



# Plymouth Creek Stabilization Project Feasibility Study



Prepared for Bassett Creek Watershed Management Commission  
5/16/2024



# Agenda

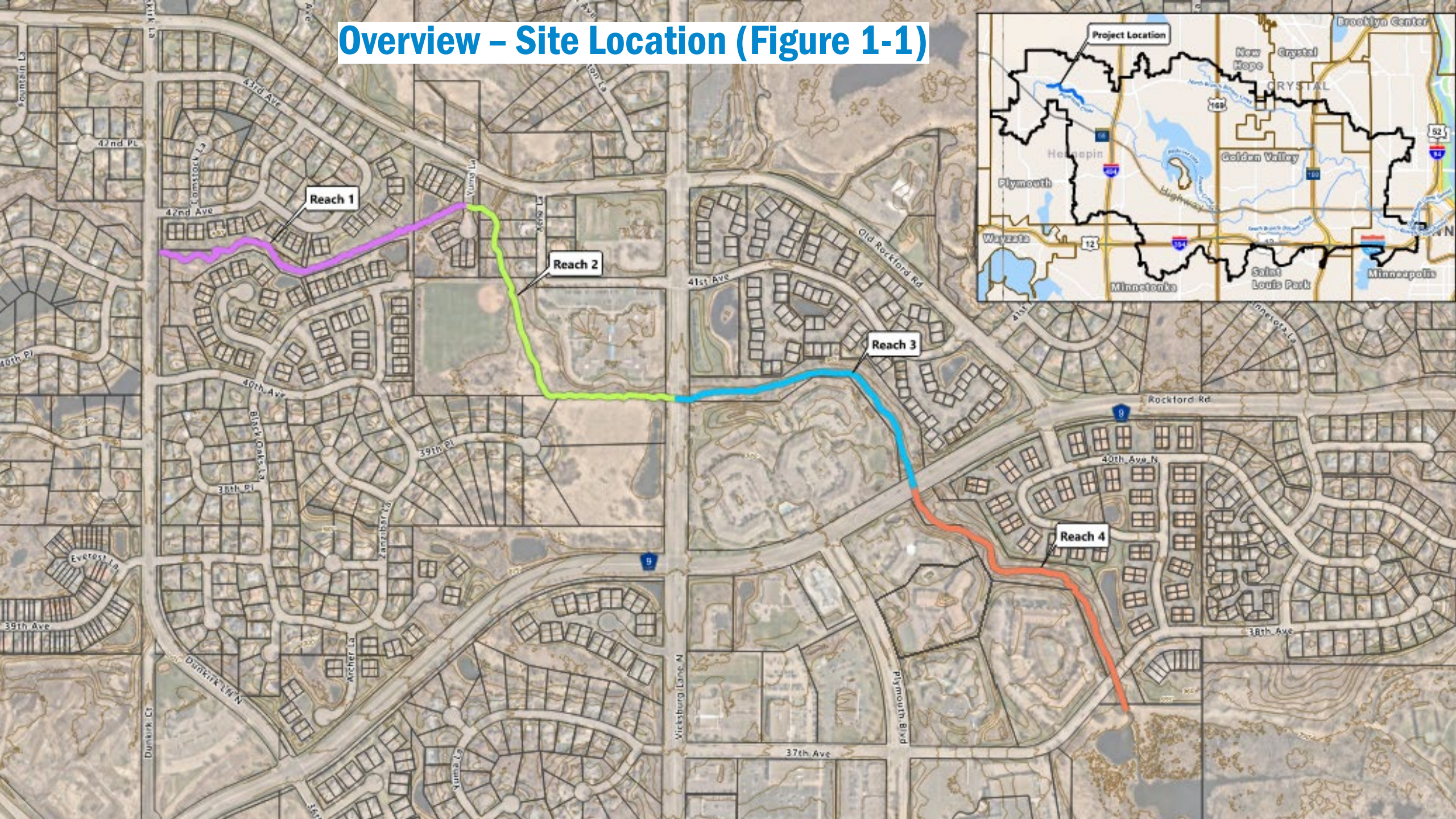


1. Overview
2. Project Goals and Considerations
3. Site Conditions (Field and Desktop)
4. Stakeholder Input
5. Proposed Concepts
6. Estimated Costs and Benefits
7. Permitting
8. Recommendations and Project Funding
9. Questions

