Middlebury Creek Road Erosion Stability Study for Addison County Regional Planning Commission Transportation Advisory Committee Meeting

January 17, 2018

Presented By:
Scott A. Williams, P.E. (Pathways)
Overall Project Team

Addison County Regional Planning Commission (Sponsoring Agency)
- Josh Donabedian, Transportation Planner
- Overall project coordination

Town of Middlebury (Project Sponsor)
- Kathleen Ramsey, Town Manager
- Dan Werner, Public Works Planning Director
- Town Infrastructure Committee

Pathways Consulting, LLC (Lead Firm)
- Scott Williams, P.E. – project manager for Pathways work
- Responsible for overall project management and delivery including field work, research, mapping, alternative analysis

Headwaters Hydrology, PLLC (Subconsultant for Pathways)
- Sean Sweeney, P.E., CWS – stream geomorphology subconsultant
- Completion of stream assessment, preliminary recommendations
Project Goals

- **STUDY AREA**: Creek Road (2.8 miles) beginning 0.4 miles south of Court Street (Route 7) to Three Mile Bridge Road, including 500 feet of Three Mile Bridge Road along Middlebury River

- Assess Extent, Frequency and Causes of Flooding

- Review Extent of Damage to Otter Creek, Middlebury River, Creek Road, and Adjacent Properties

- Review Alternatives for Reducing Flooding and Erosion

- Review Alternatives for Repairing and/or Relocating Creek Road to Re-open Creek Road and Increase Long-term Stability

- Determine Costs and Potential Funding Sources

- Seek Input and Involve Adjacent Property Owners and Community in Study Process
Project Approach and Scope of Work

• Kickoff Meeting with ACRPC and Town (March 3, 2016)

• Existing Data Collection – reviewed tax maps, aerials, wetlands, LiDAR, FEMA flood maps, soils, conservation easements, flood data, etc. (March to September 2016)

• Site Reconnaissance and Field Data Collection - site visits, limited field surveying (April to September 2016)

• Stream Geomorphic Assessment (SGA) with Headwaters
   Stream characterization, reviewed channel bed/bank materials
   Hydrologic and hydraulic modeling
   Estimated peak flows, calibrated flows from stream gage data
   Historic channel migration (reviewed aerials back to 1942)
   Surficial geology, topography, and floodplain map review
   Identified erosion areas, causes, and recommended alternatives
   produced Fluvial Erosion Hazard and Corridor map
   Completed April to June 2016
**Project Approach and Scope of Work Cont.**

- **Base Mapping** – combined field data, maps, research, other data into comprehensive resource and base maps (July 2016)

- **Conceptual Alternative Analysis** - conceptual alternatives for relocating or converting Creek and Three Mile Bridge Road, enhancing buffer, stabilizing banks (August 2016)

- **Prioritization Process** – established criteria for analyzing alternatives High, Moderate, Low, None (August 2016)

- **Public Involvement Process & Meetings**
  - Direct contact with abutting property owners (July to August 2016)
  - Interested Stakeholder Questionnaire (July to August 2016)
  - Public Meeting (September 7, 2016)
  - Town and ACRPC Steering Committee Meeting (October 18, 2016, February 2, 2017 and March 2, 2017)
Project Approach and Scope of Work Cont.

***Through Phase 2 Funding***

- **Final Creek Road Erosion Study Report (June 16, 2017):**
  - Conceptual Alternative Analysis
  - Design Recommendation Comparison Table
  - Plans, Cross Sections, Typical Details for Alternatives
  - Conceptual Engineer’s Opinion of Probable Cost (EOPC) Documents
  - Overall Design Recommendations
  - Regulatory, Permitting, and Environmental Review (Federal, State, and local agencies)
  - Potential Funding Sources
  - Future Steps
  - Compilation of all background data and information

- **Separate Executive Summary of Report (June 16, 2017)**

- **Future Project Review (beyond project scope) – Town Budget and Infrastructure Committees, Selectboard, and staff**
Site Photographs from February 25, 2016

