# Flood-Prone Area Storm Water Initiatives

October 17, 2019

# City Focus Areas

System Maintenance and Repair

Capital Project Implementation

Program Funding

Long-Range Planning

# Why Does This Take So Long?

- Hydrological analysis for each storm event (10, 25, 100 year):
  - How much water do we need to convey?
  - Where does it flow?
  - What capacity does the existing system have?
  - What conditions have changed since previous analyses? (i.e.: new development, failures of structures, additional parking/impervious, changes in climate/average rainfall)
- System Analysis
  - What pipes, inlets and other structures exist?
  - What condition are they in? Can they continue to stay in service?
- Preliminary Engineering
  - Which storm event (5, 10, 25, 100 yr) does the City want to design & construct for?
  - Based on data above, what new or replaced structures should be installed to resolve the problem?
  - What alternatives exist? (i.e.: buyouts, flood proofing, stream reclamation)

# Why Does This Take So Long?

- Cost Estimating
  - How much will new structures cost?
  - What are stormwater billpayers willing to pay?
  - What rates and fees is Council willing to set?
- Final Engineering
  - Based on all information above, the City hires contract engineers to design systems
- Implementation
  - Based on Final Engineering, the City begins construction

**WE ARE HERE**

# System Maintenance and Repair

- Repair failed section of storm sewer pipe on Oxford Avenue, west of Santa Fe Drive, Nov. 2019
- Clean out accumulated debris in the Oxford pipe, from Santa Fe Drive to the South Platte River, Feb. 2020
- Repair the existing storm sewer pipe under Jason Ct., Feb. 2020
- Develop a proactive maintenance plan; June 2020
- Complete a system-wide pipe cleaning program; July 2020

# Long-Range Planning

- Complete a city-wide storm water Master Plan; April 2020
- Update Drainage Criteria Manual; January 2020

# Program Funding

- Loaned $3 million from the General Fund Long Term Asset Reserve (LTAR) to the Storm Drainage Fund; ***COMPLETE***
- Evaluate state and federal grant opportunities; on-going
- Complete a rate & fee analysis to develop storm water utility rates which support the city's desired level of funding; March 2020
- Identify & implement an increased storm water fee; May 2020
- Issue bonds for desired level of capital funding, Summer 2020

# Capital Project Implementation

- Conduct a Stormwater Analysis and Alternatives Feasibility Study of flood-prone areas ***COMPLETE***
- Evaluate the feasibility of an alternative alignment for new storm sewer pipe along Radcliff Ave. to the South Platte River, Nov. 2019
- Issue a Request for Proposals and award a contract for preliminary and final design of selected capital projects; Feb. 2020
- Begin construction on some aspects of a project or projects, October 2020

# 3-Phase Approach

## Life Safety and Flood-Proofing

Give the City staff a quick method of responding to urgent need for life safety improvements.

IDENTIFY HOMES IN DANGER

ENGAGE OWNERS

DETERMINE METHODS AND COSTS

BUDGET FOR IMPROVEMENTS AND IMPLEMENT


## OSP Update and Prioritization

Use the 1999 OSP hydrology and hydraulics to the greatest extent practicable. This component spends time verifying the previous projects, developing other alternatives, and preparing a prioritized list of projects.

DATA GATHERING

PROJECT VERIFICATION & MAPPING

PRIORITIZATION

BUDGET AND IMPLEMENT


## Pipe Conditions Assessment

Perform pipe conditions assessment and rehabilitation.

