

Context Sensitive Design & Solutions "A Better Way"

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Design Institute - May 2004



Presentation Overview

1. Context and why it's important
2. Paradox & Challenge & Opportunity
3. What CSD/CSS is and is not
4. Mn/DOT's CSD Approach and Policy
5. Mn/DOT's CSD Principles and Benefits
6. Flexibility in Design
7. Preserving & Enhancing Context with Flexibility in Design... "A Better Way"

What is context ?

- “The interrelated condition in which something exists” (everything about the people and place)
- “The weaving of parts into a whole”



Why is context important ?

- External / Public stakeholders expect More & Better & Quicker within Budget & with their Approval



- Achieving consensus in response to context is critical for timely delivery of projects and getting them built

Why is context important ?

Five Measures of successful projects:

- Community acceptance
- Environmental compatibility
- Engineering and technical functionality
- Financial feasibility
- Timely delivery



Why is context important ?

- Context is an informant of good planning and design



Why is context important ?

Authoritative Basis for context sensitivity in transportation:

- Highway Beautification Act of 1965
- Historic Preservation Act of 1966
- Federal-Aid Highway Act of 1968 [Section 4(f) of DOT Act]
- National Environmental Policy Act of 1969
- Intermodal Surface Transportation Efficiency Act of 1991
- National Highway System Designation Act of 1995
- Transportation Equity Act for the 21st Century of 1999

Why is context important ?



It is the "continuous responsibility" of the federal government to "use all practicable means" to "assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings."

[National Environmental Policy Act of 1969]

Why is context important ?

" The new statute (23 USC 109 as stated on page 6 of the NHS Designation Act of 1995) gives broader authority for design issues than has ever been presented to engineers before, taking into consideration environmental, scenic, aesthetic, historic, community and preservation impacts."

Pamela Brown (former Deputy Counsel to MSHA
May 1998 - Thinking Beyond the Pavement Nat'l. Workshop

Why is context important ?

On January 24, 2002 FHWA Administrator Mary Peters wrote:

"Context-Sensitive Design (CSD) is an approach that places preservation of historic, scenic, natural environment, and other community values on an equal basis with mobility, safety and economics. I am asking for your support and assistance in advancing CSD as an element of our Environmental Stewardship and Streamlining efforts."

Why is context important ?

FHWA Administrator Mary Peters continued...

"A transportation facility is an integral part of the community's fabric and it can help define the character of the community or it can destroy it."

"We should seek to institutionalize the principles of CSD with the same commitment that drove the implementation of the Interstate Highway System."

U.S. General Accounting Office Report

GAO-03-398 - April 2003

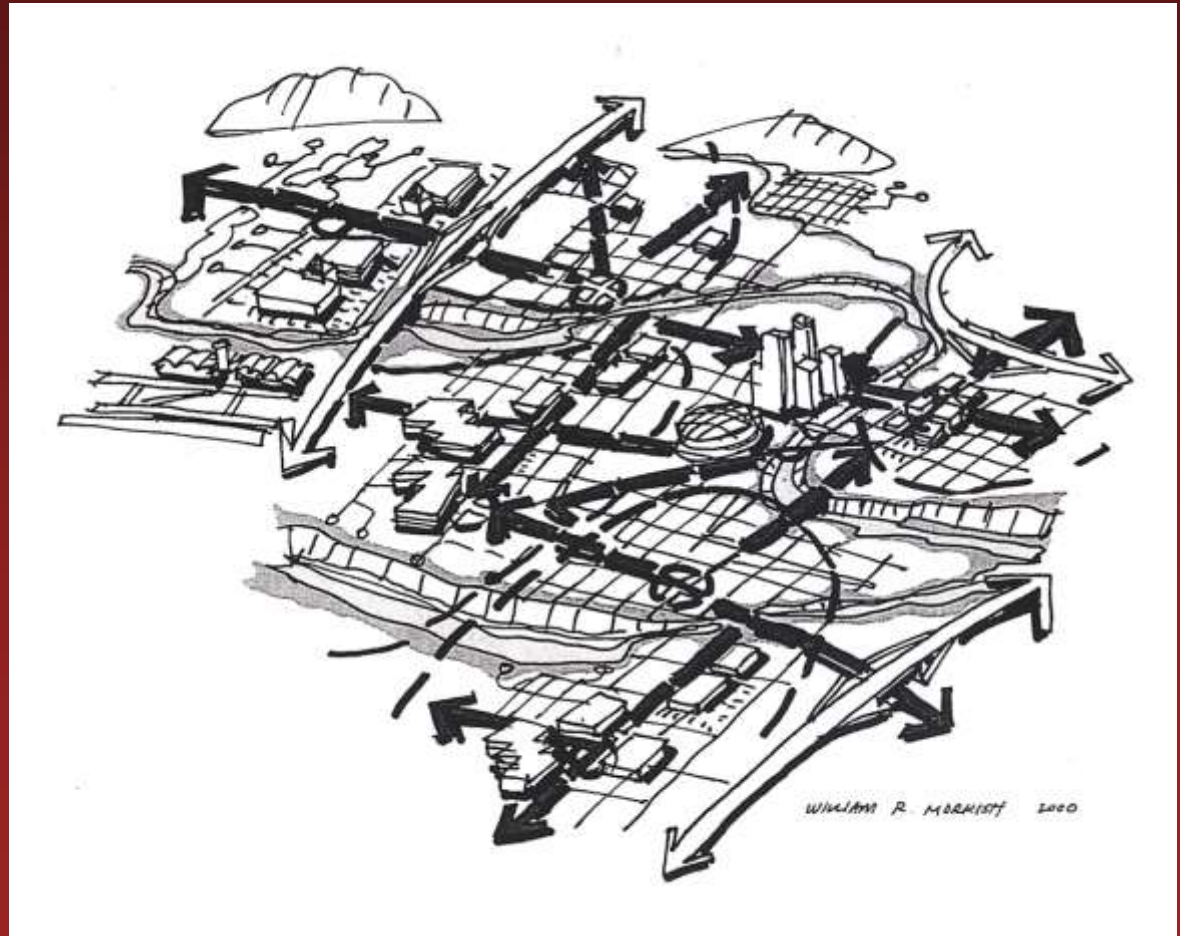
"Highway Infrastructure - Perceptions of Stakeholders on Approaches to Reduce Highway Project Completion Time"

Out of 49 approaches rated by 33 federal, state, tribal and advocacy organizations, "employing Context Sensitive Design" was rated among the 13 most promising approaches.

"Paradox"

Transportation & Land Use Planning

Misalignments
and lack of
integration in
land use and
transportation
planning.

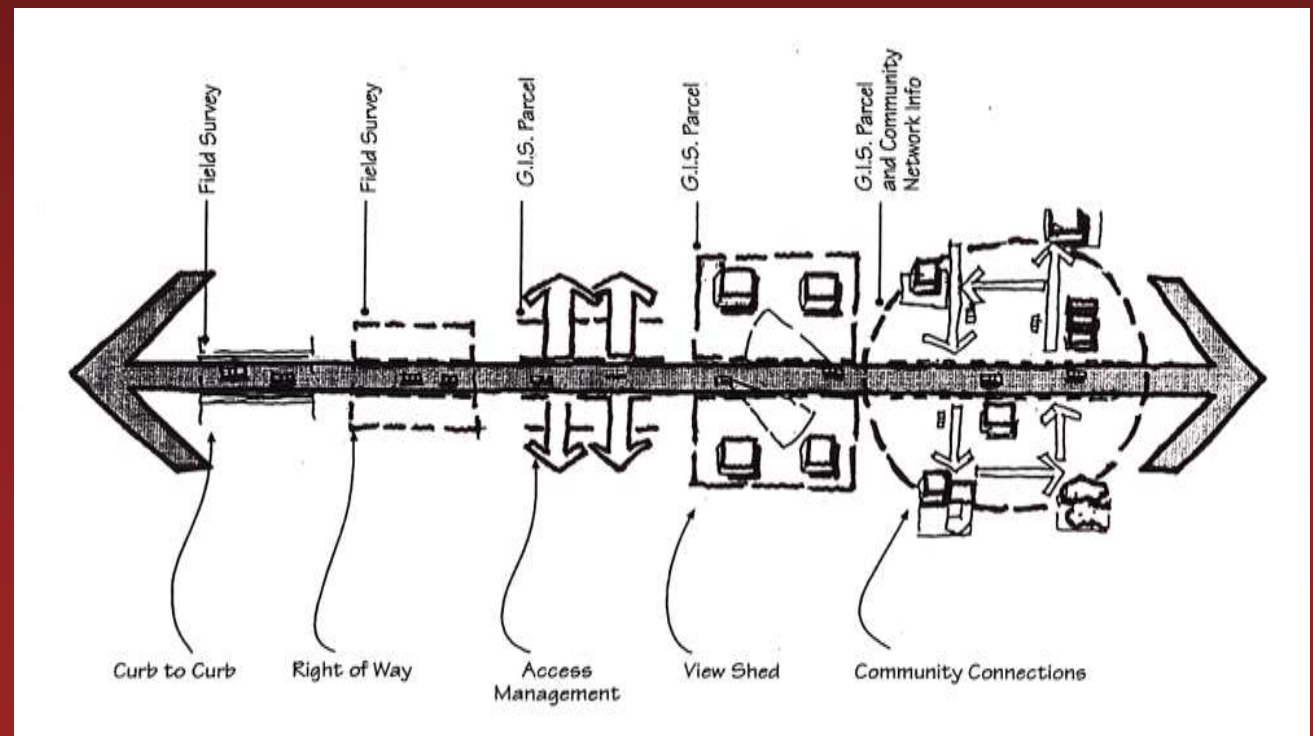


"Challenge"

