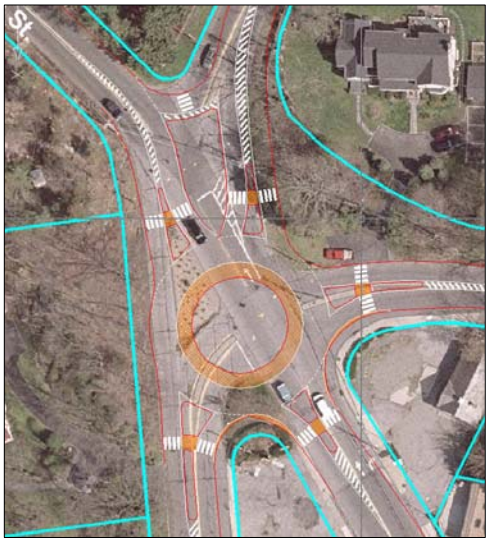

# Purchase Street (Route 120), Hillside Road & Ridge Street Planning Study

Rye, NY

Prepared for:
City of Rye

Draft Report

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## 1. Introduction

BFJ was retained by the City of Rye to investigate alternative designs for the intersection of Purchase Street (Route 120), Highland Road & Ridge Street.

The objective of this study is to review the geometric and traffic conditions of this intersection to determine whether this junction could function efficiently and safely under different controls and designs. The overall goal is to test whether the current intersection could be replaced with a compact intersection or with one or two modern roundabouts that could have shorter delays and more pedestrian friendly characteristics.

## 2. Existing Conditions

Today this intersection is controlled by flashing signals. Figure 1 illustrates existing traffic controls at the intersection.

Current peak-hour traffic volumes are shown in Figures 2 and 3. See the Appendix for detailed traffic volume counts. The following are the peak hours:

- AM Peak Hour (from 7:45 to 8:45)
- PM Peak Hour (from 5:00 to 6:00)

According to the City of Rye Police Department, over the last three years (June 2004 to June 2007) a total of 14 accidents (1 personal injury and 13 property-damage-only) were recorded. Figure 4 shows the accident locations, number of accidents and type of collisions.

## 3. Potential Alternatives

Potential alternatives are described in the following paragraphs. A 7.5 feet buffer was included in all designs parallel to the property lines for future sidewalks and landscaping.

The intersection alternatives were analyzed based on the traffic counts, the calculated peak-hour factor and the geometric configurations. Standard intersections were analyzed, using the Highway Capacity Manual method (Transportation Research Board Special Report 209, Fourth Edition, 2000 Update), and roundabouts were analyzed using the RODEL software. In addition BFJ performed a traffic simulation for each alternative using Synchro/ SimTraffic software to compare different alternatives. The performance analysis were done with existing traffic volumes. Table 1 compares the capacity analysis results for existing conditions and proposed alternatives. See Appendix for detailed analyses.