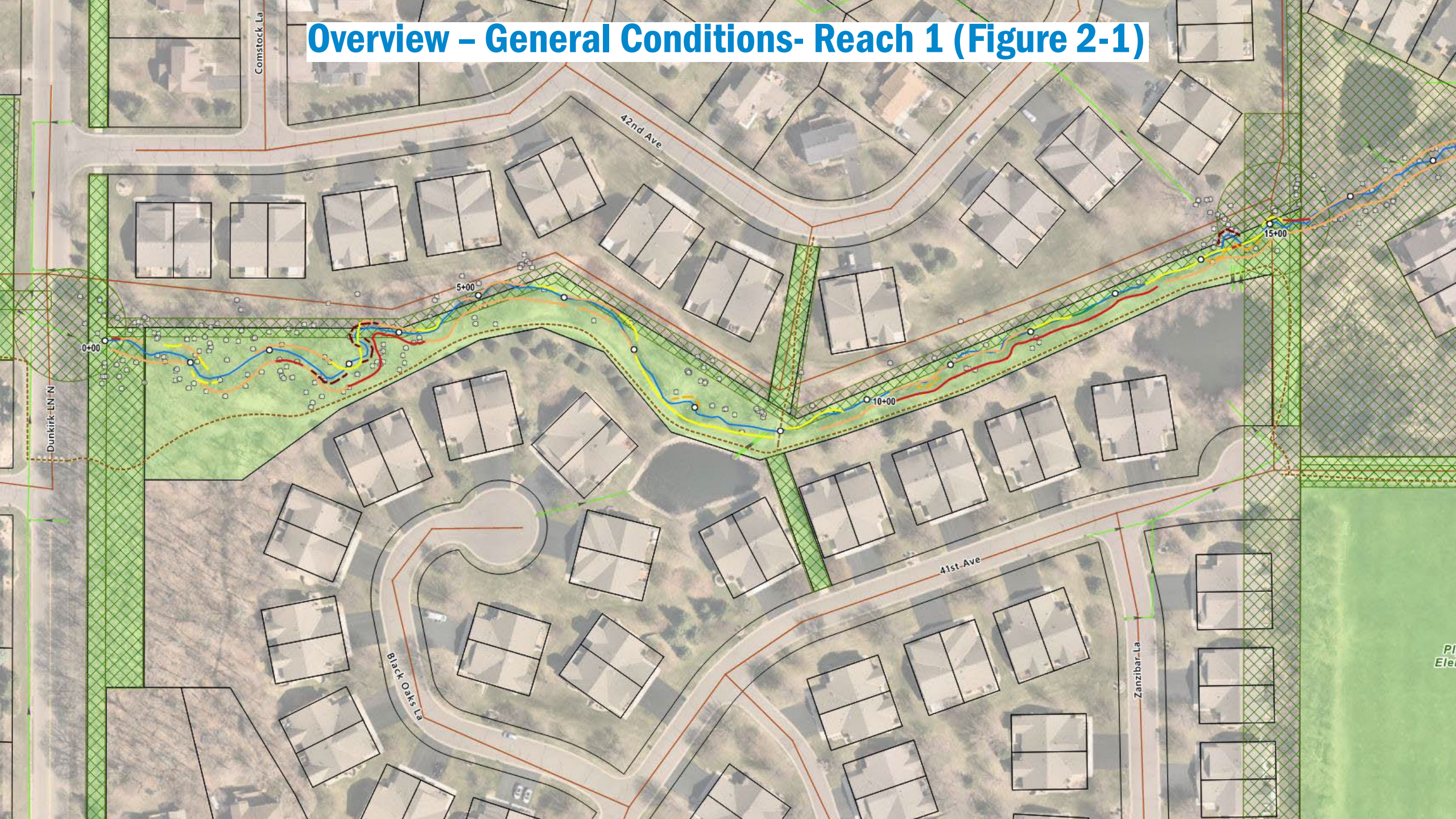
# Overview – General Conditions



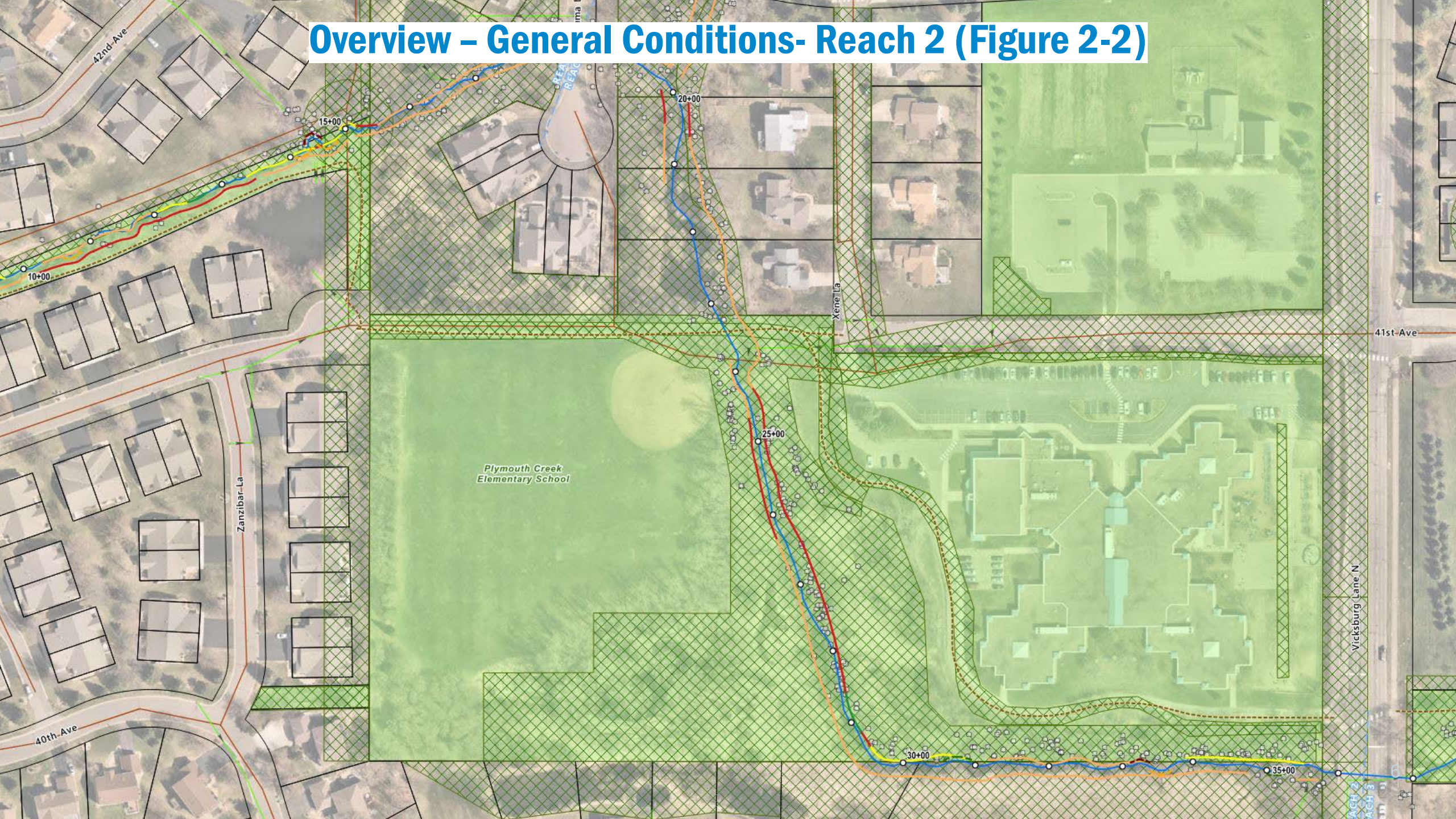
# Overview – Site Location (Figure 1-1)



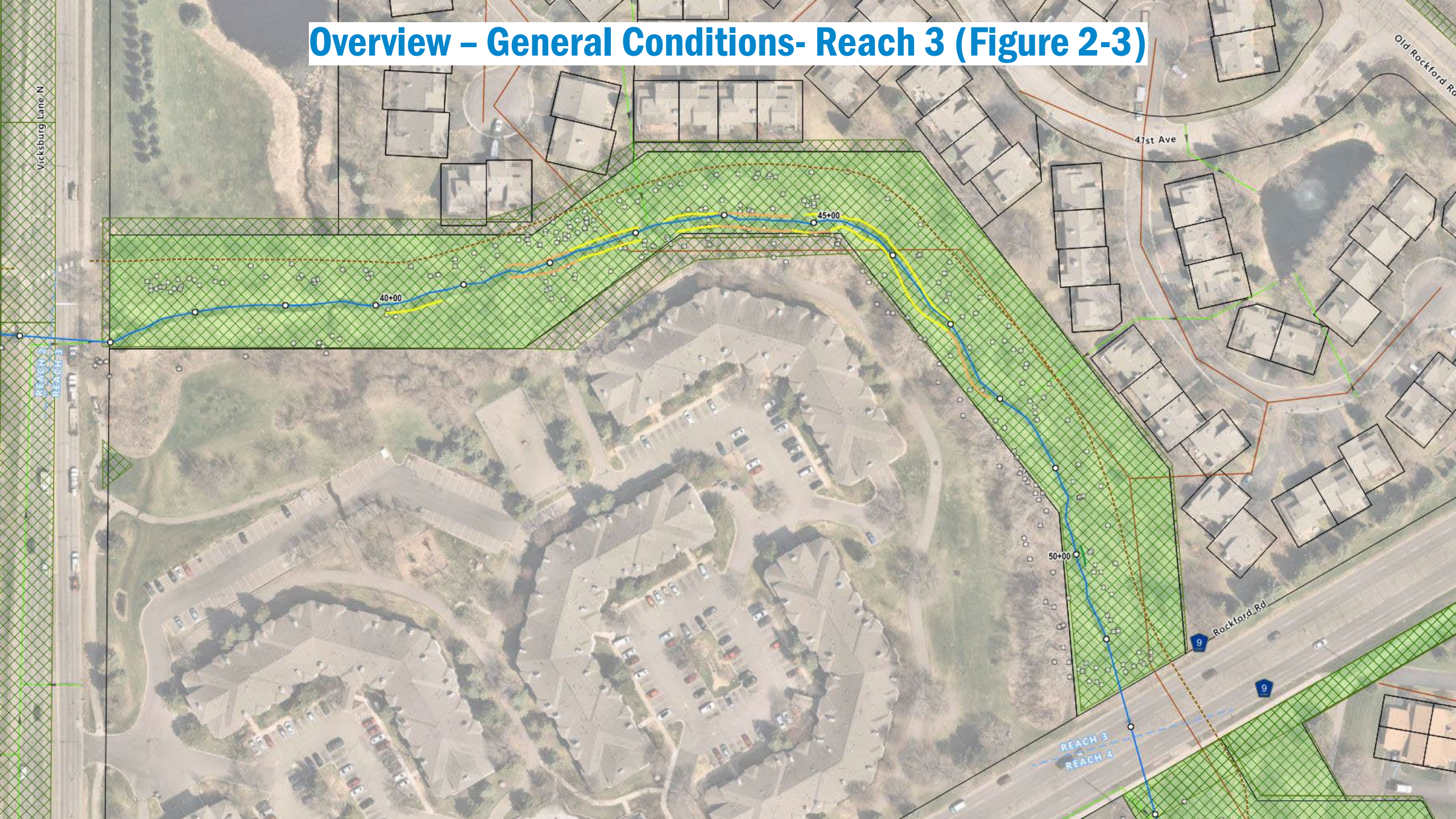
# Overview – General Conditions- Reach 1 (Figure 2-1)