INVESTIGATION & REVIEW

CONDITIONS ASSESSMENT

EVALUATION OF REPAIR METHODS

RECOMMENDATIONS

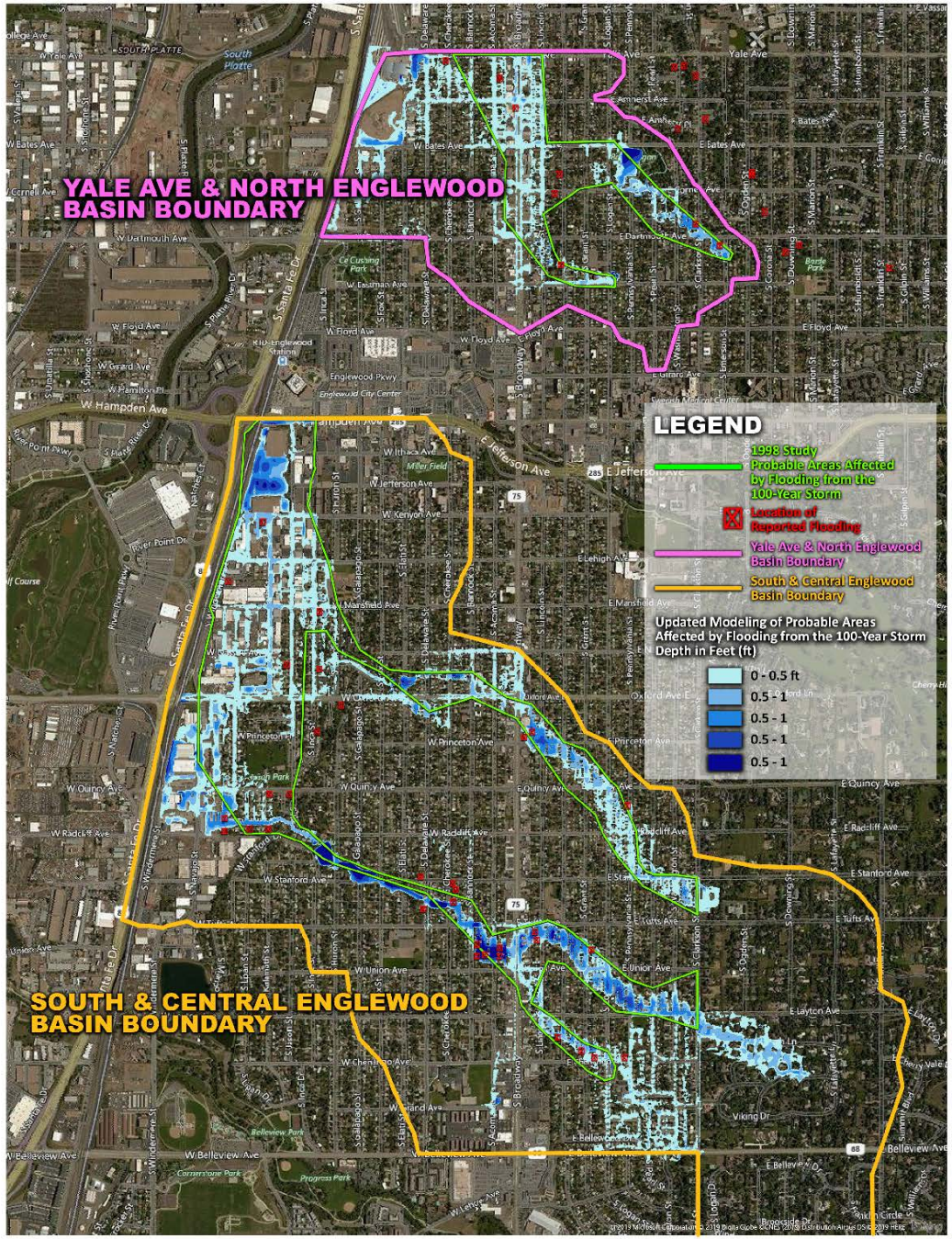
# Study Goal & Objectives

Identify both short-term and long-term solutions to flooding, as well as to determine the largest flood hazard reduction for City investment.

- Identify areas of potential flooding at various rainfall/runoff levels
- Determine and define ways of reducing flood damage through floodproofing techniques
- Assess the current conditions of the stormwater pipeline beneath Oxford, identify dangers, and describe remediation techniques
- Update the existing Outfall Systems Plan (OSP) and capital projects with budgets and a prioritized list of storm drainage projects

# Study Scope

- Flood-prone areas, identified in 1998 study
- Comprises about 3.4 square miles of total 6.6 square miles of city

