



# City of Mandan Active Transportation Demonstration Project

Summary and Evaluation



OCTOBER 19, 2018

## ACKNOWLEDGMENTS

Thanks to the City of Mandan, North Dakota Department of Transportation, and other project partners for contributing your time, energy, creativity, and expertise to this project. From the initial workshop and project planning and design, to installation, stewardship, evaluation, and removal, this work would not have been possible without your support.

Thanks also to the following organizations and individuals who volunteered time to install these projects: Houston Engineering, Ulteig Engineers, Kadrmas Lee & Jackson, Interstate Engineering, Short Elliot Hendrickson, and Curtis Johnson.



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## Introduction

Demonstration projects use short-term, low-cost materials to spark long-term safety improvements for people walking, bicycling, and driving. The demonstration projects helped communities save money by testing new designs proposed within ND Moves, the statewide active transportation and transit plan.

The demonstration projects are a partnership between the North Dakota Department of Transportation, North Dakota Department of Public Health, and participating communities. Mandan was one of nine communities who participated in the effort.

Installing the project during a short-term trial period allowed Mandan to accomplish the following:

- Test aspects of a project using a much shorter timeline than projects intended for permanent installation.
- Inspire action and build support for how the project or similar projects could be installed over time.
- Widen public engagement by allowing residents to experience new infrastructure first-hand.

- Deepen understanding of active transportation needs and resources through a planning and design workshop held in Spring 2018.
- Encourage people to work together in new ways, strengthening relationships between residents, local businesses, and government agencies.
- Gather data from the real-world use of streets before and during when the project was installed.



## Project Overview

Mandan decided to use this opportunity to test mini roundabouts, curb extensions, and artistic crosswalks on 1st Street and Main Street. The project was installed on July 11 and removed during the week of August 6. The project was meant to benefit the community by calming traffic, creating shorter crossings, and testing recommendations proposed in the Downtown Subarea Study. City staff, volunteers, and the consultant team brought the project to life using paint and vertical delineators. The City and NDDOT responded to design adjustments that were needed throughout the project based on user behavior and requests from Federal Highway Administration (FHWA).



# Making it Happen

**SPRING:** Projects began with a one to one and a half day workshop per community. After, Mandan worked with the project team to design the project, create evaluation tools, collect data about the streets' existing conditions, and spread the word about the project.

**SUMMER:** Twenty volunteers, City staff, and consultant team staff install the project on July 12. Page 6 illustrates the temporary demonstration project.