Transportation & Land Use Planning

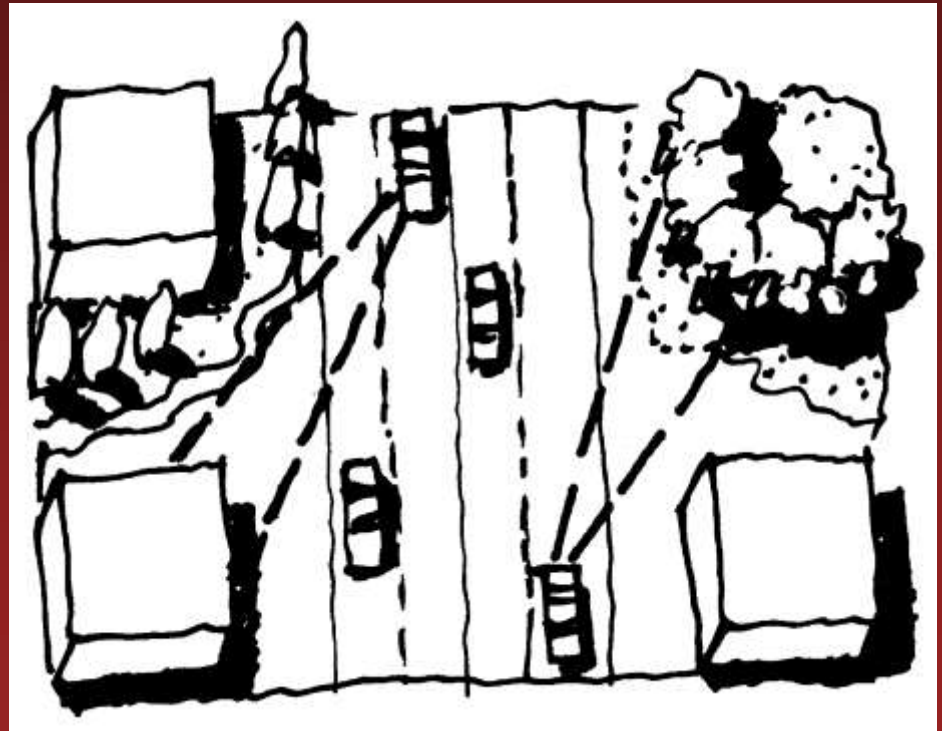
How to bring land use and transportation into alignment as mutually supportive in design and functions ?

Zones of influence should be mutually supportive



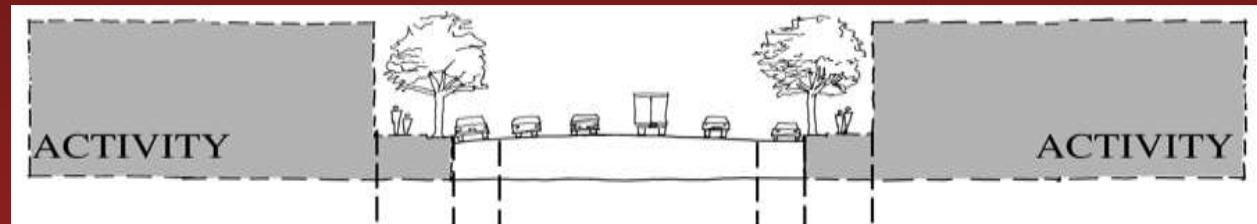
Transportation & Land Use Planning

The 3-dimensional design of the physical and visual environment, surrounding and including transportation ways, informs and influences movement, activity and behavior.

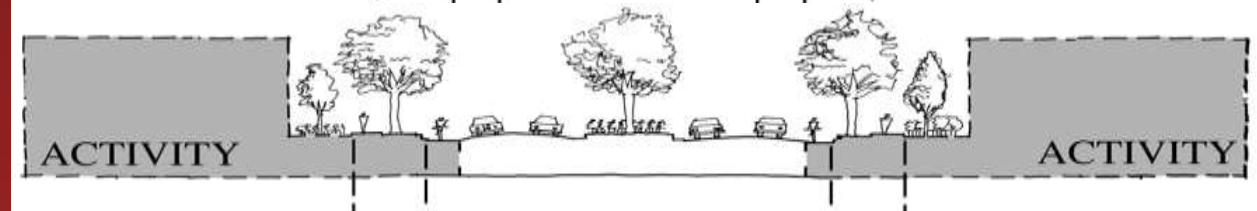


- From a “drivers” perspective, the physical/visual environment is critical in reinforcing appropriate speed and necessary decision making by the driver.
- From a “resident or merchant” perspective, the physical/visual environment is critical in reinforcing safety and a sense of economic, social and environmental health for activity along the roadway.

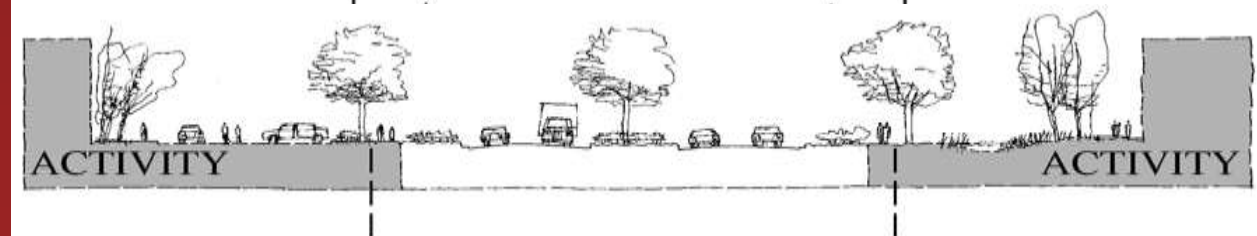
30-35 mph



40-45 mph



50-55 mph



"Opportunity"

(Transportation & Land Use Planning)

Better integration of Movement and Activity relationships and the visual environment through planning and site design reinforces:

1. Improvements in driver behavior and safety.
2. Improvements in the quality, operations and experience of movement and activity zones.
3. Development of a wider range of mutually supportive mixed land uses and modes (pedestrian, bicycle, transit).

What is CSD/CSS ?

Simultaneously advancing the objectives of safety and mobility with preservation and enhancement of aesthetic, historic, environmental, and community values ... our obligation to reflect societal values in our public works



What is CSD/CSS ?

Early and Continuous Process Integration



Scoping

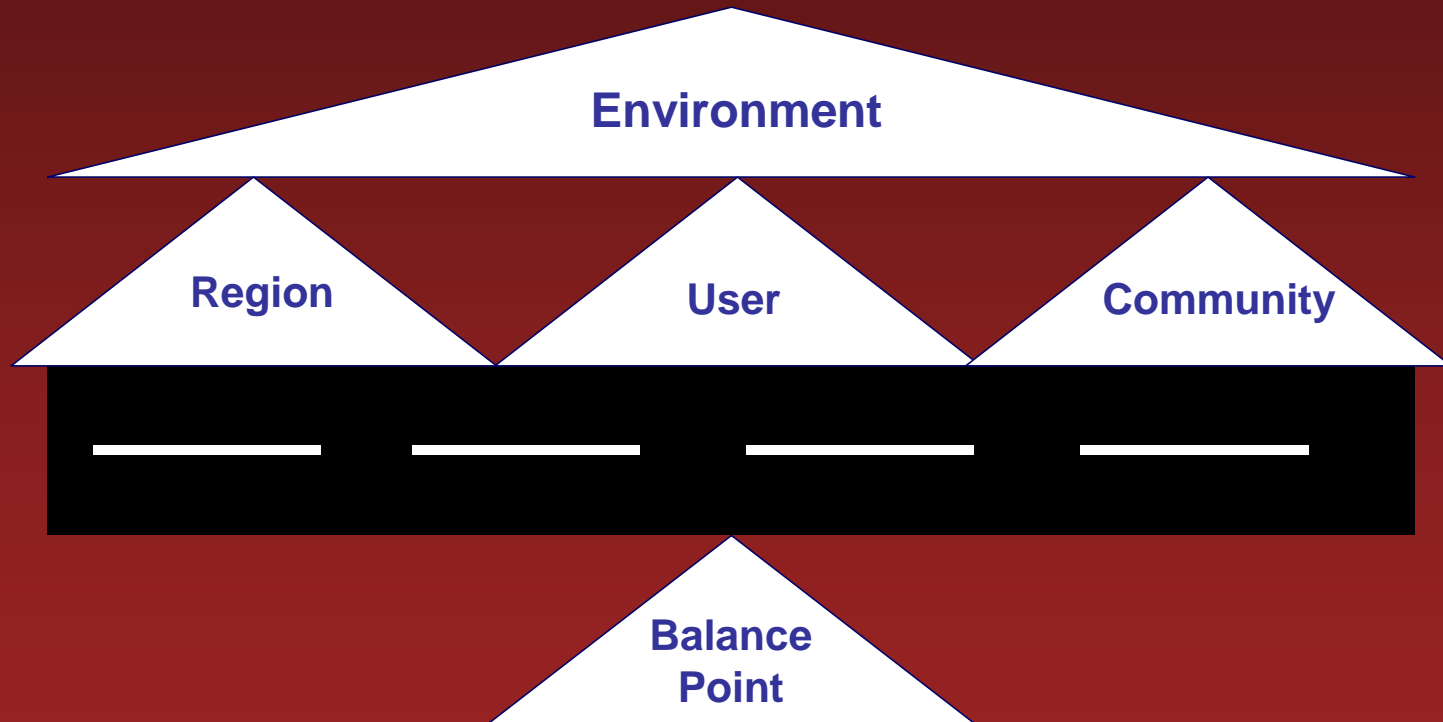
Letting

- 1 Planning & Project Management
- 2 Public & Stakeholder Involvement
- 3 Environmental Considerations
- 4 Aesthetic Considerations
- 5 Engineering & Interdisciplinary Teams

INTEGRATION

What is CSD/CSS ?

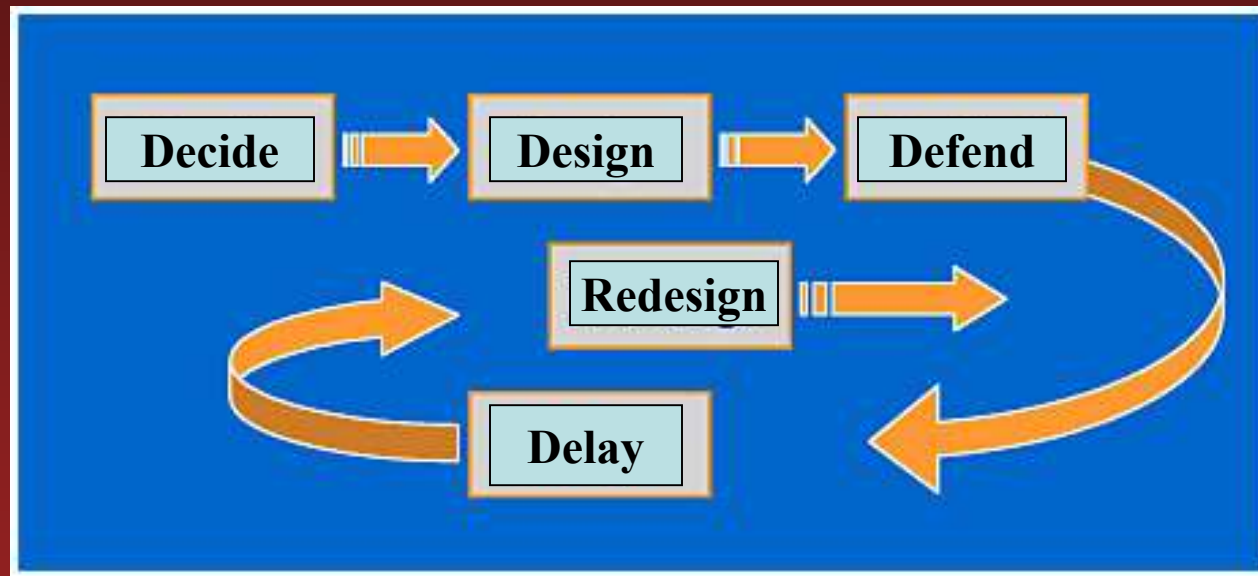
A Way to Balance Sometimes Conflicting Goals
with Broader Societal Goals



Every Project and Balance Point is Unique !

