

Road Safety Audit

Intersection
of
Minnesota Trunk Highway 23
and
Lyon County State Aid Highway 7



Study Location



What is road safety audit?

“A road safety audit is a formal examination of an existing or future road or traffic project, or any project which interacts with road users, in which an independent, qualified examiner(s) reports on the project’s accident potential and safety performance.”

Key Elements

- **Formal process not an informal check**
- **Independent process**
- **Carried out by people with appropriate experience and training**
- **Restricted to road safety issues**

Background

In August of 2006, a fatal car/bike accident occurred at this intersection. After the accident, Mn/DOT received numerous requests to improve the safety of this intersection.

Road Safety Audit

A Road Safety Audit (formal examination) was determined to be a necessary first step in improving the safety at this intersection.

Independent Qualified Examiner

**The consultant firm of
Short Elliott Hendrickson, Inc. (SEH)
was retained to perform
the safety audit.**



Road Safety Audit Team

Name	Agency
Dan Brannan	Mn/DOT-Traffic Safety Specialist
Jim Rosenow	Mn/DOT-State Geometric Design Engineer
Rick Sunstrom	Mn/DOT-Signing Supervisor
Nancy Daubenberger	Mn/DOT Metro District – Traffic Engineer
Tom Dumont	Mn/DOT District 3 – Traffic Engineer
Brad Messer	Minnesota State Patrol
George Calebaugh	SEH – Traffic Engineer

November 29, 2006

The Road Safety Audit Team met with City of Marshall staff, District 8 staff, and area State Patrol personnel.

Meeting Background Info

Items reviewed at the November 29th meeting:

- **Turning Movement Counts (9/13/04)**
- **Accident Data (5+ years of data: 17 accidents)**
- **Road Plans**
- **Meeting Notes**
- **Planning Documents**



Field Review

Following the meeting, the team performed an extensive field review of the intersection.



December 12, 2006

**SEH completed a report on the
Road Safety Audit.**

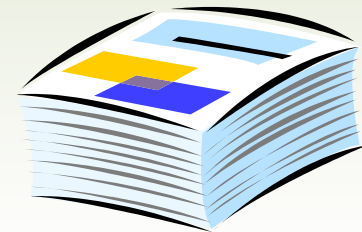
January 9, 2007

**George Calebaugh, SEH,
gave a presentation on the
Safety Audit
to
City of Marshall, Lyon County,
and Mn/DOT District 8
personnel.**

Report

Report identified potential mitigation measures:

- **15 Short-Term Improvements**
- **5 Long-Term Improvements**
- **2 Other Considerations**



Report Summary

The report summary states:

The potential mitigation measures suggested by the RSA team will require additional investigation and a detailed review by District 8 staff before any decisions can be made about which measures should be implemented.

Assigning Responsibilities

After the Safety Audit presentation, representatives of the city, county and Mn/DOT met and assigned responsibilities to the Potential Mitigation Measures identified.

Note: some measures involved more than one governmental unit.

Meetings

Additional meetings were held:

- **January 29th**
- **February 13th**
- **March 6th**

The governmental units made decisions on the mitigation measures identified.

Decisions

Decisions on the identified potential mitigation measures.

Short-Term Improvements

Recommendation #1:

Upgrade the signing at the TH 23/CSAH 7 intersection to conform to current Mn/DOT standards for expressway facilities.

This includes the following:

- **One Way**
- **Do Not Enter**
- **Stop**
- **Divided Highway**
- **Right Lane Must Turn Right**
- **Left Lane Must Turn Left**



Action #1 (Mn/DOT)

Upgrade the signs as recommended.

***Note: Work order was issued from this work
on January 30, 2007.***

Recommendation #2:

Increase the size of the STOP AHEAD sign on the northbound approach of CSAH 7 to bring the sign into compliance with the MMUTCD.



Action #2 (County)

Signs upgraded as recommended.

Recommendation #3:

Increase the size of the advance BIKE CROSSING and BIKE CROSSING signs to 36x36 signs.



Action #3 (Mn/DOT)

Signs upgraded as recommended. Will also increase bikeway signs at County Road 30 crossing.

Recommendation #4:

Add BIKE ROUTE sign with LEFT ARROW sign to eastbound TH 23 west of CSAH 7.

