

## EXISTING CONDITIONS

### Roadway System

NE 132nd Street is one of three roadways that make up the Totem Lake east-west corridor serving the Totem Lake urban center. This corridor includes:

- NE 132nd Street
- NE 124th Street
- NE 116th Street

The three roadways collectively serve a significant east-west travel demand in the north area of Kirkland. The I-405 freeway divides the travel-shed for the roadway located approximately half-way along the study focus of NE 132nd Street. A full interchange provides access to I-405 at NE 124th Street, with an additional northbound ramp to Totem Lake Boulevard. A half-interchange provides I-405 access to and from the south at NE 116th Street.

Existing roadway configuration and intersection controls are indicated in **Figure 1**. NE 132nd Street has one continuous through lane in each direction between 100th Avenue NE and 132nd Avenue NE. It is a three-lane section with a center, two-way left-turn lane between 100th Avenue NE and I-405. East of I-405, NE 132nd Street is a two-lane roadway with left-turn pockets at signalized intersections.

Direct driveway access is limited along NE 132nd Street, however, 32 cross streets and private drives intersect this 2 mile section. Eight of the intersections are signalized. These intersections are:

- 100th Avenue NE
- Juanita High School
- 108th Avenue NE
- 116th Way NE
- 116th Avenue NE/Totem Lake Boulevard NE
- 120th Avenue NE
- 124th Avenue NE
- 132nd Avenue NE

**Figure 1** shows where the signal controlled intersections are located. King County controls the signals at 100th Avenue NE, Juanita High School, 108th Avenue NE and 132nd Avenue NE. The other four intersections are controlled and coordinated by the City of Kirkland. Kirkland Fire Station # 27 controls an emergency signal located near 113th Place NE.

**Figure 2** provides the speed limits for the streets along the corridor. The posted speed limit along NE 132nd Street is 35 mph. When children are present, a 20 mph school zone exists near Juanita High School. Helen Keller Elementary school is located at 13820

108th Avenue NE, approximately six blocks to the north of NE 132nd Street. An adult school crossing guard is stationed at the 108th Avenue NE signalized intersection to assist elementary school students to cross during both morning and after-school time periods.

