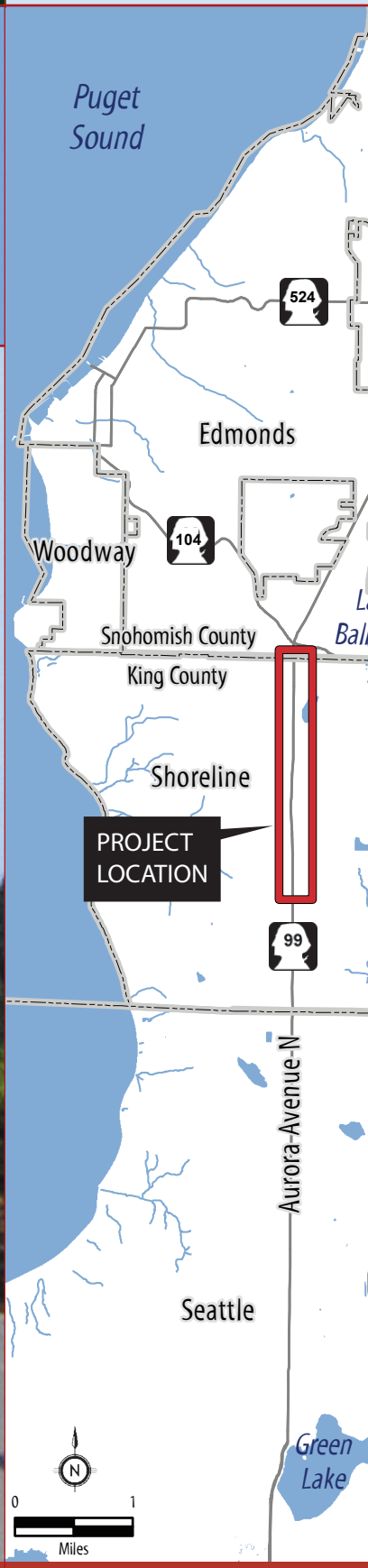
CITY OF SHORELINE

AURORA CORRIDOR

Transportation
Discipline Report

Aurora Corridor Improvement Project
N 165th Street to N 205th Street



SEPTEMBER 2007

Transportation Discipline Report

Aurora Corridor Improvement Project: N 165th Street – N 205th Street

Prepared for:

17544 Midvale Avenue N.
Shoreline, WA 98133
Contact: Kris Overleese, P.E.
206/546-0791

Prepared by:

1100 112th Avenue NE, Suite 400
Bellevue, WA 98004
Contact: Tim Newkirk
425/453-5000

11820 Northup Way, Suite E300
Bellevue, WA 98005
Contact: Jennifer Barnes
425/822-1077

September 2007

This document should be cited as:
CH2M Hill and Jones & Stokes. 2007. Transportation Discipline Report. Aurora Corridor Improvement Project: N 165th Street – N 205th Street. September. (61001.06.) Bellevue, WA. Prepared for City of Shoreline

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Acronyms and Abbreviations

ADT	average daily traffic
AWDT	average weekday traffic
BAT	Business Access and Transit
CAA	Clean Air Act
City	City of Shoreline
FGTS	Freight and Goods Transportation System
FHWA	Federal Highway Administration
GMA	Growth Management Act
HAC	high accident corridor
HAL	high accident location
HCM	Highway Capacity Manual
I	Interstate
LOS	level of service
mph	miles per hour
N	North
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NHS	National Highway System
PAL	pedestrian accident location
Project	Aurora Corridor Improvement Project: N 165th Street – N 205th Street
PSRC	Puget Sound Regional Council
RCW	Revised Code of Washington
RTP	Regional Transportation Plan
SEPA	Washington State Environmental Policy Act
SOV	single-occupancy vehicle
SR	State Route
V/C	volume to capacity ratio

vpd	vehicles per day
WSDOT	Washington State Department of Transportation

Glossary

access	The ability to enter a freeway or roadway via an on-ramp or other entry point.
arterial	A major street that primarily serves through-traffic, but also provides access to abutting properties. Arterials are often divided into principal and minor classifications depending on the number of lanes, connections made, volume of traffic, nature of traffic, speeds, interruptions (access functions), and length.
average daily traffic (ADT)	The average number of vehicles that travel on a roadway on atypical day. Under existing conditions, ADT on Aurora Avenue N is 33,000 to 39,000 vehicle trips.
business access and transit (BAT) lane	A BAT lane is a designated transit vehicle lane that also provides access to business driveways mid-block and transforms into a right-turn only lane at signalized intersections. Only transit vehicles are allowed to continue through the intersection.
capacity	The maximum sustained traffic flow of a transportation facility under prevailing traffic and roadway conditions in a specified direction.
congestion	The condition when unstable traffic flows constrain travel speeds to less than the posted limit. Recurring congestion is caused by constant excess traffic volume compared with the highway's capacity. Nonrecurring congestion is caused by unusual or unpredictable events such as traffic accidents.
delay	The increased travel time experienced because of circumstances that impede the desirable movement of traffic.
demand	The desire for travel by potential users of the transportation system.
Federal Highway Administration (FHWA)	A major agency of the United States Department of Transportation responsible for ensuring that America's roads and highways continue to be the safest and most technologically up-to-date.
general-purpose lane	A freeway or arterial lane available for use by all traffic.
Growth Management Act (GMA)	Adopted by the Washington State legislation adopted in 1990, and subsequently amended to require all cities and counties in the state to do some long-range comprehensive planning. Requirements are more extensive for the largest and fastest-growing counties and cities in the state. Such comprehensive plans must address several required topics, including but not limited to land use, transportation, capital facilities, utilities, housing, etc. The GMA requirements also include guaranteeing the consistency of transportation and capital facilities plans with land use plans.
high accident corridor (HAC)	Sections of state highway one or more miles long which have a higher than average number of severe accidents over a continuous period of time.
high accident location (HAL)	Spot locations less than a mile long which have a higher than average rate of severe accidents during the previous two years.
high-occupancy vehicle (HOV)	A special designation for a bus, carpool, or vanpool provided as an encouragement to increase ride-sharing. Specially designated HOV lanes and parking are among the incentives for persons to pool trips, use fewer vehicles, and make the transportation system more efficient. HOV lanes are generally inside (left-side) lanes, and are identified by signs and a diamond on the pavement.
Highways of Statewide Significance	Highways identified by the Washington State Transportation Commission that provide significant statewide travel and economic linkages.
jurisdiction	A municipal government agency, such as a city or county, and as appropriate, federal and state agencies and federally recognized tribes. The term also can mean "to have authority over."
level of service (LOS)	A measure of how well a freeway or local signalized intersection operates. For freeways, LOS is a measure of traffic congestion typically based on volume-to-capacity ratios. For local intersections, LOS is based on how long it takes a typical vehicle to clear the intersection. Other criteria also may be used to gauge the operating performance of transit, non-motorized, and other transportation modes.

mode	A particular means or method of travel. Typically, transportation modes include driving alone (single-occupant vehicle), carpooling (high-occupancy vehicle), non-motorized (walking, jogging, biking), or riding transit or high-capacity transit (bus, bus rapid transit, light rail, or commuter rail).
National Highway System (NHS)	Federally identified highways that are most important to interstate travel and national defense, connect other modes of transportation, and are essential for international commerce.
non-motorized	Bicycle, pedestrian, and other modes of transportation not involving a motor vehicle.
peak hour	The hour in the morning or in the afternoon when the maximum demand occurs on a given transportation facility or corridor.
peak period	The period of the day during which the maximum amount of travel occurs. It may be specified as the morning (AM) or afternoon or evening (PM) peak.
pedestrian accident location (PAL)	A highway section typically less than 0.25 mile in length where a 6-year analysis of collision history indicates that the section has had four pedestrian accidents in a 0.1 mile segment.
Puget Sound Regional Council (PSRC)	The Metropolitan Planning Organization and Regional Transportation Planning Organization for the central Puget Sound region, which is composed of Snohomish, King, Pierce, and Kitsap counties. The PSRC is the legally-mandated forum for cooperative decision-making about regional growth policies and transportation issues in the metropolitan planning area.
queue	A line of vehicles waiting to move through an access point in traffic, such as a signal or turn lane.
Regional Transportation Plan (RTP)	Provides the long-range strategy for future investments in the central Puget Sound region's transportation system.
State Environmental Policy Act (SEPA)	Adopted by the Washington State legislation in 1974 to establish an environmental review process for all development proposals and major planning studies prior to taking any action. SEPA includes early coordination to identify and mitigate any substantial issues or significant effects that may result from a project or study.
Synchro	A traffic analysis software application for performing capacity analyses and optimizing traffic signal timing for an individual intersection, an arterial, or a complete roadway network.
traffic control plan	Describes the temporary traffic control measures to be used for facilitating road users through a work zone, safely and efficiently.
travel demand forecasting	Methods for estimating the desire for travel by potential users of the transportation system, including the number of travelers, the time of day, travel mode, and travel routes.
vehicle	Any car, truck, van, motorcycle, or bus designed to carry passengers or goods. Bicycles and other pedestrian-oriented vehicles are not included in this definition.
vehicle trips	The total number of vehicles that pass through a section of roadway over a given time.
Washington State Department of Transportation (WSDOT)	The government agency responsible for the state's highways.

Chapter 1. Introduction

This chapter introduces the proposed project, explains why transportation is analyzed in the environmental process, and summarizes key findings presented in this report.

What is the purpose of this report?

The City of Shoreline (City) proposes to construct the Aurora Corridor Improvement Project: N 165th Street to N 205th Street (Project), which will improve a 2-mile-long segment of State Route (SR) 99, named Aurora Avenue North (N) within the City. This Project must be developed in compliance with the National Environmental Policy Act (NEPA) and the Washington State Environmental Policy Act (SEPA).

This Transportation Discipline Report was prepared in general accordance with Section 460 of the Washington State Department of Transportation (WSDOT) Environmental Procedures Manual (WSDOT 2006).

This report examines the potential for the Project to affect transportation services in the Aurora corridor. The report includes descriptions of the alternatives that were evaluated, a presentation of the methodology that was used to perform the analysis, a description of the existing conditions that represent the affected environment, anticipated future conditions that the Project is proposed to address, and the potential impacts and benefits that would likely result from the Project alternatives. The traffic analysis examines future growth in traffic volumes and assesses the implications with regard to traffic

operations, traffic diversion, and access. The safety analysis considers the traffic conflicts and pedestrian exposure that would affect overall safety performance. Potential mitigation measures are identified where appropriate.

Where is the Project located?

The Project is located within the city limits of the City of Shoreline on Aurora Avenue N between N 165th Street and N 205th Street (See Figure 1, *Project Vicinity*).

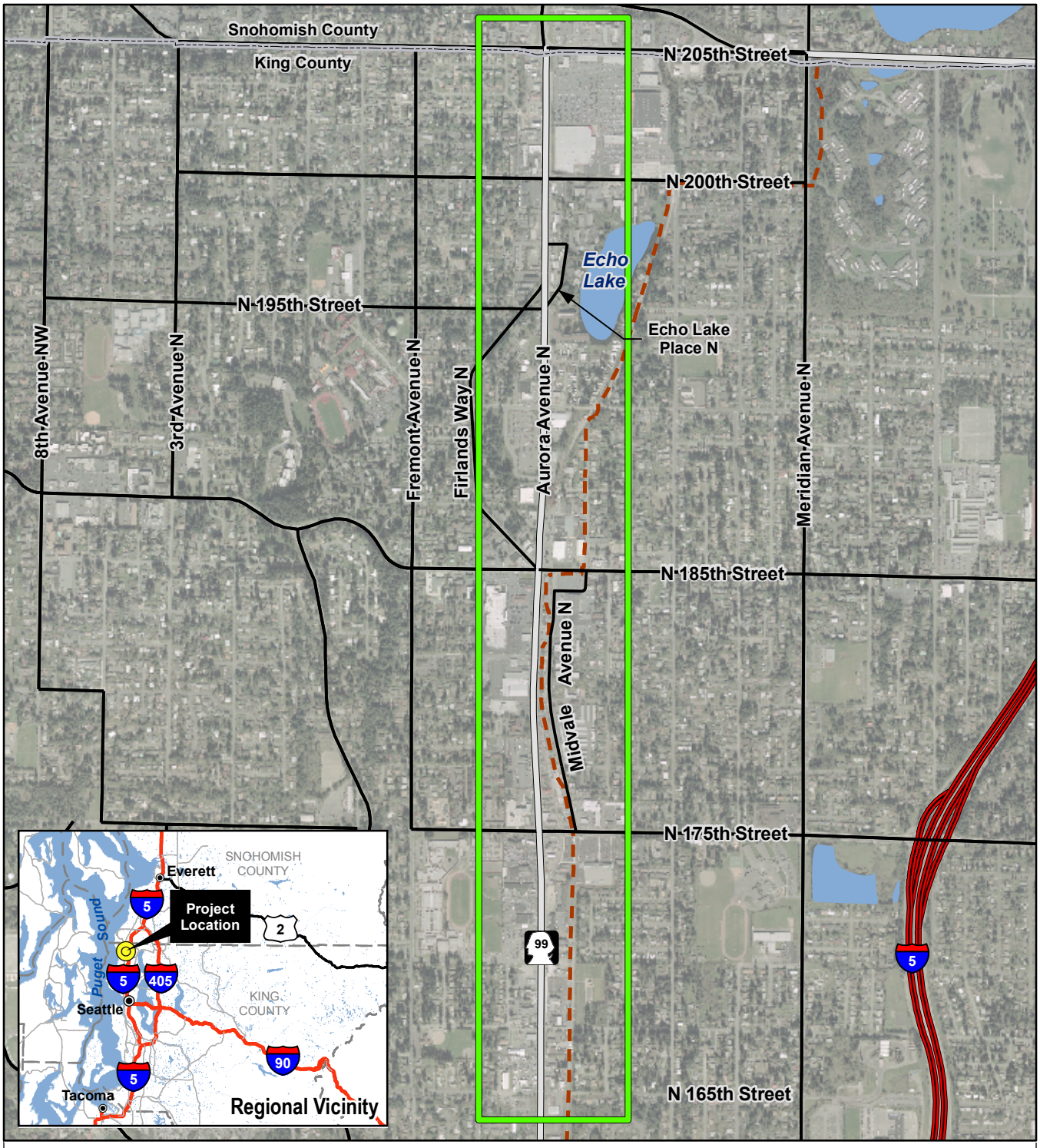
What are the existing characteristics of the Aurora corridor?

Aurora Avenue N is a major north/south urban highway that serves both local and regional traffic within the City of Shoreline (see Figure 1, *Project Vicinity*). It is a key regional vehicular, transit, and truck corridor within the greater area of Puget Sound and serves as the City's primary arterial roadway, running approximately parallel to Interstate (I)-5 with connections at N 145th Street, N 175th Street, and N 205th Street. Development along the corridor is predominantly commercial, mixed with some multi-family housing. Echo Lake is located approximately 200 feet to the east of the roadway, north of N 192nd Street. The Interurban Trail, currently under construction, runs roughly parallel to Aurora Avenue N, to the east in the Project corridor (City of Shoreline 2007). Aurora Avenue N has a 5-lane cross section, with shoulder and sidewalk of varying width located sporadically along the corridor, no curb or gutter, and little landscaping.

Under existing conditions, Average Daily Traffic (ADT) on the roadway is 33,000 to 39,000 vehicles per day. A steady level of pedestrian and bicycle travel occurs along and across the roadway, but the corridor is heavily oriented to vehicle travel and is generally not conducive to non-motorized travel. WSDOT has designated several areas of Aurora Avenue N between N 165th Street and N 205th Street with adverse safety ratings, which are described in Chapter 2. The corridor is served heavily by public transit provided by King County Metro, with additional service at the north end of the corridor provided by Community Transit.

Average Daily Traffic (ADT)

ADT represents the average number of vehicles that travel on a roadway on a typical day. Under existing conditions, ADT on Aurora Avenue N is 33,000 to 39,000 vehicle trips.



Sources: City of Shoreline (2006); Jones & Stokes (2007)

City Boundary
Project Area
Interstate
State Route
Arterial
Interurban Trail

N

Feet

0 1,000 2,000

Figure 1. Project Vicinity
Aurora Corridor Improvement Project
September 2007

Why improve Aurora Avenue N?

The purpose of the Aurora Corridor Improvement Project, N 165th Street to N 205th Street, is to improve safety, circulation, and operations for vehicular and non-motorized users of the roadway corridor, to support multi-modal transportation within the corridor, and to support economic stability along the corridor. The Purpose and Need identified for this project is described further in Chapter 2.

What are the major characteristics of the proposed project?

The Aurora Corridor Improvement Project, N 165th Street to N 205th Street, would include the following elements:

- Business Access and Transit (BAT) lanes in each direction;
- two general-purpose lanes in each direction;
- continuous sidewalk, curb, and gutter on each side of the roadway;
- landscaped center median with left-turn and u-turn pockets;
- interconnected, coordinated signal system with transit signal priority;
- improvements to intersections, including proposed new traffic signals at the intersections of Aurora Avenue N with Firlands Way N and N 182nd Street;
- marked pedestrian crossings at signalized intersections;
- improvements to Midvale Avenue N, between N 175th Street and N 182nd Street;
- improvements to Echo Lake Place, north of N 195th Street;
- new street and sidewalk lighting;
- undergrounding of utilities; and
- stormwater facilities.

Business Access and Transit (BAT) Lane

Right-side lane that serves exclusively for bus travel, and for right-turn access in and out of driveways located along the corridor.

In addition to a No Build Alternative, three Build Alternatives, called Alternative A, B and C, respectively, are under consideration. In general, they vary in centerline location, width of median, and presence or absence of an amenity zone between the curb and sidewalk. The three Build Alternatives are described in detail in Chapter 3 of this report.

Why is transportation considered for this Project?

It is important to understand the likely effects of improvements on the transportation system, to ensure that the design is efficient, and to get approvals for the Project from state and federal agencies. A multimodal transportation analysis was performed for the Aurora Avenue N Multimodal Corridor Project: North 165th Street to North 205th Street following procedures accepted by the Federal Highway Administration (FHWA) and WSDOT. These procedures are used to assess the relative safety and operational impacts of the proposed alternatives as well as other factors identified as relevant and important in a pre-design study.

What are the key points of this report?

Following are the key points of this report:

- Traffic operations would be substantially better under the Build Alternatives than under the No Build Alternative.
- Transit speed and reliability and, therefore, transit mode share would also be substantially better under the Build Alternatives than under the No Build Alternative.
- The Build Alternatives would result in less traffic diverting into neighborhoods than would be expected under the No Build Alternative.
- In terms of safety, the Build Alternatives compared to the No Build Alternative would be expected to improve safety.
- Construction staging and traffic control practices would be used to mitigate construction-related traffic impacts, which would comprise the only considerable impact under the Build Alternatives.

Mode Share

The percentage of people who choose to take each available mode of travel. Typical transportation modes include driving alone, carpooling, transit, and non-motorized travel (walking, jogging, biking)

Table 1 summarizes the potential transportation effects and mitigation that are identified in this report.

Table 1. Summary of Potential Transportation Effects and Mitigation

Potential Effects and Mitigation	Alternatives			
	No Build	A	B	C
Potential Operational Effects				
Intersection operations at N 170th Street, N 182nd Street, and N 195th Street are projected to fail under existing and projected 2030 conditions, and fail to meet the City's adopted traffic operational standards.	X			
No mitigation available.				
Projected increase in vehicular, pedestrian, and bicycle traffic over time would result in increased potential for safety conflicts, without the improvements proposed under the Build Alternatives.	X			
No mitigation available.				
The widening of Aurora Avenue N would result in longer crossing distances and pedestrian crossing times at signalized intersections.		X	X	X
Mitigation: Provide standard signal timing to allow pedestrians to cross the entire distance in one cycle length.				
Potential Construction Effects				
Reduced traffic flow		X	X	X
Mitigation: Implementation of construction best management practices.				
Mitigation: Use traffic control plans, construction staging plans, and regular communication with residents and businesses.				
Transit re-routed or stops relocated		X	X	X
Mitigation: Coordination with the Metro and Community transit agencies would be ongoing throughout the construction period to minimize impacts to transit service.				
Mitigation: Bus zone relocation or closure would be clearly signed and communicated to transit riders.				
Mitigation: Temporary stops would be provided in a safe and accessible location, separated from other traffic and construction activity by traffic barriers.				
Business access revised disrupting delivery and patron access		X	X	X
Mitigation: Temporary access revisions would be well marked and would provide the most direct access to properties possible.				
Mitigation: Owner/tenants along the corridor would be kept informed of construction schedules, schedule changes, and information detailing construction activities.				

Chapter 2. Purpose and Need

This chapter describes the overall purpose of the proposed project and identifies the specific needs that the Project would address.

What is the purpose of the Project?

The purpose of the Aurora Corridor Improvement Project: N 165th Street to N 205th Street, is to improve safety, circulation, and operations for vehicular and non-motorized users of the roadway corridor, to support multi-modal transportation within the corridor, and to support economic stability along the corridor.

How were the needs of the Aurora Avenue corridor identified?

The needs of the Aurora Avenue corridor that would be addressed by this Project were identified through the:

- Regional Metropolitan Transportation Plan,
- City Comprehensive Plan, and
- City Multimodal Pre-Design Study.

Regional Metropolitan Transportation Plan

Improvement to Aurora Avenue N between N 165th Street and N 205th Street is identified in *Destination 2030,* which is the regional Metropolitan Transportation Plan that addresses long-range

transportation needs of a growing population (PSRC 2001). The plan includes a detailed set of projects and programs that recognize the link between transportation and growth planning. It identifies more than 2,000 specific projects that will improve roads, transit and ferry service, bicycle and pedestrian systems, freight mobility, and traffic management and operations. *Destination 2030* calls for the development of new state and regional funding mechanisms to provide sustained and flexible revenues that support plan strategies, and it outlines a monitoring and review process for ensuring that plans are current and that implementation stays on course.

City Comprehensive Plan

Improving Aurora has been a community goal since the City of Shoreline incorporated in 1995. However, regional and local governments recognized the need for improvements along Aurora Avenue N even prior to the City's incorporation. Before the City was incorporated, King County initiated a project to provide transit enhancements along Aurora Avenue N. After incorporation, the City requested that the project be postponed until the City could complete its comprehensive planning process to define improvements in the Aurora Avenue N corridor.

The City of Shoreline Comprehensive Plan was first adopted in November 1998 and most recently updated in June 2005. The Plan establishes the City's vision, and establishes Framework Goals intended to guide the City to meet that vision. The City's goals for Aurora Avenue N, as stated in its Comprehensive Plan, are to improve safety for all users on the roadway, to support economic stability along the corridor, and to improve mobility by supporting multimodal transportation services (City of Shoreline 2005). Assessment of the City's goals and policies, as established in the Comprehensive Plan, is provided in the Land Use, Plans, and Policies Discipline Report prepared as part of the environmental analysis for the Project.

Multimodal Pre-Design Study

In 1998, the City of Shoreline began the 1-year Aurora Corridor Multimodal Pre-Design Study (CH2M Hill 2005). The study included an extensive Community and Agency Involvement Program involving a variety of public and private stakeholders in the plan development. Multiple opportunities for community input were provided, and emphasis was placed on clearly articulating the

Multimodal Transportation

Multimodal transportation refers to multiple choices for travel, including driving alone, carpooling, walking, biking, or riding transit.

technical elements of the plan. The Community and Agency Involvement Program included both the community and agencies because both are necessary for consensus building. A key Community and Agency Involvement Program component was the participation of a Citizens' Advisory Task Force, made up of representatives from the business and residential communities and transit users. An Interagency Technical Advisory Committee also included public sector stakeholders. These advisory committees recommended a preferred design concept, described in the following section.

Community and Agency Involvement Program elements included:

- ongoing participation of the Citizens' Advisory Task Force, Interagency Advisory Committee, and Policy Advisory Committee;
- project briefings with City Council and Planning Commission;
- three public open houses;
- open house announcements mailed to 3,000 addresses each time an event was held;
- canvassing by the Citizens' Advisory Task Force;
- meetings with property owners within the study area;
- meetings with community interest groups;
- newsletters distributed to landowners, business owners, and other interested parties; and
- press releases distributed to neighborhood associations, community groups, and local media.

Community Outreach

The City conducted a total of 23 meetings with the Citizens' Advisory Task Force, Interagency Technical Advisory Committee, and the general public. The City also conducted eight City Council briefings and two planning commission presentations. Three open houses were held during the course of the Pre-Design Study. Each meeting was designed to encourage interactive involvement through small group design workshops, informal ballots, prioritization exercises, and comment sheets.

32 Points

The corridor project design concept and the 32 Points (see exhibit on following page) were approved unanimously by the Citizens' Advisory Task Force on July 8, 1999, and were adopted unanimously by the City Council as part of Resolution 156 on August 23, 1999. The 32 Points are to be used as guides during implementation and design of Aurora Avenue improvement projects, to ensure that concerns of the community and the vision of the City Council are fully addressed.

The main features of the adopted design concept include the addition of BAT lanes in each direction on the roadway; curbs, gutters, a landscaping/street furnishing strip and sidewalks on both sides; and a landscaped center median with left and u-turn pockets. The 32 Points also included recommendation of four new signalized intersections and four new pedestrian-activated signalized crossings along the 3-mile length of Aurora Avenue N within the city limits.

The main features of the adopted design concept include:

- the addition of BAT lanes in each direction on the roadway;
- curbs, gutters, landscaping/street furnishing strip, and sidewalks on both sides; and
- the creation of a landscaped center median with left and u-turn pockets.

Exhibit. The "32 Points"

1. The maximum number of lanes on an intersection leg shall not exceed eight lanes including turning lanes. Seven lanes is the desired width.
2. Provide ability at intersections for all pedestrians to safely cross (and include median refuge at intersections with pedestrian pushbuttons). New mid-block pedestrian crossings should include pedestrian activated signals. Bus stops and pedestrian crossings will complement each other.
3. Twelve foot sidewalks will be provided on both sides of Aurora the entire length. Consider reducing the initial sidewalk width to mitigate land impacts/acquisitions on existing businesses. Note: a minimum of four feet of a landscaping/street furnishing zone is included in the twelve foot width total above.
4. Utilize more landscaping or colored pavement in sidewalk areas to soften the look. The four foot landscaping/street furnishing strip behind the curb should utilize trees in tree grates/pits (consider a combination tree protector/bike rack), low growing ground cover/shrubs, and could utilize some special paving (or brick) between curb and sidewalk to strengthen the identity of an area.
5. Strive to design the project so that new sidewalks can link to existing recently constructed sidewalks (such as Seattle Restaurant Supply, Drift-on-Inn, Schucks, Hollywood Video, and Easley Cadillac).
6. Re-align the street where possible to avoid property takes.
7. As the final design is developed, work with WSDOT to obtain design approvals for lane width reductions, and look for opportunities to reduce (but not eliminate) the median width both to enable reduction of pavement widths, construction costs, and land impacts/acquisition on existing businesses.
8. Develop median breaks or intersections for business access and U-turns at least every 800-to-1000 feet (these details will be worked out during future design phases and will be based in part on the amount of traffic entering and exiting businesses).
9. Use low growing drought resistant ground-cover and space trees in the median to allow visibility across it.
10. Unify the corridor by adding art, special light fixtures, pavement patterns (and coloring at crosswalks), street furniture, banners, unique bus shelters, etc. to dramatically enhance image and uniqueness of the streetscape and develop it differently than the standard design that has been constructed for most streets.
11. Unify the entire corridor by the use of street trees, lighting, special paving, bus zone design, and other elements to visually connect the corridor along its length.
12. Provide elements in the Interurban/Aurora Junction area, between 175th and 185th that create a safe, pedestrian oriented streetscape. Elements can include special treatments of crossings, linkages to the Interurban Trail, etc.
13. Develop signature gateway designs at 145th and 205th with special interest landscaping, lighting, paving and public art to provide a visual cue to drivers that they have entered a special place.
14. Develop themes that reflect the character and uses of different sections of the street (such as the 150th to 160th area which has a concentration of international businesses, recall the historic significance of the Interurban or other historic elements, and Echo Lake).
15. Utilize the Arts Council and neighborhoods to solicit and select art along the corridor.
16. Strengthen connections to the Interurban Trail through signing and other urban design techniques.
17. Develop a design for closure of Westminster Road between 158th and 155th by developing a southbound right turn lane at 155th Street and converting the existing road section to a driveway entrance to Aurora Square. Also, develop an elevated Interurban trail crossing through "the Triangle" that is integrated with future development of the Triangle (reserve the option to build above Westminster should we not be successful in closing the roadway).
18. Pursue modifying the access to Firlands at 185th, closing Firlands north of 195th, and developing a new signal at 195th.
19. The preferred design shall include:
    - Stormwater management improvements to accompany the project that follow the city's policies;
    - Traffic signal control and coordination technology (including coordination with Seattle and Edmonds SR 99 signal systems);
    - Traffic signal technology to enable transit priority operations;
    - Continuous illumination for traffic safety and pedestrian scale lighting;
    - Undergrounding of overhead utility distribution lines.
20. Traffic signals will include audible elements for the sight-impaired, and wheelchair detection loops for wheelchair users.
21. The City should establish a right-of-way policy to retain or relocate existing businesses along the corridor, including those that do not own the land on which they are located. Consideration should be given to providing financial incentives to those businesses.
22. Work with property and business owners during the preliminary engineering phase to consolidate driveways, share driveways, and potentially to share parking and inter business access across parcel lines. Be creative and sensitive to the parking needs of businesses, including consideration for some potential clustered/shared parking lots (especially if remnant parcels are available).
23. Provide improvements that will not generate an increase in neighborhood spillover traffic.
24. Work with transit agencies to provide increased service and seek capital investments from them to support this project.
25. Develop partnerships with WSDOT and King County/Metro to jointly fund the project.
26. Provide curb bulbs where practical on side streets to reduce pedestrian crossing width and to discourage cut-through traffic.
27. Strengthen and preserve the heritage of the red brick road. If the design impacts the red brick road in its current configuration/location north of 175th, preserve its heritage by relocating it elsewhere.
28. Consider new signalized intersections at 152nd, 165th, 182nd, and 195th.
29. Consider new pedestrian only signalized crossings in the vicinity of 149th, 170th, 180th and 202nd.
30. Sign Ronald Place south of 175th as the route to I-5.
31. Pursue reducing the speed limit to 35 mph where appropriate recognizing the potential impacts of spillover traffic with a lower posted speed.
32. Seek funding to develop a program to assist and encourage businesses to improve their facades.

City of Shoreline (Resolution 156, August 23, 1999)

What are the needs addressed by the Project?

System Linkage

The proposed project would improve regional system linkage by providing additional lane capacity, improved intersection capacity, and improved signal coordination. It would also continue the improvements underway between N 145th Street and N 165th Street, creating a consistent continuous corridor throughout the City.

Aurora Avenue N is a major north/south arterial link that serves both local and regional traffic within the City of Shoreline. It is part of the National Highway System (NHS). The portion of Aurora Avenue N within the City connects SR 104 and SR 523. In addition to serving intra-city traffic, the route serves as a regional link between cities in the Puget Sound region, connecting to the City of Seattle to the south and Snohomish County to the north. It is the significant alternative to I-5 in providing north/south regional linkage. The portion of SR 99 located within the City has also been identified as a Highway of Statewide Significance (Washington State Transportation Commission 1998). Highways of Statewide Significance, identified under the Revised Code of Washington (RCW) 47.06.140, are those facilities deemed to provide and support transportation functions that promote and maintain significant statewide travel and economic linkages. The legislation emphasizes that these significant facilities should be planned from a statewide perspective (WSDOT 2002).

The timely delivery of goods is extremely important to business operations and economic vitality. Aurora Avenue N is identified by WSDOT as a truck freight route in the statewide Freight and Goods Transportation System (FGTS). It carries more than 5 million tons of freight annually, so is classified as a T-2 tonnage class roadway (WSDOT 2005). It has also been identified as part of the King County Regional Arterial Network, and the Puget Sound Regional Council (PSRC) Metropolitan Transportation and Freight and Goods Systems. Aurora Avenue N also provides a connection between other routes on the FGTS, including Westminster Way/Greenwood Avenue (class T-2), SR 523 (class T-3), N 185th Street (class T-2), and SR 104 (class T-3) (WSDOT 2005).

Aurora Avenue N provides a linkage for commuters and transit to two regional Park-and-Ride facilities located at N 192nd Street and

National Highway System

Federally identified highways that are most important to interstate travel and national defense, connect other modes of transportation, and are essential for international commerce.

Highway of Statewide Significance

Highways identified by the Washington State Transportation Commission that provide significant statewide travel and economic linkages.

WSDOT Freight and Goods Transportation System (FGTS) Classifications

Roadways are classified according to the average volume of freight they carry each year:

T-1 > 10 million tons per year

T-2 4 million – 10 million tons per year

T-3 300,000 – 4 million tons per year

T-4 100,000 – 300,000 tons per year

T-5 At least 20,000 tons in 60 days

Aurora Avenue N; and on N 200th Street, two blocks east of Aurora Avenue N.

The City is currently completing improvements to Aurora Avenue N between N 145th Street and N 165th Street, which include similar elements to those proposed for this Project. Improvements include BAT lanes; curbs, gutters, landscaping/utility strip, and sidewalks on both sides; a landscaped center median with left and u-turn pockets, new signalized intersections, pedestrian-activated signalized crossings, undergrounding of utilities, and stormwater facilities.

Capacity

The proposed project would address capacity needs through improvements to intersection geometry and capacity, channelization, signal improvements, and additional lane capacity for business access and transit. By consolidating the number of access points according to WSDOT criteria, capacity in the corridor would be improved through the reduction of conflicts and traffic friction.

The capacity of the current facility is inadequate to accommodate projected traffic volumes. The corridor currently supports 33,000 to 39,000 vehicles per day. Traffic analysis completed for the Aurora Avenue N corridor assessed level of service (LOS) from now through the future planning year of 2030, under conditions both with and without the proposed project. Over the next 20 years, volumes along the corridor are expected to increase by 1.1% annually.