## Table 1- Capacity Analysis Results

| Intersection | | Existing * | | | | Existing + Signal * | | | | Alt. 1- Roundabout South ** | | | | Alt. 2- Roundabout North ** | | | | Alt. 3- Double Roundabout ** | | | | Compact Intersection* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM | | PM | | AM | | PM | | AM | | PM | | AM | | PM | | AM | | PM | | AM | | PM | |
| | | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay |
| Wappanocca Ave. | EB | C | 9.6 | A | 9.7 | B | 13.8 | B | 14.1 | A | 3.6 | A | 3.6 | A | 3.6 | A | 3.6 | A | 4.2 | A | 3.6 | A | 9.7 | A | 9.7 |
| Hillside Rd | WB | A | 9.7 | A | 9.3 | B | 14.1 | B | 14.0 | A | 3.6 | A | 4.2 | A | 3.6 | A | 3.6 | A | 3.6 | A | 3.6 | A | 9.8 | A | 9.3 |
| Purchase St. | NB | A | 12.7 | B | 14.9 | A | 5.5 | A | 6.2 | A | 4.2 | A | 4.8 | A | 3.6 | A | 4.2 | A | 4.2 | A | 4.2 | C | 12.8 | B | 15.0 |
| *Purchase St.* | *SB* | B | 16.7 | B | 13.5 | A | 6.4 | A | 4.7 | | | | | | | | | | | | | B | 17.3 | C | 14.0 |
| Overall | | C | 14.3 | B | 13.8 | A | 7.0 | A | 6.3 | | | | | | | | | | | | | B | 14.6 | B | 14.1 |
| Ridge St. | WB | B | 13.2 | B | 11.7 | A | 5.5 | A | 5.2 | A | 4.2 | A | 4.2 | A | 4.8 | A | 4.2 | A | 4.8 | A | 4.2 | B | 13.3 | B | 12.5 |
| Purchase St. | SB | B | 10.2 | A | 9.4 | B | 16.2 | B | 15.8 | A | 4.2 | A | 3.6 | A | 4.2 | A | 3.6 | A | 3.6 | A | 3.6 | B | 10.3 | B | 10.1 |
| *Purchase St.* | *NB* | A | 8.2 | A | 8.1 | C | 33.5 | D | 51.6 | | | | | | | | | | | | | B | 10.3 | B | 12.6 |
| Overall | | | | | | B | 19.4 | C | 30.3 | | | | | | | | | | | | | B | 11.4 | B | 12.2 |
| Total Overall ** | | | | | | | | | | A | 4.2 | A | 4.3 | A | 4.2 | A | 4.2 | A | 4.3 | A | 4.5 | | | | |
| Total Network Delay *** | | 6.7 | | 5.4 | | 42.8 | | 22.3 | | 3.4 | | 3.2 | | 3.9 | | 3.7 | | 4.3 | | 4.6 | | 6.3 | | 6.0 | |

* HCS Analysis
** RODEL Analysis
*** Simtraffic (simulaion) Analysis

- Existing Condition with Standard Traffic Signal

This alternative assumes that the intersection would basically remain as it is today but that the traffic signal would be activated in a standard actuated-coordinated way to maximize the signal performance and minimize the overall delay at both intersections.

As can be seen in Table 1 the total network delay increased almost 6 times for the AM peak hour and almost 4 times for the PM peak hour. In order to minimize delays, a 2-phase actuated-coordinated controller is proposed. Since the signal Phasing adds a certain amount of yellow and red time to all vehicles, the amount of overall delay per vehicle increased significantly.

- Single Roundabout South

This alternative includes a single-lane roundabout with a 60-foot radius at the intersection of Hillside Road and Wappanocca Avenue. A by-pass lane provides for the right-turn movement from Ridge Street to Purchase Street northbound. See Figure 5.The capacity analysis result in Table 1 shows a decrease in overall delay of 49% during the AM peak hour and 41% during the PM peak hour in comparison to today's delays.

- Single Roundabout North

This alternative includes a single-lane roundabout with a 60-foot radius at the intersection of Ridge Street and Purchase Street. A by-pass lane connects Wappanocca Avenue to Purchase Street southbound and another by-pass lane connects Purchase Street northbound to Hillside Road eastbound. See Figure 6. The capacity analysis result in Table 1 shows a decrease in overall delay of 42% during the AM peak hour and 31% during the PM peak hour in comparison to today's delays.

- Double Roundabout

This alternative includes two adjacent single-lane roundabouts forming a double roundabout compound. To simplify the maneuvers the southerly roundabout is not a complete roundabout forcing the left turn from Purchase Street into Wappanocca Ave (6 to 7 vehicles in the peak hours) to drive through the northerly roundabout. See Figure 7. The capacity analysis result in Table 1 shows a decrease in overall delay of 36% during the AM peak hour and 15% during the PM peak hour.

- Compact Intersection

This alternative eliminates the northbound right-turn lane and narrows the overall pavement. It assumes that Purchase Street (U.S. 120) is the major road, even though the major traffic flow is between Purchase Street south and Ridge Street. The traffic movements out of Ridge Street, Hillside Road and Wappanocca Ave are controlled with Stop signs. See Figure 8. The capacity analysis result in Table 1 shows a decrease in

overall delay of 6% during the AM peak hour and an increase in overall delay of 11% during the PM peak hour.