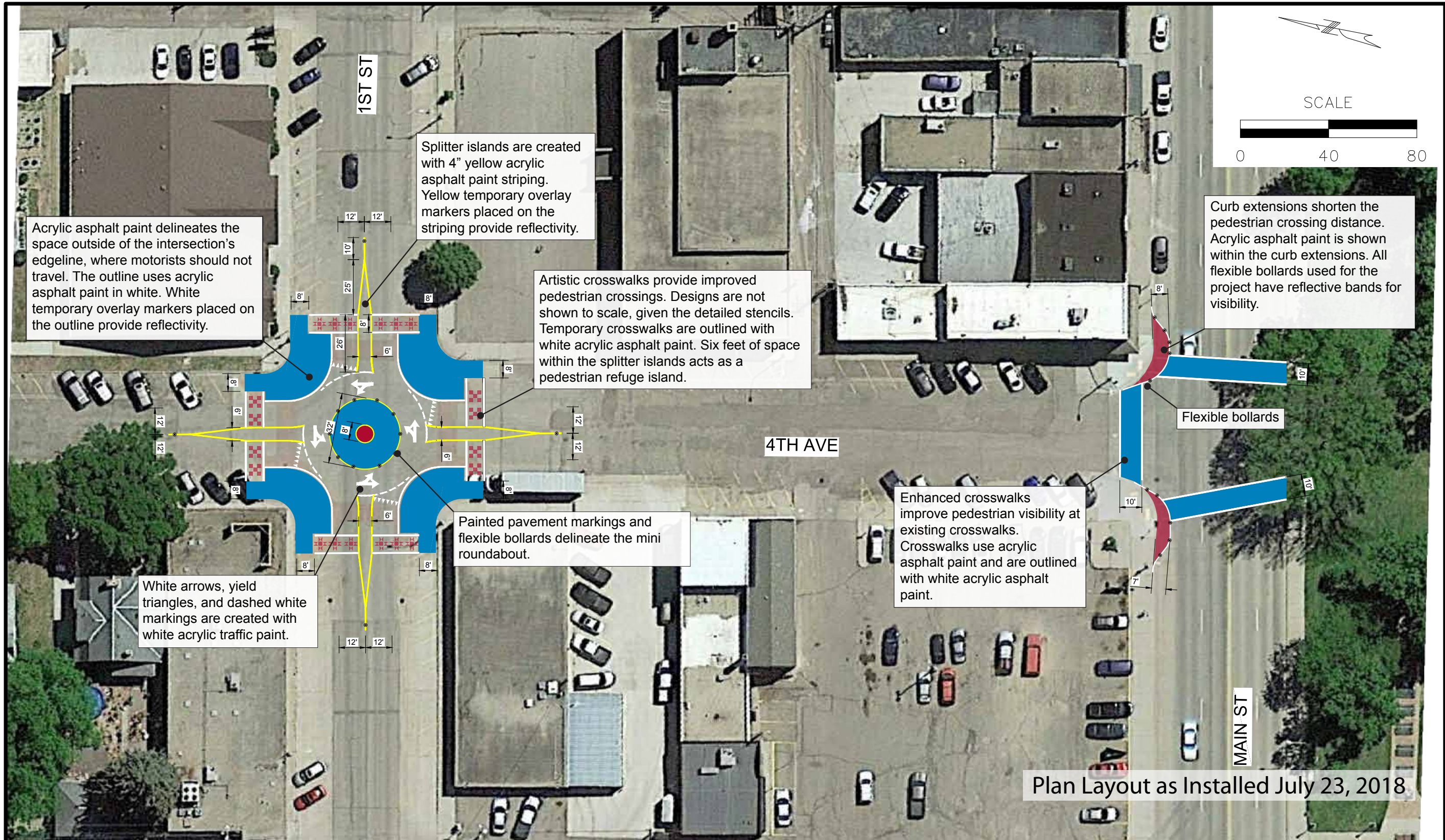
Community leaders collected data while the project was installed. These data are summarized in the following section. Community members shared their opinions about the project and thoughts about the project location's future design opportunities. Print and online surveys captured these opinions. Residents also shared feedback through social media comments and calls and emails to the local project leader.

**Appendix A** contains communication materials created for the project.



*Drone footage of the project installation (Image: Houston Engineering / City of Mandan).*





ND MOVES DEMONSTRATION PROJECT  
MANDAN - 4TH AVENUE  
1ST STREET TO MAIN AVENUE  
PLAN LAYOUT






NDDOT is leading the development of temporary demonstration projects throughout North Dakota as part of the ND Moves Statewide Active and Public Transportation Plan. The project uses temporary materials and is intended for an installation period of up to one month. Local communities will install the projects with assistance from the consultant team



# Evaluation Methodology and Results

## EVALUATION METRICS AND TOOLS

The mini roundabouts, artistic crosswalks and curb extensions were fully installed on July 13th, 2018. Baseline driver behavior observations and pedestrian and bicycle counts were collected on June 27th and 30th. During project data for the same metrics were collected on August 1st and 4th. Speed data was captured at 1st Street and 3rd Avenue from June 17th until the project was removed. Speed data was also captured at 1st Street and 4th Avenue from June 15th until the project was removed. An online public survey was available throughout the project duration.