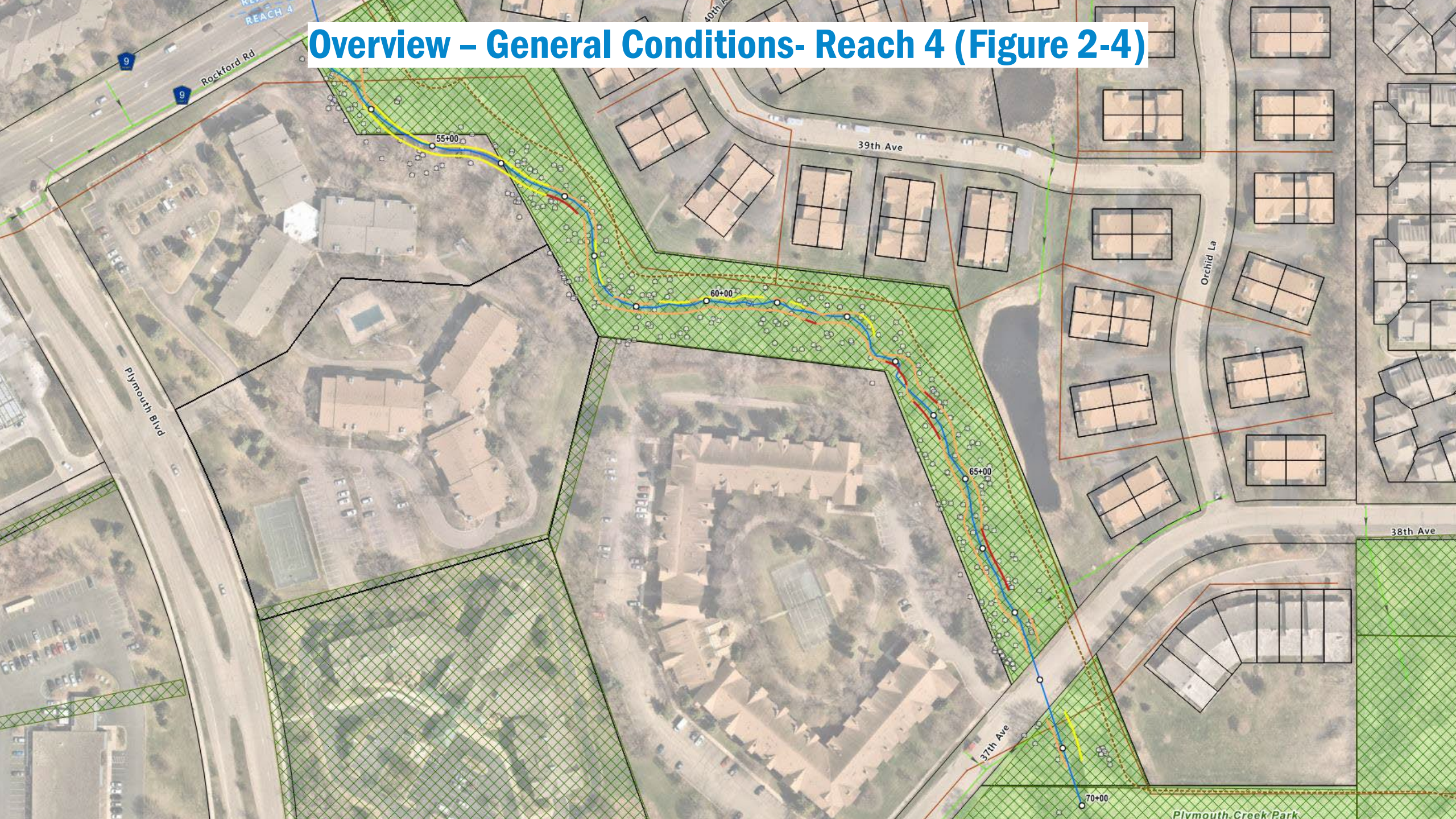
# Overview - General Conditions- Reach 2 (Figure 2-2)



# Overview – General Conditions- Reach 3 (Figure 2-3)



# Overview – General Conditions- Reach 4 (Figure 2-4)





## Project Goals



- Reduce sediment load and associated nutrient and contaminant loading to Plymouth Creek
- Preserve and enhance natural features
- Prevent future channel erosion
- Expand buffers adjacent to the stream
- Enhance buffers through removal of invasive species and replacement with native plantings
- Grade banks to improve channel access to floodplain



## Project Considerations



- Avoid floodplain impacts/no increase in flood elevations
- Maintain existing floodplain storage
- Evaluate areas for sediment removal
- Enhance vegetation and habitat where feasible
- Use bioengineering where possible
- Protect utilities and infrastructure
- Improve the public's physical/visual access to the creek
- Establish stream meanders
- Minimize tree removal



# Field Investigations and Desktop Studies- Overview



## 1. Field Investigations

- Site walk
- Tree survey
- Drone flight

## 2. Desktop Studies

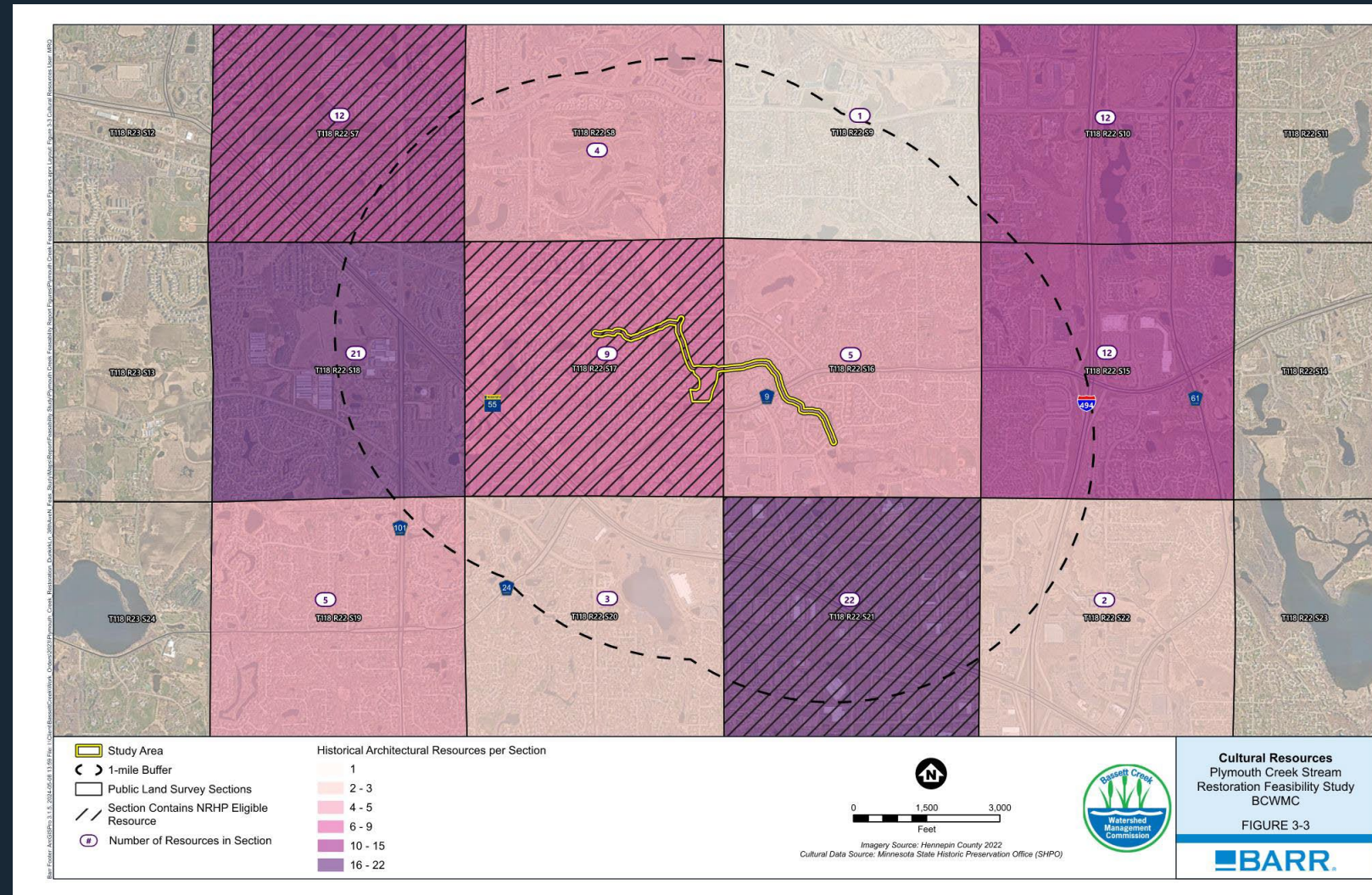
- Wetland assessment
- Environmental review
- Topography and utility location review
- Cultural resources
- Threatened and endangered species
- Project easements



