



Comprehensive
Flood and
Stormwater
Master Plan

Comprehensive Flood & Stormwater Master Plan Update

Fourmile/Wonderland Creek Meeting
October 20, 2021

10/21/2021

A group of approximately 15 people are sitting on a large, green grassy field, having a picnic. They are dressed in casual summer attire. In the background, there are large, leafy trees and a range of mountains under a cloudy sky. The scene is captured in a slightly dim, overcast light, suggesting late afternoon or early morning. A vertical white line is positioned to the right of the word 'Welcome'.

Welcome

Poll Questions:

- How long have you lived in Boulder?
- What was your experience with flooding in 2013?

Agenda

- Master Plan Overview
- Creek Overview
- Discussions on Equity
- Project Prioritization Framework
 - Overview
 - Breakout polling and discussions
- Wrap Up and Next Steps
- Comment Form

CFS Master Plan Update



Key Tasks

- Review policies
- Evaluate progress
- Develop program and process recommendations
- Provide a framework for evaluating priorities and projects

PURPOSE STATEMENT

The purpose of the plan is to improve the management of stormwater to help protect people, places, property, and ecosystems in the City of Boulder in a way that builds resilience and is consistent with community values.



Completed Community Engagement

- January: Formation of CWG
- January - March: Be Heard Boulder Launch
- July 21st: Boulder Shelter for the Homeless Visit
- August 3rd: National Night Out
- August 29th: Duck Race
- September 4th: Hometown Festival
- September 22nd & October 16th: Farmer's Market
- Oct / Nov: Virtual Community Meetings



How to Participate

Regional Meetings

Future engagement opportunities

Fall Outreach Schedule

Creek Meetings (all meetings 5:30-7:30 p.m.):

Wednesday, Oct. 20 | Fourmile & Wonderland

Thursday, Oct. 21 | Goose, Twomile & Elmer's Twomile

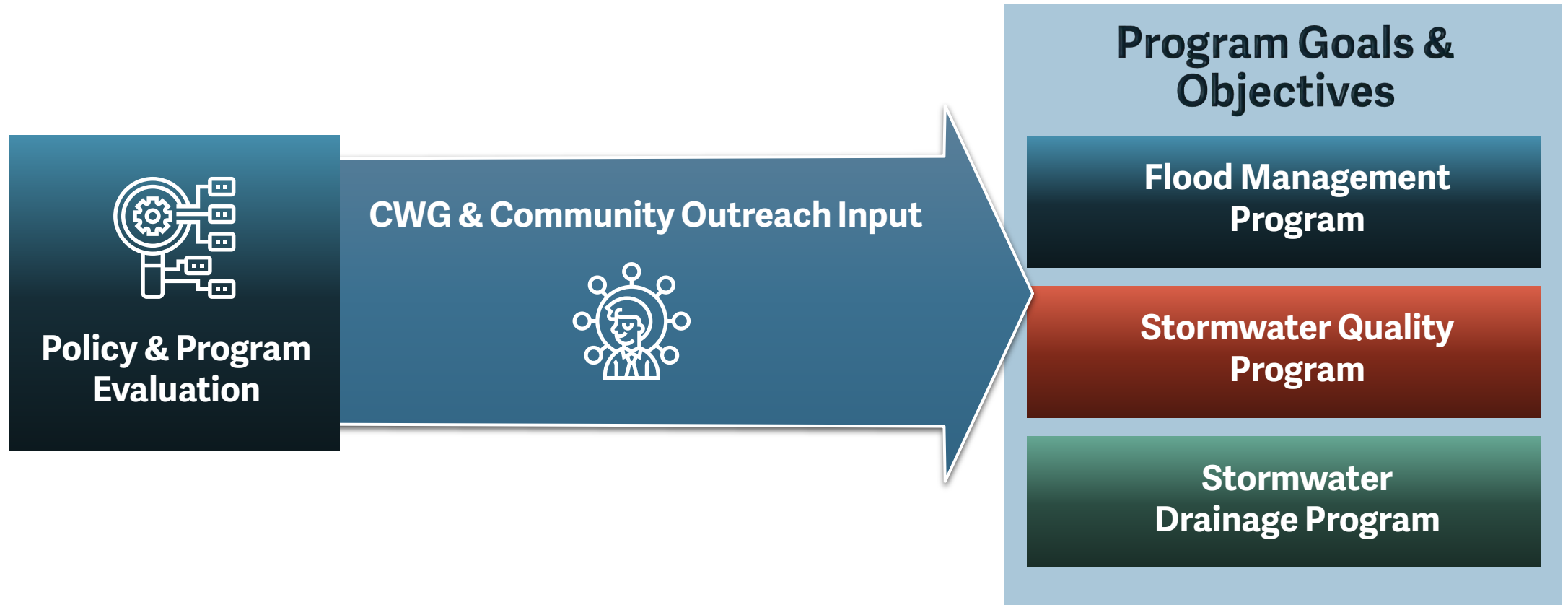
Monday, Oct. 25 | Boulder Creek/Boulder Slough, Sunshine & Gregory

Thursday, Oct. 28 | Spanish Language Meeting

Monday, Nov. 1 | Skunk, Bluebell & King's Gulch

Wednesday, Nov. 3 | S. Boulder Creek, Bear, Viele & Dry Creek Ditch #2

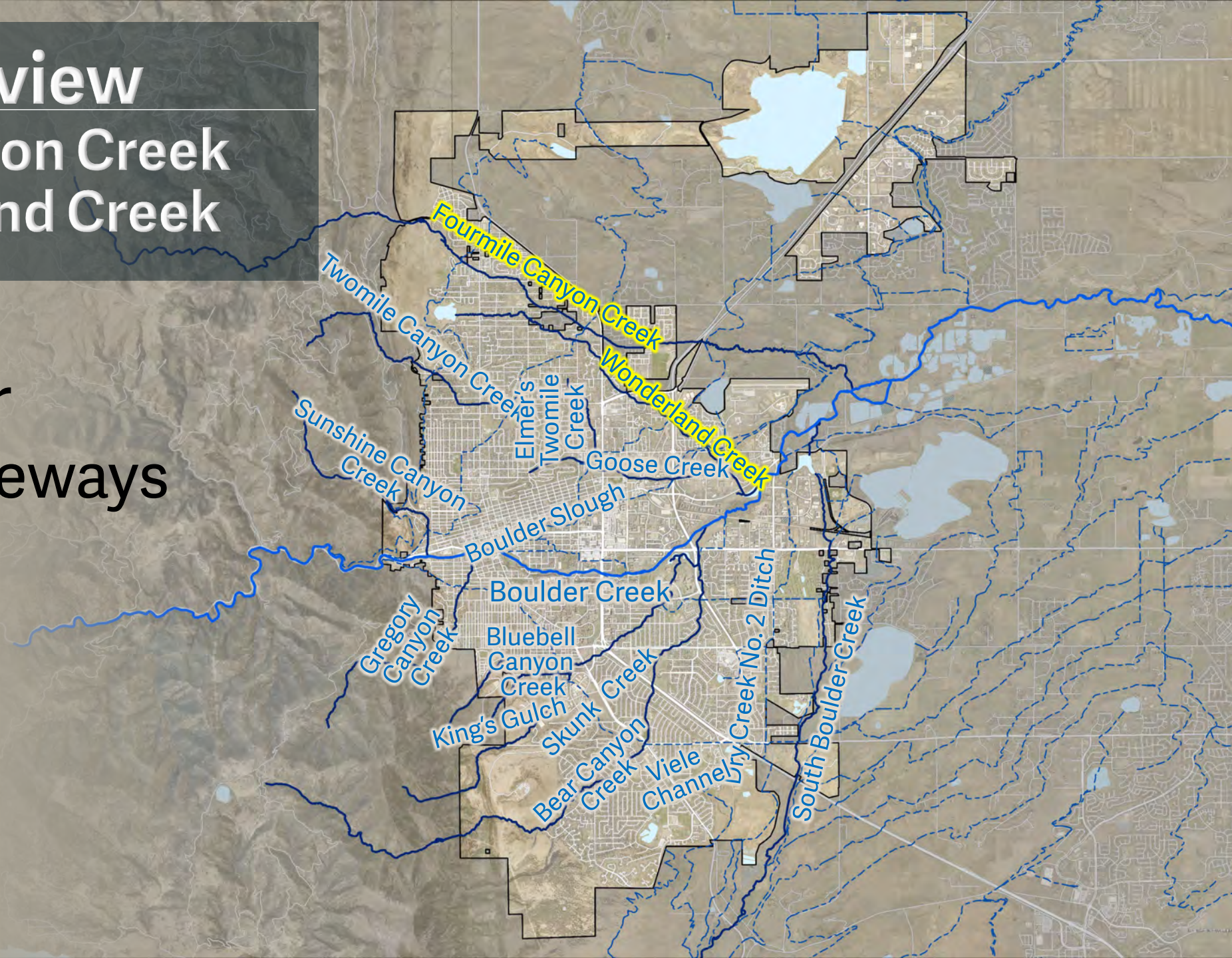
Master Plan Content Informed by Public Outreach



Creek Overview

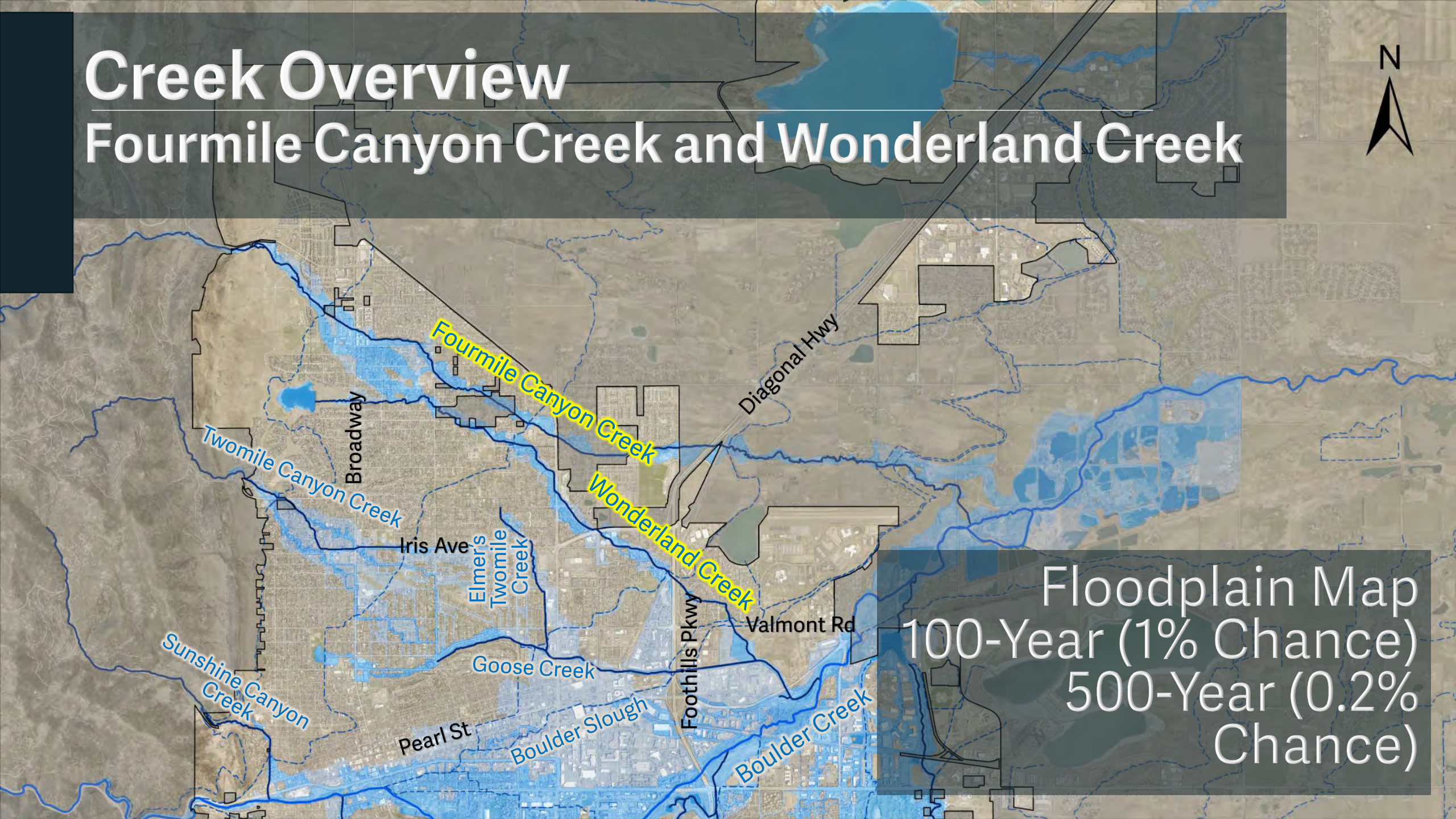
Fourmile Canyon Creek and Wonderland Creek

16 Major
Drainageways



Creek Overview

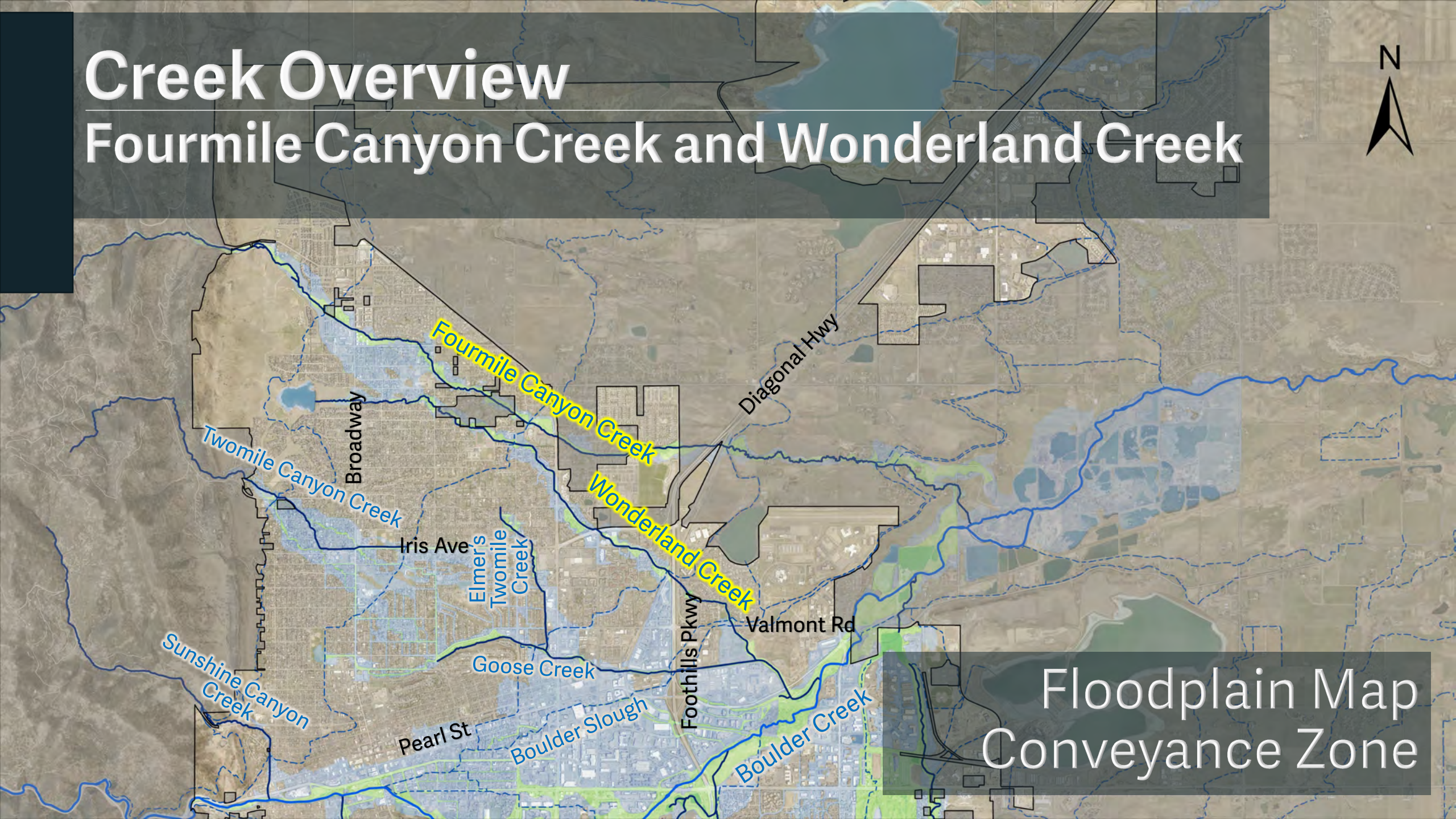
Fourmile Canyon Creek and Wonderland Creek



Floodplain Map
100-Year (1% Chance)
500-Year (0.2%
Chance)