Action #4 (Mn/DOT)

Signs added as recommended. Will also add signs at County Road 30 crossing.

Recommendation #5:

Add flashers to the BIKE CROSSING signs.

There are several alternatives for how these flashers would be activated.

- **One option is to have the flashers on continuously.**
- **Another option is to have a pushbutton to activate the flashers.**
- **A third option is to have a detector activate the flashers.**

Recommendation #5: [contd]

The total cost to provide flashing beacons at the CSAH 7 and County Road 30 is estimated to be about \$40,000 for 8 beacons.

If installed, Mn/DOT would prefer pushbutton activated flashers. Mn/DOT would not install continuously flashing beacons since this would diminish the flashing beacons effectiveness.

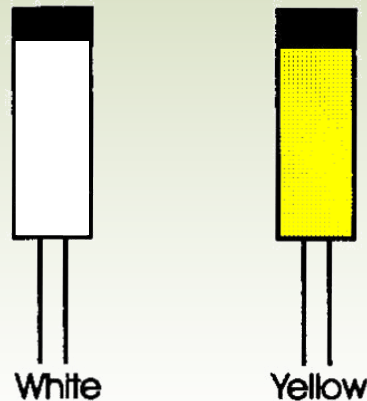
Action #5 (Mn/DOT)

Recommended that the bike trail be relocated off the trunk highway system (Mn/DOT would support relocation efforts).

If bike trail is not relocated, the flashing beacon will be submitted as a candidate for safety funds.

Recommendation #6:

The yellow delineators marking the right side of the curve in CSAH 7 immediately north of TH 23 should be replaced with white delineators to conform to MMUTCD guidelines.



GUIDE MARKER PLATE
200 x 600 mm
(8" X 24")

Action #6 (County)

White delineators were placed as recommended.

Recommendation #7:

The yellow delineators marking the right side of the curve in CSAH 7 immediately north of CSAH 7/Country Club Drive should be replaced with white delineators to conform to MMUTCD guidelines.

Action #7 (City & County)

White delineators were placed as recommended.

Recommendation #8:

Add rumble strips adjacent to the edge lines along TH 23, especially west of CSAH 7. The rumble strips will alert drivers not only that they may be leaving the road, but also that they are encroaching onto a shoulder that may be used by bicyclists.

Action #8 (Mn/DOT)

Recommend that rumble strips be added from CSAH 7 to County Road 30 on Project 4207-49. This project is currently listed in the “draft” District 8 10-Year Plan (1/31/07) for construction in 2015. The rumble strips will also be submitted as a candidate for safety funds.

Recommendation #9:

Use longer lasting materials (epoxy or plastic) for the pavement markings on the CSAH 7 approaches to TH 23.

Action #9 (County)

County requests Mn/DOT to stripe along with the TH 68 downtown project detour on CSAH 33.

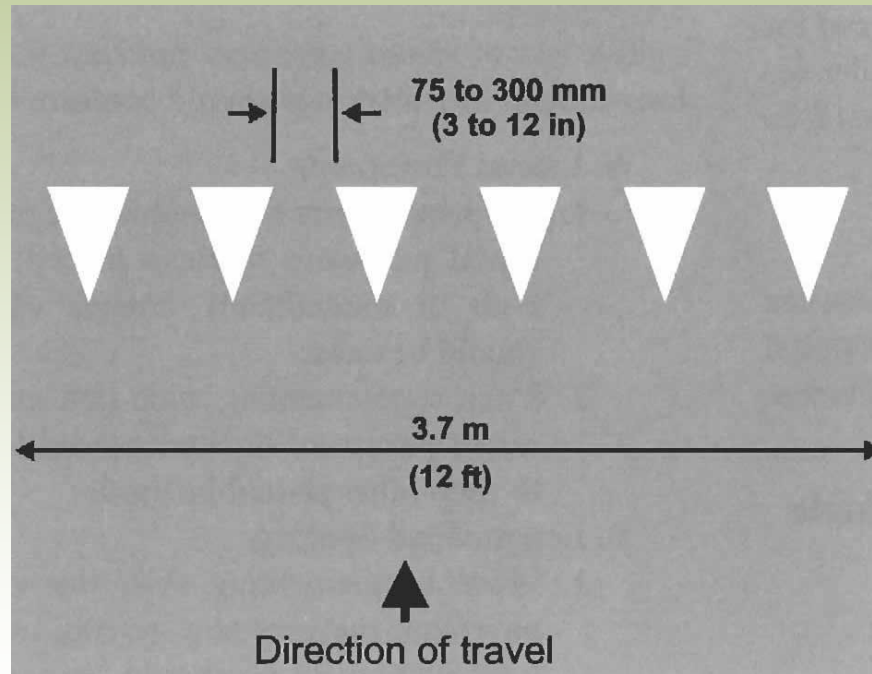
Recommendation #10:

Mark yield lines in the median crossover. This is suggested as an attempt to alert northbound and southbound drivers that they may have to stop at the YIELD signs and to have them take a better look at approaching traffic on TH 23.

Since many of the accidents recorded at this intersection are due to drivers failing to yield, this could reduce accidents.

Action #10 (Mn/DOT)

Install yield lines as suggested.

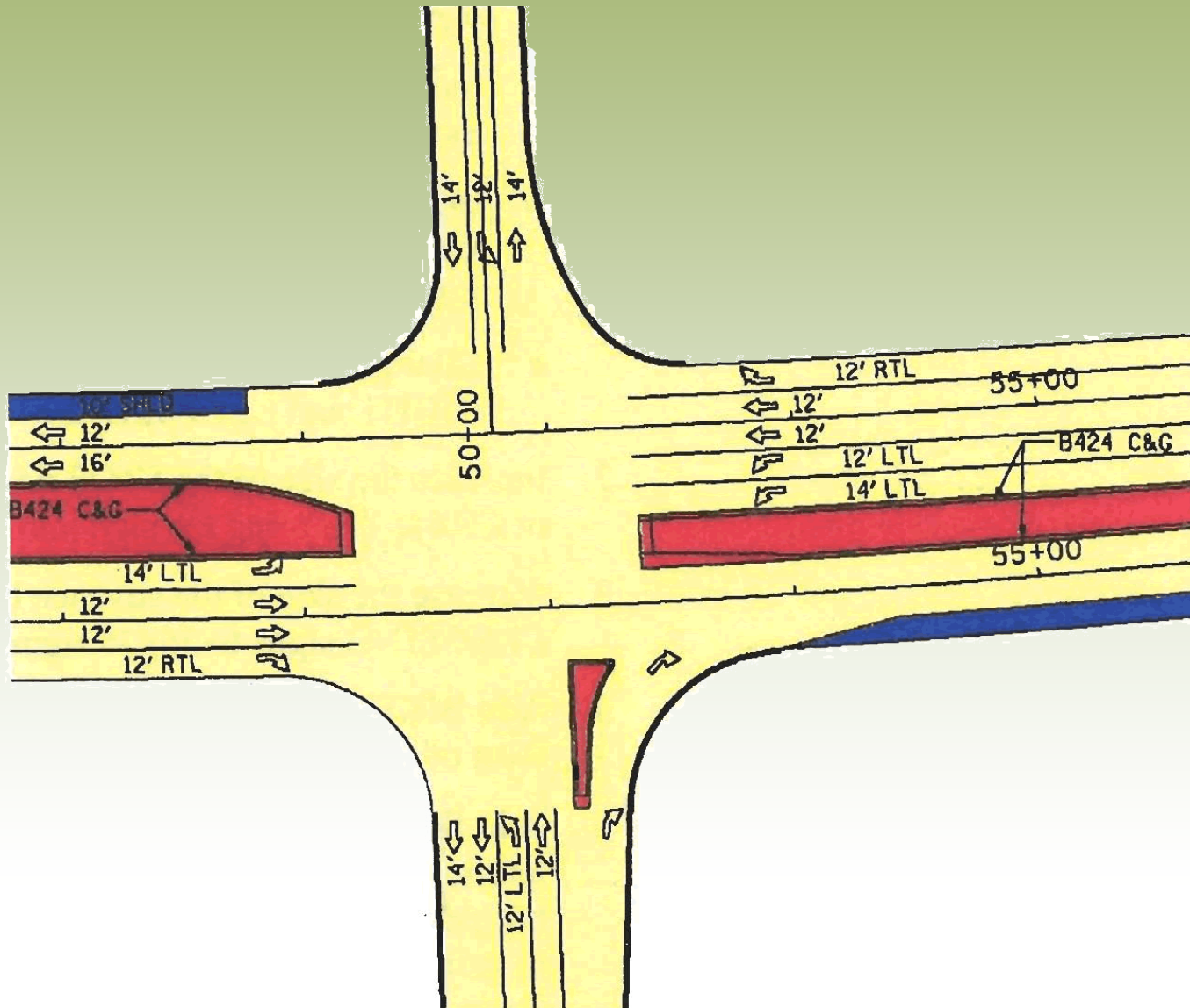


Recommendation #11:

Reconstruct the median ends on TH 23 at CSAH 7 to provide raised concrete median island ends conforming to the latest Mn/DOT standards.

At the same time, provide a defined pathway (perhaps a concrete surface) across the median area for the bike crossing. This pathway should be protected by the raised median, providing a buffer between the bike/pedestrian traffic and vehicular traffic.

Intersection Median Island End Treatment



Action #11 (Mn/DOT)

Submit the proposed construction as a candidate for safety funds.

Also consider adding the construction to Project 4207-49.

If bike trail is relocated, this action is not necessary.

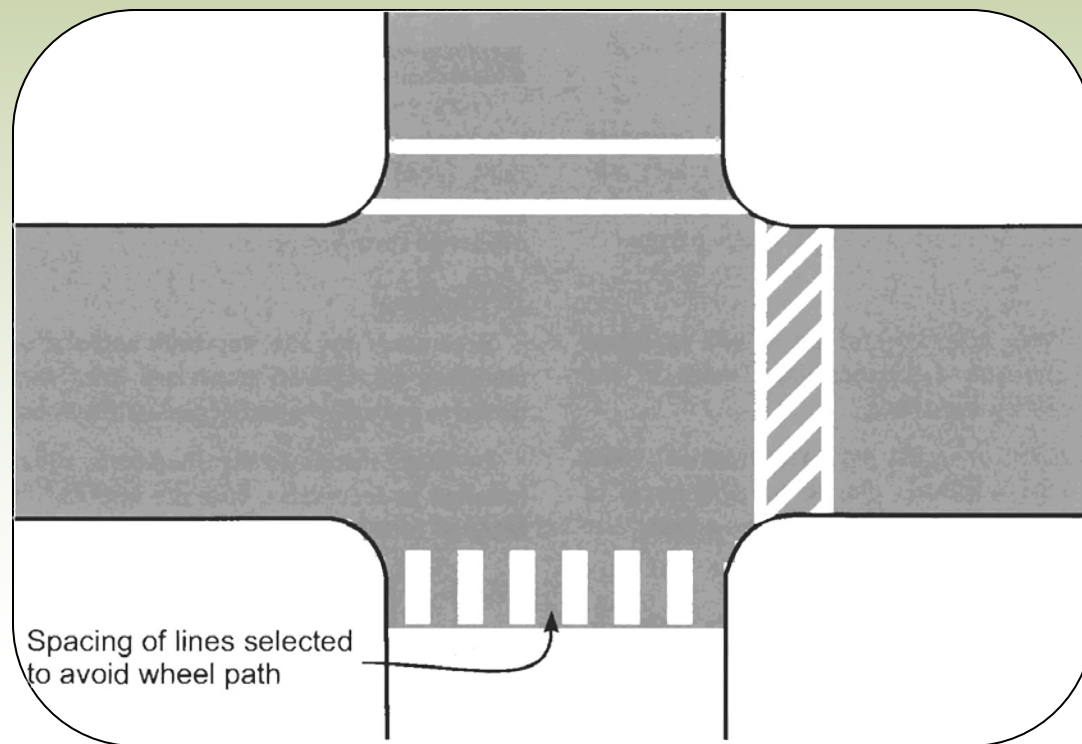
Recommendation #12:

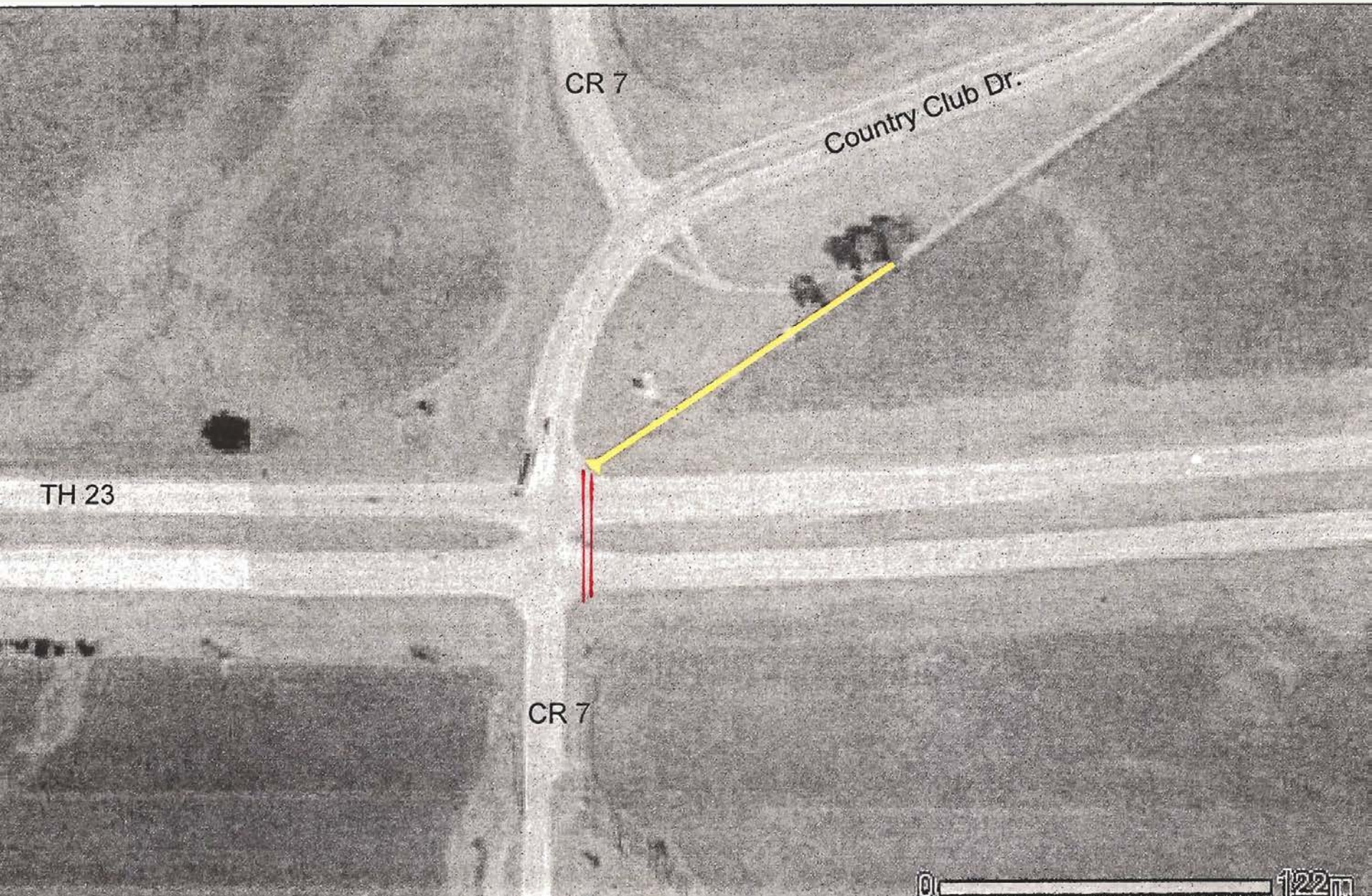
Add crosswalk markings for the bike crossing. These markings should only be added if the improvements under Items 4 and 10 are also undertaken.

Studies have shown that crosswalk markings by themselves do not provide any safety benefits on high speed/high volume roadways such as TH 23.

Action #12 (Mn/DOT)

Install crosswalk markings as suggested.





Recommendation #13:

Add a high-intensity activated crosswalk (HAWK) signal for the bike crossing.

The HAWK signal is modeled after emergency vehicle beacons. The signal display is dark until activated by a bicyclist/pedestrian; then the signal display cycles through flashing yellow, steady yellow, steady red and flashing red. This type of signal/beacon is not currently a standard device in the MMUTCD, and the use of this signal would require that the District process a FHWA request to experiment. If the FHWA approves the request to experiment, then the District could install the signal.

Action #13 (Mn/DOT)

Do not install.