# Field Investigations and Desktop Studies- Cultural Resources (Figure 3-3)



- Ancestral lands of Dakota/Lakota tribes
- 3 unrecorded cemeteries within Township 118, Range 22
- Federal involvement (funding or permitting) may include cultural resources investigation requirements

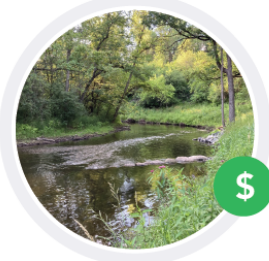
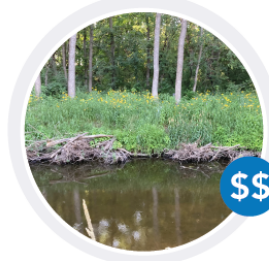
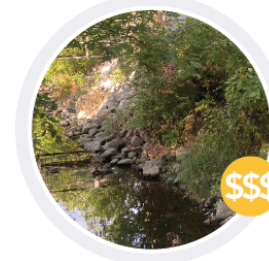


# Stakeholder Input





- Kickoff Meeting
  - November 3, 2023
  - City of Plymouth staff and BCWMC
- Technical Agency/Stakeholder Meeting
  - December 5, 2023
  - City of Plymouth, Hennepin County, USACE, MDNR, MPCA, MBWSR, BCWMC
- Public Open House
  - March 11, 2024
  - City of Plymouth and BCWMC

### Stream Stabilization Methods

| 1                                                                                                                                                                                                                                                                              | 2                                                                                                                                                                                                                                    | 3                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                             |                                                                                                                                                   |                                                                                                                                                                   |
| <b>In-stream structures</b>                                                                                                                                                                                                                                                    | <b>Bank stabilization with bioengineering methods</b>                                                                                                                                                                                | <b>Bank grading with riprap and vegetation establishment</b>                                                                                                                                                                                         |
| <b>Pros</b> <ul style="list-style-type: none"><li>• Reduces near-bank stress</li><li>• Minimal bank disturbance</li><li>• Lowest construction cost</li><li>• Diversifies flow within stream, including energy dissipation pools</li><li>• Provides in-stream habitat</li></ul> | <b>Pros</b> <ul style="list-style-type: none"><li>• More erosion protection along the base of the bank, also known as the bank toe</li><li>• Bioengineering and vegetation features can improve in-stream and bank habitat</li></ul> | <b>Pros</b> <ul style="list-style-type: none"><li>• Riprap allows for the most protection against damaging (high shear stress) flows</li><li>• Immediate stabilization of eroding areas</li></ul>                                                    |
| <b>Cons</b> <ul style="list-style-type: none"><li>• In-stream features can be obstructed with sediment and debris</li><li>• Continued erosion on unprotected bank toe outside the zone of influence of the structures</li></ul>                                                | <b>Cons</b> <ul style="list-style-type: none"><li>• Requires establishment period for vegetation features</li><li>• Moderate grading can increase construction costs, bank disturbance, and potential tree removal</li></ul>         | <b>Cons</b> <ul style="list-style-type: none"><li>• Riprap provides minimal in-stream or bank habitat</li><li>• Riprap and grading are more cost intensive</li><li>• Most bank disturbance during construction, and potential tree removal</li></ul> |

Plymouth Creek Restoration Project



## Plymouth Creek Restoration Concepts



- Re-grade channel banks where feasible, stabilize with vegetation and/or bioengineering methods, such as brush mattresses, live stakes or plantings
- Stabilize streambank toe with hard armoring (riprap), root wads/toe wood, coir logs/fascines, or a combination of these methods
- Install in-stream structures, including boulder cross vanes and J-hook vanes