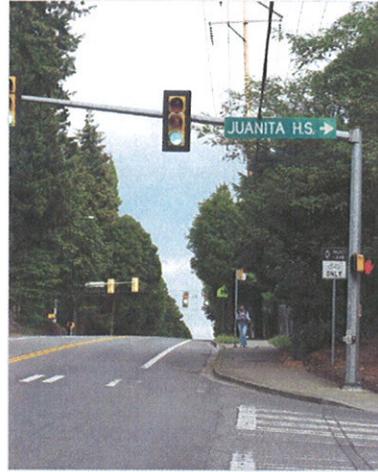


Figure 1. Existing Roadway Configuration and Intersection Control

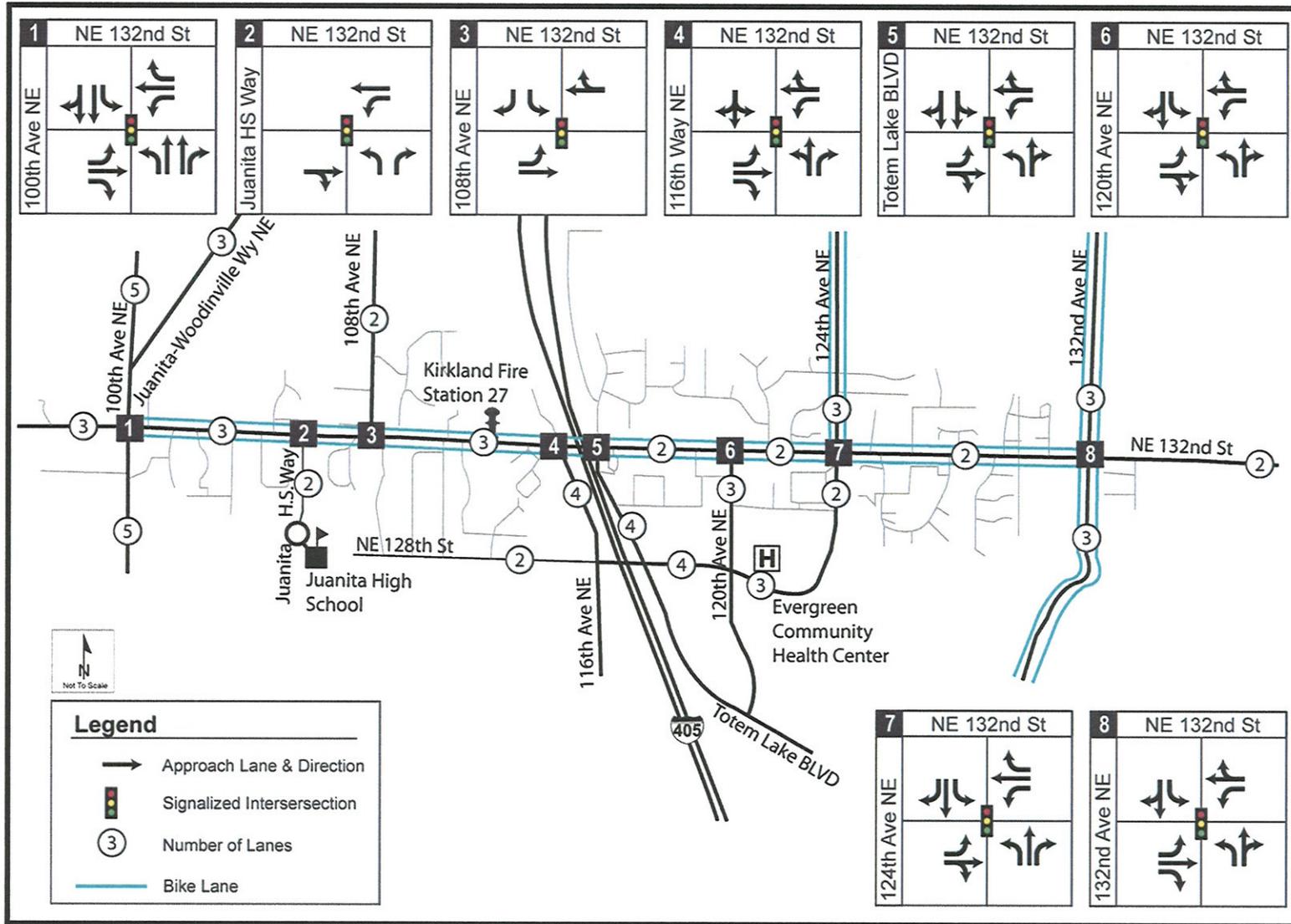
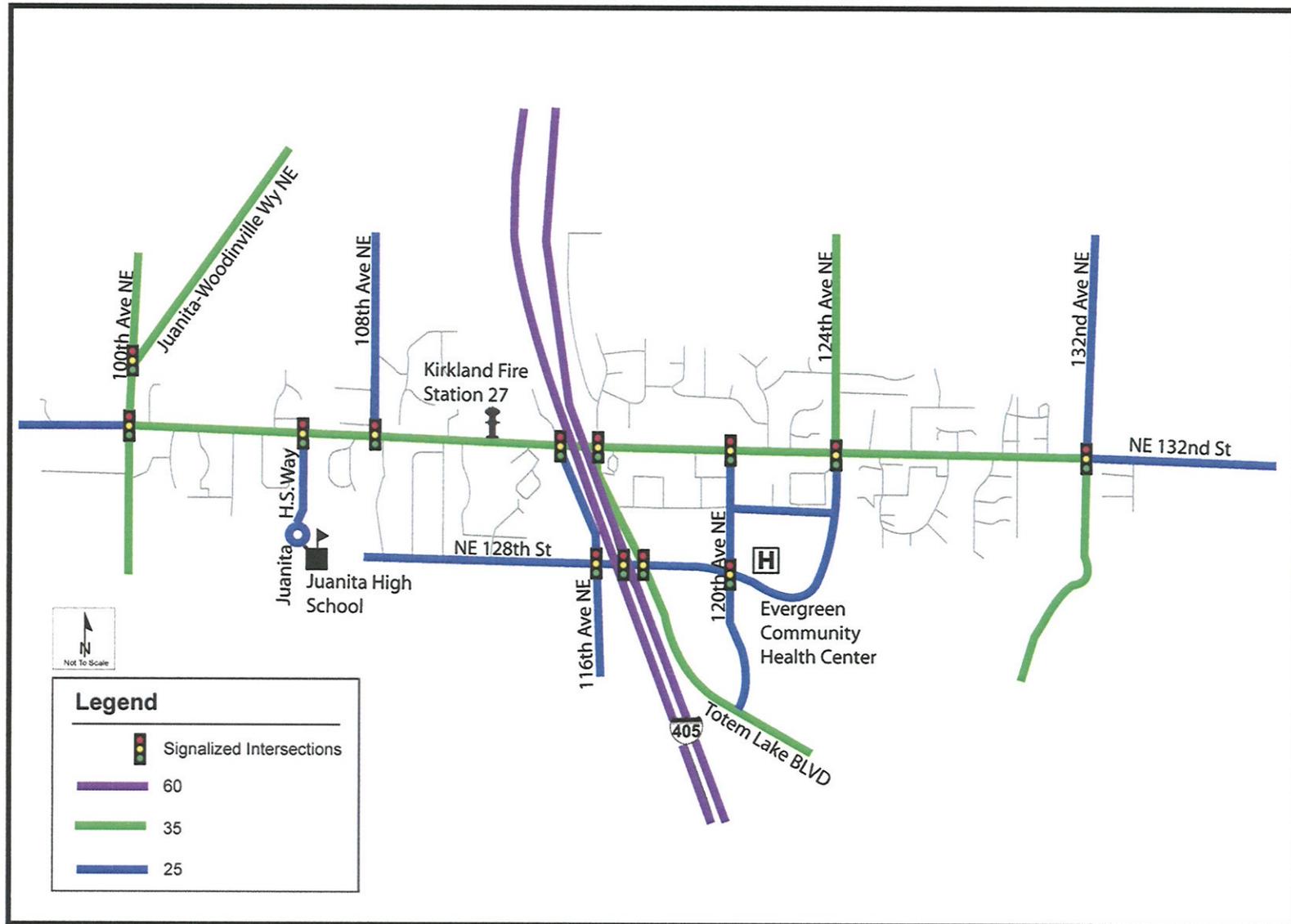


Figure 2. Existing Speed Limit and Intersection Control



**Figure 3** shows the street classifications in the corridor. Note that NE 132nd Street forms the boundary between the City of Kirkland to the south and unincorporated King County to the north between 100th Avenue NE and 128th Avenue NE. East of 128th Avenue NE, NE 132nd Street is within unincorporated King County. The Kirkland Comprehensive Plan identifies NE 132nd Street east of 100th Avenue NE as a principal arterial. The King County street classification map dated June 15, 2005, shows NE 132nd Street as a minor arterial.

**Figure 4** provides the average weekday daily traffic, as collected in 2005. However, 116th Way NE was closed to through traffic during much of the study period, due to construction of the direct access ramps at the interchange of NE 128th Street and I-405, Traffic data collected in 2005 form the basis for current conditions of the corridor.

### **Bicycle System**

Figure 1 also shows the location of bike lanes along the corridor. Bicycle lanes are provided along the majority of the NE 132nd Street corridor. The bicycle lane widths vary and are dependent upon the number of travel and turning lanes for that roadway section. Generally, the bicycle lanes are striped to be three feet wide. Where a turning lane is not provided, the lane widens to eight feet wide. The bicycle lane in the eastbound direction ends prior to the 132nd Avenue NE intersection. In the westbound direction, the bike lane ends prior to the 100th Avenue NE intersection. Signage is provided after major intersections to indicate the presence of bicycle lanes.