What is CSD/CSS ?

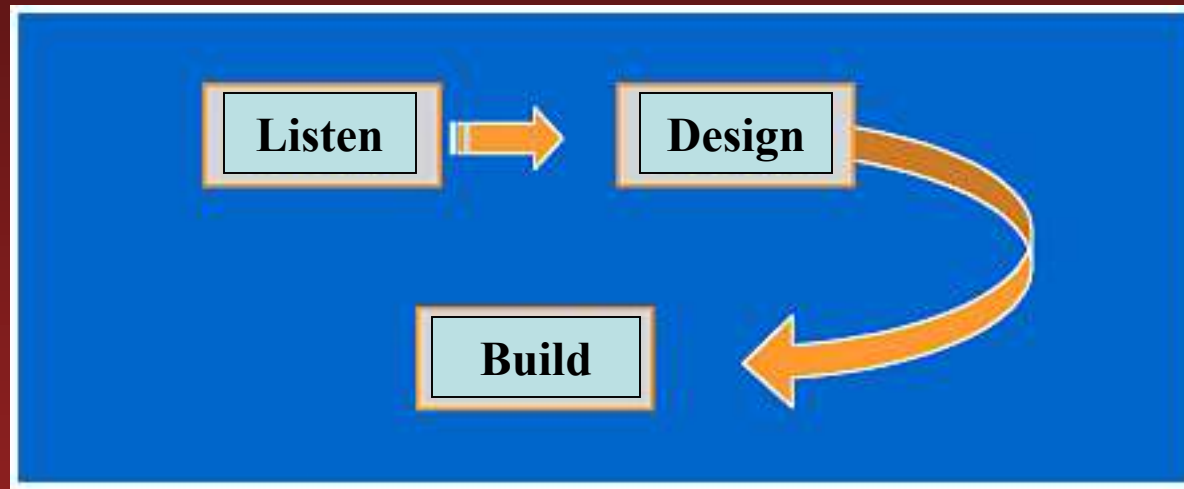
Preventing Problems that are likely to occur



"AVOIDING THE REWORK CYCLE"

What is CSD/CSS ?

Project Delivery "Streamlining"



Good Design Takes Time...

Bad Design Takes Longer !

What is CSD/CSS ?

Partnerships and "Alliance Building"



What is CSD/CSS ?

"Place Sensitive"



What is CSD/CSS ?

"Commitment Beyond the Project"



What CSD/CSS is not ?

- Compromising safety or standards
- Creating winners and losers
- Listening to the loudest voices
- Doing what each stakeholder wants
- Spending a lot more time and money
- Tacking amenities on to projects during design to try and make them successful

CSD Pilot States

In 1999, Mn/DOT along with 4 other state DOTs (MD, CONN, KY, and UT) and the Federal Lands Highway Division of FHWA were selected to help "pilot" implementation of CSD through:

- Policy development
- Training and conferences
- Research and initiatives
- Outreach and sharing

10 Keys to Mn/DOT's Success

- Effective planning and public involvement
- Perseverance of the individual (champions)
- Visionary leadership
- Maximizing funding opportunities
- Integrating interdisciplinary experts
- Design flexibility and innovation
- Learning from other's successes and failures
- Visual/environmental quality without excess cost
- Presenting and promoting the results
- Attitude and tradition of excellence

Mn/DOT's CSD Approach

Partnering with FHWA and the U of M's Center for Transportation Studies (+ sub consultants) to:

- Develop and deliver training
- Steer initiatives
- Outreach and share information

www.cts.umn.edu/education/csd

www.dot.state.mn.us/atoz.html

www.fhwa.dot.gov/csd

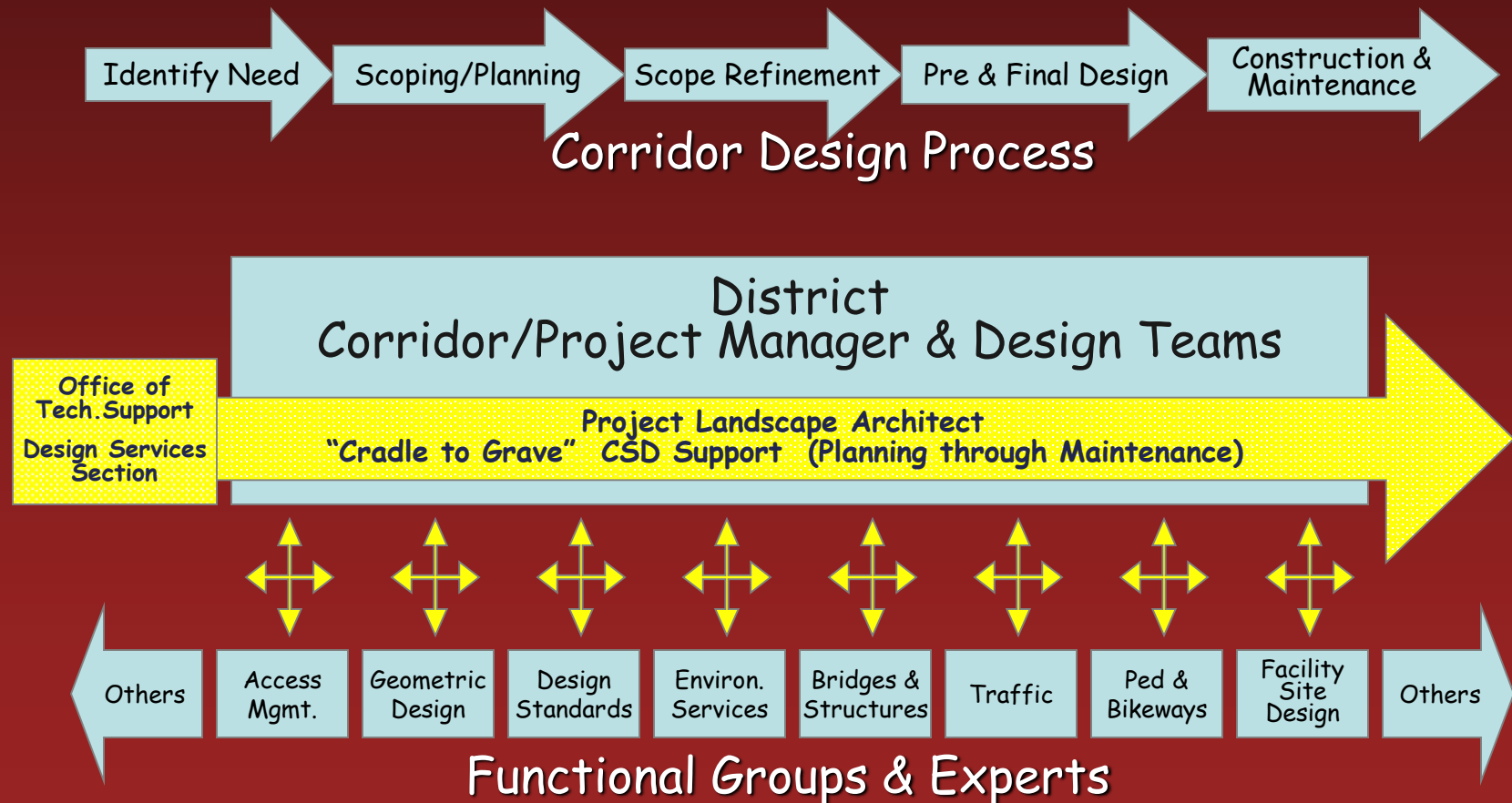
Mn/DOT's CSD Policy

(Tech Memo 00-24-TS-03 11/9/2000)

"Design Excellence Through Context Sensitive Design"

"It is Mn/DOT's policy to use a context sensitive approach to create excellence in project development - an approach that incorporates design standards, safety measures, environmental stewardship, aesthetics and community sensitive planning and design."

