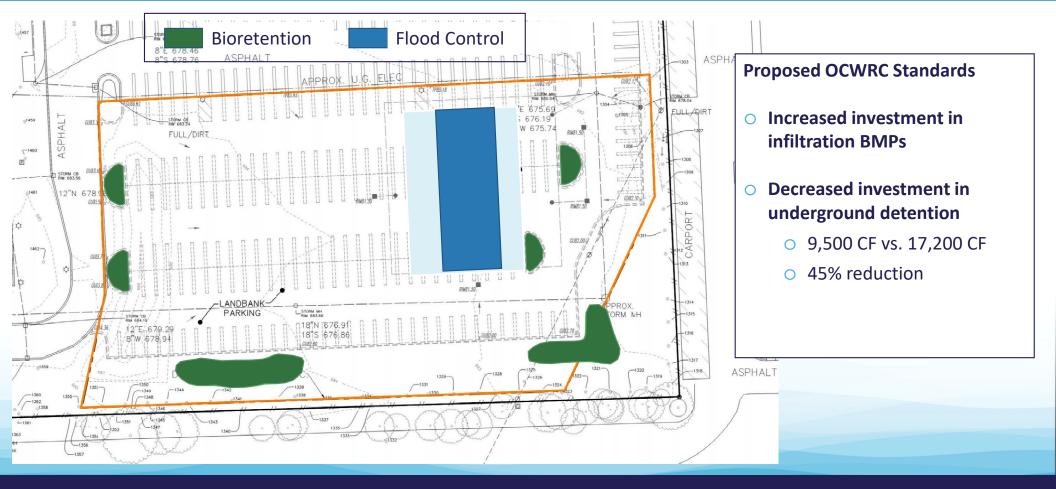
11,500 cubic feet (calculated)
CREDIT 6,460 cubic feet (bioretention)
Net volume = 6,470 cubic feet

*CPRC Volume (1.9-inch event):* **9,500 cubic feet**

Bioretention   Flood Control

Bioretention **Flood Control**

Proposed OCWRC Standards

- **Increased investment in infiltration BMPs**

- **Decreased investment in underground detention**
  - 9,500 CF vs. 17,200 CF
  - 45% reduction

EXAMPLE 2 – COMMERCIAL BUILDING
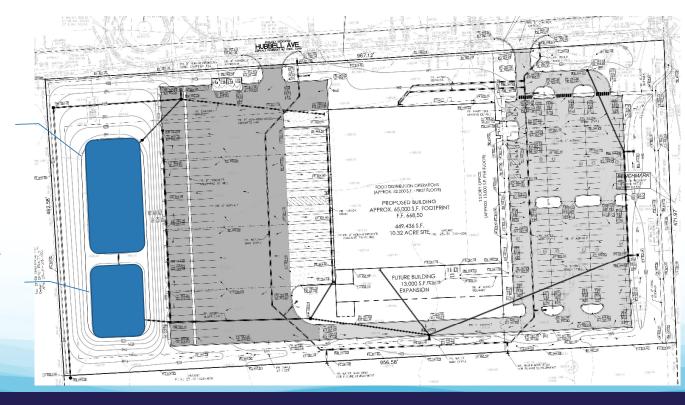
Site Information

- 10.32-acre site

- New Development

- Runoff Coefficient – 0.59

Flood Control

Forebay

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EXAMPLE 2 – COMMERCIAL BUILDING

Existing Local Standards:

Forebay Volume (WQ)
13,630 cf
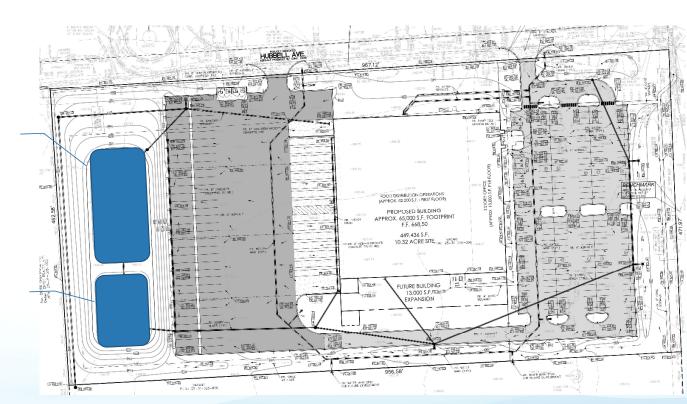
10-year detention:
56,650 cubic feet[1]

