

APPENDIX E

**TH 55 – FERNBROOK TO CSAH 61 IN PLYMOUTH
OPERATIONS MEMORANDUM**

SRF No. 0065712

MEMORANDUM

TO: Rick Brown, P.E., Vice President
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FROM: Dennis R. Eyler, P.E., P.T.O.E.

DATE: October 16, 2007

SUBJECT: TH 55 – Fernbrook to CSAH 61, in Plymouth Traffic Operations

A preliminary traffic operations analysis has been completed for the two basic design alternatives for this corridor. Those alternatives are (1) a 6 lane at-grade facility with signals at each major intersection and (2) a four lane grade separated facility with possible alternative designs for I-494 and for CSAH 61. For the “ultimate” grade separated alternative an improved interchange with free flowing key movements was assumed for I-494. (See Figure 1 attached.) For a possible interim phase where TH 55 is grade separated to the west, an improved diamond was assumed for the I-494 interchange. For both of these alternatives an at-grade intersection with traffic signal control was assumed for the intersection at CSAH 61. In effect there are three alternatives that were evaluated: at-grade, grade separated west of I-494 and grade separated including the I-494 interchange.

I. The at-grade concept

In this segment, the at-grade concept assumes a basic design with three through lanes in each direction. Auxiliary lanes are also provided eastbound through Fernbrook Lane to connect to the turn lanes to the entrance ramps to both northbound and southbound I-494 for a total of 5 eastbound through lanes at Fernbrook. Double left turn lanes are also provided on TH 55 at the ramp intersections and at Fernbrook Lane.

At I-494, the southbound exit ramp would be revised to have two right turn lanes and two left turn lanes. The right turn lanes would be signal controlled in order to manage the weaves between the west ramp and Fernbrook. The northbound exit would have three left turn lanes and two right turn lanes. The right turn lanes would also be signal controlled to manage the weave between the east ramp and CSAH 61.

At CSAH 61 the assumption made for the year 2030 forecasts was that TH 55 would be widened to three basic through lanes in each direction, extending to TH 169. In the westbound direction, TH 55 would be widened to provide four through lanes plus a left turn lane and a right turn lane. The right through lane would exit onto northbound I-494 at the east ramp. This would result in one additional westbound through lane over what currently exists at this intersection. The southbound right turn on CSAH61 should also be revised from its current free right to a dual right with signal control.

II. Grade separated concept that begins at Fernbrook and extends to the west

Fernbrook

Several interchange designs have been investigated for this location. If the grade separated alternative is selected for TH 55 to the west, ideally the I-494 interchange should have a design that provides free flowing ramp connections and also reduces the potential for weaving traffic. However, an interim design could be considered.

If a folded ramp design, or button hook ramp arrangement is used at Fernbrook then the interchange at I-494 must ultimately be revised to address potential weaving issues. However, if the I-494 interchange modifications must wait for a subsequent project, then the entrance loop from Fernbrook to eastbound TH 55 should be modified to enter as a dual right turn with signal control. The use of a traffic signal will enable traffic from Fernbrook to cross eastbound TH 55 to reach the eastbound left turn lanes at the east ramp of I-494.

For any interim design to be successful from an operations standpoint, in this area, it must address the eastbound weave between traffic entering from Fernbrook and the existing left turn to enter northbound I-494.

I-494

For this alternative, the design of this interchange would be the same as it would be for the at-grade alternative; which is an improved diamond.

CSAH 61

The layout of this intersection would be the same as it would be for the at-grade alternative which would feature the addition of a fourth westbound through lane and a revision to the southbound right turn.

III. Grade separated concept that extends through I-494, but ends west of CSAH 61

Fernbrook

With the folded ramp design, or button hook ramp arrangement at Fernbrook then a modified cloverleaf design that features two inverted or left hand loops could be used at I-494 and would meet the free flow goal while providing adequate weaving operation if collector distributor

roadways are utilized between Fernbrook and I-494. The use of roundabouts on the button hook ramps provides a point of clear demarcation of the end and beginning of the ramp roadways and the end and beginning of the surface street roadways.

I-494

Until such time as a grade separation is constructed at CSAH 61, a traffic signal will be required at the intersection of eastbound TH 55 and the ramp that serves both exits from I-494 (east ramp). This signal controlled intersection will greatly reduce the weaving problems between the east ramp and the turn lanes at CSAH 61.

The proposed cloverleaf with inverted loops may be perceived as a less than adequate interchange design for the junction of two freeways. However, it does not have any at-grade intersections. Except for the ½ intersection at the east ramp which is an interim measure until an interchange is constructed at CSAH 61. This interchange design does not have any weaving areas between loops within the interchange. In fact because it has no loop to loop weaving it has capacity nearly equal to that of a full directional interchange at a much lower construction cost.

CSAH 61

The layout of this intersection would be the same as it would be for the at-grade alternative with four westbound through lanes. The disposition of those lanes from left to right would be: westbound TH 55, westbound TH 55, exit to Fernbrook C-D road and both I-494 exits. West of CSAH 61, westbound TH 55 would be widened to 5 lanes. The disposition of the five lanes would be as follows from left to right: westbound TH 55, westbound TH 55, exit to Fernbrook C-D road, exit to southbound I-494 and exit to northbound I-494.

Operations Analysis with Respect to TH 55 at CSAH 61

An operations analysis using Synchro was performed for the at-grade alternative with the year 2030 pm peak hour forecast volumes. In that analysis the intersections at Vicksburg Lane, Fernbrook Lane and the east ramp at I-494 operated at level of service "F". The spill back from those intersections affected the operation of TH 55 and CSAH 61 to the point where that intersection also operated at level of service "F".