Landscape Architecture Unit Support Model



Mn/DOT's CSD Principles

1. Balance safety, mobility, community and environmental goals in all projects.



Mn/DOT's CSD Principles

2. Involve the public and affected agencies early and continuously.



Mn/DOT's CSD Principles

3. Address all modes of travel.



Mn/DOT's CSD Principles

4. Apply flexibility inherent in design standards.



Mn/DOT's CSD Principles

5. Use an interdisciplinary team tailored to project needs.



Mn/DOT's CSD Principles

6. Incorporate aesthetics as an integral part of good design.

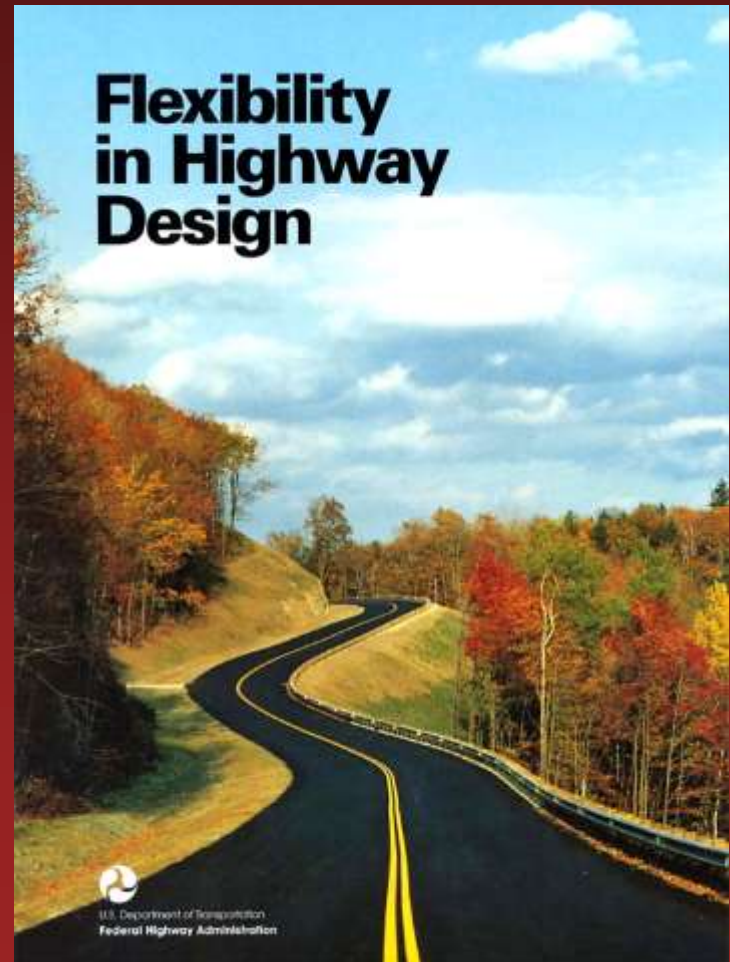


Benefits of Applying CSD Principles:

- Public acceptance, trust and support
- Positive relationships with stake holders
- Partners rather than opponents
- Timely decisions
- Decisions that "stick"
- Improved project delivery process
- Getting needed projects built

Flexibility in Design

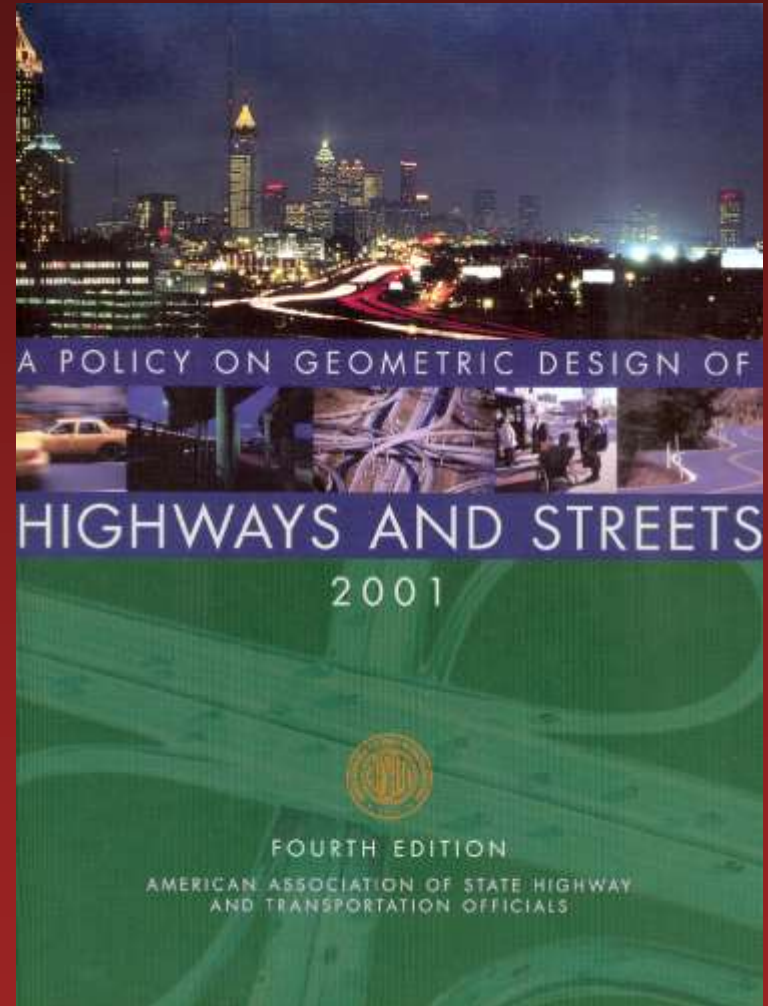
Growing out of ISTEA 1991 and NHTSA 1995...the guide does not attempt to create new standards...it explores and illustrates the flexibilities and opportunities that already exist to balance transportation, community and environmental values.



Design Flexibility vs. "Standards"

The primary geometric design tool used by highway designers, the AASHTO "Green Book", is not a set of national standards...

it is a series of guidelines and basic geometric design concepts and criteria (with flexibility ranges) that establish physical features of a roadway.



Design Flexibility vs. "Standards"

The Forward to the AASHTO "Green Book" suggests that the design criteria should be considered guidelines as opposed to standards and encourages flexibility in developing solutions tailored to situations.

- "Unique combinations of requirements that are always conflicting result in unique solutions to the design problems."
- "Sufficient flexibility is permitted to encourage independent designs tailored to particular situations."

Design Flexibility vs. "Standards"

The Forward to the AASHTO "Green Book" also encourages designers to be aware of and sensitive to the environment.

- "The effects of environmental impacts can and should be mitigated by thoughtful design processes."
- "... intended to produce highways that are safe and efficient for users, acceptable to non-users and in harmony with the environment."

Flexibility in Design

Design is a series of trade-offs between what is desired and what is justified:

- You must consider and understand the origin of standards and guidelines and the design issues and principles behind them before you can assess their appropriateness to a situation
- You must consider and understand all your design objectives and related concerns (as identified by the range of stakeholders) before you can assess what might be gained and what might be given up in any design alternative.
- Take advantage of the inherent opportunity to use your creative abilities...and do the math!

What Flexibility in Design is not ?

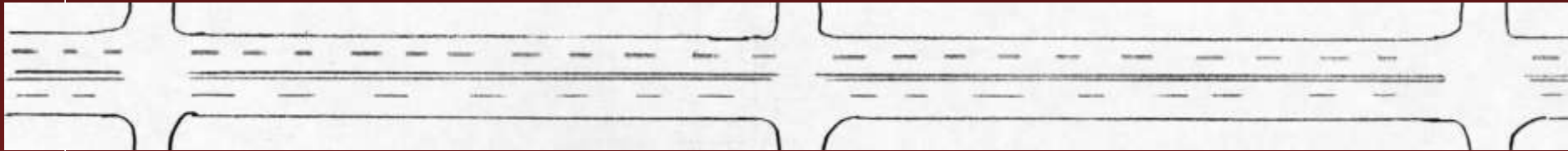
- Conservatively picking design criteria and standards values without doing the math and applying the "Think Method" of design
- Compromising safety or good design in the balancing act
- A tort liability dilemma

What Flexibility in Design is not ?



CSD = Common Sense Design

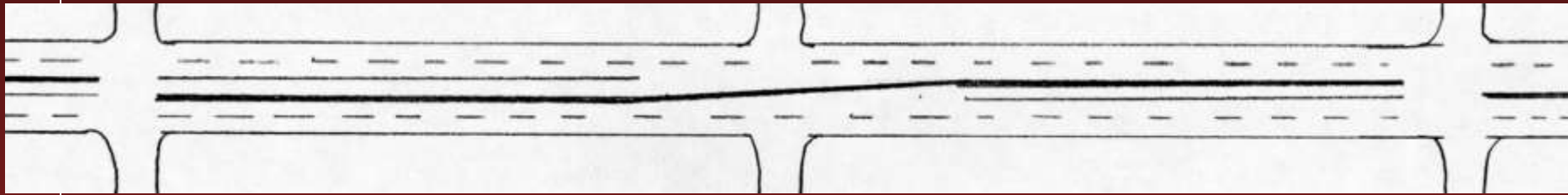
Flexibility: TH 61 in Hastings



Before Condition:

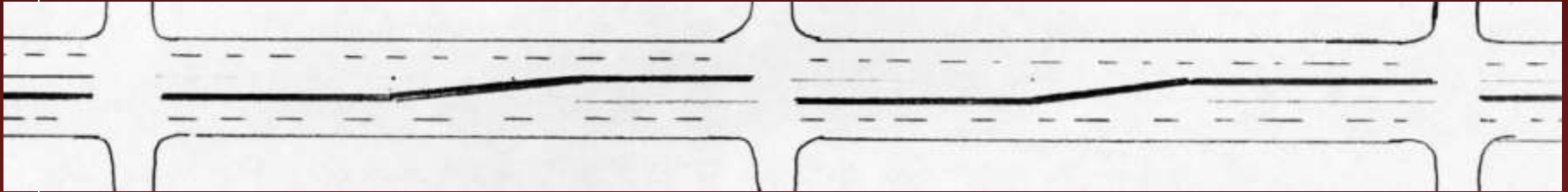
- 4-lane undivided
- High Crash Rate - 13.8 crashes/MVM
- High frequency of rear end (left turn) crashes

TH61 Hastings: Alternative 1



- 4-lane Divided / Raised median
- 300 foot Left Turn Lanes & 180 foot Tapers (standard guidance)
- Required closing access to every other street
- REJECTED and MnDOT asked to leave town

TH61 Hastings: Alternative 2



- 4-lane Divided / Raised median
- 125 foot Left Turn Lanes & 60 foot Tapers
- All public street intersections remained open
- APPROVED and constructed
- Reduced crashes by 44%

TH61 Hastings: Alternative 2



Doesn't getting a project approved and built with shortened turn lanes that still reduce crashes by 44% make more sense than spending more time and money opposing stakeholders and not getting any safety benefit built ?