LOS is the primary measurement used to determine the operating quality of a roadway segment or intersection. LOS is generally measured by the ratio of traffic volume to capacity (V/C) or by the average delay experienced by vehicles on the facility. The quality of traffic operation is graded into one of six LOS designations: A, B, C, D, E, or F. LOS A represents the best range of operating conditions and LOS F represents the worst. LOS on transportation facilities is analyzed and measured according to procedures provided in the Highway Capacity Manual (Transportation Research Board 2000). In an urban corridor such as Aurora Avenue N, LOS at intersections controls the overall LOS of the roadway. LOS for signalized intersections is determined by the average amount of delay experienced by vehicles at the intersection. LOS standards are used to evaluate the transportation impacts of long-term growth. The Washington State Growth Management Act (GMA) (RCW 36.70A, 1990) requires that jurisdictions adopt standards by which the

Level of Service (LOS) - Characteristics of Traffic Flow

LOS A	Free flow, little or no restriction on speed or maneuverability caused by the presence of other vehicles.
LOS B	Stable flow, operating speed is beginning to be restricted by other traffic.
LOS C	Stable flow, volume and density levels are beginning to restrict drivers in their maneuverability.
LOS D	Stable flow, speeds and maneuverability closely controlled due to higher volumes.
LOS E	Unstable flow, low speeds, considerable delay, volume at or near capacity, freedom to maneuver is difficult.
LOS F	Forced traffic flow, very low speeds, traffic volumes exceed capacity, long delays with stop and go traffic.

minimum acceptable roadway operating conditions are determined and deficiencies may be identified. The City has adopted a standard of LOS E for intersections within the City (City of Shoreline 2005).

Detailed traffic analysis of Aurora Avenue N is presented in this report. The analysis shows that without improvements, average delay at key signalized intersections along Aurora Avenue N will fall to LOS F. These conditions are considered unacceptable by most drivers and fail to meet the City's adopted standard of LOS E. A lack of adequate capacity along Aurora Avenue N could encourage drivers to use parallel neighborhood routes.

Regional Transportation Demand

The proposed project would provide additional automobile and transit capacity to help meet the demand that is anticipated to occur in the Aurora Corridor over the next 20 years. The City's design concept for the Project satisfies the following regional policies:

- Optimize and manage the use of transportation facilities and services.
- Manage travel demand by addressing traffic congestion and environmental objectives.
- Focus transportation investments by supporting transit- and pedestrian-oriented land use patterns.
- Expand transportation capacity by offering greater mobility options.

The PSRC has adopted a Regional Transportation Plan (RTP), the Transportation Element of *Destination 2030* (PSRC 2001). The RTP provides the long-range strategy for future investments in the central Puget Sound region's transportation system. It responds to federal legislative mandates such as the federal Transportation Equity Act for the 21st Century and the Clean Air Act (CAA); and state mandates such as the Commute Trip Reduction Law RCW (70.94.521-551) and the GMA (RCW 36.70A). It also is intended to respond to regional concerns of pressing transportation problems. The basic building blocks for the RTP are state, city, county, and transit agency plans and policies.

Regional Transportation Plan (RTP)

The RTP provides the long-range strategy for future investments in the central Puget Sound region's transportation system.

Improvements to Aurora Avenue N through Shoreline are included in the list of capital projects identified by the RTP as critical, and as

part of the Metropolitan Transportation System required to satisfy regional needs through 2030.

Modal Interrelationships

The proposed project would enhance mobility and safety for pedestrians by providing continuous sidewalk, curbs, and gutter along both sides of the roadway. Additional crosswalks would provide more safe crossings for pedestrians. Pedestrian links would also be provided to the adjacent Interurban Trail.

Bicyclists traveling along Aurora Avenue N would be allowed to travel on the sidewalks or in the BAT lanes, and would also benefit from connections provided to the Interurban Trail.

The Project would also improve transit operations and reliability through the addition of the BAT lanes, providing a lane for bus operation outside the general-purpose traffic flow.

The portion of Aurora Avenue N within the City is heavily automobile-oriented, and lacking in pedestrian or bicycle facilities. Driveway access along the corridor is largely undefined and sidewalk facilities are discontinuous and do not meet City standards. The only areas where sidewalks meet City standards are areas along developments that have been built within the last 10 years.

Buses on Aurora Avenue N travel in the general-purpose lanes and are subject to congestion. When traffic is congested, the buses are likely to be delayed. When buses stop to pick up and drop off passengers, they block traffic in one of the two general-purpose lanes that currently exist in each direction. Discontinuous sidewalks make access to transit difficult, especially for those with disabilities. The absence of even, wide, continuous pedestrian facilities can dissuade potential transit patrons from using the bus system. Bicyclists currently have to travel either on shoulders, where they exist, or in the general-purpose traffic lanes, discouraging most bicyclists.

The Interurban Trail is a pedestrian and bicycle facility that runs roughly parallel to Aurora Avenue N, providing regional connection from Everett through Seattle. Construction within the City is currently underway, with completion planned for July 2007. After construction is complete, the Interurban Trail will run throughout the entire City length, between N 145th Street and N 205th Street. In the Project area, the trail is located approximately one block east of Aurora Avenue N between N 165th Street and N 192nd Street; runs

The Interurban Trail

The Interurban Trail is a regional pedestrian and bicycle facility that runs roughly parallel to Aurora Avenue N. Construction is currently underway, with completion planned for July 2007. After construction is complete, the Interurban Trail will run throughout the entire City length, between N 145th Street and N 205th Street.

to the east of Echo Lake; runs east-west along N 200th Street to Meridian Avenue; and then runs north-south on the east side of Meridian Avenue through Ballinger Commons (City of Shoreline 2007). Existing sidewalks are inadequate to provide pedestrian connectivity along Aurora Avenue N and to the Interurban Trail.

Safety

Project elements would improve channelization; separate pedestrians from vehicular traffic, and reduce potential conflicts between vehicles, pedestrians, and bicyclists. The City is working with businesses and property owners to develop appropriate solutions that address access and parking issues, while still maintaining Project goals.

WSDOT collects and compiles historical collision data for state highways, including Aurora Avenue N (SR 99). Several areas of Aurora Avenue N, between N 165th Street and N 205th Street, have been given poor safety designations by WSDOT. WSDOT has identified one high accident corridor (HAC), three high accident locations (HALs), and two pedestrian accident locations (PALs) on Aurora Avenue N, between N 165th Street and N 205th Street, for the 2007–2009 biennium. Between 2003 and 2005, the average annual collision rate for the entire Aurora Avenue N corridor within Shoreline was calculated to be 5.5 accidents per million vehicle miles traveled. This greatly exceeds the most recently compiled (2005) statewide average for urban principal arterials of 2.6 accidents per million vehicle miles. There is strong public concern for general traffic safety and pedestrian safety along the corridor. Collision history and WSDOT safety designations are discussed in further detail in Chapter 4, *Affected Environment*.

High Accident Corridor (HAC)

A highway corridor 1 mile or greater in length where a 5-year analysis of collision history indicates that the section has higher than average collision and severity factors.

High Accident Location (HAL)

A highway section typically less than 0.25 mile in length where a 2-year analysis of collision history indicates that the section has a significantly higher than average collision and severity rate.

Pedestrian Accident Location (PAL)

A highway section typically less than 0.25 mile in length where a 6-year analysis of collision history indicates that the section has had four collisions involving pedestrian in a 0.1-mile segment.

Aurora Avenue N currently lacks adequate access management. Land use along Aurora Avenue N is predominantly commercial/retail. Most of the businesses are freestanding, with defined and undefined individual driveways, or continuous shoulder access. Numerous driveways, limited curbs and sidewalks, and erratic parking all contribute to a general lack of safe passage for pedestrians, bicyclists, and vehicles. This type of development has resulted in a very high number of individual access points that increase conflict and impact safety along the corridor. In total, there are 154 access points along the 2-mile length within the Project corridor. National Cooperative Highway Research Program

(NCHRP) Report 420 indicates that the ideal number of access points is fewer than 30 per mile (Gluck et al. 1999).

Much of the existing business parking along the corridor is directly adjacent to the roadway shoulders and is angled or perpendicular to the street. Many existing parking spaces require motorists to back onto the roadway to exit. Parking within the Aurora Avenue N roadway right-of-way occurs primarily near retail and commercial land uses within the Project area. Several businesses along the roadway between N 165th Street and N 205th Street use the shoulder for parking in areas where there is no curb, effectively blocking pedestrians and people in wheelchairs.

The Project elements that would improve safety conditions along Aurora Avenue N include:

- addition of curbs and gutters and focused driveway locations;
- even, wide, continuous sidewalks that will be safer for transit patrons;
- application of driveway width and spacing standards;
- proposed traffic signals and pedestrian crosswalks;
- conversion of the existing two-way left-turn lane into a median with channelized left-turn and u-turns;
- restriction of driveways to right-turn-in and right-turn-out only;
- elimination of parking spaces that require motorists to back onto the roadway to exit; and
- provision of the BAT lanes that would allow traffic to safely enter and exit the roadway with fewer conflicting movements and lower risk of crashes.

Social Demands/Economic Development

The Project would address the need to continue to enhance the movement of people and goods within the SR 99 commercial corridor, as identified in the Comprehensive Plan, by improving person and freight mobility; pedestrian, bicycle, and transit linkages; and overall safety for vehicular and non-vehicular travelers.

The City Comprehensive Plan provides forecasts of job growth within the Aurora Avenue N corridor. This growth depends on a revitalized roadway corridor along all of Aurora Avenue N, including the area between N 165th Street and N 205th Street.

The City Comprehensive Plan provides forecasts of job growth within the Aurora Avenue N corridor. This growth depends on a revitalized roadway corridor along all of Aurora Avenue N, including the area between N 165th Street and N 205th Street.

The Comprehensive Plan sets forth a vision that concentrated activity centers will develop at several locations along the corridor. These are located between N 175th Street and N 185th Street, and between N 200th Street and N 205th Street (Aurora Village). To support the economic development goals of the Comprehensive Plan, improvements are needed for pedestrian and transit access to and between these locations. The City's objective for Aurora Avenue N is to install improvements that would lead people to the community and its businesses (City of Shoreline 2005).

What is the legislative context for the Project?

There are three articles of legislation that provide specific direction for the Project. City Resolution 156, City Ordinance 326, and RCW 47.50 are discussed below.

City Resolution 156

Resolution 156 was adopted unanimously by the Shoreline City Council on August 23, 1999, at an open meeting that included opportunities for public testimony. This resolution accepted the recommendation of the Citizens' Advisory Task Force for the 3-mile Aurora Avenue N corridor within the city limits; found the recommendation to be in conformance with the City Comprehensive Plan (2005); initiated an amendment to the Capital Improvement Program; and directed staff to pursue environmental analysis for the corridor improvement. Resolution 156 included the 32 Points directive described earlier in this chapter.

City Ordinance 326

Ordinance 326, which consists of revisions to the City's Comprehensive Plan, was passed 5 to 1 by the Shoreline City Council on July 14, 2003. This ordinance amended the text of Land Use Policy LU48 and added a new Transportation Policy 5.1 for the purpose of identifying future right-of-way needs of Aurora Avenue N, between N 172nd Street and N 192nd Street. The

ordinance also added a right-of-way map for this area to the Transportation Element. In general, this ordinance identifies any widening that occurs along this segment of the roadway, and resulting right-of-way acquisition needed, as occurring to the east of the existing roadway. SEPA review was completed for Ordinance 326, prior to adoption. The ordinance was not subject to NEPA. However, for the purposes of the NEPA and SEPA evaluation of the Project, the separate Build Alternatives were defined to reflect widening to both the east and the west, so that the potential impacts under the full possible range of build options would be evaluated. If the Recommended Alternative that is ultimately selected requires right-of-way outside of the boundaries defined in the ordinance, Policy T5.1 in the Comprehensive Plan, which specifically defines the boundaries, would need to be amended.

Access Management RCW 47.50

To preserve the safety and operational characteristics of state highways, RCW 47.50 was enacted in 1991, designating all highways in Washington as controlled-access facilities. Aurora Avenue N, part of SR 99, is a class 4 facility according to the WSDOT access control classification system and standards. Within this class, access management measures are identified, such as minimum driveway spacing of 250 feet and installation of medians to mitigate turning, weaving, and crossing conflicts that affect safe travel. Based on the urban environment served by Aurora Avenue N and the high traffic volumes it carries, the street's design is deficient in terms of access management for the preservation of safety and traffic operations. Any improvement to Aurora Avenue N would have to comply with access management standards defined under this law.

Chapter 3. Alternatives

This chapter describes the alternatives that are being evaluated for the proposed project.

What alternatives are considered in this discipline report?

This report evaluates the potential effects of a No Build Alternative and three Build Alternatives, described in the following sections.

No Build Alternative

Under the No Build Alternative, Aurora Avenue N would remain exactly as it is today. The roadway has two general-purpose lanes in each direction with a center two-way left-turn lane. Shoulder and sidewalk of varying widths are located sporadically along the corridor with no curb or gutter and little landscaping. The corridor is served heavily by public transit provided by King County Metro, with additional service at the north end of the corridor provided by Community Transit. Buses on Aurora Avenue N would continue to travel and stop in the general-purpose lanes.

Build Alternatives

The City has proposed three Build Alternatives: Alternative A, Alternative B, and Alternative C. Table 2 provides an overview of Project features unique in an individual Build Alternative and features common among them.

Table 2. Common and Unique Features of the Aurora Corridor Improvement Project Build Alternatives

Features Common among Build Alternatives A, B, and C	
General-purposes lanes	Project design includes two general-purpose lanes in each direction.
BAT lane	Each Build Alternative would include one Business Access and Transit (BAT) lane in each direction.
Sidewalk	7-foot sidewalks would be constructed along both sides of the corridor.
Curb and Gutter	Curb and gutter would be constructed along both sides of the corridor. Curb ramps would be constructed at all intersections in accordance with ADA requirements.
Underground utilities	Utilities would be placed underground for each of the three Build Alternatives.
Vegetation	Each of the alternatives includes vegetative plantings. Extent and location vary as described below.
Center median	A center median would be added, with left-turn and u-turn pockets (width of the center median varies by alternative, as described below).
Traffic signals	New traffic signals proposed at Aurora Avenue N/N 182nd Street and Aurora Avenue N/Firlands Way N (north of N 195th Street). Signalized intersections will be widened to improve east-west capacity and traffic flow.
Road improvements	Improvements would be made to: - Echo Lake Place (north of N 195th Street), including realignment and a connection to Aurora Avenue N at Firlands Way N; and - Midvale Ave N (N 175th Street – N 183rd Street), including realignment, addition of a center turn lane, curb and gutter, and sidewalk on the east side of the roadway. The new Interurban Trail will serve as the walking path on the west side of the roadway.

Features that vary among Alternatives A, B, and C	Alternative A	Alternative B	Alternative C
Cross Section	Typically 98 feet from back-of-sidewalk to back-of-sidewalk. The cross section will be wider where utility vaults, light/signal poles, and bump outs are located, as described below. This dimension is 12 feet narrower than the cross sections proposed under Alternatives B and C, due to a narrower median (12 feet instead of 16 feet) and the absence of the 4-foot amenity zone on each side of the roadway. The City would also acquire a continuous 3-foot-wide easement behind the sidewalk on each side of the roadway for placement of utilities.	110 feet from back-of-sidewalk to back-of-sidewalk.	
Median Width	Center median would be 12 feet wide.	Center median would be 16 feet wide.	
Amenity Zone	No amenity zone provided. Utility vaults and light/signal poles would be located behind the sidewalks in the 3-foot easement area.	A 4-foot amenity zone would be located between the curb and sidewalk on each side of the street. Utility vaults, light/signal poles, bus stop signs, hydrants, and other pedestrian amenities would be located in this area.	
Bump Outs	Bump outs approximately 4 feet in additional width would be needed at u-turn and left-turn locations to achieve the turning radii needed to accommodate u-turns.	None needed. U-turns would be sufficiently accommodated within the standard roadway width.	
Placement of Alignment	Required widening would be shifted to the east of the existing right-of-way in the vicinity of N 175th Street, N 185th Street, and N 200th Street.	Required widening would be shifted to the east of the existing right-of-way in the vicinity of N 175th Street, N 185th Street, and N 200th Street.	Required widening would be shifted to the west of the existing right-of-way in the vicinity of N 175th Street, N 185th Street, and N 200th Street.
Vegetation	Limited vegetation would be provided in the median.	More vegetation accommodated by wider median. Vegetation could also be planted in areas within the amenity zone.	

All three Build Alternatives are similar in traffic operations and safety benefits with one small exception. Alternative B includes an additional westbound right-turn pocket at Aurora Avenue N and N 175th Street. Figures 2, 3, and 4 present plan views of the three Build Alternatives, respectively. Figure 5 presents more detailed schematic drawings of the proposed roadway configurations under each of the three alternatives. The drawing shows one direction of travel of the proposed roadway alternatives, which is typical of both directions.

When will the Recommended Alternative be selected?

The Recommended Alternative will be selected after all of the environmental analysis has been completed for the No Build Alternative and three Build Alternatives. The discipline reports that summarize the environmental analysis will be available for public review after they are finalized, and prior to the City's selection of the Recommended Alternative.

The boundaries of the three Build Alternatives encompass the maximum possible footprint of the Project. The Recommended Alternative ultimately selected for the Project may combine different elements from the different Build Alternatives. However, no part of the Project will occur outside of the study area analyzed in this report.

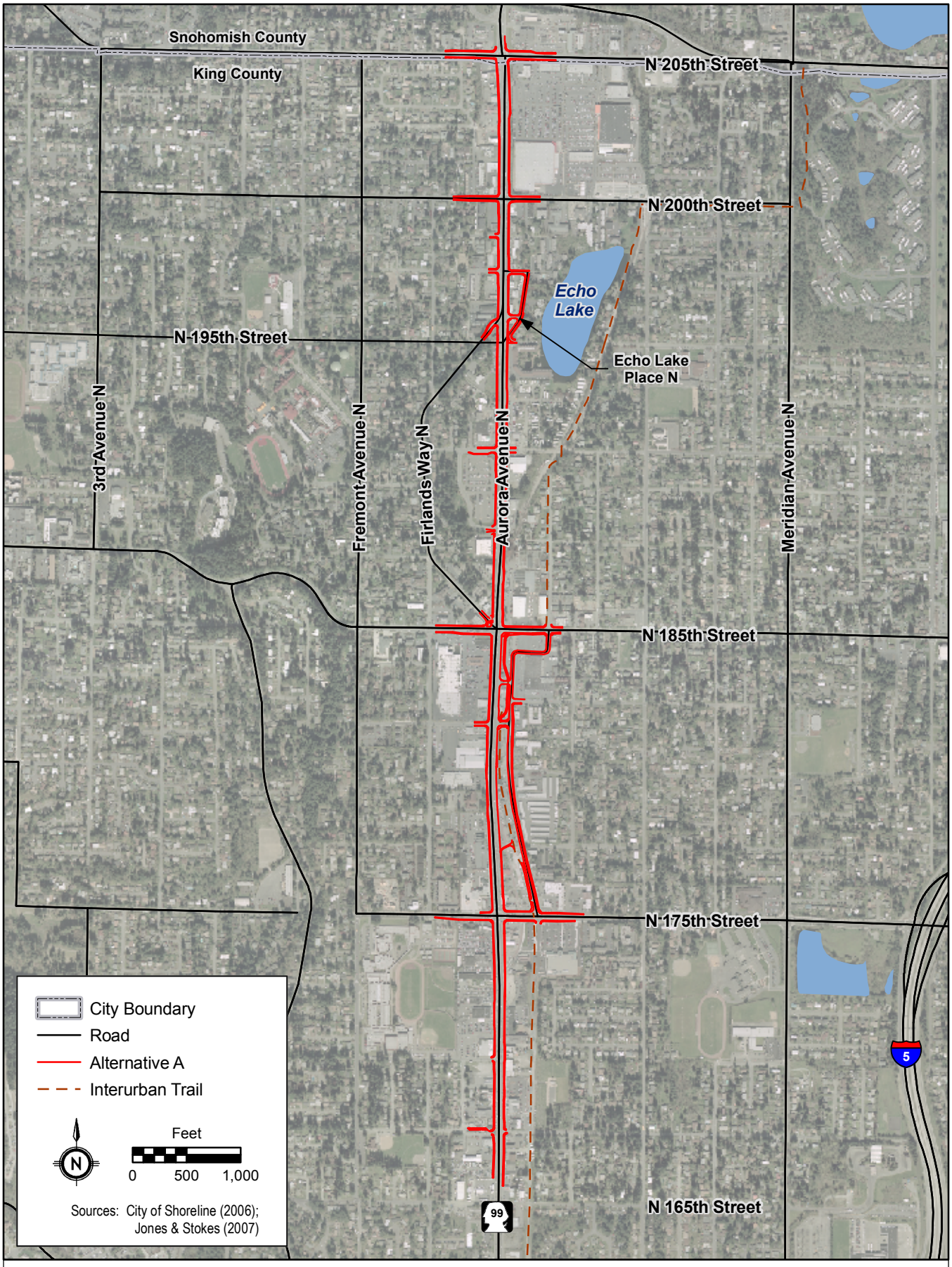


Figure 2. Alternative A
Aurora Corridor Improvement Project
September 2007

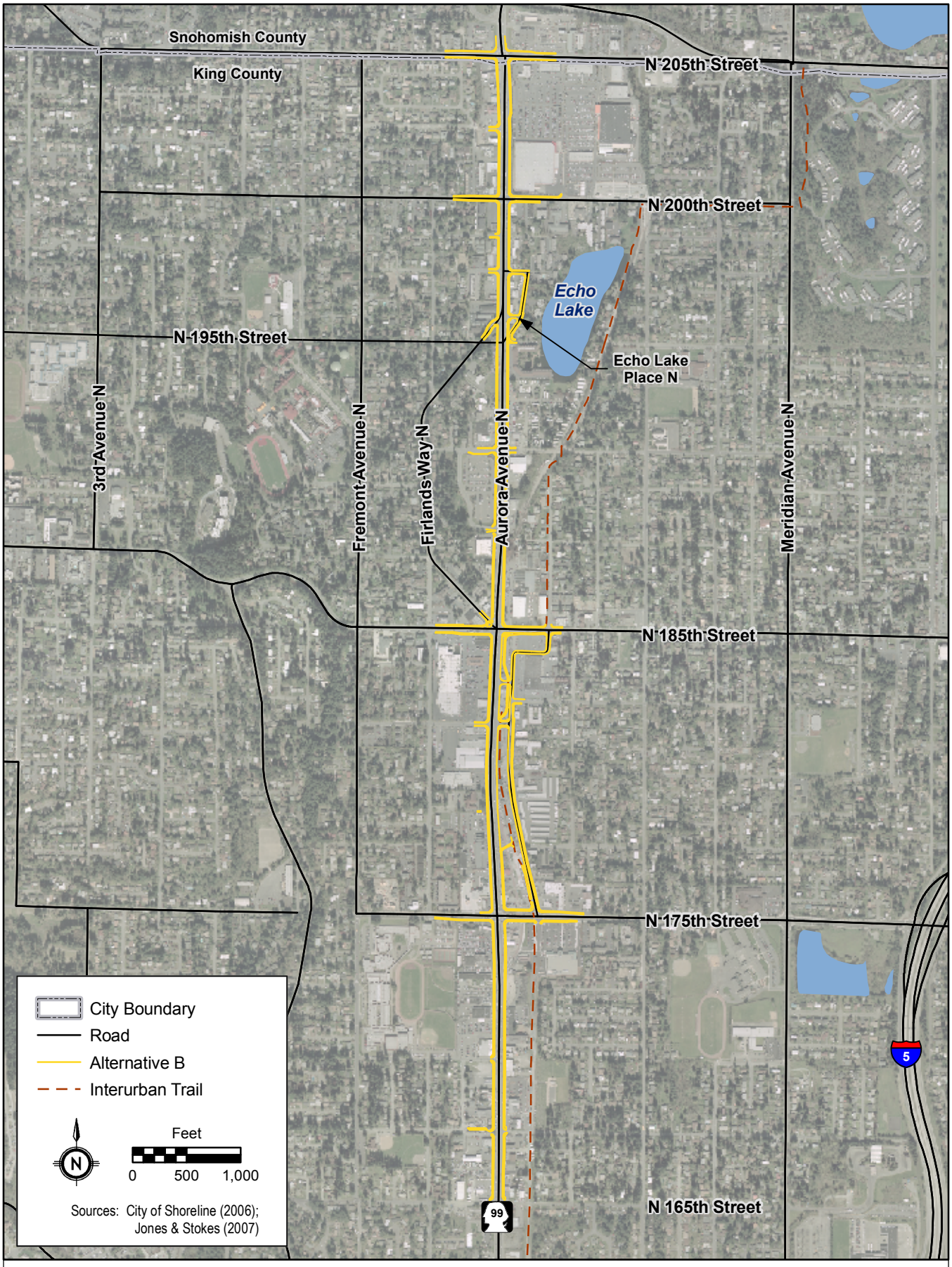


Figure 3. Alternative B
Aurora Corridor Improvement Project
September 2007

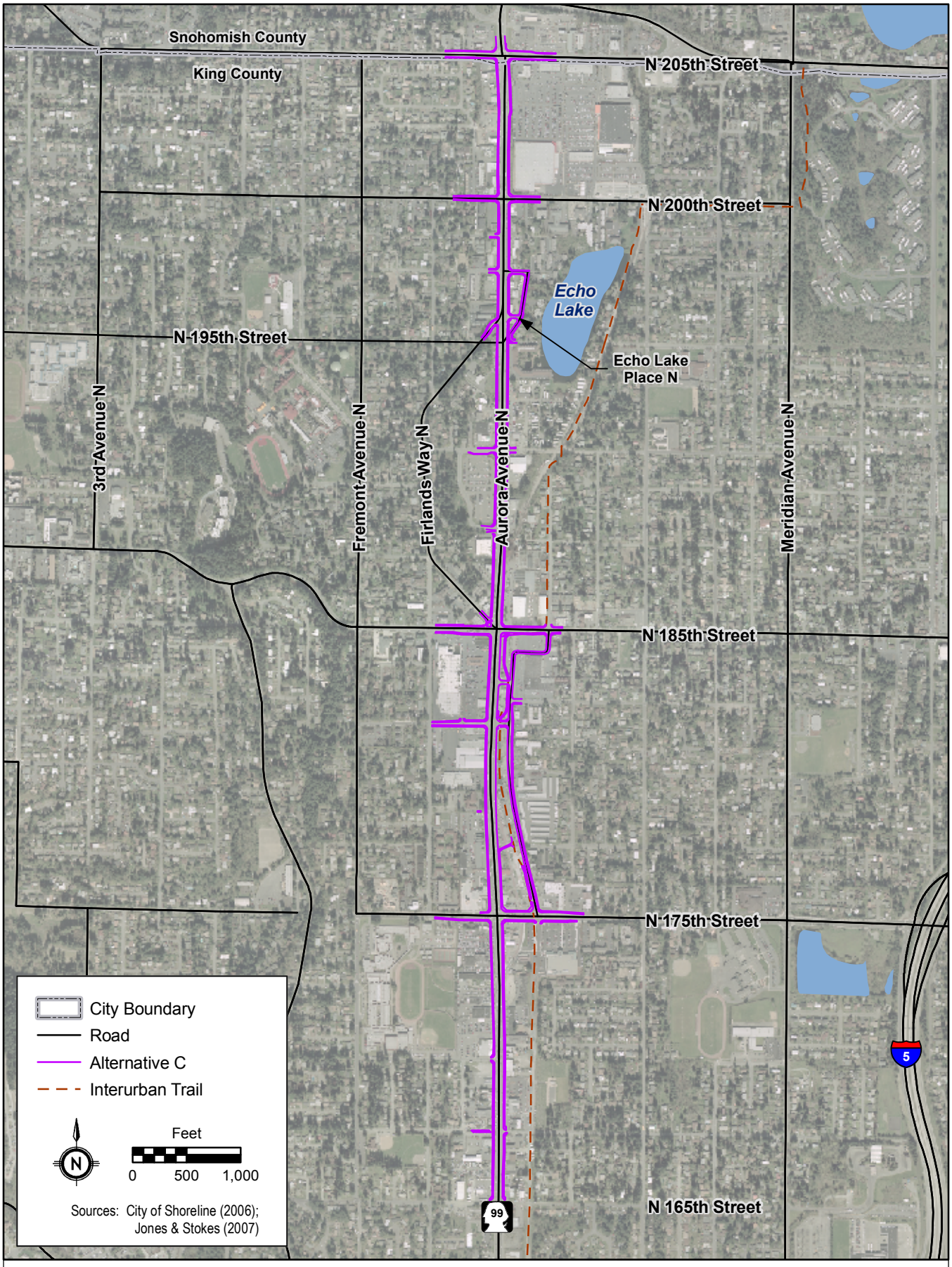
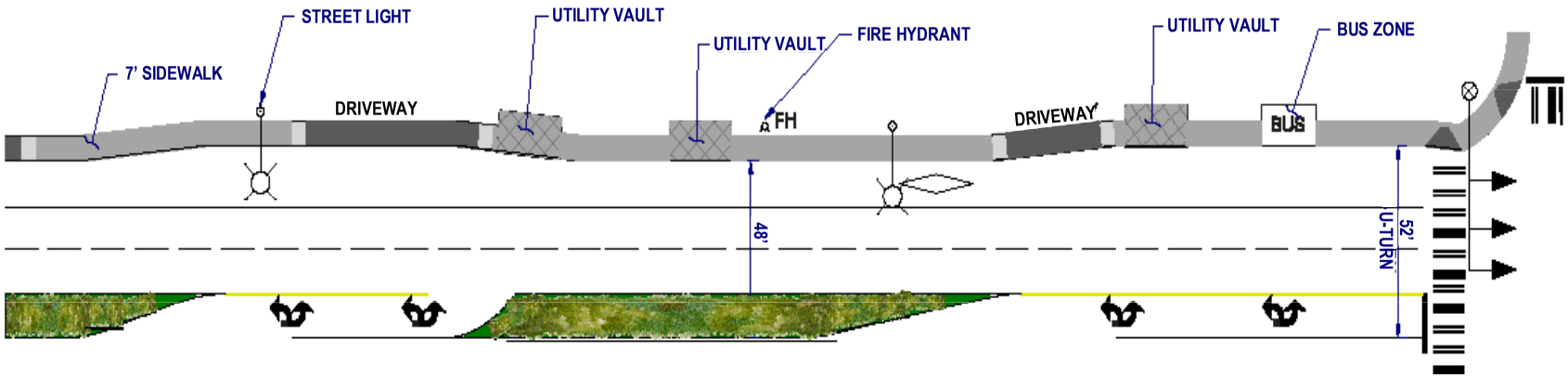


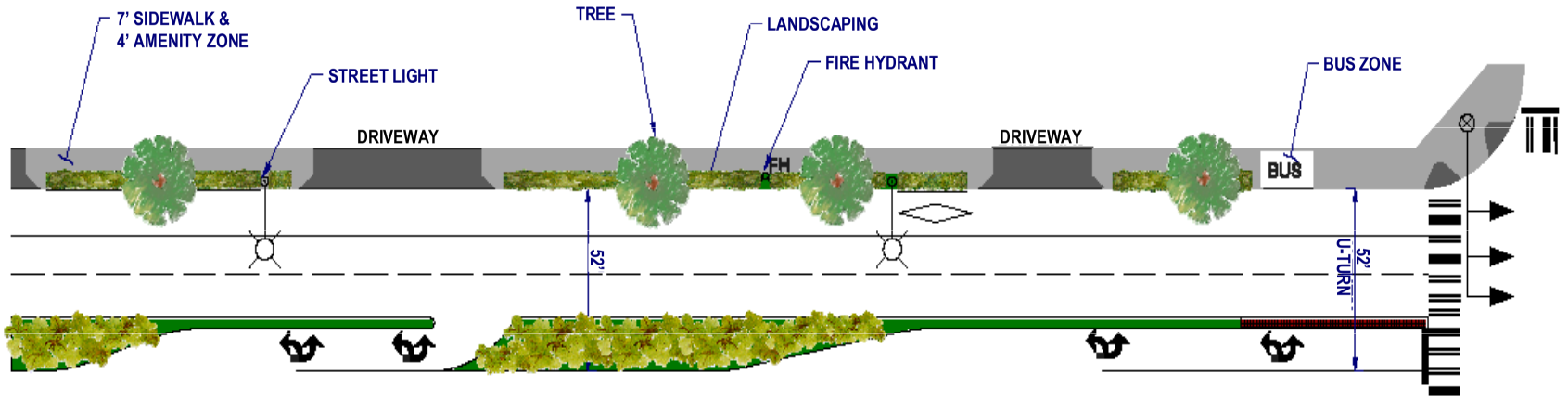
Figure 4. Alternative C
Aurora Corridor Improvement Project
September 2007

Alternative A



Alternatives B and C

Note: Drawing shows one direction of travel of the proposed roadway alternatives, which is typical of both directions



CITY OF SHORELINE AURORA CORRIDOR

Figure 5. Proposed Plan Detail for Build Alternatives
Aurora Corridor Improvement Project
September 2007

Chapter 4. Affected Environment

This chapter describes existing regulations and conditions of the environment as they relate to transportation.

What is the study area for transportation and how was it defined?

The transportation study area consists of roadway segments and intersections within and adjacent to the roadway that will be improved for this Project. The study area extends approximately 2 miles along Aurora Avenue N from N 165th Street to N 205th Street, and includes Midvale Avenue N between N 175th Street and N 185th Street (Figure 1). The study area includes 12 study intersections: nine on Aurora Avenue N and three on Midvale Avenue N. Seven intersections are currently signalized, while five are stop-controlled on the side street. Table 3 summarizes the study area intersections chosen for analysis and the type of intersection control at each one.

Traffic flows on Aurora Avenue N between N 175th Street and N 185th Street are influenced by trips between western Shoreline neighborhoods and the I-5 interchange at N 175th Street. In recognition of the importance of these trips and the surrounding streets, an expanded traffic study analyzed travel patterns and intersection operations at locations between N 175th Street and N 185th Street at Fremont Avenue N, Linden Avenue N, Ashworth Avenue N, and Meridian Avenue N. This traffic study is included as Appendix A.

Table 3. Study Area Intersections

Study Intersection	Intersection Control
Aurora Avenue N and N 205th Street	Traffic signal
Aurora Avenue N and N 200th Street	Traffic signal
Aurora Avenue N and N 195th Street	Eastbound/ Westbound stop-control
Aurora Avenue N and N 192nd Street	Traffic signal
Aurora Avenue N and N 185th Street	Traffic signal
Midvale Avenue N and N 185th Street	Northbound/ Southbound stop-control
Aurora Avenue N and N 182nd Street [1]	Eastbound/Westbound stop-control
Midvale Avenue N and N 182nd Street [1]	Eastbound stop-control
Aurora Avenue N and N 175th Street	Traffic signal
Midvale Avenue N and N 175th Street	Traffic signal
Aurora Avenue N and N 170th Street	Eastbound stop-control
Aurora Avenue N and N 165th Street [2]	Traffic signal

[1] North Central Segment of Interurban Trail segment constructed new east leg between Aurora Avenue N and Midvale Avenue N. The work was completed in July 2007.