Allowable release rate
0.2 cfs/acre

[1] (Oakland County Design Method)

Flood Control

Forebay

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EXAMPLE 2 – COMMERCIAL BUILDING

Proposed OCWRC Standards:

Infiltration BMPs *(1.3-inch event)*
28,700 cf
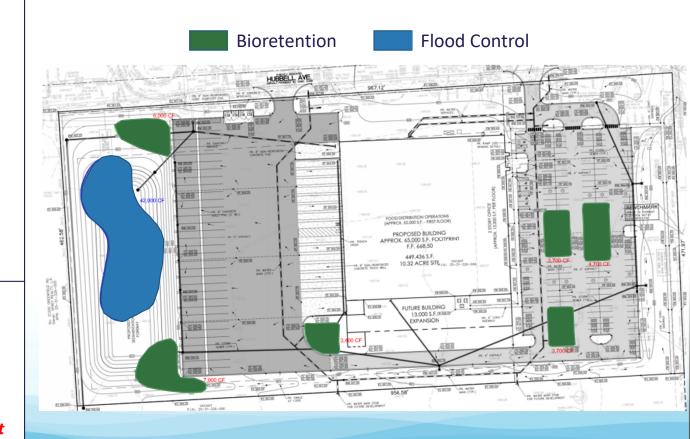
CPRC Volume *(1.9-inch event)*
42,000 cf

100-year detention *(5.24-inch event)*
54,000 cf
(0.62 cfs/acre)

100-year detention provided:

54,000 cubic feet (calculated)
CREDIT 28,700 cubic feet (bioretention)
Net volume = 25,660 cubic feet

CPRC Volume (1.9-inch event): **42,000 cubic feet**

🟩 Bioretention   🟦 Flood Control
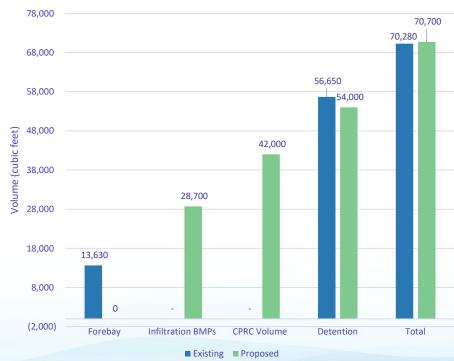
VOLUME COMPARISON