Creek Overview

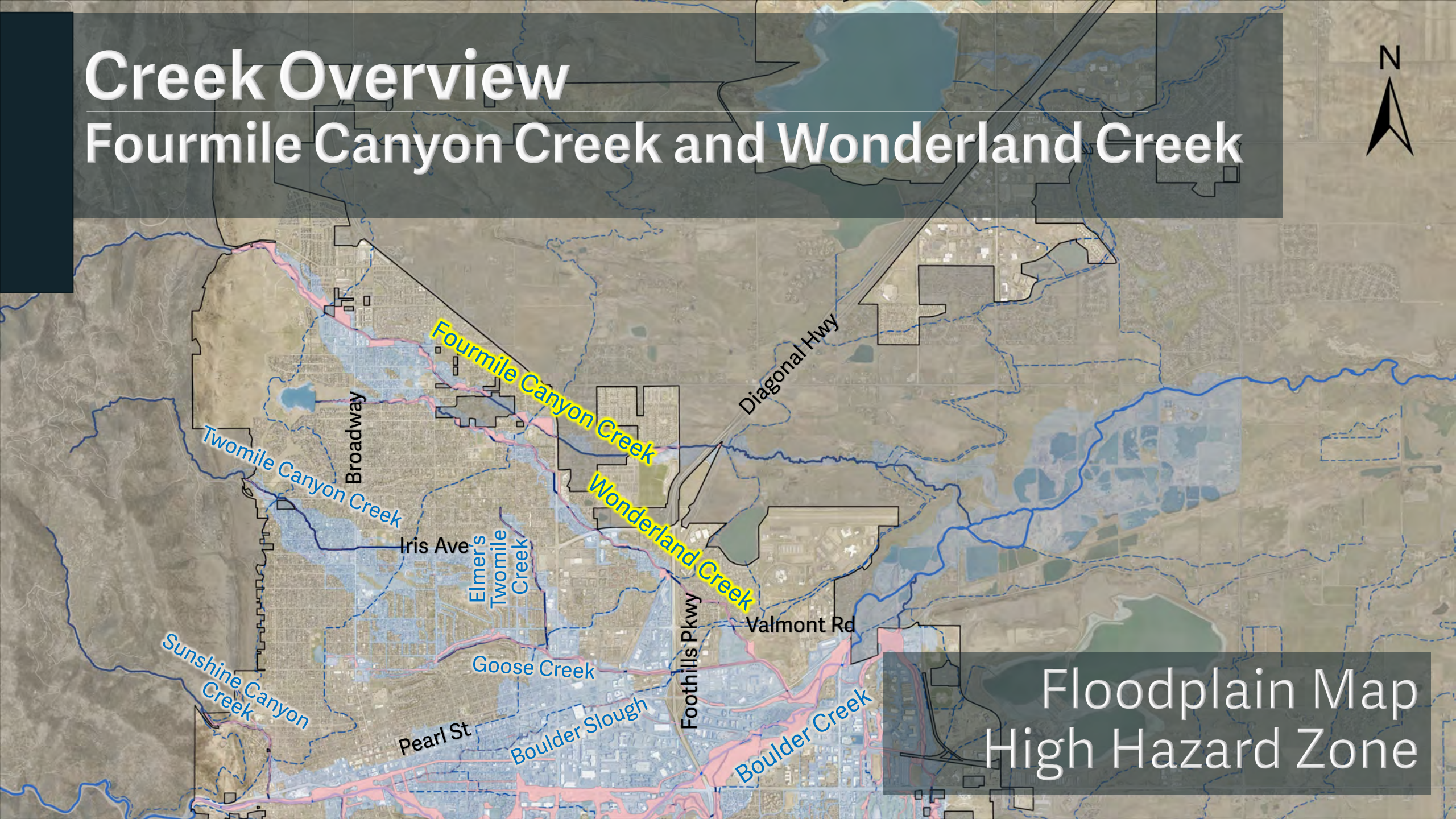
Fourmile Canyon Creek and Wonderland Creek



Floodplain Map
Conveyance Zone

Creek Overview

Fourmile Canyon Creek and Wonderland Creek



Floodplain Map
High Hazard Zone

Creek Overview

Fourmile Canyon Creek and Wonderland Creek

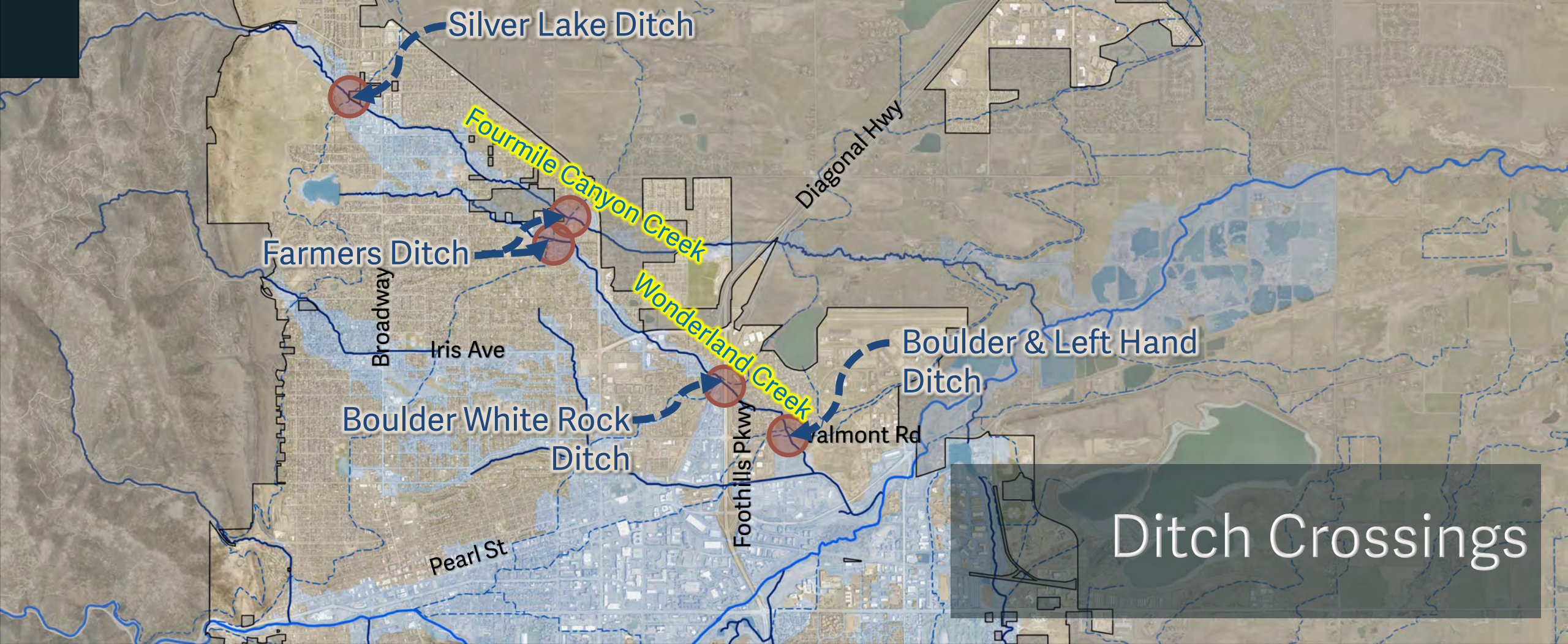


- Schools
- Hospitals
- Fire Stations
- Structural Fire Station
- Wildland Fire Cache
- Critical Facilities

Critical Facilities

Creek Overview

Fourmile Canyon Creek and Wonderland Creek



Creek Overview | Current Issues

Fourmile Canyon Creek and Farmer's Ditch



Ditch Crossings

Creek Overview

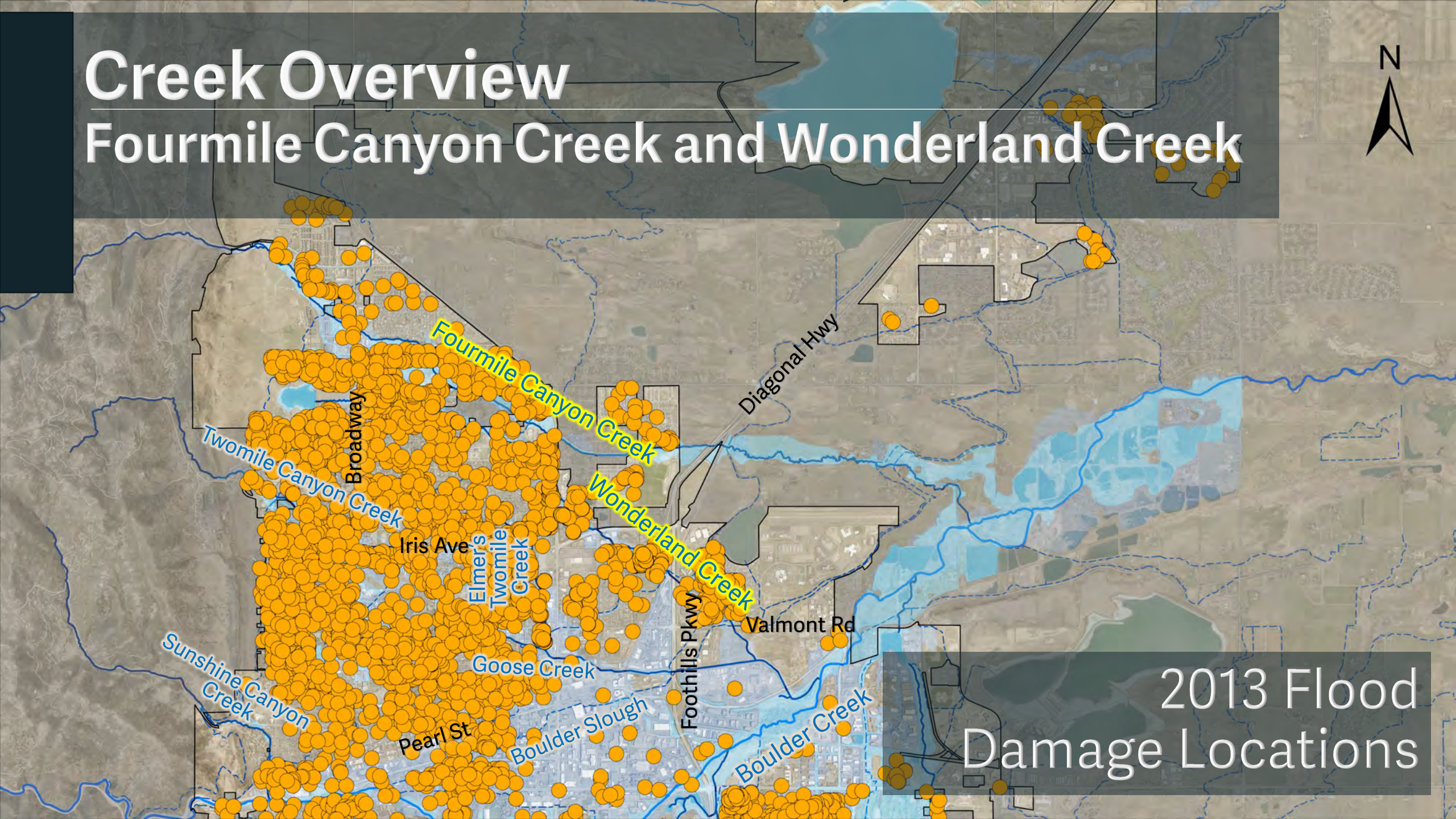
Fourmile Canyon Creek and Wonderland Creek