METRIC	METHODOLOGY
Pedestrian and Bicycle Counts 	<p><b>DESCRIPTION:</b> City staff conducted pedestrian and bicycle counts in the project area, controlling for time of day, day of week, weather, and special events.</p> <p><b>TOOLS:</b> Pedestrian and Bicycle Count Forms (see <b>Appendix B</b> for sample forms)</p>
Pedestrian Crossing Reduction 	<p><b>DESCRIPTION:</b> Pedestrian crossing improvements were evaluated based on reduction in pedestrian crossing distances.</p> <p><b>TOOL:</b> Measurements collected during installation fieldwork.</p>
Driver Behavior 	<p><b>DESCRIPTION:</b> City staff observed vehicles approaching the intersection to document driver stop compliance relative to the stop bar and crosswalk.</p> <p><b>TOOL:</b> Driver stop/yield compliance (see <b>Appendix B</b> for sample forms)</p>
Driver Speed 	<p><b>DESCRIPTION:</b> Speed feedback signs collected vehicle speed data before, during, and after the completion of the demonstration project to obtain average speeds (average of the seven daily averages for the week).</p> <p><b>TOOL:</b> Speed feedback data collected before, during, and after the completion of the demonstration project.</p>
Public Perception 	<p><b>DESCRIPTION:</b> Residents were invited to comment and share ideas with City staff.</p> <p><b>TOOLS:</b></p> <ul style="list-style-type: none"> <li>• In-person and online public perception surveys</li> <li>• Public comment boards and open comments on social media</li> </ul>

\*Detailed evaluation methodology is included in **Appendix B**










## EVALUATION RESULTS

The tables on the following pages summarize results for each intersection where temporary projects were installed. The tables evaluate results based on each evaluation metric.



### 4TH AVENUE AND 1ST STREET RESULTS

METRIC	RESULT	DETAILS
Pedestrian Counts 		Project-wide, pedestrian counts decreased. At the intersection of 4th Avenue & 1st Street, there were on average 70% fewer pedestrians during the project compared to during the project..
Bicycle Counts 		There was a shift of bicyclists riding on the sidewalk to riding in the street. Slightly more bicyclists at 4th Avenue & 1st Street rode in the street than on the sidewalk during the project.
Pedestrian Crossing Reduction 		The demonstration project reduced pedestrian crossing distance by 11-16 feet. Pedestrian crossing times were reduced by about 3-4 seconds.
Driver Behavior 		Intersection-wide at 4th Avenue & 1st Street: <ul style="list-style-type: none"> <li>• 75 percent of drivers correctly yielded to other drivers during the project</li> <li>• Before the project, 18 percent of drivers blocked the crosswalk when stopping</li> </ul>
Driver Speed 		At 1st Street and 3rd Avenue: <ul style="list-style-type: none"> <li>• Average weekday vehicle speed before project installation was over 21 miles per hour (mph)</li> <li>• Average weekday vehicle speed during the project was just below 20 mph</li> <li>• From August 6th-8th, when staff were working to dismantle one mini roundabout at a time, average weekday vehicle speed increased slightly to just over 20 mph</li> <li>• After the project was completely dismantled, average weekday vehicle speed increased to over 24 mph</li> <li>• Although the specific reasons for the speed reduction are unclear, there seems to be a correlation between the presence of the demonstration project and reduced speeds at this location.</li> </ul> <p>There was not a discernible difference between speeds at 1st Street and 4th Avenue before or during/after the project.</p>

## 4TH AVENUE AND MAIN STREET RESULTS

METRIC	RESULT	DETAILS
Pedestrian Counts 		Project-wide, pedestrian counts decreased. At the intersection of 4th Avenue & Main, there were on average 29% fewer pedestrians during the project when compared to before the project.
Bicycle Counts 		There was a shift of bicyclists riding on the sidewalk to riding in the street. At 4th Avenue & Main, 100% of bicyclists before the project were riding on the sidewalk. During the study 44% of the bicyclists were riding on the street.
Pedestrian Crossing Reduction 		The demonstration project reduced the pedestrian crossing distance by 20 to 26 feet at 4th Avenue & Main Street.
Driver Behavior 		Intersection-wide at 4th Avenue & Main Street: <ul style="list-style-type: none"> <li>• 25 percent more drivers yielded to pedestrians during the project</li> <li>• There was little significant difference in driver behavior stopping behavior during the project</li> </ul>
Driver Speed 	Speed data were not collected at 4th Avenue and Main Street.	