Example 1 - Redevelopment

Example 2 – Commercial Building

○ Fully executed Stormwater Management O&M Agreement

    ○ Legal description & easements

    ○ Stormwater system description and map

    ○ Memorandum of stormwater management O&M agreement

    ○ **Stormwater O&M plan**

    ○ **GIS data submittal for tracking**

Next Steps

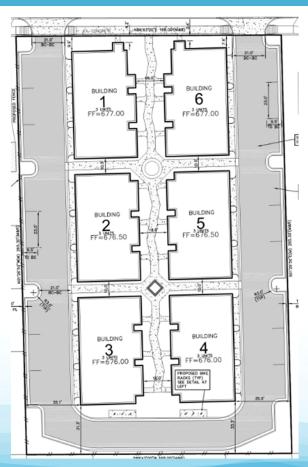Purely Resourceful

Example 2 – Multi-family Development

UNDERGROUND DETENTION STORAGE PLAN
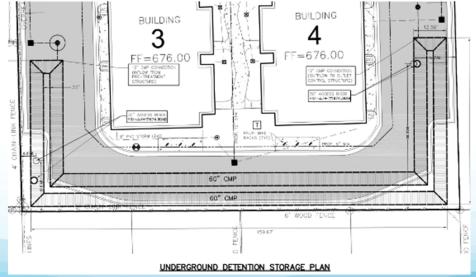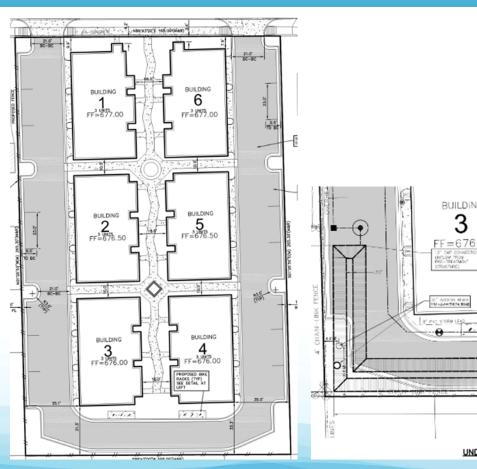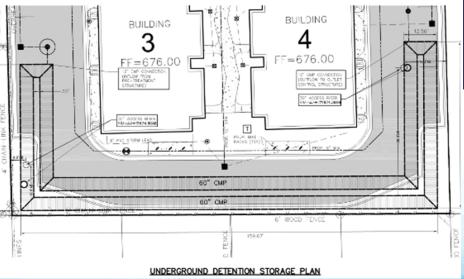
Site Information-New Development

- ○ **1.5-acre site**

- ○ **Runoff Coefficient – 0.76**

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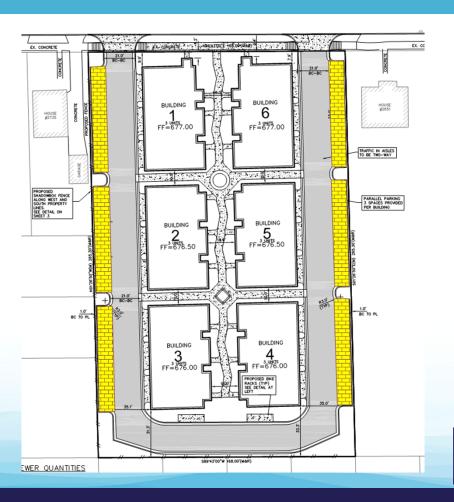# Example 2 – Multi-family Development

Existing Local Standards:

100-year stormwater detention:
10,014 cubic feet[1]

Allowable release Rate
0.2 cfs/acre

[1] (Oakland County Design Method)

Example 2 – Multi-family Development

Proposed OCWRC Standards:

Infiltration BMPs *(1.3-inch event)*
5,280 cubic feet
PROVIDED 3,350 cf
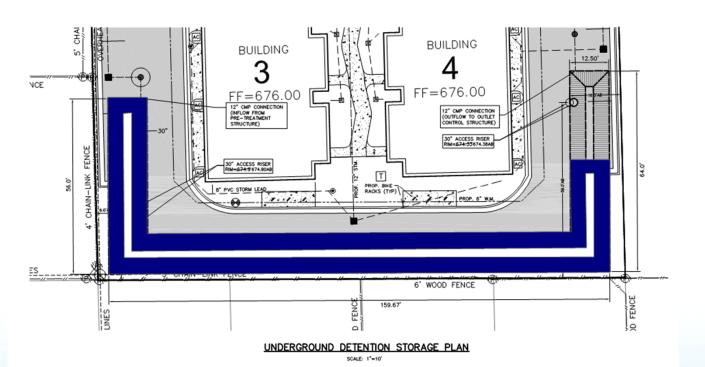
CPRC Volume *(1.9-inch event)*
7,860 cubic feet

100-year stormwater detention:
9,330 cubic feet
(1 cfs/acre)

*This site would need a waiver as they met the infiltration criteria to the Maximum Extent Practicable (MEP)

Example 2 – Multi-family Development

UNDERGROUND DETENTION STORAGE PLAN
SCALE: 1"=10'

Actual 100-year detention provided:

9,220 cubic feet (calculated)
CREDIT 3,350 cubic feet (bioretention/pervious pavers)
Net volume = 4,970 cubic feet

CPRC Volume (1.9 inch rain): **7,860 cubic feet**

This site would need a waiver as they met the infiltration criteria to the Maximum Extent Practicable (MEP)