[2] Aurora Corridor project from N 145th Street to N 165th Street constructed intersection improvements and installed traffic signal. The work was completed in July 2007.

What are the general transportation features of the study area?

General Roadway Characteristics

Aurora Avenue N (SR 99) is a five-lane-wide, urban principal arterial with a posted speed limit of 40 miles per hour (mph). The roadway is made up of two general-purpose traffic lanes in the northbound and southbound directions and a continuous center two-way left-turn lane. The roadway widens to provide an additional left-turn lane on the southbound approach at N 175th Street and the northbound approach at N 185th Street. Arterials intersecting Aurora Avenue N in the study area include N 175th Street, N 185th Street, N 200th Street, and N 205th Street.

Between N 175th Street and N 185th Street, Midvale Avenue is a residential street aligned parallel to Aurora Avenue approximately

150 to 450 feet to the east. Midvale Avenue is a two-lane roadway with a posted speed limit of 25 mph.

Access Characteristics

Access management is the regulation of public and private access to Washington State's highways, as required by state law (see Chapter 2 for description of the Access Management Law, RCW 47.50). State facilities are either access managed (i.e., access to adjacent properties is permitted) or limited access (i.e., access is not permitted except at interchanges). For facilities that provide for long distance trips and some access to adjacent properties, WSDOT manages access to preserve the safety and efficiency of these highways, as well as to preserve the public investment. Management of access is accomplished by regulating access connections to the highway.

Access characteristics on Aurora Avenue N between N 165th Street and N 205th Street do not currently meet WSDOT access management standards. Freestanding commercial buildings with individual driveways or continuous shoulder access are dominant along the roadway throughout the study area, resulting in a large number of individual access points. Much of the existing business parking along the corridor is directly adjacent to the roadway shoulders and is angled or perpendicular to the street.

Non-Motorized Characteristics

Aurora Avenue N between N 165th Street and N 205th Street lacks adequate facilities for pedestrian and bicycle travel. Numerous driveways, limited curbs and sidewalks, and erratic parking all contribute to a general lack of safe passage for pedestrians, wheelchairs, and bicyclists. Sidewalks are limited on either side of the roadway and generally occur only in front of recently developed establishments. Where no sidewalks are present, there is shoulder available. However, vehicles are often parked on the shoulder, which restricts its use by pedestrians and bicyclists. Crossings for pedestrians and bicyclists are located at all signalized intersections and at pedestrian-specific traffic signals on Aurora Avenue N near N 170th Street and N 180th Street.

How was information collected?

Information for this report was gathered from traffic data collected specifically for this Project, traffic data from previous City projects,

traffic data collected as part of the City's annual traffic counting program, collision data collected from WSDOT, and adopted comprehensive and master planning documents.

Existing Traffic Volumes

Three to five-day 24-hour traffic counts were collected by WSDOT on March 22, 2004, and by the City from March 2004 to October 2005.

Morning and afternoon peak period traffic counts were conducted at study intersections on October 28, 2004, and November 1 and 2, 2005. The 2-hour peak period counts were taken between 7:00 a.m. and 9:00 a.m. and 4:00 p.m. and 6:00 p.m.

Peak Periods (AM and PM)

The periods of the day during which the maximum amount of travel occurs. A peak period may be specified as the morning (AM) or afternoon or evening (PM) peak.

Traffic data was collected in 2004 and 2005 to avoid the effects of construction on the Aurora Corridor project between N 145th Street and N 165th Street. These traffic studies provided pre-construction conditions for the traffic analysis.

Historical Collision Data

Collision data records from January 1, 2003, to December 31, 2005, were collected from WSDOT.

Transportation Goals and Policies

Policies from two City planning documents were applied to this project, as discussed later in this chapter.

- City of Shoreline Comprehensive Plan – Transportation Element. June 3, 2005.
- City of Shoreline Transportation Master Plan. July 11, 2005.

What are the existing traffic volumes in the study area?

In the study area, average ADT volumes along Aurora Avenue N range between 33,000 and 39,000 vehicles per day. Daily traffic volumes are split approximately 52% southbound and 48% northbound.

Figure 6 shows existing AM and PM peak hour study intersection turning movement volumes, based upon the 2005 traffic counts. The

2-hour peak period traffic counts indicate that northbound travel is the dominant movement in the afternoon peak hour; while southbound travel is heaviest in the morning. The AM peak period traffic volumes in the study area are approximately 15% lower than the PM peak period traffic volumes.

The 2005 peak period traffic counts showed volume differences between adjacent study intersections. Traffic counts available at non-study intersection locations were used to reconcile the volume differences and ensure that the analysis volumes accurately reflect existing conditions.

How were traffic operations in the study area evaluated?

Intersection operations in the study area were evaluated using methodology defined in the Highway Capacity Manual (Transportation Research Board 2000) to estimate LOS, a qualitative description of traffic flow characteristics. The highest level (LOS A) describes free-flow conditions in which vehicles experience minimal delay.

The lowest level (LOS F) describes stop-and-go conditions in which long delays are experienced by most vehicles in the traffic stream. (See Chapter 2 for descriptions of all LOS designations.)

The LOS for stop-controlled intersections is defined by the control delay at the stop-controlled, side street approach(es). Control delay is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line.

LOS defines the overall operations at a signalized intersection based on average control delay. Control delay is a complex measure and is dependent on a number of variables, including the quality of progression, the cycle length, the deceleration and acceleration delay, the stopped delay, and the amount of green time available to a traffic movement. Table 4 describes the LOS and delay parameters as defined in the Highway Capacity Manual (Transportation Research Board 2000).

Synchro software uses methodologies defined in the Highway Capacity Manual to analyze both signalized and stop-controlled intersections. The model computes the LOS and delay to quantify

traffic operations at the study intersections and determine whether the intersections meet the LOS goal set by the City.

Table 4. Intersection LOS and Delay Parameters

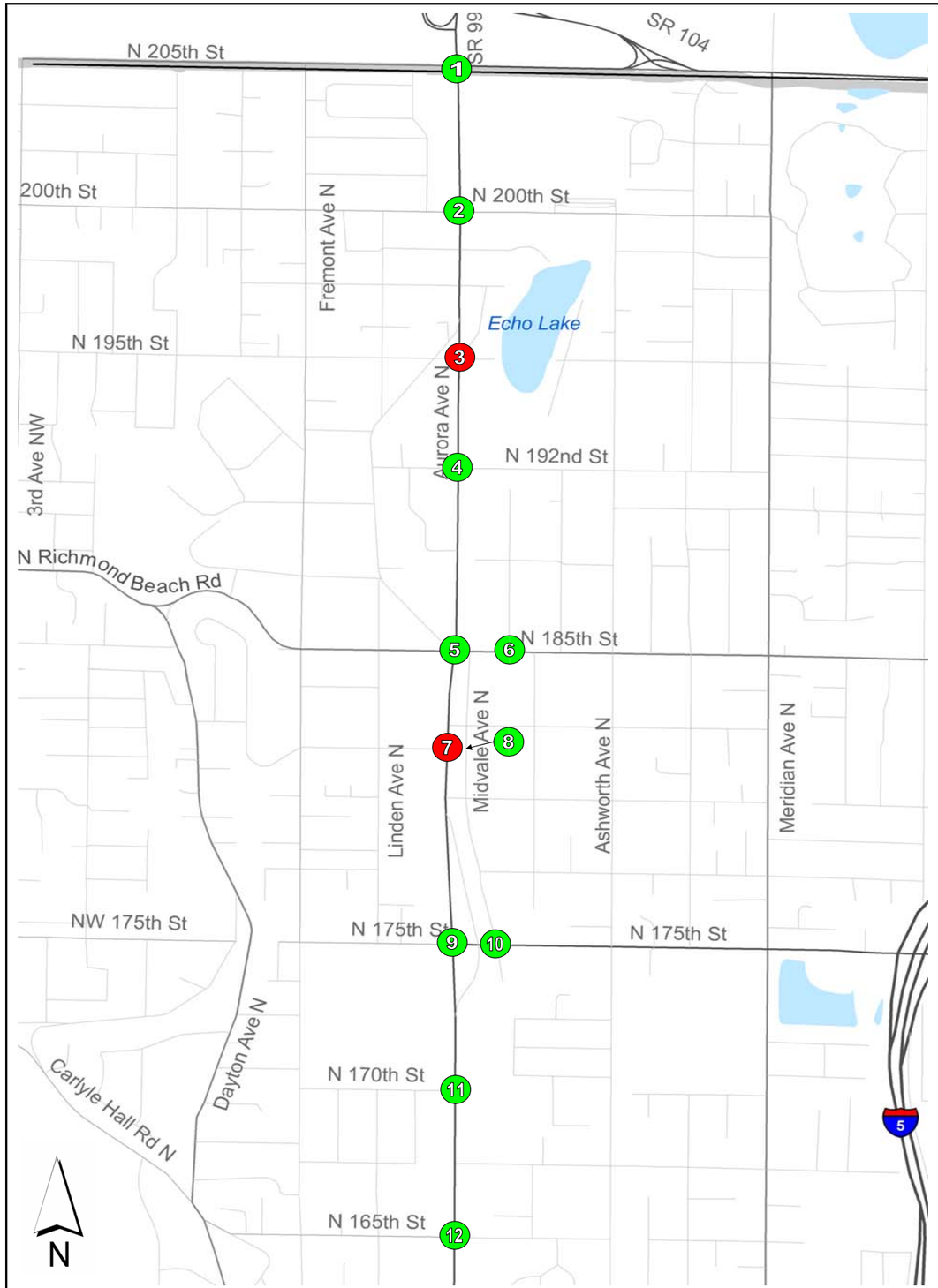
LOS	Average Control Delay (seconds per vehicle)	
	Unsignalized Intersections	Signalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	>50	>80

Source: Transportation Research Board 2000

The Synchro model includes traffic volume parameters, such as peak hour factors, truck percentages, number of pedestrians, and number of bicyclists that were derived from the hourly turning movement counts. Based on existing turn movement counts, forecasted traffic volumes, and the assumptions presented above, an operational analysis was prepared for the existing year, year of opening (2013), and design year (2030).[1]

Refer to Appendix B (Methods and Assumption Technical Memorandum) for the assumptions and data inputs used in the Synchro model.

[1] The existing year (2005) was chosen to avoid gathering data during construction of the Aurora Corridor project between N 145th Street and N 165th Street. The 2005 year provided analysis of pre-construction traffic volumes and conditions.



1 Aurora Avenue N & N 205th Street

	Control	LOS
Existing AM	Signal	E
Existing PM	***Signal***	***E***

170	***865***	***240***		70	***305***
260	1650	140		250	***405***
				220	***170***
230	155				
305	345		20	420	75
75	*105*		***75***	***1310***	***155***

2 Aurora Avenue N & N 200th Street

	Control	LOS
Existing AM	Signal	C
Existing PM	***Signal***	***D***

50	***815***	***155***		45	***95***
35	1790	80		60	***155***
				90	***180***
85	55				
115	115		15	440	70
20	*25*		***30***	***1510***	***155***

3 Aurora Avenue N & N 195th Street

	Control	LOS
Existing AM	Stop*	F
Existing PM	***Stop****	***F***

0	***1100***	***10***		10	***5***
10	1780	5		0	***0***
				10	***10***
25	15				
0	0		15	530	5
20	*40*		***20***	***1600***	***20***

4 Aurora Avenue N & N 192nd Street

	Control	LOS
Existing AM	Signal	A
Existing PM	***Signal***	***A***

15	***1000***	***35***		20	***45***
30	1600	135		20	***30***
				10	***10***
50	15				
20	10		5	505	5
10	*5*		***15***	***1615***	***30***

5 Aurora Avenue N & N 185th Street

	Control	LOS
Existing AM	Signal	E
Existing PM	***Signal***	***D***

45	***975***	***70***		20	***50***
60	1480	35		215	***280***
				175	***165***
155	80				
340	370		105	505	45
105	*130*		***105***	***1535***	***50***

6 Midvale Avenue N & N 185th Street

	Control	LOS
Existing AM	Stop*	C
Existing PM	***Stop****	***C***

15	***5***	***5***		15	***15***
5	0	10		425	***520***
				10	***30***
10	10				
475	415		5	0	10
10	*5*		***25***	***5***	***35***

7 Aurora Avenue N & N 182nd Street[a]

	Control	LOS
Existing AM	Stop*	F
Existing PM	***Stop****	***F***

30	***1175***	***20***		40	***70***
60	1550	60		5	***5***
				10	***10***
10	10				
5	5		20	580	20
110	*60*		***50***	***1490***	***30***

8 Midvale Avenue N & N 182nd Street[b]

	Control	LOS
Existing AM	Stop*	A
Existing PM	***Stop****	***A***

10	***40***	***XXX***			
10	40	XXX			
20	40				
XXX	XXX		45	40	XXX
35	*45*		***75***	***40***	***XXX***

9 Aurora Avenue N & N 175th Street

	Control	LOS
Existing AM	Signal	D
Existing PM	***Signal***	***E***

35	***1065***	***195***		45	***140***
40	1430	90		285	***265***
				415	***325***
50	40				
255	370		50	505	30
45	*120*		***65***	***1385***	***30***

10 Midvale Avenue N & N 175th Street

	Control	LOS
Existing AM	Signal	C
Existing PM	***Signal***	***C***

50	***20***	***85***		65	***110***
35	10	75		730	***705***
				15	***15***
70	30				
675	535		15	10	5
40	*25*		***45***	***45***	***10***

11 Aurora Avenue N & N 170th Street

	Control	LOS
Existing AM	Stop*	C
Existing PM	***Stop****	***C***

20	***1370***	***XXX***			
35	1850	XXX			
XXX	XXX				
XXX	XXX		25	685	XXX
35	*70*		***55***	***1785***	***XXX***

12 Aurora Avenue N & N 165th Street[c]

	Control	LOS
Existing AM	Signal	C
Existing PM	***Signal***	***C***

75	***1280***	***25***	***5***	20	***35***
55	1815	20	10	5	***5***
				15	***15***
20	10				
5	5		10	125	650	25
110	75		***10***	***205***	***1805***	***40***

LEGEND

Signal	Signalized intersection
Stop	Stop-controlled minor street
N/A	Not applicable to scenario shown
XXX	Traffic movement is not permitted
LOS	Level-of-Service
LT	Left-turn volume
TH	Through volume
RT	Right-turn volume

Traffic movement

Intersection number
2005 AM LOS — 11 — 2005 PM LOS

Intersection not applicable
LOS A - E
LOS F

NOTES

* Worst minor street reported for unsignalized intersections.

a Existing data collected prior to construction of east leg. Traffic volumes and LOS are estimates of post-project conditions.

b Existing data collected prior to construction of intersection. Traffic volumes and LOS are estimates of post-project conditions.

c Existing data collected prior to construction of traffic signal. Traffic volumes and LOS are estimates of post-project conditions.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

Example AM and PM Peak Traffic Volumes

PM Peak Hour Volumes				AM Peak Hour Volumes	***PM Peak Hour Volumes***
AM Peak Hour Volumes					
LT	LT				
TH	TH		LT	TH	RT
RT	RT		***LT***	***TH***	***RT***

Figure 6. 2005 Existing AM and PM Peak Hours Traffic Volumes and Operations

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How is the acceptable level of congestion determined?

The level of congestion allowed is determined by the acceptable LOS set by the City in Transportation Policy T13. This policy states:

> Adopt a LOS E at the signalized intersections on arterials within the City as the level of service standard for evaluating planning level concurrency and reviewing traffic impacts of developments, excluding the Highways of Statewide Significance (Aurora Avenue N and Ballinger Way NE).

(City of Shoreline 2005)

The level of acceptable congestion is defined by the City's adopted standard. Any intersection that falls below the City's adopted standard is considered deficient. The City agreed to use LOS E in this pre-design analysis for the purpose of this analysis. This is consistent with the LOS standard used on the project between N 145th Street and N 165th Street.

Congestion

The condition when unstable traffic flows constrain travel speeds to less than the posted limit. Recurring congestion is caused by constant excess traffic volume compared with the roadway's capacity. Nonrecurring congestion is caused by unusual or unpredictable events such as traffic accidents.

How do roadways in the study area operate under existing conditions?

The signalized intersections on Aurora Avenue N currently operate at LOS E or better during both AM and PM peak hours. The stop-controlled streets intersecting Aurora Avenue N currently operate at LOS F during both peak hours except Midvale Avenue N and N 185th Street (LOS C). The turning movement volumes at these approaches are low (less than 150 vehicles per hour), but the conflicting volume along Aurora Avenue N is so high that few gaps exist. This effectively reduces capacity and increases delay.

Table 5 summarizes the existing peak hour levels of service at the study area intersections. The table shows that two of the analysis intersections are operating at LOS F under existing conditions, which exceeds the City's standard of LOS E.

Table 5. Existing Intersection LOS (2005)

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay[2]	LOS	Delay[2]
Aurora Avenue N and N 205th Street	E	65	E	58
Aurora Avenue N and N 200th Street	C	33	D	40
Aurora Avenue N and N 195th Street[1]	F	59	F	72
Aurora Avenue N and N 192nd Street	A	6	A	7
Aurora Avenue N and N 185th Street	E	73	D	53
Midvale Avenue N and N 185th Street[1]	C	17	C	18
Aurora Avenue N and N 182nd Street[1, 3]	F	>150	F	>150
Midvale Avenue N and N 182nd Street[1, 3]	A	10	A	10
Aurora Avenue N and N 175th Street	D	54	E	56
Midvale Avenue N and N 175th Street	C	20	C	24
Aurora Avenue N and N 170th Street[1]	C	24	C	15
Aurora Avenue N and N 165th Street[1, 4]	C	26	C	24

Bold text indicates operations fail to meet the City standard of LOS E.

[1]Stop-controlled intersection. Reported delay is for the highest minor (stop-controlled) street approach delay.

[2] Delay is reported in units of average seconds per vehicle.

[3] Existing data collected prior to construction of N 182nd Street segment between Aurora Avenue N and Midvale Avenue N (North Central Segment of Interurban Trail). Traffic volumes and LOS/Delay are estimates of post-project conditions.

[4] Existing data collected prior to construction of intersection improvements and signal installation. (Aurora Corridor project – N 145th Street to N 165th Street). Traffic volumes and LOS/Delay are estimates of post-project conditions.

What transit service is currently available in the study area?

Aurora Avenue N is the primary transit corridor in the City. Transit service is provided in the study area by (King County) Metro Transit and (Snohomish County) Community Transit. Sound Transit does not operate any routes that run on Aurora Avenue N. Metro Transit has regular stops along N 200th Street, N 185th Street, N 175th Street, and Aurora Avenue N, and at the Shoreline Park-and-Ride and Aurora Village Transit Center. Community Transit has regular stops at Aurora Avenue N and N 205th Street and the Aurora Village Transit Center.

There are two Park-and-Ride lots located along the Aurora corridor. The Shoreline Park-and-Ride (400 stalls) is located at the southwest

corner of Aurora Avenue N and North 192nd Street and access is available from Aurora Avenue N and N 192nd Street. The Aurora Village Transit Center (200 stalls) is located one block east of Aurora Avenue N on N 200th Street. It is accessible from N 200th Street and the Aurora Village parking area. Table 6 summarizes transit service in the study area, including the Metro and Community Transit route numbers, descriptions, service days, weekday service times and directions, peak hour headways on weekdays, and stops in the study area served by each route.

Headway

The amount of time in-between consecutive buses on the same route..

Table 6. Transit Service within Study Area

No.	Route Description	Service Days	Weekday Service Times[1] (Direction)	Peak Hour Headways	Study Area Stops
(King County) Metro Transit[2]					
301	Downtown Seattle to Richmond Beach/Aurora Village Transit Center	Weekdays	4:40 a.m. to 9:30 a.m. 4:30 p.m. to 7:15 p.m. (to Seattle) 5:35 a.m. to 8 a.m. and 3 p.m. to 6:30 p.m. (to Richmond Beach/Aurora Village)	10 to 15 minutes	Aurora Village Transit Center Shoreline Park-and-Ride Others on Aurora Avenue N
303	First Hill to Shoreline Park-and-Ride	Weekdays	5:40 a.m. to 9:00 a.m. (to First Hill) 3:40 p.m. to 7 p.m. (to Shoreline Park-and-Ride)	20 to 30 minutes	Aurora Village Transit Center Shoreline Park-and-Ride
331	Kenmore Park-and-Ride to Shoreline Community College	All week	6:50 a.m. to 12:15 a.m. (to Kenmore Park-and-Ride) 6:20 a.m. to 10:35 p.m. (to Shoreline Community College)	30 minutes	Aurora Village Transit Center
342	Renton to Shoreline Park-and-Ride	Weekdays	4:45 a.m. to 8:30 a.m. (to Renton) 3:05 p.m. to 6:05 p.m. (to Shoreline Park-and-Ride)	30 minutes	Aurora Village Transit Center Shoreline Park-and-Ride
346	Northgate to Aurora Village Transit Center	All week	4:50 a.m. to 11:30 p.m. (to Northgate) 6:05 a.m. to 11:30 p.m. (to Aurora Village)	30 minutes	Aurora Village Transit Center
348	Northgate Transit Center to Richmond Beach/Mountlake Terrace	All week	5:55 a.m. to 11:30 p.m. (to Northgate) 5:50 a.m. to 12:10 a.m. (to Richmond Beach, Mountlake Terrace)	30 minutes	Aurora Avenue N at N 185th Street

No.	Route Description	Service Days	Weekday Service Times[1] (Direction)	Peak Hour Headways	Study Area Stops
358	Downtown Seattle to Aurora Village Transit Center	All week	4:25 a.m. to 1:00 a.m. (to Seattle) 5:35 a.m. to 2:05 a.m. (to Aurora Village)	5 to 15 minutes	Aurora Village Transit Center Shoreline Park-and-Ride Others on Aurora Avenue N
373	University District to Aurora Village Transit Center	Weekdays	6:10 a.m. to 9:45 a.m. (to University District) 1:30 p.m. to 7:30 p.m. (to Aurora Village)	30 minutes	Aurora Village Transit Center Shoreline Park-and-Ride Others on Aurora Avenue N
(Snohomish County) Community Transit[3]					
100 and 101	Aurora Village Transit Center to Mariner Park-and-Ride /Everett Station	All week	5:00 a.m. to 12:55 a.m. (to Aurora Village) 5:05 a.m. to 1:25 a.m. (to Mariner Park-and-Ride /Everett)	10 to 15 minutes	Aurora Avenue N and N 205th Street Aurora Village Transit Center
118	Aurora Village Transit Center to Ash Way Park-and-Ride	All week	5:50 a.m. to 11:45 p.m. (to Aurora Village) 5:30 a.m. to 11:45 p.m. (to Ash Way Park-and-Ride)	30 minutes	Aurora Avenue N and N 205th Street Aurora Village Transit Center
131	Aurora Village Transit Center to Edmonds Community College	All week	5:00 a.m. to 8:30 p.m. (to Aurora Village) 6:35 a.m. to 10:10 p.m. (to Edmonds Community College)	30 minutes	Aurora Avenue N and N 205th Street Aurora Village Transit Center
416	Edmonds to Downtown Seattle	Weekdays	3:35 p.m. to 7:10 p.m. (to Edmonds) 5:30 a.m. to 8:50 a.m. (to Seattle)	15 to 25 minutes	Aurora Avenue N and N 205th Street
870	Edmonds to University District	Weekdays	12:30 p.m. to 6:40 p.m. (to Edmonds) 6:00 a.m. to 10:25 a.m. (to University District)	35 to 65 minutes	Aurora Avenue N and N 205th Street

[1]Service times are approximate.

[2]Source: King County Metro 2006.

[3]Source: Community Transit 2005.

What pedestrian and bicycle facilities currently exist in the study area?

Sidewalks are limited on either side of Aurora Avenue N and generally occur only in front of recently developed establishments. Where no sidewalks are present, there is shoulder available.

However, vehicles are often parked on the shoulder, which restricts its use by pedestrians and bicyclists. There are currently no bike lanes on Aurora Avenue N. When completed in summer 2007, the Interurban Trail is planned to be a 3-mile non-motorized bicycle and pedestrian transportation facility that runs almost parallel to Aurora Avenue N between N 145th Street and N 205th Street. Outside of the City, the trail will connect to the regional system.

What are the traffic safety issues in the study area?

There are a number of traffic safety issues on Aurora Avenue N. The overall collision rate in the study area is more than double the statewide average for urban principal arterials. WSDOT has identified one HAC, three HALs, and two PALs on Aurora Avenue N, between N 165th Street and N 205th Street, for the 2007–2009 biennium (see Chapter 2 for descriptions of WSDOT safety designations). Three fatalities have occurred in the past 3 years, including two collisions in which pedestrians were struck by vehicles.

Safety Analysis

The following discussion will reveal the vehicle collision rates and the important patterns that emerged from the safety analysis. The collision data is categorized by intersection and roadway segment.

In the 3 years of collision data provided by WSDOT from January 1, 2003, to December 31, 2005, 455 collisions were reported in the project study area. Of the total, 254 resulted in property damage only; 187 accidents resulted in an injury; 11 were not stated; and three fatal collisions were reported.

Table 7 summarizes the type and frequency of the collisions in the study area. The predominant collision type along Aurora Avenue N in the past 3 years has been rear-end collisions (57.8%). The rear-end collision is the most common type in a congested corridor with at-grade signalized intersections and other uncontrolled access points. The next most frequent collision type was angle (19.5%), also a common type for a corridor with unmanaged access and numerous business driveways. The rear-end and angle collisions include incidents involving vehicles entering and/or leaving driveways.

Table 7. Summary of Collisions by Type

Accident Type	Number of Collisions	Percentage of Total
Rear End	263	57.8%
Angle	89	19.5%
Sideswipe	50	11.0%
Object	15	3.3%
Front End	13	2.9%
Pedestrian	13	2.9%
Bicycle	6	1.3%
Overturned	4	0.9%
Head On	1	0.2%
Other	1	0.2%
Total	455	100%

Note: Reflects data collected from January 1, 2003 to December 31, 2005

Source: WSDOT Collision Data Office, 2006.

Table 8 summarizes the study area collision types for each year in the 3-year period. The table shows that during the 3-year analysis period, an average of 152 collisions occurred per year within the project study area. The highest annual total of 170 occurred in 2004. The lowest annual total of 139 occurred in 2005. In each of the three years there were 76 to 95 collisions that resulted in property damage only, and 49 to 74 collisions that resulted in injuries.

Table 8. Annual Collision Summary

Year	Total Collisions	Property Damage Only	Injury	Not Stated	Fatality
2003	146	76	64	5	1
2004	170	95	74	1	0
2005	139	83	49	5	2
Total	455	254	187	11	3

Note: Reflects data collected from January 1, 2003 to December 31, 2005

Source: WSDOT Collision Data Office 2006.

Table 8 shows that three fatal collisions occurred during the 3-year study period, one in 2003 and two in 2005. The 2003 collision occurred at the N 182nd Street intersection, in which a vehicle making an eastbound left-turn from the stop-controlled approach was struck at an angle by a southbound vehicle. The first fatal collision in

2005 occurred south of N 185th Street near Fred Meyer, in which a pedestrian crossing at an uncontrolled location was struck and killed by a vehicle traveling northbound. The second fatal collision in 2005 occurred at the N 199th Street intersection, in which a southbound vehicle struck a pedestrian walking southbound on the right shoulder of the road. Both pedestrian fatalities occurred in the early afternoon in broad daylight.

Collision Rates

Table 9 shows the collision rates computed for each intersection and roadway segment, based on reported collisions between 2003 and 2005. Roadway segment collision rates, expressed in collisions per million vehicle miles traveled, are used to compare the collision experience of one roadway segment to another. Intersection collision rates, expressed in collisions per million entering vehicles, are used to compare the collision experience of one intersection to another. The overall collision rate for the study corridor provides a comparison to the statewide average rate for similar types of roads.

The study area of Aurora Avenue N was divided into segments between study area intersections. Individual segment collision rates are considered 1-mile segments to compute collision rates and are provided to compare between individual locations.

Intersection collisions include all that occurred within 100 feet of a controlled intersection. The study area intersections along Aurora Avenue N accounted for 60% (273 of 455) of all collisions in the study area, with the highest occurrence (59 of 273) at N 205th Street. Intersection collision rates ranged from 0.32 accidents per million entering vehicles at N 195th Street to 1.25 accidents per million entering vehicles at N 205th Street.

The roadway segments along Aurora Avenue N between study intersections accounted for approximately 40% (182 of 455) of all collisions in the study area. The Aurora Avenue N roadway segment between N 195th Street and N 200th Street had the highest incidence of collisions in the last 3 years when compared to other roadway segments. A contributing factor to this total is the unsignalized intersections at N 198th Street and N 199th Street. Roadway segment accident rates ranged from 0.03 accidents per million vehicle-miles north of N 205th Street to 1.22 accidents per million vehicle-miles between N 195th Street and N 200th Street.

Table 9. Aurora Avenue N Intersection and Roadway Segment Collision Rates

Description	Length (miles)	ADT (vpd)	Number of Collisions					Average Annual Collision Rate[1]
			PDO	Injury	Fatal	Not Stated	Total	
Aurora Avenue N Intersections								
N 205th Street	0.05	43,050	31	26	0	2	59	1.25
N 200th Street	0.05	33,650	22	16	0	0	38	1.03
N 195th Street	0.05	28,100	5	5	0	0	10	0.32
N 192nd Street	0.05	28,750	7	5	0	0	12	0.38
N 185th Street	0.05	38,750	21	22	0	1	44	1.04
N 182nd Street	0.05	29,550	8	3	1	0	12	0.37
N 175th Street	0.05	38,550	25	15	0	1	41	0.97
N 170th Street	0.05	32,650	20	11	0	3	34	0.95
N 165th Street	0.05	36,150	12	11	0	0	23	0.58
Aurora Avenue N Roadway Segments								
North of N 205th Street	0.04	35,660	0	1	0	0	1	0.03
N 205th Street to N 200th Street	0.21	34,500	6	2	0	0	8	0.21
N 200th Street to N 195th Street	0.20	32,850	21	22	1	0	44	1.22
N 195th Street to N 192nd Street	0.14	33,360	4	3	0	0	7	0.19
N 192nd Street to N 185th Street	0.26	33,360	7	5	0	0	12	0.33
N 185th Street to N 182nd Street	0.12	33,360	17	8	1	3	29	0.79
N 182nd Street to N 175th Street	0.29	33,360	14	5	0	0	19	0.52
N 175th Street to N 170th Street	0.19	38,450	15	14	0	1	30	0.71
N 170th Street to N 165th Street	0.21	39,000	17	12	0	0	29	0.68
South of N 165th Street	0.07	39,000	2	1	0	0	3	0.07
Totals for Aurora Avenue North	2.18	34,900	254	187	3	11	455	5.47

Notes:

Segments less than 1 mile in length are considered as a 1-mile segment to compute the collision rate, in accordance with WSDOT Collision Data Office practice.

Reflects data collected from January 1, 2003 to December 31, 2005

Abbreviations: vpd = vehicles per day; PDO = property damage only

[1]Units for intersection collisions rates are accidents per million entering vehicles. Units for roadway segment collision rates are accidents per million vehicle-miles.

Source: WSDOT Collision Data Office 2006.

The most recent statewide collision data (2005) indicate an overall average rate of 2.56 collisions per million vehicle-miles for statewide urban principal arterials. Individual segment collision rates are lower than the statewide average because they were calculated as though they were one-mile in length, in accordance with WSDOT Collision

Data Office practice. The total rate for the study area (5.47 collisions per million vehicle-miles) is much greater than the statewide average because it includes intersection-related accidents. The overall rate is much higher than any of the individual segment rates because it is calculated using the actual length of the study area.

Safety Programs

The WSDOT Collision Data Office uses three safety programs to identify sections of state highways with higher than average severe collision rates. The High Accident Corridor (HAC), High Accident Location (HAL), and Pedestrian Accident Location (PAL) programs are used by each of the six WSDOT Regions to develop construction priorities for every biennium. The criteria for these designations are described in Chapter 2, Purpose and Need, of this report. The most recently listed biennium listing is 2007-2009. The HAC program used five years of data (2000 to 2004); the HAL program used two years (2003-2004), and the PAL program used six years (1999-2004) for the 2007-2009 biennium listing. The WSDOT Collision Data Office identified one HAC, three HALs, and two PALs in the study area for the 2007–2009 biennium. Table 10 summarizes these locations.

Table 10. Locations with High Collision Designations

Begin Milepost	End Milepost	Location Description
High Accident Corridor (HAC)		
41.72	46.72	N 170th Street through N 205th Street
High Accident Locations (HAL)		
42.16	42.57	South of Ronald Place N to North of N 185th Street
42.94	43.34	South of N 195th Street to North of N 200th Street
43.37	43.56	South of N 205th Street to North of N 205th Street
Pedestrian Accident Locations (PAL)		
41.98	42.00	At N 175th Street
42.25	42.41	From N 180th Street to South of N 185th Street

Source: WSDOT Collision Data Office 2006.

What transportation goals and policies could be pertinent to the Project?

The City of Shoreline Comprehensive Plan – Transportation Element (City of Shoreline 2005) adopted goals and policies that pertain to the Project.

Transportation Goals

Following are transportation goals presented in the Comprehensive Plan that are applicable to the Project.

- Goal T I: Provide safe and friendly streets for Shoreline citizens.
- Goal T II: Work with transportation providers to develop a safe, efficient, and effective multimodal transportation system to address overall mobility and accessibility. Maximize the people-carrying capacity of the surface transportation system.
- Goal T IV: Provide a pedestrian system that is safe, connects to destinations, accesses transit, and is accessible by all.
- Goal T VIII: Develop a transportation system that enhances the delivery and transport of goods and services.
- Goal T X: Coordinate the implementation and development of Shoreline's transportation system with our neighbors and regional partners.
- Goal T XI: Maintain the transportation infrastructure so that it is safe and functional.