## 4. Right-of-Way Comparison

Table 2 shows the amount of new areas that need to be paved for each alternative. It shows also the amount of freed-up area in each alternative.

Table 2- Comparison of Intersection Areas in Relation to the Existing Condition

| | Roundabout South Alt. 1 | Roundabout North Alt. 2 | Double Roundabout Alt. 3 | Compact Intersection Alt. 4 |
|---|---|---|---|---|
| New Paved Area | 2559 | 8603 | 8213 | 621 |
| Freed-Up Area | 3523 | 3696 | 4584 | 8322 |
| Net Change | -964 | 4907 | 3629 | -7701 |

As can be seen, Alternative 1 requires less area in comparison to other roundabout alternatives and also less in comparison to today's layout. The compact Alternative 4 requires the least land of all alternatives. None of the alternatives require any right-of-way acquisition.

## 5. Conclusions

This analysis has shown that Alternative 1 with a roundabout located at the southerly end of the double intersection performs best in terms of delays. It is also expected that this would be the safest intersection, at least in comparison to today's intersection and to the full signalized intersection. This alternative is also very safe for pedestrians, given the single-lane configuration of the roundabout. It is significantly more pedestrian friendly than today's layout. Alternative 1 also compares well in terms of right-of-way requirement, or in terms of land area that can be landscaped.

BFJ does not recommend full signalization of this intersection since it would involve long delays.