### **Pedestrian System**

Sidewalks are provided on both sides of the street along the entire NE 132nd Street corridor. The sidewalks are continuous through the study area and conditions are fair to good except where tree roots have grown under the sidewalk causing the sidewalk to buckle. Underneath the I-405 overpass, recent construction has either removed some sidewalk sections or damaged the surface but these will be replaced with completion of the freeway work. Generally, the sidewalks are four to five feet wide with a 3-foot wide planting strip with street trees. Where a planting strip does not exist, the sidewalk is five to six feet wide.

Where trees are in a planter strip adjacent to the roadway, the mature tree roots have often caused sidewalk damage and uneven surfaces near the tree well. This may pose a tripping hazard especially for handicapped and visually impaired persons. The remaining sidewalk width at the tree well is less than three feet – and does not meet current standards for American Disability Association (ADA) access.



Figure 3. Street Classification

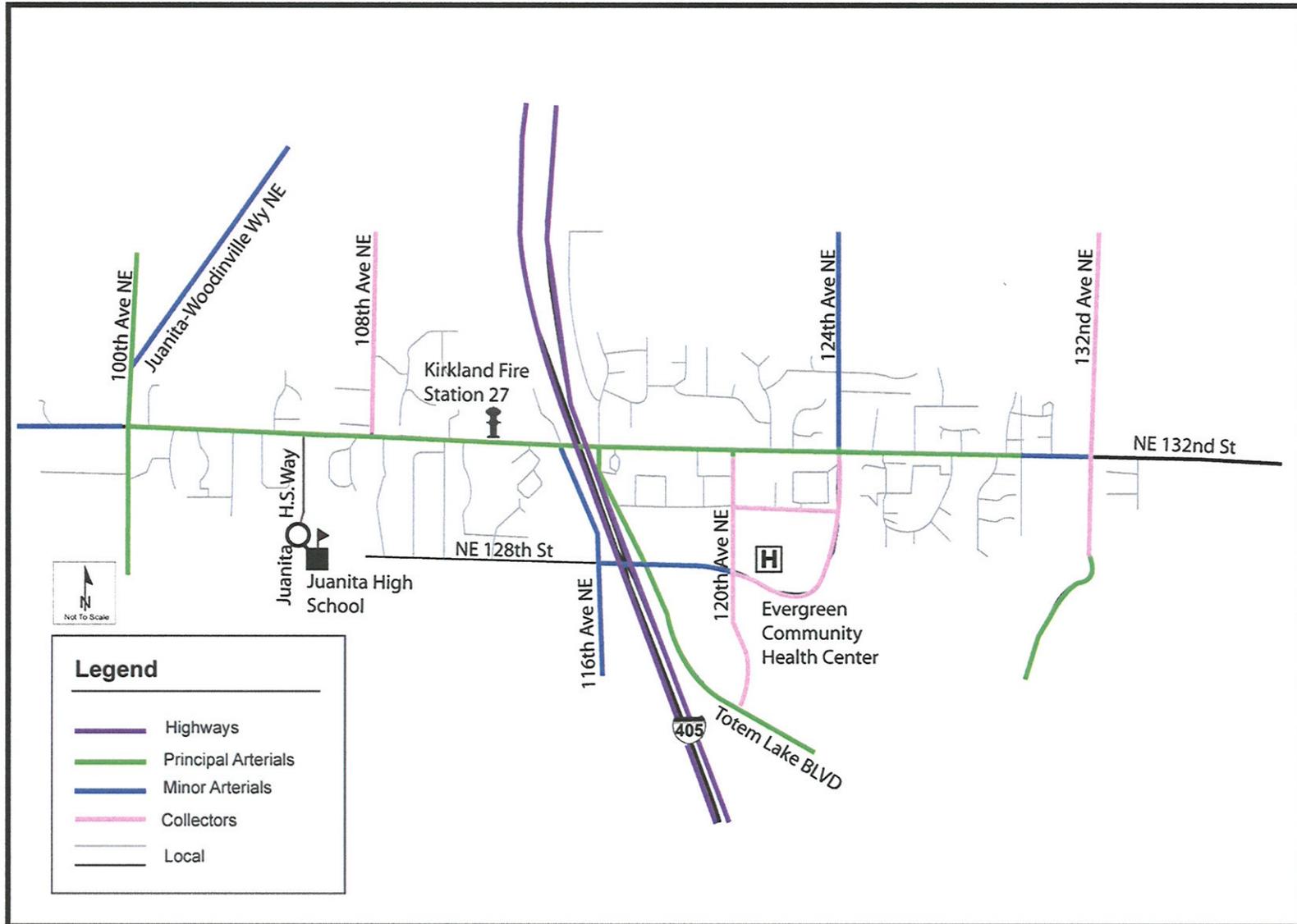


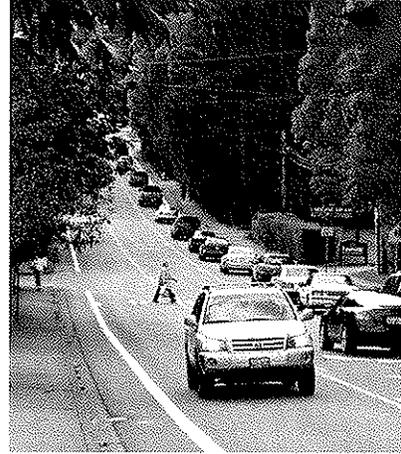


Figure 5 provides the locations of unsignalized marked pedestrian crossings. Crossings are marked at all eight signalized intersections. An additional five marked crossings are located near transit stops or schools at unsignalized intersections. A pedestrian or children crossing sign is posted in both directions prior to each unsignalized, marked crossing. These locations are:

- the west leg at 105th Avenue NE
- the west leg at 109th Avenue NE
- the east leg at 111th Place NE
- the west leg of 121st Avenue NE
- the east leg of 129th Avenue NE

Handicap ramps are provided at all intersection corners, however, they were all built at different times with different standards. Many of these ramps need to be examined for ADA compliance. Truncated domes are only present at newer ramps.