North Shore Hwy. Design Flexibility Studies

Rock cliff and
falling rock

State Park

70 mph design
speed alignment
was considered =
minimum flexibility

55 mph design
speed alignment
was selected =
maximum flexibility



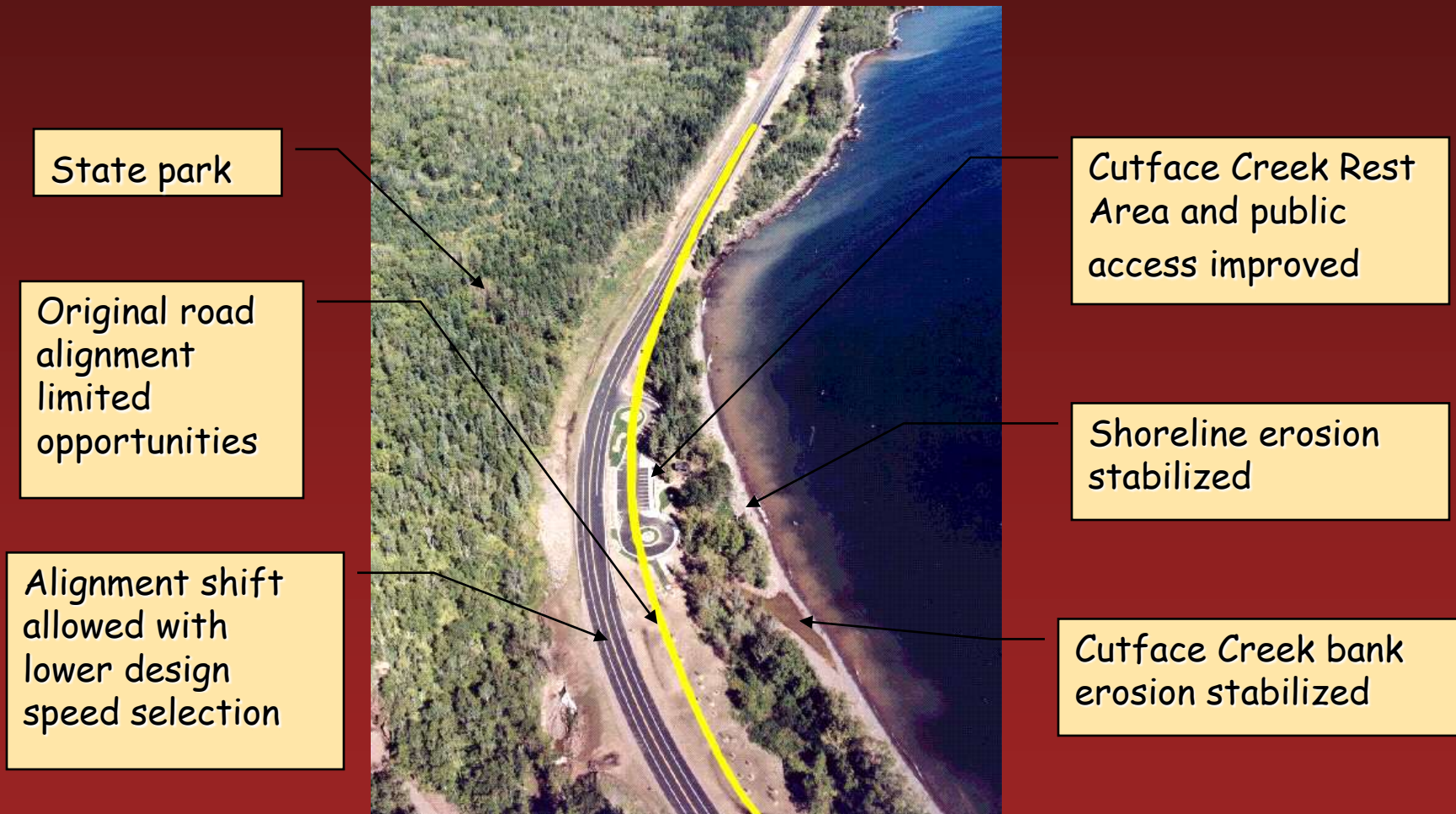
Limited use
Rest Area

Historic scenic overlook
and lake vistas

Shoreline and creek
bank erosion

Residential and
commercial development

North Shore Hwy. Design Flexibility Studies



North Shore Hwy. Benefits of a Balanced Solution

- Improved traffic safety and mobility
- Met geometric standards for 55 mph design speed
- Unnecessary R/W and construction costs were minimized (rock cuts, hauling, disposal, etc.)
- Goals of North Shore Corridor Vision were met
- Valued vistas of Lake Superior were preserved
- Public access to lakeshore was enhanced
- Eroding shoreline and creek were stabilized

continued...

North Shore Hwy. Benefits of a Balanced Solution

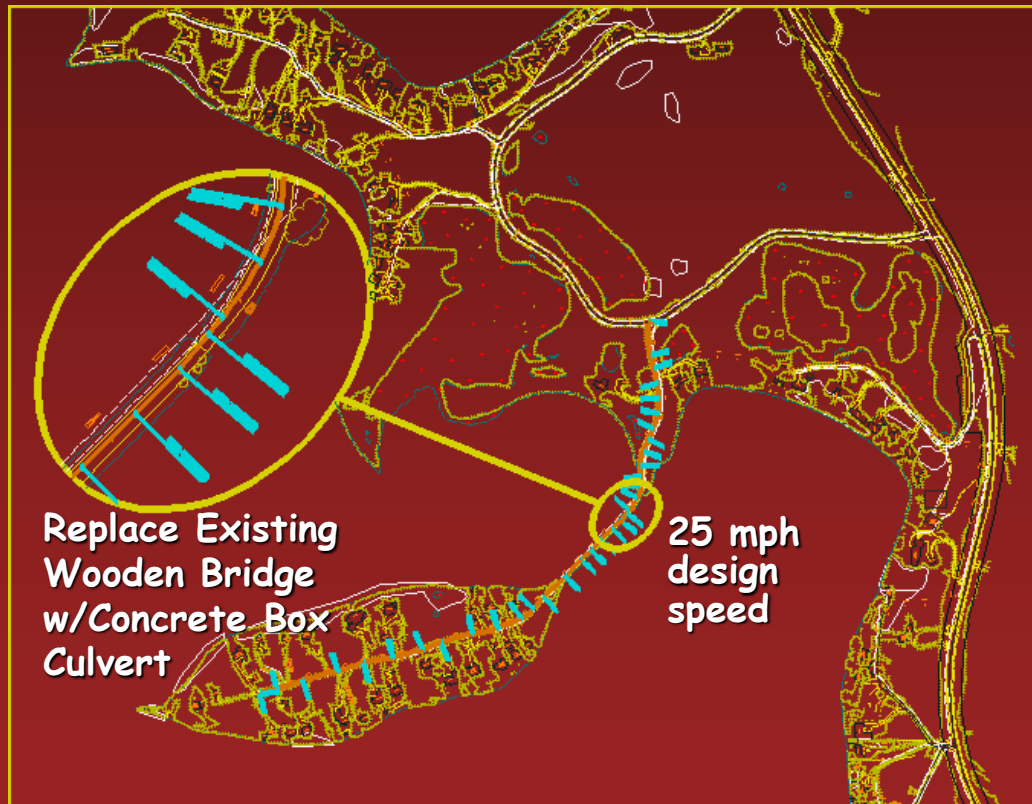
- Traffic was shifted away from lake reducing impacts and increasing enhancement opportunities at rest area
- State park, property owner and environmental impacts were minimized by alignment shifts
- Roadway alignment fit landforms and context physically and visually
- Met five key measures of successful projects

North Shore Hwy. Design Excellence enhancing "Sense of Place" and now designated an "All American Road"



Variance for Design Speed / Vertical Curve

East Gull Lake Example:



Existing Conditions

- Local Street / Residential Area
- Curvilinear alignment 20-25 mph operating speeds

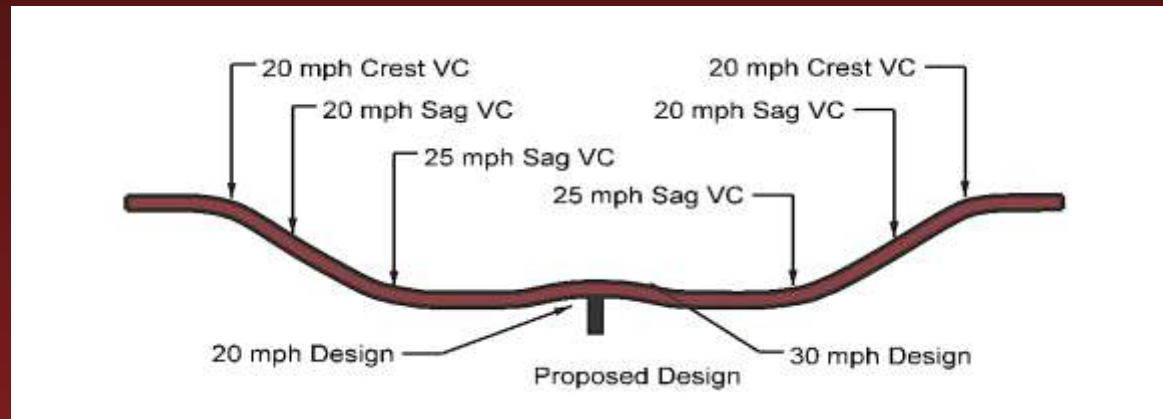
East Gull Lake: Project Objectives



- Replace bridge
- Consistent design speed
- Minimize environmental impacts



East Gull Lake Example (cont.)



- Design Guidelines - Design Speed of 30-40 mph minimum
- Project Objective - Replace the bridge, provide a consistent design speed and minimize environmental impacts
- Rejected 30 mph design - required fill in the lake and inconsistent with the rest of the roadway
- Implemented 20 mph design - no fill in the lake and consistent with Project Objectives and the rest of the roadway
- Additional Mitigations - Warning signs and street lights

Minnesota TH38

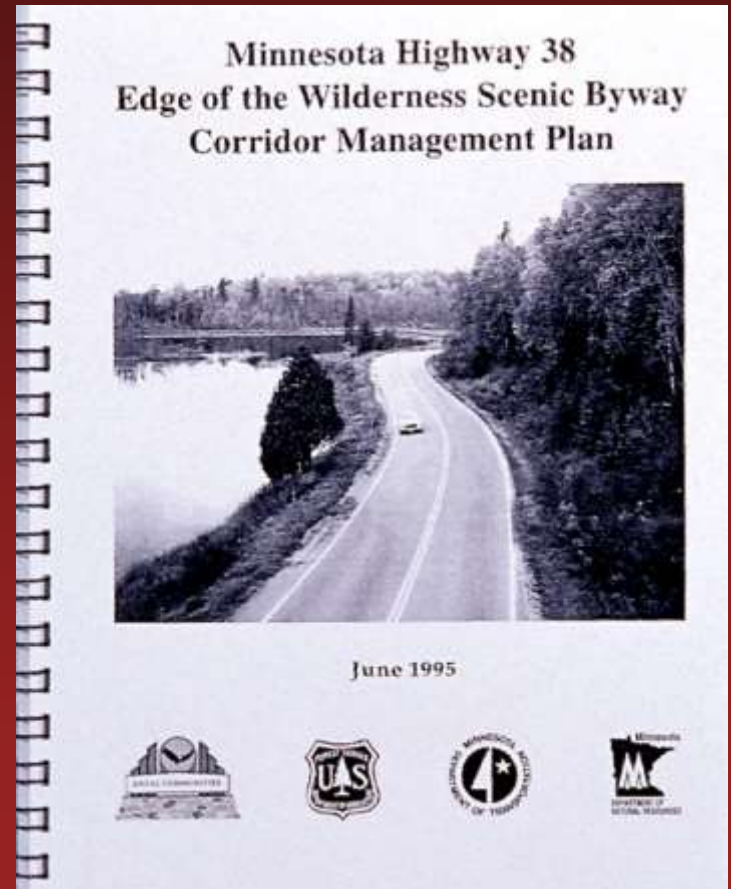
(Edge of the Wilderness National Scenic Byway)