## BOTH LOCATIONS

METRIC	RESULT	DETAILS
Public Perception* 		Public perception of the projects was mixed. <ul style="list-style-type: none"> <li>• Many survey comments focus on the need to educate drivers how to use the mini-roundabouts. This resulted in survey respondents who walked or took transit indicating neutral or negative feelings related to the project</li> <li>• Seventy-eight percent of survey respondents who drove described the experience negatively. Generally, respondents expressed confusion about what a long-term roundabout would look like.</li> <li>• Business responses were mixed, with approximately half of businesses reporting positively about numerous factors including safety and traffic flow</li> </ul>

\*Detailed public perception results are included in **Appendix C**

# Recommendations for Long-term Change

Mandan is dedicated to improving active transportation safety and connectivity in the near- and long-term. This demonstration project is one step in this direction. With the addition of key design changes, the potential long-term concepts could offer several benefits:

- Shorter pedestrian crossing distances
- Better pedestrian visibility at corners
- Slower driver speeds through the intersection
- Increased space for landscaping

Installing a long-term project would use concrete curb and more permanent pavement markings instead of bright paint and vertical delineators. Artistic crosswalks have the potential to be transformed into high visibility crosswalks during the upcoming Main Street redesign project.

## PHASING OF LONG-TERM CHANGES

Changes to 1st Street could occur in two phases. The City would install concrete curb extensions and high visibility crosswalks during **Phase One**. A neighborhood traffic circle could be installed within the intersection as **Phase Two**. The neighborhood traffic circle is a modified design from the mini roundabout that was tested during the project. Compared to the demonstration project, the Phase Two long term concept shows more space for motorists to maneuver within the intersection. This takes project feedback

into account from truck drivers and people hauling trailers or recreational vehicles. Main Street improvements could be completed as one phase. Long-term concepts are shown on pages 12 and 13.

## WHAT ASPECTS OF THE PROJECT WORKED WELL?

- The project was a chance to quickly and efficiently plan, design, install, and evaluate a project.
- Speeds along 1st Street were reduced.
- Shortened pedestrian crossing distance and increased visibility of pedestrians crossing the street at Main Avenue and 1st Street.
- Motorists made turns without impeding into temporary curb extensions on Main Avenue.

- Motorists who approached the mini roundabouts slowly, as intended, correctly negotiated the intersections.
- Adding flexible delineators to the outside of the mini roundabouts during the project improved driver compliance.
- Residents were able to provide immediate feedback about the project. Design changes throughout the project improved mini roundabout driver compliance.
- The projects were located in a very visible area.
- Members of the public also suggested other ideas for places where mini roundabouts could work in Mandan, even if they were opposed to a roundabout at the project location.



*A neighborhood traffic circle with a landscaped center.*

## WHAT LESSONS LEARNED COULD BE APPLIED FOR FUTURE DEMONSTRATION PROJECTS?

- The mixture of mini roundabout and curb extension projects sparked residents' interest in the initiative. However, it is recommended that future projects pick only one site to simplify the project process.
- The size of the roundabout was modified during the demonstration project. City and NDDOT staff received reports of motorists improperly using the intersection at the beginning of the installation. During the project, bollards were placed on the outside of the mini roundabout. Compliance increased following this change.
- NDDOT refined processes during the project to streamline design guidance for future demonstration projects.
- If future demonstration projects are pursued, the City could produce and distribute concept drawings and example images to show members of the public options for long-term change earlier in the project process. This could help avoid confusion by showing residents what permanent changes to the site could look like and could better communicate the project's intent.
- The project required high levels of coordination from City staff, however City staff can use project resources for future projects.
- Future demonstration projects should follow Manual on Uniform Traffic Control

Devices (MUTCD) standards for pavement markings, paint color, and roadway geometry. Paint in earth tones such as tan or brick should be used for treatments like curb extensions, and vertical delineator colors should be consistent with lane line striping.

- Americans with Disabilities Act (ADA) compliance needs to be addressed if a temporary project changes a site's pedestrian access route.
- Future projects could benefit from Police and Fire Department and truck driver involvement during installation. This could allow larger vehicles to experience the project as it is installed.
- Less durable paint is recommended for future projects.

