

Appendix H – Supplementary County Resources



Building a Better World
for All of Us®

May 26, 2020

RE: Steele County, Minnesota
City of Owatonna
Traffic Signal Field Analysis
SEH No. 153593

Mr. Paul Sponholz, PE
Assistant County Engineer
Steele County Highway Department
PO Box 890
3000 Hoffman Drive NW
Owatonna, Minnesota 55060

Dear Mr. Sponholz:

The Steele County Highway Department, in conjunction with the City of Owatonna, retained Short Elliott Hendrickson Inc. (SEH) to provide assistance with determining projected budgeting and planning for future traffic signal maintenance and improvements throughout the City of Owatonna. Currently, the City/County has a total of 19 City and/or County owned and operated traffic signal systems under their jurisdiction. The locations of these signal systems are summarized as follows:

1. Hoffman Drive (CSAH 2) at 24th Avenue NW
2. Hoffman Drive (CSAH 2) at 21st Avenue NW
3. 21st Avenue NW at West Frontage Road
4. Hoffman Drive (CSAH 2) at East Interstate 35 Ramps
5. Hoffman Drive (CSAH 2/45) at State Avenue/CSAH 45
6. Hoffman Drive (CSAH 45) at North Street
7. Hoffman Drive (CSAH 45) at Rose Street (CSAH 19)/Glendale Street
8. Rose Street (CSAH 19) at Cedar Avenue
9. West Bridge Street at Park Drive
10. West Bridge Street at West Interstate 35 Ramps
11. West Bridge Street at Allan Avenue/Florence Avenue
12. West Bridge Street at State Avenue
13. Main Street (CSAH 48) at Oak Avenue (CSAH 45)
14. Main Street (CSAH 48) at West Park Square
15. Main Street (CSAH 48) at Elm Avenue
16. Main Street (CSAH 48) at Grove Avenue
17. Main Street (CSAH 48) at Lincoln Avenue
18. Cedar Avenue (CSAH 45) at Hy-Vee Entrance
19. Cedar Avenue (CSAH 45) at 18th Street

Engineers | Architects | Planners | Scientists

Short Elliott Hendrickson Inc., 3535 Vadnais Center Drive, St. Paul, MN 55110

SEH is 100% employee-owned | sehinc.com | 651.490.2000 | 800.325.2055 | 888.908.8166 fax

In January-May 2020, the County had SEH complete a detailed field analysis of these signal systems. SEH also completed traffic counts at each intersection along with a review of signal timing that will be discussed and coordinated with the County in a future document and in future field work on each signal system.

In general, many of the existing signal systems are either beginning to show their age and are in need of significant upgrades; or have portions of the signal system/intersection that are not up to current State signal and ADA design standards and may need to be considered for minor upgrades over time.

Review of Traffic Counts and Warrant Analysis

As part of our review of each intersection, we also reviewed traffic count data obtained in January-February 2020 by SEH for each intersection approach and compared these counts with the warrants for signalization as listed in the Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD).

The following 6 signal systems are able to fully meet MnMUTCD warrants for signalization:

- Hoffman Drive (CSAH 2) at 21st Avenue NW
- Hoffman Drive (CSAH 2) at East Interstate 35 Ramps
- Hoffman Drive (CSAH 2/45) at State Avenue/CSAH 45
- Hoffman Drive (CSAH 45) at North Street
- Main Street (CSAH 48) at Oak Avenue (CSAH 45)
- Cedar Avenue (CSAH 45) at 18th Street

Signal systems that do not fully meet MnMUTCD warrants for signalization but are able to meet at least 60% of either Warrant 1A (Minimum Vehicular Volume) or Warrant 1B (Interruption of Continuous Flow) and thus be considered as justified and not requiring removal including the following 8 signal systems:

- Hoffman Drive (CSAH 2) at 24th Avenue NW
- Hoffman Drive (CSAH 45) at Rose Street (CSAH 19)/Glendale Street
- West Bridge Street at Park Drive
- West Bridge Street at West Interstate 35 Ramps
- West Bridge Street at Allan Avenue/Florence Avenue
- West Bridge Street at State Avenue
- Main Street (CSAH 48) at Grove Avenue
- Cedar Avenue (CSAH 45) at Hy-Vee Entrance

The following 5 signal systems were not able to meet at least 60% of Warrants 1A or 1B and thus may need to be considered for removal:

- 21st Avenue NW at West Frontage Road
- Rose Street (CSAH 19) at Cedar Avenue
- Main Street (CSAH 48) at West Park Square
- Main Street (CSAH 48) at Elm Avenue
- Main Street (CSAH 48) at Lincoln Avenue

For the 5 signal systems that do not meet at least 60% of MnMUTCD Signal Warrants 1A or 1B, there may be other circumstances at each intersection (heavy commercial/office development, higher pedestrian volumes, geometric issues, etc.) that can justify maintaining a signal system at these locations.

Field Review

As part of the process to determine the condition and needs at each of the above mentioned signalized intersections, we performed a detailed field review of these 19 signal systems between January 23-30, 2020 along with subsequent site visits to review other items and confirm conditions of previously reviewed items in April-May 2020. Items reviewed at each signal system included but were not limited to the following:

1. Overall general condition of signal components and age of each system.
2. Presence of components at each signal system and intersection that meet ADA requirements for access to the signal system and intersection.
3. Presence of current standard signal components, such as ADA compliant pedestrian push buttons, LED pedestrian signal indications with “countdown timer” indications, LED vehicular signal lenses, APS (audible) pedestrian push buttons, “Flashing Yellow Arrow” signal operations, etc.
4. Paint condition of signal system and the need for repainting in the near future.
5. Current maintenance items that need to be addressed by the City/County to ensure that each signal system is fully operational and in good working condition.

Individual Intersection Evaluations

With regards to current condition and our recommendations, we have broken up our analysis into recommended minor improvements as well as our observations of each signal system. Maintenance and potential future improvements are listed with an estimated construction cost and how the improvement would be required to be enacted (by City/County forces, or by a separate contractor).

Some items are more critical than others and are recommended to be addressed as soon as possible. Other items can be addressed by adding them to other City/County roadway and signal projects in the future, to be able to save costs on work items by including them on larger projects that are let during the construction season.

With regards to specific needs at each signal system, please note the following:

1. ADA Compliance Notes

With regards to ADA (Americans with Disabilities Act) requirements, the Federal and Minnesota Manuals on Uniform Traffic Control Devices (MnMUTCD), and PROWAG (Public Right of Way Accessibility Guidance), existing intersections without ADA compliant pedestrian curb ramps and accessible sidewalks are not required to have these upgraded to the newer ADA standards unless other significant sidewalk and/or road work is completed at these locations. However, the City/County is required to at least have a transition plan in-place for upgrading curb ramps to ADA compliance.

Work to upgrade signal systems to include the APS (Accessible Pedestrian Systems) audible pedestrian push buttons system either has already been completed or will be completed in 2020 by others at 6 of the 19 signal systems listed above. For the remaining 13 signal systems, we recommend that the City/County program and budget for upgrading these signal systems over the

next few years so that signal systems throughout the City have these capabilities and there is consistency in operation of pedestrian detection.

We also recommend that the City/County consider including the APS system with any new signal system installations or full signal replacements (as well as with significant signal revision work) to ensure that these signal systems will be in compliance with recommended ADA and PROWAG standards.

2. Flashing Yellow Arrow Operation

With regards to the use of “Flashing Yellow Arrow” left turn phasing, the State is recommending that any new signal system with protected or protected/permissive left turn phasing instead include the “flashing yellow arrow” operation. Implementing this operation for existing signal systems is being incorporated at many locations throughout the State as budget allows. We recommend including the use of the “flashing yellow arrow” operation for any new, replaced, or significantly revised signal system where the controller and controller cabinet are being upgraded or replaced as part of that work.

