

**REPLINGER & ASSOCIATES LLC**  
TRANSPORTATION ENGINEERING

To: Martin Montalvo, Operations Manager  
From: John Replinger, PE  
Subject: Glen Oak Road/Coast Redwood Avenue/Tharp Court  
Date: May 1, 2013

**Issues**

In response to citizen requests, the city contracted for an evaluation of two issues. The first is a suggestion for establishment of a marked crosswalk crossing from north to south across Glen Oak Road at either the east or west corner of Tharp Court. The second relates to possible sight obstruction issues associated with the on-street parking on Glen Oak Road.

This memorandum responds to those two issues. It explains the site conditions and summarizes traffic count information and speed observations conducted in April 2013. Further, it explains the rationale behind establishment of marked pedestrian crossings, summarizes observations relating to sight distance, and provides my recommendations.

**Location and Site Conditions**

Glen Oak Road is a collector street running in an east-west orientation between Highway 213 and Beaver Creek Road in the south part of Oregon City. For most of its length, the posted speed limit is 35 mph. The exception is a school speed zone that exists for a short distance near the intersection of Glen Oak Road and High School Avenue.

The subject of this memorandum is the intersection of Glen Oak Road with Coast Redwood Avenue and Tharp Court. This intersection is located approximately 2300 feet west of the intersection of Glen Oak Road and Beaver Creek Road. The intersection is a four-leg intersection in which the north leg (Coast Redwood Avenue) and the south leg (Tharp Court) are slightly offset. The centerline of Tharp Court is approximately 17 feet west of the centerline of Coast Redwood Avenue. This offset was observed to have no effect on traffic operations.

In the vicinity of this intersection, Glen Oak Road has a curb-to-curb width of approximately 50 feet. Its configuration includes one travel lane in each direction and curbside parking on both the north and south sides. The eastbound direction features a travel lane of approximately 13 feet in width suitable for shared use by motor vehicles and bicyclists. The westbound direction features a separate six-foot marked bicycle lane adjacent to an 11-foot motor vehicle travel lane.

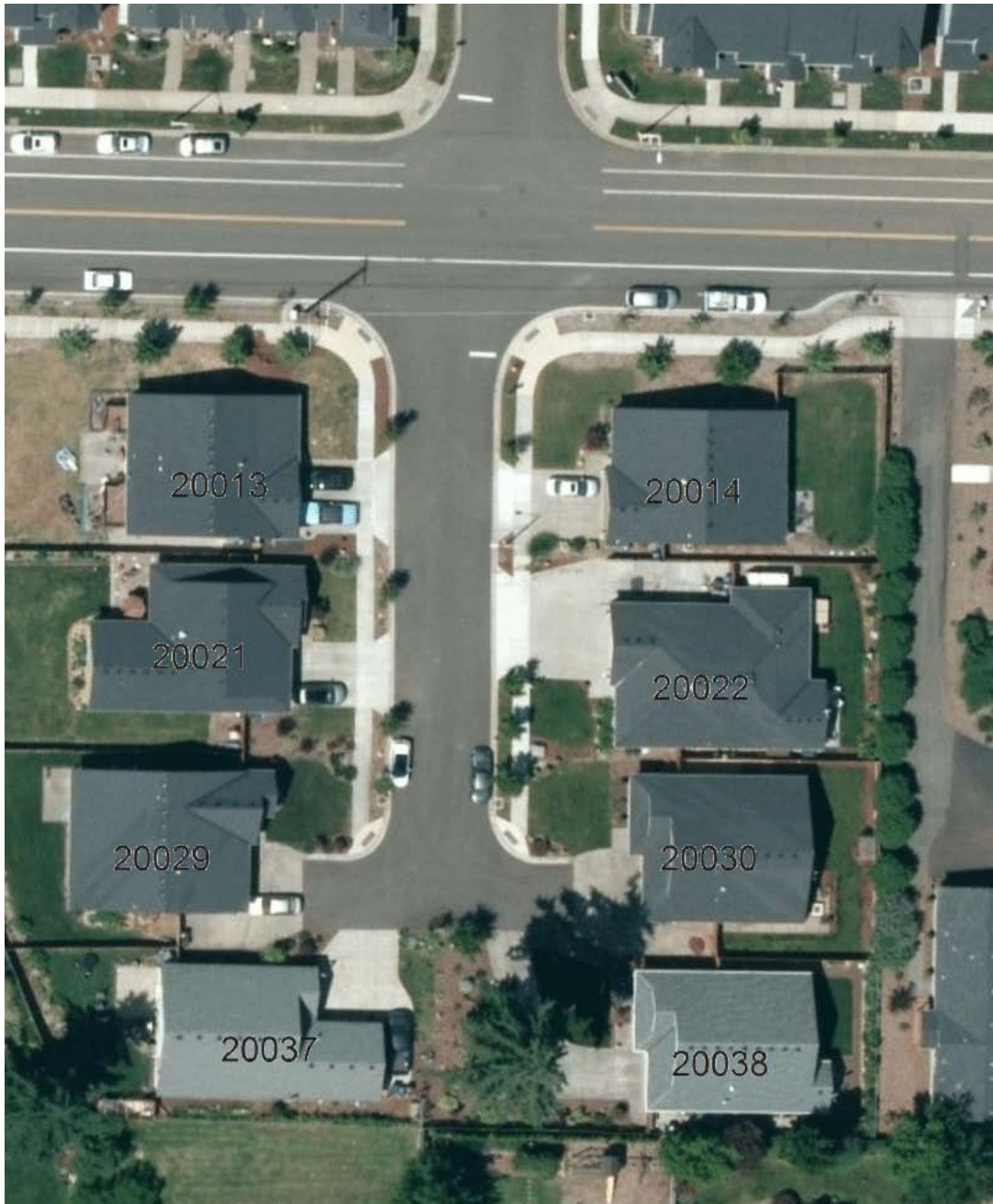
Coast Redwood Avenue is a local street with a curb-to-curb width of 32 feet. Coast Redwood Avenue extends north a distance of approximately 800 feet to its northern terminus at Meyers Road. There are intermediate connections with other local streets and alleys. Coast Redwood Avenue is the most easterly of three north-south connections west of Beaver Creek Road between Glen Oak Road and Meyers Road. The other connections are Quaking Aspen Avenue

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and High School Avenue. As a connection between Glen Oak Road and Meyers Road, Coast Redwood Avenue is a route for traffic associated with the high school.