Transportation Policies

Safe and Friendly Streets

- Policy T5: Develop a safe roadway system as a high priority. Examples of methods to improve safety include:
  - center left-turn lanes;
  - median islands;
  - turn prohibitions;
  - signals, illumination;
  - access management; and
  - other traffic engineering techniques.

- Policy T9: Minimize curb cuts (driveways) on arterial streets by combining driveways through the development review process and in implementing capital projects.

Multi-Modal Transportation System

- Policy T10: Implement the Transportation Master Plan that integrates Green Streets, bicycle routes, curb ramps, major sidewalk routes, street classification, bus routes and transit access, street lighting, and roadside storm drainage improvements. Promote adequate capacity on the roadways and intersections to provide access to homes and businesses.
- Policy T12: Implement a coordinated signal system that is efficient and that is flexible depending on the demand or time of day, and responsive to all types of users.
- Policy T13: Adopt LOS E at the signalized intersections on the arterials within the City as the level of service standard for evaluating planning level concurrency and reviewing traffic impacts of developments, excluding the Highways of Statewide Significance (Aurora Avenue N and Ballinger Way NE). The level of service shall be calculated with the delay method described in the Transportation Research Board's Highway Capacity Manual 2000 or its updated versions.
- Policy T16: Design transportation improvements to support the City's land use goals and fit the character of the areas through which they pass.

Pedestrian System

- Policy T29: Provide sidewalks on arterial streets and neighborhood collectors.
- Policy T34: Implement the City's curb ramp program to install wheelchair ramps at all curbed intersections.

Freight Mobility System

- Policy T55: Ensure that service and delivery trucks, and other freight transportation can move with minimal delay on appropriate streets and rail systems in the City as shown on the truck route map.
- Policy T58: Work with developers/property owners along the Aurora Avenue N corridor and in North City to plan business access streets as a part of redevelopment.

Funding

- Policy T59: Aggressively seek grant opportunities to implement the adopted Transportation Element to ensure that Shoreline receives its fair share of regional and federal funding. Pursue grant opportunities for joint project needs with adjacent jurisdictions.

Regional Coordination

- Policy T66: Develop short-, medium-, and long-range priorities and implementation strategies for improvements to the state highway system within and adjacent to the City of Shoreline. Advocate for added access to and connections on to I-5 through the City of Shoreline.

Chapter 5. Potential Effects

This chapter describes potential transportation effects identified under the No Build and three Build Alternatives.

How was future traffic in the study area projected?

Travel demand forecasting from the City's Comprehensive Plan – Transportation Element (City of Shoreline 2005) and the PSRC 2030 travel demand model (PSRC 2001) were consulted to determine the expected growth in traffic volumes along Aurora Avenue N. The City's travel demand model is consistent with the PSRC demand model. Based on expected traffic growth projected by these two sources, it was determined that traffic in the study area would increase at an average of approximately 1.1% per year.

Traffic Volume Growth Rate

The rate of traffic increase as projected by City studies. Traffic in the study area is projected to increase at an average of 1.1% per year.

The traffic volume growth rate was applied to the 2005 existing intersection turning movement volumes to derive year 2013 No Build, 2013 Build, 2030 No Build and 2030 Build scenario traffic volume forecasts. The Build scenario traffic volumes applied to all three Build Alternatives.

Figure 7 shows the AM peak hour traffic volumes forecasted for use in the intersection operational analysis of 2013 No Build and the three Build Alternatives. Figure 8 shows the PM peak hour traffic volumes forecasted for use in the intersection operational analysis of 2013 No Build and three Build Alternatives. Figure 9 shows the AM

peak hour traffic volumes forecasted for use in the intersection operational analysis of 2030 No Build and three Build Alternatives.

Figure 10 shows the PM peak hour traffic volumes forecasted for use in the intersection operational analysis of 2030 No Build and three Build Alternatives.

All three Build Alternatives are similar in traffic operations and safety benefits with one small exception. Alternative B includes an additional westbound right-turn pocket at Aurora Avenue N and N 175th Street.

How were traffic operations evaluated?

Future forecasted traffic operations were evaluated in a similar manner to existing traffic operations described in Chapter 4. Intersection operations at signalized and stop-controlled intersections were graded using LOS as defined in the Highway Capacity Manual (Transportation Research Board 2000). A Synchro traffic model was created for each No Build and Build Alternative scenario for 2013 and 2030 during the same AM and PM peak hours (Appendix B).

How are roadways within the study area expected to operate under future No Build conditions?

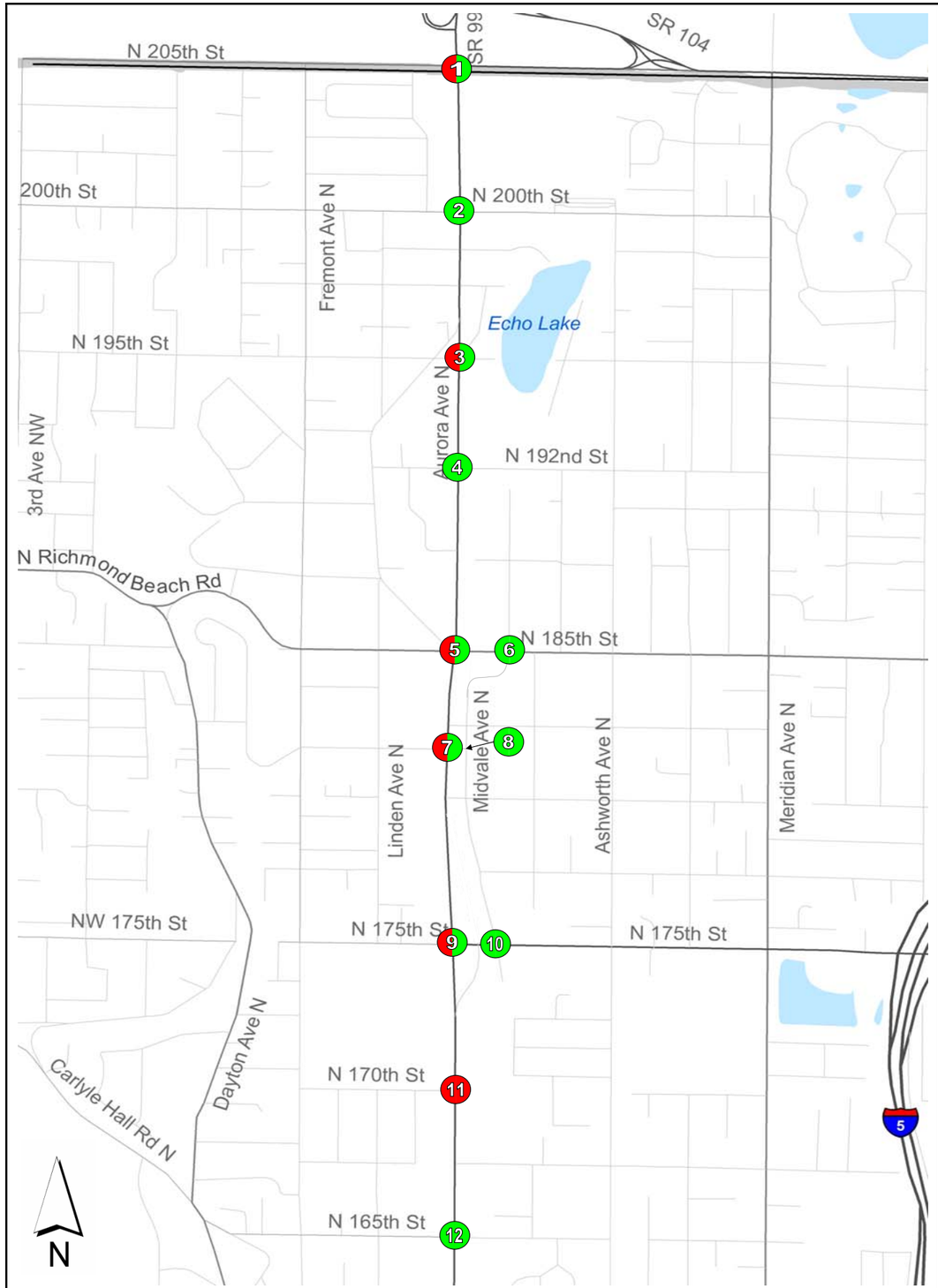
Under the No Build Alternative, intersection LOS would deteriorate below acceptable levels as travel demand increases throughout the corridor. In the year of opening (2013) six intersections would operate at LOS F during at least one peak hour, failing to meet the LOS goal. In the design year (2030) seven intersections would operate at LOS F during at least one peak hour, failing to meet the LOS goal. In addition, the lack of signalization at N 182nd Street and N 195th Street would greatly impair access to Aurora Avenue N at these locations, even for right-turning vehicles. Due to the poor service at these intersections, vehicles may take alternate routes through the street network to access signal-controlled intersections.

Year of Opening (2013)

Year in which construction will be completed and the Project is fully operational.

Design Year (2030)

Long-range planning year, defined by FHWA. Proposed improvement projects should be designed to address deficiencies projected to occur through this year.



1 Aurora Avenue N & N 205th Street

	Control	LOS
2013 No Build	Signal	F
2013 Build	***Signal***	***D***

285	***1800***	***155***		80	***80***	***170***	170			***60***	***60***
285	1800	155		275	***275***	***380***	380		25	460	85	***130***	130		XXX	20	480	80
240	***240***	***115***	*115*			***25***	***460***	***85***				***30***	*30*		***20***	***20***	***480***	***80***

2 Aurora Avenue N & N 200th Street

	Control	LOS
2013 No Build	Signal	E
2013 Build	***Signal***	***E***

40	***1950***	***90***	***5***	50	***50***	***XXX***	20			***15***	***15***
40	1950	90	XXX	70	***70***	***XXX***	5		XXX	20	580	10	***XXX***	15			
				100	***100***	***65***	*45*		***20***	***20***	***600***	***10***					

3 Aurora Avenue N & N 195th Street

	Control	LOS
2013 No Build	Stop*	F
2013 Build	***Stop****	***B***

15	***1960***	***10***	***5***	15	***30***	***20***	20			***10***	***10***
15	1945	10	XXX	5	***XXX***	***20***	20		XXX	20	630	20	***20***	15			
				15	***XXX***	***60***	*60*		***20***	***15***	***630***	***20***					

4 Aurora Avenue N & N 192nd Street

	Control	LOS
2013 No Build	Signal	A
2013 Build	***Signal***	***B***

35	***1750***	***150***	***5***	25	***25***	***20***	20			***10***	***10***
35	1750	150	XXX	25	***25***	***15***	15		XXX	10	550	10	***15***	15			
				15	***15***	***10***	*10*		***20***	***10***	***550***	***10***					

5 Aurora Avenue N & N 185th Street

	Control	LOS
2013 No Build	Signal	F
2013 Build	***Signal***	***D***

70	***1615***	***40***	***5***	25	***25***	***90***	90			***15***	15
70	1615	40	XXX	235	***235***	***405***	405		XXX	115	550	50	***455***	455		10	5	15
				195	***195***	***145***	*145*		***20***	***115***	***550***	***50***	***10***	*10*		***10***	***5***	***15***

6 Midvale Avenue N & N 185th Street

	Control	LOS
2013 No Build	Signal	A
2013 Build	***Signal***	***A***

10	***5***	***15***		20	***20***	***45***	***40***			***20***	***20***
10	5	15		465	***465***	***455***	455		10	5	15	***40***	40				
				15	***15***	***10***	*10*		***10***	***5***	***15***	***XXX***	*XXX*		***55***	***50***	***XXX***

7 Aurora Avenue N & N 182nd Street[a]

	Control	LOS
2013 No Build	Stop*	F
2013 Build	***Signal***	***B***

70	***1700***	***65***	***5***	45	***45***	***15***	15			***10***	***10***
70	1700	65	XXX	10	***10***	***10***	10		XXX	15	630	20	***10***	10			
				10	***10***	***60***	*60*		***20***	***15***	***630***	***20***					

8 Midvale Avenue N & N 182nd Street[b]

	Control	LOS
2013 No Build	Stop*	A
2013 Build	***Signal***	***C***

10	***50***	***XXX***				***40***	40				
10	50	XXX				***XXX***	*XXX*		55	50	XXX						
						55	*55*		***55***	***50***	***XXX***						

9 Aurora Avenue N & N 175th Street

	Control	LOS
2013 No Build	Signal	F
2013 Build	***Signal***	***D***

45	***1580***	***100***	***5***	50	***50***	***45***	45			***35***	35
45	1580	100	XXX	315	***315***	***405***	405		XXX	55	550	45	***585***	585		20	15	10
				455	***455***	***135***	*135*		***20***	***55***	***550***	***145***	***30***	*30*		***20***	***15***	***10***

10 Midvale Avenue N & N 175th Street

	Control	LOS
2013 No Build	Signal	C
2013 Build	***Signal***	***B***

40	***15***	***85***		75	***75***	***XXX***	30			***20***	***20***
40	15	85		795	***795***	***XXX***	*XXX*		XXX	30	750	XXX	***XXX***	*XXX*			
				20	***20***	***80***	*80*		***20***	***30***	***760***	***XXX***					

11 Aurora Avenue N & N 170th Street

	Control	LOS
2013 No Build	Stop*	F
2013 Build	***Stop****	***F***

40	***2040***	***XXX***	***XXX***			***XXX***	XXX			***15***	15
40	2030	XXX	XXX			***XXX***	XXX		XXX	140	710	30	***5***	5			
						80	*80*		***10***	***140***	***710***	***30***	***85***	85			

12 Aurora Avenue N & N 165th Street[c]

	Control	LOS
2013 No Build	Signal	C
2013 Build	***Signal***	***C***

60	***1985***	***25***	***20***	25	***25***	***15***	15			***10***	***10***
60	1985	25	10	5	***5***	***5***	5		10	140	710	30	***85***	85			
				20	***20***	***85***	*85*		***10***	***140***	***710***	***30***					

LEGEND

Signal	Signalized intersection
Stop	Stop-controlled minor street
XXX	Traffic movement is not permitted
LOS	Level-of-Service
UT	U-turn volume
LT	Left-turn volume
TH	Through volume
RT	Right-turn volume

Traffic movement

Intersection number
2013 NB AM LOS — 11 — 2013 Build AM LOS

Intersection not applicable
LOS A - E
LOS F

NOTES

* Worst minor street reported for unsignalized intersections.

a Existing data collected prior to construction of east leg. Traffic volumes and LOS are estimates of post-project conditions.

b Existing data collected prior to construction of intersection. Traffic volumes and LOS are estimates of post-project conditions.

c Existing data collected prior to construction of traffic signal. Traffic volumes and LOS are estimates of post-project conditions.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

Example AM Peak Traffic Volumes

2013 Build AM Peak Hour
2013 No Build AM Peak Hour

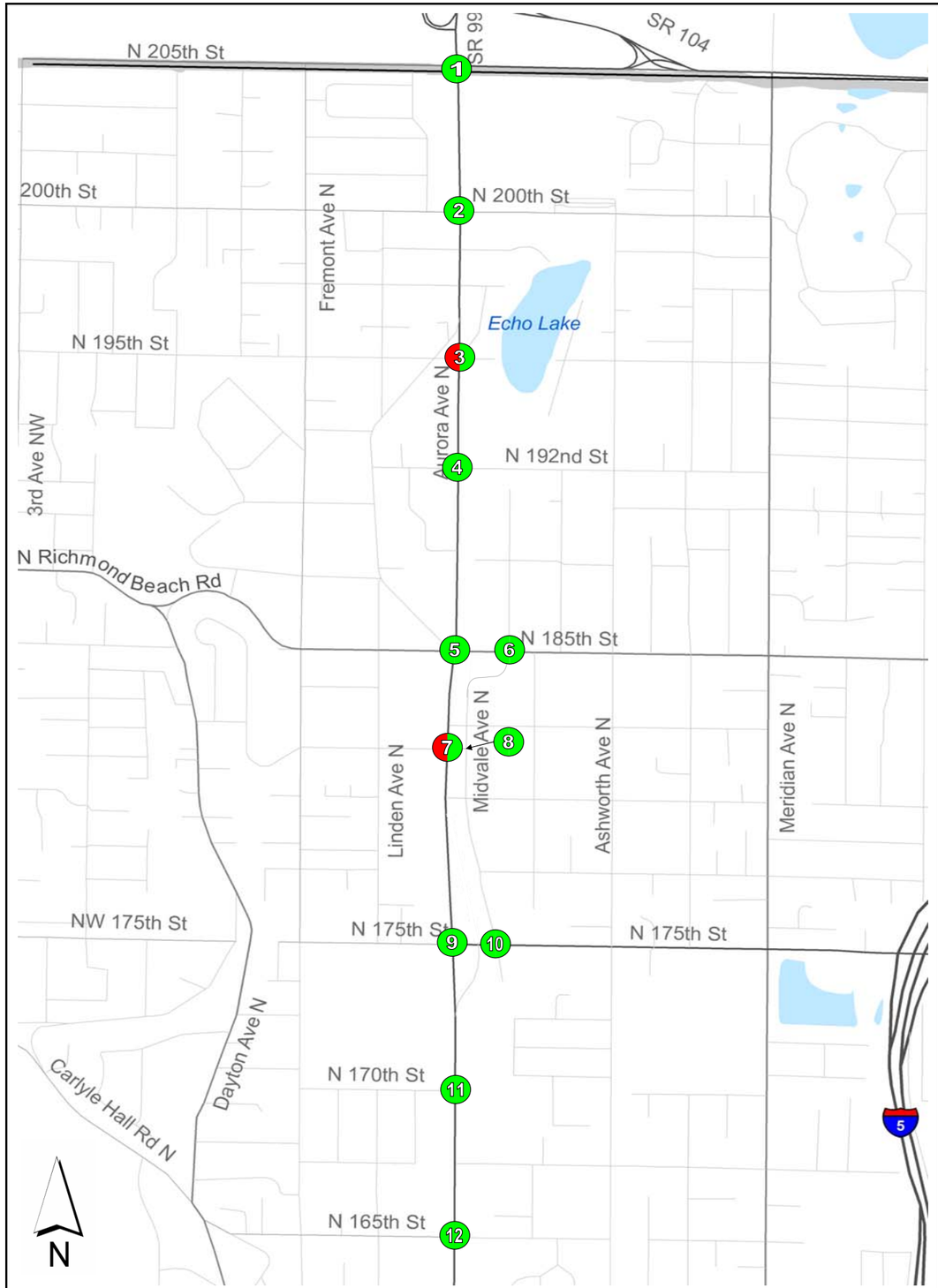
LT	LT			UT	LT	TH	RT
TH	TH			***UT***	***LT***	***TH***	***RT***
RT	RT						

2013 No Build AM Peak Hour

2013 Build AM Peak Hour

Figure 7. 2013 No Buillld and Build Alternatives A/B/C
AM Peak Hour - Traffic Volumes and Operations

Aurora Corridor Improvement Project
August 2007



1 Aurora Avenue N & N 205th Street

	Control	LOS
2013 No Build	Signal	E
2013 Build	***Signal***	***D***

185	***945***	***265***		335	***335***
185	945	265		445	***445***
				185	***185***
255	255								
335	335			85	1440	170
85	*85*			***85***	***1440***	***170***

2 Aurora Avenue N & N 200th Street

	Control	LOS
2013 No Build	Signal	E
2013 Build	***Signal***	***D***

55	***900***	***170***	***15***		105	***105***
55	900	170	XXX		170	***170***
					200	***200***
95	95								
130	130			XXX	35	1645	170
25	*25*			***10***	***35***	***1645***	***170***

3 Aurora Avenue N & N 195th Street

	Control	LOS
2013 No Build	Stop*	F
2013 Build	***Stop****	***B***

5	***1215***	***15***	***20***		10	***25***
5	1200	15	XXX		5	***XXX***
					15	***XXX***
XXX	30								
XXX	5			XXX	25	1745	25
55	*25*			***10***	***25***	***1775***	***25***

4 Aurora Avenue N & N 192nd Street

	Control	LOS
2013 No Build	Signal	A
2013 Build	***Signal***	***B***

20	***1100***	***40***	***20***		50	***50***
20	1100	40	XXX		35	***35***
					15	***15***
55	55								
25	25			XXX	20	1760	35
15	*15*			***10***	***20***	***1760***	***35***

5 Aurora Avenue N & N 185th Street

	Control	LOS
2013 No Build	Signal	E
2013 Build	***Signal***	***C***

50	***1065***	***80***	***20***		55	***55***
50	1065	80	XXX		305	***305***
					180	***180***
170	170								
370	370			XXX	115	1675	55
115	*115*			***15***	***115***	***1675***	***55***

6 Midvale Avenue N & N 185th Street

	Control	LOS
2013 No Build	Signal	A
2013 Build	***Signal***	***A***

20	***10***	***10***		20	***20***
20	10	10		570	***570***
				35	***35***
15	15								
520	520			30	10	40
15	*15*			***30***	***10***	***40***

7 Aurora Avenue N & N 182nd Street[a]

	Control	LOS
2013 No Build	Stop*	F
2013 Build	***Signal***	***C***

35	***1285***	***20***	***20***		80	***80***
35	1285	20	XXX		10	***10***
					10	***10***
15	15								
10	10			XXX	45	1630	35
110	*110*			***15***	***45***	***1630***	***35***

8 Midvale Avenue N & N 182nd Street[b]

	Control	LOS
2013 No Build	Stop*	A
2013 Build	***Signal***	***C***

10	***50***	***XXX***							
10	50	XXX							
25	25								
XXX	XXX			90	50	XXX
40	*40*			***90***	***50***	***XXX***

9 Aurora Avenue N & N 175th Street

	Control	LOS
2013 No Build	Signal	E
2013 Build	***Signal***	***C***

40	***1160***	***215***	***20***		155	***155***
40	1160	215	XXX		290	***290***
					355	***355***
55	55								
300	300			XXX	75	1525	40
50	*50*			***15***	***75***	***1525***	***345***

10 Midvale Avenue N & N 175th Street

	Control	LOS
2013 No Build	Signal	C
2013 Build	***Signal***	***B***

55	***25***	***95***		120	***120***
55	25	95		770	***770***
				20	***20***
80	80								
735	735			50	50	15
45	*45*			***50***	***50***	***15***

11 Aurora Avenue N & N 170th Street

	Control	LOS
2013 No Build	Stop*	C
2013 Build	***Stop****	***C***

25	***1515***	***XXX***	***XXX***						
25	1495	XXX	XXX						
XXX	XXX								
XXX	XXX			XXX	60	1945	XXX
40	*40*			***15***	***60***	***1965***	***XXX***

12 Aurora Avenue N & N 165th Street[c]

	Control	LOS
2013 No Build	Signal	C
2013 Build	***Signal***	***C***

85	***1395***	***30***	***20***		40	***40***
85	1395	30	10		5	***5***
					20	***20***
25	25								
10	10			10	225	1965	45
120	*120*			***10***	***225***	***1965***	***45***

LEGEND

Signal	Signalized intersection
Stop	Stop-controlled minor street
XXX	Traffic movement is not permitted
LOS	Level-of-Service
UT	U-turn volume
LT	Left-turn volume
TH	Through volume
RT	Right-turn volume

Traffic movement

Intersection number
2013 NB PM LOS — 11 — 2013 Build PM LOS

Intersection not applicable
LOS A - E
LOS F

NOTES

* Worst minor street reported for unsignalized intersections.

a Existing data collected prior to construction of east leg. Traffic volumes and LOS are estimates of post-project conditions.

b Existing data collected prior to construction of intersection. Traffic volumes and LOS are estimates of post-project conditions.

c Existing data collected prior to construction of traffic signal. Traffic volumes and LOS are estimates of post-project conditions.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

Example PM Peak Traffic Volumes

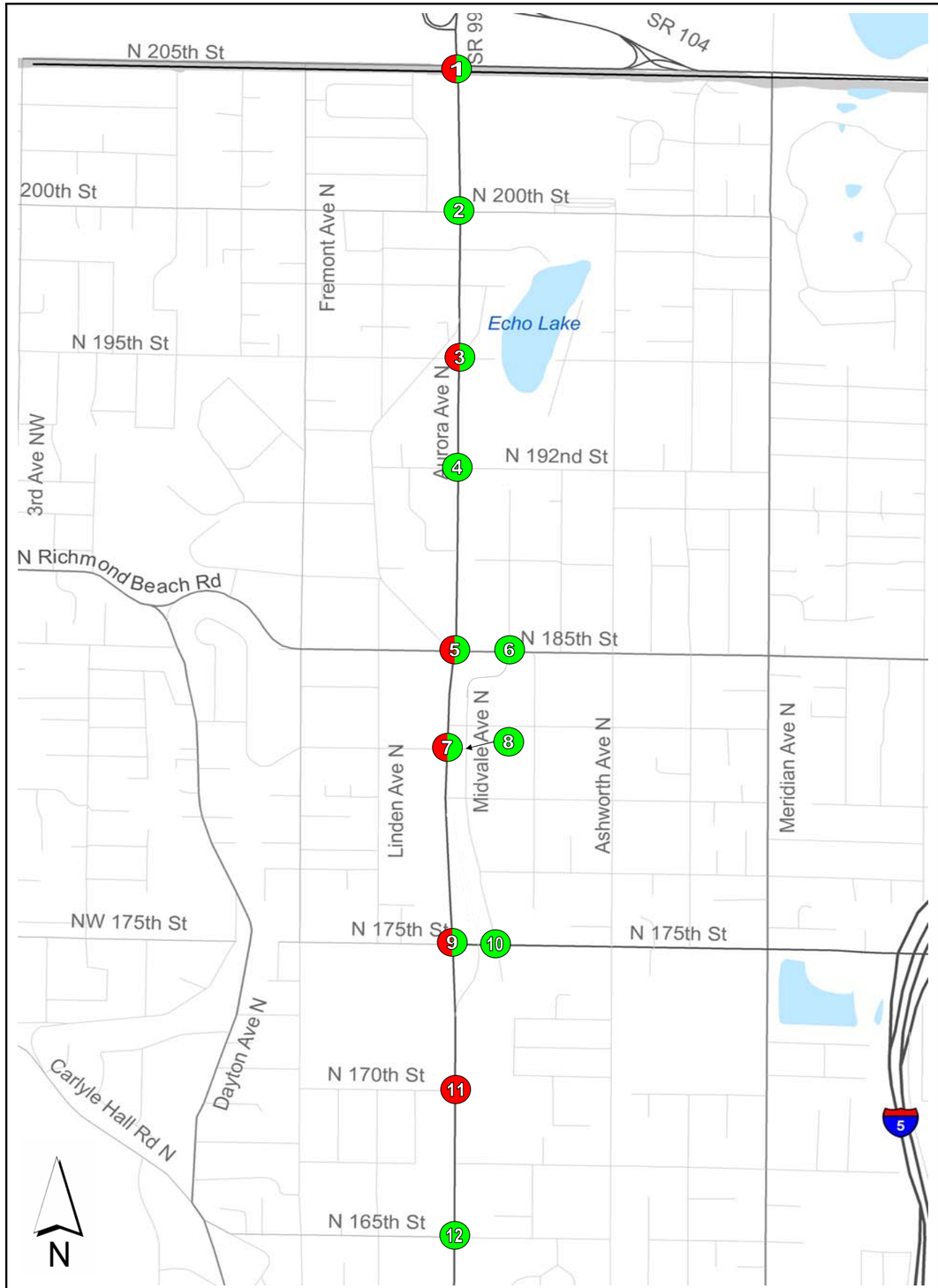
2013 Build PM Peak Hour
2013 No Build PM Peak Hour

2013 No Build PM Peak Hour / ***2013 Build PM Peak Hour***

LT	LT			UT	LT	TH	RT
TH	TH			***UT***	***LT***	***TH***	***RT***
RT	RT						

Figure 8. 2013 No Buillld and Build Alternatives A/B/C
PM Peak Hour - Traffic Volumes and Operations

Aurora Corridor Improvement Project
August 2007



1 Aurora Avenue N & N 205th Street

	Control	LOS
2030 No Build	Signal	F
2030 Build	***Signal***	***E***

335	***2055***	***180***		90	***90***	***200***	200			***60***	***60***
335	2055	180		320	***320***	***440***	440		30	540	100
				285	***285***	***135***	*135*		***30***	***540***	***100***

2 Aurora Avenue N & N 200th Street

	Control	LOS
2030 No Build	Signal	D
2030 Build	***Signal***	***D***

45	***2255***	***105***	***10***	60	***60***	***75***	75			***60***	***60***
45	2255	105	XXX	80	***80***	***150***	150		XXX	20	565	90
				115	***115***	***35***	*35*		***25***	***20***	***565***	***90***

3 Aurora Avenue N & N 195th Street

	Control	LOS
2030 No Build	Stop*	F
2030 Build	***Stop****	***A***

15	***2270***	***10***	***10***	15	***15***	***20***	20			***20***	***10***
15	2270	10	XXX	5	***5***	***5***	5		XXX	20	675	10
				15	***15***	***55***	*55*		***25***	***20***	***675***	***10***

4 Aurora Avenue N & N 192nd Street

	Control	LOS
2030 No Build	Signal	A
2030 Build	***Signal***	***B***

40	***2040***	***175***	***10***	30	***30***	***20***	20			***10***	***10***
40	2040	175	XXX	30	***30***	***15***	15		XXX	10	645	10
				15	***15***	***10***	*10*		***20***	***10***	***645***	***10***

5 Aurora Avenue N & N 185th Street

	Control	LOS
2030 No Build	Signal	F
2030 Build	***Signal***	***E***

80	***1860***	***45***	***10***	30	***30***	***105***	105			***60***	***60***
80	1860	45	XXX	275	***275***	***475***	475		XXX	135	625	60
				225	***225***	***170***	*170*		***25***	***135***	***625***	***60***

6 Midvale Avenue N & N 185th Street

	Control	LOS
2030 No Build	Signal	A
2030 Build	***Signal***	***A***

10	***5***	***15***		20	***20***	***15***	15			***15***	***15***
10	5	15		535	***535***	***525***	525		10	5	15
				15	***15***	***10***	*10*		***10***	***5***	***15***

7 Aurora Avenue N & N 182nd Street[a]

	Control	LOS
2030 No Build	Stop*	F
2030 Build	***Signal***	***C***

80	***1975***	***80***	***10***	50	***50***	***15***	15			***15***	***15***
80	1975	80	XXX	10	***10***	***10***	10		XXX	20	745	25
				15	***15***	***70***	*70*		***20***	***20***	***745***	***25***

8 Midvale Avenue N & N 182nd Street[b]

	Control	LOS
2030 No Build	Stop*	B
2030 Build	***Signal***	***C***

10	***60***	***XXX***				***50***	50			***50***	***50***
10	60	XXX				***XXX***	XXX		65	60	XXX
						65	*65*		***65***	***60***	***XXX***

9 Aurora Avenue N & N 175th Street

	Control	LOS
2030 No Build	Signal	F
2030 Build	***Signal***	***E***

55	***1825***	***115***	***10***	60	***60***	***55***	55			***60***	***60***
55	1825	115	XXX	340	***340***	***475***	475		XXX	65	665	40
				530	***530***	***150***	*150*		***25***	***65***	***665***	***140***

10 Midvale Avenue N & N 175th Street

	Control	LOS
2030 No Build	Signal	C
2030 Build	***Signal***	***B***

45	***15***	***100***		85	***85***	***40***	40			***20***	***15***
45	15	100		900	***900***	***655***	655		20	15	10
				20	***20***	***35***	*35*		***20***	***15***	***10***

11 Aurora Avenue N & N 170th Street

	Control	LOS
2030 No Build	Stop*	F
2030 Build	***Stop****	***F***

45	***2370***	***XXX***	***XXX***			***XXX***	XXX				
45	2360	XXX	XXX			***XXX***	XXX		XXX	35	870	XXX
						90	*90*		***25***	***35***	***880***	***XXX***

12 Aurora Avenue N & N 165th Street[c]

	Control	LOS
2030 No Build	Signal	D
2030 Build	***Signal***	***D***

75	***2315***	***30***	***10***	30	***30***	***15***	15			***10***	***10***
75	2315	30	10	5	***5***	***5***	5		10	160	830	35
				20	***20***	***100***	*100*		***10***	***160***	***830***	***35***

LEGEND

Signal	Signalized intersection
Stop	Stop-controlled minor street
XXX	Traffic movement is not permitted
LOS	Level-of-Service
UT	U-turn volume
LT	Left-turn volume
TH	Through volume
RT	Right-turn volume

Traffic movement

Intersection number

2030 NB AM LOS — 11 — 2030 Build AM LOS

Intersection not applicable
LOS A - E
LOS F

NOTES

* Worst minor street reported for unsignalized intersections.

a Existing data collected prior to construction of east leg. Traffic volumes and LOS are estimates of post-project conditions.

b Existing data collected prior to construction of intersection. Traffic volumes and LOS are estimates of post-project conditions.

c Existing data collected prior to construction of traffic signal. Traffic volumes and LOS are estimates of post-project conditions.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