- 47 miles - 2 lane minor arterial
- 370 to 4500 ADT, 8% trucks
- Great variation in alignments
- Northwood's experience with lakes, wetlands & National Forest
- Safety and efficiency concerns



TH 38 Corridor Reconstruction Goals

- Safety, efficiency, community acceptance and environmental compatibility
- Use funding efficiently
- Public involvement
- Interdisciplinary & stakeholder work teams
- Partner with stakeholders (USFS, byway groups, cities, counties)
- Corridor management plan



TH 38 Design Concepts and Solutions

- Original Design Concept
70mph design speed with straightening, leveling, passing lanes, paved shoulders
- Accepted Design Concept
maintain existing horizontal and vertical alignments with spot upgrades, 12' lanes, paved shoulders
- Flexibility in Design
lowered design speed (50-55mph) constrained alignment and R/W, modified cross-section to reduce footprint



TH38 Design Solutions

- Continuous rumble strip
- 6' paved shoulders
- Reinforced gravel/bituminous mix soft shoulders
- Shallow ditch bottoms at higher vertical alignment areas
- Steeper backslopes/minimal vegetation removal

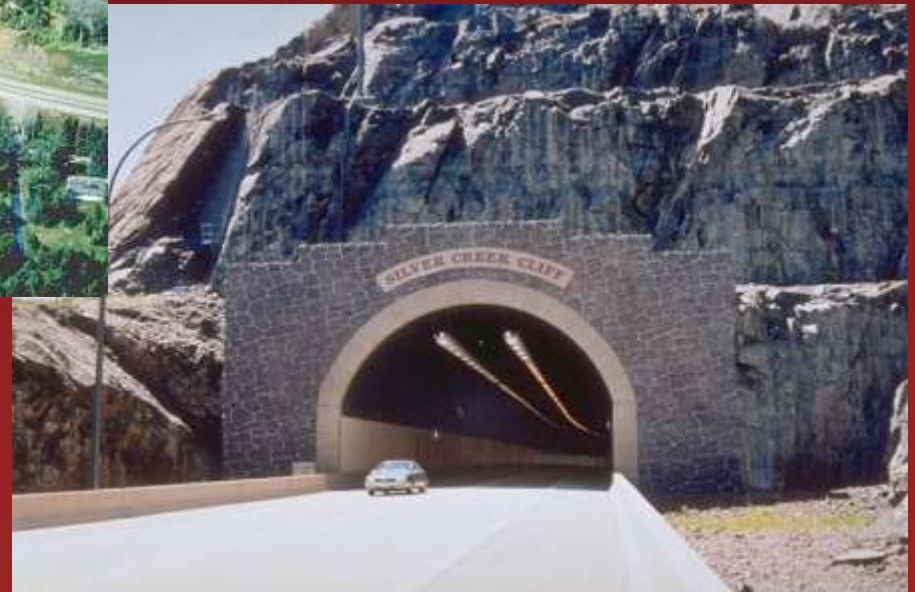


TH 38 Design Solutions

- Big Fork Bridge, interpretive kiosk and trailhead
- Reflecting "sense of place" and fitting physically and visually within the surrounding community and environment... an Asset



TH 61 - North Shore Hwy. Silver Creek Cliff Tunnel and TH 61 realignment



TH 61 - North Shore Hwy. Gooseberry River Crossing and DOT/DNR joint facility partnership



TH 61 - North Shore Hwy. DOT/DNR joint rest area, interpretive facility and gift shop



TH 61 - North Shore Hwy. New Gooseberry River Bridge with pedestrian under crossing linking to trail system



Extension of I-35 into Duluth

Single Point Interchange plus Cut & Cover Tunnels

- Multi-modal transportation and community needs were met
- Historic buildings and facilities were preserved
- Lake-effect icing on roadways was minimized
- Downtown and lakefront linked for pedestrians by tunnel lid parks and open space
- Access to businesses and parking maintained
- Economy and experience were enhanced



Extension of I-35E into Duluth

Cut and cover tunnel approach and treatments



Extension of I-35E into Duluth Restoration of Leif Ericksen Park and Rose Gardens



77th Street "Reliever" - Richfield MN

Addressing neighborhood concerns in the improvement of local parallel street to allow motorists to bypass a congested section of I-494.



77th Street "Reliever" - Richfield MN

Addressing motorists, neighbors and pedestrians



TH 8 - Taylors Falls

Pedestrian Underpass and Scenic Overlook



I-35E Parkway - St. Paul



"Litigated"



I-94 / I-35E "Capitol Commons" Area

"Classical"



TH 55 Minnehaha Park

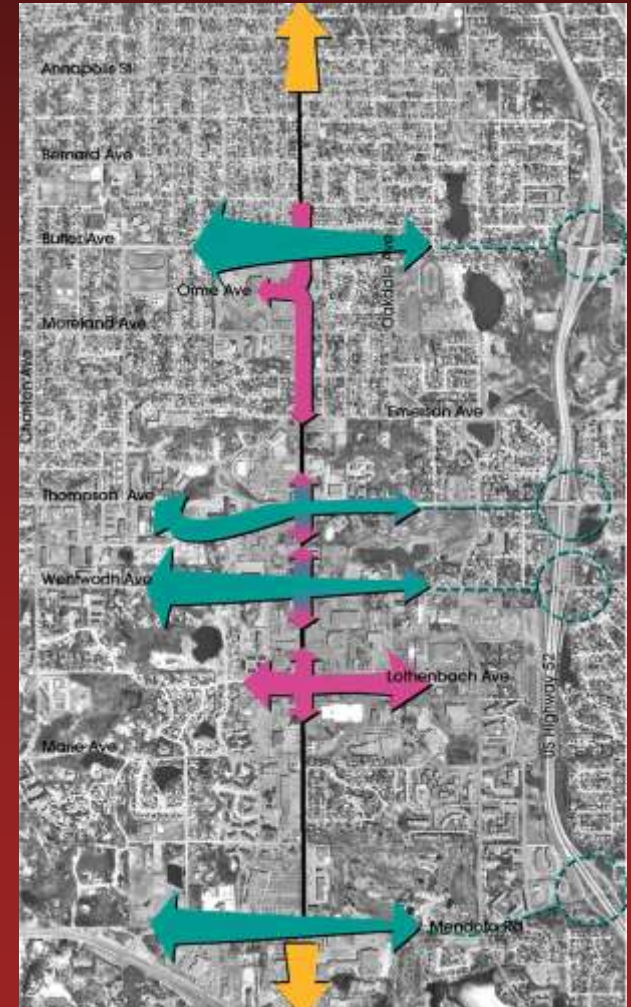
Land Bridge & Longfellow House Restoration



- Provided for safer and less interrupted traffic flow on TH 55 and along Minnehaha Parkway
- Enhanced mobility for pedestrians and bicyclists
- The land bridge physically reconnected fragmented areas of the park with continuous green space
- The historic Longfellow House was relocated and restored adjacent to the land bridge and a historic trolley line

Robert Street System Relationships

- Traffic volume: 25,000 ADT
- Stable crash patterns
- Acceptable LOS with completion of parallel TH52
- Crossing movements are increasing
- Through demand has decreased
- Increasing % of local trips