Tharp Court is a cul-de-sac with a length of approximately 200 feet that terminates in a hammerhead turn-around.

An aerial photograph below depicts the intersection and Tharp Court.



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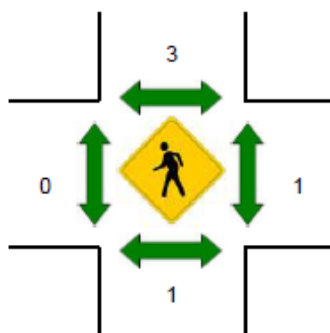
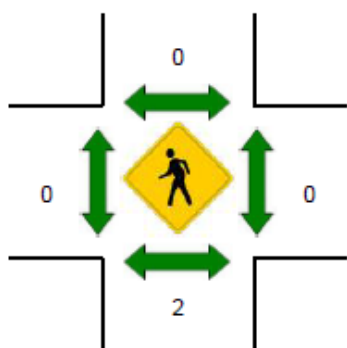
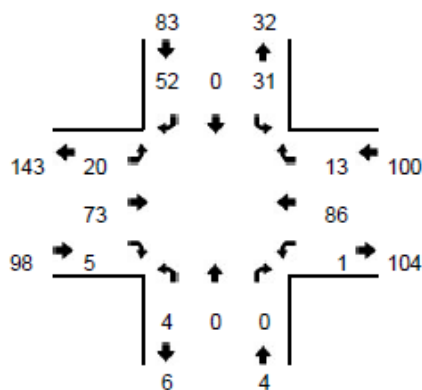
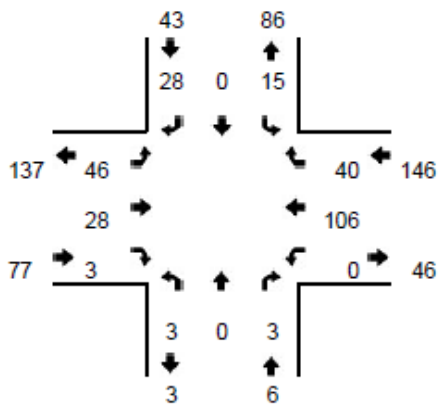
**Traffic Counts**

Traffic counts were conducted on Tuesday, April 23, 2013. Counts were conducted for two hours during the morning from 7:00 am until 9:00 am and in the afternoon from 2:30 pm until 6:00 pm. The afternoon period includes both the hour corresponding with the end of the school day and the peak hour of adjacent street traffic. The counts include pedestrian activity.

The highest hours represented by the morning peak period and mid-afternoon peak period are depicted in the graphics below.

AM Peak Hour (7:00 AM – 8:00 AM)

PM Peak Hour (2:50 PM – 3:50 PM)



Full summaries of the traffic count data are provided in the appendix.

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### **Speed Studies**

In connection with this study, observations were also conducted to assess travel speed on Glen Oak Road. The observations were conducted for a 24-hour period. The speed study also provided hourly counts of traffic on Glen Oak Road.

Key data gained from the speed study included the mean, median, mode and 85<sup>th</sup> percentile speeds. These values were 30, 31, 33, and 37 mph, respectively. The 85<sup>th</sup> percentile speed is the speed at which 85 percent of drivers are driving below. The 85<sup>th</sup> percentile speed is the value used in setting speed zones. The 85<sup>th</sup> percentile speed was observed to be 37 mph, which indicates that the 35 mph posted speed on Glen Oak road is appropriate. The observed speeds on Gen Oak Road help validate the observations about sight distance and pedestrian activity.

Results of the speed study including the speeds observed and the hourly counts are included in the appendix.

### **Information on Marked and Unmarked Crosswalks**

Since the installation of a marked crosswalk has been suggested, it is worth reviewing information about marked and unmarked crosswalks including results of safety information.

First, it is important to recognize that under Oregon law, crosswalks exist on each approach at intersections whether they are marked or not. A crosswalk does not exist only when action has been taken to formally close the crosswalk and it is posted with "CROSSWALK CLOSED."

One of the most definitive studies on the pedestrian safety issue is the report commissioned by the Federal Highway Administration and undertaken by the University of North Carolina's Highway Safety Research Center. *Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines* was published in August 2005. The study, conducted by Charles V. Zegeer and others, involved five years of pedestrian crashes at 1000 marked and 1000 unmarked crosswalks. The study included various road types, speeds, and volumes. The study concluded "that on two-lane roads, the presence of a marked crosswalk alone at an uncontrolled location was associated with no difference in pedestrian crash rate, compared to an unmarked crosswalk."

The study also assessed the crash severity and concluded "Crash severity did not differ significantly between marked and unmarked crosswalks on two-lane roads."

The study differentiated between two-lane roads and wider roads with varying speeds. The results summarized above are only those associated with two-lane roads, which are relevant to this analysis.

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### **Sight Distance**

The American Association of State Highway and Transportation Officials' Geometric Design of Highways and Streets provides equations and tables with stopping sight distance. The design value associated with a 35 mph design speed (applicable to Glen Oak Road) is 250 feet. This accounts for the distance traveled by a vehicle between the time a driver recognizes a need to stop and the distance needed to actually stop the vehicle.