# Proposed Concepts – Bioengineering and Hard Armoring Elements



## Bioengineering

### Vegetated Reinforced Soil Slopes



### Brush Mattress



### Coir Log



# Proposed Concepts – Bioengineering and Hard Armoring Elements



## Bioengineering

### Vegetated Buffers



### Live Staking



### Root Wads





# Proposed Concepts – Bioengineering and Hard Armoring Elements



## Bioengineering

## Hard Armoring

### Cross Vanes

### J-hooks

### Riprap Toe

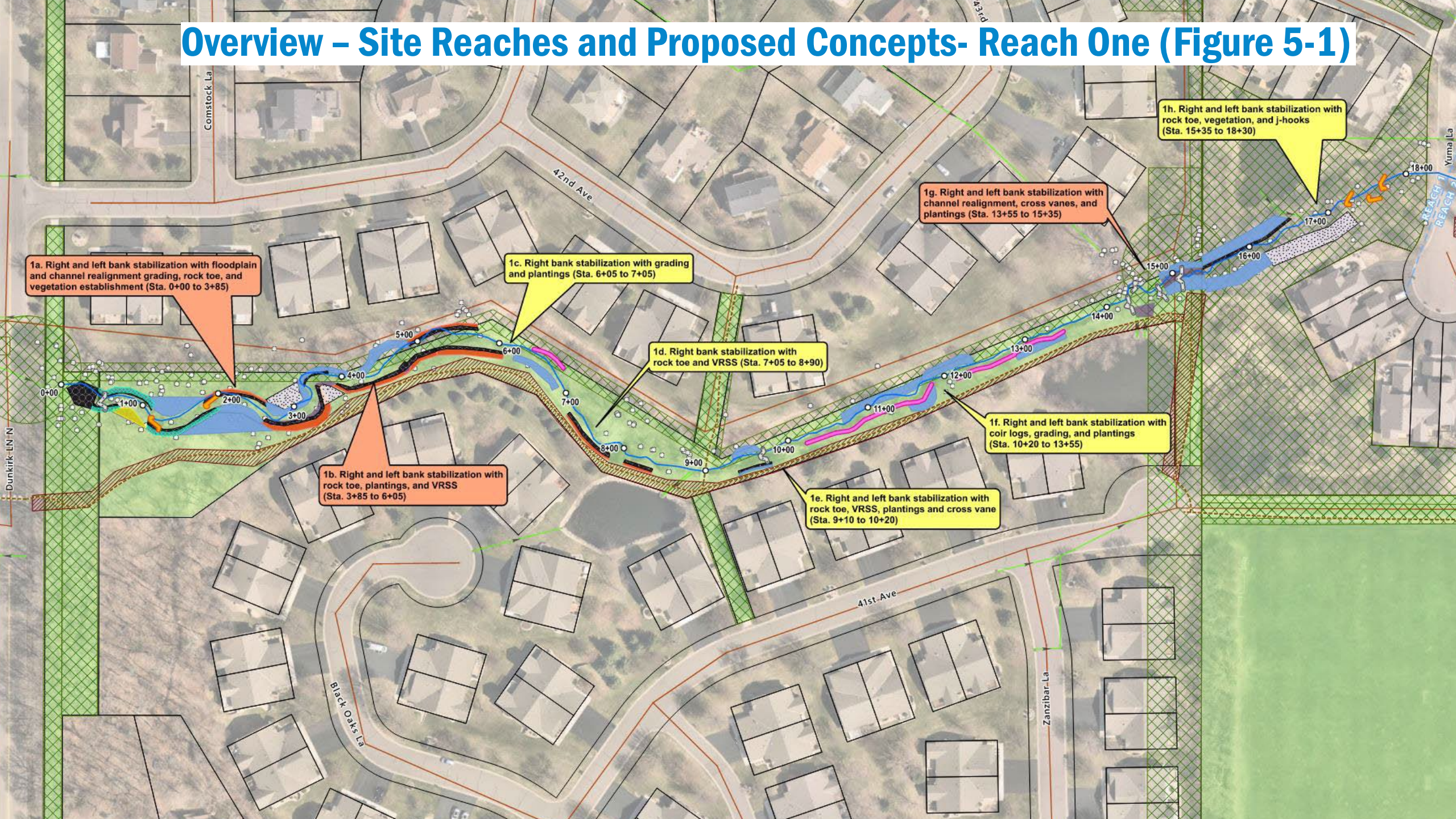


# Plymouth Prioritization Criteria

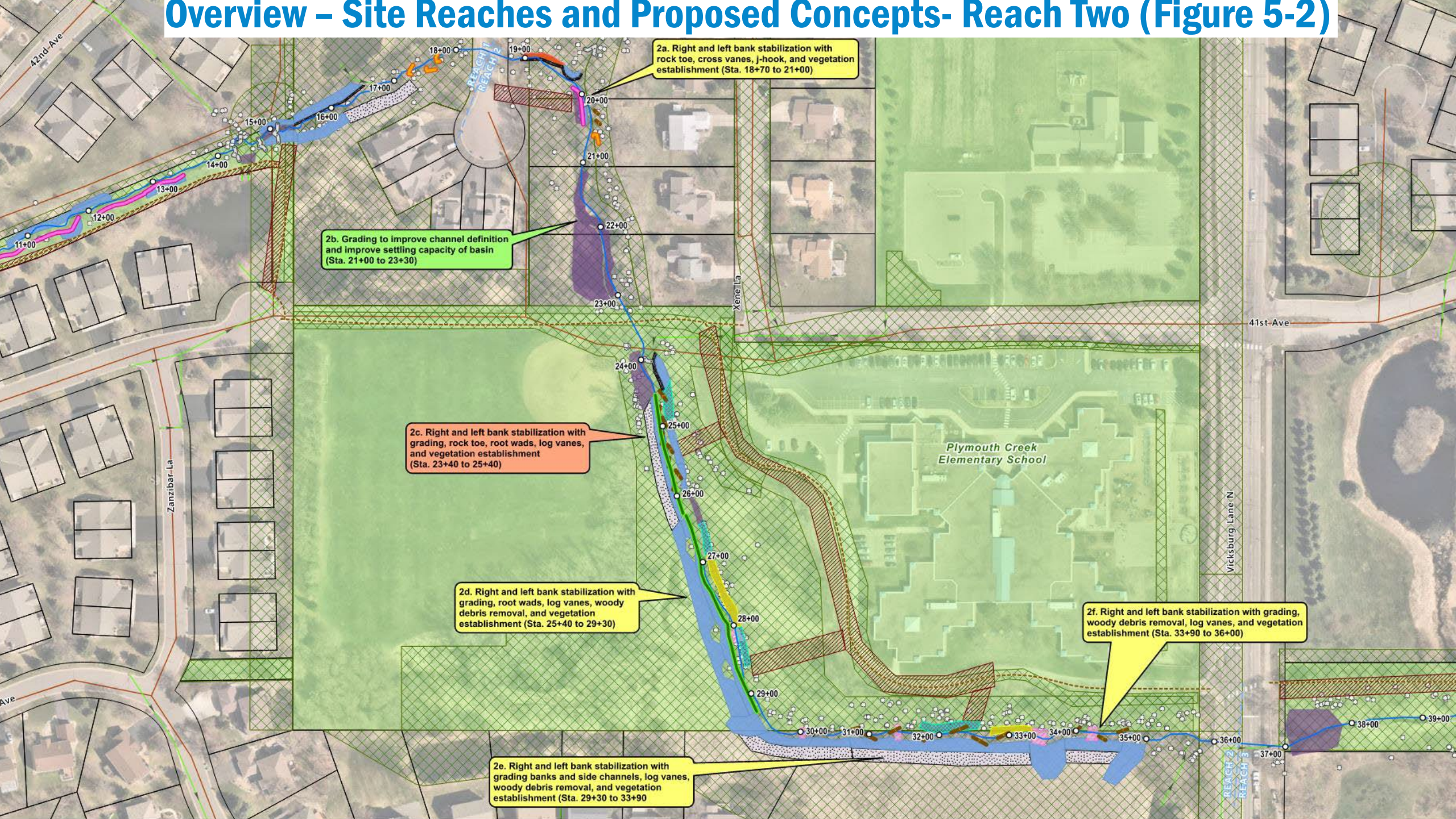


- Severity of existing erosion
- Creek ownership
- Riparian ownership/access for stabilization and vegetation work
- Ease of construction access
- Protection of existing structure/infrastructure
- Impact on surrounding areas
- Potential for future erosion
- Opportunity of habitat creation or restoration
- Maintaining healthy trees, native significant trees
- Vegetation establishment
- Education potential

# Overview - Site Reaches and Proposed Concepts- Reach One (Figure 5-1)



# Overview – Site Reaches and Proposed Concepts- Reach Two (Figure 5-2)



2a. Right and left bank stabilization with rock toe, cross vanes, j-hook, and vegetation establishment (Sta. 18+70 to 21+00)

2b. Grading to improve channel definition and improve settling capacity of basin (Sta. 21+00 to 23+30)