Group is concerned about placing a non-standard device experimentally at this high speed location.

Recommendation #14:

Increase the corner radius in the northwest and southeast corners of the TH 23/CSAH 7 intersection to better accommodate large trucks.

This improvement will allow trucks to make the turn without going off the pavement or swinging into the adjacent traffic lane.

Action #14 (Mn/DOT)

No action at this time.

Turning movement checks were made via plans and “auto turn”. Intersection should accommodate large trucks.

As part of project scoping for Project 4207-49, check as built in field to make sure it matches plan. If need for further work is identified, consider adding to Project 4207-49.

Recommendation #15:

Add crashworthy end treatments to the bridge railing ends for the bridge on CSAH 7 south of TH 23.

Action #15 (County)

County to consider.

Not a requirement at this time.

Long-Term Improvements

Recommendation #L-1:

Change the TH 23/CSAH 7 intersection to a grade-separated interchange.

This improvement will significantly reduce crashes. However, this type of improvement has the highest cost and greatest right of way needs of any of the alternatives suggested.

Action #L-1

(City, County, Mn/DOT)

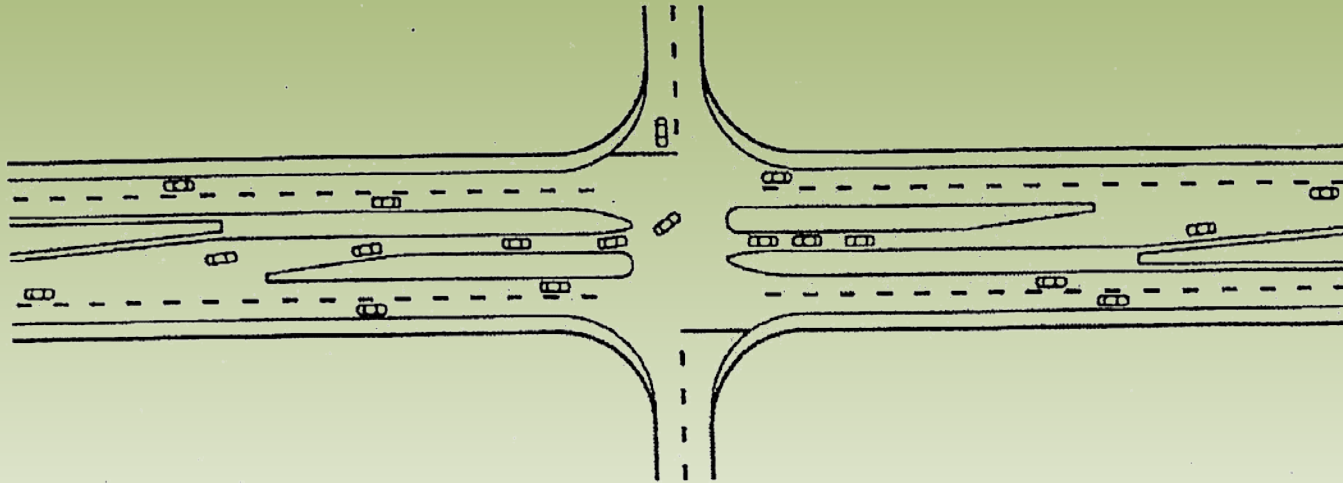
The City and County wish to pursue this with Mn/DOT as a right of way footprint and official mapping.

Recommendation #L-2:

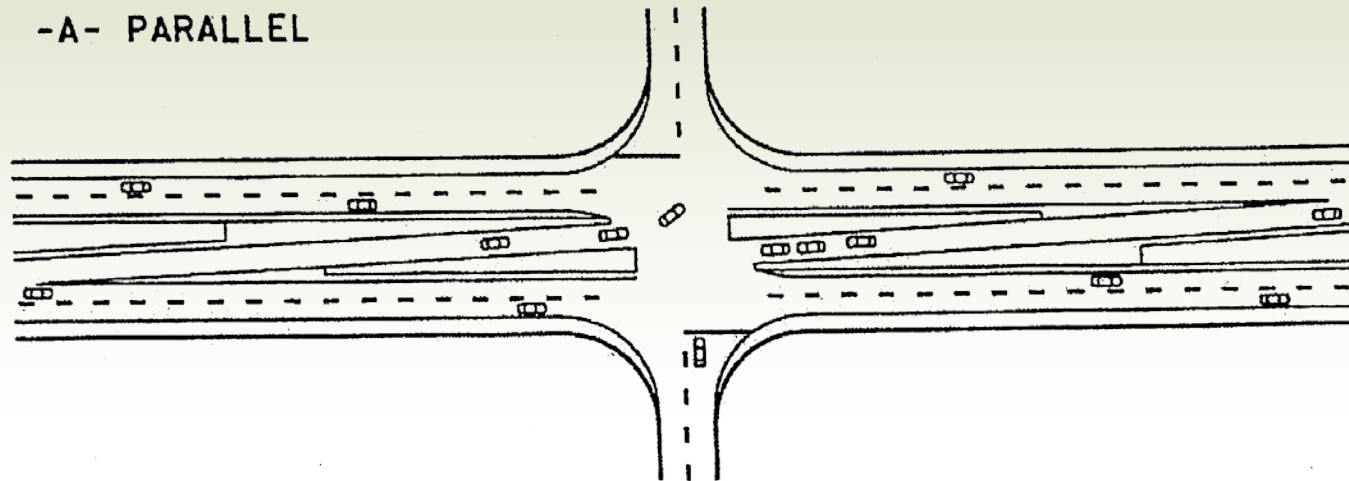
Reconfigure the intersection to provide offset left turn lanes for the TH 23 approaches.

The offset left turn lanes should provide better sight distance for TH 23 left turners when there is traffic in the opposing left turn lane.

Offset Left Turn Lanes



-A- PARALLEL



-B- TAPERED

Action #L-2 (Mn/DOT):

No action at this time. Further investigation on future improvement projects.

Mn/DOT is concerned about the operational efficiency of this design and the lack of driver experience with this type of left turn design. Additional median width would be necessary which would require reconstruction of portions of the four-lane. This would be a very expensive improvement.

Recommendation #L-3:

Reconfigure the intersection to provide a free right turn lane for southbound CSAH 7 with an acceleration lane on TH 23 for this movement. (The southbound rights turn movement is the heaviest CSAH 7 movement at the intersection.)

This improvement could be combined with #L-2 above.

Turning movement checks were made via plans and “auto turn”.

Intersection should accommodate.

The current intersection geometrics allow trucks to enter without swinging into the adjacent lane.

The accident review does not identify slow accelerating trucks as a cause of crashes at this intersection.

Action #L-3 (Mn/DOT):

No action at this time.

This improvement was correctly categorized as a long term improvement. Accident data does not indicate the lack of a free right turn lane and acceleration to be a problem.