North end of project area <10 foot buffer

Middle of project area <10 foot buffer

South end of project area <10 foot buffer

Banks along Middlebury River <10’ buffer
Summary of Stream Assessment Results

• Otter Creek
  - Channel generally stable horizontally and vertically
  - Little channel migration over past 70 years
  - Banks consist of soils naturally resistant to erosion
  - Active erosion in 7% of banks (1,000 feet on road side)
  - River corridor confined on west by railroad embankment
  - Creek Road does not confine river since not elevated
  - Erosion primarily due to lack of riparian vegetation, close proximity of Creek Road preventing vegetated buffer critical to bank stability and river health

• Middlebury River
  - Channel unstable horizontally and vertically
  - Active channel migration and adjustment
  - Channel bend has shifted 160 feet toward road since 1942
  - Current erosion in most banks (500 feet on Creek Road)
  - Banks too high along Creek Road and confined by road
  - Creek Road on outside of meander bend
  - Erosion primarily due to channel migrating toward Creek Road, channel deepening at bank toe, lack of riparian vegetation, increased scour on banks
Stream Assessment Recommendations

• **Otter Creek Corridor:**
  - Meander Belt Corridor = 960 feet (to accommodate channel in stable condition)
  - River Corridor = 1,200 feet (with buffer for channel to evolve, maintain stability)
  - Otter Creek currently occupies full river corridor, road prevents adequate buffer
  - Recommendations:
    - 1st Priority to relocate Creek Road outside river corridor
    - If not feasible, shift road as far as possible (at outside of meander bends), stabilize river banks, and restore 25-foot vegetated buffer with native plantings
    - Bank stabilization (hard armoring) where road not moved
    - Maintain current road elevation to prevent floodplain cutoff

• **Middlebury River Corridor:**
  - Meander Belt Corridor = 550 feet
  - River Corridor = 750 feet
  - River will continue to migrate within corridor, confined by road with no buffer
  - Recommendations for Middlebury River:
    - 1st Priority to relocate Creek Road outside river corridor
    - If not feasible, relocate road outside meander belt corridor
    - If not feasible, shift road as far as possible (75 feet), stabilize with bioengineered banks
    - Avoid stabilizing bank in current location to prevent disruption of adjustment process
    - Bank stabilization (hard armoring) if road not moved at least 75 feet
    - Lower bank height by excavating floodplain bench
Prioritization Criteria for Study Area

Established 4 priority levels to determine critical focus areas, magnitude of issues (i.e., road damage), feasibility, and related costs, PRIORITY PLAN

- **HIGH PRIORITY (RED = 700 feet):**
  - Area of active bank erosion
  - Less than 10 feet of riparian buffer between road and bank
  - Road at top of bank
  - Current damage to road and/or bank
  - No vegetation in limited riparian buffer

- **MODERATE PRIORITY (ORANGE = 7,000 feet):**
  - Some limited bank erosion
  - Between 10 to 25 feet of riparian buffer
  - Road separated minimally from top of bank
  - Limited vegetation in riparian buffer

- **LOW PRIORITY (YELLOW = 2,300 feet):**
  - No active bank erosion
  - 25 feet or greater width of riparian buffer
  - Adequate vegetation in riparian buffer

- **NONE (GREEN = 4,900 feet):**
  - No bank erosion
  - Adequate riparian buffer
  - Significant separation (>100 feet) between road and river
Conceptual Priorities Plan
Initial Conceptual Alternatives Considered

Alternative #1 – Relocation of Road Outside Corridor
- Option A – 10,600 feet of new road = $1,500,000
- Option B1 – 8,000 feet of new road = $1,275,000
- Option B2 – 7,500 feet of new road = $1,258,000

Alternative #2 – Shift Road to Restore 25 foot Buffer
- Shift 8,000 feet of road = $995,000 (w/o bank stabilization)

Alternative #3 – Bank Stabilization on Existing Road
- 700 to 4,200 feet (depending on priority) = $420,000 to $2,520,000