2013 Flood Extents

Creek Overview

Fourmile Canyon Creek and Wonderland Creek



2013 Flood
Damage Locations

Creek Overview | 2013 Flood



Fourmile Canyon Creek

Wagonwheel Gap Road

Creek Overview | 2013 Flood



**Fourmile Canyon
Creek**
Yellow Pine & 7th

Creek Overview | 2013 Flood

Fourmile Canyon Creek West of Broadway



Creek Overview | 2013 Flood



**Fourmile Canyon
Creek**
Broadway

Creek Overview | 2013 Flood

Fourmile Canyon Creek East of Broadway



Creek Overview | 2013 Flood



**Fourmile Canyon
Creek**
Violet Park

Creek Overview | 2013 Flood

Fourmile Canyon Creek – Upland and 19th St



Creek Overview | 2013 Flood

Fourmile Canyon Creek – Crest View Elementary School



Creek Overview | 2013 Flood



Wonderland Creek
Broadway

Creek Overview | 2013 Flood

Wonderland Creek – 19th Street



Creek Overview | 2013 Flood



Wonderland Creek
Centennial Middle School

Creek Overview | 2013 Flood

Wonderland Creek – Winding Trail



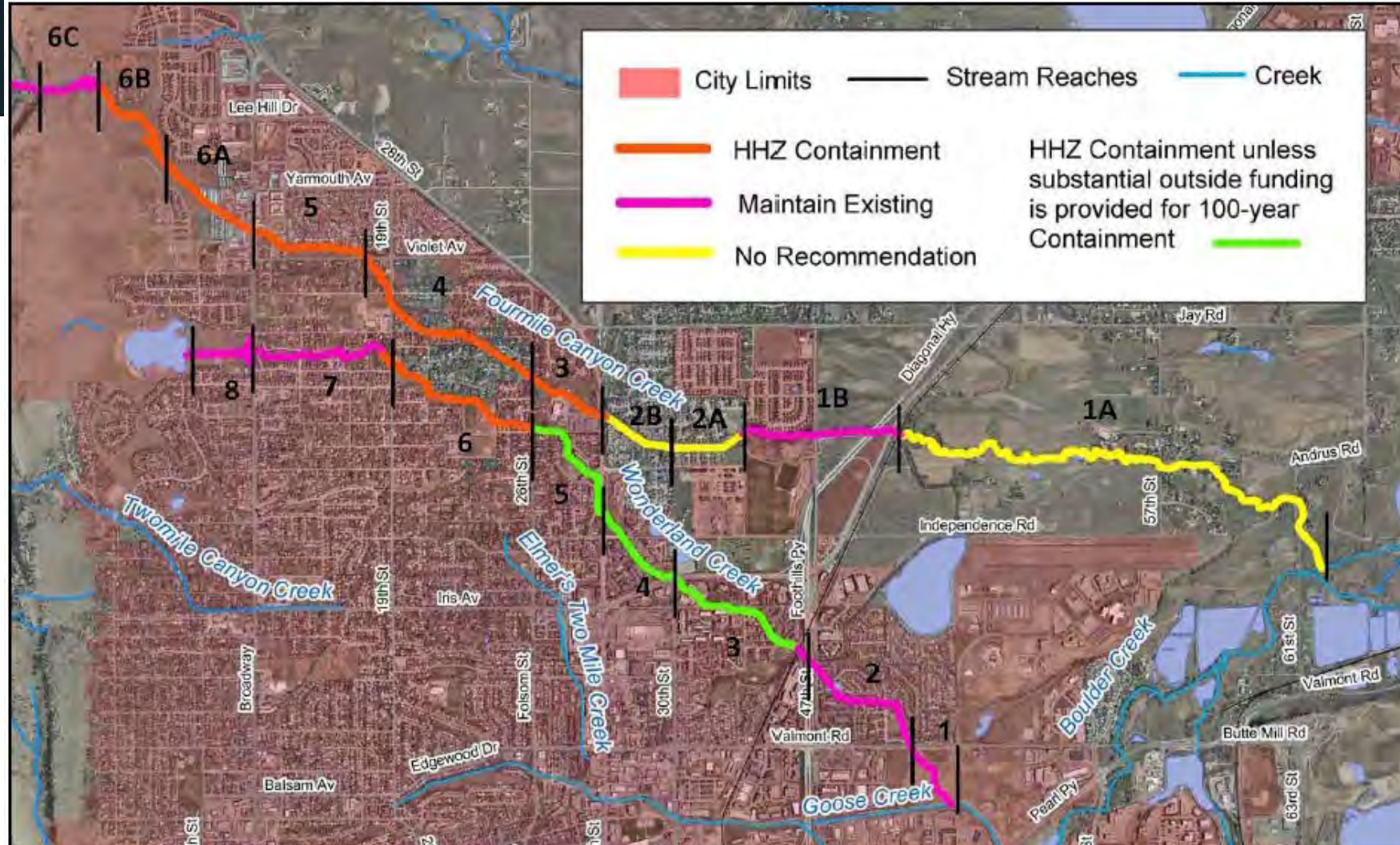
Creek Overview | 2013 Flood



Wonderland Creek
West of Foothills

Creek Overview

Fourmile Canyon Creek and Wonderland Creek



Master Plan
Recommendations

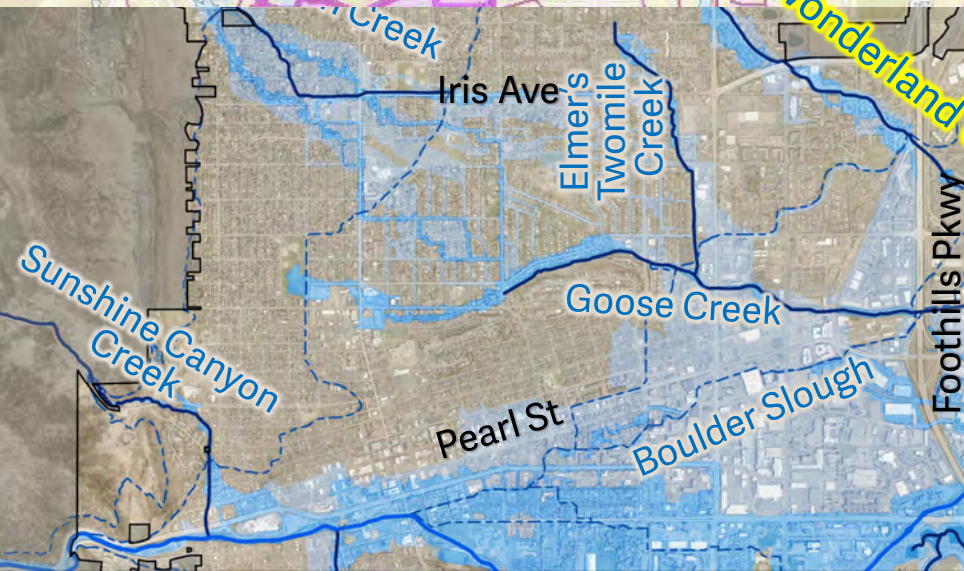
Creek Overview

Fourmile Canyon Creek and Wonderland Creek



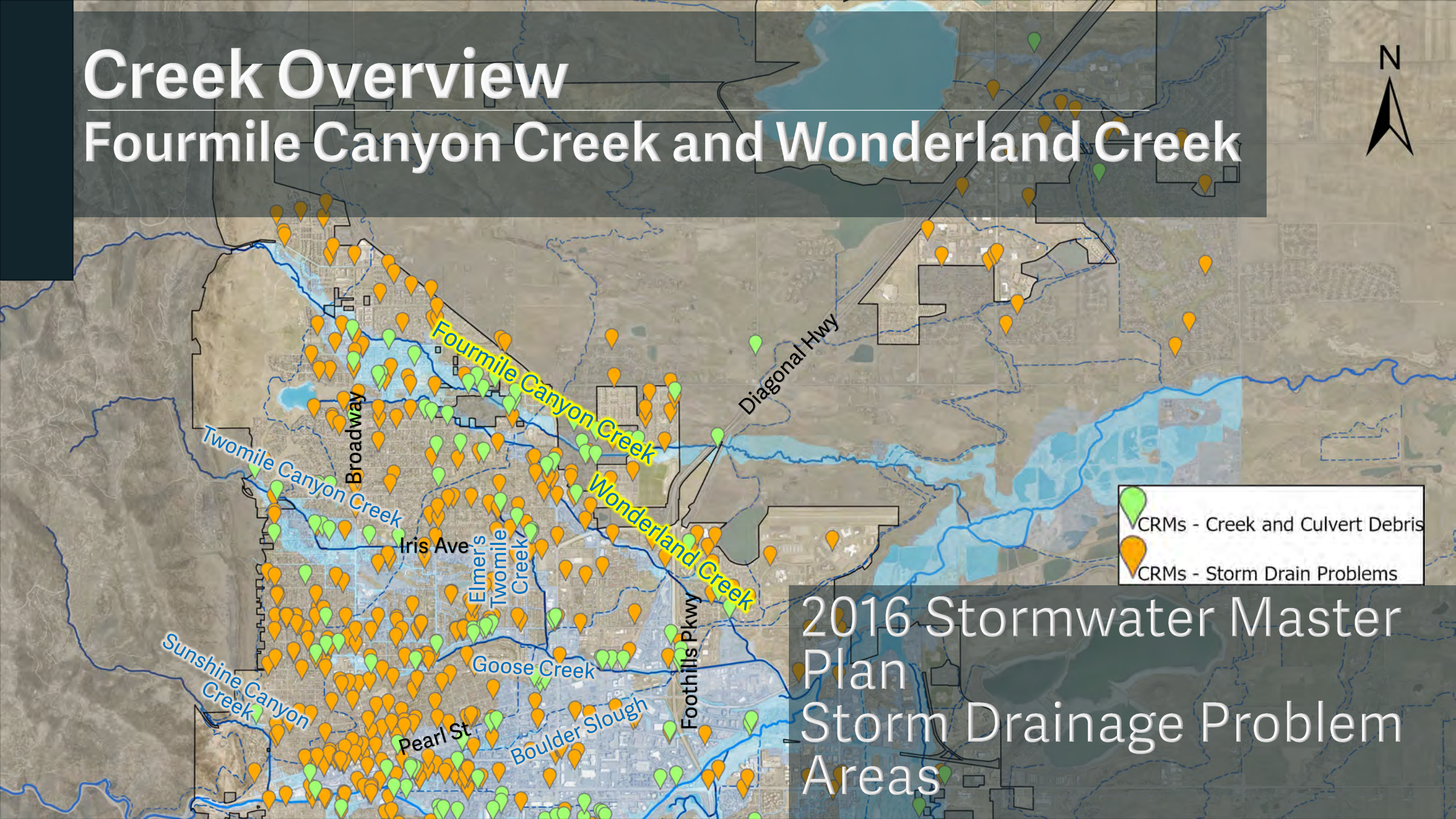
Diagonal Hwy

2016 Stormwater Master
Plan
Storm Drainage Problem
Areas



Creek Overview

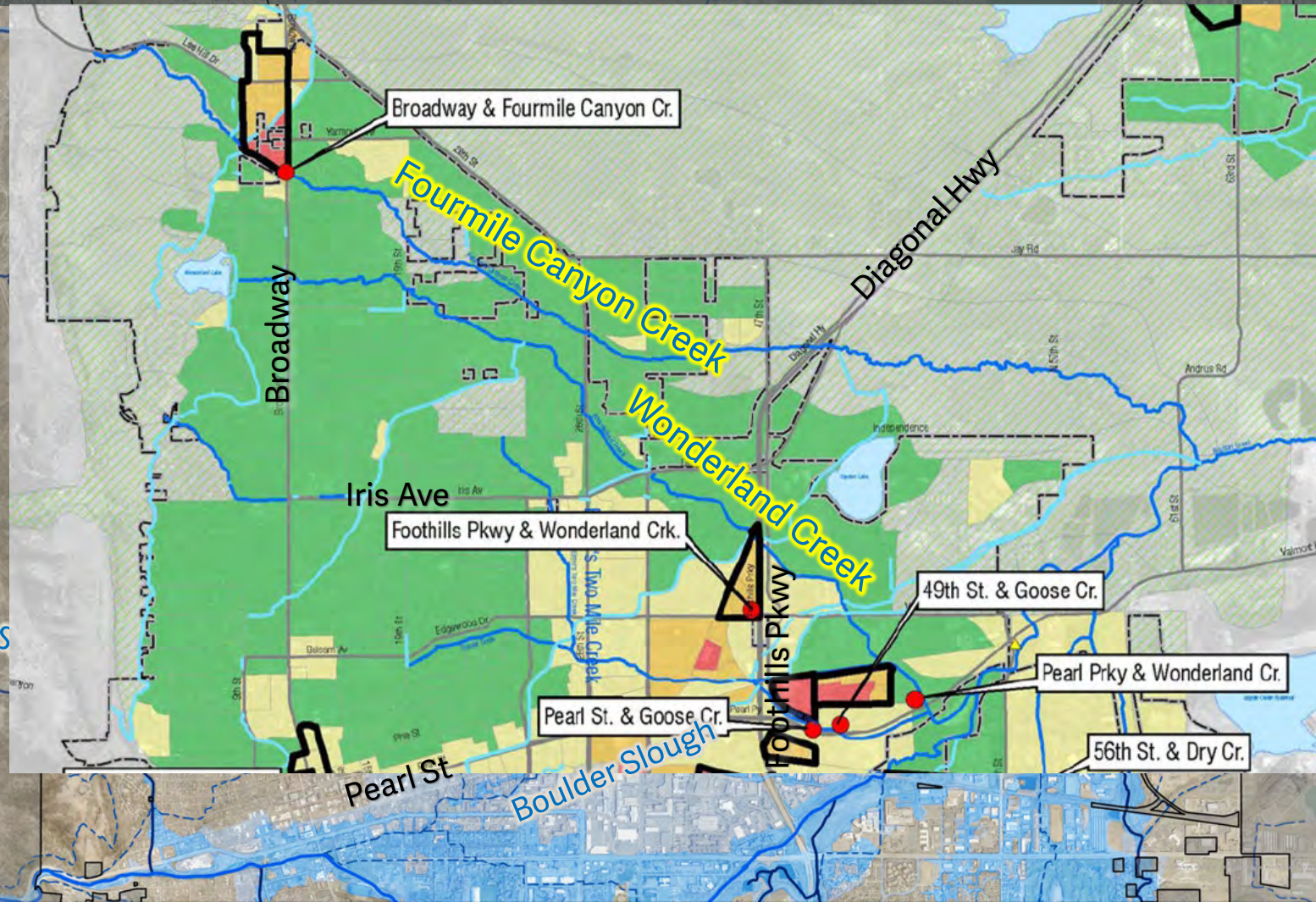
Fourmile Canyon Creek and Wonderland Creek



2016 Stormwater Master
Plan
Storm Drainage Problem
Areas

Creek Overview

Fourmile Canyon Creek and Wonderland Creek



2016
Stormwater
Master Plan
Water Quality
Concerns

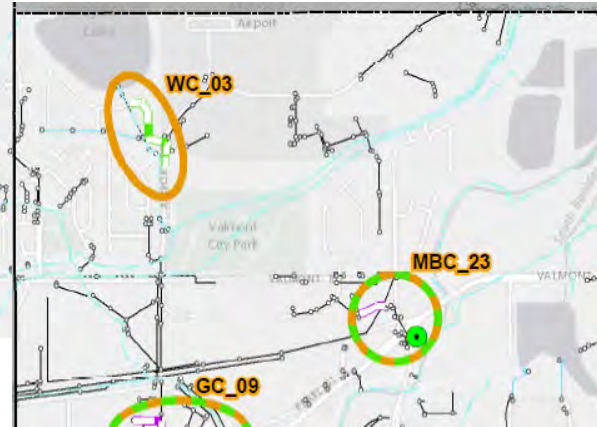
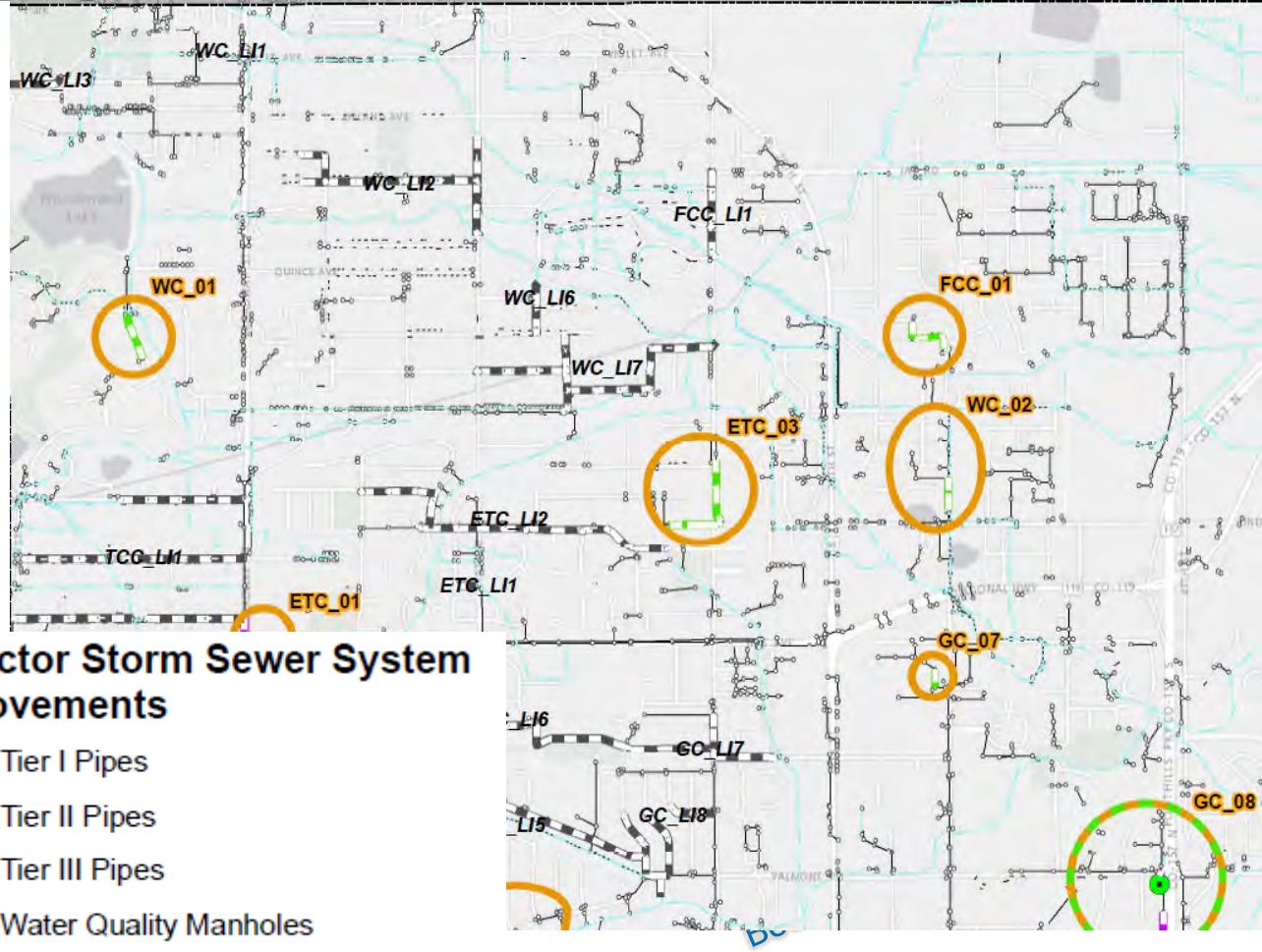
Creek Overview

Fourmile Canyon Creek and Wonderland Creek

2016 Stormwater Master Plan Recommendations

Collector Storm Sewer System Improvements

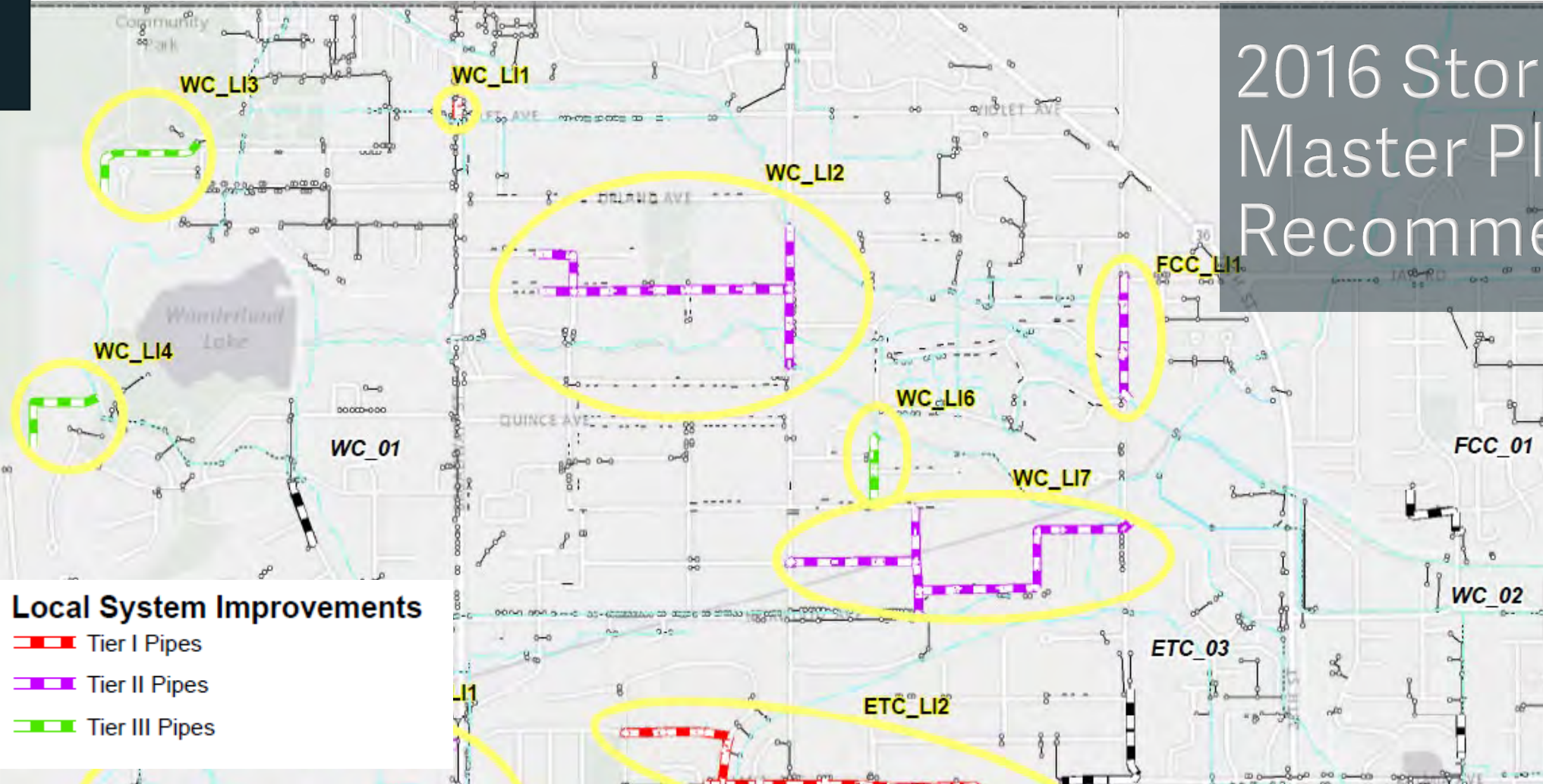
- Tier I Pipes
- Tier II Pipes
- Tier III Pipes
- Water Quality Manholes
- Water Quality Surface BMP