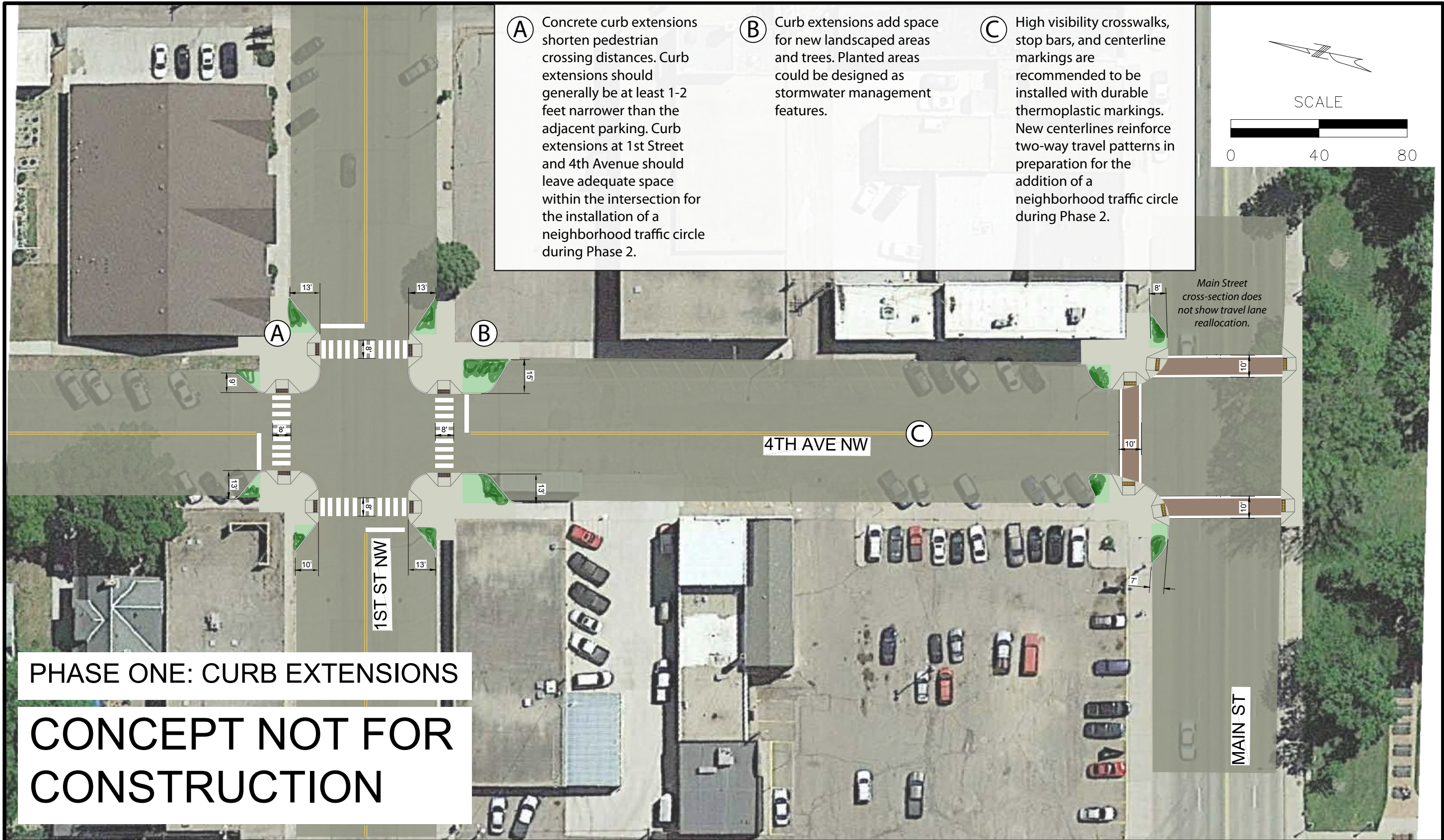
- Future project ideas include back-in angled parking by City Hall or a parklet on a commercial avenue perpendicular to Main Street such as Collins, 1st NW, 2nd NW, 3rd NW, or 4th NW.

## WHAT ASPECTS OF THE PROJECT COULD BE REFINED FOR LONG-TERM CHANGE?

- Redesign the mini-roundabout intersections as neighborhood traffic circles to respond to driver feedback while calming traffic.
- Install brick-colored crosswalks and other placemaking idea. See page 14 for more information and other ideas.
- Continue public engagement to help residents understand how to use curb extensions and neighborhood traffic circles.