On-street parking by vehicles parked along Glen Oak Road can limit the sight distance of a motorist on Glen Oak Road approaching the intersection and a motorist approaching Glen Oak Road on either Coast Redwood Avenue or Tharp Court. As observed in the field, on-street parking was found to be most used along the north side of Glen Oak Road to the east of Coast Redwood Avenue. This on-street parking interferes with the ability of westbound traffic on Glen Oak Road and southbound traffic on Coast Redwood Avenue to see each other. Similar interference could occur in other quadrants of the intersection, but on-street parking was not observed in these quadrants during site visits.

### **Recommendations Relating to the Installation of a Marked Crosswalk**

As explained above, a crosswalk exists unless crossings are specifically prohibited. The marking of a crosswalk has been shown to have no significant impact on the safety of a crosswalk for pedestrians.

Traffic count data collected for the study showed minimal pedestrian activity during the peak hours. Only a single pedestrian was observed to cross Glen Oak Road during the AM and PM peak periods. The highest hourly two-way volume on Glen Oak Road was less than 240 vehicles per hour. This corresponds with an average arrival of only four vehicles per minute. Pedestrians would rarely have to wait long before identifying a gap of sufficient time to safely walk across the road. At the standard walking speed of 3.5 feet per second, crossing Glen Oak road is calculated to take just over 14 seconds from curb to curb.

Given the low volume of crossing movements by pedestrians, the relatively low volume of automobile traffic and the lack of a safety benefit, marking a pedestrian crosswalk does not appear warranted. I do not recommend installation of a marked crossing.

### **Recommendations Relating to Sight Distance**

The most conservative approach for sight distance is to prohibit all obstructions within a "sight triangle" that uses the stopping sight distance on the main road and the point at which a vehicle is supposed to stop on the side street approach. This conservative approach would preclude on-street parking and the placement of street trees and other appurtenances for a considerable distance. It would make for a very sterile environment and is not in keeping with the type of street environment that the city is seeking to create with its street designs. In fact, the provision

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of on-street parking is generally thought to create a more pedestrian-friendly environment by placing parked cars between the sidewalk and moving vehicles and causing motorists to slow and behave more cautiously due to the presence of vehicles engaged in parking maneuvers.

To compensate for reduced sight distance, motorists instinctively take actions to compensate for the presence of obstructions. Typically, a motorist advances in his/her vehicle beyond the stop bar or crosswalk to a point at which he or she can see far enough in the direction of on-coming traffic. This action was observed at the subject intersection, especially on those occasions when a larger vehicle was parked on Glen Oak Road to the east of Coast Redwood Avenue.

Rather than adopting an approach that maximizes sight distance or an approach that keeps things as they are, I recommend a compromise solution. I recommend posting of no parking for a distance of 50 feet along Glen Oak Road from the end of the curb return in both the northeast and southwest quadrants of the intersection. Parking along the south side of Glen Oak Road seems to be seldom used, but the north side, particularly east of Coast Redwood Avenue is often used. Prohibiting parking for a distance of 50 feet from the curb return eliminates only two parking spaces and could inconvenience residents of one or two units. There appears to be sufficient parking elsewhere along the block to accommodate residents' needs.

A similar parking restriction in the southeast and northwest quadrants of the intersection is not necessary because a motorist's view of on-coming traffic from the right is greater. Parking can remain in these quadrants.

A parking restriction along the north side of Glen Oak Road east of Coast Redwood Avenue would provide some benefit to motorists entering the intersection from Coast Redwood Avenue and allow them to see on-coming traffic more easily without pulling as far forward as they sometimes have to today. A similar parking restriction along the south side of Glen Oak Road west of Tharp Court would benefit motorists entering the intersection from Tharp Court and allow them to see on-coming eastbound traffic on Glen Oak Road more easily.

The illustration on the next page shows approximate locations where parking prohibition is recommended.

Posting a portion of the street for no parking does not violate the city's street standards.

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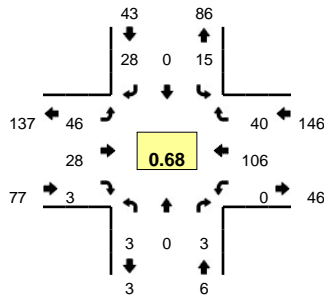
**Recommendations Related to Speed Zone**

The Oregon Department of Transportation is the authority responsible for establishing speed zones. Based on the observations conducted in connection with this study, asking the Oregon Department of Transportation to conduct a formal speed study would not be worthwhile. A formal study would be very unlikely to cause the Oregon Department of Transportation to alter the existing speed zone for Glen Oak Road.

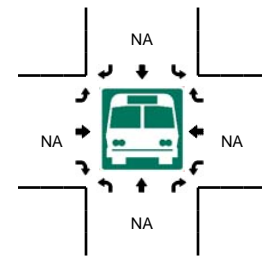
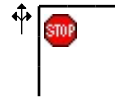
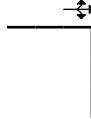
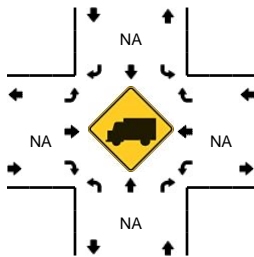
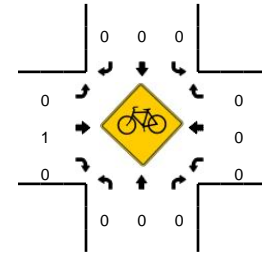
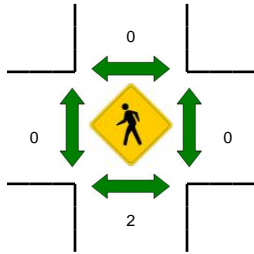