Creek Overview

Fourmile Canyon Creek and Wonderland Creek

2016 Stormwater Master Plan Recommendations

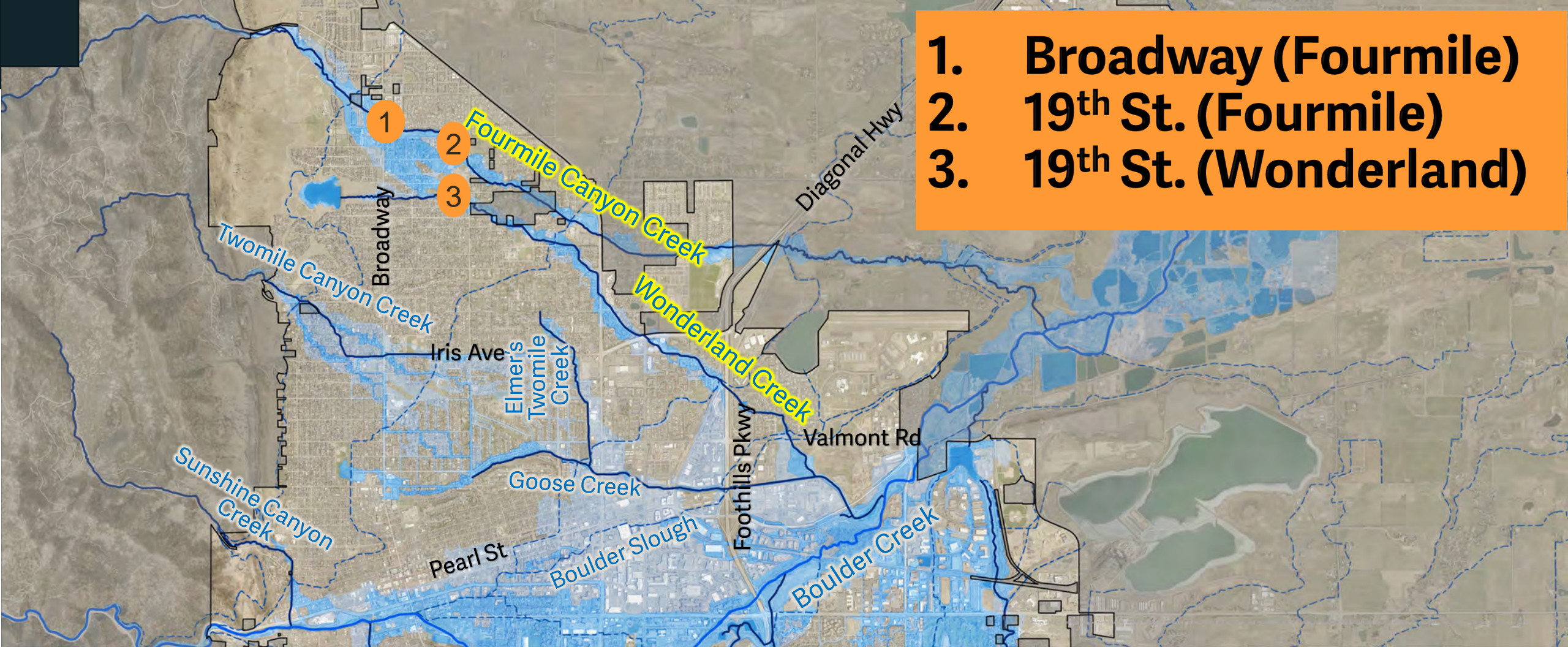


Creek Overview | Current Projects

Fourmile Canyon Creek and Wonderland Creek



1. **Broadway (Fourmile)**
2. **19th St. (Fourmile)**
3. **19th St. (Wonderland)**



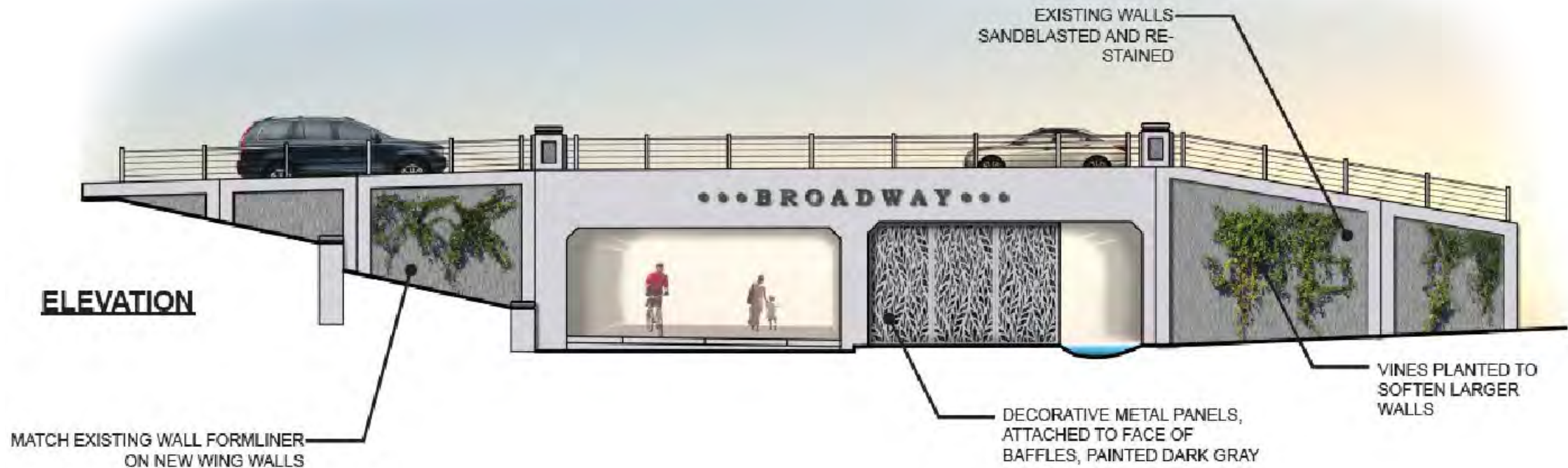
Creek Overview | Current Projects

Fourmile Canyon Creek - Broadway Reconstruction



Creek Overview | Current Projects

Fourmile Canyon Creek - Broadway Reconstruction



Creek Overview | Current Projects

Fourmile Canyon Creek Underpass at 19th Street



Creek Overview | Current Projects

Fourmile Canyon Creek Underpass at 19th Street



Creek Overview | Current Projects

Fourmile Canyon Creek Underpass at 19th Street



Creek Overview | Current Projects

Wonderland Creek at 19th Street

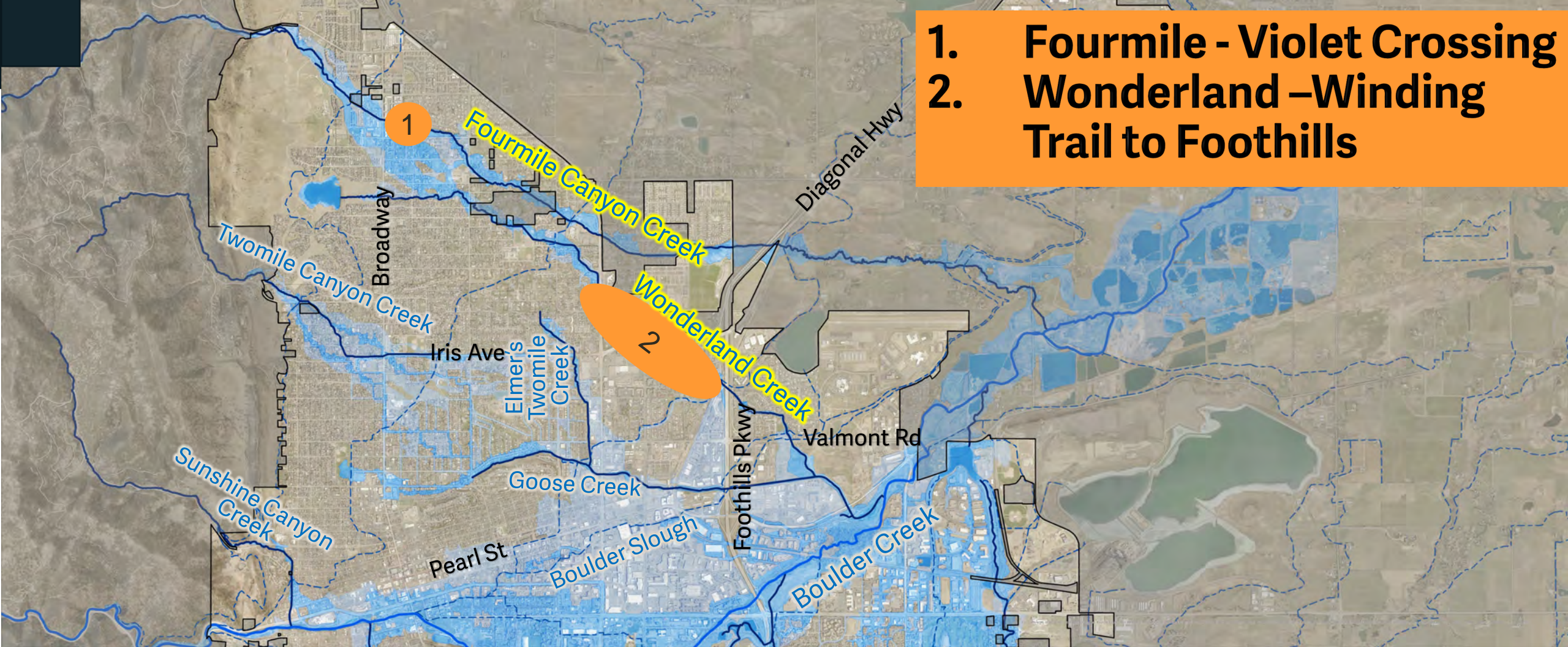


Creek Overview | Recent Projects

Fourmile Canyon Creek and Wonderland Creek



1. Fourmile - Violet Crossing
2. Wonderland –Winding Trail to Foothills



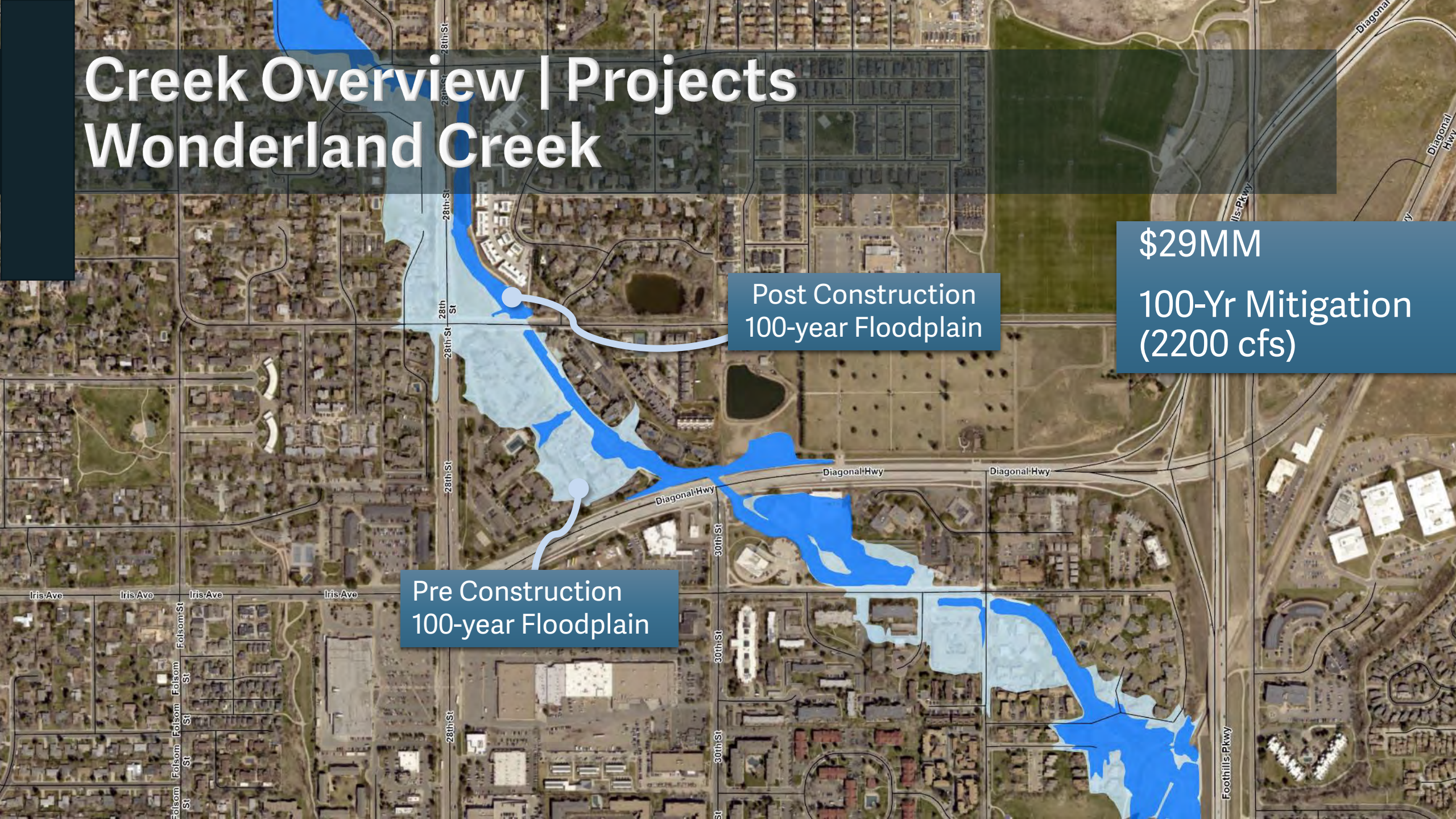
Creek Overview | Projects Wonderland Creek

Post Construction
100-year Floodplain

\$29MM

100-Yr Mitigation
(2200 cfs)

Pre Construction
100-year Floodplain



Creek Overview | Projects

Wonderland Creek



**28th Street & Winding Trail
Before & After**

Creek Overview | Projects



Wonderland Creek
Boulder White Rock Ditch
Overflow Structure

Creek Overview | Projects

Wonderland Creek



**Policy &
Program
Evaluation** + **Community
Input** + **Existing
Creek
Plans**



**Inform Policy
Recommendations**

**Develop Project
Prioritization
Framework**

Project Prioritization Criteria

Life Safety

Ability to
Implement

Efficiency & Cost

**Social Impact,
Equity & Fairness**

Protect Property

Cultural
Resources

Environmental
Resources

Infrastructure
Resiliency

Protect Critical
Facilities

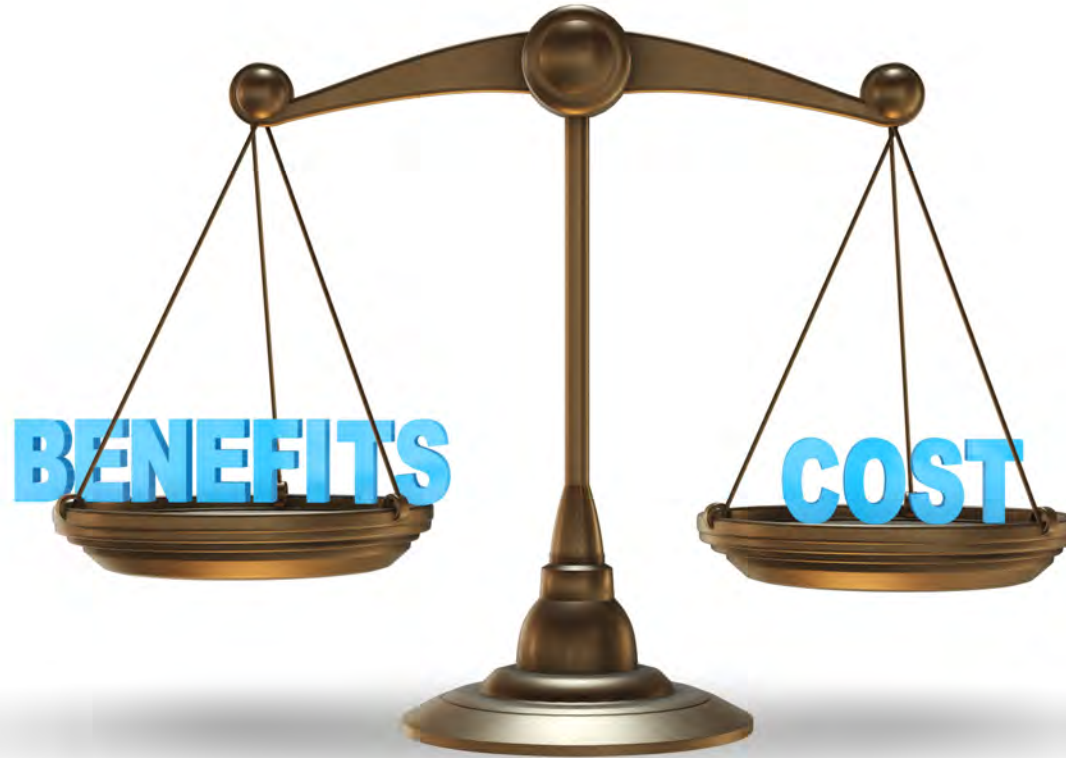
Equity



When one's identity cannot predict the outcome.