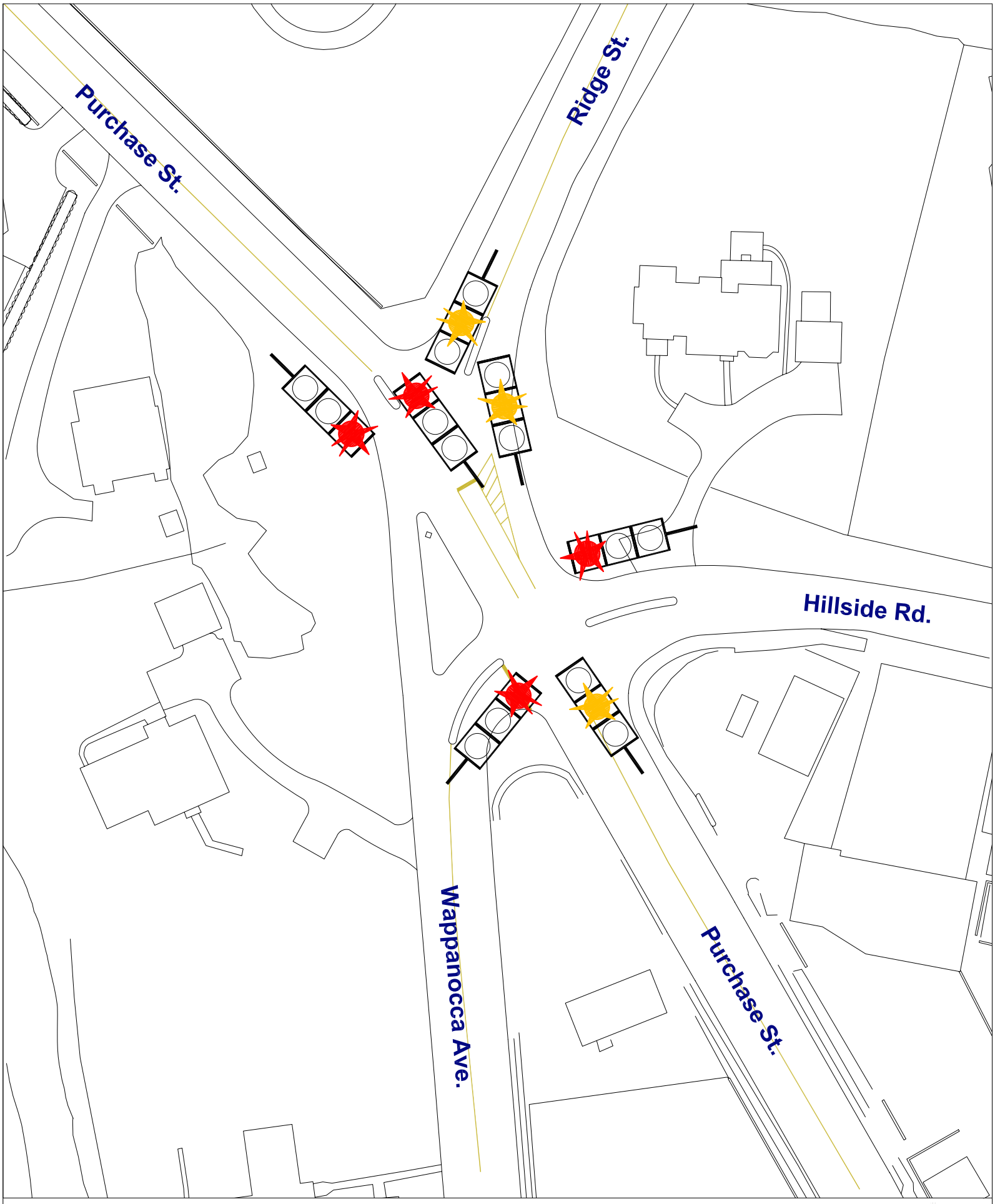


Figure 1- Existing Traffic Control