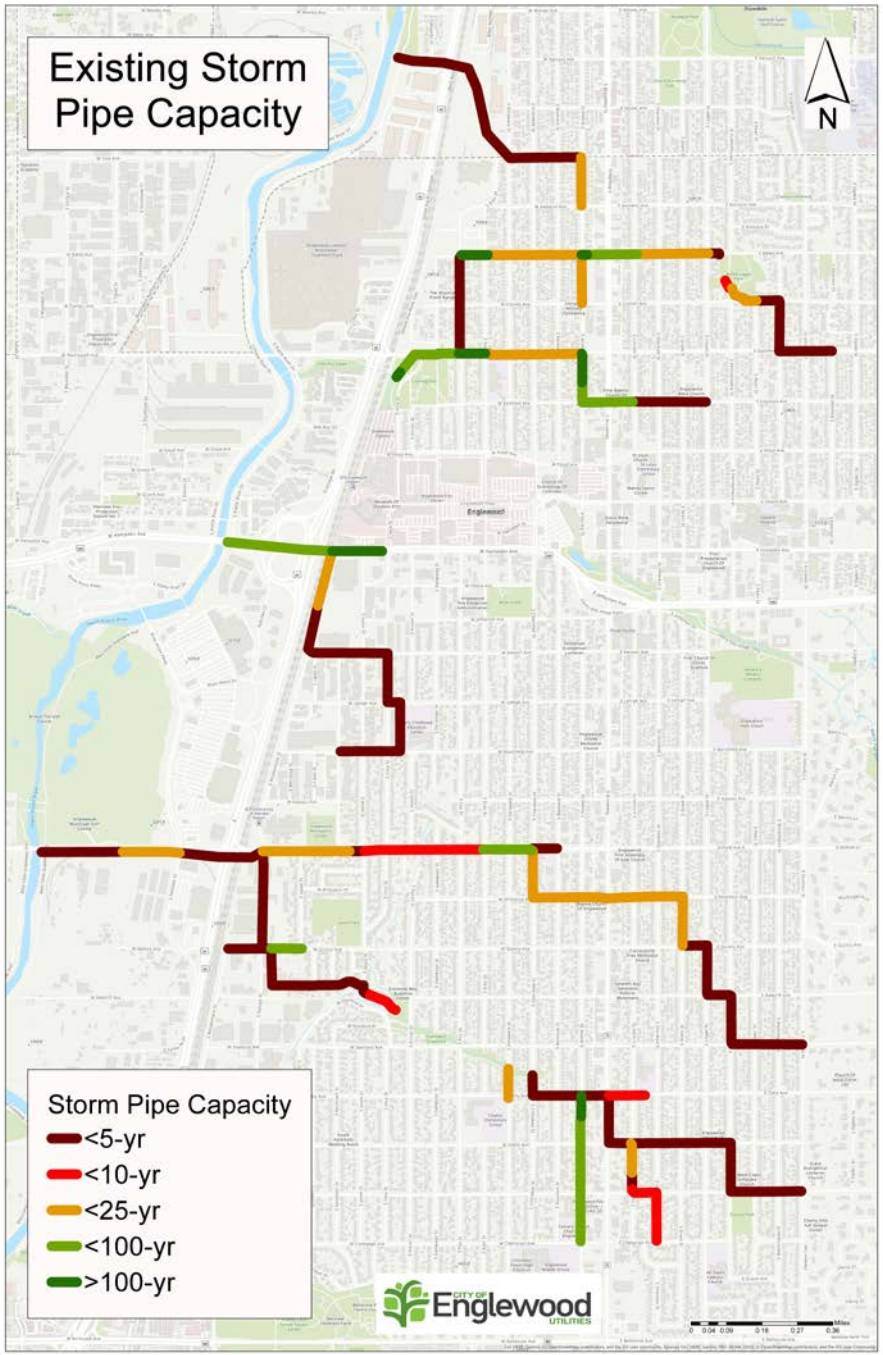


# Study Website

- City webpage under Public Works:
- https://www.englewoodco.gov/government/city-departments/public-works/stormwater-feasibility-study

