



# Commerce City Drainage Manual Update

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12 October 2020

# Overview

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- Purpose and Need
- Technical Criteria
- Why Good Drainage Criteria
- Retention Policy
- Pumped Drainage
- Policy Chapter Update

# Purpose and Need

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- To update the Commerce City Drainage Design and Technical Criteria Manual.
  - The City’s Drainage Manual has not been updated since 1989.
  - Technical Criteria in our Manual is outdated.
  - Update Manual to correspond with Mile High Flood District (MHFD) storm drainage criteria.
  - Update Manual to correspond with MS4 requirements

# Technical Criteria

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- MHFD has three volumes for their Urban Storm Drainage Criteria Manual
  - Volume 1; Management, Hydrology, and Hydraulics
  - Volume 2; Structures, Storage and Recreation
  - Volume 3; Stormwater Quality
- Commerce City Drainage Manual will be updated to match MHFD criteria.



# Why Good Drainage Criteria?



# Commerce City Flooding



# Commerce City Flooding

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# Commerce City Flooding



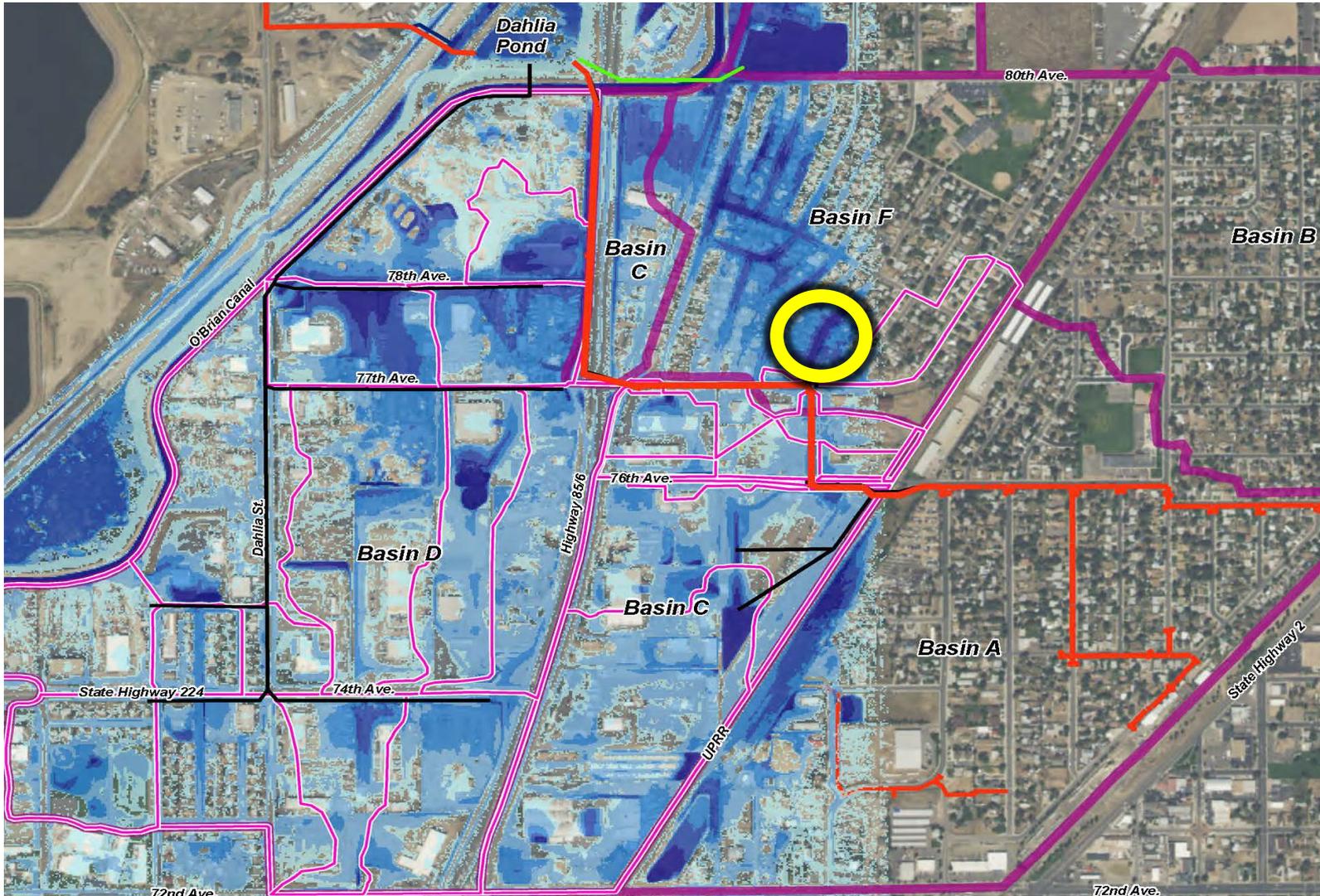
# Commerce City Flooding



# Commerce City Flooding



# Dahlia/Kenwood Storm Outfalls





# Hwy 85 Frontage Road



# Development



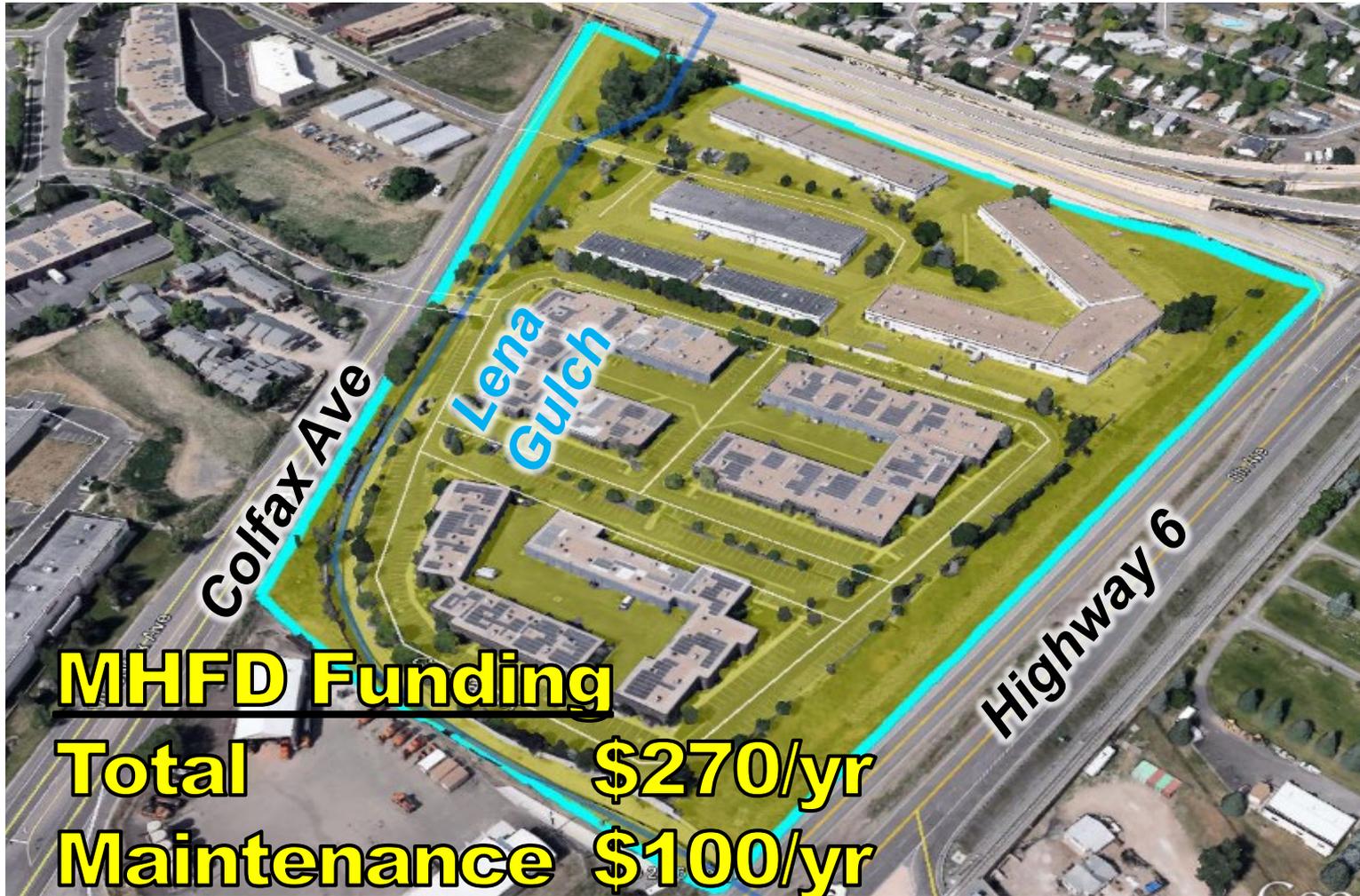
# Lena Gulch at Hwy 6



# Lena Gulch at Hwy 6



# Lena Gulch at Hwy 6



# Lena Gulch at Hwy 6

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**17,000  
YEARS**

# I-70 Viaduct



# Westerly Creek

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# Westerly Creek

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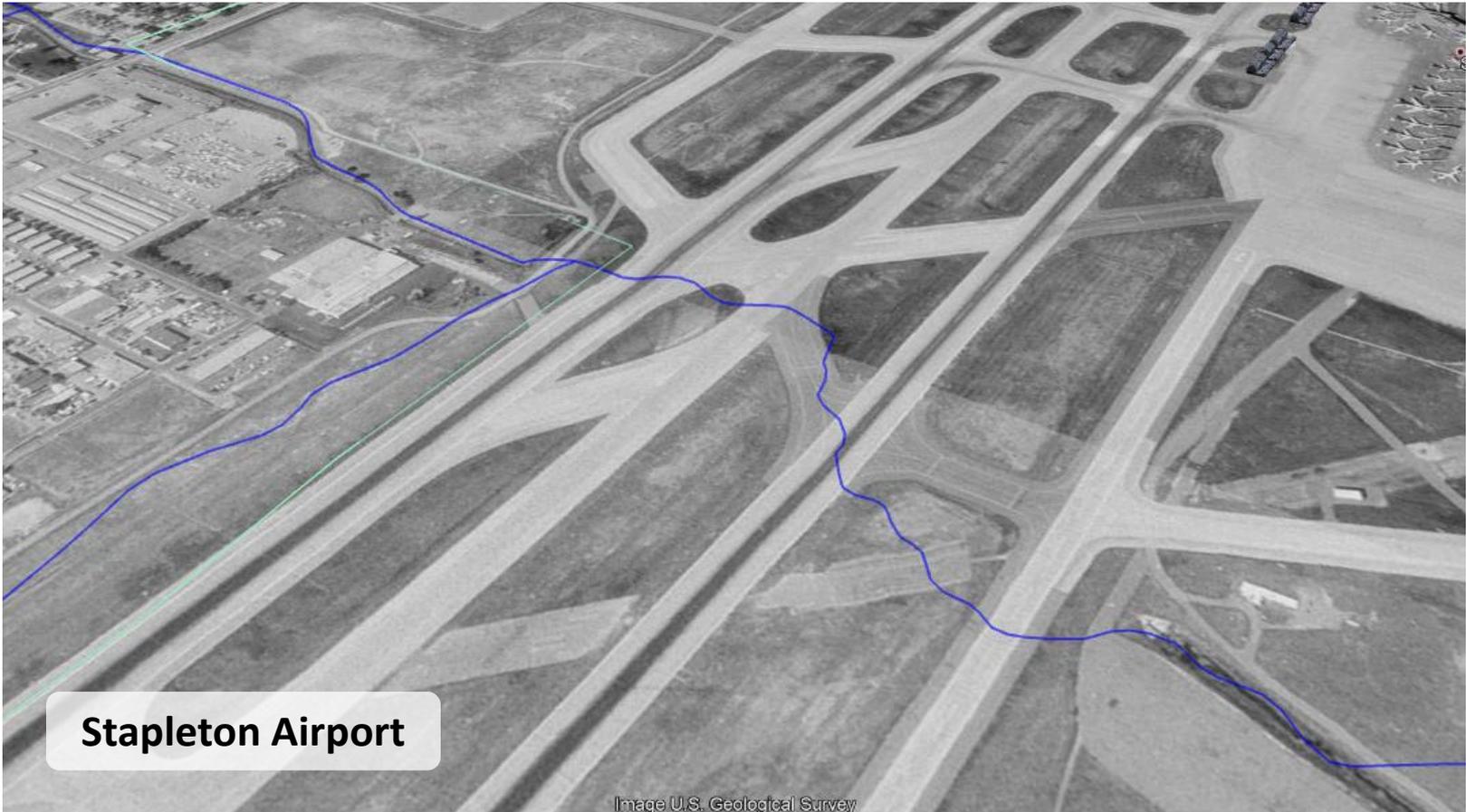