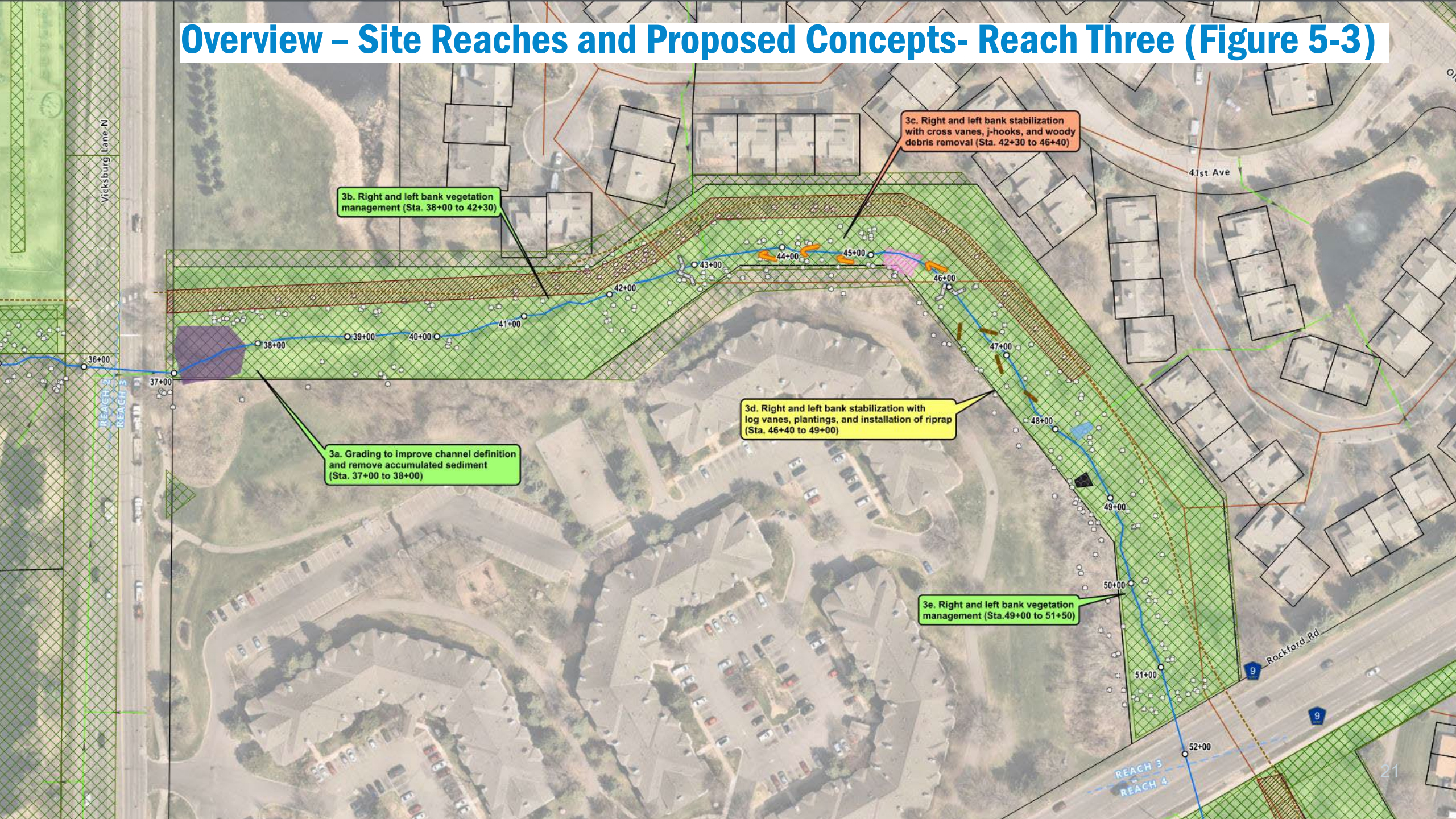
2c. Right and left bank stabilization with grading, rock toe, root wads, log vanes, and vegetation establishment (Sta. 23+40 to 25+40)

2d. Right and left bank stabilization with grading, root wads, log vanes, woody debris removal, and vegetation establishment (Sta. 25+40 to 29+30)

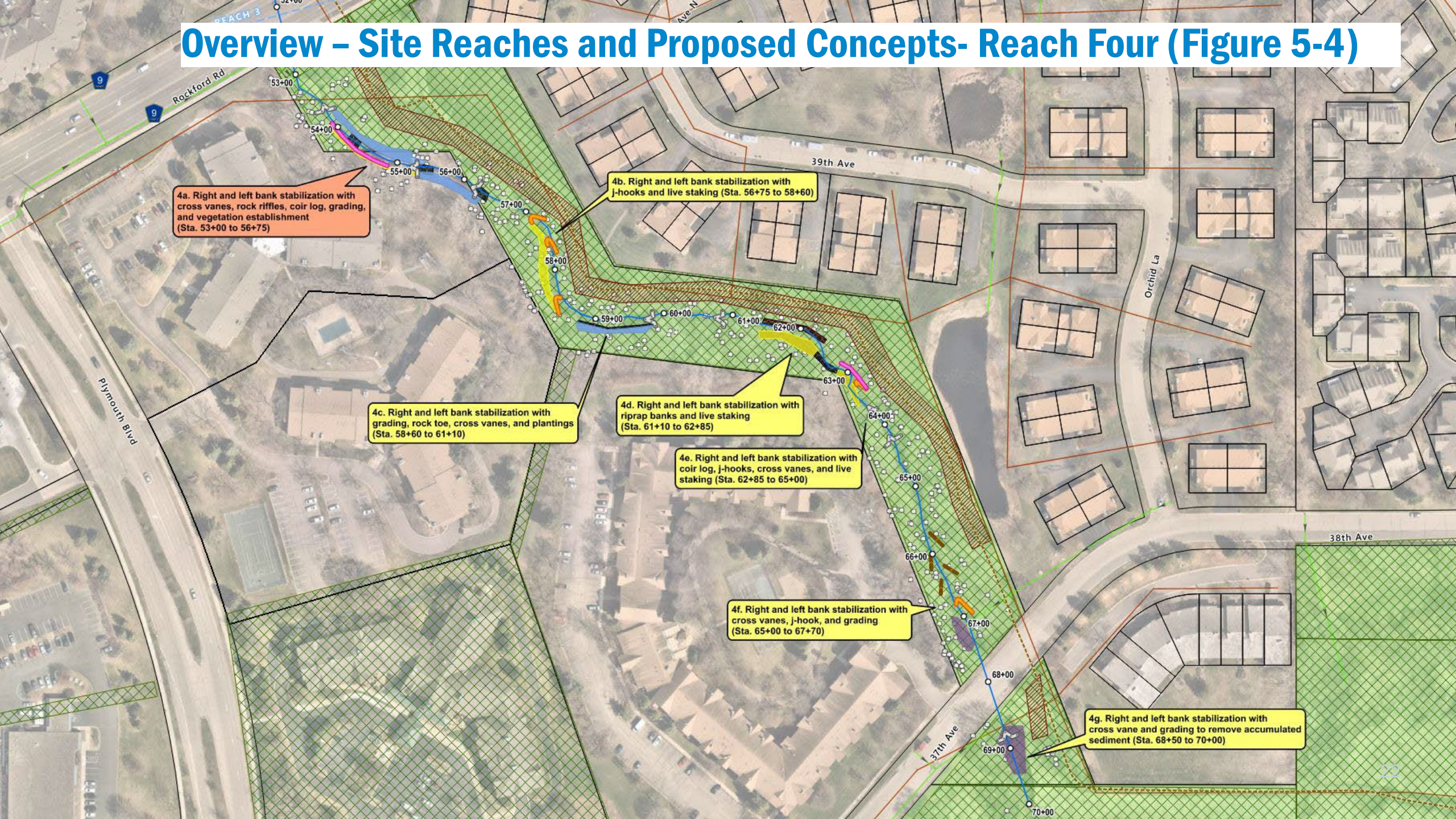
2e. Right and left bank stabilization with grading banks and side channels, log vanes, woody debris removal, and vegetation establishment (Sta. 29+30 to 33+90)

2f. Right and left bank stabilization with grading, woody debris removal, log vanes, and vegetation establishment (Sta. 33+90 to 36+00)