A detailed operations analysis was not performed for the grade separated alternative where the I-494 interchange remained as a diamond with signals at the ramp intersection. However, since the east ramp, even with three left turn lanes from the ramp and three lanes each way on TH 55 would operate at LOS "F" it was assumed that the backup would affect CSAH 61 and cause it to also operate at LOS "F".

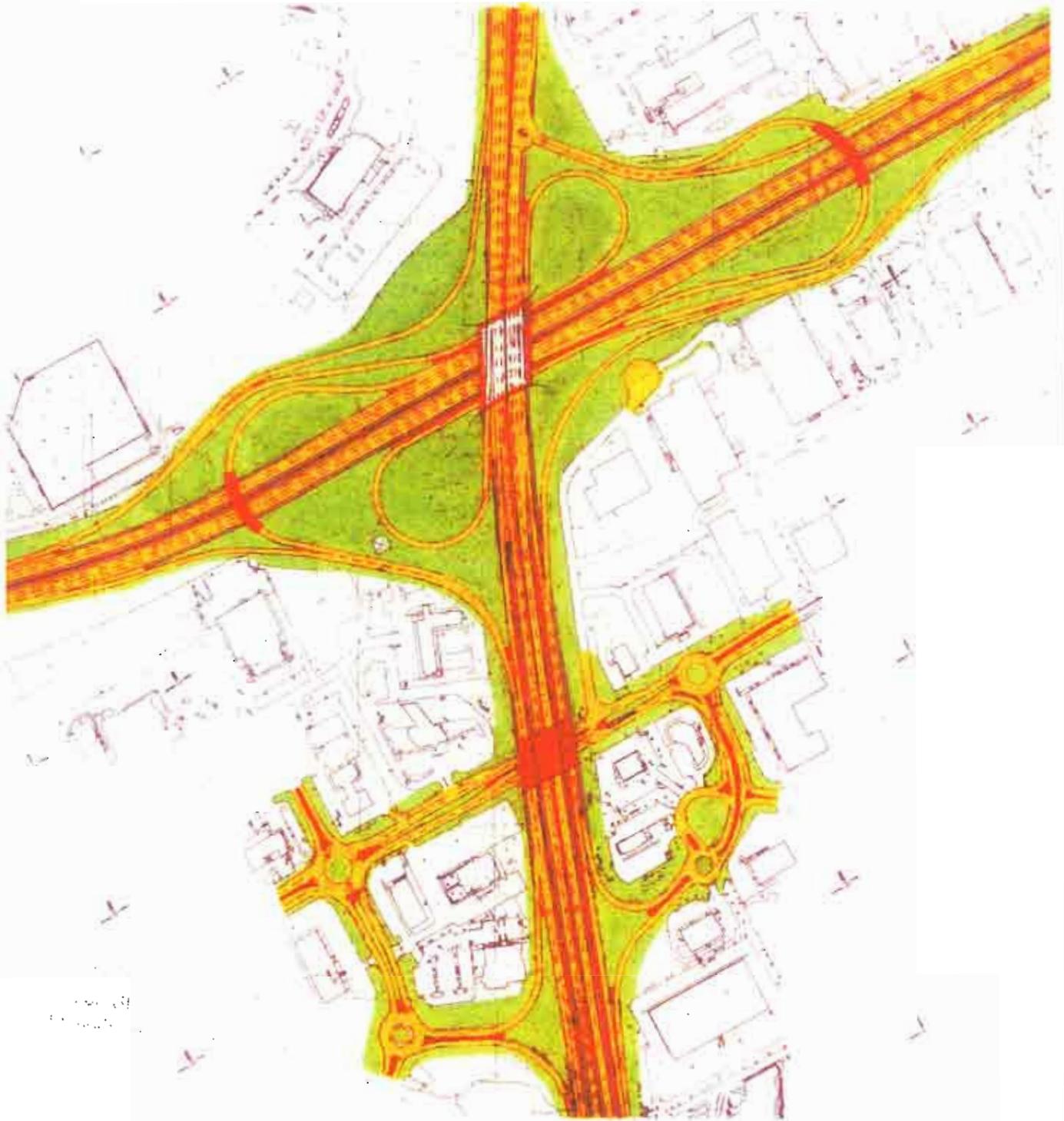
Traffic Simulation

For both the at-grade alternative and the full grade separated alternative, VISSIM simulation models were developed. For both alternatives the CSAH 61 intersection remained at-grade. For the at-grade alternative congestion at the intersections to the west spilled back into the CSAH 61

intersection causing it to fail. For the full grade separated alternative the operation at CSAH 61 appeared to be stable which meant that it was in the LOS "D" range.

A critical lane calculation was performed for the year 2030 pm peak hour volumes and the proposed geometry. That calculation yielded a critical lane volume of 1400 which meant that from a planning level perspective the operation would be acceptable. This was based on traffic strictly adhering to the downstream lane assignments which direct the westbound TH 55 through traffic to use the left two lanes. If any of the westbound traffic uses one of the other westbound through lanes to pass through the CSAH 61 intersection, then the critical lane volumes would be lower and the level of service would improve.

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I-494 / TH 55 Interchange Concept

TH 55 from Rockford to Plymouth
S.P. 2722-68 & S.P. 27-596-02
Hennepin County

Figure 1