The street trees along the corridor are mature with a full canopy resulting in a tunnel effect for the sidewalks on the south side of NE 132nd Street where trees are in a planting strip. The roadway lighting on the power poles on the north side of NE 132nd Street does not provide pedestrian-level lighting for much of the sidewalk access to transit stops or along the corridor.

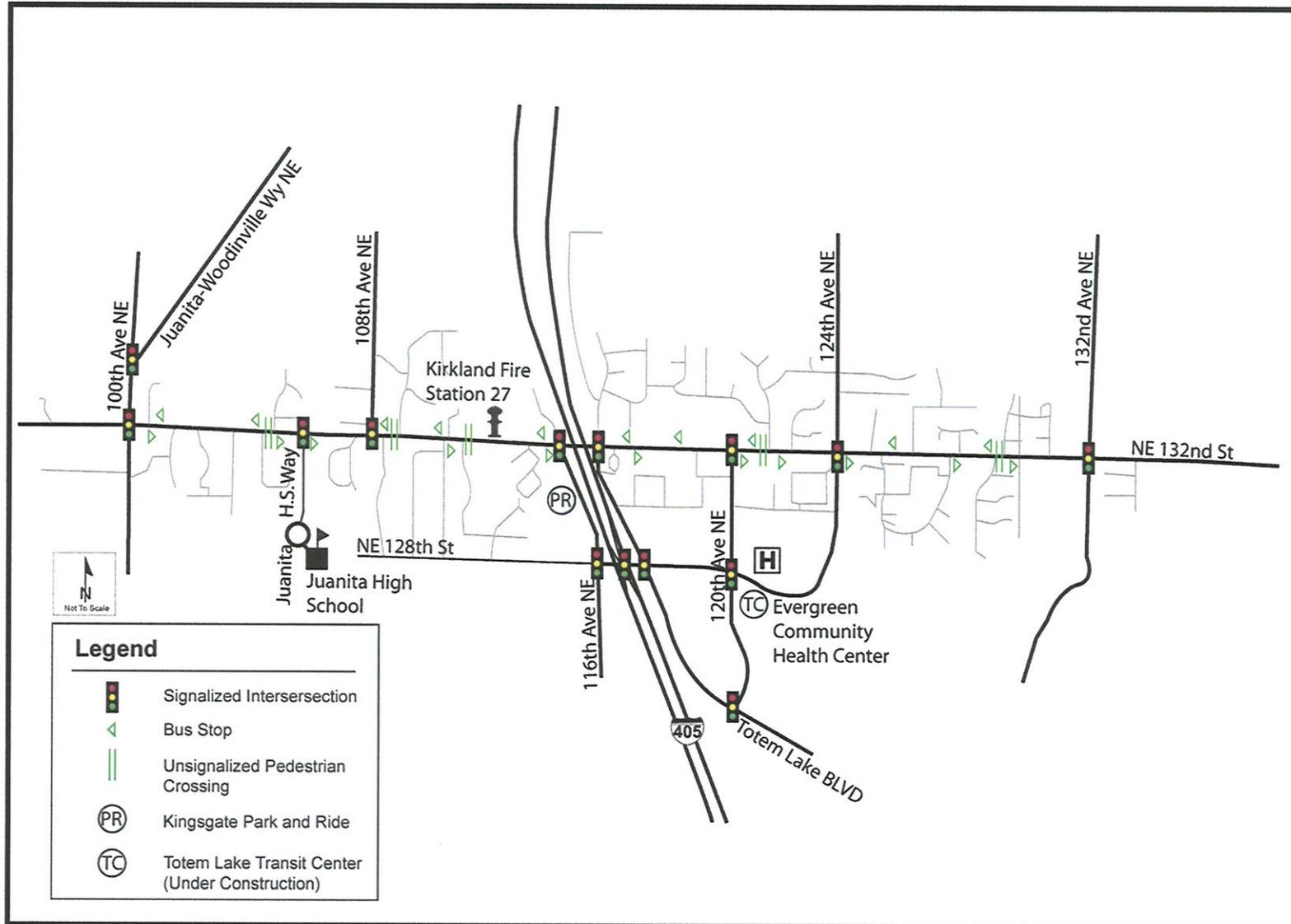


## Transit System

Figure 5 also shows the transit facility locations. King County Metro provides the transit service along NE 132nd Street. There are 11 stops on the south side (eastbound) of NE 132nd Street, and 10 stops on the north side (westbound). The stops are spaced roughly every 1,000 feet. The stop on the north side of NE 132nd Street near 121st Avenue NE is the only stop with a shelter.

Ten bus routes travel along this stretch on NE 132nd Street. The majority of these routes make a trip to, from or through the Kingsgate Park and Ride, which is located just south of NE 132nd Street along the west side of 116th Way NE. About half of the routes serve riders during the peak period only. The remaining routes provide all day service on both weekdays and weekends. These routes provide connections to neighboring cities of Bellevue, Redmond, Woodinville and Kenmore. Table 1 summarizes the transit service along this corridor. Note that during the construction of the Totem Lake Freeway Station and Transit Center, many routes were altered.

Figure 5. Crosswalk and Transit Facility Locations



According to passenger data by stop, provided by King County Metro, the busiest bus zones, with over 20 passengers per day, are located at 100th Avenue NE, 116th Avenue NE, 120th Avenue NE, 121st Avenue NE, 124th Avenue NE in the eastbound direction and at 116th Avenue NE and 121st Avenue NE in the westbound direction. Other locations range from 5 to 19 passengers per day. Some locations are fairly closely spaced and there may be the opportunity to consolidate stops with the potential for improved crosswalk locations.