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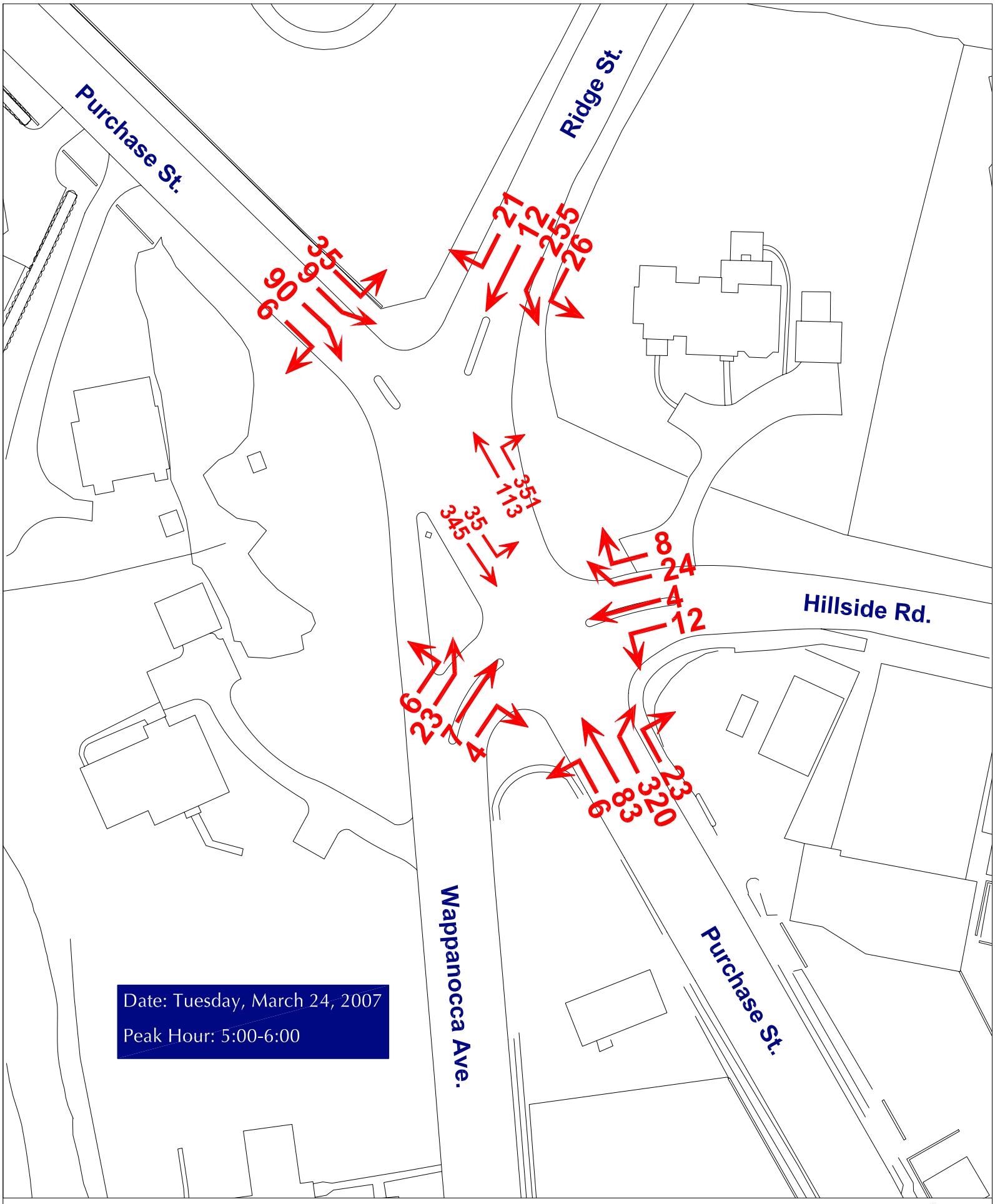