**Stapleton Redevelopment**

© 2018 Google

# Westerly Creek 1993

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# Westerly Creek

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# Westerly Creek During 2013 Flood

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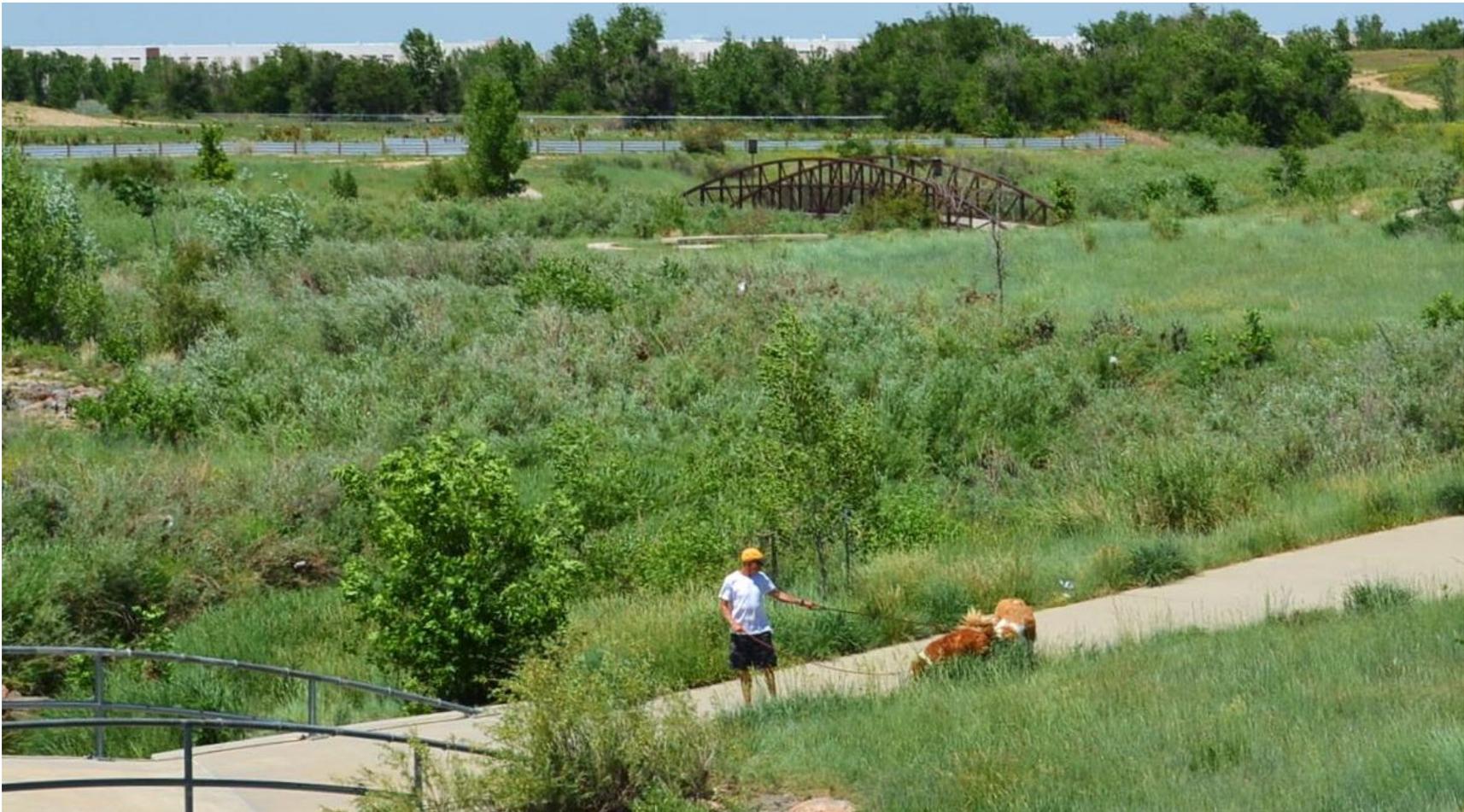
# Westerly Creek the Next Day