**Table 1. King County Metro Transit Service**

Route #	Service Destination	Headways (peak/midday/ evening/Sat/Sun)	Service Period
230	Kingsgate P&R, Totem Lake, Kirkland TC, Bellevue TC, Overlake TC, Redmond	30/30/60/60/60	Weekday/Sat/Sun
236	Woodinville P&R, Kingsgate, Totem Lake, Juanita, Kirkland TC	30/30/30/60/60	Weekday/Sat/Sun
238	UW Bothell, Brickyard P&R, Kingsgate P&R, Totem Lake, Rose Hill, Kirkland TC	30/30/60/60/60	Weekday/Sat/Sun
252	Kingsgate P&R, Downtown Seattle	10-20/-/-/-/-	Weekday peak direction
255	Brickyard P&R, Kingsgate P&R, Juanita, Kirkland TC, Downtown Seattle	10-15/30/60/ 30-60/30-60	Weekday/Sat/Sun
257	Kingsgate P&R, Downtown Seattle	30/-/-/-/-	Weekday peak direction
277	Kingsgate P&R, University District	30/-/-/-/-	Weekday peak direction
630	Kingsgate P&R, Bellevue TC	30/-/-/-/-	Weekday peak
644	Kenmore P&R, Kingsgate P&R, Overlake TC	30/-/-/-/-	Weekday peak direction
935	Kenmore, Juanita, Totem Lake, Kingsgate P&R	30/60/ DART / DART / DART	Weekday/Sat/Sun

Note: DART = Dial a Ride Transit

## Collisions

King County and the City of Kirkland maintain collision data along NE 132nd Street. King County has three years of collision data for a period starting on January 1, 2002 and ending on December 31, 2004. The City of Kirkland has six years worth of collision data starting from January 1, 2001 and ending on December 31, 2006.

Collision history indicates that most locations along the NE 132nd Street Corridor have less than three accidents per year. Locations with more than three collisions per year tended to be clustered around congested intersections, including:

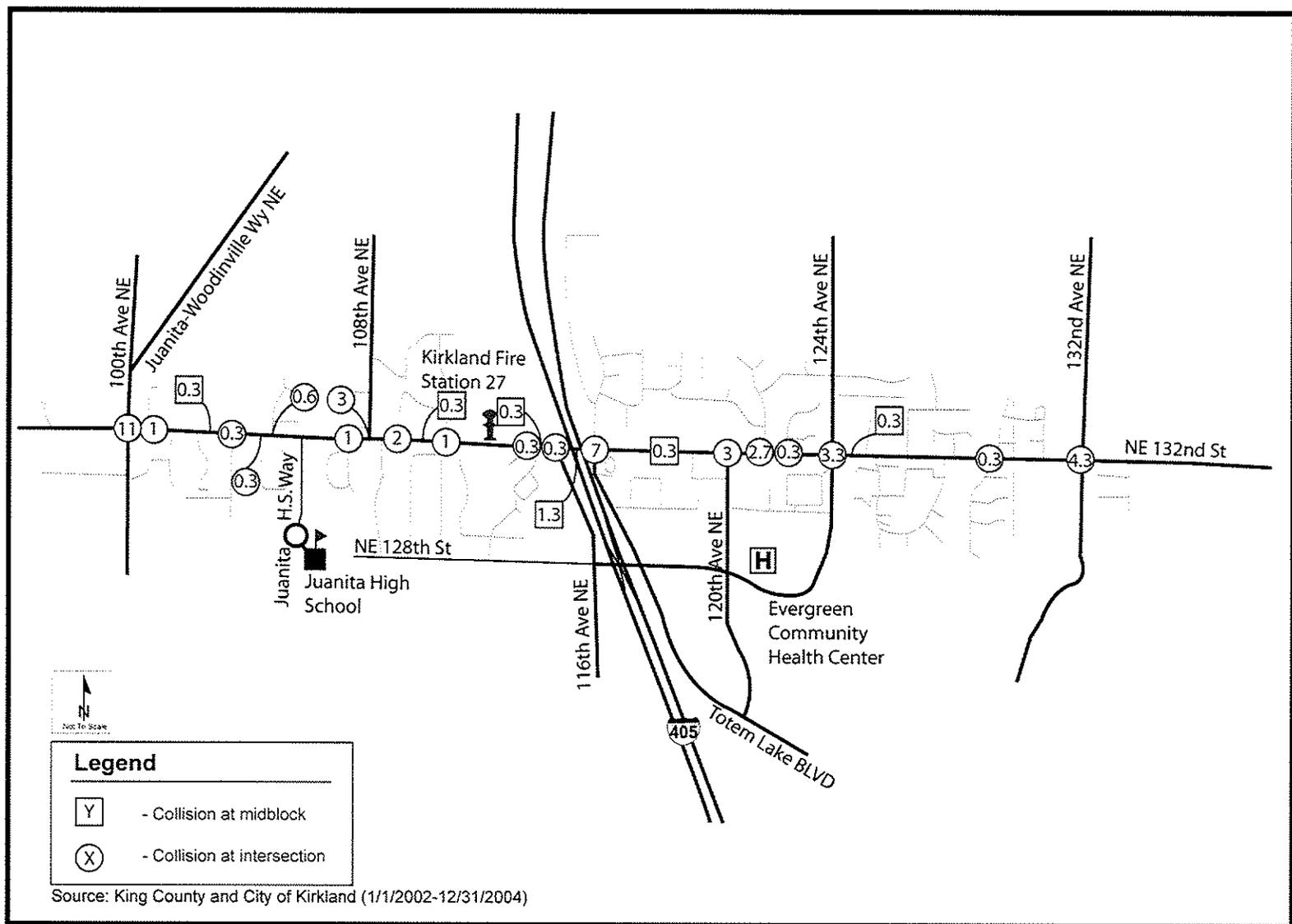
- 100th Avenue NE/NE 132nd Street
- 116th Way NE/NE 132nd Street
- Totem Lake Boulevard/NE 132nd Street
- 132nd Avenue NE/NE 132nd Street

The largest number of collisions is recorded at the 100th Avenue NE intersection, followed by the Totem Lake Boulevard NE/116th Avenue NE intersection. The largest number of mid-block collisions is noted between 116th Way NE and Totem Lake Boulevard NE/116th Avenue NE. The most common collision type rear endings are noted at two intersections: 100th Avenue NE/NE 132nd Street and 116th Way NE/NE 132nd Street as well as certain mid-block stretches along NE 132nd Street. These patterns and types of recorded collisions suggest that congestion is a major cause.