Example AM Peak Traffic Volumes

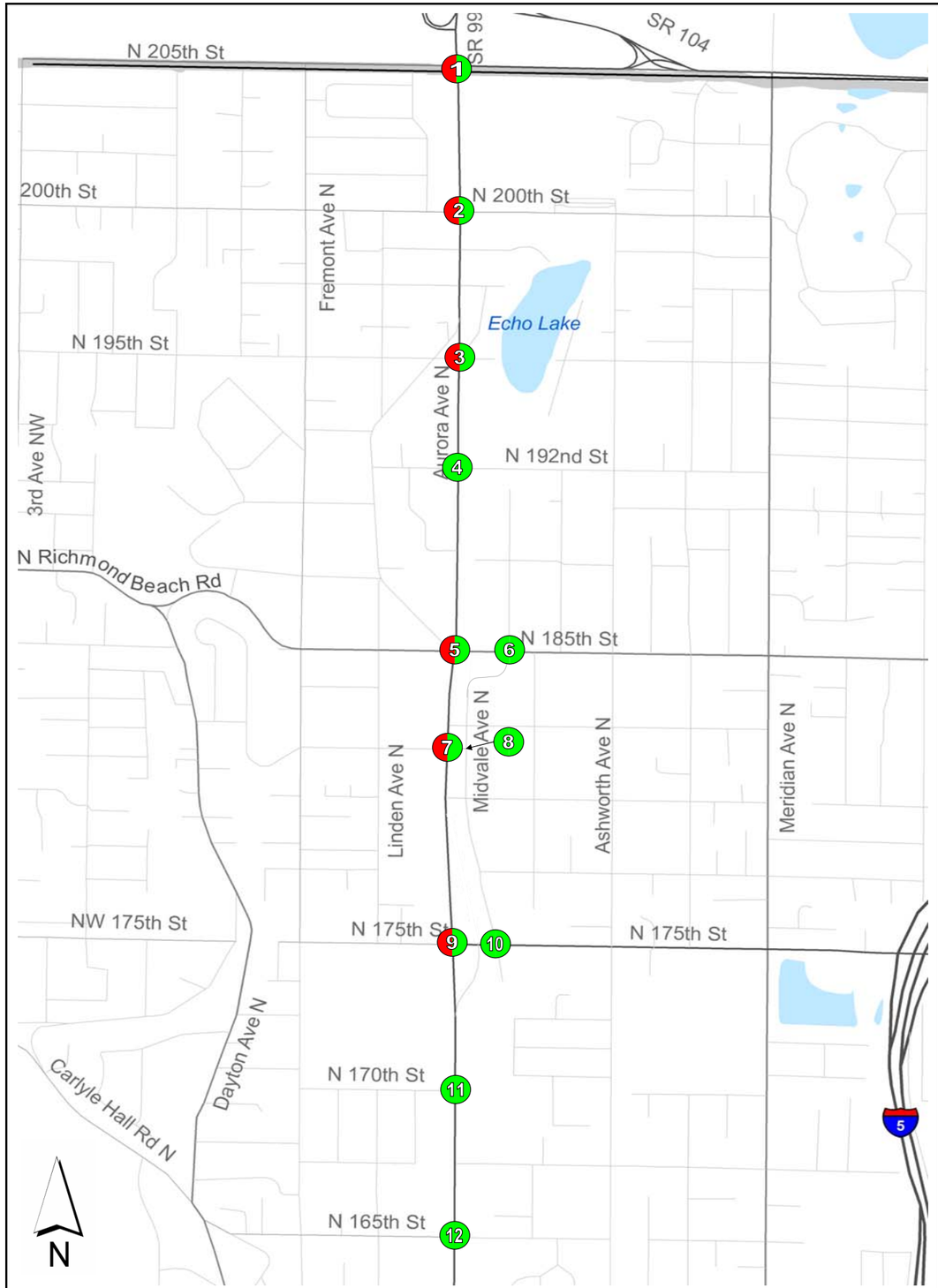
2030 Build AM Peak Hour						***LT***	LT			UT	***LT***
2030 No Build AM Peak Hour						***TH***	TH			LT	***TH***
						RT	RT			TH	***RT***
										RT	***UT***

2030 No Build AM Peak Hour

2030 Build AM Peak Hour

Figure 9. 2030 No Builld and Build Alternatives A/B/C
AM Peak Hour - Traffic Volumes and Operations

Aurora Corridor Improvement Project
August 2007



1 Aurora Avenue N & N 205th Street

	Control	LOS
2030 No Build	Signal	F
2030 Build	***Signal***	***E***

220	***1075***	***310***		390	***390***	***65***	***1040***	***200***	***20***	125	***125***
220	1075	310		520	***520***	65	1040	200	XXX	200	***200***
				220	***220***					230	***230***
295	295					***110***	110				
390	390			100	1675	200	***150***	150		XXX	40	1890	200
100	*100*			***100***	***1675***	***200***	***30***	*30*		***15***	***40***	***1890***	***200***

2 Aurora Avenue N & N 200th Street

	Control	LOS
2030 No Build	Signal	F
2030 Build	***Signal***	***E***

3 Aurora Avenue N & N 195th Street

	Control	LOS
2030 No Build	Stop*	F
2030 Build	***Stop****	***B***

5	***1380***	***15***	***25***	15	***15***	***20***	***1275***	***45***	***20***	60	***60***
5	1380	15	XXX	5	***5***	20	1275	45	XXX	40	***40***
				15	***15***					15	***15***
35	35					***65***	65				
5	5			XXX	30	2040	30	***30***	30		XXX	20	2060	40
30	*30*			***15***	***30***	***2040***	***30***	***15***	*15*		***15***	***20***	***2060***	***40***

4 Aurora Avenue N & N 192nd Street

	Control	LOS
2030 No Build	Signal	B
2030 Build	***Signal***	***B***

5 Aurora Avenue N & N 185th Street

	Control	LOS
2030 No Build	Signal	F
2030 Build	***Signal***	***E***

60	***1235***	***90***	***25***	65	***65***	***195***	195				
60	1235	90	XXX	370	***370***	***435***	435		XXX	135	1925	65
				215	***215***	***135***	*135*		***15***	***135***	***1925***	***65***

6 Midvale Avenue N & N 185th Street

	Control	LOS
2030 No Build	Signal	A
2030 Build	***Signal***	***A***

20	***10***	***10***		20	***20***	***15***	15				
20	10	10		655	***655***	***595***	595		35	10	45
				35	***35***	***15***	*15*		***35***	***10***	***45***

7 Aurora Avenue N & N 182nd Street[a]

	Control	LOS
2030 No Build	Stop*	F
2030 Build	***Signal***	***D***

40	***1500***	***25***	***25***	90	***90***	***15***	15				
40	1500	25	XXX	10	***10***	***20***	20		XXX	55	1900	40
				15	***15***	***125***	*125*		***20***	***55***	***1900***	***40***

8 Midvale Avenue N & N 182nd Street[b]

	Control	LOS
2030 No Build	Stop*	B
2030 Build	***Signal***	***C***

20	***60***	***XXX***				***35***	35				
20	60	XXX				***XXX***	XXX		95	60	XXX
						50	*50*		***95***	***60***	***XXX***

9 Aurora Avenue N & N 175th Street

	Control	LOS
2030 No Build	Signal	F
2030 Build	***Signal***	***D***

45	***1350***	***250***	***20***	180	***180***	***65***	65				
45	1350	250	XXX	345	***345***	***325***	325		XXX	85	1770	40
				415	***415***	***60***	*60*		***20***	***85***	***1770***	***345***

10 Midvale Avenue N & N 175th Street

	Control	LOS
2030 No Build	Signal	C
2030 Build	***Signal***	***B***

65	***30***	***110***		155	***155***	***90***	90				
65	30	110		870	***870***	***855***	855		60	60	15
				20	***20***	***55***	*55*		***60***	***60***	***15***

11 Aurora Avenue N & N 170th Street

	Control	LOS
2030 No Build	Stop*	C
2030 Build	***Stop****	***C***

30	***1770***	***XXX***	***XXX***			***XXX***	XXX				
30	1750	XXX	XXX			***XXX***	XXX		XXX	75	2200	XXX
						45	*45*		***20***	***75***	***2220***	***XXX***

12 Aurora Avenue N & N 165th Street[c]

	Control	LOS
2030 No Build	Signal	C
2030 Build	***Signal***	***D***

100	***1635***	***35***	***25***	45	***45***	***30***	30				
100	1635	35	5	5	***5***	***10***	10		10	265	2215	55
				20	***20***	***145***	*145*		***10***	***265***	***2215***	***55***

LEGEND

Signal	Signalized intersection
Stop	Stop-controlled minor street
N/A	Not applicable to scenario shown
XXX	Traffic movement is not permitted
LOS	Level-of-Service
UT	U-turn volume
LT	Left-turn volume
TH	Through volume
RT	Right-turn volume

Traffic movement

Intersection number

2030 NB PM LOS — 11 — 2030 Build PM LOS

Intersection not applicable
LOS A - E
LOS F

NOTES

* Worst minor street reported for unsignalized intersections.

a Existing data collected prior to construction of east leg. Traffic volumes and LOS are estimates of post-project conditions.

b Existing data collected prior to construction of intersection. Traffic volumes and LOS are estimates of post-project conditions.

c Existing data collected prior to construction of traffic signal. Traffic volumes and LOS are estimates of post-project conditions.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

Example AM Peak Traffic Volumes

2030 Build PM Peak Hour
2030 No Build PM Peak Hour

2030 No Build PM Peak Hour
2030 Build PM Peak Hour

LT	LT			UT	LT	TH	RT
TH	TH						
RT	RT			***UT***	***LT***	***TH***	***RT***

Figure 10. 2030 No Builld and Build Alternatives A/B/C PM Peak Hour - Traffic Volumes and Operations

Aurora Corridor Improvement Project
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Year of Opening (2013) Traffic Conditions

Future traffic conditions were analyzed for the year of opening (2013) No Build Alternative. The No Build Alternative lane channelization and intersection control would remain the same as existing at all intersections except Midvale Avenue N and N 185th Street. The City has included a new traffic signal at this intersection by 2013 in its Capital Facilities Plan. No signal timing optimization was performed for the current signalized intersections.

Figure 11 summarizes the No Build intersection lane channelization and control for the build year 2013.

Forecasted traffic volumes for both peak hours were used to analyze the study intersections. The average annual growth rate used was 1.1% for both peak hours. Figures 7 and 8 show the year of opening (2013) AM and PM peak hour traffic volumes forecasted for use in the intersection operational analysis of the No Build Alternative.

Table 11 summarizes the 2013 No Build Alternative peak hour LOS along Aurora Avenue N. The existing LOS and delay are provided for comparison.

Under the No Build Alternative, all the stop-controlled approaches intersecting Aurora Avenue N are forecasted to operate at LOS F during both peak hours, except during the PM peak hour at N 170th Street. This would occur because northbound and southbound traffic are expected to leave minimal gaps for side-street traffic to make a turn.

All of the signalized intersections are projected to operate at LOS E or better during the PM peak hour. But during the AM peak hour the signalized intersections at Aurora Avenue N and N 175th Street, N 185th Street, and N 205th Street are projected to operate at LOS F.

Table 11. Future 2013 No Build Intersection LOS Results

	2005 Existing				2013 No Build			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]
Aurora Avenue N and N 205th Street	E	65	E	58	F	90	E	71
Aurora Avenue N and N 200th Street	C	33	D	40	D	47	E	64
Aurora Avenue N and N 195th Street[1]	F	59	F	72	F	>150	F	>150
Aurora Avenue N and N 192nd Street	A	6	A	7	A	8	A	9
Aurora Avenue N and N 185th Street	E	73	D	53	F	106	E	70
Midvale Avenue N and N 185th Street	C[1]	17	C[1]	18	A	4	A	5
Aurora Avenue N and N 182nd Street[1, 3]	F	>150	F	>150	F	>150	F	>150
Midvale Avenue N and N 182nd Street[1, 3]	A	10	A	10	A	10	A	10
Aurora Avenue N and N 175th Street	D	54	E	56	F	75	E	67
Midvale Avenue N and N 175th Street	C	20	C	24	C	24	C	29
Aurora Avenue N and N 170th Street[1]	C	24	C	15	F	>150	C	17
Aurora Avenue N and N 165th Street	C[4]	26	C[4]	24	C	30	C	24

Bold text indicates operations fail to meet goal of LOS E.

[1] Stop-Controlled intersection. Reported delay is for the highest minor (stop-controlled) street approach delay.

[2] Delay is reported in units of average seconds per vehicle.

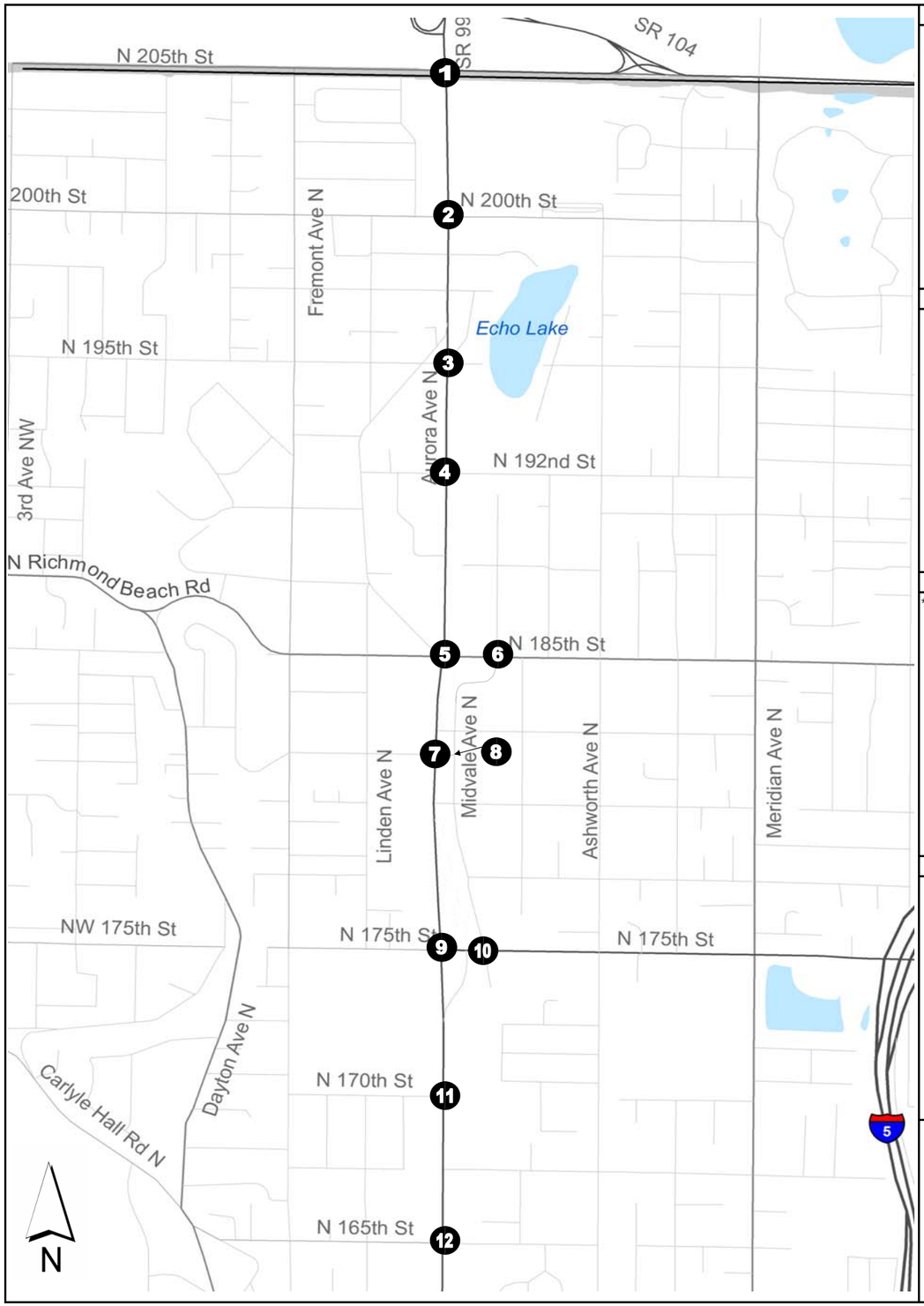
[3] Existing data collected prior to construction of N 182nd Street segment between Aurora Avenue N and Midvale Avenue N (North Central Segment of Interurban Trail). Traffic volumes and LOS/Delay are estimates of post-project conditions.

[4] Existing data collected prior to construction of intersection improvements and signal installation. (Aurora Corridor project – N 145th Street to N 165th Street). Traffic volumes and LOS/Delay are estimates of post-project conditions.

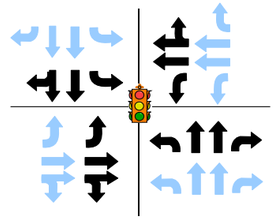
Design Year (2030) Traffic Conditions

Future traffic conditions were analyzed for the design year (2030) No Build Alternative. The No Build Alternative lane channelization and intersection control would remain the same at all intersections except Midvale Avenue N and N 185th Street. This intersection will be signalized by the year of opening and remain so until the design year. Optimization of signal timing was performed for all the signalized intersections. Figure 12 provides the No Build intersection lane channelization and control for the design year 2030.

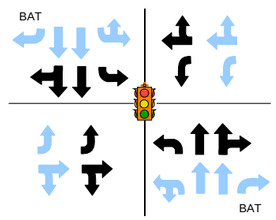
Forecasted traffic volumes for both peak hours were used to analyze the study intersections. The average annual growth rate used was 1.1% for both peak hours. Figures 9 and 10 show the design year (2030) AM and PM peak hour traffic volumes forecasted for use in the intersection operational analysis of the No Build Alternative.



1 Aurora Avenue N & N 205th Street

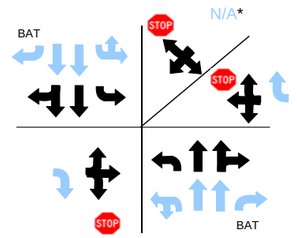


2 Aurora Avenue N & N 200th Street

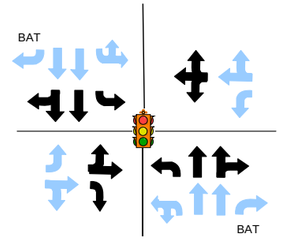


3 Aurora Avenue N & N 195th Street

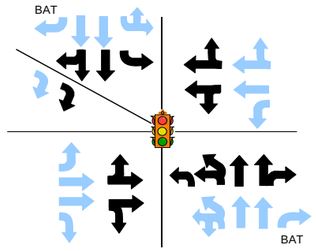
* Direct Echo Lake access removed under Build



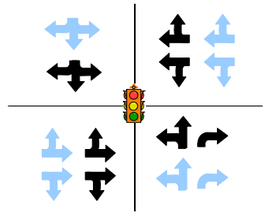
4 Aurora Avenue N & N 192nd Street



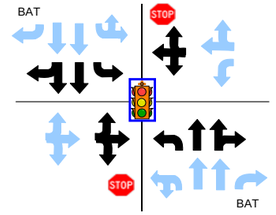
5 Aurora Avenue N & N 185th Street



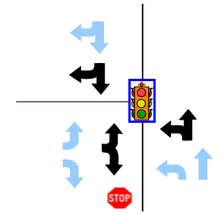
6 Midvale Avenue N & N 185th Street



7 Aurora Avenue N & N 182nd Street

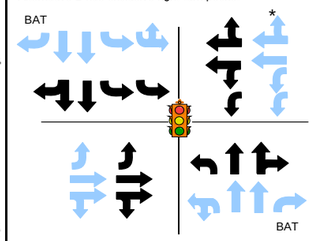


8 Midvale Avenue N & N 182nd Street

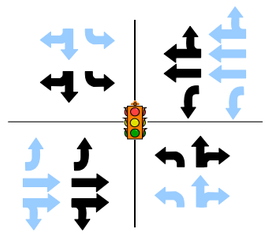


9 Aurora Avenue N & N 175th Street

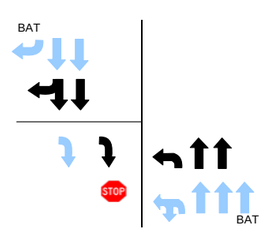
* Alternative B has exclusive right-turn pocket



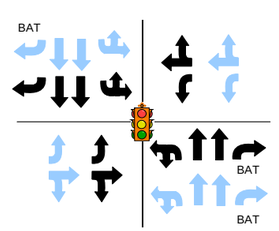
10 Midvale Avenue N & N 175th Street



11 Aurora Avenue N & N 170th Street



12 Aurora Avenue N & N 165th Street



LEGEND

- Signalized intersection
- Signalized intersection with Build
- Stop-controlled approach
- 2013 No Build lane channelization
- 2013 Build lane channelization
- 11 Intersection number
- BAT Business access and transit lane

Figure 11. 2013 No Build and Build Alternatives A/B/C Intersection Lane Channelization and Control

Aurora Corridor Improvement Project

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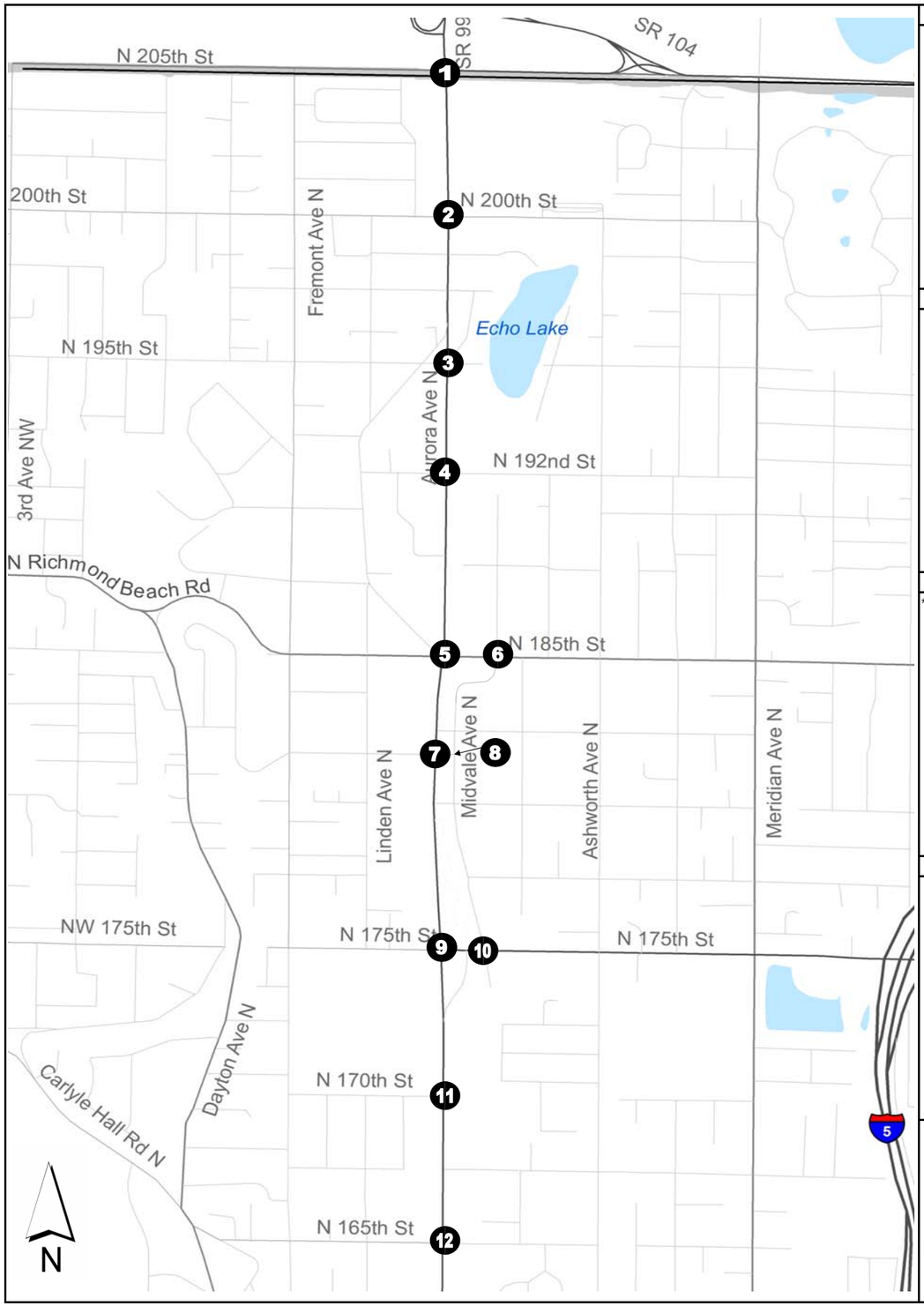
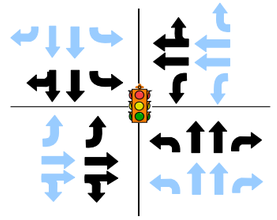
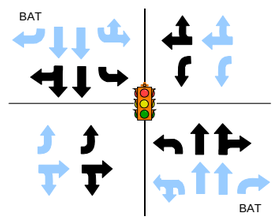


1 Aurora Avenue N & N 205th Street

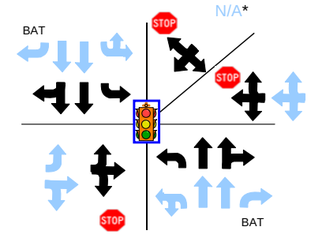


2 Aurora Avenue N & N 200th Street

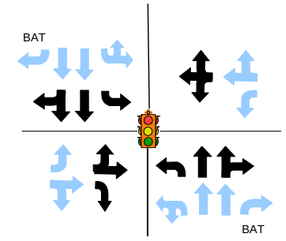


3 Aurora Avenue N & N 195th Street

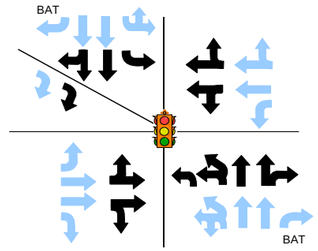
* Direct Echo Lake access removed under Build



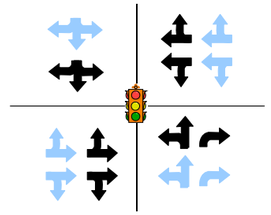
4 Aurora Avenue N & N 192nd Street



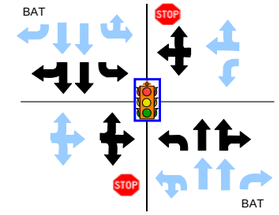
5 Aurora Avenue N & N 185th Street



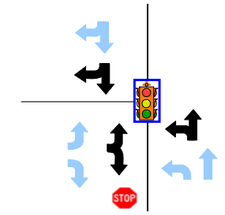
6 Midvale Avenue N & N 185th Street



7 Aurora Avenue N & N 182nd Street

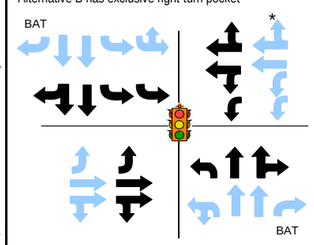


8 Midvale Avenue N & N 182nd Street

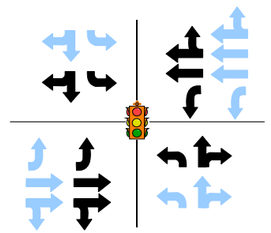


9 Aurora Avenue N & N 175th Street

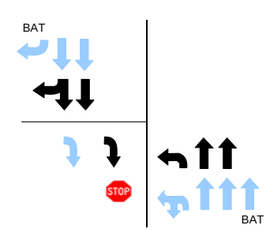
* Alternative B has exclusive right-turn pocket



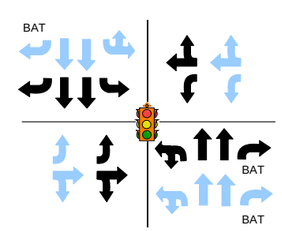
10 Midvale Avenue N & N 175th Street



11 Aurora Avenue N & N 170th Street



12 Aurora Avenue N & N 165th Street



LEGEND

- Signalized intersection
- Signalized intersection with Build
- Stop-controlled approach
- 2030 No Build lane channelization
- 2030 Build lane channelization
- 11 Intersection number
- BAT Business access and transit lane

Figure 12. 2030 No Build and Build Alternatives A/B/C Intersection Lane Channelization and Control

Aurora Corridor Improvement Project

August 2007

Table 12 summarizes the 2030 No Build Alternative peak hour LOS along Aurora Avenue N. The existing LOS and delay are provided for comparison.

Table 12. Future 2030 No Build Intersection LOS Results

	2005 Existing				2030 No Build			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]
Aurora Avenue N and N 205th Street	E	65	E	58	F	102	F	99
Aurora Avenue N and N 200th Street	C	33	D	40	D	48	F	90
Aurora Avenue N and N 195th Street[1]	F	59	F	72	F	>150	F	>150
Aurora Avenue N and N 192nd Street	A	6	A	7	A	3	B	12
Aurora Avenue N and N 185th Street	E	73	D	53	F	119	F	112
Midvale Avenue N and N 185th Street	C[1]	17	C[1]	18	A	4	A	5
Aurora Avenue N and N 182nd Street[1, 3]	F	>150	F	>150	F	>150	F	>150
Aurora Avenue N and N 182nd Street[1, 3]	A	10	A	10	B	10	B	10
Aurora Avenue N and N 175th Street	D	54	E	56	F	97	F	81
Midvale Avenue N and N 175th Street	C	20	C	24	C	24	C	31
Aurora Avenue N and N 170th Street[1]	C	24	C	15	F	>150	C	20
Aurora Avenue N and N 165th Street	C[4]	26	C[4]	24	D	50	C	34

Bold text indicates operations fail to meet goal of LOS E.

[1]Stop-Controlled intersection. Reported delay is for the highest minor (stop-controlled) street approach delay.

[2]Delay is reported in units of average seconds per vehicle.

[3] Existing data collected prior to construction of N 182nd Street segment between Aurora Avenue N and Midvale Avenue N (North Central Segment of Interurban Trail). Traffic volumes and LOS/Delay are estimates of post-project conditions.

[4] Existing data collected prior to construction of intersection improvements and signal installation. (Aurora Corridor project – N 145th Street to N 165th Street). Traffic volumes and LOS/Delay are estimates of post-project conditions.

Under the No Build Alternative, all the stop-controlled approaches intersecting Aurora Avenue N are projected to operate at LOS F during both peak hours, except during the PM peak hour at N 170th Street. This would occur because north- and southbound traffic are expected to leave minimal gaps for side-street traffic to make a turn.

Four of the eight signalized analysis intersections are projected to operate at LOS F during the PM peak hour. They include the intersections of Aurora Avenue N with N 175th Street, N 185th Street, N 200th Street, and N 205th Street. Only Aurora Avenue N at

N 200th Street is projected to operate better than LOS F during the AM peak hour.

How is the roadway expected to operate under the Build Alternatives?

The additional capacity provided by the Build Alternatives would provide better operating conditions along Aurora Avenue N than would be expected under the No Build Alternative. In the year of opening (2013) all study intersections are forecasted to operate at LOS D or better under all three Build Alternatives during both peak hours, with two exceptions. The signalized intersection at Aurora Avenue N/N 200th Street would operate at LOS E during the AM peak hour and the stop-controlled approach at N 170th Street would operate at LOS F during the AM peak hour, not meeting the LOS goal. The proposed southbound BAT lane through this intersection should provide further operational improvements beyond LOS F. However, the Synchro model is not capable of analyzing a special use BAT lane that provides a two-stage movement. Vehicles using this intersection would be expected to experience less delay than LOS F.

In the design year (2030) all study intersections are forecasted to operate at LOS E or better under all three Build Alternatives during both peak hours, with one exception. The stop-controlled approach at N 170th Street would operate at LOS F during the AM peak hour, not meeting the LOS goal. The proposed southbound BAT lane through this intersection should provide further operational improvements beyond LOS F. However, the Synchro model is not capable of analyzing a special use BAT lane that provides a two-stage movement. Vehicles using this intersection would be expected to experience less delay than LOS F. In addition, the proposed signalization at Aurora Avenue N/N 182nd Street and Aurora Avenue N/N 196th Street would improve operations to LOS C or better during both peak hours.

Major benefits of the Build Alternatives would be improved transit speed and reliability as well as the preservation of business access under congested conditions. Delays experienced at minor street approaches along the corridor would also be improved under the Build Alternatives.

New Traffic Signal Installations

New traffic signal installations have been proposed for intersections of Aurora Avenue N with N 182nd Street and N 196th Street. These installations are subject to signal warrant justification in accordance with the *Manual on Uniform Traffic Control Devices for Streets and Highways* (FHWA 2003). Based on projected traffic volumes, the signal warrant analysis indicates a likelihood of justification for the signal at N 182nd Street by the year of opening (2013). As such, the proposed signal was assumed to be in place under each Build Alternative by 2013. The signal warrant analysis did not indicate a likelihood of justification for the signal at N 196th Street by 2013 based on projected traffic volumes. Therefore, a right-in, right-out, left-in, stop-controlled approach was assumed for the N 196th Street movements. Justification of the signal was assumed by the design year (2030), so a new traffic signal was analyzed at N 196th Street intersection.

The State Traffic Engineer ultimately has authority over the installation of new traffic signals on Aurora Avenue N (SR 99). The possibility exists that no new signals would be permitted at N 182nd Street or N 196th Street in either year. Without traffic signals, left-turns out of the side street approaches will be prohibited. Left-turn movements from these side streets would be required to turn right and make a U-turn at a downstream mid-block location or proceed to the nearest signalized intersection. With restriction of the left-turn out movement, the stop-controlled approaches would operate at acceptable LOS during both peak hours.

Year of Opening (2013) Traffic Conditions

Future traffic conditions were analyzed for the year of opening (2013) Build Alternatives A, B, and C. Table 13 shows the changes in study intersections according to the three Build Alternatives. The only difference, in relation to traffic operating capacity and safety, between Alternatives A/C and B is the addition of a westbound right-turn pocket on N 175th Street at Aurora Avenue N.

Table 13. Year of Opening (2013) Intersection Modifications

Study Intersection	Alternatives A, B, and C
Aurora Avenue N and N 205th Street	Northbound: new BAT lane Southbound: new right-turn pocket; southbound BAT lane begins on south leg of intersection Westbound: new right-turn pocket
Aurora Avenue N and N 200th Street	Northbound: new BAT lane Southbound: new BAT lane
Aurora Avenue N and N 196th Street	Shift intersection north to align with N 196th Street and Firlands Way N Terminate fifth leg access to Echo Lake Place Northbound: new BAT lane Southbound: new BAT lane Eastbound: restrict to right-turn-out only Westbound: restrict to right-turn-out only
Aurora Avenue N and N 192nd Street	Northbound: new BAT lane Southbound: new BAT lane Eastbound: re-stripe for left-turn pocket and shared through/right-turn lane Westbound: new left-turn pocket
Aurora Avenue N and N 185th Street	Allow east/west protected left-turn phasing Northbound: new BAT lane and reduce to one left-turn pocket Southbound: new BAT lane Eastbound: new left and right-turn pockets Westbound: new left-turn pocket
Midvale Avenue N and N 185th Street	No modifications as part of this project
Aurora Avenue N and N 182nd Street	New traffic signal Northbound: new BAT lane Southbound: new BAT lane Westbound: new left-turn pocket
Midvale Avenue N and N 182nd Street	New traffic signal
Aurora Avenue N and N 175th Street	Allow east/west protected left-turn phasing Northbound: new BAT lane Southbound: new BAT lane Westbound: provide two left-turn pockets Westbound (Alternative B only): provide a new westbound right-turn pocket
Midvale Avenue N and N 175th Street	Westbound: new through lane
Aurora Avenue N and N 170th Street	Northbound: new BAT lane Southbound: new BAT lane
Aurora Avenue N and N 165th Street	Southbound: new BAT lane

Along with the northbound/southbound BAT lanes that operate as general purpose vehicle right-turn pockets at intersections along Aurora Avenue N, the modifications include a new traffic signal at Aurora Avenue N and N 182nd Street, and the reduction of the northbound left-turn lanes from two to one at Aurora Avenue N and N 185th Street. Figure 11 provides the Build Alternatives intersection lane channelization and control for the 2013 year of opening.