Other Possible Alternatives Not Initially Studied:
- Full Road Closure – affects access to abutting properties
- Conversion of Road to Multi-Use Path – same as above
- Limited Road Improvements – maintaining road in-place with drainage improvements, resurfacing and/or raising road (not advisable due to active floodplain), viewed as short-term approach
Conceptual Alternative #2 – Riparian Buffer Restoration with Road Shift
Conceptual Alternative #3 – Bank Stabilization
Conceptual Alternative Analysis

• Conceptual alternatives revised following feedback from public and Steering Committee to consider:
  ❖ Additional Meadow Glen Road connection
  ❖ Abandoning all or part of existing road for relocation options
  ❖ Revised relocation options based on feasibility
  ❖ Add option for converting road to multi-use path
  ❖ Add option for maintaining road with minimum improvements

• Engineer’s Opinion of Probable Cost documents prepared for each alternative

• Comparison Chart prepared to aid review and comparison

• 3 previous alternatives expanded to 8:
  ❖ Road relocation alternatives #1A to 1D with variations for maintaining, shifting, and implementing bank stabilization for remaining road
  ❖ Other alternatives #2-5 for road shift, bank stabilization, conversion of road to multi-use path, and maintaining in-place
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Final Design Recommendations Considered

- Design Recommendation #1 – Road Shift with Riparian Buffer Restoration
- Design Recommendation #2 – Bank Stabilization and Minimum Roadway Improvements
- Design Recommendation #3 – Meadow Glen Drive Road Connection With Road Shift and Riparian Buffer Restoration on North/South Creek Road
- Design Recommendation #4 – Maintaining Creek Road In-Place
Design Recommendation #1 – Road Shift with Riparian Buffer Restoration

[Map Image]

Legend:
- Middlebury Area Land Trust
- Mitigation Site Boundary
- Wetlands - View
- Wetlands - Advisory
- Existing Stream / Ditch
- Existing Culvert (Creek Road)
- Existing Creek Road to Remain
- Shift Creek Bed Within Existing Right-of-Way to Restore 25-Foot Riparian Buffer (Requires Additional 10-40 Feet of Right-of-Way)
- Shift Creek Road Outside Existing Right-of-Way to Support 25-Foot Riparian Buffer (Requires Additional 10-40 Feet of Right-of-Way)

Pathways Consulting, LLC
Cross-Sections for Design Recommendation #1 – Road Shift with Buffer Restoration

CROSS-SECTION – ROAD SHIFT WITHIN ROW WITH BANK STABILIZATION

CROSS-SECTION – ROAD SHIFT OUTSIDE ROW WITH BANK STABILIZATION
Design Recommendation #2 – Bank Stabilization and Minimum Roadway Improvements
Cross-Section for Design Recommendation #2 – Bank Stabilization and Minimum Roadway Improvements

CROSS-SECTION – BANK STABILIZATION
Bank Restoration Examples

- Fabric Encapsulated Soil (FES)
- FES with Floodplain Bench
- FES with Stone Fill, Floodplain Bench
- Stone Fill with Loam & Vegetation
Design Recommendation #3 – Meadow Glen Drive Connection with Road Shift and Riparian Buffer Restoration on North/South Creek Road
Cross-Sections for Design Recommendation #3 – Meadow Glen Drive Connection with Road Shift and Riparian Buffer Restoration on North/South Creek Road

CROSS-SECTION – ROAD SHIFT WITHIN ROW WITH BANK STABILIZATION

CROSS-SECTION – ROAD SHIFT OUTSIDE ROW WITH BANK STABILIZATION
Design Recommendation #4 – Minimum Roadway Improvements To Maintain Creek Road In-Place
# Design Recommendations #1-4 Comparison Table

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<th>DESIGN #3</th>
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<td>New Road Alignment Required</td>
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<td>8,000 LF (park)</td>
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<td>Right of Way (ROW) or Easement Acquisition Required</td>
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<td>7,000 LF of ROW (average 10-15 feet width) on 7 private properties</td>
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Pathways Consulting, LLC
Comparison of Final Design Recommendations

- **Design Recommendation #1 – Road Shift with Riparian Buffer Restoration**
  - Shift 8,320 feet of Creek Road within, or near ROW
  - 7,400 feet of new ROW acquisition or easements (10 to 40 feet)
  - Restores 25-foot buffer between road and Otter Creek banks
  - Estimated Cost = $1,150,000