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# Westerly Creek 8 Months Later

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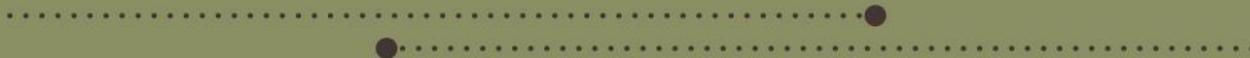


# Kenwood Street



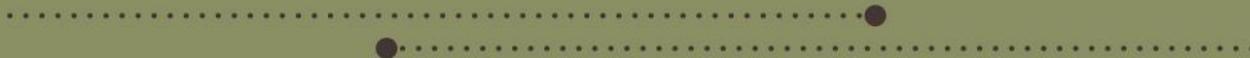


# Questions?





# RETENTION PONDS & PUMPED DRAINAGE



# PRESENTATION OVERVIEW.....●

- **RETENTION**
  - *What is it?*
  - *Known issues*
  - *Advantages & disadvantages*
  - *Questions for City Council input*
- **PUMPED DRAINAGE**
  - (same topics)*



# RETENTION - *What is it?*

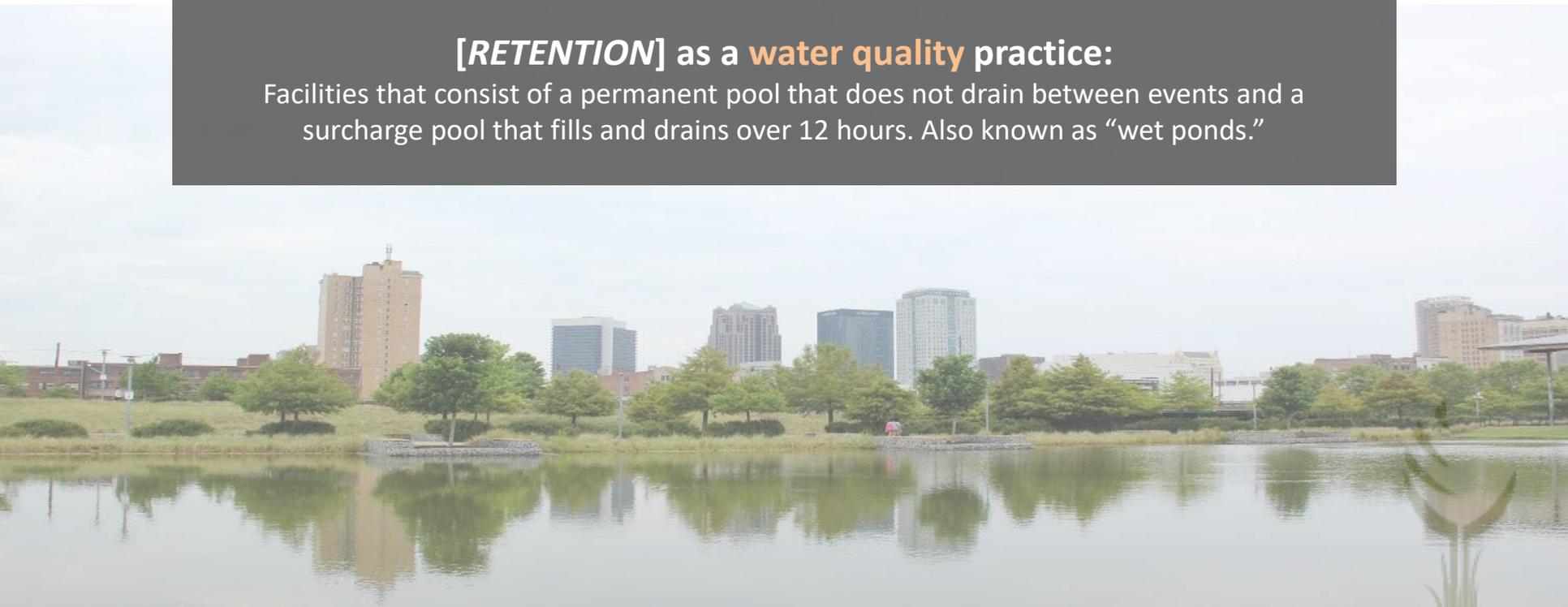
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## **[RETENTION]** as a **flood control practice:**