- Study link:
- www.calibre-engineering.com/cityofenglewoodoutfallsystemsplan

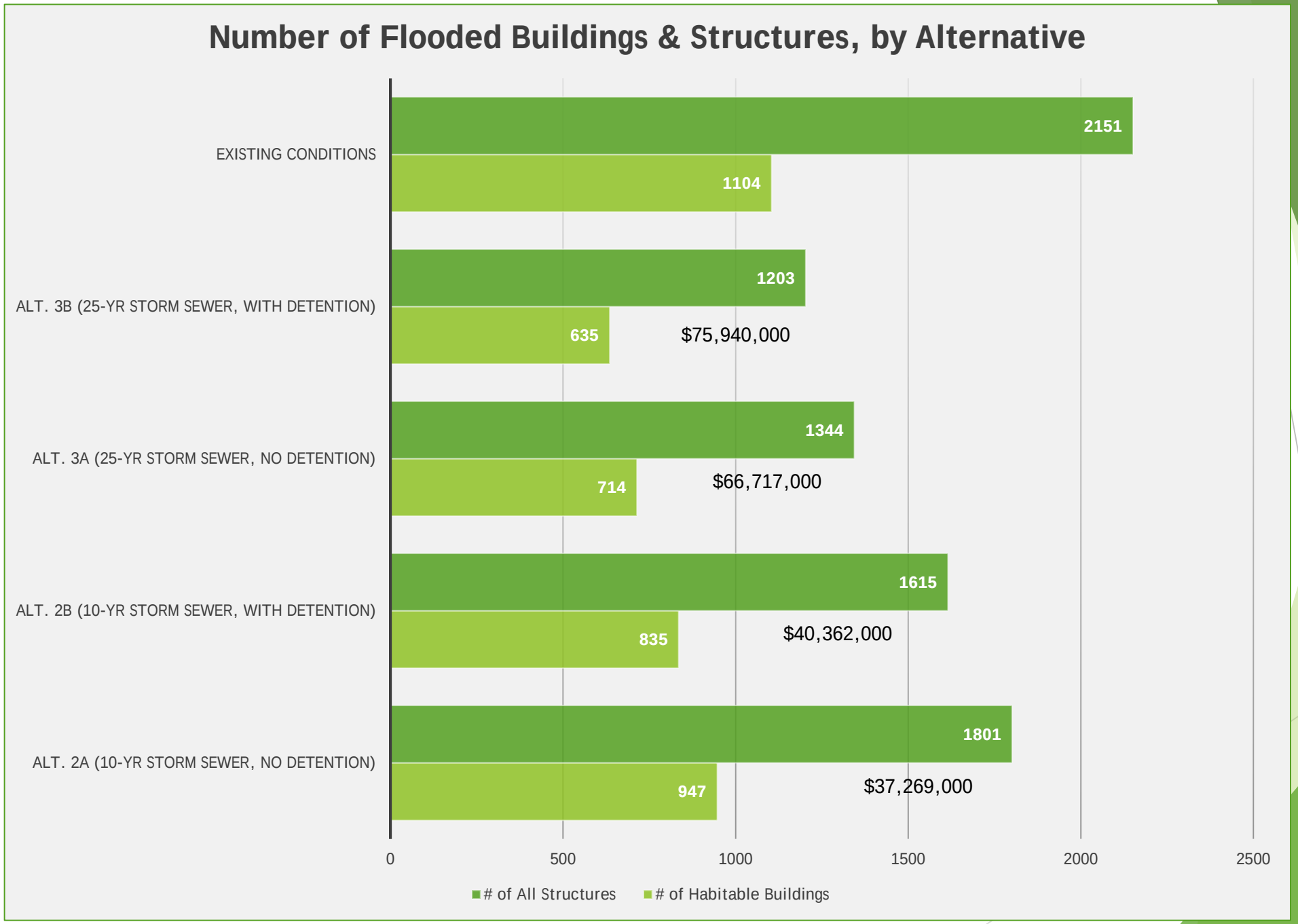
# Existing Pipe Capacity



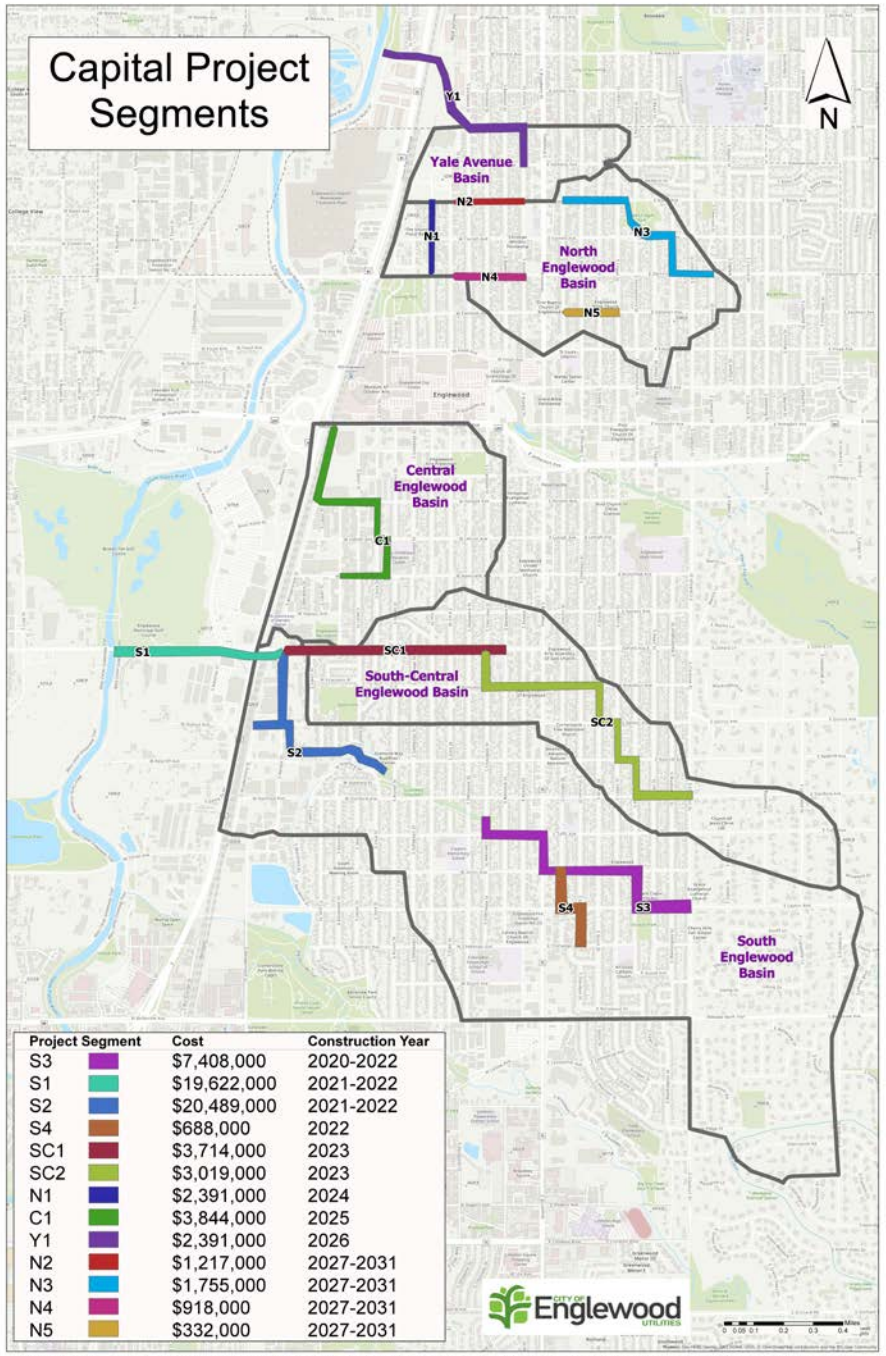
# Project Alternatives

- Storm sewers throughout the study area were sized to convey the 5, 10, 25 and 100-year storm events, both including and excluding the effect of the proposed detention facilities on the peak flows

- 4 ALTERNATIVES; 7 OPTIONS
  - 1A: **5**-year Storm Sewer Design - No Detention
  - 1B: **5**-year Storm Sewer Design - With Detention
  - 2A: **10**-year Storm Sewer Design - No Detention
  - 2B: **10**-year Storm Sewer Design - With Detention
  - 3A: **25**-year Storm Sewer Design - No Detention
  - 3B: **25**-year Storm Sewer Design - With Detention
  - 4: **100**-year Storm Sewer Design - No Detention


Number of Flooded Buildings & Structures, by Alternative
EXISTING CONDITIONS
2151
1104
ALT. 3B (25-YR STORM SEWER, WITH DETENTION)
1203
635
$75,940,000
ALT. 3A (25-YR STORM SEWER, NO DETENTION)
1344
714
$66,717,000
ALT. 2B (10-YR STORM SEWER, WITH DETENTION)
1615
835
$40,362,000
ALT. 2A (10-YR STORM SEWER, NO DETENTION)
1801
947
$37,269,000
0
500
1000
1500
2000
2500
# of All Structures
# of Habitable Buildings