Source: OEHR.

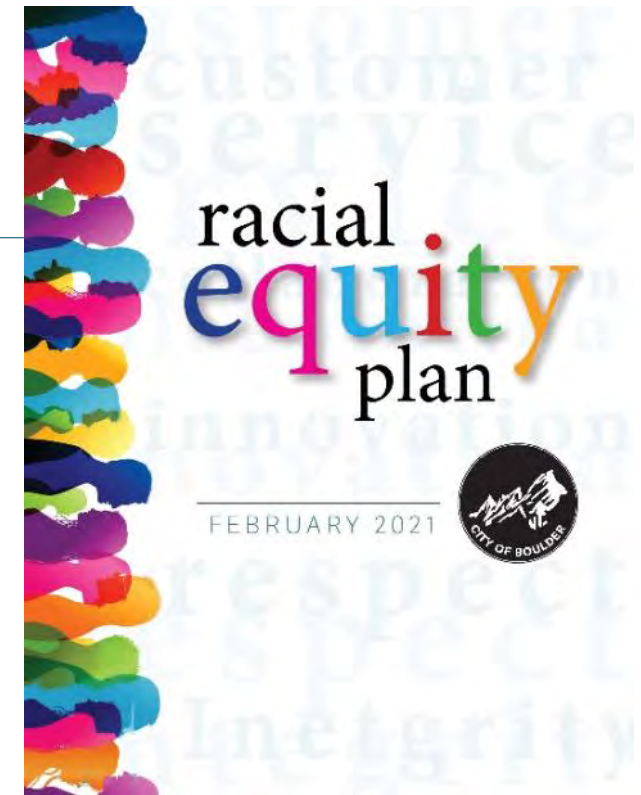
Project Prioritization Criteria



Racial Equity

When race does not determine or predict the distribution of resources, economic/political/social opportunities, and burdens for group members in society.

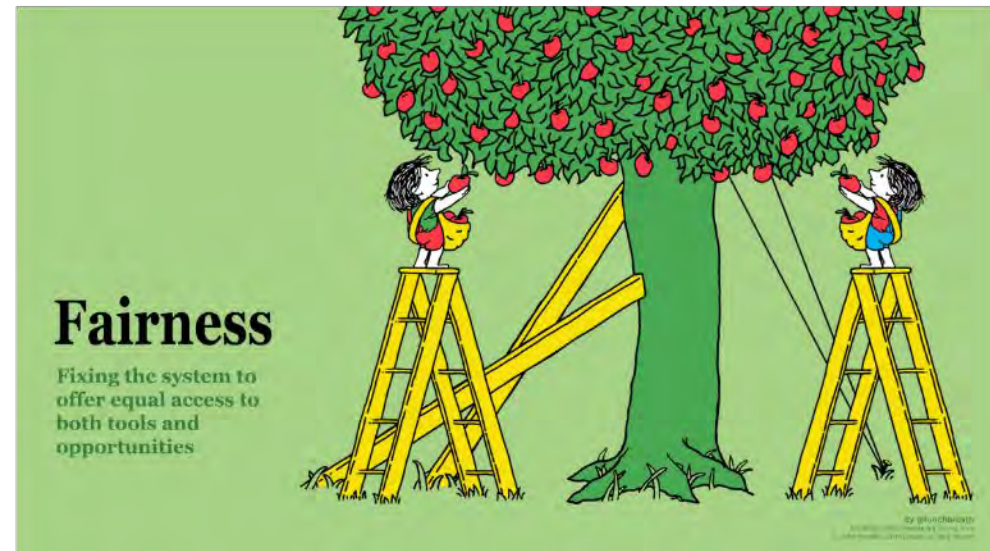
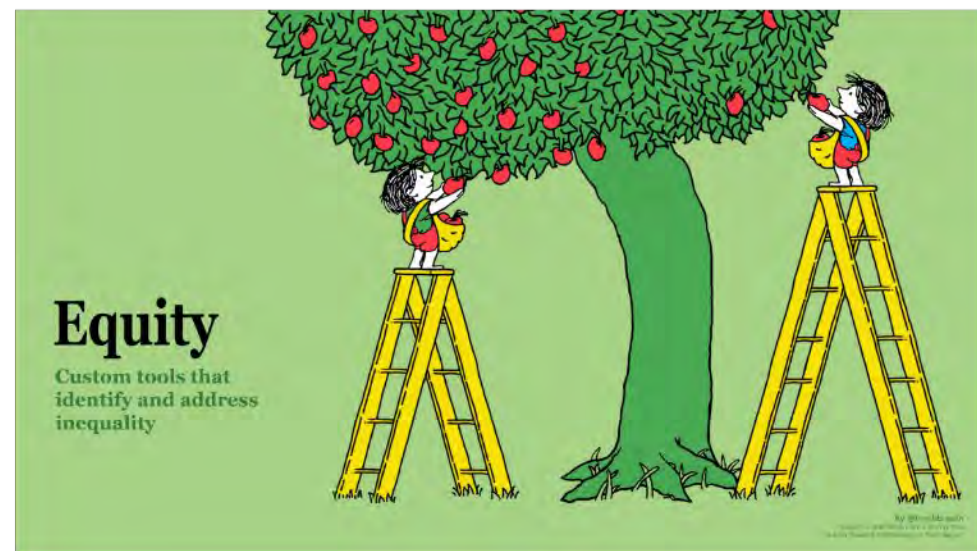
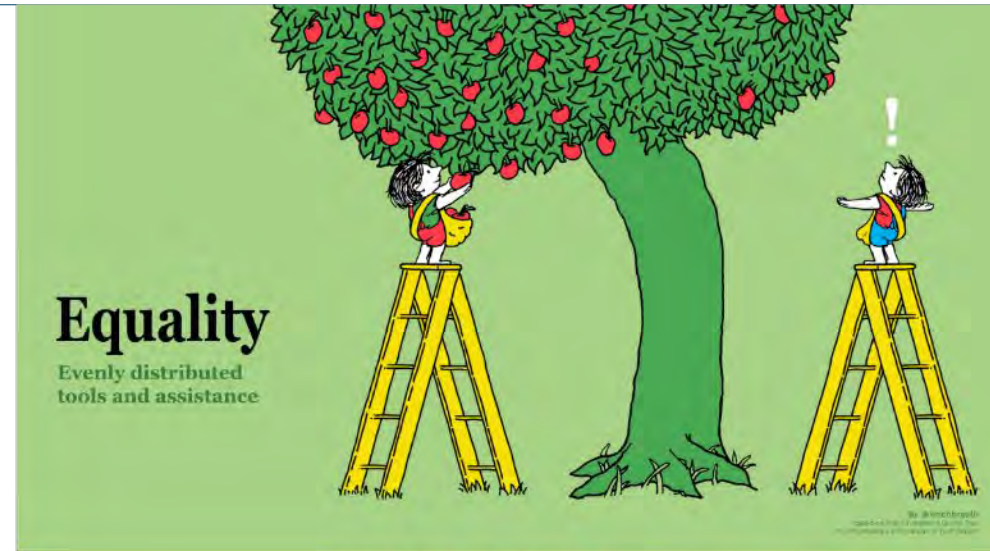
Source: OEHR and Seattle RSJI.



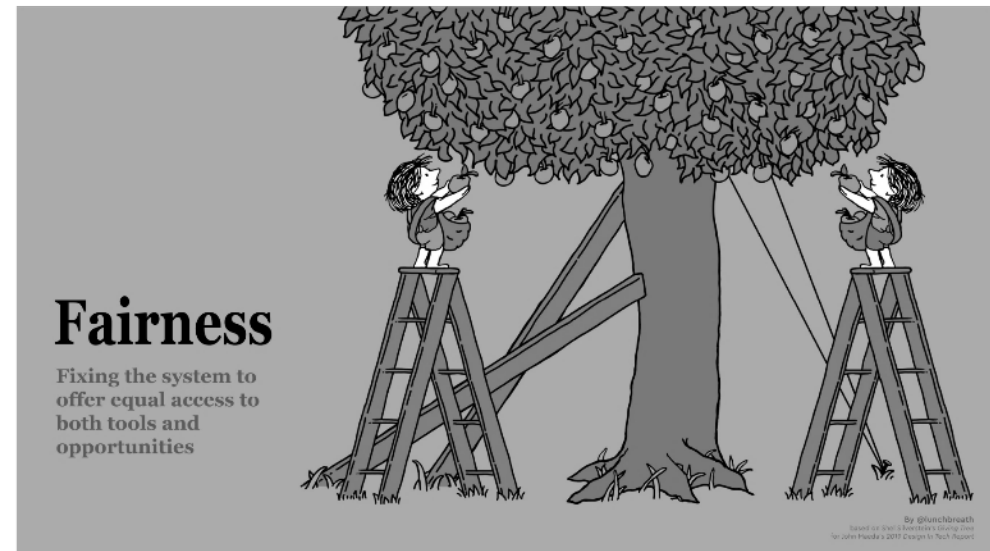
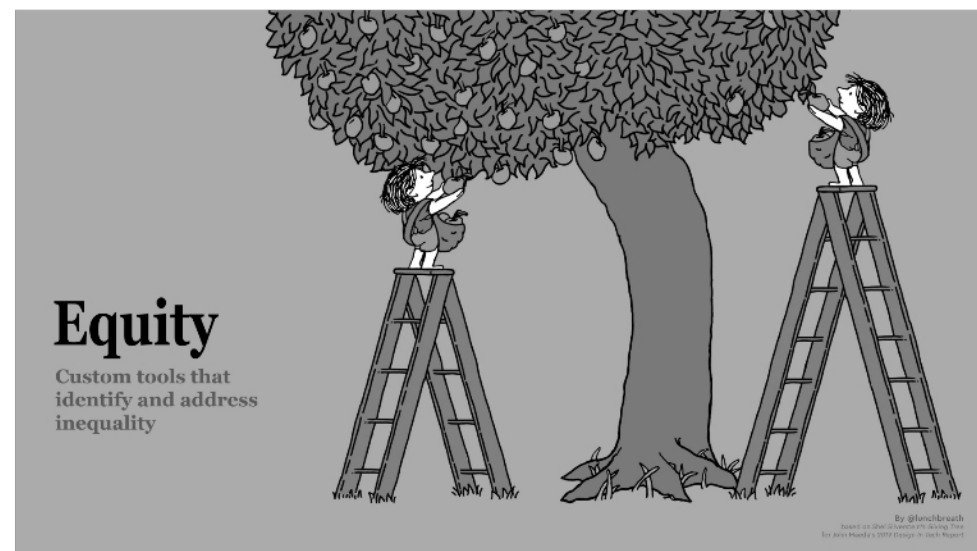
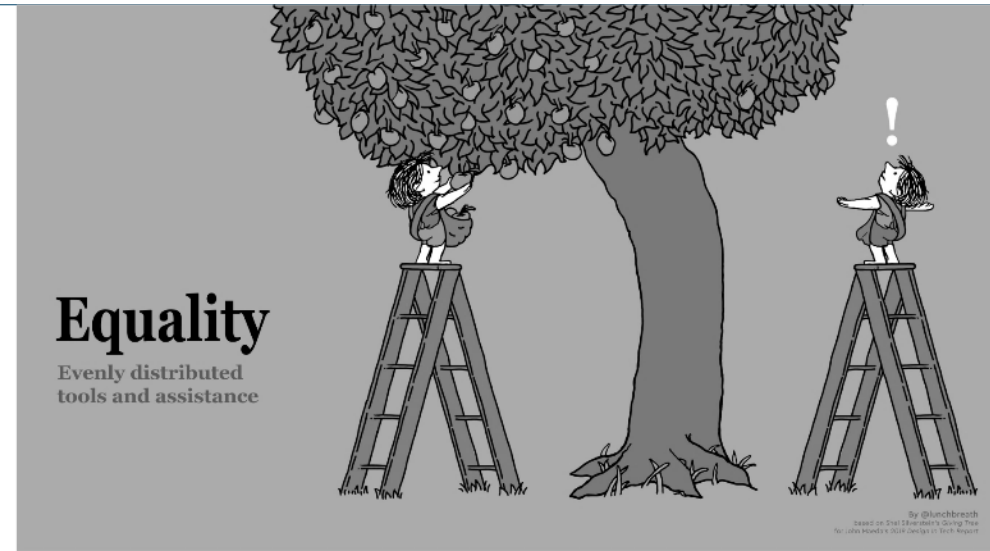
City of Boulder Racial Equity Plan, 2021



