HIAWATHA AVENUE LRT ANALYSIS
EXECUTIVE SUMMARY

The Minnesota Department of Transportation has developed and prepared a preliminary layout and operational plan for light rail operation in the Hiawatha Avenue corridor. The layout and operational plan has been submitted to the City of Minneapolis for review and comment. Westwood Professional Services, Inc., under contract to the City of Minneapolis, has reviewed and analyzed the proposed plan and has developed a series of recommended actions to be considered as the final layout and operating plans are developed.

This review covers only the portion of the Hiawatha Avenue LRT Project Route between E. 26th Street and E. 54th Street in south Minneapolis. This report does not include either the downtown portion of the route or the crossing at Lake Street; each of these has very different operational characteristics and concerns from the remainder of the route. These areas have been separately analyzed and are addressed in other reports.

In preparing this report, Westwood gathered information from and spoke with LRT and signal system operators in several U.S. cities that have operational light rail systems. From this information, it is clear that the Hiawatha Corridor characteristics (e.g., proximity of LRT tracks to nearby arterial roadway, traffic volume on nearby roadway, complexity of current signal operations at adjoining intersections, etc.) are different from any other LRT line in the U.S.

The Mn/DOT-proposed layout and operations plan for the Hiawatha Corridor portion of LRT includes the following:

- The LRT line generally crosses intersecting roadways at grade.
- The crossings will be equipped with railroad-type crossing protection (gate arms and flashing lights).
- The crossings are adjacent to signalized Hiawatha Avenue signals that presently run in a coordinated system along Hiawatha.
- Mn/DOT and Metro Transit have decided that they will operate the LRT line through the Hiawatha Corridor section in an absolute, railroad-style preemption mode. This guarantees that the LRT vehicle will pass through each crossing with no delay from automobile traffic.

Hiawatha Avenue is a high volume arterial with ten multi-phase traffic signal systems in the portion of the corridor under analysis. Currently, Hiawatha operates in a coordinated mode, providing progressive traffic movement to Hiawatha traffic while also maintaining acceptable service levels to the cross streets. Any attempt to introduce LRT in the vicinity of the Hiawatha arterial will cause some level of degradation to traffic flow at the Hiawatha traffic signal systems. As demonstrated by LRT systems throughout the U.S., there is a range of treatments that can be applied to the LRT - automobile signal system interaction. These vary from a “railroad-style absolute pre-empt” (which gives full preference to the LRT vehicle regardless of automobile impact) to an “LRT priority” scheme (which provides a high level of service to the LRT vehicle, but does so in a fashion that minimizes impacts to the nearby automobile flows). The LRT operations option chosen by Mn/DOT, absolute pre-empt, will cause the maximum amount of

degradation to the street traffic system. Similarly, with this option, the amount of mitigation necessary to make LRT co-exist with the street system signals is at a maximum.

Given that Mn/DOT has already selected the LRT preempt mode of operation, the main tasks of this study were to:

- analyze the impacts of the LRT preempt operations,
- determine strategies or mitigations that could be employed to lessen those impacts, and
- identify open issues that need to be further explored in the detail design process.

To assess the impacts, Westwood developed a multi-layered spreadsheet describing LRT and automobile traffic signal characteristics in the Hiawatha Corridor and combined this spreadsheet with standard traffic signal modeling software packages. Within the general realm of preempt operations there are detailed differences in exactly how the traffic signal is managed to achieve safe preempt service. One of the key variables is whether or not a “track clearance” phase needs to be provided to clear out any vehicles which may be stopped on the tracks. (Provision of a track clearance phase creates more disruption to automobile traffic than does the scenario without a track clearance phase.) The Mn/DOT plan does not state if the signal preemption will be accomplished with or without a track clearance movement. (This detail has apparently not yet been addressed by the Mn/DOT design team.) Therefore, the Westwood analysis considered a range of operations for the preempt family of scenarios.

The results of the analyses show the following major findings:

- LRT preempt operation causes significantly more impact to the Hiawatha street corridor traffic than does an LRT priority operation.

- If LRT preempt with a track clearance phase is utilized, the Hiawatha Corridor traffic signals would not be able to stay in a coordinated mode; they would each need to run in a “free” or “isolated” mode.

- Several modifications to the sequencing and operation of the traffic signals in the Hiawatha corridor are recommended to improve the safety and efficiency of operation with the implementation of an LRT operation. These recommendations are appropriate for either of the proposed preempt/priority types of operation. The recommended changes include changes to traffic signal heads, traffic signal phasings and left turn treatments at the intersection.

- For several of the traffic signals in the Hiawatha Corridor to provide any type of acceptable service levels, the cross streets will need to have geometric expansion and the operational updates described immediately above will need to be implemented.

- If the geometric and signal operation changes are implemented, and if careful attention is paid to scheduling the arrival of LRT vehicles from opposing directions to not occur back-to-back, acceptable signal service can be maintained in the peak hours at headways as short as six minutes. If headways go below six minutes, the signal system cannot process the cross street traffic at the Hiawatha intersections.

- Information from other cities that have operating Light Rail systems indicates that to achieve proper interaction of the LRT and street system signals, a significant amount of design coordination must occur between the LRT designers and the signal operating agency. To date this coordination has not occurred for the Hiawatha project. The analyses show that a number of minor or subtle changes in LRT operation can lessen the impact of individual traffic signal preemption events on general traffic flow within the corridor. It will be important for the City to attempt to influence exactly how the traffic signal preemption operation is achieved.

- A significant design issue needs to be addressed and resolved in the detail design phase (i.e., whether or not a track clearance phase needs to be provided). This issue will greatly affect the impact level caused by a traffic signal preemption event.