Holding areas that do not have an outlet to release captured water. Water captured in a retention pond evaporates or infiltrates into underlying soils to restore pre-event capacity.

## **[RETENTION]** as a **water quality practice:**

Facilities that consist of a permanent pool that does not drain between events and a surcharge pool that fills and drains over 12 hours. Also known as “wet ponds.”



# RETENTION - *Known issues*

- Often implemented to allow development **without requiring outfalls**
- Retention **requires water rights**
- Commerce City **may not be able to obtain a storage water right** for a retention facility.
- Obtaining water rights can be **very costly** and may **require a Plan for Augmentation**
- Back-to-back runoff events have the potential to **exceed capacity** and **cause flooding**
- Good drainage policy dictates that **development should not be allowed without an outfall**
- Retention ponds may cause **groundwater “mounding”** that can affect foundations and basements of nearby structures
- Some retention ponds are designed with infiltration through the bottom of the pond as the “outlet.” Maintaining infiltration over time will be **expensive** and in some cases **infeasible**





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# RETENTION – Advantages & Disadvantages

## ADVANTAGES

May allow development without outfalls

Effective as a water quality practice

Open water surface enhances aesthetics and may provide habitat for wildlife

Can be converted to detention at a future date

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## DISADVANTAGES

Postpones construction of outfalls. Can result in unintended flooding and/or requirements for pumped drainage that are costly and less reliable than gravity drainage

Water rights are required

May degrade water quality if it attracts waterfowl; bird-strike potential

Problems associated with stagnation (*e.g.*, mosquitos, algae, odor)

May be an attractive nuisance

Infiltration is used as “outlet” not likely sustainable for the long term

Potential legal implications and retrofit costs



# RETENTION - *Questions for input*



- **Should retention be allowed as a flood control practice?**
  - If so, what criteria or restrictions should apply?
- **Should retention be allowed as a water quality practice?**
- **Is implementation of retention as a “temporary” measure realistic?**
- **Does Commerce City have a means to bring any existing retention facilities into compliance with water rights requirements?**
- **How should the City’s policy for retention be related to the policy addressing outfalls?**



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# PUMPED DRAINAGE - *What is it?*

## PUMPING *as a drainage practice*

- Considered a “practice of last resort”
- Drainage via gravity is preferred due to greater reliability, lower lifecycle costs, simpler design
- Having allowances is desirable where pumped drainage is unavoidable
- ASCE)/WEF *Manual of Practice* provides guidance on pumped drainage