Traffic operations under all the Build Alternatives are nearly identical. The addition of a westbound right-turn pocket at Aurora Avenue N and N 175th Street under Alternative B increases or decreases the overall intersection delay by one second along Aurora Avenue N from N 175th Street to N 185th Street. This occurs because the westbound right-turn pocket reduces the delay to this movement and allows northbound vehicles to enter the traffic stream easier and reach N 182nd Street.

Build Alternatives

Forecasted traffic volumes for both peak hours were used to analyze the study intersections. The average annual growth rate used was 1.1% for both peak hours. Figures 7 and 8 show the year of opening (2013) AM and PM peak hour traffic volumes forecasted for use in the intersection operational analysis of the Build Alternatives A, B, and C. Signal timing was optimized at each of the modified intersections so signals would operate in a coordinated system.

Table 14 summarizes the 2013 Build Alternatives A, B, and C peak hour LOS along Aurora Avenue N. The 2013 No Build LOS and delay are provided for comparison.

Table 14. Year of Opening (2013) No Build and Build Alternatives Intersection LOS

	2013 No Build				2013 Build Alternatives A, B, and C			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]
Aurora Avenue N and N 205th Street	F	90	E	71	D	50	D	47
Aurora Avenue N and N 200th Street	E	72	E	64	E	59	D	50
Aurora Avenue N and N 195th Street[1]	F	>150	F	>150	B	14	B	15
Aurora Avenue N and N 192nd Street	A	8	A	9	B	11	B	14
Aurora Avenue N and N 185th Street	F	106	E	70	D	44	C	32
Midvale Avenue N and N 185th Street	A	4	A	5	A	4	A	5
Aurora Avenue N and N 182nd Street	F[1]	>150	F[1]	>150	B	18	C	24 Alt B: 25
Midvale Avenue N and N 182nd Street	A[1]	10	A[1]	10	C	23	C	29 Alt B: 30
Aurora Avenue N and N 175th Street	F	75	E	67	D	46	C	34 Alt B: 33
Midvale Avenue N and N 175th Street	C	24	C	29	B	12	B	19
Aurora Avenue N and N 170th Street[1]	F	>150	C	17	F	139	C	17
Aurora Avenue N and N 165th Street	C	30	C	24	C	31	C	33

Bold text indicates operations fail to meet goal of LOS E.

[1] Stop-controlled intersection. Reported delay is for the highest minor (stop-controlled) street approach delay.

[2] Delay is reported in units of average seconds per vehicle.

With the improvements proposed under Build Alternatives A, B, and C, all of the study intersections projected to operate at LOS F under the 2013 No Build Alternative improve to LOS D or better, except for the stop-controlled approach at N 170th Street during the AM peak hour.

A new traffic signal will be installed at Aurora Avenue N and N 182nd Street only if the State Traffic Engineer approves it. Without a traffic signal, left-turns out of the N 182nd Street approaches will be prohibited. Drivers who want to turn left from N 182nd Street will need to turn right and make a U-turn at N 185th Street or N 175th Street. This would result in increased U-turn volumes at the signalized intersections and slightly increased overall intersection delays. With restriction of the left-turn out movement, the stop-controlled N 182nd Street approaches would operate at acceptable LOS during both peak hours.

Design Year (2030) Traffic Conditions

Future traffic conditions were analyzed for the design year (2030) Build Alternatives A, B, and C. The 2030 Build Alternative changes to study intersections are the same as 2013 Build Alternative changes (see Table 13) with one addition. Full access will be allowed at Aurora Avenue N and N 196th Street and a new traffic signal will be installed.

Along with the northbound/southbound BAT lanes that operate as general purpose vehicle right-turn pockets at intersections along Aurora Avenue N, the modifications include a new traffic signal at Aurora Avenue N and N 196th Street, a new traffic signal at Aurora Avenue N and N 182nd Street, and the reduction of the northbound left-turn lanes from two to one at Aurora Avenue N and N 185th Street. Figure 12 provides the Build Alternatives intersection lane channelization and control.

Traffic operations under all the Build Alternatives are nearly identical. The addition of a westbound right-turn pocket at Aurora Avenue N and N 175th Street under Alternative B increases the overall intersection delay up to three seconds at Aurora Avenue N and N 182nd Street.

Build Alternatives

Forecasted traffic volumes for both peak hours were used to analyze the study intersections. The average annual growth rate used was 1.1% for both peak hours. Figures 9 and 10 show the design year (2030) AM and PM peak hour traffic volumes forecasted for use in the intersection operational analysis of Build Alternatives A, B and C. Signal timing was optimized at each of the modified intersections so signals would operate in a coordinated system.

Table 15 summarizes the 2030 Build Alternatives A, B, and C peak hour LOS along Aurora Avenue N. The 2030 No Build LOS and delay are provided for comparison.

Table 15. Design Year (2030) No Build and Build Alternative Intersection LOS

	2030 No Build				2030 Build Alternatives A, B, and C			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]
Aurora Avenue N and N 205th Street	F	102	F	99	E	71	E	72
Aurora Avenue N and N 200th Street	D	48	F	90	D	48	E	71
Aurora Avenue N and N 195th Street[1]	F	>150	F	>150	A	7	B	10
Aurora Avenue N and N 192nd Street	A	3	B	12	B	15	B	10
Aurora Avenue N and N 185th Street	F	119	F	112	E	78	E	56
Midvale Avenue N and N 185th Street	A	4	A	5	A	4	A	5
Aurora Avenue N and N 182nd Street	F[1]	>150	F[1]	>150	C	22 Alt B: 23	D	35 Alt B: 38
Midvale Avenue N and N 182nd Street	B[1]	10	B[1]	10	C	24	C	28
Aurora Avenue N and N 175th Street	F	97	F	81	E	70	D	48
Midvale Avenue N and N 175th Street	C	24	C	31	B	14	B	19
Aurora Avenue N and N 170th Street[1]	F	>150	C	20	F	121	C	20
Aurora Avenue N and N 165th Street	D	50	C	34	D	50	D	47

Bold text indicates operations fail to meet goal of LOS E.

[1] Stop controlled intersection. Reported delay is for highest minor (stop-controlled) street approach delay.

[2] Delay is reported in units of average seconds per vehicle.

With the improvements proposed under Build Alternatives A, B, and C, all of the study intersections forecasted to operate at LOS F under the 2030 No Build improve to LOS E or better except the stop-controlled approach at N 170th Street during the AM peak hour.

New traffic signals will be installed at the intersections of Aurora Avenue N/N 182nd Street and Aurora Avenue N/N 196th Street only if the State Traffic Engineer approves them. Without a traffic signal, left-turns out of the N 182nd Street and N 196th Street approaches will be prohibited. Drivers who want to turn left from the side street will need to turn right and make a U-turn at a downstream mid-block location or proceed to a signalized intersection. This would result in increased U-turn volumes at the signalized intersections and slightly increase overall intersection delays. With restriction of the left-turn out movement, the stop-controlled N 182nd Street and N 196th Street approaches would operate at acceptable LOS during both peak hours.

What are the potential effects on pedestrians and bicyclists?

No Build Alternative

Under the No Build Alternative, Aurora Avenue N would continue to be a nonstandard and uncomfortable environment for pedestrians and bicyclists due to the lack of sidewalks and the lack of adequate crossing opportunities. The potential for collisions involving pedestrians would increase due to increasing traffic volumes on the roadway and increased number of pedestrians due to the proximity of Aurora Avenue N to the Interurban Trail.

Alternative A

Pedestrian safety improvements along Aurora Avenue N under Build Alternative A would include continuous sidewalks; improved pedestrian-scaled lighting throughout the corridor; and improved pedestrian crossings, including new signalized crossings at N 182nd Street by 2013 and N 196th Street by 2030. Such elements would reduce pedestrian exposure to conflicts with motor vehicles and might decrease the number of pedestrian-involved accidents along the corridor. They would improve access for transit patrons. Bicyclists would also benefit from the improved and signalized crossings. The planned Interurban Trail is expected to provide the non-motorized alternative to Aurora Avenue N.

The widening of Aurora Avenue N will result in longer crossing distances and pedestrian crossing times at signalized intersections.

Alternative A would provide a 7-foot-wide sidewalk along both sides of the roadway for the entire 2-mile segment. This would provide the necessary condition for the disabled and mobility challenged and would comply with the requirements of the Americans with Disabilities Act.

Alternatives B and C

Pedestrian safety improvements along Aurora Avenue N under Build Alternatives B and C would include continuous sidewalks; improved pedestrian-scaled lighting throughout the corridor; and improved pedestrian crossings, including new signalized crossings at N 182nd Street by 2013 and N 196th Street by 2030. Such elements would reduce pedestrian exposure to conflicts with motor vehicles and

might decrease the number of pedestrian-involved accidents along the corridor. They would improve access for transit patrons. Bicyclists would also benefit from the improved and signalized crossings. The planned Interurban Trail is expected to provide the non-motorized alternative to Aurora Avenue N.

The widening of Aurora Avenue N will result in longer crossing distances and pedestrian crossing times at signalized intersections. Alternative B would provide a 7-foot-wide sidewalk along both sides of the roadway for the entire 2-mile segment. In addition, a 4-foot-wide landscape and amenity zone would be provided as an additional benefit to pedestrian safety and comfort. The 4-foot-wide amenity zone would buffer pedestrians from vehicular traffic and provide an area for the installation of utilities, poles, and vaults that might otherwise conflict with the walkway for pedestrians. The amenity zone also would allow the necessary width to accommodate the full driveway apron without affecting the cross-slope or grade of the 7-foot-wide sidewalk. This would provide a more desirable condition for the disabled and mobility challenged and would ensure compliance with the requirements of the Americans with Disabilities Act.

What is the potential effect on safety in the project area?

No Build Alternative

Under the No Build Alternative, accident experience would be expected to worsen. Lack of access controls would lead to accident rates equal to or greater than those under existing conditions. The total number of accidents per year would be higher due to increasing traffic volumes and greater occurrence of conflicting vehicle movements. Under the No Build Alternative, continued land use redevelopment along the corridor would add some sidewalk and defined driveway access points. These changes would serve to improve pedestrian safety, but would do nothing to reduce the number of conflicting vehicular movements.

Build Alternatives

All three Build Alternatives would provide comprehensive access management improvements to Aurora Avenue N such as the addition of curbs and gutters; the application of driveway width and spacing

standards; the conversion of the existing two-way left-turn lane into a channelized left-turn and u-turn lane and a raised median; and the restriction of most driveways to right-turn-in and right-turn-out only. Research (Parsonson, Waters, and Fincher 1993) indicates that implementing access management can reduce overall crash rates up to 26% and reduce property-damage-only rates up to 40%. Based on the level of access management provided under the Build Alternatives, it would be expected that the accident experience would be reduced relative to the No Build Alternative.

The Build Alternatives would also improve safety by reducing congestion and increasing capacity at N 175th Street, N 185th Street, N 192nd Street, and N 205th Street; installing new traffic signals at N 182nd Street and N 196th Street; constructing new BAT lanes that would provide right-turn only lanes at intersections; and improving signal timing for the entire corridor. The BAT lanes also serve to remove turning movements accessing adjacent businesses from the congested general-purpose travel lanes. Under Alternatives B and C, the amenity zone would have a beneficial effect on pedestrian safety, by providing increased separation between the roadway and the sidewalk.

What is the potential effect on transit in the project area?

No Build Alternative

Under the No Build Alternative transit speed and reliability would deteriorate as traffic congestion continues to increase because transit vehicles would be required to share lanes with general-purpose vehicles. At locations where transit vehicles pull out of the traffic lanes to serve transit stops, re-entry into the traffic lanes would involve more delay because there would be fewer adequate gaps in the traffic flow available.

Build Alternatives

Under all of the Build Alternatives, transit service would improve all along Aurora Avenue N through the Aurora Corridor projects. Continuous BAT lanes would be developed in each direction throughout the corridor, thereby completing the three-mile length in the City. These lanes would be shared with traffic entering the roadway and accessing driveways and cross streets. In addition,

enhanced bus zones and bus shelters would be created and transit signal priorities would be established. Enhancing transit features along Aurora Avenue N would encourage more transit use by commuters and each new transit user could remove vehicles from the road, reducing traffic congestion. A continuous sidewalk system in the corridor would make it safer and more convenient to access transit stops.

Transit speed and reliability would be expected to improve over existing conditions and the No Build Alternative; as a result, transit would attract more riders. Under the Build Alternatives, transit would achieve a much higher mode share of trips along the corridor, especially during peak periods. Enhanced bus shelters, transit lanes, and transit signal priority are among the improvements proposed in the Project. Transit feature enhancements, along with improvements in transit speed and reliability, would be expected to result in higher transit use by commuters.

The proposed Interurban Trail would provide alternative enhanced routes for pedestrians and bicyclists accessing transit along the Aurora Avenue N corridor. When combined with the improvements described above, access to the transit system would be greatly improved.

What are the potential effects on vehicular and non-motorized traffic due to construction?

No Build Alternative

No construction is required in the No Build Alternative, and thus no effects to non-motorized traffic would occur.

Build Alternatives

Construction activity impacts on traffic flow would potentially result from lane closures, detours, and temporary traffic control measures. Revisions to business access typically disrupt access due to driver unfamiliarity with the new access conditions. Temporary striping and lane markings may cause disruptions to normal traffic flows. Delivery and patron access would also be impacted during construction.

Chapter 6. Measures to Avoid or Minimize Project Effects

This chapter identifies mitigation measures intended to avoid or minimize the potential effects described in Chapter 5.

What mitigation measures are proposed to avoid and/or minimize operational impacts on vehicle traffic?

No adverse impacts to transportation would be anticipated under the Build Alternatives. Transportation operations and safety would be improved under the Build Alternatives. The safety and operations of general-purpose traffic, transit, and pedestrians would be improved, and access to businesses along the corridor would be improved and made safer.

Because the Build Alternatives would enhance traffic capacity, additional volumes could be accommodated and overall traffic operations would be improved as a result of the improvements.

What mitigation measures are proposed to avoid and/or minimize construction impacts on vehicle, pedestrian, and bicycle traffic?

Impacts related to the Build Alternatives would be mitigated to the greatest extent possible through the application of construction best management practices including Traffic Control Plans, construction staging plans, and continual communication and coordination with businesses along the corridor. City residents would be advised to use alternate routes during periods of closure and regional transit service would be used to provide additional person-movement capacity at these times.

Planning adequate traffic control during design and construction of this Project is crucial to a smooth, successful, and safe construction. In addition to providing safety to workers, motorists, and pedestrians, the traffic control plan must provide access to the work zones, business driveway delineation, signage for businesses, and lighting. Continued public information and opportunities for input would be provided throughout the period of construction. In addition, partnerships with adjacent businesses would be maintained throughout the construction period to ensure that business access needs are met during construction. All transportation modes—pedestrians, bicycles, transit, trucks, and passenger vehicles—would be taken into account.

Transit

Coordination with the King County Metro and Snohomish County Community transit agencies would be ongoing throughout the construction period to minimize impacts to transit service. Bus zone relocation or closure would be clearly signed and communicated to transit riders. Temporary stops would be provided in a safe and accessible location, free of conflicts from other traffic and construction activity.

Bicycles and Pedestrians

The needs of bicyclists and pedestrians within the construction zones will be considered, and the range of pedestrian needs is wide, including those of the elderly and those with sensory impairments.

The following will be considered when developing a Traffic Control Plan for road construction:

- Bicyclists and pedestrians may be separated from work site activities to avoid impedance to the work and safety risks.
- Bicyclists and pedestrians may be separated from other traffic moving through or around the work area.
- Bicyclists and pedestrians may be provided with a safe travel way (temporary sidewalk or bike path).
- Construction flaggers may be provided to facilitate the safe movement of pedestrians and bicyclists through the work zone.
- Well-marked detour routes for bicycles and pedestrians will be provided to enable direct and safe access to destinations.

Traffic Control Plan

Formal traffic control plans will be prepared for the construction of the Project to ensure that adequate traffic control will be provided during the construction phases and to help ensure that access through the construction zone and to businesses will be safe. Traffic control plans will be prepared in accordance with standards provided in the Manual on Uniform Traffic Control Devices for Streets and Highways (FHWA 2003).

Construction Staging Plan

The primary options for construction staging are shift, detour, and half-width construction. Shift construction allows business access during construction and minimizes the spread of construction impacts throughout the community. The shift option maintains the existing lane configuration of the roadway by using reduced lane widths to maximize roadway capacity and driver comfort during construction. By using shift construction staging, the sidewalk and amenity zone, driveways, and new curb-and-gutter would be constructed for the 2 miles on one side. Once completed, traffic would be shifted toward the recently completed section and the opposing sidewalk and amenity zone, driveways, and curb-and-gutter will be constructed. Finally, traffic would be shifted to create a work zone for the construction of the median.

Half-width construction staging is another option that maintains some service along the roadway during construction. With this option, all of the roadway traffic would be placed on one half of the

roadway while the other half is under construction. The number of traffic lanes would be reduced, and business access would be more difficult to provide.

Construction detours might be needed if major structural repair of the roadway or extensive underground utility relocation is required. Such detours would usually be considered only if the following conditions apply:

- The route under construction is other than a high-volume route and detour length is less than 10 miles.
- Significant environmental impacts and right-of-way clearance problems are anticipated.
- The cost of maintaining the designated detour route is less than the cost of the half-width construction option.

When detours and lane closures are needed on high-volume multilane highways, they are generally scheduled to occur during the non-peak daytime and nighttime hours when traffic volumes are at their lowest levels. Detour routes, when used will be well signed, using only appropriate arterial routes.

Choosing the sequence of construction requires tradeoffs between competing goals of construction. These include minimizing the length of construction, keeping traffic flowing, maximizing access to properties, and ensuring proper pavement construction.

Maintaining Access and Communication

During the course of construction, access to businesses along Aurora Avenue N would be maintained. Temporary access revisions would be well marked and would provide the most direct access to properties possible.

Signing during construction can be divided into two categories, signs that are required to identify the worksite and its related conditions and hazards, and signs that identify business locations and access points that might be obscured during construction.

Owner and tenants along the corridor will be kept informed of construction schedules, schedule changes, and information detailing construction activities. Construction information will be provided via a project website, phone line, newsletters, and personal contact with the contractor and construction management team.

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Appendix A

Expanded Network Traffic Study: Routing Option Analysis Results, Recommendations, and Cost

Aurora Avenue North Multimodal Corridor Project

N 165th Street to N 205th Street

Public Outreach and Pre-Environmental

Expanded Network Traffic Study: Routing Option Analysis Results, Recommendations, and Costs

PREPARED FOR: Kris Overleese, City of Shoreline
PREPARED BY: Newkirk, Tim/CH2M HILL
COPIES: McKenzie, John/CH2M HILL

DATE: April 26, 2007

Introduction

This technical memorandum supports the attached traffic analysis tables and figures summarizing the results of seven (7) potential routing options of traffic between the western Shoreline neighborhoods accessed through N 185th Street and the Interstate 5/N. 175th Street interchange. The purpose of analyzing seven potential routing options is to determine how the preliminary build alignment and parallel streets would operate under heavier travel patterns and if any negative impacts could be expected. This traffic analysis is part of the larger multimodal corridor project extending from N. 165th Street to N. 205th Street along Aurora Avenue North. This project will widen Aurora Avenue North from five lanes to seven lanes with left-turn pockets at intersections, a raised median, Business Access and Transit (BAT) lanes, sidewalks, and drainage facilities.

This technical memorandum contains brief discussions of the methods and assumptions used in the analysis, modeling techniques and results, initial conclusions of the analysis results, and the next steps to take.

Traffic Analysis Methodology and Forecasting Assumptions

A Synchro traffic operations model was constructed for the study area based on traffic counts, field observations, and signal timing plans (provided by King County). The model includes traffic volume parameters, such as peak hour factors, truck percentages, pedestrians, and bicyclists that were derived from the hourly turning movement counts. The Synchro model uses methodology defined in the 2000 Highway Capacity Manual (HCM 2000) to analyze both signalized and stop-controlled intersections. The model computes the level-of-service, delay, and queues to quantify traffic operations at the study intersections. Table 1 describes the LOS and delay parameters.

TABLE 1
HCM LOS and Delay Parameters
Unsignalized and Signalized Intersections

LOS	Unsignalized Intersections (average seconds/vehicle)	Signalized Intersections (average seconds/vehicle)
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	>50	>80

AM and PM peak hour traffic counts used in the model for the Aurora Avenue corridor were collected in fall 2004 at the following intersections in this network analysis:

- Aurora Avenue & N. 185th Street
- Aurora Avenue & N. 175th Street

AM and PM peak hour traffic counts used in the model for the following study intersections were collected in November 2005 and March 2006:

- Fremont Avenue & N. 185th Street
- Linden Avenue & N. 185th Street
- Midvale Avenue & N. 185th Street
- Ashworth Avenue & N. 185th Street
- Meridian Avenue & N. 185th Street
- Fremont Avenue & N. 182nd Street
- Linden Avenue & N. 182nd Street
- Aurora Avenue & N. 182nd Street
- Fremont Avenue & N. 175th Street
- Linden Avenue & N. 175th Street
- Midvale Avenue & N. 175th Street
- Ashworth Avenue & N. 175th Street
- Meridian Avenue & N. 175th Street

Construction on Aurora Avenue North between N 145th Street and N 165th Street began in August 2005. Traffic counts on Aurora Avenue North at N 175th Street and N 185th Street were collected prior to construction, and therefore the data used in the model for these intersections reflects normal travel patterns. Construction activities may have affected traffic patterns along Aurora Avenue North in November 2005 and March 2006. It is not likely that traffic counts collected on the expanded network (Fremont Avenue, Linden Avenue, Midvale, Ashworth, and Meridian) after the onset of construction would have been influenced because Aurora Avenue North remained two-lanes in each direction during the time the counts were performed. However, in the traffic model that was developed for this study, pre-construction traffic counts were used as the baseline to adjust later count data along Aurora Avenue North to normal 2005 conditions and to balance volumes between

adjacent study intersections to reflect mid-block driveway activity and uncounted residential streets.

Current Travel Paths

The number of trips traveling between the western Shoreline neighborhoods (west of the Fremont Avenue and N. 185th Street intersection) and the I-5/N. 175th Street interchange (east of the Meridian Avenue and N. 175th Street intersection) was estimated using the 2005 existing traffic volumes. This was done using a procedure that considered the total volume entering the start point or intersection (AM: eastbound, PM: westbound) and reduced that volume according to the turning movement distribution at downstream intersections along the possible paths until the end point or intersection. Trips were assumed to travel directly from start to end without making an intermediate stops or taking circuitous routes. See Attachment 1 for the possible paths.

Approximately 17% of the possible AM peak hour trips approaching the Fremont Avenue & N. 185th Street intersection from the west travel to the I-5/N. 175th Street interchange. Trips from the western Shoreline neighborhoods were assumed to take three paths to the I-5 interchange. They are (1) south on Fremont Avenue then east on N. 175th Street to I-5; (2) east on N. 185th Street, south on Aurora Avenue, then east on N. 175th Street; and (3) east on N. 185th Street, south on Meridian Avenue, then east on N. 175th Street.

Approximately 14% of the possible PM peak hour trips approaching the Meridian Avenue & N. 175th Street intersection from the east travel to the western Shoreline area. Trips from I-5 were assumed to take six main paths to the western Shoreline neighborhoods. They are (1) north on Meridian Avenue and west on N. 185th Street; (2) west on N. 175th Street, north on Ashworth Avenue, then west on N. 185th Street; (3) west on N. 175th Street, north on Aurora Avenue via Midvale Avenue, then west on N. 185th Street; (4) west on N. 175th Street, north on Aurora Avenue, then west on N. 185th Street; (5) west on N. 175th Street, north on Linden Avenue, then west on N. 185th Street; and (6) west on N. 175th Street, north on Fremont Avenue, then west on N. 185th Street. Secondary paths along N. 182nd Street were included with paths 3, 4, and 5. This was done to capture as many trips as possible. The PM peak hour trip percentage is less than the AM peak hour because more types of trips are made during the afternoon commute and intermediate stops occur with greater frequency.

Traffic Volume Forecasting

The Puget Sound Regional Council (PSRC), City of Shoreline Comprehensive Plan, and N. 185th Street/Aurora Avenue Intersection Analysis (prepared by TENW) forecasts were considered for estimating 2030 traffic volumes at the study intersections. After studying these forecasts and considering the differences each had in forecast years, land use, and network detail, an annual growth rate of 1.1 percent per year was applied to 2005 Existing traffic volumes to estimate 2030 No-Build AM and PM peak hour volumes. The 2030 intersection turning movement volumes were balanced between adjacent intersections after the growth rate was applied. Manual adjustments were made to create traffic volumes for the 2030 Preliminary Build alignment. The adjustments were made to account for the turn restrictions, new street connections, and street closures proposed in the Preliminary Build alignment.

Traffic Operations Modeling and Results

AM and PM peak hour traffic operations analyses were completed for the following scenarios and routing options.

2005 Existing. This scenario includes current intersection control, lane channelization, and signal timing and coordination for the 15 intersections listed above. See Figure 1 for the current lane channelization and intersection control (except at Midvale Avenue and N. 185th Street).

2030 No-Build. This scenario includes current intersection control, lane channelization, and optimized signal timing and coordination for 14 of the 15 intersections listed above. The installation of a new traffic signal is planned at the intersection of Midvale Avenue and N. 185th Street. See Figure 1 for the 2030 No-Build lane channelization and intersection control.

2030 Preliminary Build. This scenario includes 2030 No-Build intersection control (except at Aurora Avenue and N. 182nd Street), preliminary alignment lane channelization and optimized signal timing and coordination for the 15 intersections listed above. In addition, Aurora Avenue and N. 182nd Street was signalized and connected to a new signalized intersection at Midvale Avenue and N. 182nd Street. See Figure 2 for the preliminary build lane channelization and intersection control.

2030 Build Routing Options. These scenarios included the same intersection control and lane channelization as the 2030 Preliminary Build scenario. Signal timing and coordination plans were optimized for each routing option.

Build Routing Options

The percentages determined above from the current travel paths were applied to the 2030 Preliminary Build traffic volumes to estimate the number of future trips traveling the same paths. These future trips were then transferred from their current paths and assigned to one of the seven routing options. The routing options are described below.

1. Fremont Avenue

   AM: Trips travel east on N. 185th Street, south on Fremont Avenue, and east on N. 175th Street to I-5.

   PM: Trips travel west on N. 175th Street, north on Fremont Avenue, and west on N. 185th Street to western Shoreline.

2. Linden Avenue

   AM: Trips travel east on N. 185th Street, south on Linden Avenue, and east on N. 175th Street to I-5.

   PM: Trips travel west on N. 175th Street, north on Linden Avenue, and west on N. 185th Street to western Shoreline.

3. Aurora Avenue

AM: Trips travel east on N. 185th Street, south on Aurora Avenue, and east on N. 175th Street to I-5.

PM: Trips travel west on N. 175th Street, north on Aurora Avenue, and west on N. 185th Street to western Shoreline.

4. Meridian Avenue

AM: Trips travel east on N. 185th Street, south on Meridian Avenue, and east on N. 175th Street to I-5.

PM: Trips travel west on N. 175th Street, north on Meridian Avenue, and west on N. 185th Street to western Shoreline.

5. Fremont to Aurora Avenue (AM) and Ashworth Avenue (PM)

AM: Trips travel east on N. 185th Street, south on Fremont Avenue, east on N. 182nd Street, south on Aurora Avenue, and east on N. 175th Street to I-5.

PM: Trips travel west on N. 175th Street, north on Ashworth Avenue, and west on N. 185th Street to western Shoreline.

6. Aurora Avenue and Midvale Avenue

AM: Trips travel east on N. 185th Street, south on Aurora Avenue, east on N. 182nd Street, south on Midvale Avenue, and east on N. 175th Street to I-5.

PM: Trips travel west on N. 175th Street, north on Midvale Avenue, west on N. 182nd Street, north on Aurora Avenue, and west on N. 185th Street to western Shoreline.

7. Linden to Midvale Avenue (AM) and Midvale to Fremont Avenue (PM)

AM: Trips travel east on N. 185th Street, south on Linden Avenue, east on N. 182nd Street, south on Midvale Avenue, and east on N. 175th Street to I-5.

PM: Trips travel west on N. 175th Street, north on Midvale Avenue, west on N. 182nd Street, north on Fremont Avenue, and west on N. 185th Street to western Shoreline.

Traffic Operations Results

The results of the three scenarios and seven routing options are summarized in Tables 2 to 8 and Figures 1 to 9. Figure 1 compares the LOS and delay of the 2005 Existing and 2030 No-Build scenarios and shows the 2030 No-Build AM and PM peak hour traffic volumes. Figure 2 compares the LOS and delay of the 2030 No-Build and 2030 Preliminary Build scenarios and shows the 2030 Preliminary Build AM and PM peak hour traffic volumes. Figures 3 to 9 compare the LOS and delay of the 2030 Preliminary Build to the seven different 2030 Build Routing Options and show the routing options' 2030 AM and PM peak hour traffic volumes.

It is important to note that queuing at many of the movements with reassigned trips increased to a length that would likely exceed the available storage at the 95th percentile level.

Conclusions

The results of the traffic operations analysis of the seven routing options provide information about how the 2030 Preliminary Build alignment and parallel streets are forecasted to operate and allow for some conclusions to be made. Six conclusions are described below, but there may be others.

1. In any future scenario or routing option, the intersection at Meridian Avenue and N. 175th Street is forecasted to operate at LOS E during the PM peak hour and is nearly at LOS F.
2. The street network is forecasted to operate better overall when drivers use multiple routes and trips are dispersed according to current travel patterns.
3. Through traffic on Linden Avenue should be discouraged during the AM peak hour because of the LOS F conditions forecasted at Linden Avenue and N. 175th Street (see Figure 4) and its residential nature.
4. Through traffic along N. 182nd Street between Linden Avenue and Fremont Avenue should be discouraged during both peak hours because of LOS E and F conditions forecasted at Fremont Avenue and N. 182nd Street (see Figures 7 and 9) and its residential nature.
5. Ashworth Avenue is not a likely travel path for through traffic and should continue to be discouraged during the PM peak hour because of LOS F conditions forecasted at Ashworth Avenue and N. 185th Street (see Figure 2) and its residential nature.
6. Through traffic should be encouraged to use Aurora Avenue and N. 175th Street during the morning commute towards the I-5/N. 175th Street interchange because the southbound double left-turns are forecasted to be underutilized with current travel patterns.

Recommendations for Improvements

Based on the results of the traffic analysis, recommendations were made for intersection and street improvements. These improvements will be evaluated by the City for possible inclusion into the Capital Improvement Program's (CIP) 2008-2010 cycle or included in the environmental analysis of the Aurora Corridor project. The improvements include additional intersection capacity, signal upgrades, sidewalk installations, and other neighborhood projects.

Table 2 summarizes the improvements recommended. The project's location, description, type (intersection capacity, neighborhood improvement, or signal upgrade), project placement (in the next CIP cycle or included as part of the Aurora Avenue environmental analysis document), and the reason for the project are given for eight projects. The intent of placing certain projects on the CIP list is to move these improvements forward independently of the Aurora Avenue project.

TABLE 2
Recommended Improvement Projects

Location	Description	Type	Project Placement / [cost][1]	Reason for Project
1. Meridian Avenue and N. 175th Street	Add exclusive WB right-turn and SB left-turn lanes	Intersection capacity	CIP 2008-2010 **[$2,275,000]**	Improve east-west mobility and alternative Aurora Avenue route
2. Linden Avenue, N. 175th Street to N. 182nd Street	Install sidewalks on both sides of Linden Avenue	Neighborhood improvement	CIP 2008-2010 **[$2,548,000]**	Preserve residential nature and emphasize pedestrian corridor
3. N. 182nd Street, Fremont Avenue to Linden Avenue	Monitor traffic volumes and speeds for potential traffic calming measures	Neighborhood improvement	CIP 20XX-20XX ***[n/a]***	Preserve residential nature and discourage cut-through traffic
4. Midvale Avenue and N. 175th Street	Build WB left-turn, two through, and one shared through/right-turn lanes	Intersection capacity	Aurora Avenue ***[Included w/ Aurora Project]***	Analyze in environmental document of Aurora project
5. N. 182nd Street, Aurora Avenue to Midvale Avenue	Extend N. 182nd Street and install traffic signals at adjacent intersections	Intersection capacity	Aurora Avenue ***[Included w/ Aurora Project]***	Analyze in environmental document of Aurora project
6. Aurora Avenue and N. 185th Street	Add exclusive EB right-turn lane	Intersection capacity	Aurora Avenue ***[Included w/ Aurora Project]***	Analyze in environmental document of Aurora project and improve east-west mobility
7. Meridian Avenue and N. 185th Street	Add exclusive EB, NB, and SB right-turn lanes	Intersection capacity	CIP 2008-2010 **[$2,510,000]**	Improve alternative Aurora Avenue route
8. Ashworth Avenue and N. 185th Street	Install traffic signal	Signal upgrade	CIP 2008-2010 **[$832,000]**	Improve alternative Aurora Avenue route

1 – Costs are in 2007 dollars

Opinions of Cost

The eight projects described in Table 2 were analyzed and given a planning-level cost estimate. The following Table 3 summarizes these costs. Detailed cost estimates are included in Attachment 2.

TABLE 3
Estimated CIP Program Costs

Location	Description	Right-of-Way Cost	Construction Cost	Program Development	Contingency	Total
1. Meridian Avenue and N. 175th Street	Add exclusive WB right-turn and SB left-turn lanes	$430,113	$1,058,000	$264,500	$525,000	$2,275,000
2. Linden Avenue, N. 175th Street to N. 182nd Street	Install sidewalks on both sides of Linden Avenue	$0	$1,568,000	$392,000	$588,000	$2,548,000
3. N. 182nd Street, Fremont Avenue to Linden Avenue	Monitor traffic volumes and speeds for potential traffic calming measures					n/a
4. Midvale Avenue and N. 175th Street	Build WB left-turn, two through, and one shared through/right-turn lanes					Included with Aurora Project
5. N. 182nd Street, Aurora Avenue to Midvale Avenue	Extend N. 182nd Street and install traffic signals at adjacent intersections					Included with Aurora Project
6. Aurora Avenue and N. 185th Street	Add exclusive EB right-turn lane					Included with Aurora Project
7. Meridian Avenue and N. 185th Street	Add exclusive EB, NB, and SB right-turn lanes	$566,870	$1,087,000	$271,750	$579,000	$2,509,000
8. Ashworth Avenue and N. 185th Street	Install traffic signal	$0	$512,000	$128,000	$192,000	$832,000

Note: all costs are in 2007 dollars.