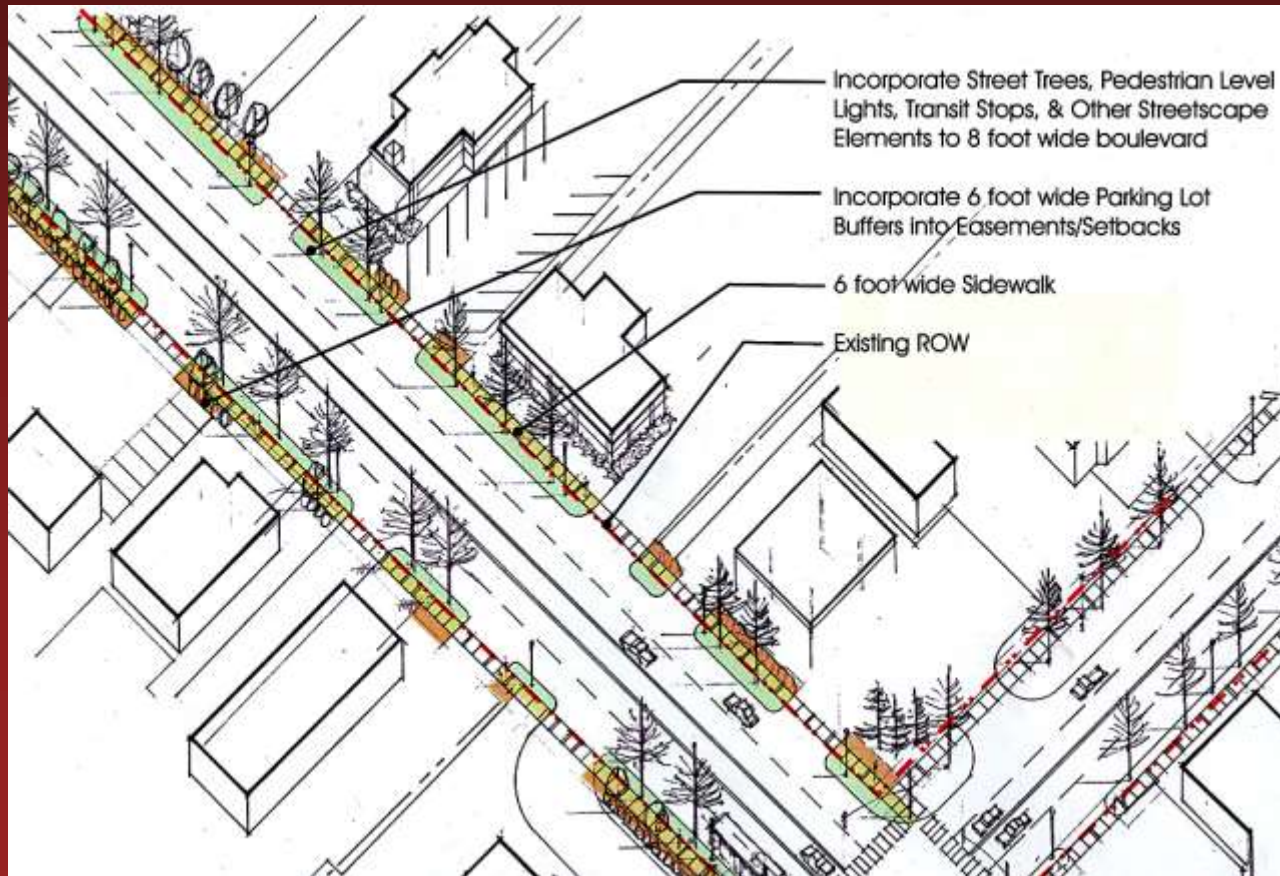


Robert Street

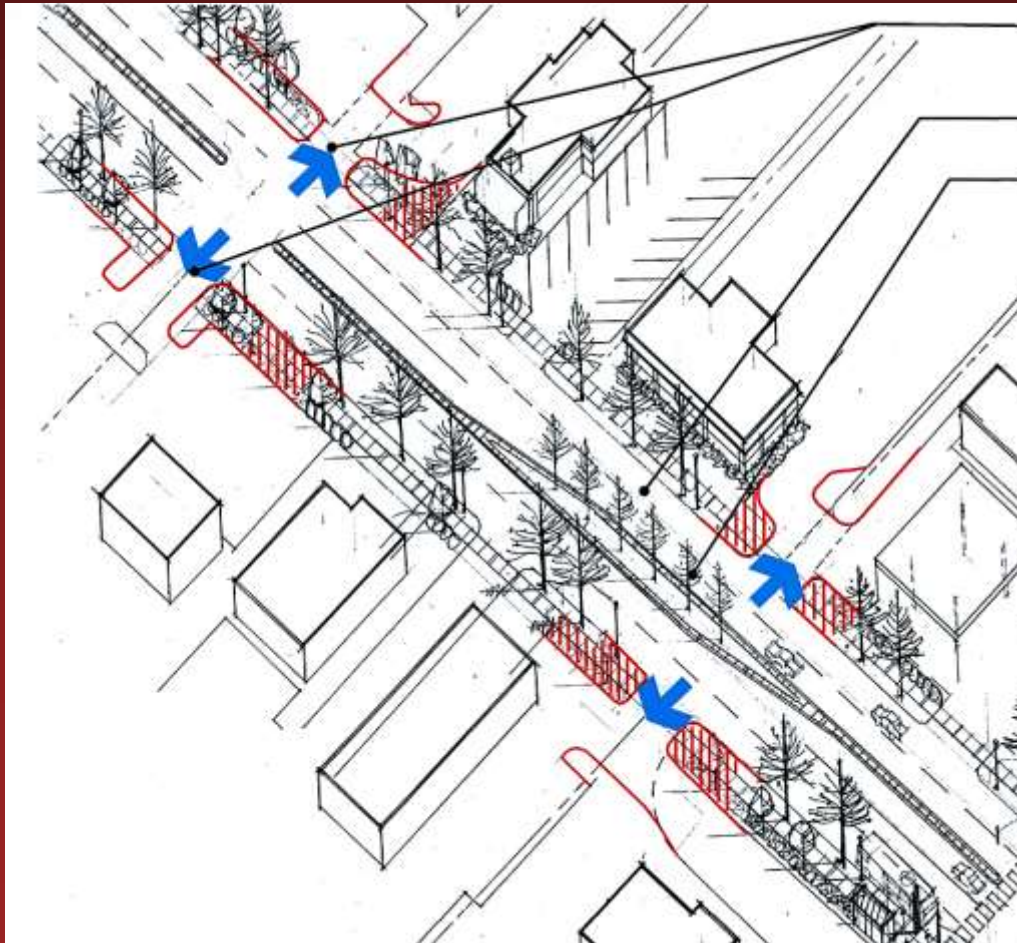
Issues and Opportunities

- Insufficient realm for pedestrians
- Excessive amount of access points existed
- Uniform signal spacing existed
- Need/desire to renovate highway commercial into sustainable scale retail
- Need/desire to diversify land uses in corridor