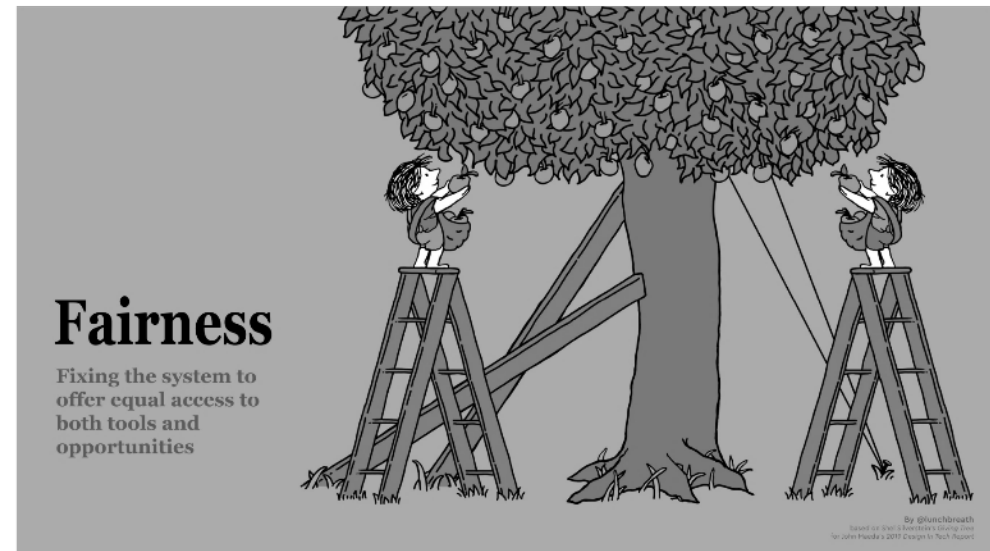
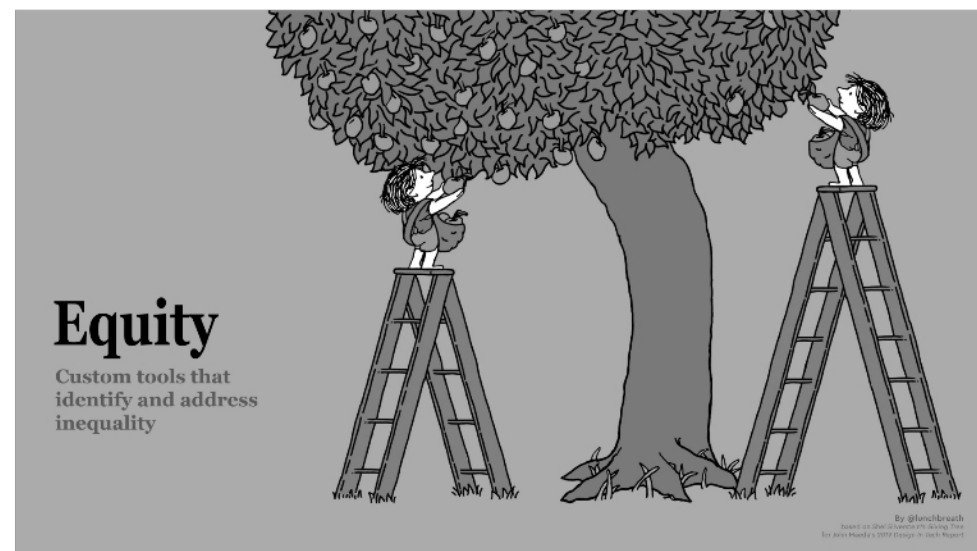
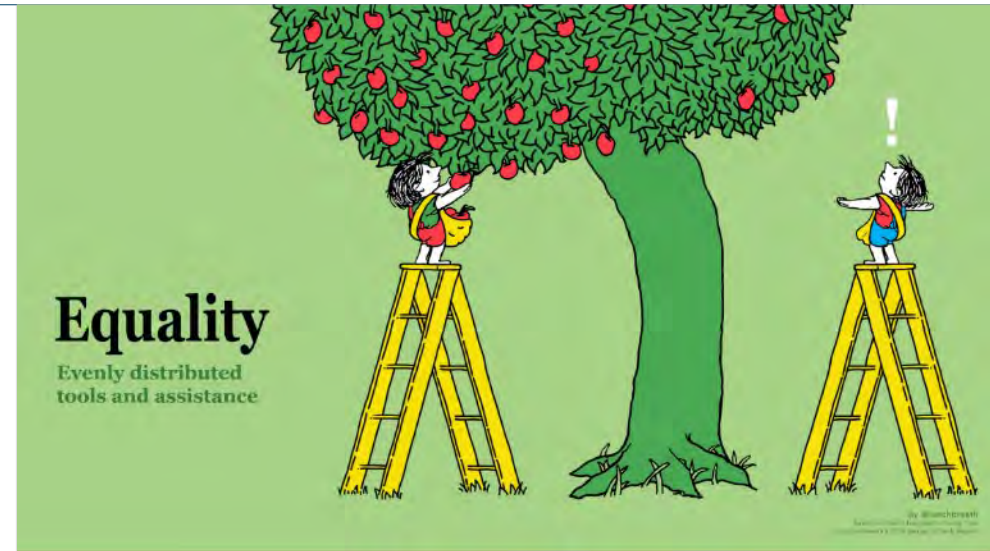
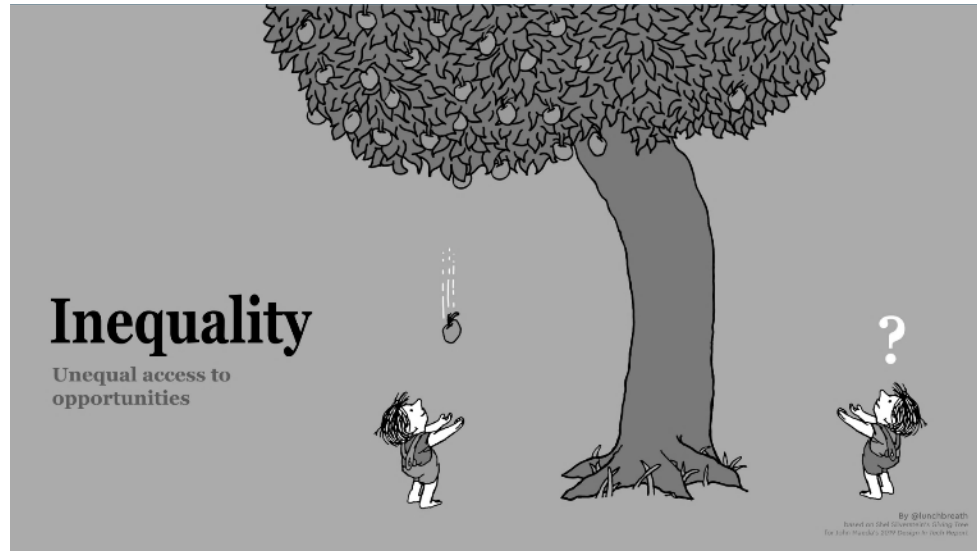
What does *Equity* mean?



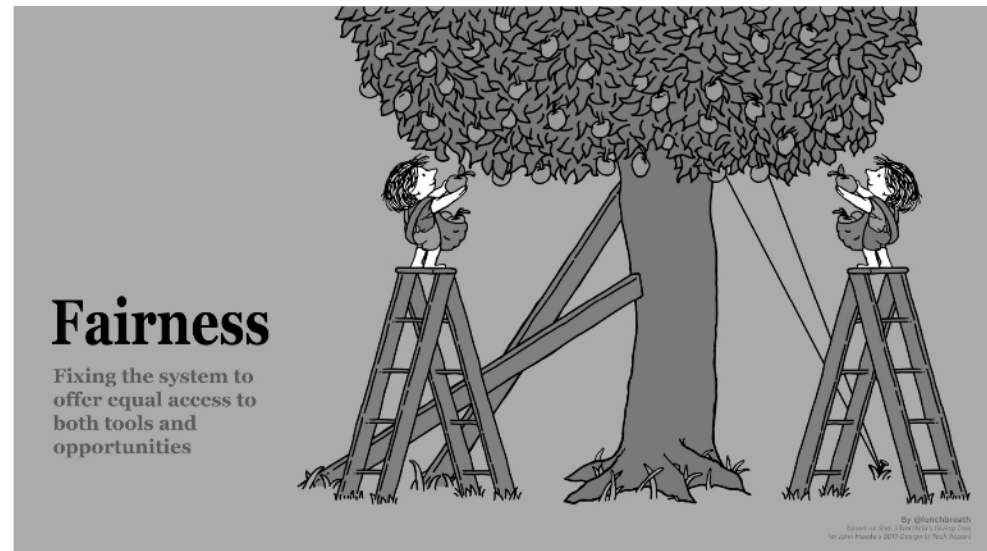
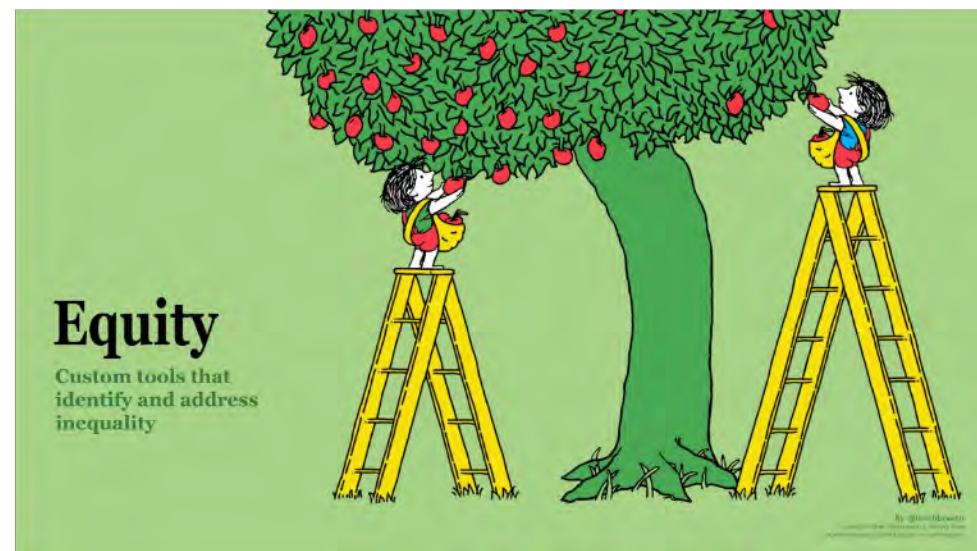
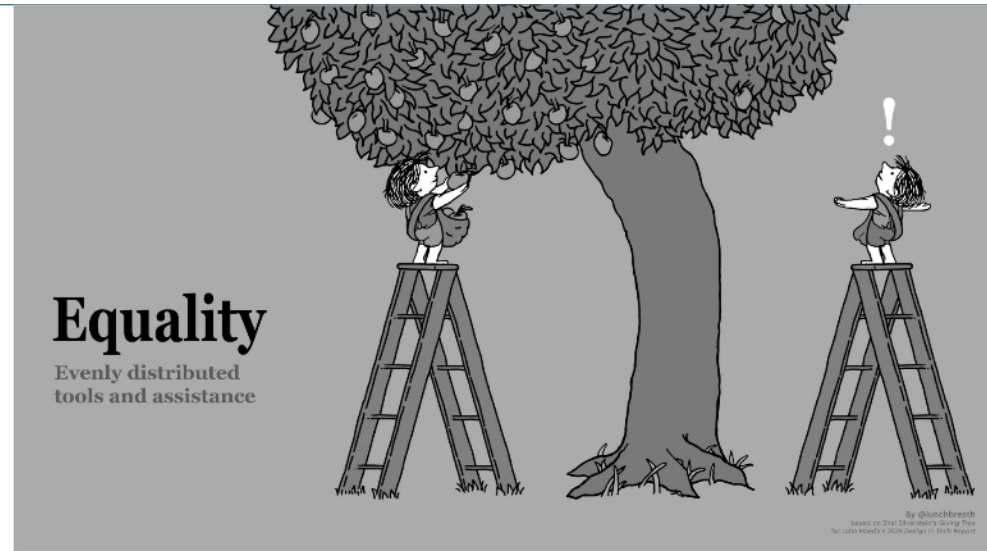
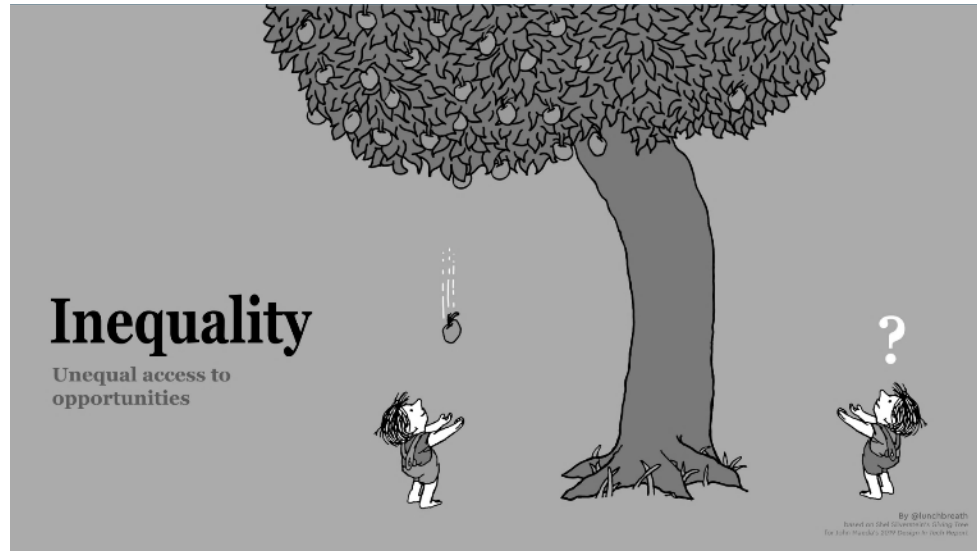
Inequity



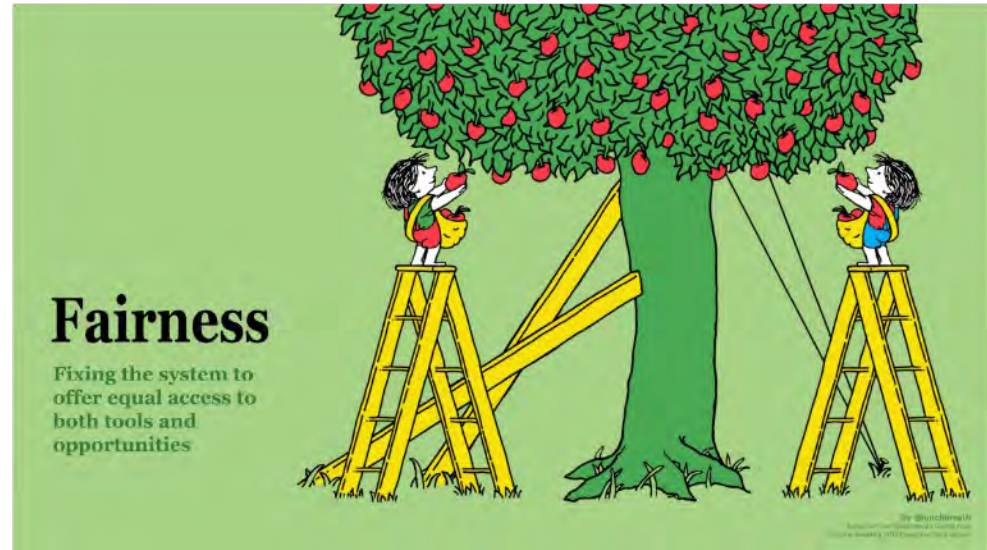
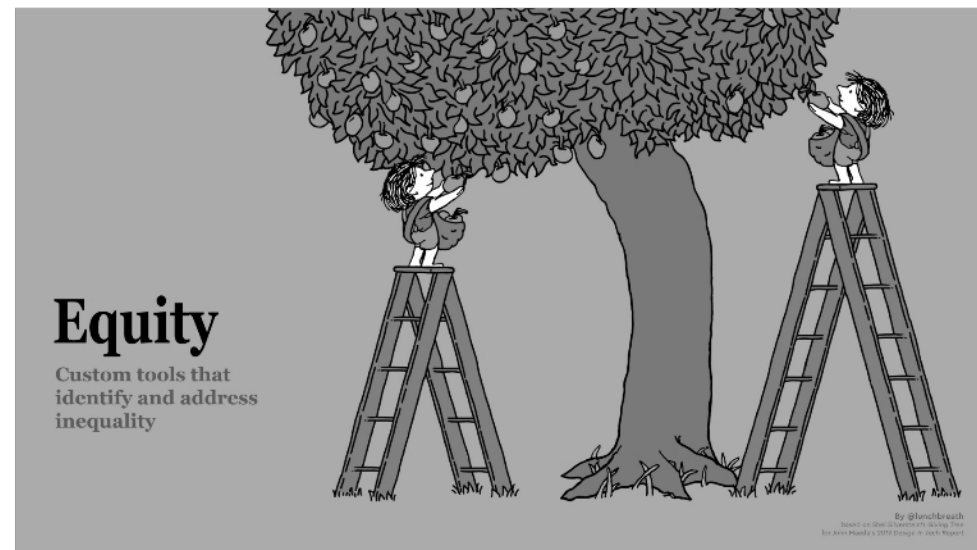
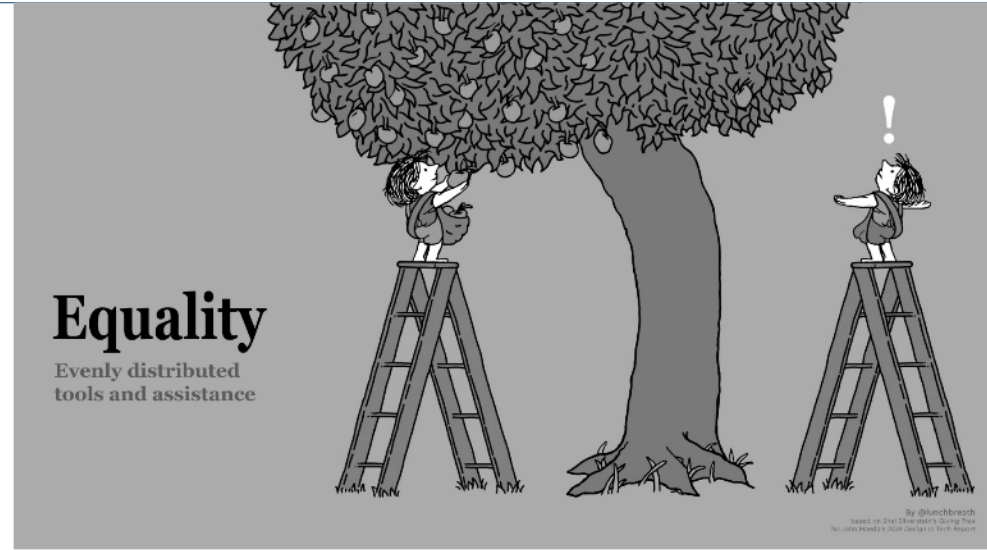
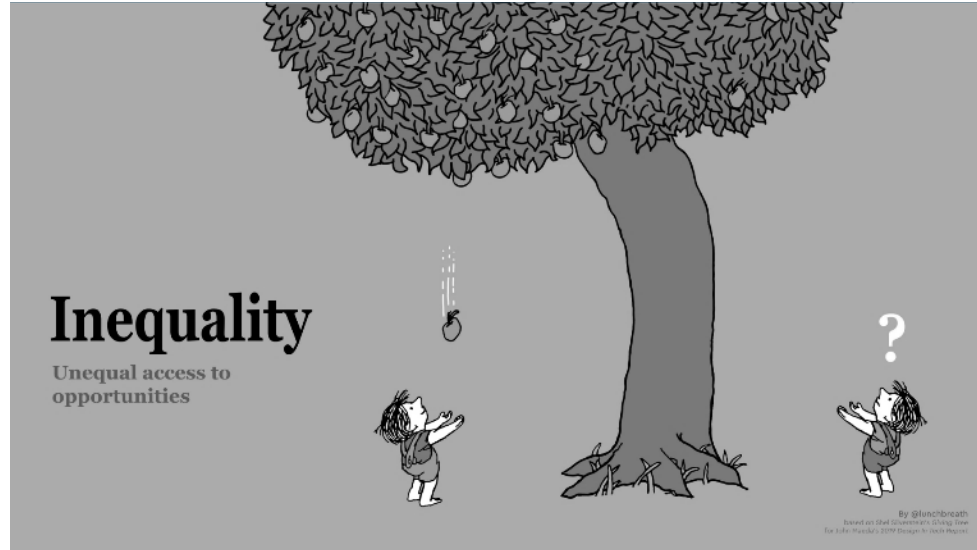
Equality