SUMMARY RESULTS

Tables and Figures

Shoreline Aurora Multimodal Corridor - N. 165th Street to N. 205th Street

Operational Analysis of Study Intersections

Routing Option 1

Intersection Description	2005 Existing				2030 No Build				2030 Build - Current Routing				2030 Build - Fremont Avenue			
	AM		PM		AM		PM		AM		PM		AM		PM	
Signalized	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Fremont Ave N & N. 185th Street	D	36.2	C	32.9	C	33.4	C	32.9	C	33.4	C	32.9	C	32.0	C	32.7
Linden Ave N & N. 185th Street	B	18.0	A	6.0	B	12.0	A	6.8	B	12.0	A	6.8	B	12.8	A	6.1
Aurora Ave N & N. 185th Street	E	79.4	D	52.7	**F**	**124.5**	**F**	**109.5**	E	73.9	E	59.5	E	69.0	E	59.1
Midvale Ave N & N. 185th Street*	C	17.1	C	18.3	A	3.9	A	5.0	A	3.9	A	5.0	A	3.9	A	5.1
Ashworth Ave N & N. 185th Street*	D	27.9	E	36.4	E	40.4	**F**	**89.4**	E	40.4	**F**	**89.4**	D	31.6	**F**	**58.4**
Meridian Ave N & N. 185th Street	D	43.6	D	48.0	E	65.3	E	77.7	E	65.3	E	77.7	E	55.4	E	77.6
Fremont Ave N & N. 182nd Street*	D	30.4	C	16.4	D	31.6	C	21.3	D	31.6	C	21.3	E	39.5	D	25.7
Linden Ave N & N. 182nd Street*	C	15.5	B	13.8	B	14.4	B	14.6	B	14.4	B	14.5	B	14.4	B	13.9
Aurora Ave N & N. 182nd Street	**F**	**109.9**	**F**	**87.4**	**F**	**>150**	**F**	**>150**	C	22.9	C	22.8	C	21.7	B	17.7
Midvale Ave N & N. 182nd Street	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	24.9	C	29.2	C	25.1	C	28.7
Fremont Ave N & N. 175th Street	B	18.0	A	7.7	C	22.6	B	10.4	C	22.6	B	10.4	C	33.6	B	10.1
Linden Ave N & N. 175th Street*	D	26.8	C	19.3	E	48.4	D	26.7	E	38.0	C	24.4	E	47.3	D	29.6
Aurora Ave N & N. 175th Street	D	53.6	D	53.9	**F**	**96.4**	**F**	**82.4**	E	73.5	D	51.0	E	79.0	D	47.8
Midvale Ave N & N. 175th Street	C	20.3	C	24.3	C	25.7	C	31.5	D	43.4	D	54.4	E	64.1	E	65.8
Ashworth Ave N & N. 175th Street*	B	12.9	B	12.4	B	12.8	B	14.0	B	12.8	B	14.0	B	12.8	B	14.5
Meridian Ave N & N. 175th Street	D	42.4	D	47.0	D	50.7	E	76.6	D	48.2	E	76.6	D	51.9	E	76.4

Source: Synchro Signalized LOS/Delay Calculation and Highway Capacity Manual (HCM) Unsignalized Report.

Note: Highlighted numbers indicate LOS/Delay above acceptable City standards.

* LOS and delay is reported for worst minor street approach for unsignalized intersections.

N/A: Not applicable. Intersection control does not apply for this scenario.

Shoreline Aurora Multimodal Corridor - N. 165th Street to N. 205th Street

Operational Analysis of Study Intersections

Routing Option 2

Intersection Description	2005 Existing				2030 No Build				2030 Build - Current Routing				2030 Build - Linden Avenue			
	AM		PM		AM		PM		AM		PM		AM		PM	
Signalized	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Fremont Ave N & N. 185th Street	D	36.2	C	32.9	C	33.4	C	32.9	C	33.4	C	32.9	C	33.7	C	33.8
Linden Ave N & N. 185th Street	B	18.0	A	6.0	B	12.0	A	6.8	B	12.0	A	6.8	B	11.6	A	8.7
Aurora Ave N & N. 185th Street	E	79.4	D	52.7	**F**	**124.5**	**F**	**109.5**	E	73.9	E	59.5	E	69.0	E	58.9
Midvale Ave N & N. 185th Street*	C	17.1	C	18.3	A	3.9	A	5.0	A	3.9	A	5.0	A	3.9	A	5.1
Ashworth Ave N & N. 185th Street*	D	27.9	E	36.4	E	40.4	**F**	**89.4**	E	40.4	**F**	**89.4**	D	31.8	**F**	**58.4**
Meridian Ave N & N. 185th Street	D	43.6	D	48.0	E	65.3	E	77.7	E	65.3	E	77.7	E	55.4	E	77.6
Fremont Ave N & N. 182nd Street*	D	30.4	C	16.4	D	31.6	C	21.3	D	31.6	C	21.3	D	22.5	C	19.2
Linden Ave N & N. 182nd Street*	C	15.5	B	13.8	B	14.4	B	14.6	B	14.4	B	14.5	C	17.8	C	19.3
Aurora Ave N & N. 182nd Street	**F**	**109.9**	**F**	**87.4**	**F**	**>150**	**F**	**>150**	C	22.9	C	22.8	C	21.7	B	16.8
Midvale Ave N & N. 182nd Street	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	24.9	C	29.2	C	25.1	C	30.0
Fremont Ave N & N. 175th Street	B	18.0	A	7.7	C	22.6	B	10.4	C	22.6	B	10.4	B	17.7	B	10.7
Linden Ave N & N. 175th Street*	D	26.8	C	19.3	E	48.4	D	26.7	E	38.0	C	24.4	**F**	**>150**	C	22.9
Aurora Ave N & N. 175th Street	D	53.6	D	53.9	**F**	**96.4**	**F**	**82.4**	E	73.5	D	51.0	E	79.0	D	46.6
Midvale Ave N & N. 175th Street	C	20.3	C	24.3	C	25.7	C	31.5	D	43.4	D	54.4	E	64.1	E	69.0
Ashworth Ave N & N. 175th Street*	B	12.9	B	12.4	B	12.8	B	14.0	B	12.8	B	14.0	B	12.8	B	14.5
Meridian Ave N & N. 175th Street	D	42.4	D	47.0	D	50.7	E	76.6	D	48.2	E	76.6	D	51.9	E	76.4

Source: Synchro Signalized LOS/Delay Calculation and Highway Capacity Manual (HCM) Unsignalized Report.

Note: Highlighted numbers indicate LOS/Delay above acceptable City standards.

* LOS and delay is reported for worst minor street approach for unsignalized intersections.

N/A: Not applicable. Intersection control does not apply for this scenario.

Shoreline Aurora Multimodal Corridor - N. 165th Street to N. 205th Street

Operational Analysis of Study Intersections

Routing Option 3

Intersection Description	2005 Existing				2030 No Build				2030 Build - Current Routing				2030 Build - Aurora Avenue			
	AM		PM		AM		PM		AM		PM		AM		PM	
Signalized	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Fremont Ave N & N. 185th Street	D	36.2	C	32.9	C	33.4	C	32.9	C	33.4	C	32.9	C	33.7	C	33.8
Linden Ave N & N. 185th Street	B	18.0	A	6.0	B	12.0	A	6.8	B	12.0	A	6.8	B	11.7	A	6.2
Aurora Ave N & N. 185th Street	E	79.4	D	52.7	**F**	**124.5**	**F**	**109.5**	E	73.9	E	59.5	E	75.7	E	61.8
Midvale Ave N & N. 185th Street*	C	17.1	C	18.3	A	3.9	A	5.0	A	3.9	A	5.0	A	3.9	A	5.1
Ashworth Ave N & N. 185th Street*	D	27.9	E	36.4	E	40.4	**F**	**89.4**	E	40.4	**F**	**89.4**	D	31.6	**F**	**58.4**
Meridian Ave N & N. 185th Street	D	43.6	D	48.0	E	65.3	E	77.7	E	65.3	E	77.7	E	55.4	E	77.6
Fremont Ave N & N. 182nd Street*	D	30.4	C	16.4	D	31.6	C	21.3	D	31.6	C	21.3	D	27.5	C	19.2
Linden Ave N & N. 182nd Street*	C	15.5	B	13.8	B	14.4	B	14.6	B	14.4	B	14.5	B	14.4	B	13.9
Aurora Ave N & N. 182nd Street	**F**	**109.9**	**F**	**87.4**	**F**	**>150**	**F**	**>150**	C	22.9	C	22.8	D	41.0	D	36.9
Midvale Ave N & N. 182nd Street	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	24.9	C	29.2	C	24.9	C	27.6
Fremont Ave N & N. 175th Street	B	18.0	A	7.7	C	22.6	B	10.4	C	22.6	B	10.4	B	17.7	B	10.7
Linden Ave N & N. 175th Street*	D	26.8	C	19.3	E	48.4	D	26.7	E	38.0	C	24.4	D	31.3	C	22.7
Aurora Ave N & N. 175th Street	D	53.6	D	53.9	**F**	**96.4**	**F**	**82.4**	E	73.5	D	51.0	E	61.7	D	49.8
Midvale Ave N & N. 175th Street	C	20.3	C	24.3	C	25.7	C	31.5	D	43.4	D	54.4	E	67.2	E	63.0
Ashworth Ave N & N. 175th Street*	B	12.9	B	12.4	B	12.8	B	14.0	B	12.8	B	14.0	B	12.8	B	14.5
Meridian Ave N & N. 175th Street	D	42.4	D	47.0	D	50.7	E	76.6	D	48.2	E	76.6	D	51.9	E	76.4

Source: Synchro Signalized LOS/Delay Calculation and Highway Capacity Manual (HCM) Unsignalized Report.

Note: Highlighted numbers indicate LOS/Delay above acceptable City standards.

* LOS and delay is reported for worst minor street approach for unsignalized intersections.

N/A: Not applicable. Intersection control does not apply for this scenario.

Shoreline Aurora Multimodal Corridor - N. 165th Street to N. 205th Street

Operational Analysis of Study Intersections

Routing Option 4

Intersection Description	2005 Existing				2030 No Build				2030 Build - Current Routing				2030 Build - Meridian Avenue			
	AM		PM		AM		PM		AM		PM		AM		PM	
Signalized	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Fremont Ave N & N. 185th Street	D	36.2	C	32.9	C	33.4	C	32.9	C	33.4	C	32.9	C	33.7	C	33.8
Linden Ave N & N. 185th Street	B	18.0	A	6.0	B	12.0	A	6.8	B	12.0	A	6.8	B	11.7	A	6.2
Aurora Ave N & N. 185th Street	E	79.4	D	52.7	**F**	**124.5**	**F**	**109.5**	E	73.9	E	59.5	**F**	**82.4**	E	63.8
Midvale Ave N & N. 185th Street*	C	17.1	C	18.3	A	3.9	A	5.0	A	3.9	A	5.0	A	3.9	A	5.0
Ashworth Ave N & N. 185th Street*	D	27.9	E	36.4	E	40.4	**F**	**89.4**	E	40.4	**F**	**89.4**	**F**	**55.2**	**F**	**128.0**
Meridian Ave N & N. 185th Street	D	43.6	D	48.0	E	65.3	E	77.7	E	65.3	E	77.7	E	77.0	E	78.6
Fremont Ave N & N. 182nd Street*	D	30.4	C	16.4	D	31.6	C	21.3	D	31.6	C	21.3	D	27.5	C	19.2
Linden Ave N & N. 182nd Street*	C	15.5	B	13.8	B	14.4	B	14.6	B	14.4	B	14.5	B	14.4	B	13.9
Aurora Ave N & N. 182nd Street	**F**	**109.9**	**F**	**87.4**	**F**	**>150**	**F**	**>150**	C	22.9	C	22.8	C	20.6	C	22.7
Midvale Ave N & N. 182nd Street	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	24.9	C	29.2	C	25.0	C	27.4
Fremont Ave N & N. 175th Street	B	18.0	A	7.7	C	22.6	B	10.4	C	22.6	B	10.4	B	17.2	B	10.7
Linden Ave N & N. 175th Street*	D	26.8	C	19.3	E	48.4	D	26.7	E	38.0	C	24.4	D	33.5	C	22.7
Aurora Ave N & N. 175th Street	D	53.6	D	53.9	**F**	**96.4**	**F**	**82.4**	E	73.5	D	51.0	E	59.9	D	48.6
Midvale Ave N & N. 175th Street	C	20.3	C	24.3	C	25.7	C	31.5	D	43.4	D	54.4	E	70.0	D	54.3
Ashworth Ave N & N. 175th Street*	B	12.9	B	12.4	B	12.8	B	14.0	B	12.8	B	14.0	B	12.8	B	13.0
Meridian Ave N & N. 175th Street	D	42.4	D	47.0	D	50.7	E	76.6	D	48.2	E	76.6	D	46.8	E	76.0

Source: Synchro Signalized LOS/Delay Calculation and Highway Capacity Manual (HCM) Unsignalized Report.

Note: Highlighted numbers indicate LOS/Delay above acceptable City standards.

* LOS and delay is reported for worst minor street approach for unsignalized intersections.

N/A: Not applicable. Intersection control does not apply for this scenario.

Shoreline Aurora Multimodal Corridor - N. 165th Street to N. 205th Street

Operational Analysis of Study Intersections

Routing Option 5

Intersection Description	2005 Existing				2030 No Build				2030 Build - Current Routing				2030 Build - Fremont to Aurora (AM) and Ashworth Avenue (PM)			
	AM		PM		AM		PM		AM		PM		AM		PM	
Signalized	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Fremont Ave N & N. 185th Street	D	36.2	C	32.9	C	33.4	C	32.9	C	33.4	C	32.9	C	32.0	C	33.8
Linden Ave N & N. 185th Street	B	18.0	A	6.0	B	12.0	A	6.8	B	12.0	A	6.8	B	12.8	A	6.2
Aurora Ave N & N. 185th Street	E	79.4	D	52.7	**F**	**124.5**	**F**	**109.5**	E	73.9	E	59.5	E	70.4	E	63.8
Midvale Ave N & N. 185th Street*	C	17.1	C	18.3	A	3.9	A	5.0	A	3.9	A	5.0	A	3.9	A	5.0
Ashworth Ave N & N. 185th Street*	D	27.9	E	36.4	E	40.4	**F**	**89.4**	E	40.4	**F**	**89.4**	D	31.6	**F**	**>150**
Meridian Ave N & N. 185th Street	D	43.6	D	48.0	E	65.3	E	77.7	E	65.3	E	77.7	E	55.4	E	77.6
Fremont Ave N & N. 182nd Street*	D	30.4	C	16.4	D	31.6	C	21.3	D	31.6	C	21.3	**F**	**73.9**	C	19.2
Linden Ave N & N. 182nd Street*	C	15.5	B	13.8	B	14.4	B	14.6	B	14.4	B	14.5	C	20.9	B	13.9
Aurora Ave N & N. 182nd Street	**F**	**109.9**	**F**	**87.4**	**F**	**>150**	**F**	**>150**	C	22.9	C	22.8	C	27.9	C	22.7
Midvale Ave N & N. 182nd Street	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	24.9	C	29.2	C	31.6	C	27.4
Fremont Ave N & N. 175th Street	B	18.0	A	7.7	C	22.6	B	10.4	C	22.6	B	10.4	B	17.2	B	10.7
Linden Ave N & N. 175th Street*	D	26.8	C	19.3	E	48.4	D	26.7	E	38.0	C	24.4	D	33.3	C	22.7
Aurora Ave N & N. 175th Street	D	53.6	D	53.9	**F**	**96.4**	**F**	**82.4**	E	73.5	D	51.0	E	58.4	D	48.6
Midvale Ave N & N. 175th Street	C	20.3	C	24.3	C	25.7	C	31.5	D	43.4	D	54.4	E	61.8	D	54.3
Ashworth Ave N & N. 175th Street*	B	12.9	B	12.4	B	12.8	B	14.0	B	12.8	B	14.0	B	12.8	B	14.5
Meridian Ave N & N. 175th Street	D	42.4	D	47.0	D	50.7	E	76.6	D	48.2	E	76.6	D	51.9	E	76.4

Source: Synchro Signalized LOS/Delay Calculation and Highway Capacity Manual (HCM) Unsignalized Report.

Note: Highlighted numbers indicate LOS/Delay above acceptable City standards.

* LOS and delay is reported for worst minor street approach for unsignalized intersections.

N/A: Not applicable. Intersection control does not apply for this scenario.

Shoreline Aurora Multimodal Corridor - N. 165th Street to N. 205th Street

Operational Analysis of Study Intersections

Routing Option 6

Intersection Description	2005 Existing				2030 No Build				2030 Build - Current Routing				2030 Build - Midvale Avenue and Aurora Avenue Combo			
	AM		PM		AM		PM		AM		PM		AM		PM	
Signalized	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Fremont Ave N & N. 185th Street	D	36.2	C	32.9	C	33.4	C	32.9	C	33.4	C	32.9	C	33.7	C	33.8
Linden Ave N & N. 185th Street	B	18.0	A	6.0	B	12.0	A	6.8	B	12.0	A	6.8	B	11.7	A	6.2
Aurora Ave N & N. 185th Street	E	79.4	D	52.7	**F**	**124.5**	**F**	**109.5**	E	73.9	E	59.5	E	76.2	E	59.8
Midvale Ave N & N. 185th Street*	C	17.1	C	18.3	A	3.9	A	5.0	A	3.9	A	5.0	A	3.9	A	5.1
Ashworth Ave N & N. 185th Street*	D	27.9	E	36.4	E	40.4	**F**	**89.4**	E	40.4	**F**	**89.4**	D	31.8	**F**	**58.4**
Meridian Ave N & N. 185th Street	D	43.6	D	48.0	E	65.3	E	77.7	E	65.3	E	77.7	E	55.4	E	77.6
Fremont Ave N & N. 182nd Street*	D	30.4	C	16.4	D	31.6	C	21.3	D	31.6	C	21.3	D	27.5	C	19.2
Linden Ave N & N. 182nd Street*	C	15.5	B	13.8	B	14.4	B	14.6	B	14.4	B	14.5	B	14.4	B	13.9
Aurora Ave N & N. 182nd Street	**F**	**109.9**	**F**	**87.4**	**F**	**>150**	**F**	**>150**	C	22.9	C	22.8	D	35.1	D	39.7
Midvale Ave N & N. 182nd Street	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	24.9	C	29.2	C	20.4	D	48.0
Fremont Ave N & N. 175th Street	B	18.0	A	7.7	C	22.6	B	10.4	C	22.6	B	10.4	B	17.2	B	10.7
Linden Ave N & N. 175th Street*	D	26.8	C	19.3	E	48.4	D	26.7	E	38.0	C	24.4	D	33.3	C	22.7
Aurora Ave N & N. 175th Street	D	53.6	D	53.9	**F**	**96.4**	**F**	**82.4**	E	73.5	D	51.0	E	61.6	D	47.5
Midvale Ave N & N. 175th Street	C	20.3	C	24.3	C	25.7	C	31.5	D	43.4	D	54.4	E	67.8	D	53.4
Ashworth Ave N & N. 175th Street*	B	12.9	B	12.4	B	12.8	B	14.0	B	12.8	B	14.0	B	12.8	B	14.4
Meridian Ave N & N. 175th Street	D	42.4	D	47.0	D	50.7	E	76.6	D	48.2	E	76.6	D	51.9	E	76.4

Source: Synchro Signalized LOS/Delay Calculation and Highway Capacity Manual (HCM) Unsignalized Report.

Note: Highlighted numbers indicate LOS/Delay above acceptable City standards.

* LOS and delay is reported for worst minor street approach for unsignalized intersections.

N/A: Not applicable. Intersection control does not apply for this scenario.

Shoreline Aurora Multimodal Corridor - N. 165th Street to N. 205th Street

Operational Analysis of Study Intersections

Routing Option 7

Intersection Description	2005 Existing				2030 No Build				2030 Build - Current Routing				2030 Build - Linden to Midvale (AM) and Midvale to Fremont(PM)			
	AM		PM		AM		PM		AM		PM		AM		PM	
Signalized	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Fremont Ave N & N. 185th Street	D	36.2	C	32.9	C	33.4	C	32.9	C	33.4	C	32.9	C	32.8	C	32.7
Linden Ave N & N. 185th Street	B	18.0	A	6.0	B	12.0	A	6.8	B	12.0	A	6.8	B	12.9	A	6.1
Aurora Ave N & N. 185th Street	E	79.4	D	52.7	**F**	**124.5**	**F**	**109.5**	E	73.9	E	59.5	E	73.7	E	57.6
Midvale Ave N & N. 185th Street*	C	17.1	C	18.3	A	3.9	A	5.0	A	3.9	A	5.0	A	3.9	A	5.1
Ashworth Ave N & N. 185th Street*	D	27.9	E	36.4	E	40.4	**F**	**89.4**	E	40.4	**F**	**89.4**	D	31.8	**F**	**58.4**
Meridian Ave N & N. 185th Street	D	43.6	D	48.0	E	65.3	E	77.7	E	65.3	E	77.7	E	55.4	E	77.6
Fremont Ave N & N. 182nd Street*	D	30.4	C	16.4	D	31.6	C	21.3	D	31.6	C	21.3	D	27.5	E	37.3
Linden Ave N & N. 182nd Street*	C	15.5	B	13.8	B	14.4	B	14.6	B	14.4	B	14.5	D	26.0	D	25.3
Aurora Ave N & N. 182nd Street	**F**	**109.9**	**F**	**87.4**	**F**	**>150**	**F**	**>150**	C	22.9	C	22.8	D	51.0	C	32.0
Midvale Ave N & N. 182nd Street	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	24.9	C	29.2	C	23.9	D	51.7
Fremont Ave N & N. 175th Street	B	18.0	A	7.7	C	22.6	B	10.4	C	22.6	B	10.4	B	17.2	B	10.7
Linden Ave N & N. 175th Street*	D	26.8	C	19.3	E	48.4	D	26.7	E	38.0	C	24.4	D	33.1	C	22.7
Aurora Ave N & N. 175th Street	D	53.6	D	53.9	**F**	**96.4**	**F**	**82.4**	E	73.5	D	51.0	E	64.7	D	48.1
Midvale Ave N & N. 175th Street	C	20.3	C	24.3	C	25.7	C	31.5	D	43.4	D	54.4	E	72.3	E	55.7
Ashworth Ave N & N. 175th Street*	B	12.9	B	12.4	B	12.8	B	14.0	B	12.8	B	14.0	B	12.8	B	14.5
Meridian Ave N & N. 175th Street	D	42.4	D	47.0	D	50.7	E	76.6	D	48.2	E	76.6	D	51.9	E	76.4

Source: Synchro Signalized LOS/Delay Calculation and Highway Capacity Manual (HCM) Unsignalized Report.

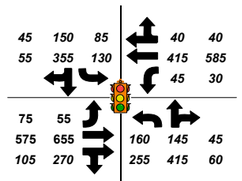
Note: Highlighted numbers indicate LOS/Delay above acceptable City standards.

* LOS and delay is reported for worst minor street approach for unsignalized intersections.

N/A: Not applicable. Intersection control does not apply for this scenario.

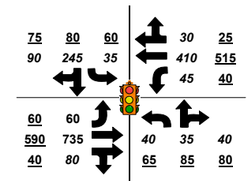
1 Fremont Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 No-Build	*C*	*33*	C	33
2005 Existing	*D*	*36*	C	33



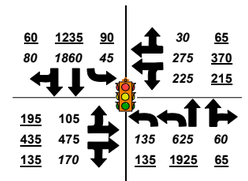
2 Linden Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 No-Build	*B*	*12*	A	7
2005 Existing	*B*	*18*	A	6



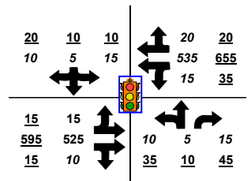
3 Aurora Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 No-Build	*F*	*125*	F	110
2005 Existing	*E*	*79*	D	53



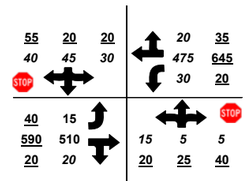
4 Midvale Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 No-Build	*A*	*4*	A	5
2005 Existing	*C*	*17*	C	18



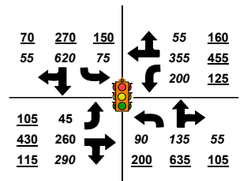
5 Ashworth Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 No-Build	*E*	*40*	F	89
2005 Existing	*D*	*28*	E	36



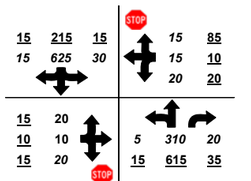
6 Meridian Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 No-Build	*E*	*65*	E	78
2005 Existing	*D*	*44*	D	48



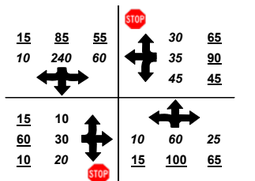
7 Fremont Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 No-Build	*D*	*32*	C	21
2005 Existing	*D*	*30*	C	16



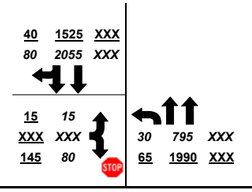
8 Linden Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 No-Build	*B*	*14*	B	15
2005 Existing	*C*	*16*	B	14



9 Aurora Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 No-Build	*F*	*>150*	F	>150
2005 Existing	*F*	*110*	F	87

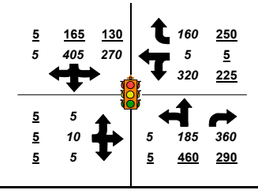


10 Midvale Ave N & N. 182nd Street

Intersection not applicable.

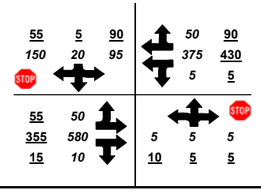
11 Fremont Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 No-Build	*C*	*23*	B	10
2005 Existing	*B*	*18*	A	8



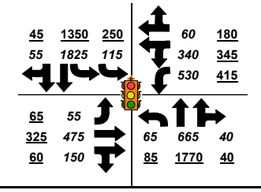
12 Linden Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 No-Build	*E*	*48*	D	27
2005 Existing	*D*	*27*	C	19



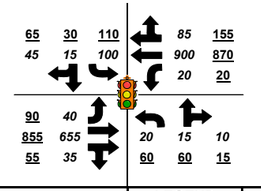
13 Aurora Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 No-Build	*F*	*96*	F	82
2005 Existing	*D*	*54*	D	54



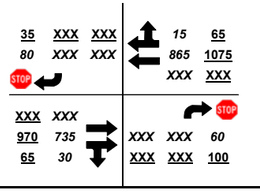
14 Midvale Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 No-Build	*C*	*26*	C	32
2005 Existing	*C*	*20*	C	24



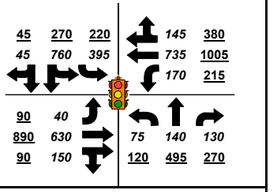
15 Ashworth Ave N & N. 175th Street*

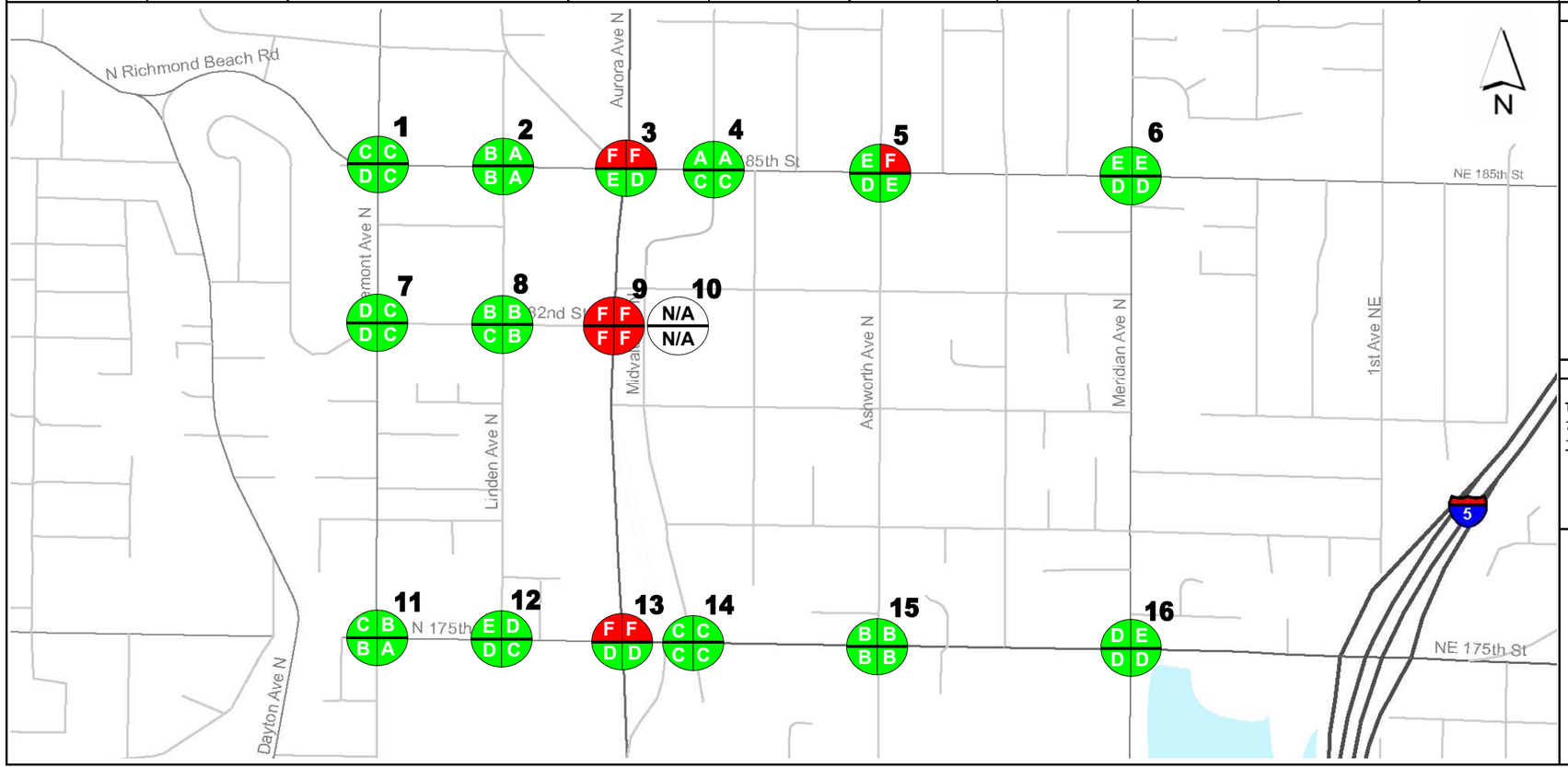
	AM Peak		PM Peak	
2030 No-Build	*B*	*13*	B	14
2005 Existing	*B*	*13*	B	12



16 Meridian Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 No-Build	*D*	*51*	E	77
2005 Existing	*D*	*42*	D	47





LEGEND

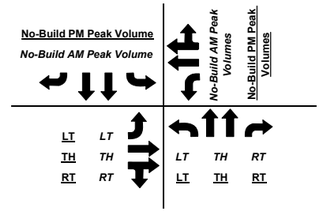
AM PM
2030 No-Build D D
2005 Existing F F

2 ← Intersection Number

Intersection not applicable.
LOS A - E
LOS F
XXX Indicates that movement is not allowed.
LOS Level-of-Service

Signalized intersection
Stop-controlled approach
No-Build Lane Channelization
Signalized intersection with No-Build

Example AM and PM Peak Traffic Volumes



KEY
LT: Left-turn volume RT: Right-turn volume
TH: Through volume

NOTES

* Worst minor street stopped delay reported for unsignalized intersections.
Text Bold represents traffic volumes, levels-of-service, and delay for 2030 No-Build.
Text Italics represents traffic volumes, levels-of-service, and delay for all AM Peak Hour scenarios.
Text Underline represents traffic volumes, levels-of-service, and delay for all PM Peak Hour scenarios.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

FIGURE 1
2030 No-Build Intersection Volumes and LOS
AM and PM Peak Hours

SHORELINE

CH2MHILL

1 Fremont Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 No-Build	C	33	C	33
2030 Prel Build	***C***	***33***	**C**	**33**

45 150 85 — 40 40
55 355 130 — 415 585
45 30
75 55 — 160 145 45
575 655
105 270 — 255 415 60

2 Linden Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 No-Build	B	12	A	7
2030 Prel Build	***B***	***12***	**A**	**7**

75 80 60 — 30 25
90 245 35 — 410 515
45 40
60 60 — 40 35 40
590 735
40 80 — 65 85 80

3 Aurora Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 No-Build	F	125	F	110
2030 Prel Build	***E***	***74***	**E**	**60**

60 1235 90 25 — 30 65
80 1860 45 10 — 275 370
BAT — 225 215
195 105 — 25 135 625 60
435 475
135 170 — 15 135 1925 65
BAT

4 Midvale Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 No-Build	A	4	A	5
2030 Prel Build	***A***	***4***	**A**	**5**

20 10 10 — 20 20
10 5 15 — 535 655
15 35
15 15 — 10 5 15
595 525
15 10 — 35 10 45

5 Ashworth Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 No-Build	E	40	F	89
2030 Prel Build	***E***	***40***	**F**	**89**

55 20 20 — 20 35
40 45 30 — 475 645
STOP — 30 20
40 15 — 15 5 5
590 510
20 20 — 20 25 40
STOP

6 Meridian Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 No-Build	E	65	E	78
2030 Prel Build	***E***	***65***	**E**	**78**

70 270 150 — 55 160
55 620 75 — 355 455
200 125
105 45 — 90 135 55
430 260
115 290 — 200 635 105

7 Fremont Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 No-Build	D	32	C	21
2030 Prel Build	***D***	***32***	**C**	**21**