For existing signal systems, we recommend consideration of this modification but note that this change in operations on an existing signal system is often an expensive endeavor. Several traffic signal controller units within existing City traffic signals are incapable of operating the “flashing yellow arrow” without upgrade to a newer controller unit. Similarly, some of the controller cabinets within the City are also too old to be able to accommodate “flashing yellow arrow” operation (cabinets greater than 20 years old are generally considered by the State and the industry as being too old for use of this operation) and would require full replacement. A typical new compatible controller unit is estimated to cost between \$5,000 and \$7,000 while a new TS-2 controller cabinet capable of operating the “flashing yellow arrow” is estimated to cost around \$25,000 (including labor to install the new cabinet). Add in additional overhead signal heads that are needed to allow for this operation, and the cost to upgrade an existing signal system to “flashing yellow arrow” can often exceed \$50,000 or more. Thus, careful consideration is needed when contemplating upgrading a signal system to have the “flashing yellow arrow” operation.

3. Painting

Signal systems generally should be considered for full re-painting approximately every 8-10 years in order to address peeling and rusting issues and be able to keep these poles in use until the end of the overall signal system lifespan. At this time, we estimate that a number of the City/County owned signal systems will be in need of re-painting over the next 5 years. Painting costs are typically approaching \$8,000 to \$10,000 per intersection based on recent bid costs if a private contractor is used for these services. These intersections could also be programmed for painting by City or County forces as well.

4. Signal Replacement

In general, all of the City/County owned and operated traffic signal systems are in fair/good condition and would not require significant replacement work for several years. Note that a signal system typically has a useful lifespan of approximately 30-40 years before replacement is

recommended to address age of system, potential concerns about structural soundness of various components, and upgrading to current design standards.

The following signal systems are either approaching or exceeding the 30-40 year lifespan and thus are recommended to be considered for full replacement in the next 5-10 years:

- Hoffman Drive (CSAH 45) at North Street
- West Bridge Street at Allan Avenue/Florence Avenue
- West Bridge Street at State Avenue
- Main Street (CSAH 48) at Oak Avenue (CSAH 45)
- Main Street (CSAH 48) at West Park Square
- Main Street (CSAH 48) at Elm Avenue

5. LED Indication Upgrades

All City/County owned traffic signal systems have previously had all vehicle and pedestrian signal indications upgraded to LED indications, with only the upgrading to have “countdown timer” pedestrian indications needed at several locations.

6. Video Detection

Of note is that upgrading all 3-4 intersection approaches at a signal system to have video vehicular detection typically costs around \$35,000 to \$40,000 per intersection to complete (labor included). For a new signal system, this cost is similar to the costs of having in-pavement vehicular detection installed (which includes additional handholes and conduit needed to reach advance detection areas). For an existing signal system, this would be an added cost and would have all existing advance detection components be abandoned in-place. However, there are significant benefits to having video detection retroactively added to a signal system including flexibility in detector placements to address current and future traffic patterns, the ability to maintain vehicular detection when construction is ongoing (including mill and overlay work that impacts existing loops in pavement), and the ability to revise detection areas when lanes are closed for area construction.

Video detection does require additional maintenance versus in-pavement detectors (including periodic re-aiming of cameras and cleaning of camera lenses). In-pavement vehicular detection often does not require any on-going maintenance unless wiring or in-pavement detectors are disturbed by area construction, rodents in handholes chew through wiring, or there is standing water in handholes that can damage loop detector wiring and splicing over time.

7. Battery Back-Up Service

Battery back-up service cabinet capabilities exist for 17 of the 19 signal systems, with only the 2 signals at the Interstate 35 ramps not having batteries or inverters installed within existing back-up ready cabinets. At several locations, battery back-up systems were either found to not be working or require new batteries. We are in contact with Mobotrex (the supplier of the original battery back-up systems) to diagnose issues at several locations and will follow-up with the City/County and Mobotrex to help address these issues.