- **Design Recommendation #2 – Bank Stabilization and Minimum Roadway Improvements**
  - Implement 2,200 feet of bank stabilization along critical sections including stone fill toe protection and fabric encapsulated soil (FES)
  - Minimum roadway improvements along 12,400 feet of road including resurfacing 50%, 800 feet of fabric road stabilization, upgrading drainage crossings, adding three new drainage crossings, new ditching
  - Estimated Cost = $1,469,000
Comparison of Final Design Recommendations (Cont.)

- Design Recommendation #3 – Meadow Glen Drive Road Connection With Road Shift and Riparian Buffer Restoration on North/South Creek Road
  - Constructing new 2,000-foot road connection between Meadow Glen Drive and Creek Road
  - Shift 4,210 feet of Creek Road within, or near ROW
  - Abandon and restore 4,800 feet of existing road to natural condition
  - 2,000 feet of new ROW acquisition (60 feet wide) for new road, 3,970 feet of additional ROW or easements (10 to 40 feet) for road shift
  - Restores 25-foot buffer between road and Otter Creek banks
  - Estimated Cost = $1,388,000

- Design Recommendation #4 – Maintain Creek Road In-Place
  - Implement minimum roadway improvements along 12,400 feet of road including resurfacing 50%, 800 feet of fabric road stabilization, upgrading drainage crossings, adding three new drainage crossings, 8,000 feet of new ditching, and 1,300 feet of bank stabilization
  - Estimated Cost = $530,000
Regulatory, Permitting, and Environmental Review

• Completed preliminary assessment of regulatory reviews and/or permits needed for designs #1-4:
  ❖ VANR and USACE Wetland permitting
  ❖ VANR Stream Alteration permitting
  ❖ Endangered and/or Threatened Species review
  ❖ FEMA coordination and review
  ❖ Town Zoning and Subdivision regulations review for farmland, wildlife habitat, shorelands, riparian buffers, floodplains, subdivisions
  ❖ Town Conservation Commission
  ❖ Conservation easement impact potential and negotiations (MALT, Ducks Unlimited, and others)
  ❖ Historic Preservation review
Overall Recommendation

• Design Recommendation #1 (Road Shift):
  ❖ Cost-effective and feasible
  ❖ Restores riparian buffer, shifts road away from Otter Creek
  ❖ Addresses current bank erosion areas
  ❖ Lowest cost of long-term solutions considered
  ❖ Limited width ROW acquisition (less costly than full-width acquisition and eases negotiation)
  ❖ Less impacts to natural resources, private properties, and existing conservation easements
  ❖ Maintains existing traffic pattern and public use
  ❖ Moderate permitting considerations
  ❖ Recommended through Town review
  ❖ Reasonably supported by public opinion
Future Steps and Funding Potential

• Future tasks for implementing design recommendation:
  ▶ Additional public engagement and sharing
  ▶ Site reconnaissance and investigation (survey, wetlands, etc.)
  ▶ Final engineering and design with capable consulting firm
  ▶ Boundary surveying, deed research, and ROW acquisition
  ▶ Abutting property owner negotiations
  ▶ Environmental and natural resource review
  ▶ Local, State and Federal regulatory review and permitting (VANR, USACE, FEMA, Town, etc.)
  ▶ Explore funding through various grant and/or loan programs:
    ➢ FEMA Hazard and Pre-Disaster Mitigation Grant Programs
    ➢ Vermont Better Roads
    ➢ VANR Conservation Ecosystem Restoration Grant Program
    ➢ USDA Rural Development Grant Program
  ▶ Secure funding for project design and construction
Conclusion of Study

• Final Creek Road Erosion Study Report (June 16, 2017):
  - Compilation of all work, plans, analysis, and documentation completed during the project
  - Included separate Executive Summary document for Town

• Future Project Review (beyond study scope):
  - Town has already engaged in planning discussions through Selectboard, Infrastructure and Budget Committees, Public Works, and other Town staff

• QUESTIONS?