

## INNER LOOP SCOPING REPORT ATTACHMENTS

- A. Go/No Go Traffic Assessment
- B. Safety Considerations, Accident History and Analysis
- C. I-490 Ramp Evaluation and Analysis
- D. Main Street Alternatives
- E. Minimum Lane Requirements
- F. Hazardous Waste
- G. Endangered Species
- H. Probable Cost and Benefit/Cost Assessment
- I. Memorandum of Understanding - Draft

## E. Minimum Lane Requirements

## **Memo**

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**Stantec**

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Date: June 12, 2009

File: Inner Loop Lane Requirements

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### **Reference: Lane Requirement - Inner Loop**

We have reviewed and analyzed what might be the minimum number of lanes required on a raised Inner Loop from Monroe Avenue/Chestnut Street to Charlotte Street. For this preliminary evaluation, it was assumed that traditional intersections with traffic signal control would be used. The option of introducing roundabouts along this section will be evaluated as a next step. This preliminary analysis includes the following assumptions:

- Year 2035 traffic volumes were used as the basis of the evaluation;
- A new I-490 westbound off-ramp to the Inner Loop would be constructed;
- Two-way traffic operations could occur on South Union Street between Monroe Avenue and the Inner Loop connection (near Charlotte Street);
- South Union Street would remain one-way northbound, north of an Inner Loop connection near Charlotte Street;
- Charlotte Street would be re-connected;
- Inner Loop on/off ramps to South Union Street will occur north of Charlotte Street.

Review of the initial analysis and traffic volumes indicates that the weekday evening peak travel period is the controlling factor requiring the most travel lanes to accommodate future traffic. Thus the weekday evening peak travel hour was analyzed to determine the minimum number of travel lanes necessary to accommodate future volumes.

The initial attempt was to reduce the raised Inner Loop to one travel lane in each direction with a center turn lane. This however, did not work at all of the intersections due to high traffic volumes, which in cases resulted in failing traffic operations and vehicle queues extending through adjacent intersections. This initial analysis indicates the following minimum requirements:

**Southbound Traffic** – A single through travel lane will be adequate, with left turn lanes as needed. The southbound approach to Monroe/Chestnut will require a second through lane (through/right turn travel lane).

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**Reference: Inner Loop Lane Requirements**

**Northbound Traffic** – A single northbound travel lane is adequate from Monroe Street to Broad Street, with left turn lanes as needed. From Broad Street to University Avenue, two (2) northbound travel lanes are required with left turn lanes as needed.

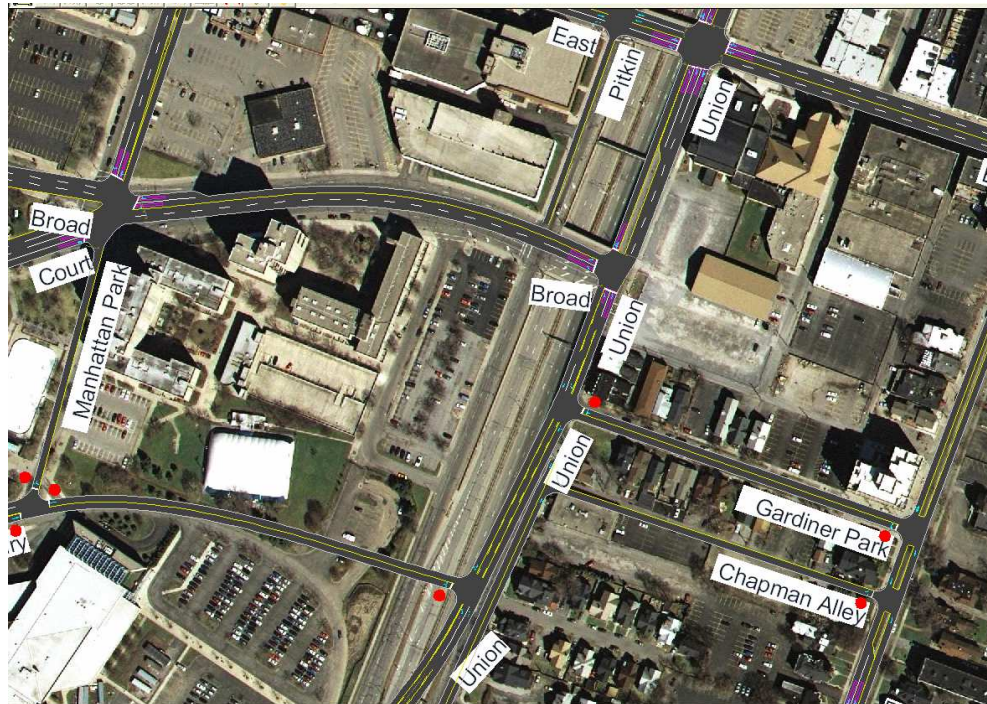
The following three figures show a possible overall layout. Note that these are the minimum number of lanes. An additional southbound lane could be added, as well as parking lanes (northbound and southbound), if desired.