**Figure 6** provides an overview of the total number and most common type of collisions for the three-year collision history. **Figure 7** provides the average number of collisions for the NE 132nd Street corridor.



Figure 7. Average Number of Collisions per Year



## **Traffic Analysis**

Mirai analyzed NE 132nd Street operations from 100th Avenue NE to 132nd Avenue NE with the Synchro 6.14 software. This operations analysis software is frequently used by agencies for local street analyses. The main inputs into the Synchro model are lane geometry, roadway speed limits, vehicular traffic volumes, peak hour factor, heavy vehicle percentage and signal phasing and timing information.

The intersections are evaluated based on level of service (LOS) as defined in the Highway Capacity Manual (HCM). Intersection LOS is a measurement of the quality of traffic flow or traffic congestion at an intersection. The LOS grading ranges from A to F, with LOS A assigned when minimal delays are present and low volumes are experienced. LOS F indicates stop-and-go conditions with frequent and lengthy delays.

Synchro calculates intersection LOS, which is defined by the amount of intersection delay per vehicle. For instance, a signalized intersection operating at an average delay per vehicle exceeding 80 seconds is reported to operate at LOS F. The intersection delay for a signalized intersection takes into account the delay caused by the signal control and the queue delay caused by spilling and storage blockage from the adjacent intersections in the network. The average intersection delay for unsignalized intersections, based on the HCM method, is estimated as an average of each traffic movement's delay and does not include delays caused by queuing.

SimTraffic is an extended feature of Synchro that performs micro-simulation and animation of vehicle traffic. With SimTraffic, individual vehicles are modeled and displayed traveling a street network. SimTraffic models signalized and unsignalized intersection operations with cars and heavy vehicles such as trucks and buses. SimTraffic takes multiple inputs from the Synchro model, and then employs driver behavior theories in a further effort to accurately simulate the traffic. Visual and numerical data from the simulation can be used to study traffic flow through the network and identify potential problem areas.

Kirkland assesses the roadway network concurrency on an area-wide basis using a volume to capacity (V/C) ratio for key intersections to identify any potential project requirements. This V/C ratio is determined using the National Cooperative Highway Research Program (NCHRP) Circular 212 method for evaluating intersection operation with the conflicting traffic volumes at an intersection. Kirkland's V/C ratio concurrency standard is 1.40 for individual intersection. Mirai calculated the concurrency V/C values for existing, 2007 and mid-term future year, 2014.

## **Current Traffic Volumes**

Our study was initiated when there were some construction roadway closures in the study area. The construction of the NE 128th Street roadway crossing I-405 and the direct access ramp intersection required partial closure of 116th Way NE south of NE 132nd Street. This change in the network did influence the traffic patterns for travelers accessing southbound I-405. City of Kirkland provided traffic counts from year 2005 as a baseline for the analysis and we conducted some additional turning movement counts at three intersections along the corridor to fill in the gaps in data

and to confirm baseline traffic volumes and conditions. Current traffic volumes for year 2007 were developed using the 2005 counts and applying a small growth factor for two years. Traffic volumes for the NE 132nd Street corridor were adjusted between intersections to use counts from different periods.

### **AM Peak Hour Conditions**

Figure 8 shows the AM peak hour turning movement volumes. During the AM peak hour, traffic congestion is observed in the eastbound and westbound direction approaching the signal at Juanita High School. Morning school peak coincides with the commute peak period and this overlap results in congestion along NE 132nd Street that stretches and impacts the operation of the 100th Avenue NE at the NE 132nd Street signal. The morning peak at Juanita High School is approximately a half-hour during the AM peak hour – and the intensity has an impact on overall travel along NE 132nd Street on the west side of the corridor. To some extent, the signals at 100th Avenue NE and 108th Avenue NE meter the southbound traffic toward the high school. Also, the limitations for entering traffic to flow freely on the school campus leads to backups for traffic on NE 132nd Street on the west side of the corridor.

On-site circulation at the high school provides for access to parking, bus circulation and drop-off traffic – all converging at the traffic circle central to the campus. The single entry lane does not meet the demand for arriving traffic at the school in the morning peak. The constrained entry to the high school creates problems in the morning peak period along the NE 132nd Street arterial.

Traffic simulation of the corridor using the current traffic counts also indicates a high demand for 116th Way NE to be used to access I-405 ramps at the Totem Lake interchange. Morning peak period backups on NE 132nd Street also radiate from the 116th Way NE intersection, at times extending through the signal at 108th Avenue NE. However, congestion at 116th Way NE is not as severe or intense as at the Juanita High School access, especially for the half-hour of student arrivals.

Figure 9 provides an overview of the current AM peak operation at the corridor traffic signals, showing intersection LOS and average delay for the intersection.

### **PM Peak hour Conditions**

Figure 10 shows the PM peak hour turning movement volumes. During the PM peak hour, traffic congestion is observed in the westbound direction towards 100th Avenue NE. This intersection is a node of congestion, with high travel demand in the northbound direction as well as substantial westbound demand from NE 132nd Street. Mirai's observations and traffic simulations suggest that the signal at 100th Avenue NE favors the heavy northbound movements, resulting in travel delays for the lower volume traffic on NE 132nd Street. Many times, the queues in the westbound direction along NE 132nd Street can back up well beyond 108th Avenue NE and a rolling queue can extend through the Totem Lake Boulevard intersection, just to the east of I-405.

Congestion is also observed in the vicinity of the closely spaced intersections at 116th Way NE and 116th Avenue NE/Totem Lake Boulevard NE. At 116th Way NE, the

heavy westbound movement conflicts with the northbound left-turn movements from 116th Way NE. At 116th Avenue NE/Totem Lake Boulevard NE, the eastbound and westbound through movement conflict with the heavy northbound left-turn movement from Totem Lake Boulevard NE. The short spacing between the two intersections and limited storage length for all lane capacity constrain the amount of northbound left-turning vehicles clearing the signal.

At 124th Avenue NE, traffic counts and Mirai observations show a heavy demand for the eastbound left-turn movement. Many times, the left-turn pocket is filled to capacity. However, the queues generally clear within one cycle.