## PUMPED *outflows for detention*

- May be used for stormwater conveyance or to release flows from stormwater detention
- When used in conjunction with stormwater detention, pumped drainage effectively acts as an outlet for detention facility

# PUMPED DRAINAGE - *Known issues*

- Pumped drainage **requires additional** design; **equipment** that must be purchased, maintained, and replaced; and more **energy** than gravity drainage.
- Pumps run on electricity or fuel that **may be cut off or run out during a storm event**, leading to a failure of the pumping system that can lead to flooding



# PUMPED DRAINAGE

## *Advantages & Disadvantages*

### ADVANTAGES

May be only alternative when gravity drainage infeasible

Can be used to meet State Engineers Office (SEO) maximum drain time criteria

Can be used to drain existing retention facilities between storms

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### DISADVANTAGES

Not as reliable as gravity drainage

Additional design costs

Additional lifecycle costs

Potential for noise and aesthetic impacts

Need for backup power

Need for backup pumps

May require heavy equipment for maintenance/repair

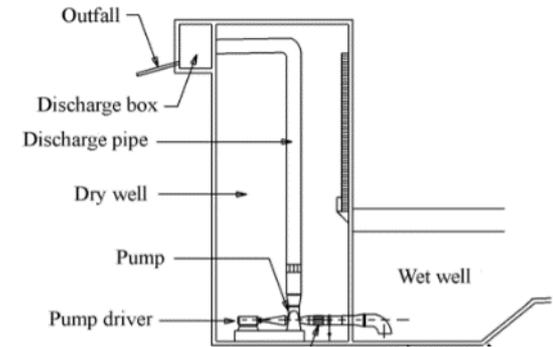
Must plan to screen out excessive sediment, trash, and debris or select pumps capable of handling highly-variable inflows

High capacity pumps may be required to meet drain times

Must have an adequately sized conveyance for discharge from pumps

# PUMPED DRAINAGE – *Questions for input*

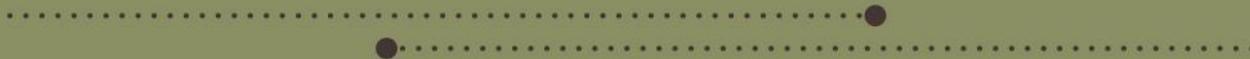
- Should Commerce City allow pumped drainage?
- Should the Commerce City Manual include additional guidance on pumped drainage?
- What steps must an applicant/engineer go through to demonstrate that gravity drainage is infeasible?
- Should different criteria apply for retrofits?
- Should a *variance process* or *Board of Adjustment* hearing be required?
- Does Commerce City have preferences for the types of pumps allowed?
- Should bonding be required long term operation and maintenance?
- Should applicant be required to design an ultimate connection to a future master planned outfall?
- Should applicant be required to pay for future conversion costs upfront?
- What kind of design guidance should be included in the Manual?
- What checklists would be useful in the Manual?



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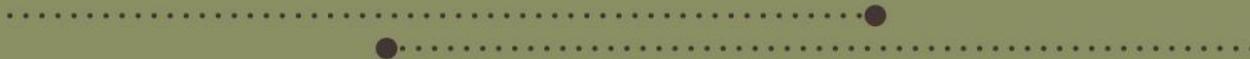