*A mountable neighborhood traffic circle with shared lane markings (Image: NACTO.org).*

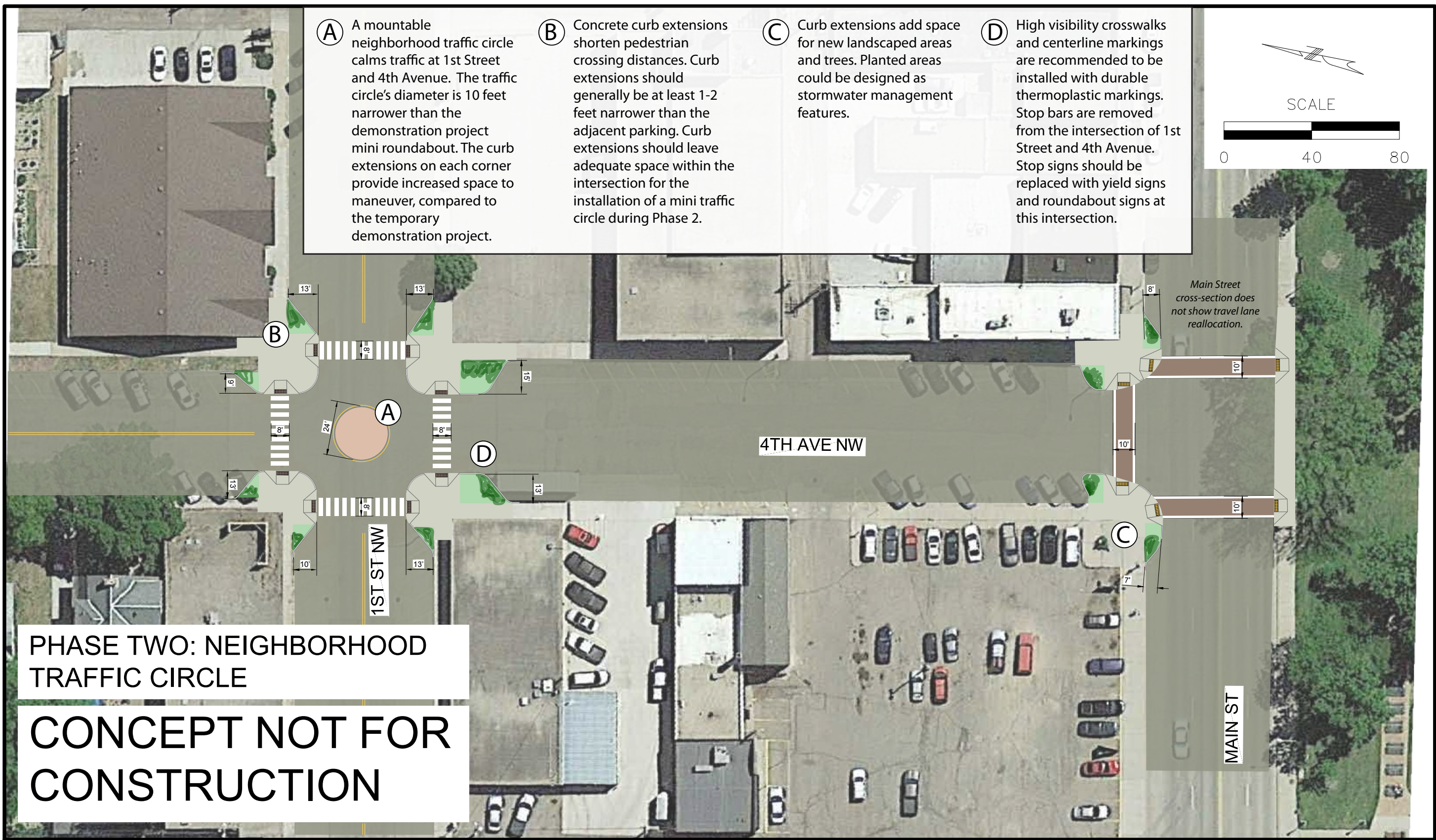
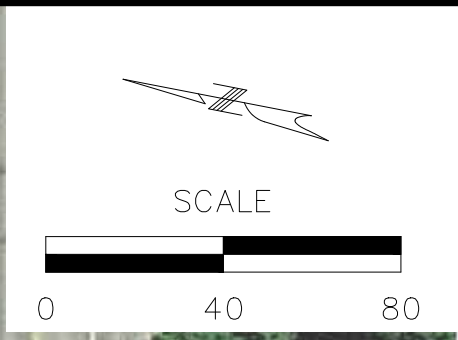