**LOCATION:** Coast Redwood Ave/Tharp St -- S Glen Oak Rd  
**CITY/STATE:** Oregon City, OR

**QC JOB #:** 10945401  
**DATE:** Tue, Apr 23 2013



**Peak-Hour: 7:00 AM -- 8:00 AM**  
**Peak 15-Min: 7:20 AM -- 7:35 AM**

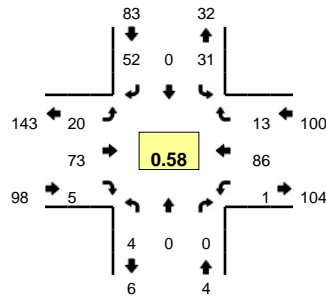


| 5-Min Count Period<br>Beginning At | Coast Redwood Ave/Tharp St<br>(Northbound) |      |       |   | Coast Redwood Ave/Tharp St<br>(Southbound) |      |       |   | S Glen Oak Rd<br>(Eastbound) |      |       |   | S Glen Oak Rd<br>(Westbound) |      |       |   | Total | Hourly Totals |
|------------------------------------|--|------|-------|---|--|------|-------|---|------------------------------|------|-------|---|------------------------------|------|-------|---|-------|---------------|
|                                    | Left                                       | Thru | Right | U | Left                                       | Thru | Right | U | Left                         | Thru | Right | U | Left                         | Thru | Right | U |       |               |
| 7:00 AM                            | 1  | 0    | 0     | 0 | 1  | 0    | 1     | 0 | 4                            | 2    | 0     | 0 | 0                            | 12   | 3     | 0 | 24    |               |
| 7:05 AM                            | 1  | 0    | 0     | 0 | 0  | 0    | 1     | 0 | 0                            | 1    | 0     | 0 | 0                            | 4    | 3     | 0 | 10    |               |
| 7:10 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 1     | 0 | 0                            | 3    | 0     | 0 | 0                            | 8    | 3     | 0 | 15    |               |
| 7:15 AM                            | 0  | 0    | 2     | 0 | 0  | 0    | 2     | 0 | 8                            | 0    | 1     | 0 | 0                            | 12   | 6     | 0 | 31    |               |
| 7:20 AM                            | 0  | 0    | 0     | 0 | 2  | 0    | 4     | 0 | 6                            | 2    | 1     | 0 | 0                            | 12   | 4     | 0 | 31    |               |
| 7:25 AM                            | 0  | 0    | 0     | 0 | 3  | 0    | 4     | 0 | 9                            | 2    | 0     | 0 | 0                            | 8    | 8     | 0 | 34    |               |
| 7:30 AM                            | 0  | 0    | 0     | 0 | 4  | 0    | 5     | 0 | 7                            | 0    | 0     | 0 | 0                            | 11   | 8     | 0 | 35    |               |
| 7:35 AM                            | 0  | 0    | 0     | 0 | 3  | 0    | 3     | 0 | 5                            | 4    | 1     | 0 | 0                            | 11   | 3     | 0 | 30    |               |
| 7:40 AM                            | 1  | 0    | 1     | 0 | 1  | 0    | 5     | 0 | 4                            | 3    | 0     | 0 | 0                            | 4    | 1     | 0 | 20    |               |
| 7:45 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 2     | 0 | 1                            | 4    | 0     | 0 | 0                            | 10   | 0     | 0 | 17    |               |
| 7:50 AM                            | 0  | 0    | 0     | 0 | 1  | 0    | 0     | 0 | 2                            | 3    | 0     | 0 | 0                            | 9    | 0     | 0 | 15    |               |
| 7:55 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 0     | 0 | 0                            | 4    | 0     | 0 | 0                            | 5    | 1     | 0 | 10    | 272           |
| 8:00 AM                            | 0  | 0    | 0     | 0 | 0  | 1    | 0     | 0 | 0                            | 3    | 0     | 1 | 0                            | 5    | 1     | 0 | 11    | 259           |
| 8:05 AM                            | 0  | 0    | 1     | 0 | 1  | 0    | 0     | 0 | 4                            | 1    | 0     | 0 | 0                            | 11   | 0     | 0 | 18    | 267           |
| 8:10 AM                            | 0  | 0    | 0     | 0 | 1  | 0    | 0     | 0 | 0                            | 2    | 0     | 0 | 0                            | 5    | 1     | 0 | 9     | 261           |
| 8:15 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 2     | 0 | 1                            | 1    | 0     | 0 | 0                            | 4    | 0     | 0 | 8     | 238           |
| 8:20 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 0     | 0 | 1                            | 2    | 0     | 1 | 0                            | 1    | 0     | 0 | 5     | 212           |
| 8:25 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 1     | 0 | 1                            | 1    | 0     | 0 | 0                            | 5    | 0     | 0 | 8     | 186           |
| 8:30 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 1     | 0 | 0                            | 0    | 1     | 0 | 0                            | 9    | 0     | 0 | 11    | 162           |
| 8:35 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 0     | 0 | 0                            | 3    | 0     | 0 | 1                            | 2    | 0     | 0 | 6     | 138           |
| 8:40 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 3     | 0 | 2                            | 4    | 0     | 0 | 0                            | 3    | 0     | 0 | 12    | 130           |
| 8:45 AM                            | 0  | 0    | 0     | 0 | 0  | 0    | 1     | 0 | 3                            | 2    | 0     | 0 | 0                            | 8    | 0     | 0 | 14    | 127           |
| 8:50 AM                            | 0  | 0    | 1     | 0 | 0  | 0    | 1     | 0 | 1                            | 4    | 0     | 0 | 1                            | 2    | 3     | 0 | 13    | 125           |
| 8:55 AM                            | 0  | 0    | 0     | 0 | 1  | 0    | 2     | 0 | 1                            | 3    | 0     | 0 | 0                            | 4    | 0     | 0 | 11    | 126           |
| Peak 15-Min Flowrates              | Northbound                                 |      |       |   | Southbound                                 |      |       |   | Eastbound                    |      |       |   | Westbound                    |      |       |   | Total |               |
|                                    | Left                                       | Thru | Right | U | Left                                       | Thru | Right | U | Left                         | Thru | Right | U | Left                         | Thru | Right | U |       |               |
| All Vehicles                       | 0  | 0    | 0     | 0 | 36   | 0    | 52    | 0 | 88                           | 16   | 4     | 0 | 0                            | 124  | 80    | 0 | 400   |               |
| Heavy Trucks                       | 0  | 0    | 0     | 0 | 0  | 0    | 0     | 0 | 0                            | 4    | 0     | 0 | 0                            | 0    | 0     | 0 | 4     |               |
| Pedestrians                        | 0  | 0    | 0     | 0 | 0  | 0    | 0     | 0 | 0                            | 0    | 0     | 0 | 0                            | 0    | 0     | 0 | 0     |               |
| Bicycles                           | 0  | 0    | 0     | 0 | 0  | 0    | 0     | 0 | 0                            | 0    | 0     | 0 | 0                            | 0    | 0     | 0 | 0     |               |
| Railroad                           |  |      |       |   |  |      |       |   |                              |      |       |   |                              |      |       |   |       |               |
| Stopped Buses                      |  |      |       |   |  |      |       |   |                              |      |       |   |                              |      |       |   |       |               |