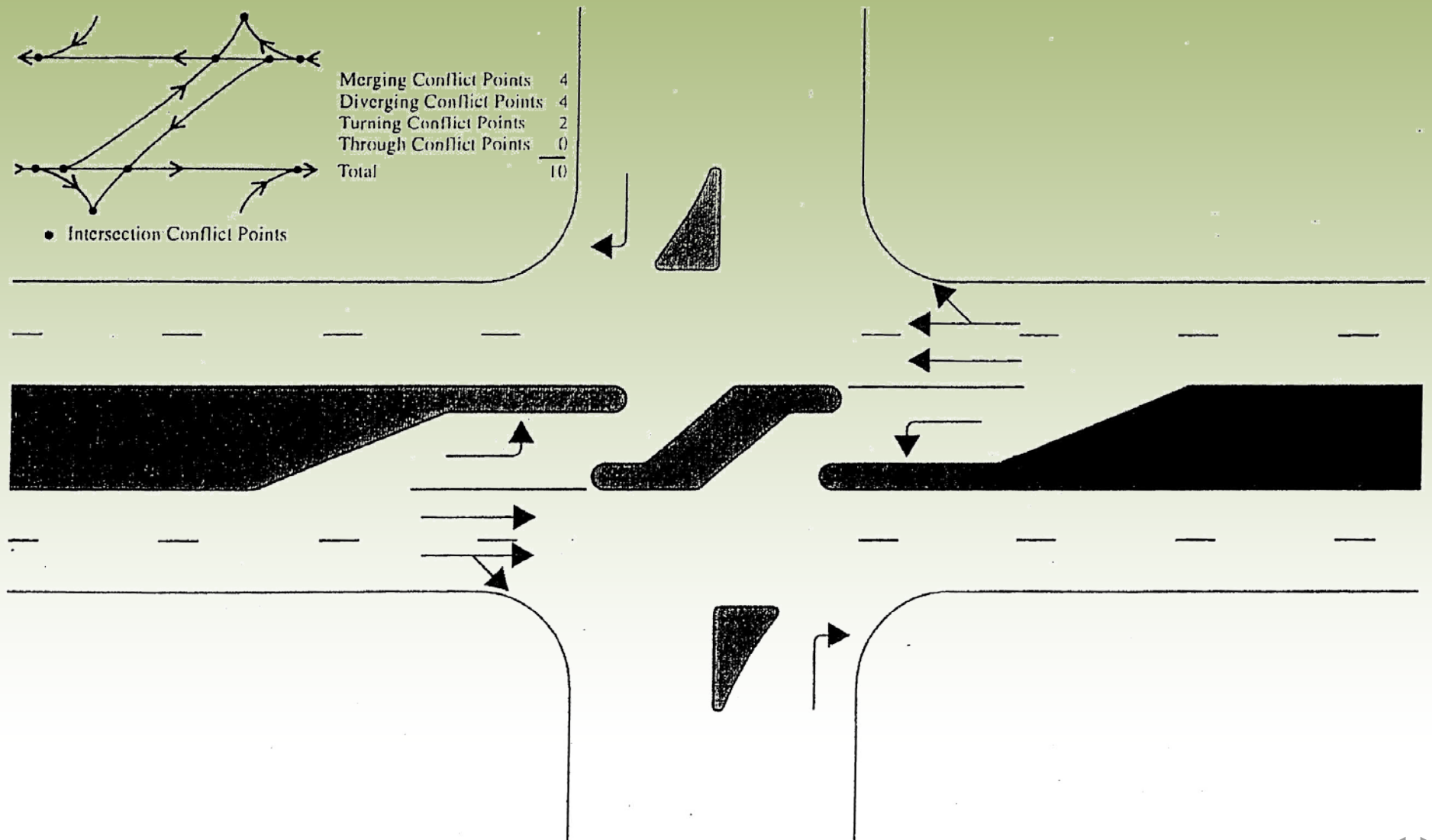
However, it may improve the capacity of the intersection. Therefore, it should be further investigated on future improvement projects in this area such as Project 4207-49.

Recommendation #L-4:

Reconfigure the intersection to allow only eastbound and westbound left turns from TH 23 across the median crossover.

This will create what is called $\frac{3}{4}$ access intersection.

$\frac{3}{4}$ Access Intersection



Action #L-4 (Mn/DOT):

No action at this time.

Further investigation on future improvement projects.

Recommendation #L-5:

Reconstruct the CSAH 7/Country Club Drive intersection. Realign the north and west legs of the intersection so that CSAH 7 becomes the through road and is straight all the way to TH 23. Realign Country Club Drive to the north and tee it into CSAH 7.

Action #L-5 (County, City):

County and City may coordinate a project into 2014-2015.

Other Considerations

Other #1:

Provide sidewalks or trails along CSAH 7 and alternate off-road facilities along TH 23 to better accommodate pedestrians and bicyclists.

It appears some planning for bike/hike trails in the County has been completed. The City may want to take a more detailed look along the TH 23 corridor to determine where grade-separated bike/hike crossings may be appropriate.

Action Other #1

(City, County, Mn/DOT):

Mn/DOT Maintenance and City to partner in the modification and extension of the existing trail along Country Club Drive to TH 23 this spring. The City/County will be working with the YMCA group to submit an enhancement proposal for consideration of an off-road trail from CSAH 7 to CSAH 30 in Lynd along the north side of TH 23 right of way. This is a different route than the conceptual layout route developed by the County. The actual route will be developed through the appropriate boards, councils, and interested parties.



Other #2:

The County & City should consider forming a safe communities coalition (SCC). Funding programs for education and safety improvements are available through the SCC. Grants from the “Safe Routes to School” program could be used to help educate students on safe road crossing practices, as well as to help fund improvements along specific routes. The “Drive Alive” program could be used for educational outreach to senior citizens for safe driving and safe roadway crossing practices.

Action Other #2:

A safe communities coalition was formed.

Efforts are underway to establish a district wide support group.

THE END