Robert Street Edge Treatments



Robert Street Access Consolidation

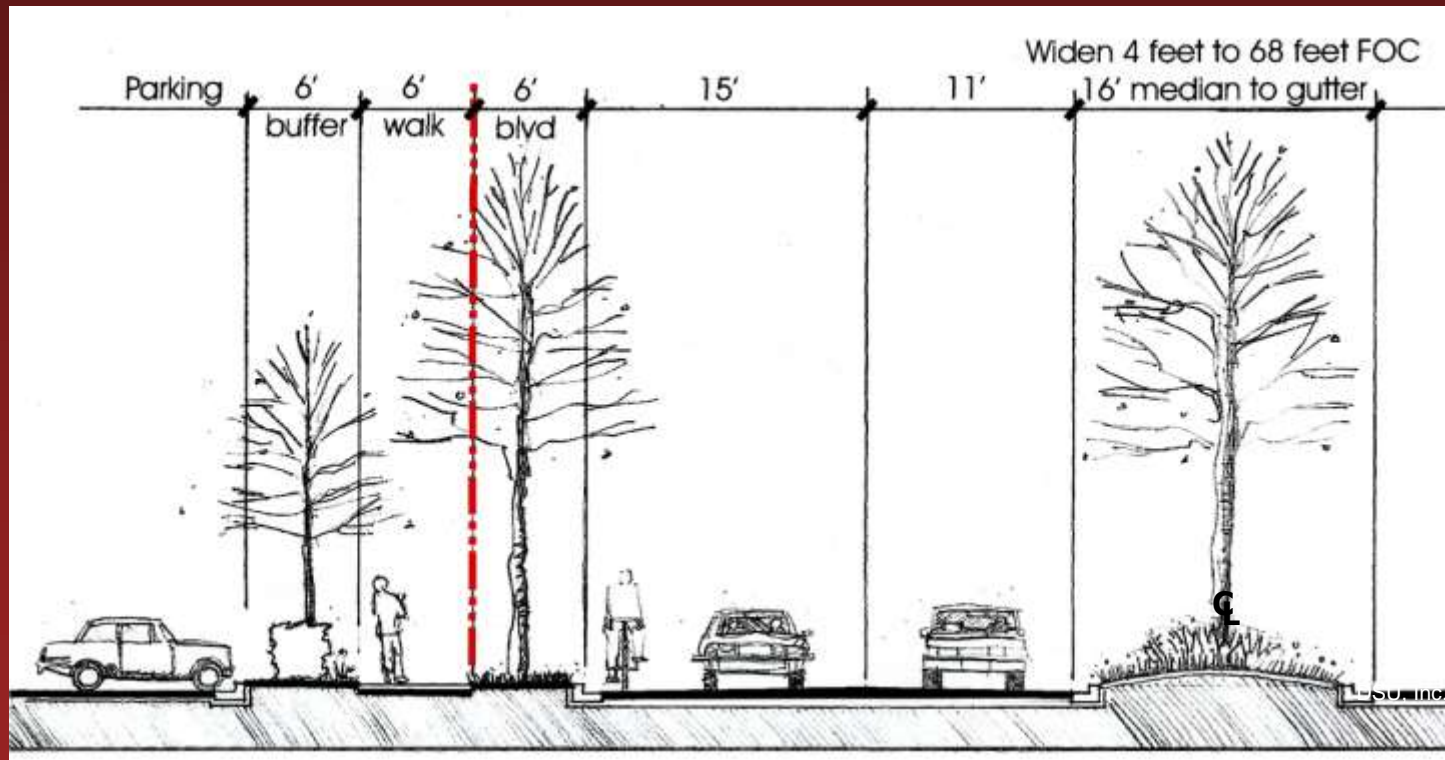


Combine access where possible to minimize hazardous turning movements

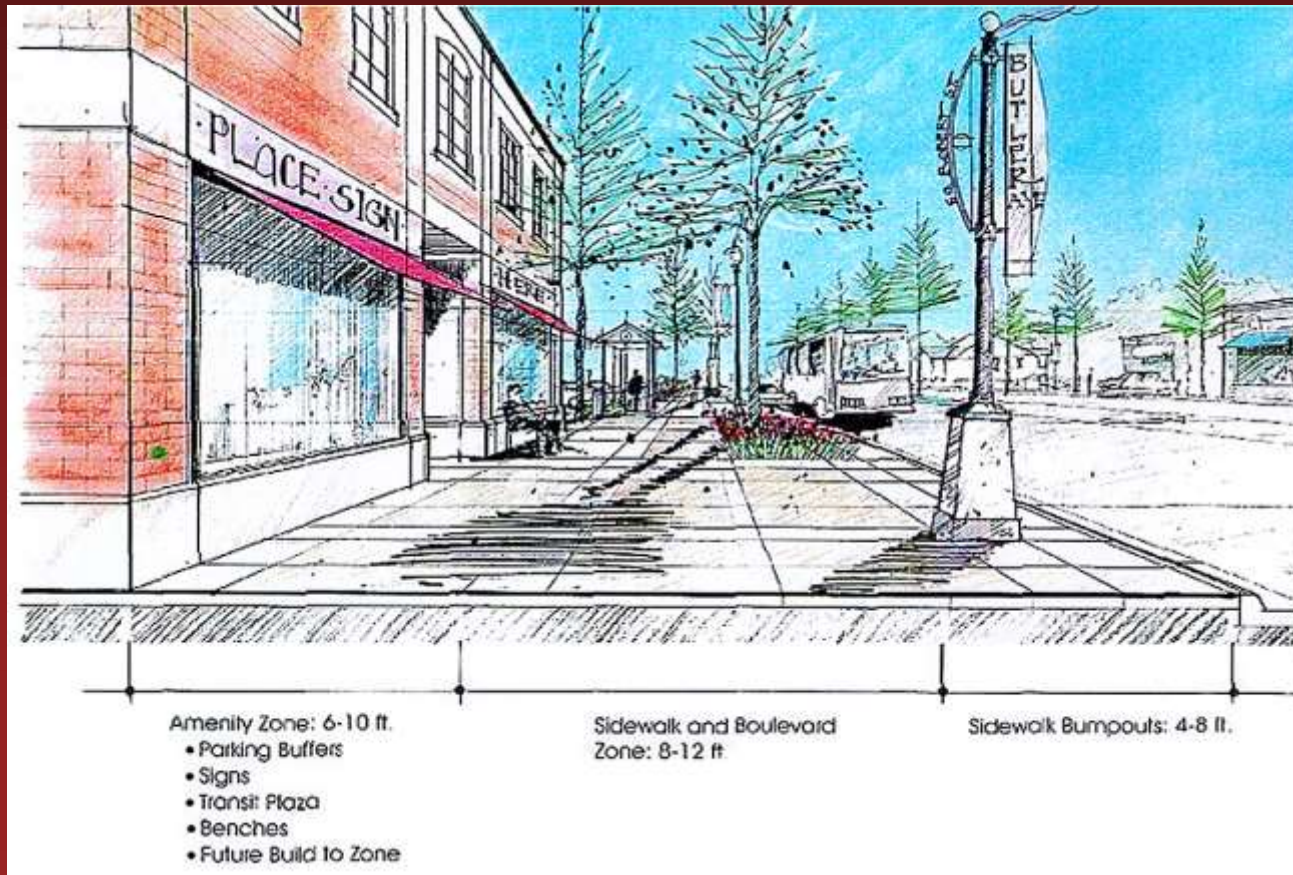
Widen street to 68 feet curb to curb

Incorporate 16 foot wide landscaped median

Robert Street Introduction of Median



Robert Street Amenity Zone Concept



Robert Street

Urban Design Component



Better integration of Movement & Activity; Better Edge & System relationships; Consolidated Access & Parking; Renovation in stages.

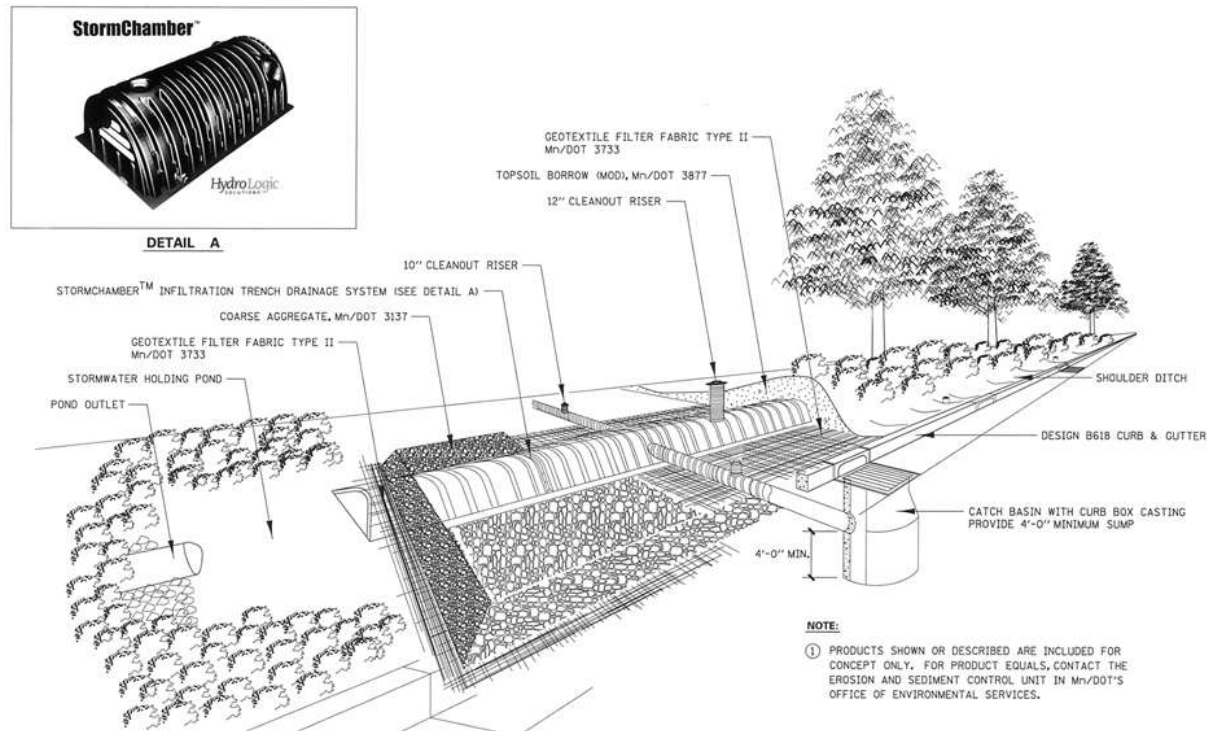
TH 10 - Rice Lake Wetland Reclamation

Control structure increases wetland area within a
DNR Management Area (670 acres)

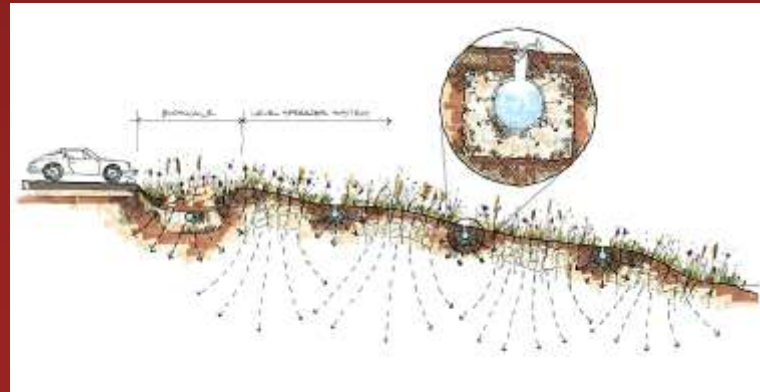
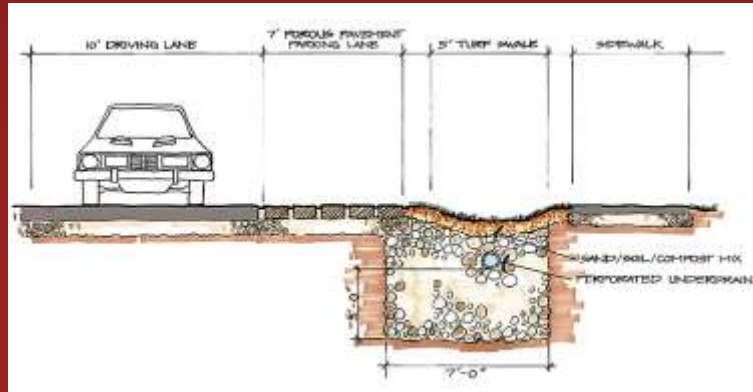
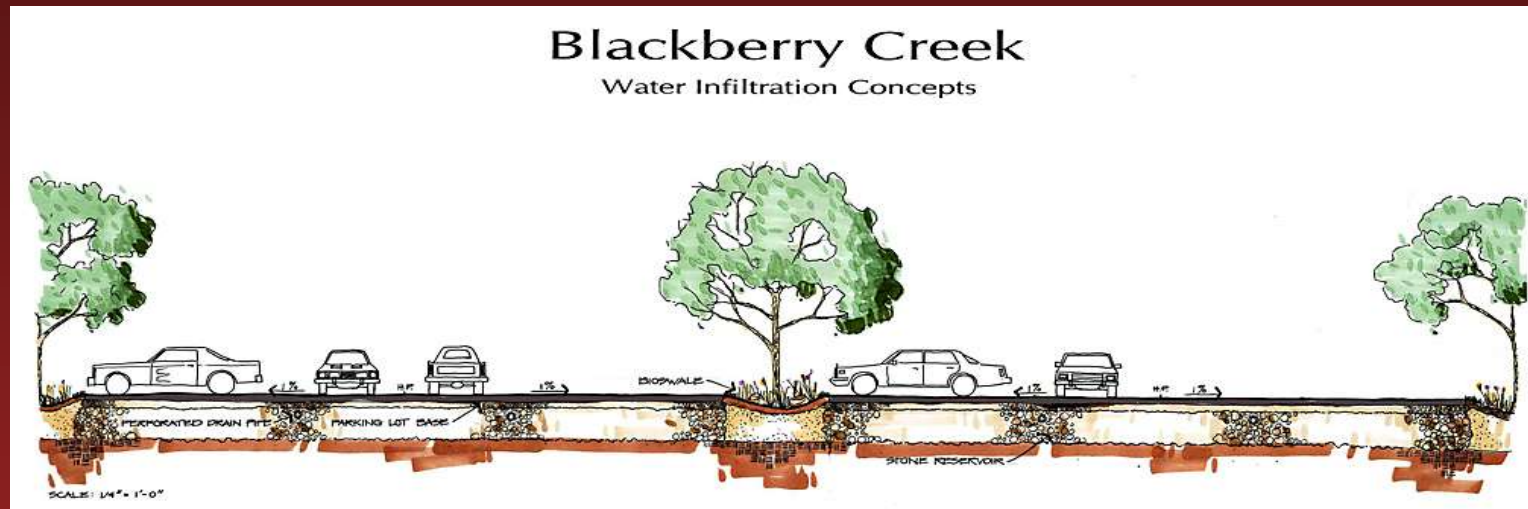


TH 10 - Detroit Lakes

"Hybrid" Stormwater management concept to address conflicting City, Watershed District and Mn/DOT objectives



Water Infiltration Concepts by: James Patchett - Conservation Design Forum, Inc.



Water Infiltration Concepts by: James Patchett - Conservation Design Forum, Inc.



Level Spreader System



Biodiversity Corridor "Connectivity"



Before



After

Preserving & Enhancing Context with Flexibility in Design Should Be A Normal Way of Doing Business



Thanks to the following, for
their contributions:

Charleen Zimmer (AICP)

Jim Rosenow (PE)

Howard Preston (PE)

Bill Morrish (AIA)

James Patchett (LA)

Fred Dock (PE, AICP)

Geoff Martin (LA)

David Larson (LA)

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Remember!
Balanced Process
and Outcomes