# Proposed Projects




| Project Segment | Cost | Construction Year |
|---|---|---|
| S3 | $7,408,000 | 2020-2022 |
| S1 | $19,622,000 | 2021-2022 |
| S2 | $20,489,000 | 2021-2022 |
| S4 | $688,000 | 2022 |
| SC1 | $3,714,000 | 2023 |
| SC2 | $3,019,000 | 2023 |
| N1 | $2,391,000 | 2024 |
| C1 | $3,844,000 | 2025 |
| Y1 | $2,391,000 | 2026 |
| N2 | $1,217,000 | 2027-2031 |
| N3 | $1,755,000 | 2027-2031 |
| N4 | $918,000 | 2027-2031 |
| N5 | $332,000 | 2027-2031 |

Note: Dates and costs are estimates only. Ability to complete segments will be dependent upon council approved rates and fees, bond market conditions, and economic conditions that will affect contractor pricing.

# Project Prioritization

- According to these criteria; the proposed project segments are prioritized as follows:
  - South Englewood Basin Segment 1 (S1)
  - South Englewood Basin Segment 2 (S2)
  - South Englewood Basin Segment 3 (S3)
  - South Englewood Basin Segment 4 (S4)
  - South-Central Englewood Basin Segment 1 (SC1)
  - South-Central Englewood Basin Segment 2 (SC2)
  - Central Englewood Basin Segment 1 (C1)
  - Yale Avenue Basin Segment 1 (Y1)
  - North Englewood Basin Segment 1 (N1)
  - North Englewood Basin Segment 2 (N2)
  - North Englewood Basin Segment 3 (N3)
  - North Englewood Basin Segment 5 (N5)
  - North Englewood Basin Segment 4 (N4)

# Project Costs

| Segment | Description | Total Est. Construction Cost - No Detention | | Total Est. Construction Cost - With Detention | |
|---|---|---|---|---|---|
| | | 10-year Capacity | 25-year Capacity | 10-year Capacity | 25-year Capacity |
| S1 | South Platte River to Navajo St | $11,861,000 | $19,622,000 | $9,033,000 | $16,801,000 |
| S2 | Oxford St to Rotolo Park | $10,435,000 | $20,489,000 | $11,411,000 | $23,874,000 |
| S3 | Cherokee St to Clarkson St | $5,380,000 | $7,408,000 | $9,523,000 | $12,885,000 |
| S4 | Union Ave to Chenango Ave | $452,000 | $688,000 | $452,000 | $688,000 |
| | **South Englewood Basin Total Cost** | **$28,128,000** | **$48,207,000** | **$30,419,000** | **$54,248,000** |
| SC1 | Navajo St to Bannock St | $1,673,000 | $3,714,000 | $1,823,000 | $5,583,000 |
| SC2 | Oxford St to Clarkson St | $1,109,000 | $3,019,000 | $1,174,000 | $3,174,000 |
| | **South-Central Englewood Basin Total Cost** | **$2,782,000** | **$6,733,000** | **$2,997,000** | **$8,757,000** |
| C1 | Hampden Ave to Mansfield Ave | $2,405,000 | $3,843,000 | $2,405,000 | $3,843,000 |
| | **Central Englewood Basin Total Cost** | **$2,405,000** | **$3,843,000** | **$2,405,000** | **$3,843,000** |
| N1 | Dartmouth Ave to Bates Ave | $1,197,000 | $1,321,000 | $1,126,000 | $1,822,000 |
| N2 | Elati St to Acoma St (Bates Ave) | $0 | $1,217,000 | $0 | $1,217,000 |
| N3 | Lincoln St to Emerson St | $831,000 | $1,755,000 | $1,489,000 | $2,412,000 |
| N4 | Elati St to Acoma St (Dartmouth Ave) | $0 | $918,000 | $0 | $918,000 |
| N5 | Lincoln St to Logan St | $290,000 | $332,000 | $290,000 | $332,000 |
| | **North Englewood Basin Total Cost** | **$2,318,000** | **$5,543,000** | **$2,905,000** | **$6,701,000** |
| Y1 | South Platte River to Amherst Ave | $1,636,000 | $2,391,000 | $1,636,000 | $2,391,000 |
| | **Yale Ave Basin Total Cost** | **$1,636,000** | **$2,391,000** | **$1,636,000** | **$2,391,000** |
| | **Total Est. Construction Cost - All Basins** | **$37,269,000** | **$66,717,000** | **$40,362,000** | **$75,940,000** |

# Questions & Discussion