Figure 3- PM Peak Hour Traffic Volumes

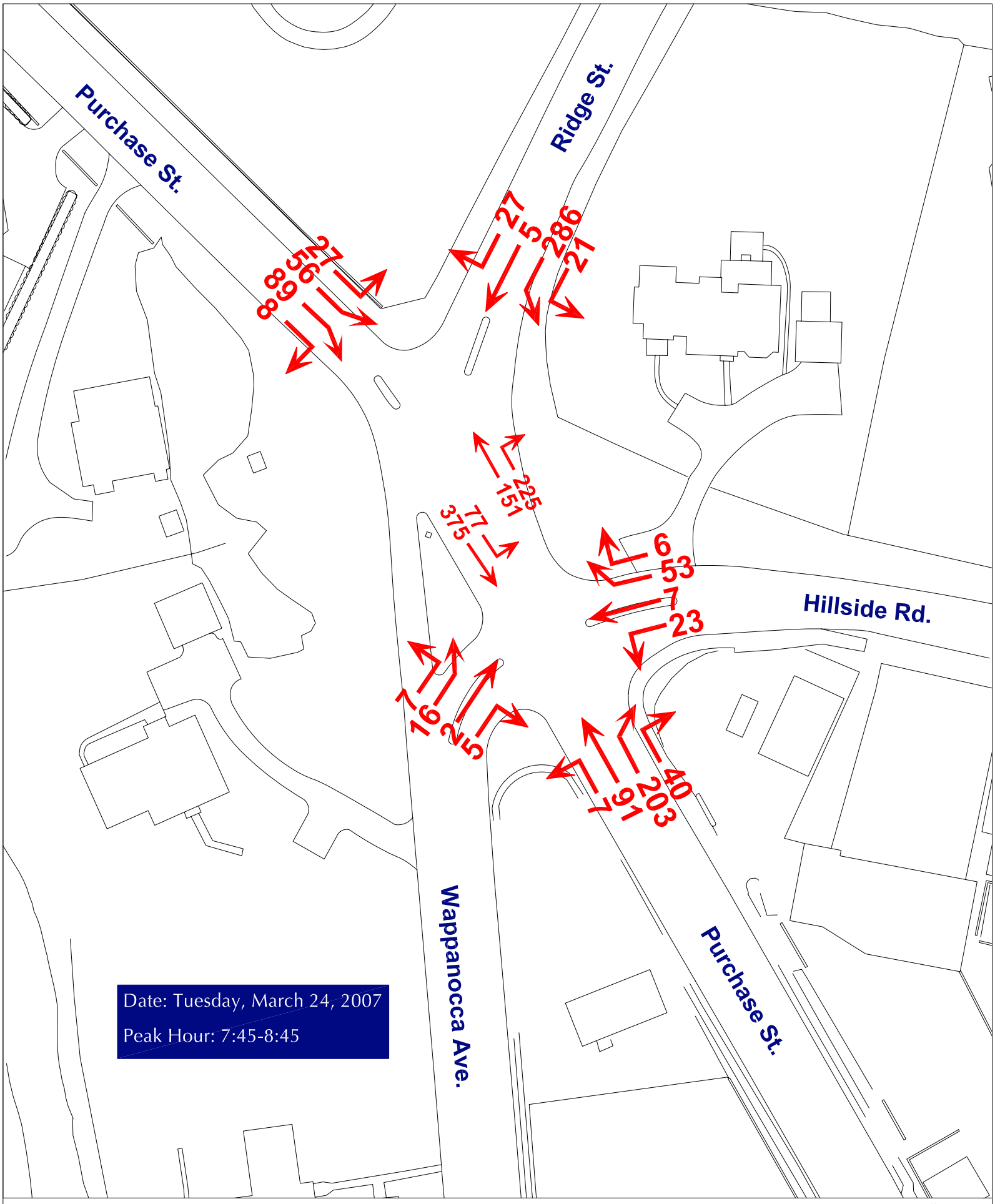


Figure 2- AM Peak Hour Traffic Volumes

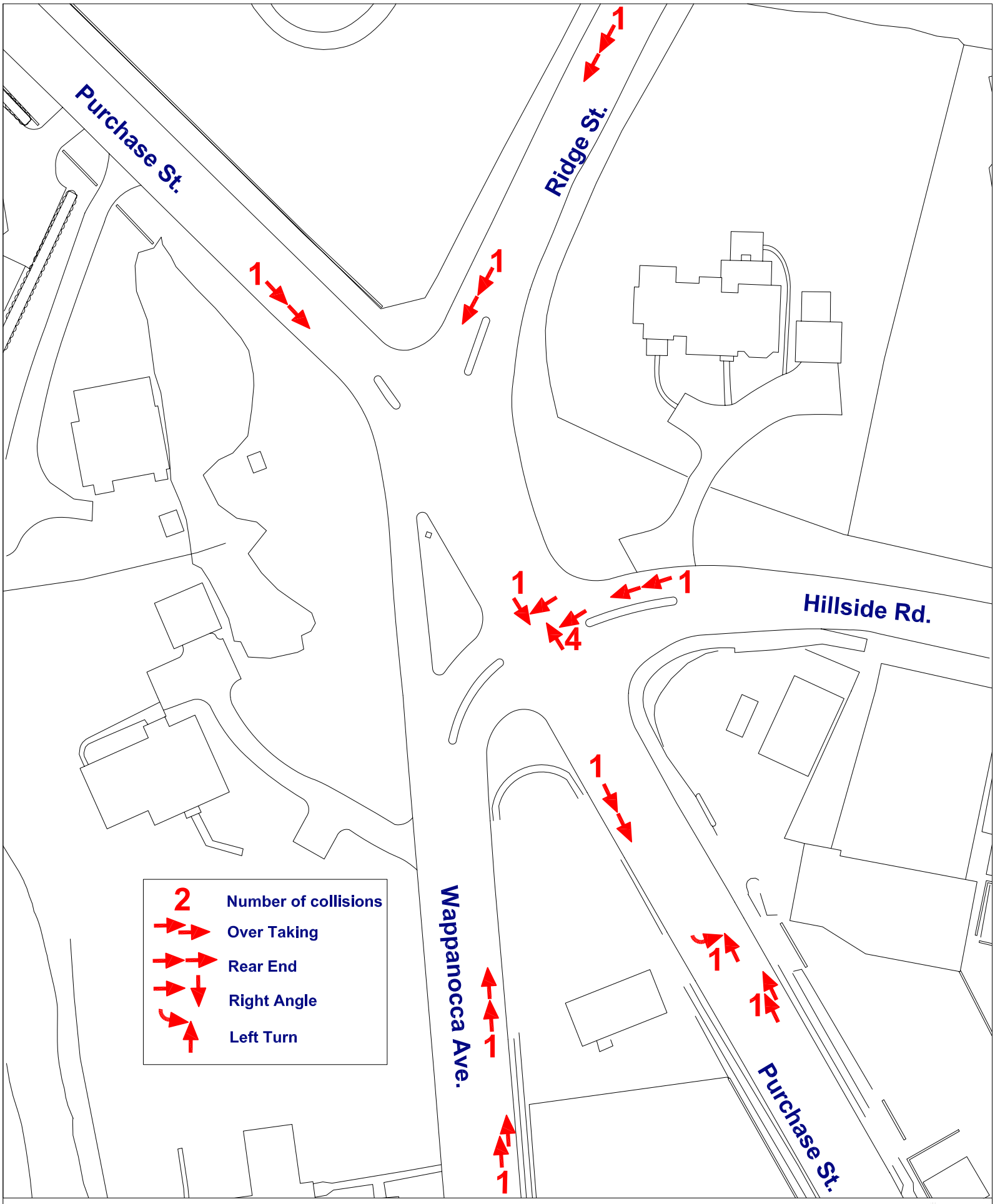


Figure 4- Crash Summary (June 2004- June 2007)

## Table 1- Capacity Analysis Results

| Intersection | | Existing * | | | | Existing + Signal * | | | | Alt. 1- Roundabout South ** | | | | Alt. 2- Roundabout North ** | | | | Alt. 3- Double Roundabout ** | | | | Compact Intersection* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM | | PM | | AM | | PM | | AM | | PM | | AM | | PM | | AM | | PM | | AM | | PM | |
| | | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay |
| Wappanocca Ave. | EB | C | 9.6 | A | 9.7 | B | 13.8 | B | 14.1 | A | 3.6 | A | 3.6 | A | 3.6 | A | 3.6 | A | 4.2 | A | 3.6 | A | 9.7 | A | 9.7 |
| Hillside Rd | WB | A | 9.7 | A | 9.3 | B | 14.1 | B | 14.0 | A | 3.6 | A | 4.2 | A | 3.6 | A | 3.6 | A | 3.6 | A | 3.6 | A | 9.8 | A | 9.3 |
| Purchase St. | NB | A | 12.7 | B | 14.9 | A | 5.5 | A | 6.2 | A | 4.2 | A | 4.8 | A | 3.6 | A | 4.2 | A | 4.2 | A | 4.2 | C | 12.8 | B | 15.0 |