ND MOVES DEMONSTRATION PROJECT  
 MANDAN - 4TH AVENUE  
 1ST STREET TO MAIN AVENUE  
 POTENTIAL CONCEPT FOR LONG-TERM  
 CHANGES - PHASE 1: CURB EXTENSIONS

In the summer of 2018, NDDOT led the development of temporary demonstration projects throughout North Dakota as part of the ND Moves Statewide Active and Public Transportation Plan. The drawing above shows a potential design for long-term changes to the project area, based on the temporary demonstration project.  
**This concept is not intended as a construction document. This is not in place of NEPA or other design and environmental processes.**



- (A)** A mountable neighborhood traffic circle calms traffic at 1st Street and 4th Avenue. The traffic circle's diameter is 10 feet narrower than the demonstration project mini roundabout. The curb extensions on each corner provide increased space to maneuver, compared to the temporary demonstration project.
- (B)** Concrete curb extensions shorten pedestrian crossing distances. Curb extensions should generally be at least 1-2 feet narrower than the adjacent parking. Curb extensions should leave adequate space within the intersection for the installation of a mini traffic circle during Phase 2.
- (C)** Curb extensions add space for new landscaped areas and trees. Planted areas could be designed as stormwater management features.
- (D)** High visibility crosswalks and centerline markings are recommended to be installed with durable thermoplastic markings. Stop bars are removed from the intersection of 1st Street and 4th Avenue. Stop signs should be replaced with yield signs and roundabout signs at this intersection.



PHASE TWO: NEIGHBORHOOD TRAFFIC CIRCLE

# CONCEPT NOT FOR CONSTRUCTION

ND MOVES DEMONSTRATION PROJECT  
 MANDAN - 4TH AVENUE  
 1ST STREET TO MAIN AVENUE  
 POTENTIAL CONCEPT FOR LONG-TERM  
 CHANGES - PHASE 2: NEIGHBORHOOD  
 TRAFFIC CIRCLE

In the summer of 2018, NDDOT led the development of temporary demonstration projects throughout North Dakota as part of the ND Moves Statewide Active and Public Transportation Plan. The drawing above shows a potential design for long-term changes to the project area, based on the temporary demonstration project. **This concept is not intended as a construction document. This is not in place of NEPA or other design and environmental processes.**







Interlocking pavers form an attractive streetscaping element. Note that reflective, 12" wide crosswalk striping is recommended in thermoplastic instead of brick (image: interlockdesign.org)

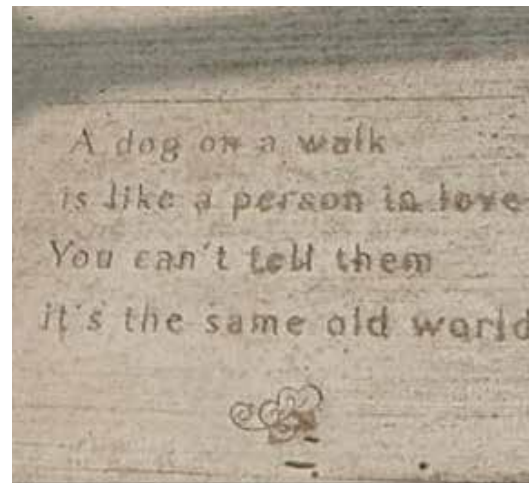


Thermoplastic faux-brick pavers are eye catching. The durable material does not typically fade over time and is longer-lasting than paint (Image: Denver Urbanism).