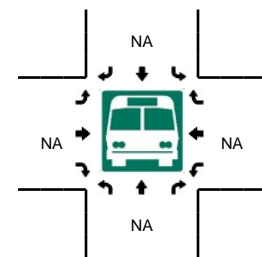
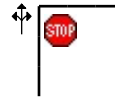
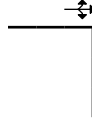
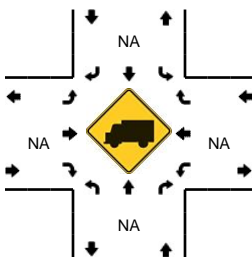
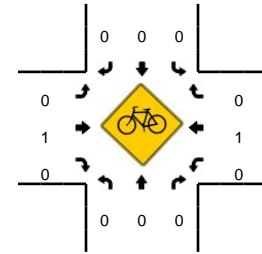
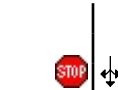
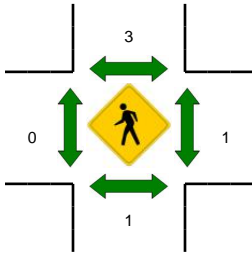
Comments:

**LOCATION:** Coast Redwood Ave/Tharp St -- S Glen Oak Rd  
**CITY/STATE:** Oregon City, OR

**QC JOB #:** 10945402  
**DATE:** Tue, Apr 23 2013



**Peak-Hour: 2:50 PM -- 3:50 PM**  
**Peak 15-Min: 2:55 PM -- 3:10 PM**



| 5-Min Count Period Beginning At | Coast Redwood Ave/Tharp St (Northbound) |      |       |   | Coast Redwood Ave/Tharp St (Southbound) |      |       |   | S Glen Oak Rd (Eastbound) |      |       |   | S Glen Oak Rd (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---|------|-------|---|---|------|-------|---|---------------------------|------|-------|---|---------------------------|------|-------|---|-------|---------------|
|                                 | Left                                    | Thru | Right | U | Left                                    | Thru | Right | U | Left                      | Thru | Right | U | Left                      | Thru | Right | U |       |               |
| 2:30 PM                         | 0                                       | 0    | 0     | 0 | 1                                       | 0    | 0     | 0 | 1                         | 5    | 0     | 0 | 0                         | 5    | 0     | 0 | 12    |               |
| 2:35 PM                         | 0                                       | 0    | 0     | 0 | 0                                       | 0    | 0     | 0 | 2                         | 1    | 0     | 0 | 0                         | 9    | 1     | 0 | 13    |               |
| 2:40 PM                         | 1                                       | 0    | 0     | 0 | 0                                       | 0    | 2     | 0 | 4                         | 2    | 1     | 1 | 0                         | 6    | 0     | 0 | 17    |               |
| 2:45 PM                         | 2                                       | 0    | 0     | 0 | 1                                       | 0    | 1     | 0 | 2                         | 3    | 0     | 0 | 0                         | 1    | 0     | 0 | 10    |               |
| 2:50 PM                         | 1                                       | 0    | 0     | 0 | 1                                       | 0    | 7     | 0 | 3                         | 4    | 1     | 0 | 1                         | 4    | 2     | 0 | 24    |               |
| 2:55 PM                         | 1                                       | 0    | 0     | 0 | 8                                       | 0    | 17    | 0 | 2                         | 7    | 0     | 1 | 0                         | 5    | 4     | 0 | 45    |               |
| 3:00 PM                         | 0                                       | 0    | 0     | 0 | 12                                      | 0    | 8     | 0 | 1                         | 13   | 0     | 0 | 0                         | 11   | 2     | 0 | 47    |               |
| 3:05 PM                         | 0                                       | 0    | 0     | 0 | 4                                       | 0    | 6     | 0 | 1                         | 7    | 0     | 0 | 0                         | 11   | 2     | 0 | 31    |               |
| 3:10 PM                         | 0                                       | 0    | 0     | 0 | 2                                       | 0    | 2     | 0 | 1                         | 4    | 0     | 0 | 0                         | 8    | 1     | 0 | 18    |               |
| 3:15 PM                         | 0                                       | 0    | 0     | 0 | 0                                       | 0    | 1     | 0 | 2                         | 5    | 1     | 0 | 0                         | 7    | 0     | 0 | 16    |               |
| 3:20 PM                         | 0                                       | 0    | 0     | 0 | 1                                       | 0    | 2     | 0 | 1                         | 6    | 0     | 0 | 0                         | 11   | 0     | 0 | 21    |               |
| 3:25 PM                         | 0                                       | 0    | 0     | 0 | 0                                       | 0    | 0     | 0 | 1                         | 4    | 2     | 0 | 0                         | 5    | 1     | 0 | 13    | 267           |
| 3:30 PM                         | 1                                       | 0    | 0     | 0 | 1                                       | 0    | 4     | 0 | 2                         | 7    | 0     | 0 | 0                         | 2    | 1     | 0 | 18    | 273           |