**Figure 11** provides an overview of the current PM peak operation at the corridor traffic signals. Currently, the intersections meet the concurrency standards for the City of Kirkland, with V/C ratios under 1.40.

Figure 8. 2007 AM Peak Hour Turning Movement Volumes

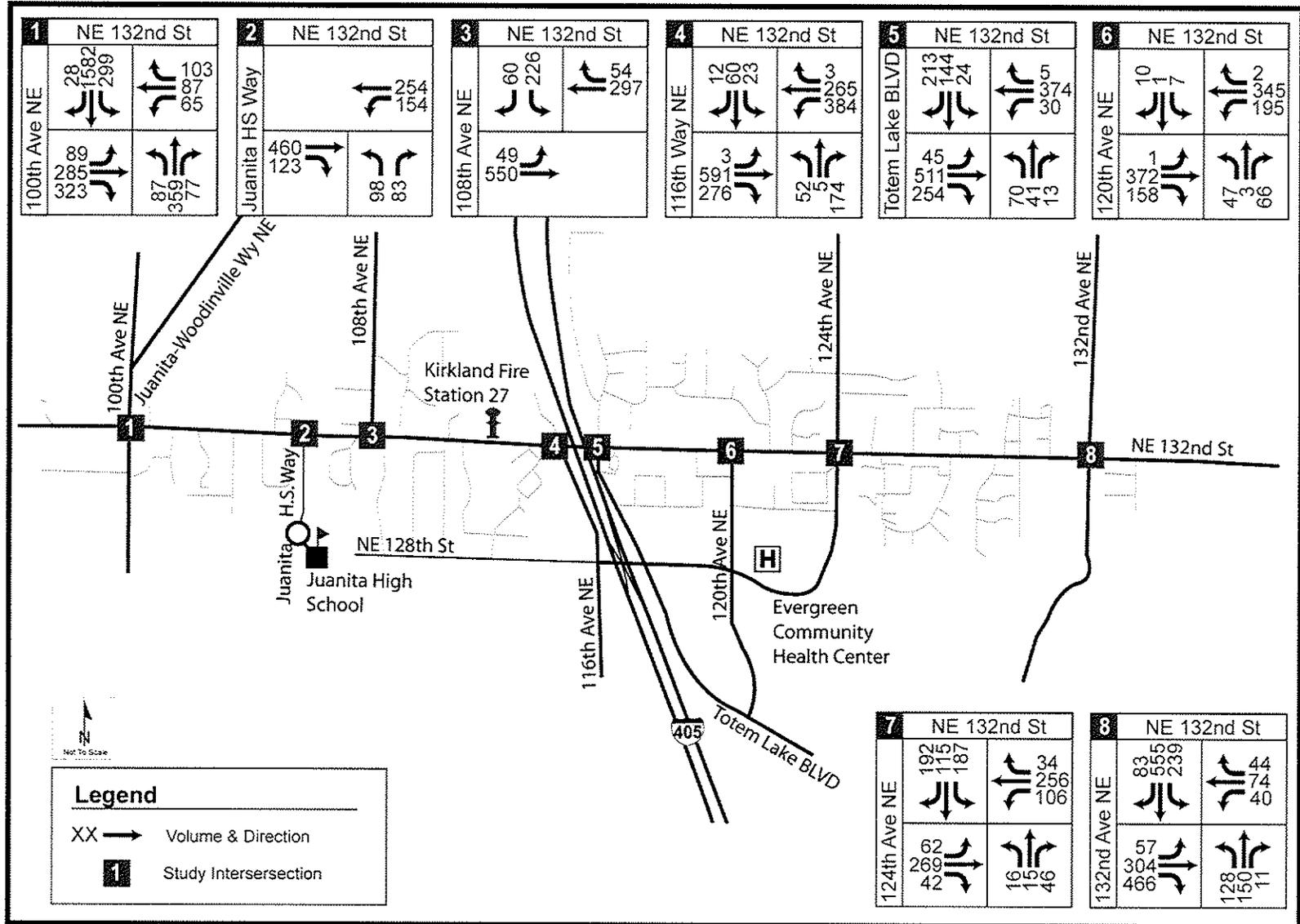


Figure 9. 2007 AM Peak Hour Operations

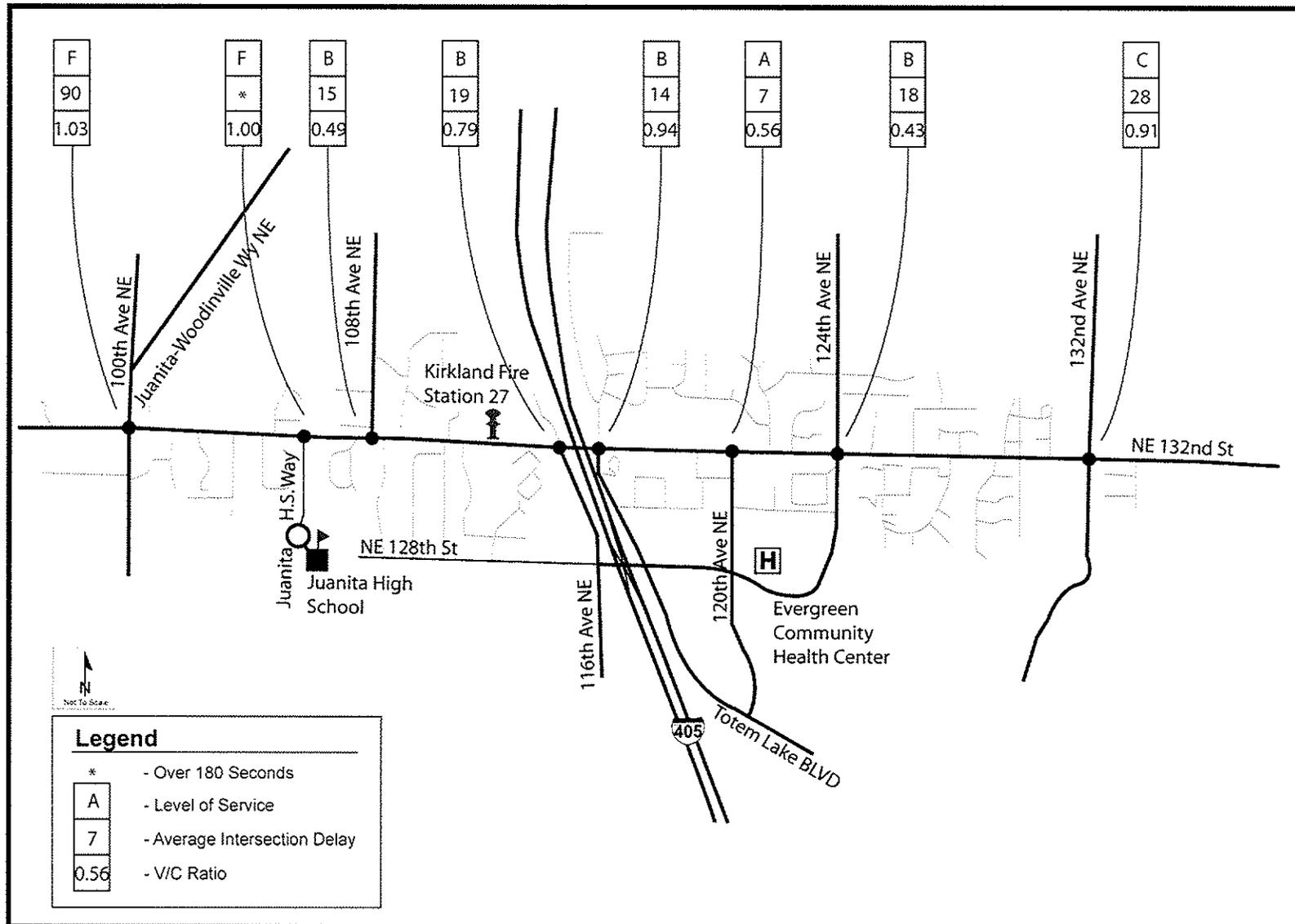


Figure 10. 2007 PM Peak Hour Turning Movement Volumes

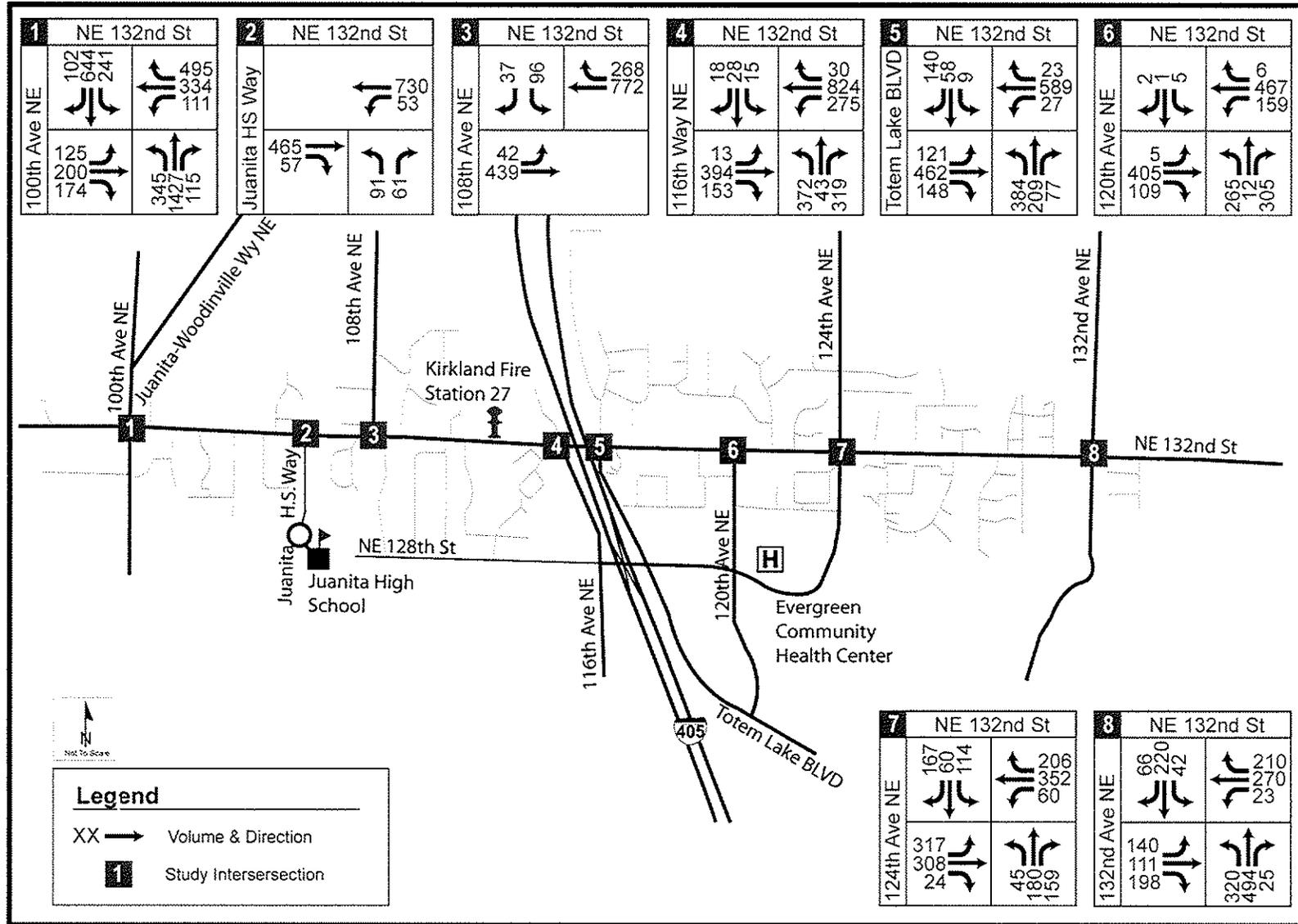


Figure 11. 2007 PM Peak Hour Operations