# Overview - Site Reaches and Proposed Concepts- Reach Three (Figure 5-3)



# Overview – Site Reaches and Proposed Concepts- Reach Four (Figure 5-4)

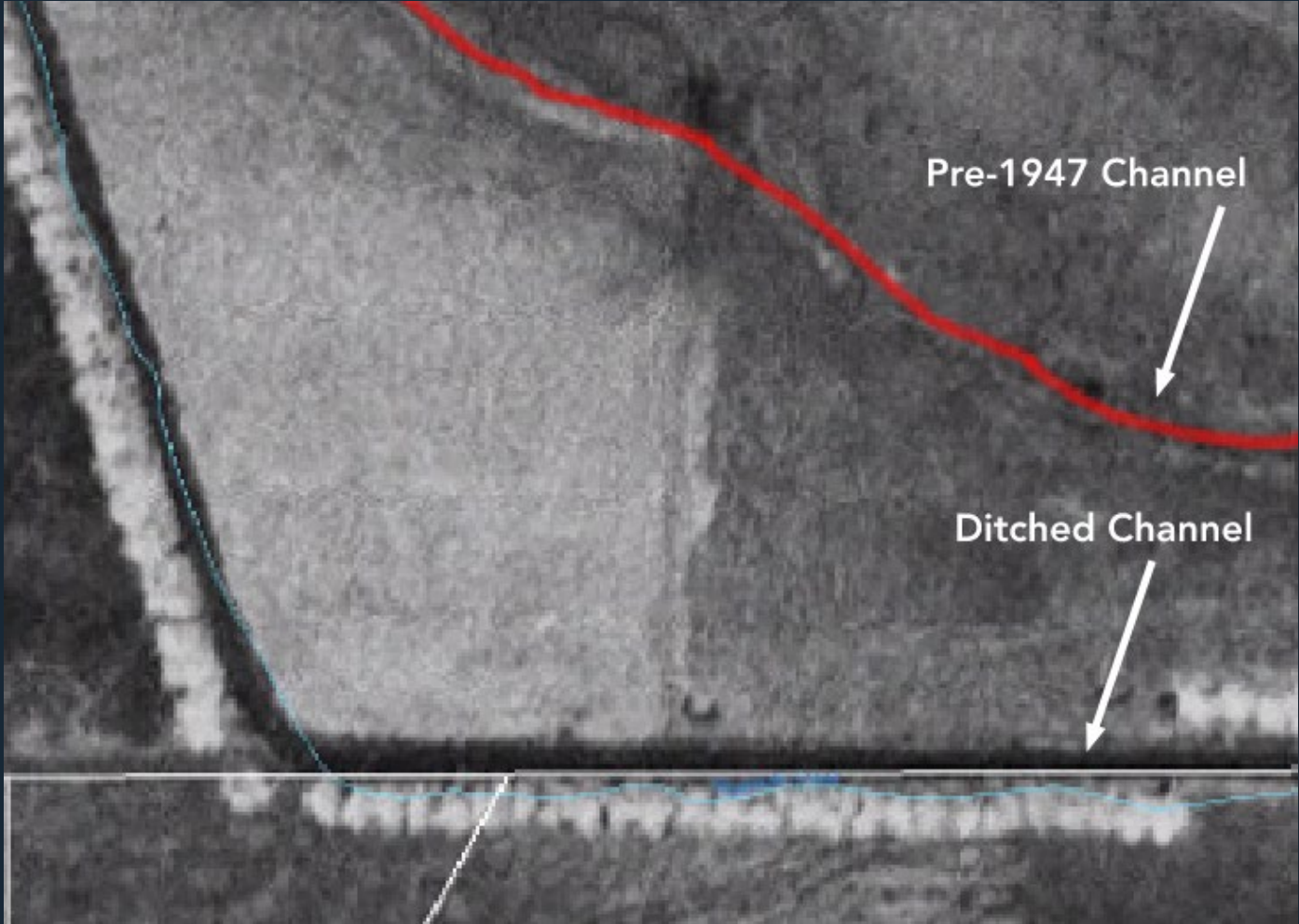


## Additional Proposed Concepts



- Meander
- Sediment removal
- Riparian vegetation management

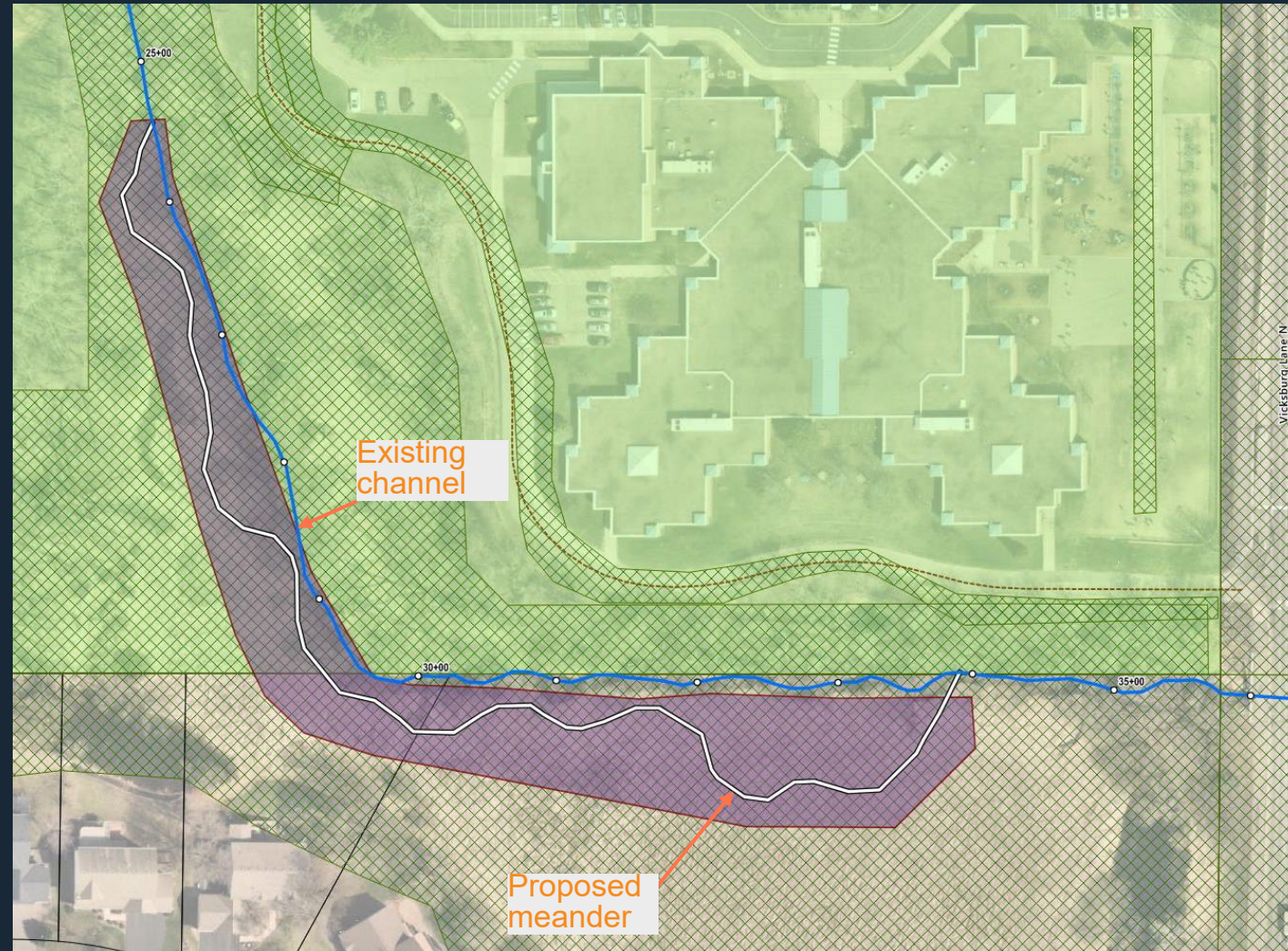
# Proposed Concept - Meander





## Proposed Concept – Meander (Figure 5-5)

- Restore stream to more natural pattern
- Increase stream length and sinuosity
- Decrease velocities and likelihood of bank erosion
- Increase resiliency during higher flow storm events
- Enhance in-stream and riparian habitat
- Promote groundwater connectivity
- Enhance geomorphic processes including sediment transport and deposition
- Enhance floodplain connectivity if floodplain grading is incorporated into the design