| 3:35 PM                         | 0                                       | 0    | 0     | 0 | 1                                       | 0    | 1     | 0 | 2                         | 4    | 0     | 0 | 0                         | 7    | 0     | 0 | 15    | 275           |
| 3:40 PM                         | 0                                       | 0    | 0     | 0 | 0                                       | 0    | 2     | 0 | 0                         | 8    | 1     | 0 | 0                         | 8    | 0     | 0 | 19    | 277           |
| 3:45 PM                         | 1                                       | 0    | 0     | 0 | 1                                       | 0    | 2     | 0 | 3                         | 4    | 0     | 0 | 0                         | 7    | 0     | 0 | 18    | 285           |
| 3:50 PM                         | 0                                       | 0    | 0     | 0 | 2                                       | 0    | 3     | 0 | 1                         | 3    | 0     | 0 | 0                         | 8    | 0     | 0 | 17    | 278           |
| 3:55 PM                         | 0                                       | 0    | 0     | 0 | 1                                       | 0    | 1     | 0 | 1                         | 8    | 0     | 0 | 0                         | 9    | 0     | 0 | 20    | 253           |
| 4:00 PM                         | 0                                       | 0    | 0     | 0 | 0                                       | 0    | 3     | 0 | 2                         | 7    | 0     | 0 | 0                         | 6    | 0     | 0 | 18    | 224           |
| 4:05 PM                         | 1                                       | 0    | 0     | 0 | 0                                       | 0    | 0     | 0 | 0                         | 10   | 2     | 0 | 0                         | 7    | 1     | 0 | 21    | 214           |
| 4:10 PM                         | 0                                       | 0    | 0     | 0 | 3                                       | 0    | 2     | 0 | 1                         | 5    | 0     | 0 | 0                         | 8    | 1     | 0 | 20    | 216           |
| 4:15 PM                         | 1                                       | 0    | 0     | 0 | 0                                       | 0    | 6     | 0 | 3                         | 10   | 0     | 0 | 0                         | 5    | 0     | 0 | 25    | 225           |
| 4:20 PM                         | 0                                       | 0    | 1     | 0 | 2                                       | 0    | 4     | 0 | 0                         | 9    | 1     | 0 | 0                         | 7    | 1     | 0 | 25    | 229           |
| 4:25 PM                         | 0                                       | 0    | 0     | 0 | 0                                       | 0    | 0     | 0 | 2                         | 6    | 0     | 0 | 0                         | 7    | 0     | 0 | 15    | 231           |
| Peak 15-Min Flowrates           | Northbound                              |      |       |   | Southbound                              |      |       |   | Eastbound                 |      |       |   | Westbound                 |      |       |   | Total |               |
|                                 | Left                                    | Thru | Right | U | Left                                    | Thru | Right | U | Left                      | Thru | Right | U | Left                      | Thru | Right | U |       |               |
| All Vehicles                    | 4                                       | 0    | 0     | 0 | 96                                      | 0    | 124   | 0 | 16                        | 108  | 0     | 4 | 0                         | 108  | 32    | 0 | 492   |               |
| Heavy Trucks                    | 0                                       | 0    | 0     | 0 | 0                                       | 0    | 8     | 0 | 4                         | 0    | 0     | 0 | 0                         | 8    | 4     | 0 | 24    |               |
| Pedestrians                     |   | 4    |       |   |   | 12   |       |   |                           | 0    |       |   |                           | 4    |       |   | 20    |               |
| Bicycles                        | 0                                       | 0    | 0     |   | 0                                       | 0    | 0     |   | 0                         | 0    | 0     |   | 0                         | 0    | 0     |   | 0     |               |
| Railroad                        |   |      |       |   |   |      |       |   |                           |      |       |   |                           |      |       |   |       |               |
| Stopped Buses                   |   |      |       |   |   |      |       |   |                           |      |       |   |                           |      |       |   |       |               |

Comments:

| <b>LOCATION:</b> S Glen Oak Rd between Quinalt Dr and Coast Redwood Av/Tharp Ct<br><b>SPECIFIC LOCATION:</b> 400 ft from<br><b>CITY/STATE:</b> Oregon City, OR |     |                  |     |     |     | <b>QC JOB #:</b> 10945403<br><b>DIRECTION:</b> EB/WB<br><b>DATE:</b> Apr 23 2013 - Apr 23 2013 |     |     |                                |                      |
|--|-----|------------------|-----|-----|-----|--|-----|-----|--------------------------------|----------------------|
| Start Time   | Mon | Tue<br>23-Apr-13 | Wed | Thu | Fri | Average Weekday<br>Hourly Traffic  | Sat | Sun | Average Week<br>Hourly Traffic | Average Week Profile |
| 12:00 AM   |     | 17               |     |     |     | 17   |     |     | 17                             |                      |
| 1:00 AM  |     | 5                |     |     |     | 5  |     |     | 5                              |                      |
| 2:00 AM  |     | 0                |     |     |     | 0  |     |     | 0                              |                      |
| 3:00 AM  |     | 4                |     |     |     | 4  |     |     | 4                              |                      |
| 4:00 AM  |     | 5                |     |     |     | 5  |     |     | 5                              |                      |
| 5:00 AM  |     | 18               |     |     |     | 18   |     |     | 18                             |                      |
| 6:00 AM  |     | 73               |     |     |     | 73   |     |     | 73                             |                      |
| 7:00 AM  |     | <b>190</b>       |     |     |     | <b>190</b>   |     |     | <b>190</b>                     |                      |
| 8:00 AM  |     | 95               |     |     |     | 95   |     |     | 95                             |                      |
| 9:00 AM  |     | 75               |     |     |     | 75   |     |     | 75                             |                      |
| 10:00 AM   |     | 64               |     |     |     | 64   |     |     | 64                             |                      |
| 11:00 AM   |     | 85               |     |     |     | 85   |     |     | 85                             |                      |
| 12:00 PM   |     | 99               |     |     |     | 99   |     |     | 99                             |                      |
| 1:00 PM  |     | 92               |     |     |     | 92   |     |     | 92                             |                      |
| 2:00 PM  |     | 136              |     |     |     | 136  |     |     | 136                            |                      |
| 3:00 PM  |     | <b>197</b>       |     |     |     | <b>197</b>   |     |     | <b>197</b>                     |                      |
| 4:00 PM  |     | 167              |     |     |     | 167  |     |     | 167                            |                      |
| 5:00 PM  |     | 164              |     |     |     | 164  |     |     | 164                            |                      |
| 6:00 PM  |     | 161              |     |     |     | 161  |     |     | 161                            |                      |
| 7:00 PM  |     | 108              |     |     |     | 108  |     |     | 108                            |                      |
| 8:00 PM  |     | 100              |     |     |     | 100  |     |     | 100                            |                      |
| 9:00 PM  |     | 54               |     |     |     | 54   |     |     | 54                             |                      |
| 10:00 PM   |     | 25               |     |     |     | 25   |     |     | 25                             |                      |
| 11:00 PM   |     | 20               |     |     |     | 20   |     |     | 20                             |                      |
| <b>Day Total</b>   |     | 1954             |     |     |     | 1954   |     |     | 1954                           |                      |
| % Weekday Average  |     | 100.0%           |     |     |     |  |     |     |                                |                      |
| % Week Average   |     | 100.0%           |     |     |     | 100.0%   |     |     |                                |                      |
| AM Peak  |     | 7:00 AM          |     |     |     | 7:00 AM  |     |     | 7:00 AM                        |                      |
| Volume   |     | 190              |     |     |     | 190  |     |     | 190                            |                      |
| PM Peak  |     | 3:00 PM          |     |     |     | 3:00 PM  |     |     | 3:00 PM                        |                      |
| Volume   |     | 197              |     |     |     | 197  |     |     | 197                            |                      |
| <i>Comments:</i>   |     |                  |     |     |     |  |     |     |                                |                      |

**LOCATION:** S Glen Oak Rd between Quinalt Dr and Coast Redwood Av/Tharp Ct  
**SPECIFIC LOCATION:** 400 ft from  
**CITY/STATE:** Oregon City, OR