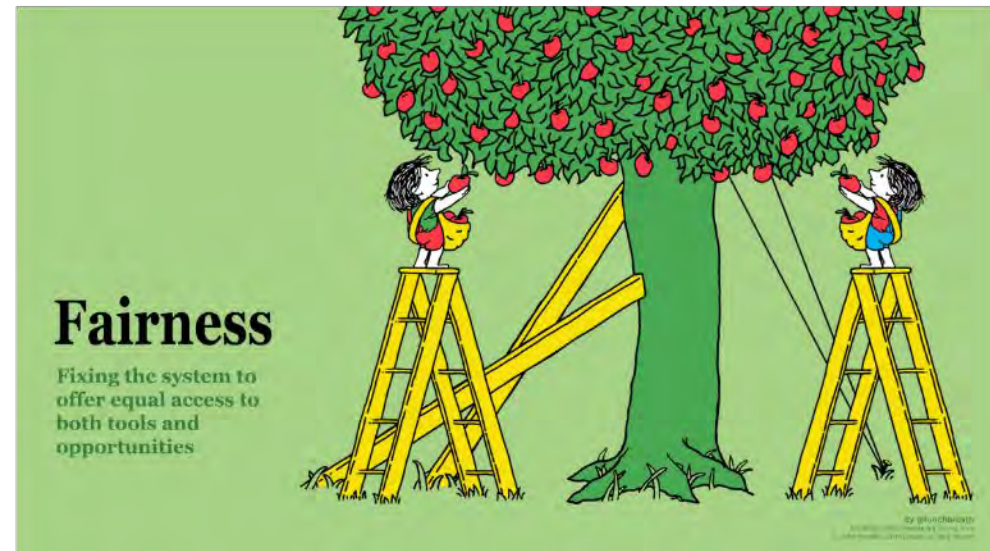
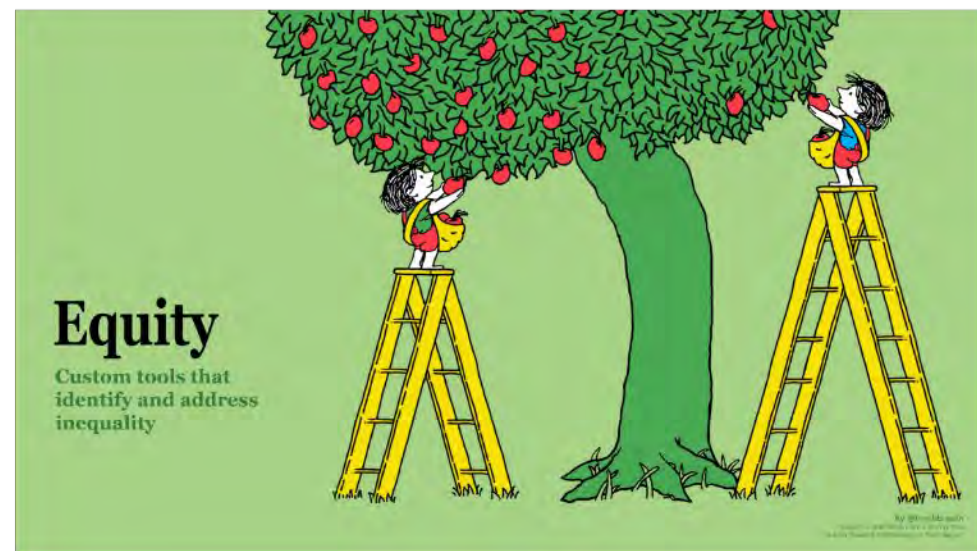
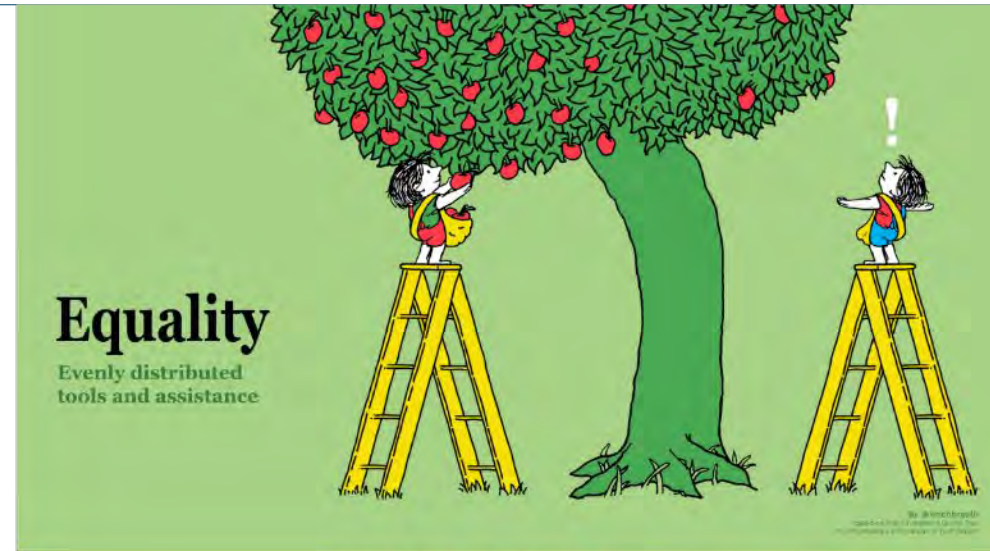
Equity



Fairness



Equity and Fairness

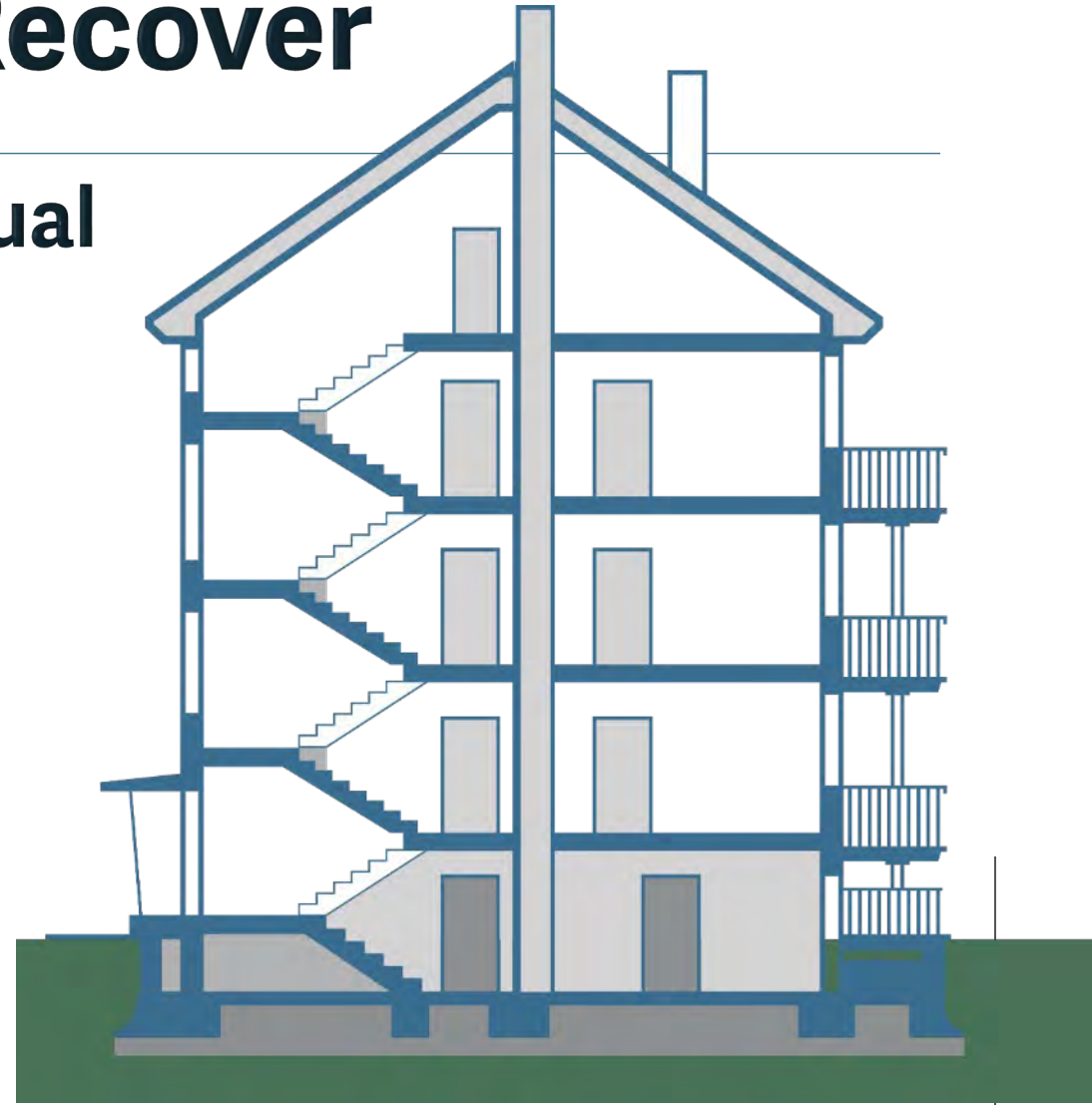
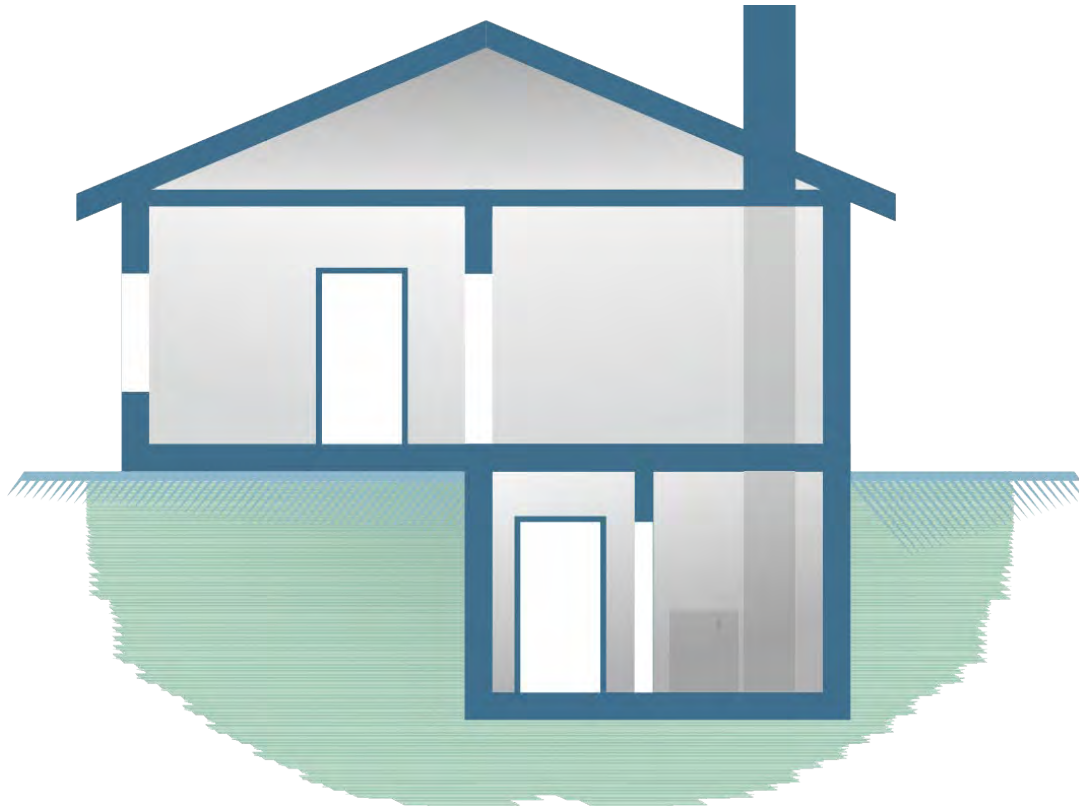


How do we prioritize projects with equity and fairness in mind?



Resiliency & Ability to Recover

Impacts from flooding are not equal



Equity, Fairness and Resiliency

Variation in creeks and drainage areas



Boulder Creek



Gregory Canyon Creek



Bluebell Canyon Creek



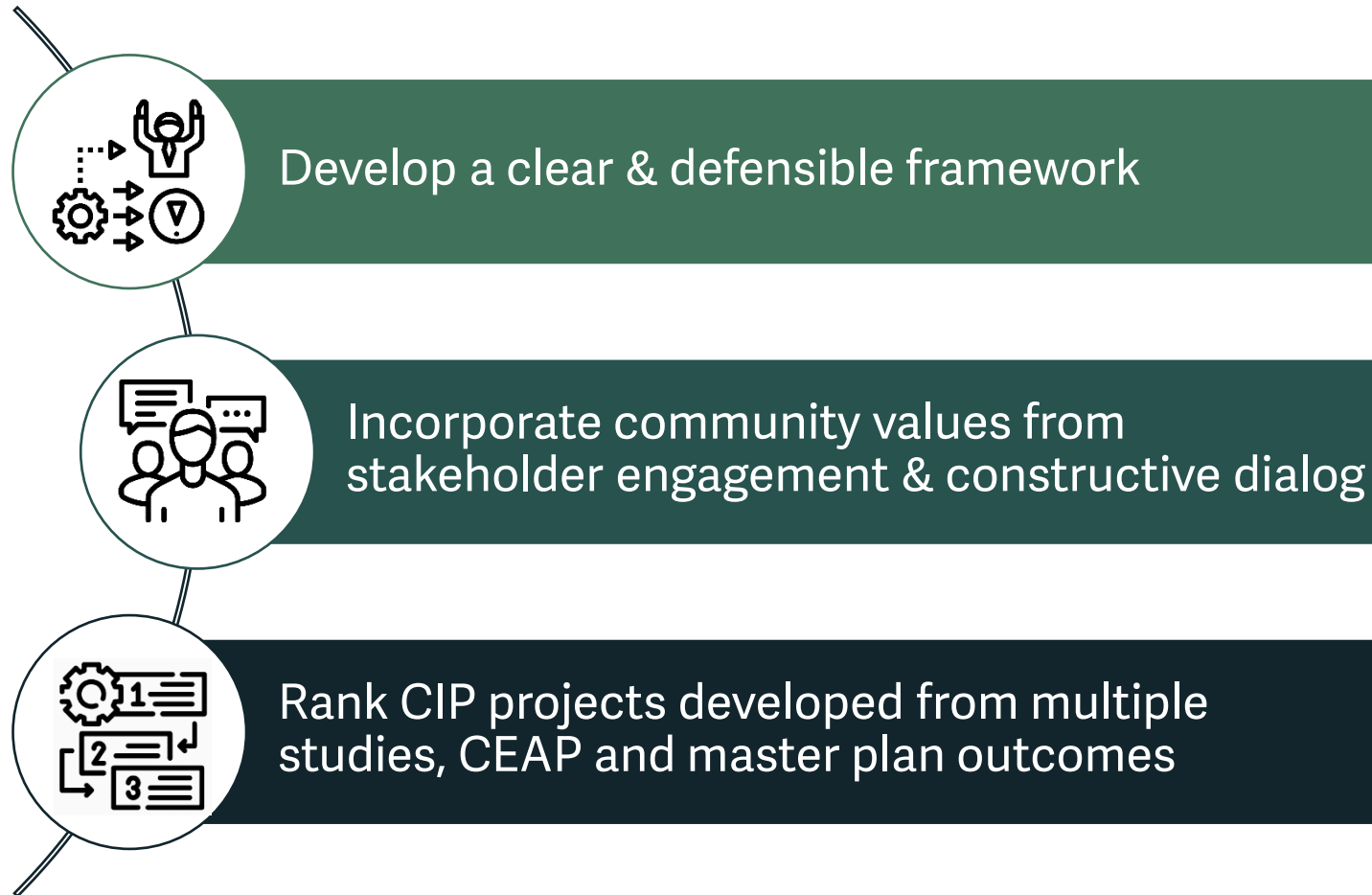
Project Prioritization Framework to Aid Good Decision Making

Building projects that align with community values & meet the Utility's goals and objectives



Project Prioritization Framework to Aid Good Decision Making

Building projects that align with community values & meet the Utility's goals and objectives



CIP Project Prioritization | Background

Historic Criteria Sets Used in Boulder

- Stormwater and Flood Management CIP Prioritization Guiding Principles
- Mitigation Planning Evaluation of Alternatives
- Community & Environmental Assessment Process (CEAP) Criteria



Other County & City CIP Prioritization Criteria

Stormwater and Flood Management Project Prioritization Goals

Stormwater and flood management projects should...