# Proposed Concept - Sediment Removal



- Recommend removal of sediment that is impeding flow in two locations:
  - Upstream of Rockford Road and
  - Upstream of 38<sup>th</sup> Avenue
- Recommend leaving sediment in-place that is functioning as floodplain and not inhibiting culvert flow



# Proposed Concept - Riparian Vegetation Management



- Remove invasive plants
- Plant native vegetation to stabilize soils and increase erosion resistance
- Open tree canopy to allow understory vegetation to grow
- Buffer ranges from 15 to 80 feet, most 25 to 40 feet wide



# Estimated Cost and Benefits

| Option Description                                             | Cost Estimate <sup>(1,4,5)</sup>         | Annualized Cost <sup>(2)</sup> | TP Loading             |                                   | TSS Loading            |                                   | Tree Loss <sup>(5)</sup> |
|----------------------------------------------------------------|------------------------------------------|--------------------------------|------------------------|-----------------------------------|------------------------|-----------------------------------|--------------------------|
|                                                                |                                          |                                | Load Reduction (lb/yr) | Cost/lb/yr Reduced <sup>(3)</sup> | Load Reduction (lb/yr) | Cost/lb/yr Reduced <sup>(3)</sup> |                          |
| Option 1. High-ranked restoration areas                        | \$726,000<br>(\$581,000–\$944,000)       | \$50,000                       | 43.6                   | \$1,163                           | 87,310                 | \$0.57                            | 35                       |
| Option 2. High- and medium-ranked restoration areas            | \$2,066,000<br>(\$1,653,000–\$2,686,000) | \$145,000                      | 148.4                  | \$977                             | 296,720                | \$0.49                            | 75                       |
| Option 3. All proposed restoration areas                       | \$2,196,000<br>(\$1,757,000–\$2,855,000) | \$156,000                      | 148.4                  | \$1,051                           | 296,720                | \$0.53                            | 76                       |
| Option 1a. High-ranked restoration area + meander              | \$1,369,000<br>(\$1,096,000–\$1,780,000) | \$88,000                       | 85.2                   | \$1,033                           | 170,510                | \$0.52                            | 35                       |
| Option 2a. High- and medium-ranked restoration areas + meander | \$2,360,000<br>(\$1,888,000–\$3,068,000) | \$162,000                      | 148.4                  | \$1,092                           | 296,720                | \$0.55                            | 71                       |
| Option 3a. All proposed restoration areas + meander            | \$2,420,000<br>(\$1,936,000–\$3,146,000) | \$170,000                      | 148.4                  | \$1,146                           | 296,720                | \$0.57                            | 72                       |

# Required New Easements Summary



| Design Option             | Length of Permanent Easement for Stream Work (Channel or Riparian) | Length of Temporary Easement for Construction Access | Length of Temporary Easement for Vegetation Management | Total Length of Easement |
|---------------------------|--------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------|--------------------------|
| Option 1                  | 250                                                                | 395                                                  | 904                                                    | 1,550                    |
| Option 2, without meander | 250                                                                | 806                                                  | 2,142                                                  | 3,468                    |
| Option 3, without meander | 250                                                                | 806                                                  | 3,105                                                  | 4,161                    |
| Meander                   | 0                                                                  | 0                                                    | 0                                                      | 0                        |

- Coordination with private property owners will be required for all three options
- City will lead effort of coordinating with property owners and obtaining agreements

# Permitting



- Clean Water Act Section 404 and Section 401 Water Quality Certification
- MPCA Construction Stormwater General Permit
- Compliance with the Minnesota Wetland Conservation Act
- Environmental Assessment Worksheet (potentially required)
- MDNR Public Waters Work Permit
- BCWMC Requirements (floodplain and erosion control)

## Recommendation



- Option 3a (if funding allows)
- Option 1a (if funding is limited, adding medium and low priority sites if possible)
- Basis for recommendation
  - Stabilize eroding banks
  - Improve habitat
  - Reduce chance of future erosion
  - Protect existing infrastructure, including paved trails and sewer lines
  - Ease and value of performing all work as part of a single project

## Recommendation



- Prioritization and specific stream restorations methods may change during planning, pre-bid, or construction phase based on any of the following:
  - Changed site conditions
  - Site access/permission
  - Bid results
  - Other site conditions or constraints



# Project Funding

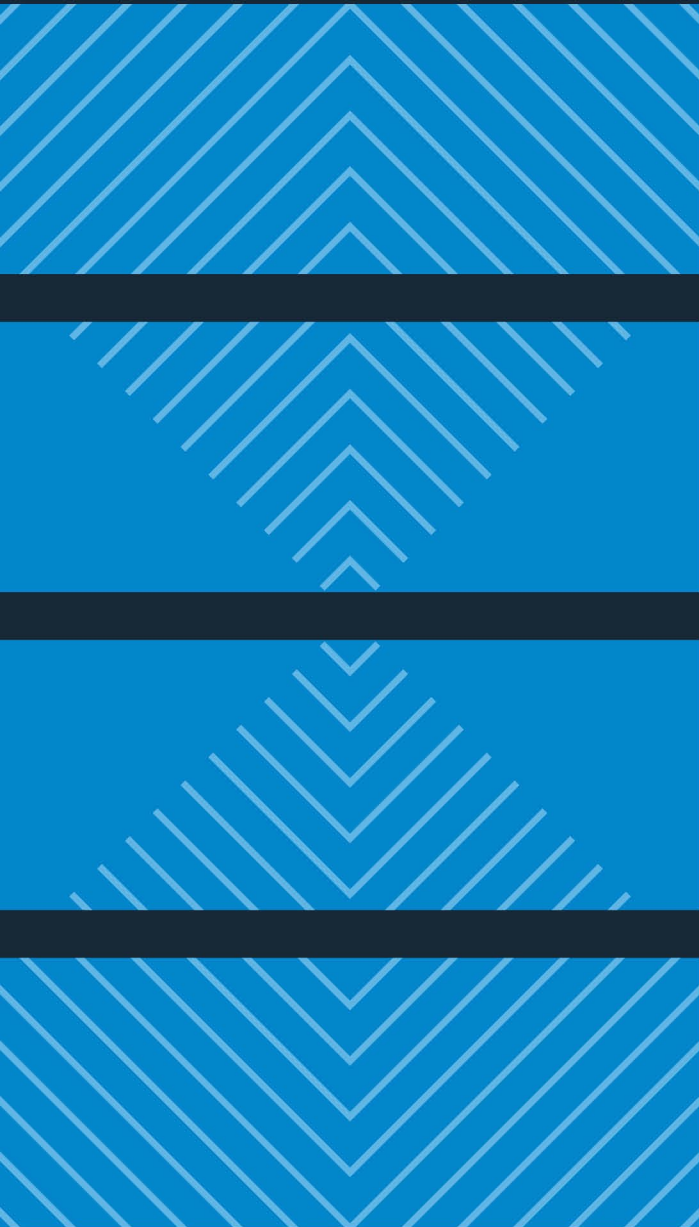


- Bassett Creek Watershed Management Commission Capital Improvement Project funds
  - \$1,000,000 - 2025
  - \$1,000,000 - 2026
- City of Plymouth
  - CIP funds may be available, need to request soon
- Grant possibilities
  - Conservation Partners Legacy Grant Program (\$5K to \$500K)
  - Clean Water Fund Projects and Practices Grant (competitive, annual cycle, 2023 awarded grants up to \$975K)
  - Hennepin County Opportunity Grants (up to \$100K)
  - Watershed-based Implementation Funding (every two years)

# Project Timeline



- May or June 2024 – Commission selects option and sets levy amount
- September 2024 – Hold public hearing and order project
- Fall 2024 – Develop agreement with City for design and construction of project
- Fall/Winter 2025-2026 and potentially 2026-2027 construction



# Discussion/Questions?