# Questions & Discussion?





# Policy Chapter

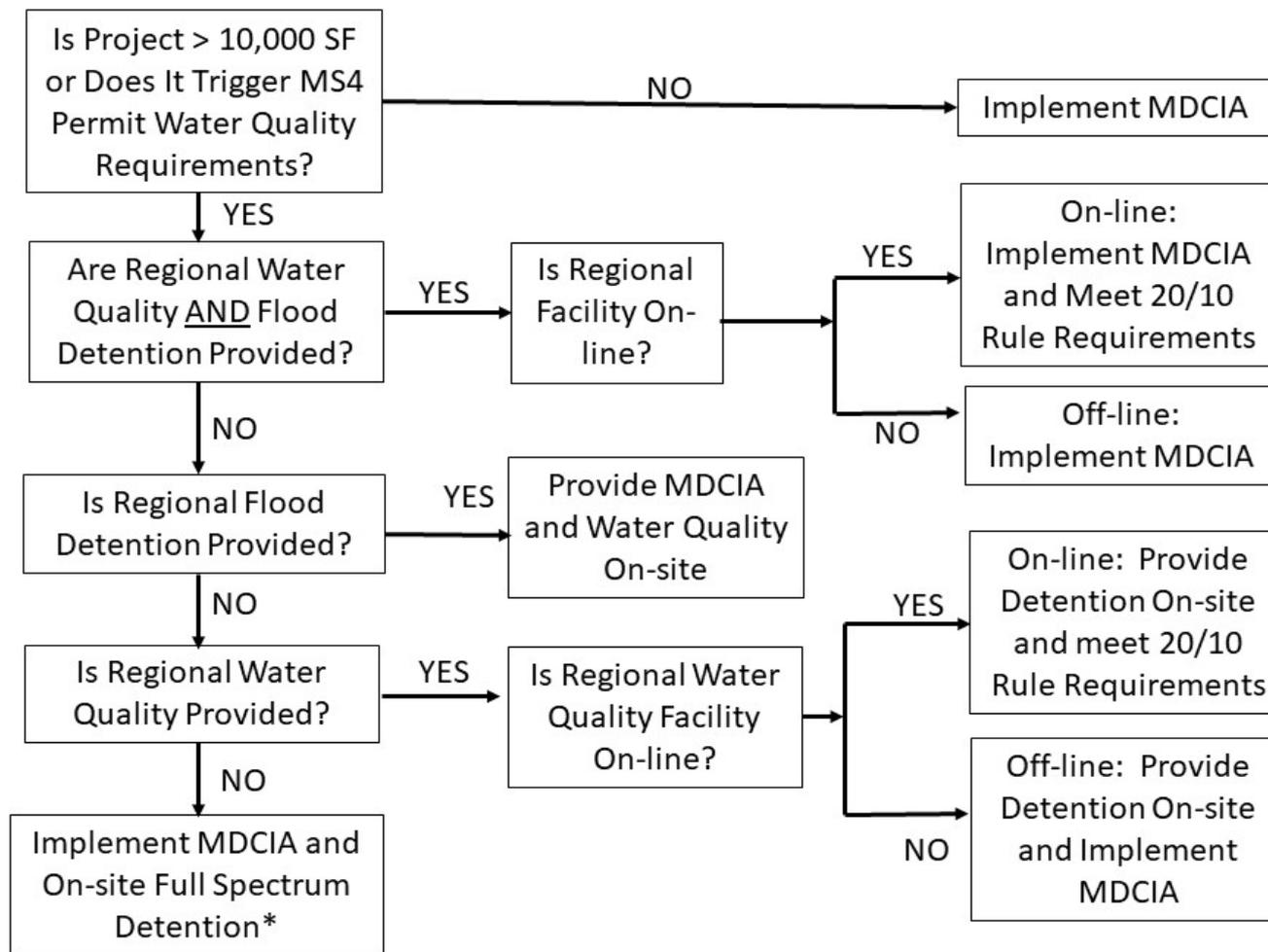


# POLICY CHAPTER TOPICS OVERVIEW

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- Principles
- Policies
- Drainage Planning
- Flood Detention (Storage) and Stormwater Quality Facilities
- Drainage Design
- Operation and Maintenance of Drainage Facilities
- Storm Drainage Planning and Irrigation Facilities

# REQUIREMENTS FOR DETENTION & STORMWATER QUALITY



# CHANGES FROM PREVIOUS MANUAL

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- Improved readability and technical clarity
- Most underlying policies & principles stayed the same, with some exceptions highlighted today
- Improved consistency with currently applicable MHFD criteria
- Improved consistency with MS4 permit requirements



# Questions & Discussion?