- *Protect people from harm, educate the community, reduce risks, and...*
- *Preserve, protect, and restore the natural resources associated with creeks and wetlands for the multiple benefits they provide to support a resilient community*
- *Provide resilient infrastructure that addresses uncertainty, including climate change considerations*
- *Provide access for emergency response and recovery efforts*
- *Minimize property damage*
- *Provide efficient and cost-effective solutions*

... in ways that are mindful and equitable to our entire community.

As we evaluate flood mitigation projects and approaches, we are committed to mutually respectful conversations about these issues in a way that is productive and safe for all involved.

Project Prioritization Criteria

Life Safety

Ability to
Implement

Efficiency & Cost

Social Impact,
Equity & Fairness

Protect Property

Cultural
Resources

Environmental
Resources

Infrastructure
Resiliency

Protect Critical
Facilities

LIFE SAFETY

- Consequence of Failure
- Reduce/Eliminate High Hazard Zone Areas or Residential Structures
- Maintain Emergency Access for First Responders



ABILITY TO IMPLEMENT

A background image showing hands assembling puzzle pieces on a wooden surface. The puzzle pieces are light-colored with some darker pieces already in place. The hands are positioned as if they are about to place a piece into a gap.

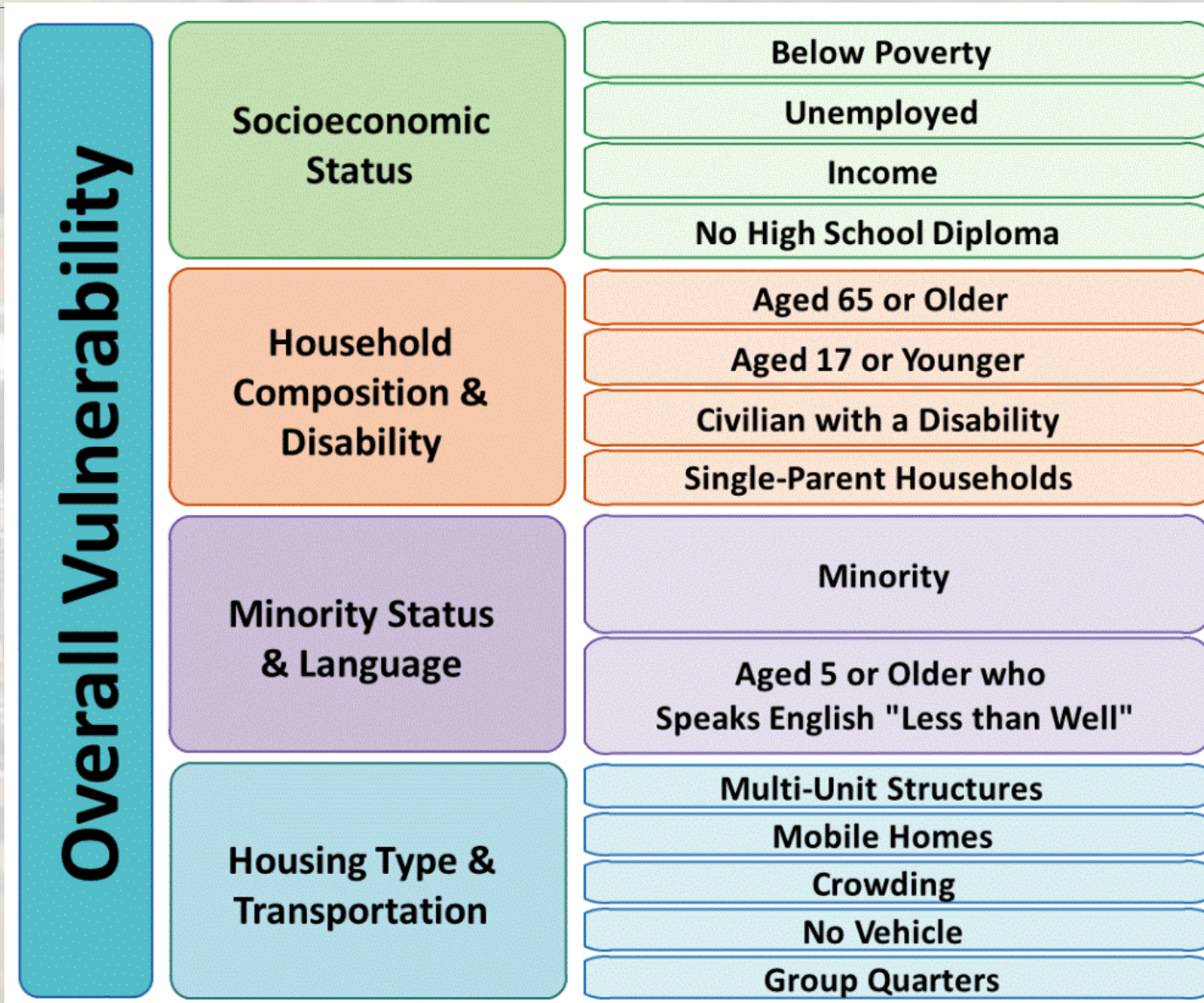
- Minimal Constraints:
Institutional, Legal, Land ownership, etc.
- Community Acceptance/Support
- Project Readiness
- Ease of Construction

EFFICIENCY AND COST

- Capital Cost
- Operations and Maintenance Cost
- Ability to Leverage Funding



Social Impact, Equity and Fairness



PROTECT PROPERTY

- Protect from Physical Damage
- Reduce Economic Loss



CULTURAL RESOURCES

- Protect Historic Structures
- Protect/Provide Community Amenities



ENVIRONMENTAL RESOURCES


- Protect/Restore Floodplains and Wetlands
- Protect/Improve Water Quality
- Increase Habitat Connectivity

INFRASTRUCTURE RESILIENCY

- Reduce Damage to Existing Infrastructure: Roadways, Water & Sewer Lines, Utility Services, etc.
- Increase Infrastructure Capacity
- Reduce/Mitigate Channel Migration and Erosion
- Disconnect Storm Flows from Irrigation Ditches

PROTECT CRITICAL FACILITIES

- Schools, Daycares, Hospitals, Senior Living Facilities, etc.
- Essential Services: Fire, Police, Water Treatment, etc.
- Hazardous Materials Facilities



Breakout Discussion

Criteria Weighting Exercise

CIP Project Prioritization Tool | Criteria Voting

ds Criteria Voting - 9-20-21 WRAB Meeting

Efficiency & Cost

- Capital Cost
- O&M Cost
- Ability to Leverage Funding

★ - 0

Social Impact, Equity & Fairness

- Socioeconomic Status: Income, Employment, Education
- Household Composition: Youth, Elderly, Disability, Single Parent
- Racial Equity and Language
- Housing Type and Transportation: Multi-unit, Manufactured Homes, Dorms and Lack of Vehicle Access

★ - 0

Ability to Implement

- Minimal Constraints: Institutional, Legal, Landownership, etc.
- Community Acceptance / Support
- Project Readiness
- Ease of Construction

★ - 0

Protect Critical Facilities

- Schools, Daycares, Hospitals, Sr. Living Facilities, etc.
- Essential Services: Fire, Police, Water Treatment, etc.
- Hazardous Materials Facilities

★ - 0

Life Safety

- Consequence of Failure
- Reduce/Eliminate of High Hazard Zone Areas or Residential Structures
- Maintain Emergency Access for First Responders

★ - 0

Environmental Resources

- Protect/Restore Floodplains and Wetlands
- Protect/Improve Water Quality
- Increase Habitat Connectivity

★ - 0

Cultural Resources

- Protect Historic Structures
- Protect/Provide Community Amenities

★ - 0

Protect Critical Facilities

- Protect from Physical Damage
- Reduce Economic Loss

★ - 0

Infrastructure Resiliency

- Reduce Damage to Existing Infrastructure: roadways, water & sewer lines, utility services, etc.
- Increase Infrastructure Capacity
- Reduce/Mitigate Channel Migration and Erosion
- Disconnect Storm Flows from Irrigation Ditches

★ - 0

Step 1: Enter your name

Enter your name to participate

Join

Step 2: Click "Join"

Participants 1

Laurel Olsen

CIP Project Prioritization Tool | Criteria Voting

The screenshot displays the 'Criteria Voting - 9-20-21 WRAB Meeting' interface. It features a grid of criteria cards, each with a title, a list of sub-criteria, and a voting section. The voting section includes a red star, a yellow star, and a grey star. A black box with the text 'Click light grey stars to vote' points to the grey star of the 'Infrastructure Resiliency' card. A blue box with the text 'You're done when all 20 votes have been applied (0 votes available)' points to the '14 votes available' button. A green box with the text 'Click yellow stars to remove a vote' points to the yellow star of the 'Life Safety' card. A blue box with the text 'Click here for more information on the card' points to the information icon of the 'Protect Property' card. A red box with the text 'Red stars tally your total votes for the card' points to the red star of the 'Environmental Resources' card. The interface also includes a top navigation bar with buttons for 'Add a Card', 'Upload', 'Rank by votes', and a sidebar with a 'Chat' button and a 'Participants' list.

Criteria Voting - 9-20-21 WRAB Meeting

Click light grey stars to vote

You're done when all 20 votes have been applied (0 votes available)

Click yellow stars to remove a vote

Click here for more information on the card

Red stars tally your total votes for the card

Criteria Cards:

- Efficiency & Cost**
 - Capital Cost
 - O&M Cost
 - Ability to Leverage Funding

★ 1
- Infrastructure Resiliency**
 - Reduce Damage to Existing Infrastructure: roadways, water & sewer lines, utility services, etc.
 - Increase Infrastructure Capacity
 - Reduce/Mitigate Channel Migration and Erosion
 - Disconnect Storm Flows from Irrigation Ditches

★ 3
- Social Impact, Equity & Fairness**
 - Socioeconomic Status: Income, Employment, Education
 - Household Composition: Youth, Elderly, Disability, Single Parent
 - Racial Equity and Language
 - Housing Type and Transportation: Multi-unit, Manufactured Homes, Dorms and Lack of Vehicle Access

★ 1
- Cultural Resources**
 - Protect Historic Structures
 - Protect/Provide Community Amenities

★ 0
- Ability to Implement**
 - Minimal Constraints: Institutional, Legal, Landownership, etc.
 - Community Acceptance / Support
 - Project Readiness
 - Ease of Construction

★ 1
- Protect Property**
 - Protect from Physical Damage
 - Reduce Economic Loss

★ 0
- Environmental Resources**
 - Protect/Restore Floodplains and Wetlands
 - Protect/Improve Water Quality
 - Increase Habitat Connectivity

★ 0
- Life Safety**
 - Consequence of Failure
 - Reduce/Eliminate of High Hazard Zone Areas or Residential Structures
 - Maintain Emergency Access for First Responders

★ 0

14 votes available Private Voting

Chat Enabled

Participants 1 Enabled

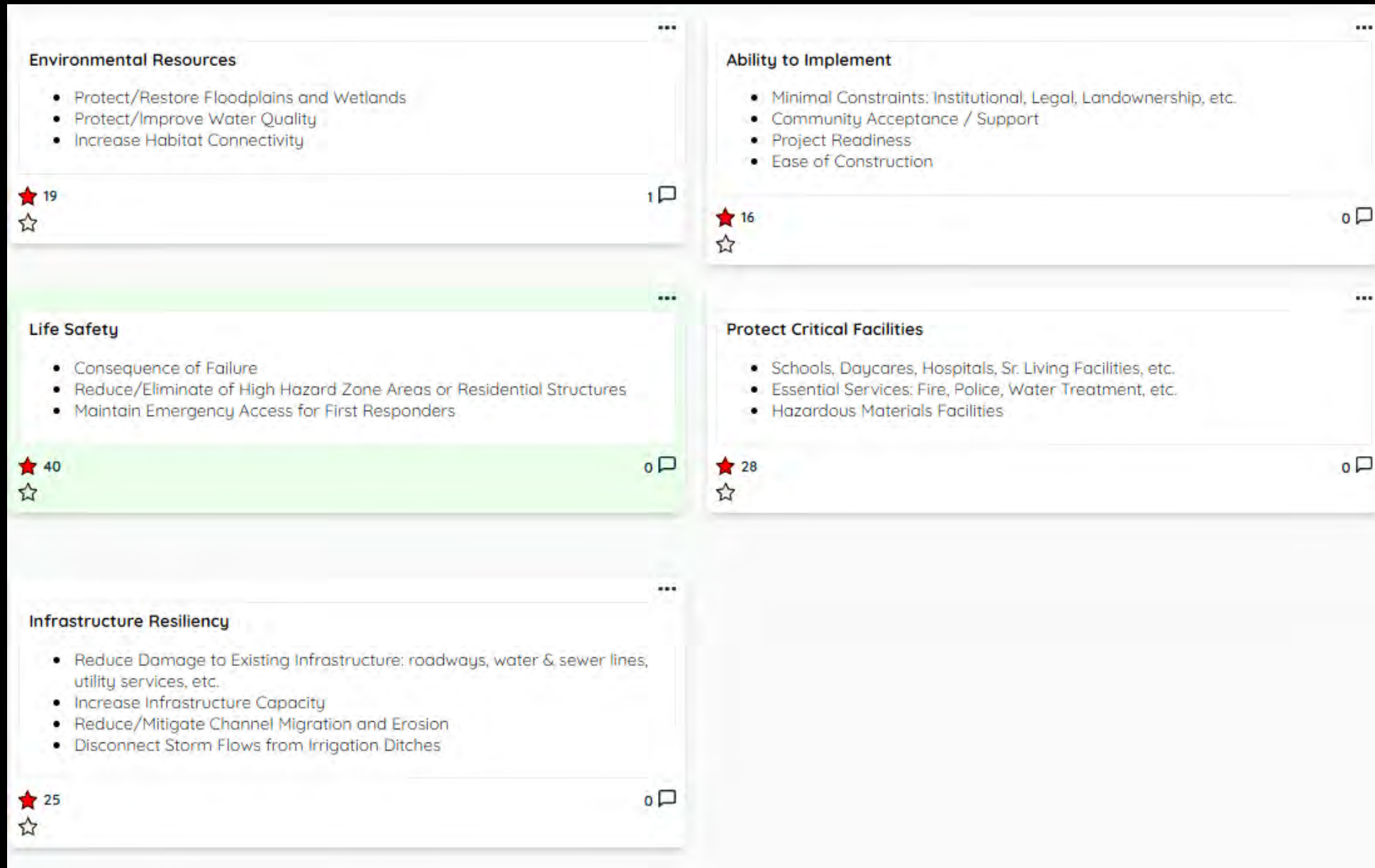
Laurel Olsen

A diverse group of people, including men and women of various ethnicities, are seated in a classroom or meeting room. In the foreground, a woman with curly hair is raising her right hand. To her left, a man is smiling. Other people in the background are looking towards the front of the room. The image has a dark, semi-transparent overlay.

Poll Question

Did your thinking evolve over the course of the discussions and activities?

Dotstorming Results



Dotstorming Results

Protect Property

- Protect from Physical Damage
- Reduce Economic Loss

★ 28



0



Cultural Resources

- Protect Historic Structures
- Protect/Provide Community Amenities

★ 3



0



Social Impact, Equity & Fairness

- Socioeconomic Status: Income, Employment, Education
- Household Composition: Youth, Elderly, Disability, Single Parent
- Racial Equity and Language
- Housing Type and Transportation: Multi-unit, Manufactured Homes, DORMS and Lack of Vehicle Access

★ 24



0



Efficiency & Cost

- Capital Cost
- O&M Cost
- Ability to Leverage Funding

★ 17



0





Comprehensive
**Flood and
Stormwater**
Master Plan

Wrap Up

Comment Form link in chat

Questions? Email: cfsinfo@bouldercolorado.gov



Comprehensive Flood and Stormwater Master Plan





Comprehensive Flood and Stormwater Master Plan





Breakout Discussion

How do we best protect our community so that all of us recover from flooding?

Given the examples provided, what is the city's role and what is the community's role?

Prepare to share one surprising/important thing that was discussed.