| *Purchase St.* | *SB* | B | 16.7 | B | 13.5 | A | 6.4 | A | 4.7 | | | | | | | | | | | | | B | 17.3 | C | 14.0 |
| Overall | | C | 14.3 | B | 13.8 | A | 7.0 | A | 6.3 | | | | | | | | | | | | | B | 14.6 | B | 14.1 |
| Ridge St. | WB | B | 13.2 | B | 11.7 | A | 5.5 | A | 5.2 | A | 4.2 | A | 4.2 | A | 4.8 | A | 4.2 | A | 4.8 | A | 4.2 | B | 13.3 | B | 12.5 |
| Purchase St. | SB | B | 10.2 | A | 9.4 | B | 16.2 | B | 15.8 | A | 4.2 | A | 3.6 | A | 4.2 | A | 3.6 | A | 3.6 | A | 3.6 | B | 10.3 | B | 10.1 |
| *Purchase St.* | *NB* | A | 8.2 | A | 8.1 | C | 33.5 | D | 51.6 | | | | | | | | | | | | | B | 10.3 | B | 12.6 |
| Overall | | | | | | B | 19.4 | C | 30.3 | | | | | | | | | | | | | B | 11.4 | B | 12.2 |
| Total Overall ** | | | | | | | | | | A | 4.2 | A | 4.3 | A | 4.2 | A | 4.2 | A | 4.3 | A | 4.5 | | | | |
| Total Network Delay *** | | 6.7 | | 5.4 | | 42.8 | | 22.3 | | 3.4 | | 3.2 | | 3.9 | | 3.7 | | 4.3 | | 4.6 | | 6.3 | | 6.0 | |

* HCS Analysis
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