**Figure 1  
Main Street to East Avenue**



Reference: Inner Loop Lane Requirements

**Figure 2**  
**East Avenue to an Extended Woodbury Boulevard**



**Figure 3**  
**Extended Woodbury Boulevard to Monroe/Chestnut Street**



**Reference: Inner Loop Lane Requirements**

The following sections show greater detail at each intersection, with the last section showing some concept of how much land could be freed up for future development.

**Intersecting Side Streets**

**Charlotte Street** – A single lane in each direction (eastbound and westbound) with the possible need for a traffic signal or roundabout at the South Union Street intersection. Figure 2 shows the intersection and the connection from South Union Street to the Inner Loop. It also shows Pitkin Street as a single southbound alley to provide access to adjacent properties, as well as emergency vehicle access.

**Figure 4**



**Reference: Inner Loop Lane Requirements**

**East Avenue at South Union Street** – With the limited space on either side of East Avenue, it does not appear possible to widen East Avenue to provide opposing left turn lanes and provide two through travel lanes in each direction. Analysis of providing opposing left turn lanes and only a single through/right turn lane on East Avenue found that the eastbound approach would operate under failing conditions and the westbound approach at LOS of “E”. Thus, it is proposed that the lane configuration on East Avenue remain as currently provided (Figure 5).

**Broad Street at South Union Street** – This existing six lane approach can be reduced to two (2) eastbound lanes (separate left and right turn lanes) and a single (1) westbound lane, under traffic signal control (Figure 5). Possibly providing a second westbound (Broad Street) turn lane into the parking garage may be considered.

**Figure 5**



**Reference: Inner Loop Lane Requirements**

**Broad Street to Monroe Avenue/Chestnut Street**

The alignment and intersections in this section could be done in a number of different ways, with possible alternative connections. One alternative might be the following:

**Broad Street to Gardiner Park** – in this case, the raised Inner Loop uses South Union Street and this would provide access to the commercial buildings on the east side. The raised Inner Loop would then swing to the west. South Union Street, south of Gardiner Park (basically the residential section) could be severed from the raised Inner Loop, converted to two way operations, with a one-way connection to Alexander Street using Chapman Alley, as shown in Figure 6.

