RISK ASSESSMENT
FOR
ENCROACHMENT DESIGN

Date 1-11-17
District 2
County Polk
Vicinity of 2.5 mi. W of Jct. TH 75
Sec. 26 T 147 N R 49 W

DATA REQUIREMENTS

1. Location of Crossing: Roadway CSAH 1 C.S. _____ M.P. _____
2. Name of Stream: Red River of the North Bridge No. Old: 5767 New: _____
3. Current ADT 271(2017); Projected ADT 299(2037)
4. Type of Traffic:
   a. Practicable detour available No _____ Yes X
   If no is checked, please explain: _____

   If there is no practicable detour available, then the use of the road must be analyzed. Considerations such as emergency vehicle access, emergency supply and evacuation route, and the need for school bus, milk and mail routes should be studied. Factors to consider for this analysis include design frequency, depth, duration, and frequency of inundation if appropriate, and available funding.
5. Hydraulic Data: (Fill in as appropriate)

   Approximate Flowline Elevation 802.0

Q_2 =		TW_2 Elevation	
(Q_7) =	27,000 cfs	TW_7 Elevation	846.7
Q_{10} =	31,660 cfs	TW_{10} Elevation	848.6
Q_{25} =		TW_{25} Elevation	
Q_{50} =	60,210 cfs	TW_{50} Elevation	858.7
Q_{100} =	75,130 cfs	TW_{100} Elevation	862.2

   Circle Design Frequency

   Reasons for selecting Design Frequency: Roadway will begin to overtop during 7 year flood.
6. Magnitude and Frequency of smaller of "Overtopping" or "500 year" flood:
   27,000 cfs 7 year frequency
7. Low member elevation 844.3
8. Minimum roadway overflow elevation if appropriate 846.7
9. Elevation of high risk property, i.e. residences None apparent in floodplain
   Other buildings None apparent in floodplain
10. Horizontal location of overflow:
    At structure _____ (See 12); Not at structure X
11. Type of proposed structure:
    Bridge X (See 12); Culvert(s) _____
12. If the proposed structure is a bridge with the sag point located on the bridge and there is ice and debris potential, strong consideration should be given to using Q_{50} as design discharge with 3' of clearance between the 50 year tailwater stage and low member.

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1. BACKWATER DAMAGE - Major flood damage in this context refers to shopping centers, hospitals, chemical plants, power plants, housing developments, etc.

   1a. Is the overtopping flood greater than the 100 year flood?

   Yes _____(Go to 1b.); No __X__(Go to 1e.)

   1b. Is the overtopping flood greater than the "greatest" flood (500 yr. frequency)?

   Yes _____(Go to 1d.); No _____(Go to 1c.)

   1c. Is there major flood damage potential for the overtopping flood?

   No _____(Go to 1e.)

   YES_____ (Go to 1e.)

   1d. Is there major flood damage potential for the "greatest" flood (500 year frequency)?

   No _____(Go to 1e.)

   YES_____ (Go to 1e.)

   1e. Will there be flood damage potential to residence(s) or other buildings during a 100 year flood?

   Yes _____(Go to 1f.); No __X__(Go to 2)

   1f. Could this flood damage occur even if the roadway crossing wasn't there?

   Yes _____(Go to 1g.); No _____(Go to 1h.)

   1g. Could this flood damage be significantly increased by the backwater caused by the proposed crossing?

   Yes _____(Go to 1h.); No _____(Go to 2)

   1h. Could the stream crossing be designed in such a manner so as to minimize this potential flood damage?

   Yes _____(Go to 1i.); No _____ (Go to 2)

   1i. Does the value of the building(s) and/or its contents have sufficient value to justify further evaluation of risk and potential flood damage?

   No _____

   YES_____ (Go to 2)

2. TRAFFIC RELATED LOSSES

   2a. Is the overtopping flood greater than the "greatest" flood (500 yr. frequency)?

   Yes _____(Go to 3); No __X__(Go to 2b.)

   2b. Does the ADT exceed 50 vehicles per day?

   Yes __X__(Go to 2c.); No _____(Go to 3)

   2c. Would the (duration of road closure in days) multiplied by the (length of detour minus the length of normal route in miles) exceed 20?

   Yes __X__(Go to 2d.); No _____(Go to 3)

   2d. Does the annual risk cost for traffic related costs exceed 10% of the annual capital costs?

   No __X__ (Go to 3) (See figures A and B for assistance)

   YES_____ (Go to 3)

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3. ROADWAY AND/OR STRUCTURE REPAIR COSTS

3a. Is the overtopping flood less than a 100 year frequency flood?

Yes __X__(Go to 3b.); No _____(Go to 3i.)

3b. Compare the tailwater (TW) elevation with the roadway sag point elevation for the overtopping flood. Check the appropriate category.

__X__ When TW is above the sag point (Go to 4)

_____ When TW is between 0 and .5 ft. below sag point (Go to 3c)

_____ When TW is between .5 ft. and 1.0 ft. below sag point (Go to 3d)

_____ When TW is between 1.0 ft. and 2.0 ft. below sag point (Go to 3e)

_____ When TW is more than 2.0 ft. below sag point (Go to 3g)

3c. Does the embankment have a good erosion resistant vegetative cover?

Yes _____(Go to 3i.); No _____(Go to 3d.)

3d. Is the shoulder constructed from erosion resistant material such as paved, coarse gravel, or clay type soil?

Yes _____(Go to 3i.); No _____(Go to 3e.)

3e. Will the duration of overtopping for the 25 year flood exceed 1 hour?

Yes _____(Go to 3f.); No _____(Go to 3i.)

3f. Is the embankment constructed from erosion resistant material such as a clay type soil?

Yes _____(Go to 3i.); No _____(Go to 3g.)

3g. Is the overtopping flood less than a 25 year frequency flood?

Yes _____(Go to 3h.); No _____(Go to 3i.)

3h. Will the cost of protecting the roadway and/or embankment from severe damage caused by overtopping exceed the cost of providing additional culvert or bridge capacity?

No _____(Go to 3i.)

Yes_____
(Go to 3i.)

3i. Is there damage potential to the structure caused by scour, ice, debris or other means during the lesser of the overtopping flood or the 100 year flood?

Yes _____(Go to 3j.); No _____(Go to 4)

3j. Will the cost of protecting the structure from damage exceed the cost of providing additional culvert or bridge waterway capacity?

No _____(Go to 4)

Yes _____
(Go to 4)

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4. Will the capital cost of the structure exceed $1,000,000?

   No __X__(Go to 5)

   YES_____ (Go to 5)

5. In your opinion, are there any other factors which you feel should require further study through a risk analysis?

   No __X__(Go to 6)

   YES_____ (Indicate)

6. If there are no TN's in the LTEC Design column on the right, proceed with the design, selecting the lowest acceptable grade line and the smallest waterway opening consistent with the constraints imposed on the project. The risk assessment has demonstrated that potential flood damage costs, traffic related costs, roadway and/or structure repair costs are minor and therefore disregarded for this project.

   One or more TN's in the LTEC Design column indicates further analysis in the category checked may be required utilizing the LTEC Design process or justification why it is not required.

   Justification: _____

   _____

   _____

   _____

Risk Assessment by: Dan Krocheski

Printed Name: Daniel Krocheski, P.E.

License Number: 45779

Date: 1/11/17