## WHAT OTHER CHANGES COULD BE CONSIDERED LONG-TERM?

### • PLACEMAKING ON MAIN STREET:

- The Main Street redesign project offer opportunities to add placemaking elements to Main Street. Brick elements and landscaping could be added to give vibrancy to curb extensions.
- Brick-colored pavers within crosswalks could enhance the area's aesthetics. This and similar changes could encourage people to walk through downtown Mandan for dining, shopping, and local events.
- Crosswalk design should comply with MUTCD standards. Highly durable materials such as interlocking concrete pavers would not require paint to achieve a brick color. The pavers could hold their color over many seasons. The crosswalk paving pattern or color could differ slightly from intersection to intersection to add visual interest and character. Pattern and color variation should remain compliant with MUTCD and other standards.



- Other placemaking ideas include:
  - Use contrasting materials such as concrete and asphalt to mark travel lanes versus parking areas. This approach also visually narrows the roadway.
  - Work with local artists to create sculptures or other works of public art such as murals or large-scale mosaics. Sidewalk poetry can be added as an inexpensive element when constructing new sidewalk. Poems are stamped into wet concrete using a mold.
  - Coordinate with NDDOT to consider reallocating space from one additional parking space per corner at Main Street (one each side of a curb extension) to create longer curb extensions. This could create additional space for bike racks, landscaping, or other features. This design change would also improve pedestrian visibility at Main Street, which is a high speed and traffic volume roadway.
  - Add street trees, if space allows.
  - Use native plants within planters or other landscaping elements. Include small signs or plaques to describe the benefits of using native plants.
  - Add pedestrian scale lighting along Main Street. Consider adding hangers for planters and/or decorative flags to change throughout the seasons.

Sidewalk poetry is stamped into new sidewalk. The inexpensive design choice attracts positive attention and unique detail. A hashtag, City logo, City motto or other element could be added to further personalize the sidewalk poetry.



*This curb extension doubles as a bioswale to filter stormwater.*



*Curb extension with drainage inlet, artistic stamped concrete, brick paving, and planter (Image: Eric Fidler, <https://www.flickr.com/photos/greatphotographic/5996098479>).*

- **WINTER MAINTENANCE:** Curb extension and mini traffic circle design is important to ensure snow plows will be able to negotiate both elements. Curb extensions should be designed approximately one to two feet less than the full width of adjacent on-street parking. Snow plows will drive parallel to parked cars without hitting and potentially damaging the curb extensions.
- Mini traffic circle design should consider winter maintenance by ensuring travel lanes leave enough space for snow plows to maneuver. Plows would perform a first pass around the circle and an additional pass, slightly outside of where the plow first traveled. This is important to make sure travel lanes are cleared. The [Indiana Local Technical Assistance Program \(LTAP\) Roundabout Maintenance Manual](#) provides guidance related to winter maintenance and other seasonal maintenance topics (pages 8-9).
- Some communities plow mountable curb extensions. However, others do not. Reflective markers on poles and painted curbs serve as additional reminders about the presence of concrete curbs.
- Snow plow operators should be briefed on proper clearance techniques. Snow plow “rodeo” competitions have been used in New York State, for example, to educate snow plow operators.
- **STORMWATER MANAGEMENT:** Curb extensions offer the possibility of installing stormwater management features. Cities are increasingly using features such as bioswales to manage stormwater. Bioswales concentrate and/or remove pollution and debris from runoff water.

The channeled depression or trench can double as an attractive landscaping area with low maintenance, native plants.

- **ENGAGE THE PUBLIC:** Share illustrative options for long-term change with the public. As stated in the previous section, this could help avoid confusion by showing residents what permanent curb extensions and neighborhood traffic circles could look like.
- Mini traffic circle design should consider the needs of large vehicles including fire trucks, recreational vehicles, and vehicles hauling farm equipment. The size of the roundabout needs to be large enough that passenger vehicles negotiate around the roundabout rather than traveling straight through the intersection's center.

## Recommended Next Steps

- Coordinate with NDDOT to discuss permanent changes on State right-of-way; coordinate with local leadership to discuss permanent changes on local roadways
- Use the findings presented here and other data to develop additional design documents from the recommended long-term concept
- Gather public and stakeholder input regarding the proposed long-term project
- Estimate project cost
- Identify funding sources