**Figure 6**



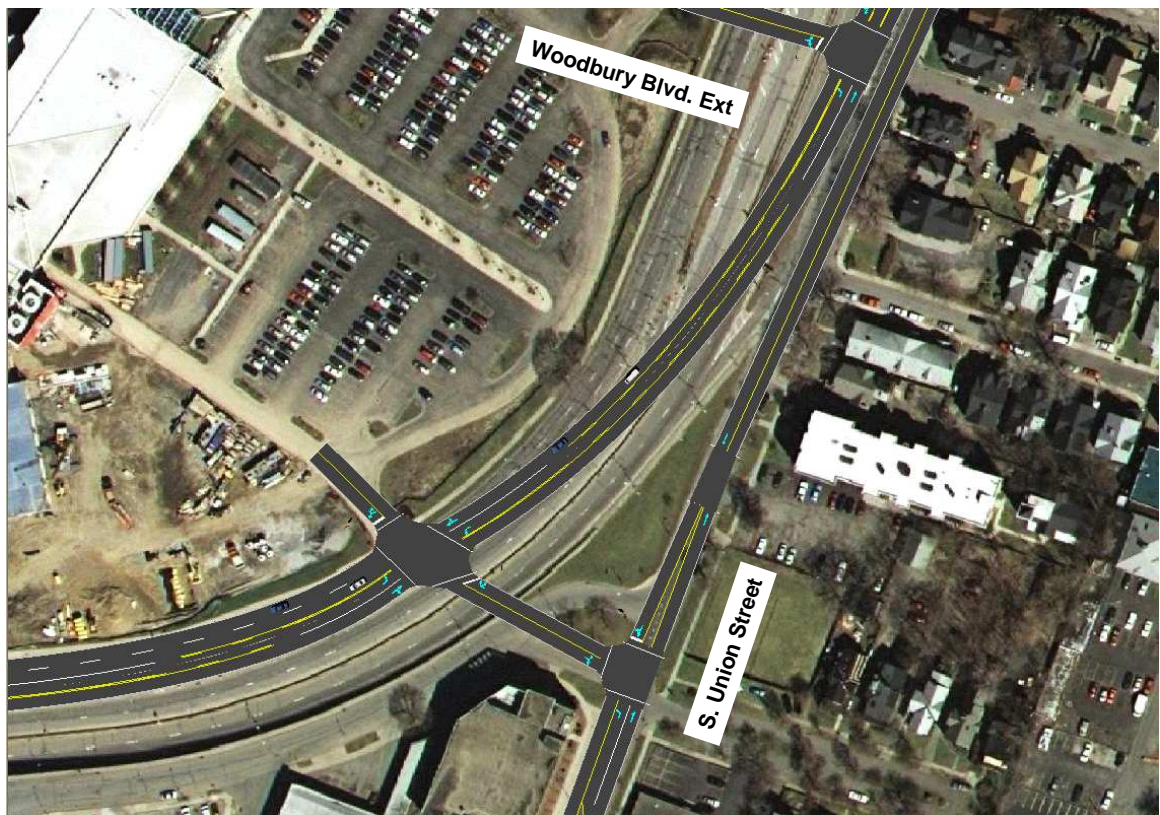


**Reference: Inner Loop Lane Requirements**

**Gardiner Park to Monroe Avenue**

In this section, the possibility exists to extend Woodbury Avenue east to meet the new raised Inner Loop section. A new Howell Street intersection could be created that connects South Union Street to the raised Inner Loop and adds a fourth leg to this intersection to serve the Strong Museum, as shown in Figure 7.

**Figure 7**



**Reference: Inner Loop Lane Requirements**

**Inner Loop and Monroe Chestnut** – This is and will continue to be a busy intersection. To maintain non-failing traffic operations at this intersection requires:

- Two (2) southbound through lanes, a separate left turn lane plus the free flowing right turn lane on Chestnut Street (a reduction of one lane on this approach in comparison to existing). Only one (1) northbound lane is required under this intersection layout with a left turn lane for traffic entering the parking garage.
- The Monroe Avenue approach will work with a single northbound through/right turn lane or possibly a right turn peel off lane and a separate left turn lane.
- The eastbound Inner Loop approach requires a separate left, a through and a right turn lane.
- The westbound Inner Loop approach would require a separate left turn lane, a through lane and a through/right turn lane. This lane configuration is shown in Figure 8.

Further lane reductions may result if the I-490 off-ramp is not constructed

**Figure 8**



**Reference: Inner Loop Lane Requirements**

Note that attempts were made to reduce the raised Inner Loop westbound lanes to two (2) lanes (a left and separate through/right lane). However, with this lane reduction, significant backups of traffic will occur on the raised Inner Loop westbound approach to Chestnut Street and on southbound Chestnut Street approach. In the eastbound direction, with a new I-490 eastbound off-ramp to the Inner Loop, the eastbound right turn only lane onto Monroe Avenue might need to be a through/right turn lane if a weaving issue occurs with traffic exiting each of the two separate off-ramps. This eastbound second through lane would merge into a single lane after the Chestnut/Monroe Avenue intersection.

**Roundabouts**

Initial analyses of using single lane roundabouts at the primary intersections (as shown in Figure 9) were considered. The initial results indicate they would work at most intersections; however, because of the entry angle and volume at the Monroe/Chestnut Street, backups may occur. Similar concerns may result at the intersection of South Union Street and East Avenue. Further detailed analysis will be required to determine whether a roundabout should be considered at any or all of these intersections.