**QC JOB #:** 10945403  
**DIRECTION:** EB/WB  
**DATE:** Apr 23 2013

| Start Time       | 1<br>15 | 16<br>20 | 21<br>25 | 26<br>30 | 31<br>35 | 36<br>40 | 41<br>45 | 46<br>50 | 51<br>55 | 56<br>60 | 61<br>65 | 66<br>70 | 71<br>75 | 76<br>999 | Total | Pace<br>Speed | Number<br>in Pace |  |  |
|------------------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-------|---------------|-------------------|--|--|
| 12:00 AM         | 0       | 1        | 3        | 7        | 5        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 17    | 26-35         | 12                |  |  |
| 1:00 AM          | 3       | 0        | 1        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 5     | 21-30         | 2                 |  |  |
| 2:00 AM          | 0       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 0     | 1-10          | 0                 |  |  |
| 3:00 AM          | 0       | 0        | 1        | 2        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 4     | 26-35         | 3                 |  |  |
| 4:00 AM          | 0       | 0        | 4        | 0        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 5     | 16-25         | 4                 |  |  |
| 5:00 AM          | 2       | 2        | 4        | 3        | 3        | 4        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 18    | 31-40         | 7                 |  |  |
| 6:00 AM          | 2       | 2        | 12       | 15       | 25       | 17       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 73    | 31-40         | 42                |  |  |
| 7:00 AM          | 8       | 4        | 18       | 49       | 55       | 46       | 9        | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 190   | 26-35         | 104               |  |  |
| 8:00 AM          | 1       | 6        | 17       | 16       | 40       | 13       | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 95    | 26-35         | 56                |  |  |
| 9:00 AM          | 1       | 4        | 4        | 19       | 27       | 16       | 4        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 75    | 26-35         | 46                |  |  |
| 10:00 AM         | 0       | 2        | 4        | 19       | 25       | 11       | 3        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 64    | 26-35         | 44                |  |  |
| 11:00 AM         | 0       | 2        | 9        | 19       | 24       | 25       | 4        | 2        | 0        | 0        | 0        | 0        | 0        | 0         | 85    | 31-40         | 49                |  |  |
| 12:00 PM         | 0       | 1        | 10       | 18       | 32       | 27       | 11       | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 99    | 31-40         | 59                |  |  |
| 1:00 PM          | 3       | 3        | 13       | 21       | 31       | 16       | 4        | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 92    | 26-35         | 52                |  |  |
| 2:00 PM          | 1       | 0        | 15       | 28       | 49       | 33       | 9        | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 136   | 31-40         | 81                |  |  |
| 3:00 PM          | 4       | 6        | 21       | 48       | 64       | 44       | 8        | 2        | 0        | 0        | 0        | 0        | 0        | 0         | 197   | 26-35         | 112               |  |  |
| 4:00 PM          | 1       | 4        | 18       | 45       | 47       | 43       | 8        | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 167   | 26-35         | 92                |  |  |
| 5:00 PM          | 0       | 8        | 13       | 42       | 47       | 47       | 5        | 2        | 0        | 0        | 0        | 0        | 0        | 0         | 164   | 31-40         | 94                |  |  |
| 6:00 PM          | 4       | 1        | 13       | 49       | 62       | 26       | 4        | 1        | 1        | 0        | 0        | 0        | 0        | 0         | 161   | 26-35         | 111               |  |  |
| 7:00 PM          | 4       | 0        | 15       | 26       | 44       | 17       | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 108   | 26-35         | 70                |  |  |
| 8:00 PM          | 5       | 4        | 16       | 18       | 37       | 17       | 3        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 100   | 26-35         | 55                |  |  |
| 9:00 PM          | 2       | 1        | 5        | 15       | 20       | 9        | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 54    | 26-35         | 35                |  |  |
| 10:00 PM         | 1       | 2        | 3        | 7        | 8        | 2        | 1        | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 25    | 26-35         | 15                |  |  |
| 11:00 PM         | 2       | 0        | 3        | 6        | 4        | 5        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 20    | 26-35         | 10                |  |  |
| <b>Day Total</b> | 44      | 53       | 222      | 473      | 651      | 419      | 79       | 12       | 1        | 0        | 0        | 0        | 0        | 0         | 1954  | 26-35         | 1124              |  |  |
| <b>Percent</b>   | 2.3%    | 2.7%     | 11.4%    | 24.2%    | 33.3%    | 21.4%    | 4.0%     | 0.6%     | 0.1%     | 0.0%     | 0.0%     | 0.0%     | 0.0%     | 0.0%      |       |               |                   |  |  |
| <b>ADT 1954</b>  |         |          |          |          |          |          |          |          |          |          |          |          |          |           |       |               |                   |  |  |
| <b>AM Peak</b>   | 7:00 AM | 8:00 AM  | 7:00 AM  | 7:00 AM  | 7:00 AM  | 7:00 AM  | 7:00 AM  | 11:00 AM |          |          |          |          |          |           |       | 7:00 AM       |                   |  |  |
| <b>Volume</b>    | 8       | 6        | 18       | 49       | 55       | 46       | 9        | 2        |          |          |          |          |          |           |       | 190           |                   |  |  |
| <b>PM Peak</b>   | 8:00 PM | 5:00 PM  | 3:00 PM  | 6:00 PM  | 3:00 PM  | 5:00 PM  | 12:00 PM | 3:00 PM  | 6:00 PM  |          |          |          |          |           |       |               | 3:00 PM           |  |  |
| <b>Volume</b>    | 5       | 8        | 21       | 49       | 64       | 47       | 11       | 2        | 1        |          |          |          |          |           |       |               | 197               |  |  |

Comments:

|   |                 |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                   |  |                       |                           |
|---|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|--|-----------------------|---------------------------|
| <b>LOCATION:</b> S Glen Oak Rd between Quinalt Dr and Coast Redwood Av/Tharp Ct |                 |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                   | <b>QC JOB #:</b> 10945403  |                       |                           |
| <b>SPECIFIC LOCATION:</b> 400 ft from   |                 |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                   | <b>DIRECTION:</b> EB/WB  |                       |                           |
| <b>CITY/STATE:</b> Oregon City, OR  |                 |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                   | <b>DATE:</b> Apr 23 2013 - Apr 23 2013   |                       |                           |
| <b>Start Time</b>   | <b>1<br/>15</b> | <b>16<br/>20</b> | <b>21<br/>25</b> | <b>26<br/>30</b> | <b>31<br/>35</b> | <b>36<br/>40</b> | <b>41<br/>45</b> | <b>46<br/>50</b> | <b>51<br/>55</b> | <b>56<br/>60</b> | <b>61<br/>65</b> | <b>66<br/>70</b> | <b>71<br/>75</b> | <b>76<br/>999</b> | <b>Total</b>   | <b>Pace<br/>Speed</b> | <b>Number<br/>in Pace</b> |
| <b>Grand Total</b>  | 44              | 53               | 222              | 473              | 651              | 419              | 79               | 12               | 1                | 0                | 0                | 0                | 0                | 0                 | 1954   | 26-35                 | 1124                      |
| <b>Percent</b>  | 2.3%            | 2.7%             | 11.4%            | 24.2%            | 33.3%            | 21.4%            | 4.0%             | 0.6%             | 0.1%             | 0.0%             | 0.0%             | 0.0%             | 0.0%             | 0.0%              |  |                       |                           |
| <b>Cumulative<br/>Percent</b>   | 2.3%            | 5.0%             | 16.3%            | 40.5%            | 73.8%            | 95.3%            | 99.3%            | 99.9%            | 100.0%           | 100.0%           | 100.0%           | 100.0%           | 100.0%           | 100.0%            |  |                       |                           |
| <b>ADT<br/>1954</b>   |                 |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                   | <b>85th Percentile</b> 37 MPH<br><b>Mean Speed(Average):</b> 30 MPH<br><b>Median</b> 31 MPH<br><b>Mode:</b> 33 MPH |                       |                           |
| <i>Comments:</i>  |                 |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |                   |  |                       |                           |