8. Emergency Vehicle Preemption (EVP)

All signal systems within the City of Owatonna have siren-activated EVP components, which include microphone detectors mounted on traffic signal mast arms, mast arm poles, and pedestal poles. Also included are confirmation lights facing each approach that show oncoming emergency vehicle drivers that their call has been recognized by the signal system. Siren-activated EVP systems do not require any additional emergency vehicle equipment, but can pose problems with detection depending on where the emergency vehicle is coming from.

Siren-activated EVP systems were installed between 2006-2008 on all signal systems and have a 10-year warranty on components which has expired at all locations. From our field review, we noted several locations where these systems are not operational which has also been confirmed by City emergency staff. Thus, repairs to either cabinet components or the microphone detectors themselves, or re-programming in the signal cabinets are needed to make these systems fully operational.

Another option for EVP on each signal system is the more commonly used optically programmed EVP system. These systems are activated based on line-of-sight of signal pole or mast arm mounted detectors from an emergency vehicle mounted strobe light that needs to be purchased separately and installed on each emergency vehicle for the system to operate. These systems are able to recognize detection from a line-of-sight distance of up to 2,000 feet and have been very reliable. Maintenance on these systems typically includes re-aiming of the pole and mast arm mounted detectors and changing of confirmation lights (similar to the siren-activated systems). These systems have been known to work well for more than 20 years and generally do not require much maintenance.

If the City/County were to consider replacing the siren-activated EVP systems with an optically programmed EVP system, existing cables at each signal system should be able to be reused for either system. Detectors would need to be replaced as would controller cabinet cards. In some cases, advance detection (via advance and separate pedestal pole mounted installations) would be required with the optically programmed systems where there are significant curves on an approach to an intersection.

For each individual signal system analysis, we noted where advance detection would be required and estimated costs to convert an EVP system from siren-activated to optically programmed. Note that these estimated costs do NOT include the cost of emergency vehicle mounted emitters ("strobe lights").

Based on a conversation with a local supplier of the Opticom EVP systems, current estimated cost to purchase an emitter ranges between \$750 per emitter (for a basic emitter that does not have a separate vehicle ID that can be used to trace which vehicles are activating an EVP system) to \$1,050 per emitter (for an emitter with vehicle ID capabilities). Mounting hardware and work to install these emitters are fairly minor items. Note that emitters would be required to be installed on ALL emergency vehicles that the City or County uses to activate this type of system.

In general, we are strong proponents of the optically programmed EVP systems as these are much more reliable and provide good preemption capabilities. The siren-activated systems are less

expensive and work well in areas with good range for picking up a siren but have their limitations on overall range and advance detection.

Should the City or County be interested in changing to an optically programmed EVP system, we can work with both agencies to design these modifications and determine equipment needs for each location. For now, we continue to work with the SONEM system supplier to diagnose problems with each siren-activated system and hopefully will be able to assist each agency soon with items needed to address issues at several locations.

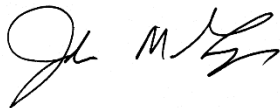
Conclusion

With each individual intersection analysis, we included a summary section listing recommended replacements and improvements that the City/County should prioritize when funds are available. Estimated improvement costs include all known indirect costs needed to implement that improvement.

Note however that design costs for plan preparation and bidding of these potential work items are not included given that these costs can vary significantly depending on what is included in each proposed project. Typical design and construction costs for a set number of signal improvements can run between \$5,000 and \$10,000 per project. ADA curb ramp design work would likely add another \$8,000 to \$10,000 per intersection to survey the intersection and develop detailed ADA plans.

Please review the above mentioned information and the attached intersection-specific information at your convenience and let us know if you have any specific comments or questions related to these items. Feel free to either call me at 651.402.4383 or email me at jgray@sehinc.com to discuss further as needed and/or if you wish for us to follow up on specific maintenance items on behalf of the City or County. Thank you.

Sincerely,
Short Elliott Hendrickson, Inc.

A handwritten signature in black ink, appearing to read 'J M Gray', with a stylized flourish at the end.

John M. Gray, PE
Project Engineer

c: Kyle Skov, City of Owatonna