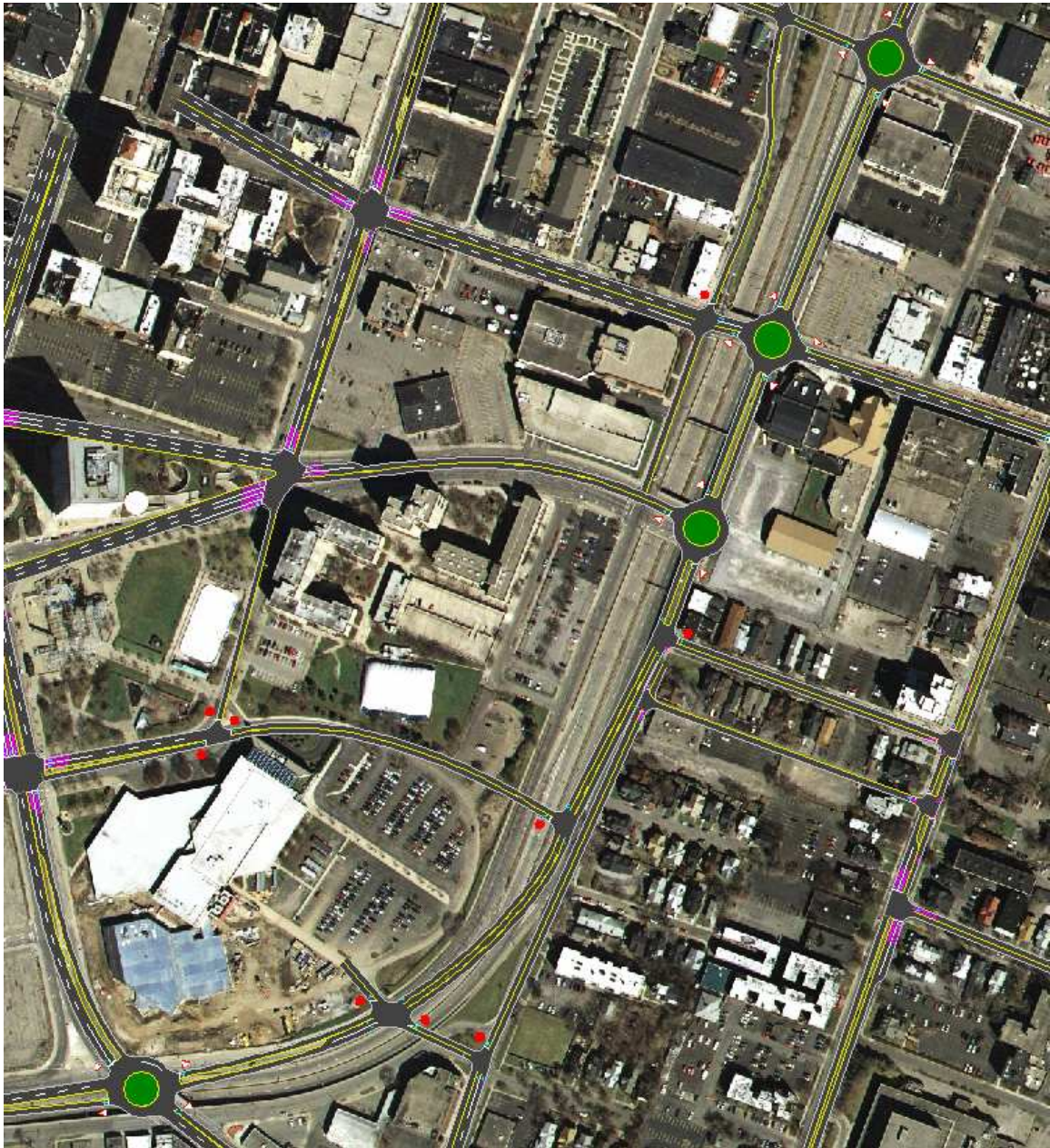
A number of things should be noted with respect to use of roundabouts, which are:

- Would provide a safer travel environment than a traffic signal controlled intersection;
- A pedestrian attempting to cross the street, however, would have to travel around 204 feet, in comparison to crossing four lanes at a signalized intersection of 48 feet;
- Would reduce the amount of future developable land and push many of the intersections away from existing developed land.
- May provide the additional benefits in decreased delay, no energy costs or equipment maintenance.

Some possible roundabouts are shown in Figure 9.

Reference: Inner Loop Lane Requirements

Figure 9



**Reference: Inner Loop Lane Requirements**

**Land Development**

To obtain some concept of the amount of land that could be freed up for future development by raising and reducing the size of the Inner Loop, scaled buildings were added to some sections of the raised Inner Loop. Figure 10 shows office buildings and housing in the vacated land north of Monroe Avenue. Figure 11 shows what this may look like at an angle looking northeast. Figure 12 shows a close up of possible development around South Union Street and Howell Street looking northwest.

**Figure 10**



**Reference: Inner Loop Lane Requirements**

**Figure 11**



**Reference: Inner Loop Lane Requirements**

**Figure 12**



As indicated by these figures, raising the Inner Loop will allow for significant development on the land freed up by reducing the number of travel lanes.

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June 15, 2009

Jim Hofmann

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### **Reference: Inner Loop Lane Requirements**

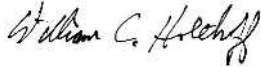
### **Conclusion**

The analysis was undertaken to determine the minimum number of travel lanes required and how much land might be freed up by reducing the number of travel lanes. The analysis indicates a significant amount of land could be freed up, which could allow significant development to occur.

These are the minimum number of lanes using standard traffic signal controlled intersections. Additional lanes could be added to improve traffic flow and to balance the network. Parking lanes could also be added, however, this would reduce some of the land that would be created for future development. Part of the center left turn lane could also be planted in various sections to further create a boulevard look.

The use of roundabouts will also be considered and analyzed in a latter phase of this study.

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