STOP
15 215 15 — 15 85
15 625 30 — 15 10
20 20
15 20 — 5 310 20
10 10
15 20 — 15 615 35
STOP

8 Linden Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 No-Build	B	14	B	15
2030 Prel Build	***B***	***14***	**B**	**15**

STOP
15 85 55 — 30 65
10 240 60 — 35 90
45 45
15 10 — 10 60 25
60 30
10 20 — 15 100 65
STOP

9 Aurora Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 No-Build	F	>150	F	>150
2030 Prel Build	***C***	***23***	**C**	**23**

40 1500 25 25 — 50 90
80 2055 80 10 — 10 10
BAT — 15 15
15 15 — 20 20 745 25
20 10
125 70 — 20 55 1900 40
BAT

10 Midvale Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 No-Build	N/A	N/A	N/A	N/A
2030 Prel Build	***C***	***25***	**C**	**29**

20 60 XXX
10 60 XXX
35 50 — 65 60 XXX
XXX XXX
50 65 — 95 60 XXX

11 Fremont Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 No-Build	C	23	B	10
2030 Prel Build	***C***	***23***	**B**	**10**

5 165 130 — 160 250
5 405 270 — 5 5
320 225
5 5 — 5 185 360
5 10
5 5 — 5 460 290

12 Linden Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 No-Build	E	48	D	27
2030 Prel Build	***E***	***38***	**C**	**24**

55 5 90 — 50 90
150 20 95 — 375 430
STOP — 5 5
55 50 — 5 5 5
355 580
15 10 — 10 5 5
STOP

13 Aurora Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 No-Build	F	96	F	82
2030 Prel Build	***E***	***74***	**D**	**51**

45 1350 250 20 — 60 180
55 1825 115 10 — 340 345
BAT — 530 415
65 55 — 25 65 665 140
325 475
60 150 — 20 85 1770 345
BAT

14 Midvale Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 No-Build	C	26	C	32
2030 Prel Build	***D***	***43***	**D**	**54**

65 30 110 — 85 155
45 15 100 — 900 870
20 20
90 40 — 20 15 10
855 655
55 35 — 60 60 15

15 Ashworth Ave N & N. 175th Street*

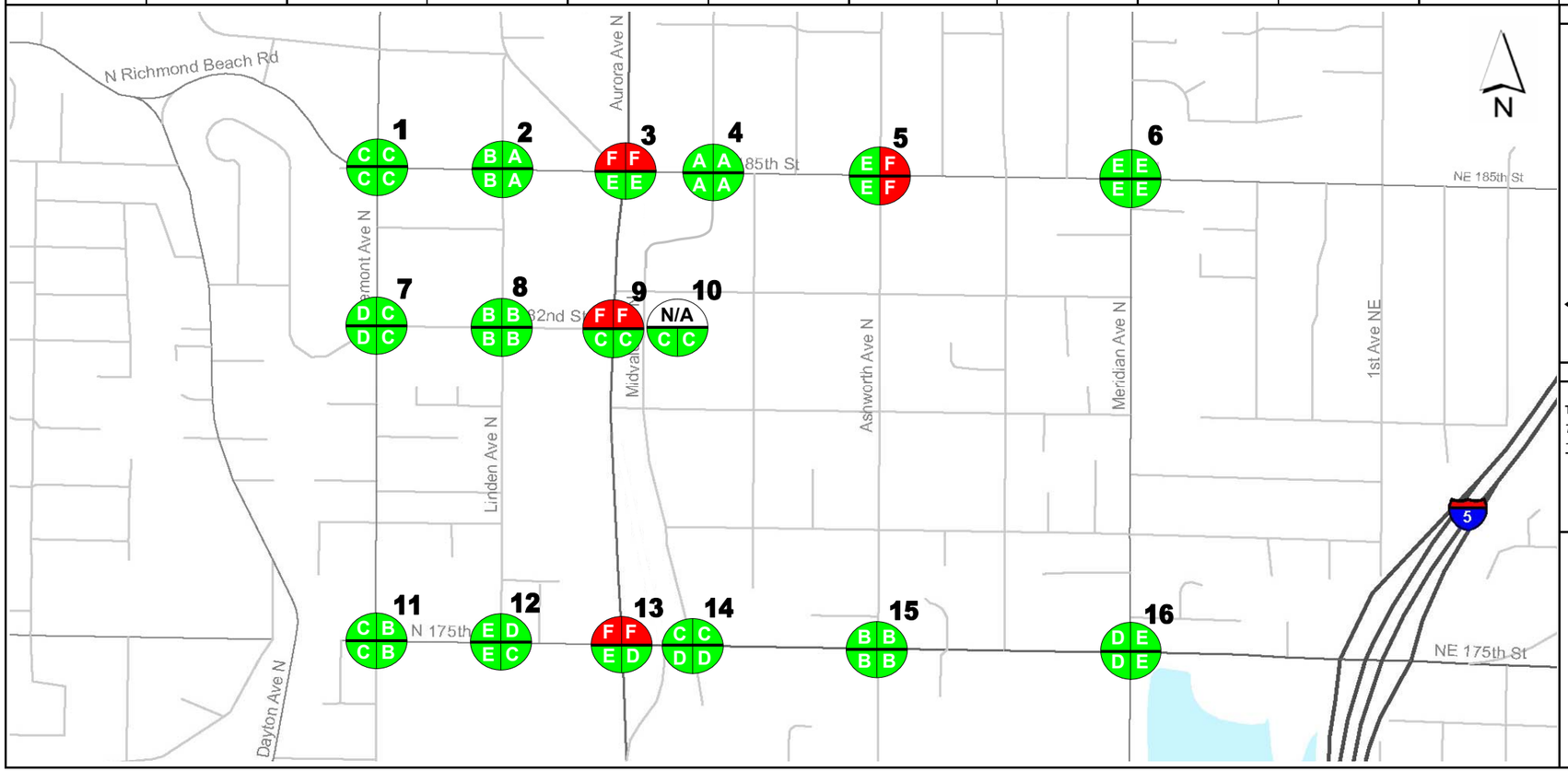
	AM Peak		PM Peak	
2030 No-Build	B	13	B	14
2030 Prel Build	***B***	***13***	**B**	**14**

35 XXX XXX — 15 65
80 XXX XXX — 865 1075
STOP — XXX XXX
XXX XXX — XXX XXX 60
970 735
65 30 — XXX XXX 100
STOP

16 Meridian Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 No-Build	D	51	E	77
2030 Prel Build	***D***	***48***	**E**	**77**

45 270 220 — 145 380
45 760 395 — 735 1005
170 215
90 40 — 75 140 130
890 630
90 150 — 120 495 270



LEGEND

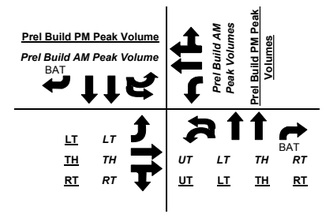
AM PM
2030 No-Build D D
2030 Prel Build F F

2 ← Intersection Number

Intersection not applicable.
LOS A - E
LOS F
XXX Indicates that movement is not allowed.
LOS Level-of-Service

Signalized intersection
Stop-controlled approach
Preliminary Build Lane Channelization
BAT Business Access and Transit Lane
Signalized intersection with Prel Build

Example AM and PM Peak Traffic Volumes



KEY

UT: U-turn volume	TH: Through volume
LT: Left-turn volume	RT: Right-turn volume

NOTES

* Worst minor street stopped delay reported for unsignalized intersections.
Text Bold represents traffic volumes, levels-of-service, and delay for 2030 Preliminary Build.
Text Italics represents traffic volumes, levels-of-service, and delay for all AM Peak Hour scenarios.
Text Underline represents traffic volumes, levels-of-service, and delay for all PM Peak Hour scenarios.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

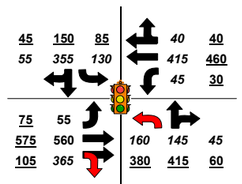
FIGURE 2
2030 Preliminary Build Intersection Volumes and LOS
AM and PM Peak Hours

SHORELINE

CH2MHILL

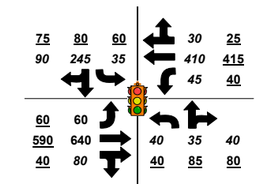
1 Fremont Ave N & N. 185th Street

	AM Peak			PM Peak		
2030 Option 1	*C*	*32*		*C*	*33*	
2030 Prel Build	*C*	*33*		*C*	*33*	



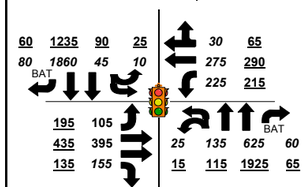
2 Linden Ave N & N. 185th Street

	AM Peak			PM Peak		
2030 Option 1	*B*	*13*		*A*	*6*	
2030 Prel Build	*B*	*12*		*A*	*7*	



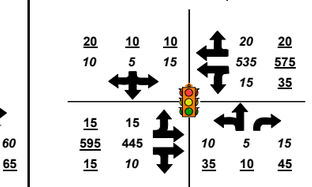
3 Aurora Ave N & N. 185th Street

	AM Peak			PM Peak		
2030 Option 1	*E*	*69*		*E*	*59*	
2030 Prel Build	*E*	*74*		*E*	*60*	



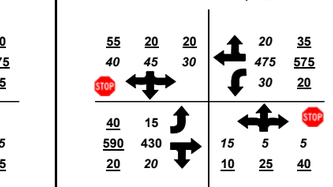
4 Midvale Ave N & N. 185th Street*

	AM Peak			PM Peak		
2030 Option 1	*A*	*4*		*A*	*5*	
2030 Prel Build	*A*	*4*		*A*	*5*	



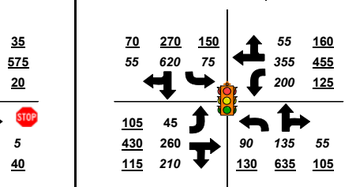
5 Ashworth Ave N & N. 185th Street*

	AM Peak			PM Peak		
2030 Option 1	*D*	*32*		*F*	*58*	
2030 Prel Build	*E*	*40*		*F*	*89*	



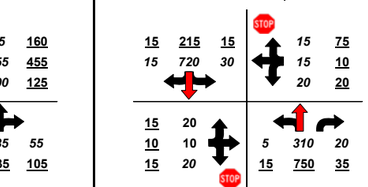
6 Meridian Ave N & N. 185th Street

	AM Peak			PM Peak		
2030 Option 1	*E*	*55*		*E*	*78*	
2030 Prel Build	*E*	*65*		*E*	*78*	



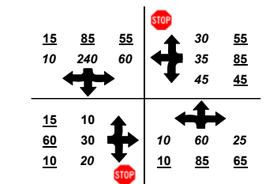
7 Fremont Ave N & N. 182nd Street*

	AM Peak			PM Peak		
2030 Option 1	*E*	*40*		*D*	*26*	
2030 Prel Build	*D*	*32*		*C*	*21*	



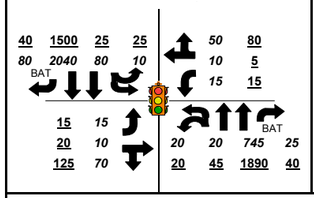
8 Linden Ave N & N. 182nd Street*

	AM Peak			PM Peak		
2030 Option 1	*B*	*14*		*B*	*14*	
2030 Prel Build	*B*	*14*		*B*	*15*	



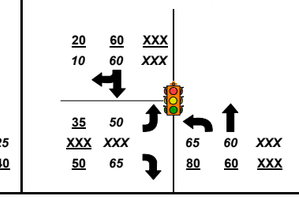
9 Aurora Ave N & N. 182nd Street

	AM Peak			PM Peak		
2030 Option 1	*C*	*22*		*B*	*18*	
2030 Prel Build	*C*	*23*		*C*	*23*	



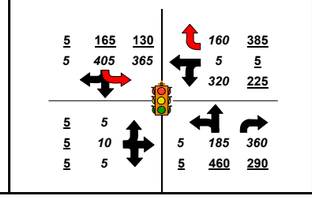
10 Midvale Ave N & N. 182nd Street

	AM Peak			PM Peak		
2030 Option 1	*C*	*25*		*C*	*29*	
2030 Prel Build	*C*	*25*		*C*	*29*	



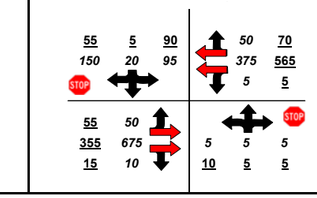
11 Fremont Ave N & N. 175th Street

	AM Peak			PM Peak		
2030 Option 1	*E*	*47*		*D*	*30*	
2030 Prel Build	*E*	*38*		*C*	*24*	



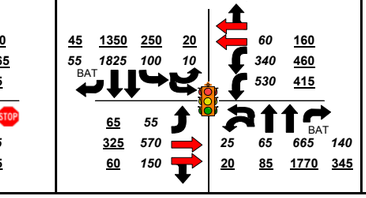
12 Linden Ave N & N. 175th Street*

	AM Peak			PM Peak		
2030 Option 1	*E*	*47*		*D*	*30*	
2030 Prel Build	*E*	*38*		*C*	*24*	



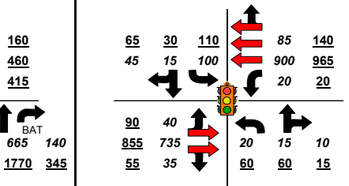
13 Aurora Ave N & N. 175th Street

	AM Peak			PM Peak		
2030 Option 1	*E*	*79*		*D*	*48*	
2030 Prel Build	*E*	*74*		*D*	*51*	



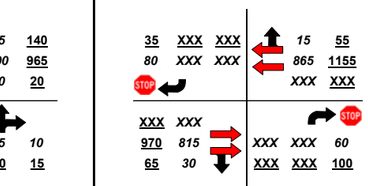
14 Midvale Ave N & N. 175th Street

	AM Peak			PM Peak		
2030 Option 1	*E*	*64*		*E*	*66*	
2030 Prel Build	*D*	*43*		*D*	*54*	



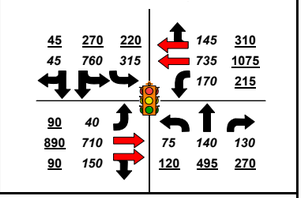
15 Ashworth Ave N & N. 175th Street*

	AM Peak			PM Peak		
2030 Option 1	*B*	*13*		*B*	*15*	
2030 Prel Build	*B*	*13*		*B*	*14*	



16 Meridian Ave N & N. 175th Street

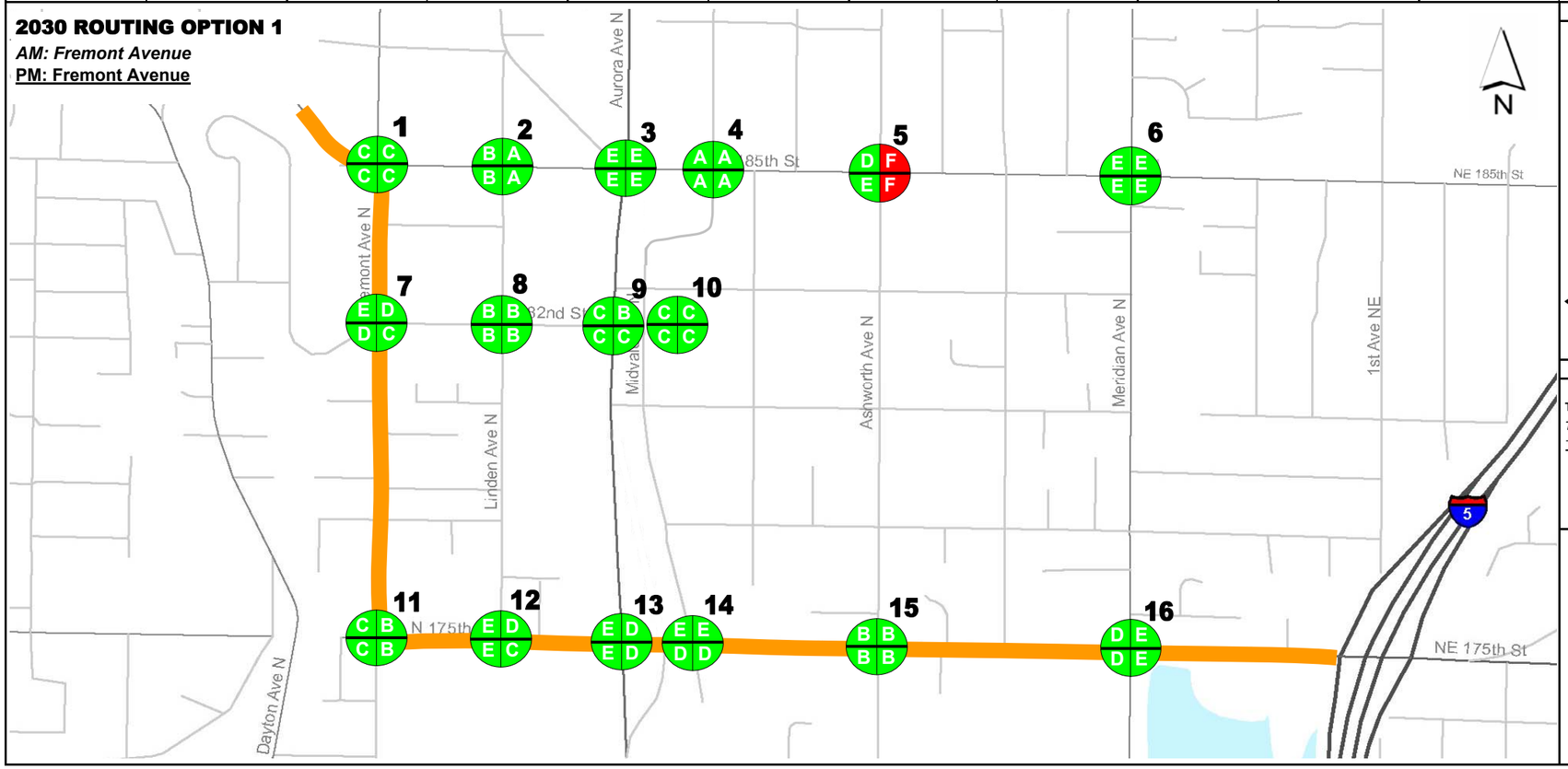
	AM Peak			PM Peak		
2030 Option 1	*D*	*52*		*E*	*76*	
2030 Prel Build	*D*	*48*		*E*	*77*	



2030 ROUTING OPTION 1

AM: Fremont Avenue

PM: Fremont Avenue



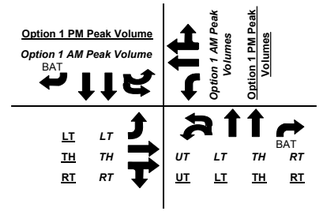
LEGEND

AM PM
2030 Option 1 / 2030 Prel Build: D D / F F

2 ← Intersection Number

- Intersection not applicable.
- LOS A - E
- LOS F
- XXX Indicates that movement is not allowed.
- LOS Level-of-Service
- Signalized intersection
- STOP Stop-controlled approach
- Preliminary Build Lane Channelization
- BAT Business Access and Transit Lane
- Lane(s) effected by Routing Option 1

Example AM and PM Peak Traffic Volumes



KEY

UT: U-turn volume	TH: Through volume
LT: Left-turn volume	RT: Right-turn volume

NOTES

* Worst minor street stopped delay reported for unsignalized intersections.

Text Bold represents traffic volumes, levels-of-service, and delay for 2030 Routing Option 1.

Text Italics represents traffic volumes, levels-of-service, and delay for all AM Peak Hour scenarios.

Text Underline represents traffic volumes, levels-of-service, and delay for all PM Peak Hour scenarios.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

FIGURE 3
2030 Build Intersection Volumes and LOS
AM and PM Peak Hours

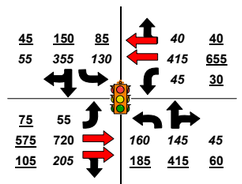
Routing Option 1: Fremont Avenue

SHORELINE

CH2MHILL

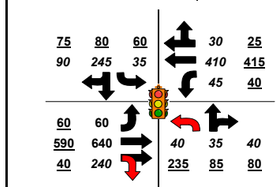
1 Fremont Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 2	*C*	*34*	**C**	**34**
2030 Prel Build	*C*	*33*	C	33



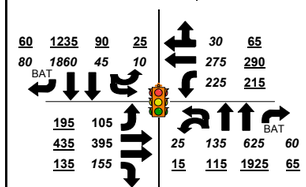
2 Linden Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 2	*B*	*12*	**A**	**9**
2030 Prel Build	*B*	*12*	A	7



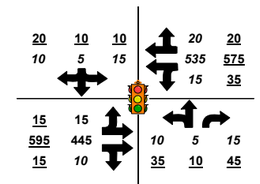
3 Aurora Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 2	*E*	*69*	**E**	**59**
2030 Prel Build	*E*	*74*	E	60



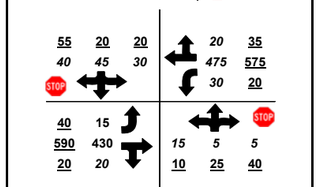
4 Midvale Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 2	*A*	*4*	**A**	**5**
2030 Prel Build	*A*	*4*	A	5



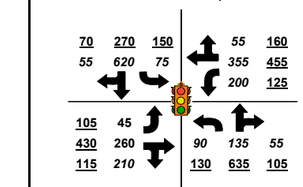
5 Ashworth Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 2	*D*	*32*	**F**	**58**
2030 Prel Build	*E*	*40*	F	89



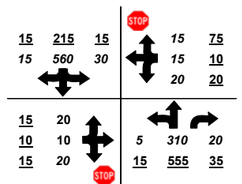
6 Meridian Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 2	*E*	*55*	**E**	**78**
2030 Prel Build	*E*	*65*	E	78



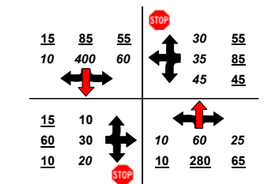
7 Fremont Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 2	*D*	*23*	**C**	**19**
2030 Prel Build	*D*	*32*	C	21



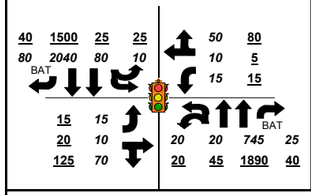
8 Linden Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 2	*C*	*18*	**C**	**19**
2030 Prel Build	*B*	*14*	B	15



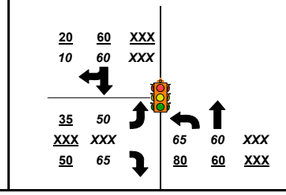
9 Aurora Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 2	*C*	*22*	**B**	**17**
2030 Prel Build	*C*	*23*	C	23



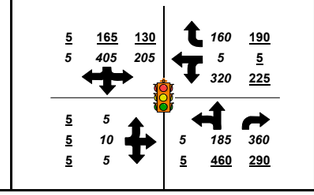
10 Midvale Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 2	*B*	*18*	**B**	**11**
2030 Prel Build	*C*	*25*	C	29



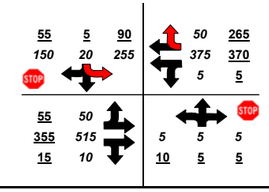
11 Fremont Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 2	*B*	*18*	**B**	**11**
2030 Prel Build	*C*	*23*	B	10



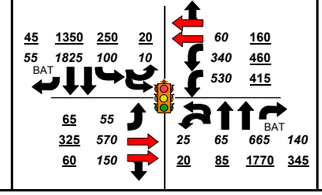
12 Linden Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 2	*F*	*>150*	**C**	**23**
2030 Prel Build	*E*	*38*	C	24



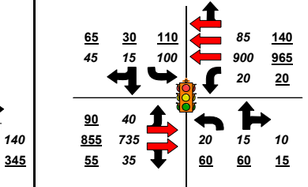
13 Aurora Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 2	*E*	*79*	**D**	**47**
2030 Prel Build	*E*	*74*	D	51



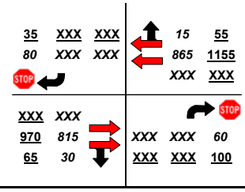
14 Midvale Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 2	*E*	*64*	**E**	**69**
2030 Prel Build	*D*	*43*	D	54



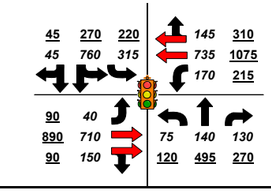
15 Ashworth Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 2	*B*	*13*	**B**	**15**
2030 Prel Build	*B*	*13*	B	14



16 Meridian Ave N & N. 175th Street

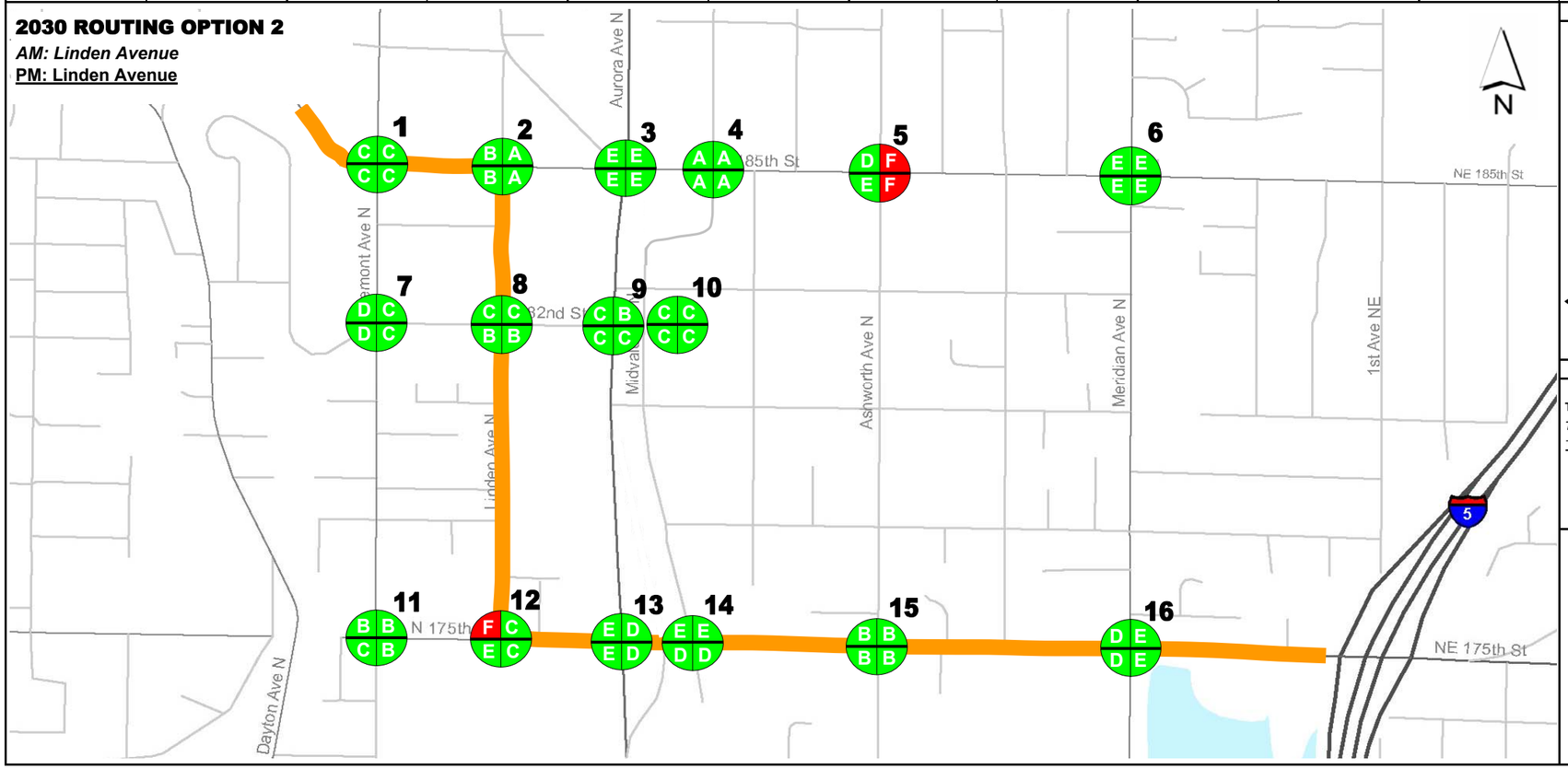
	AM Peak		PM Peak	
2030 Option 2	*D*	*52*	**E**	**76**
2030 Prel Build	*D*	*48*	E	77



2030 ROUTING OPTION 2

AM: Linden Avenue

PM: Linden Avenue



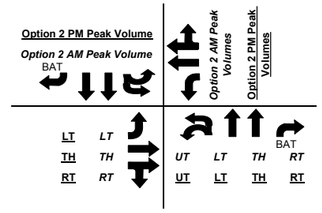
LEGEND

AM PM
2030 Option 2 D D
2030 Prel Build F F

2 ← Intersection Number

- Intersection not applicable.
- LOS A - E
- LOS F
- XXX Indicates that movement is not allowed.
- LOS Level-of-Service
- Signalized intersection
- Stop-controlled approach
- Preliminary Build Lane Channelization
- BAT Business Access and Transit Lane
- Lane(s) effected by Routing Option 2

Example AM and PM Peak Traffic Volumes



KEY

UT: U-turn volume	TH: Through volume
LT: Left-turn volume	RT: Right-turn volume

NOTES

* Worst minor street stopped delay reported for unsignalized intersections.

Text Bold represents traffic volumes, levels-of-service, and delay for 2030 Routing Option 2.

Text Italics represents traffic volumes, levels-of-service, and delay for all AM Peak Hour scenarios.

Text Underline represents traffic volumes, levels-of-service, and delay for all PM Peak Hour scenarios.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

FIGURE 4
2030 Build Intersection Volumes and LOS
AM and PM Peak Hours

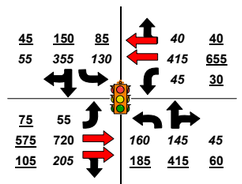
Routing Option 2: Linden Avenue

SHORELINE

CH2MHILL

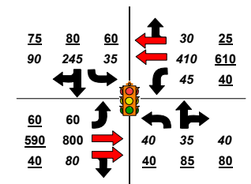
1 Fremont Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 3	*C*	*34*	C	34
2030 Prel Build	*C*	*33*	C	33



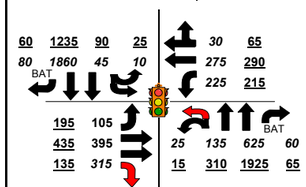
2 Linden Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 3	*B*	*12*	A	6
2030 Prel Build	*B*	*12*	A	7



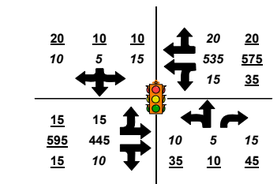
3 Aurora Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 3	*E*	*76*	E	62
2030 Prel Build	*E*	*74*	E	60



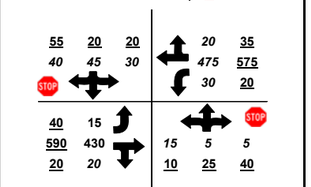
4 Midvale Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 3	*A*	*4*	A	5
2030 Prel Build	*A*	*4*	A	5



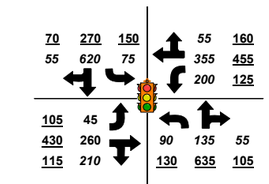
5 Ashworth Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 3	*D*	*32*	F	58
2030 Prel Build	*E*	*40*	F	89



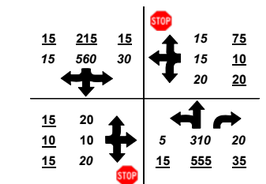
6 Meridian Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 3	*E*	*55*	E	78
2030 Prel Build	*E*	*65*	E	78



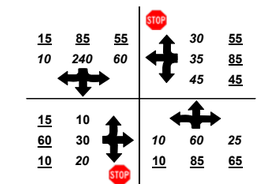
7 Fremont Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 3	*D*	*28*	C	19
2030 Prel Build	*D*	*32*	C	21



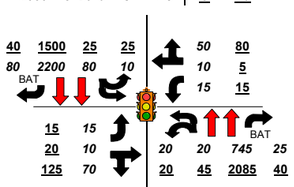
8 Linden Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 3	*B*	*14*	B	14
2030 Prel Build	*B*	*14*	B	15



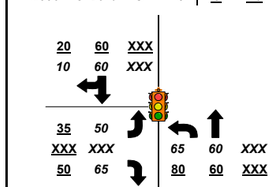
9 Aurora Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 3	*D*	*41*	D	37
2030 Prel Build	*C*	*23*	C	23



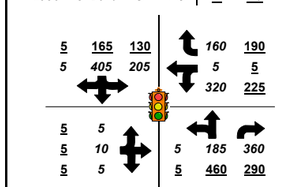
10 Midvale Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 3	*B*	*18*	B	11
2030 Prel Build	*C*	*25*	C	29



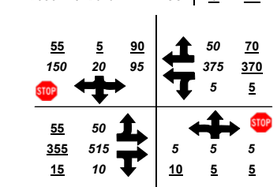
11 Fremont Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 3	*D*	*31*	C	23
2030 Prel Build	*C*	*23*	B	10



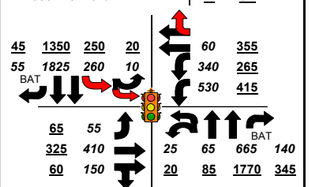
12 Linden Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 3	*E*	*62*	D	50
2030 Prel Build	*E*	*74*	D	51



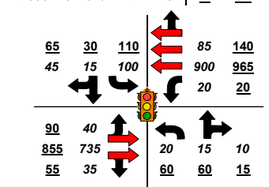
13 Aurora Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 3	*E*	*67*	E	63
2030 Prel Build	*D*	*43*	D	54



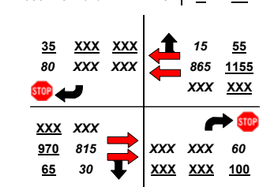
14 Midvale Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 3	*E*	*67*	E	63
2030 Prel Build	*D*	*43*	D	54



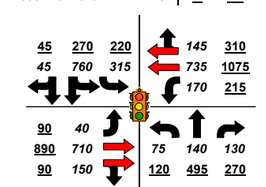
15 Ashworth Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 3	*B*	*13*	B	15
2030 Prel Build	*B*	*13*	B	14



16 Meridian Ave N & N. 175th Street

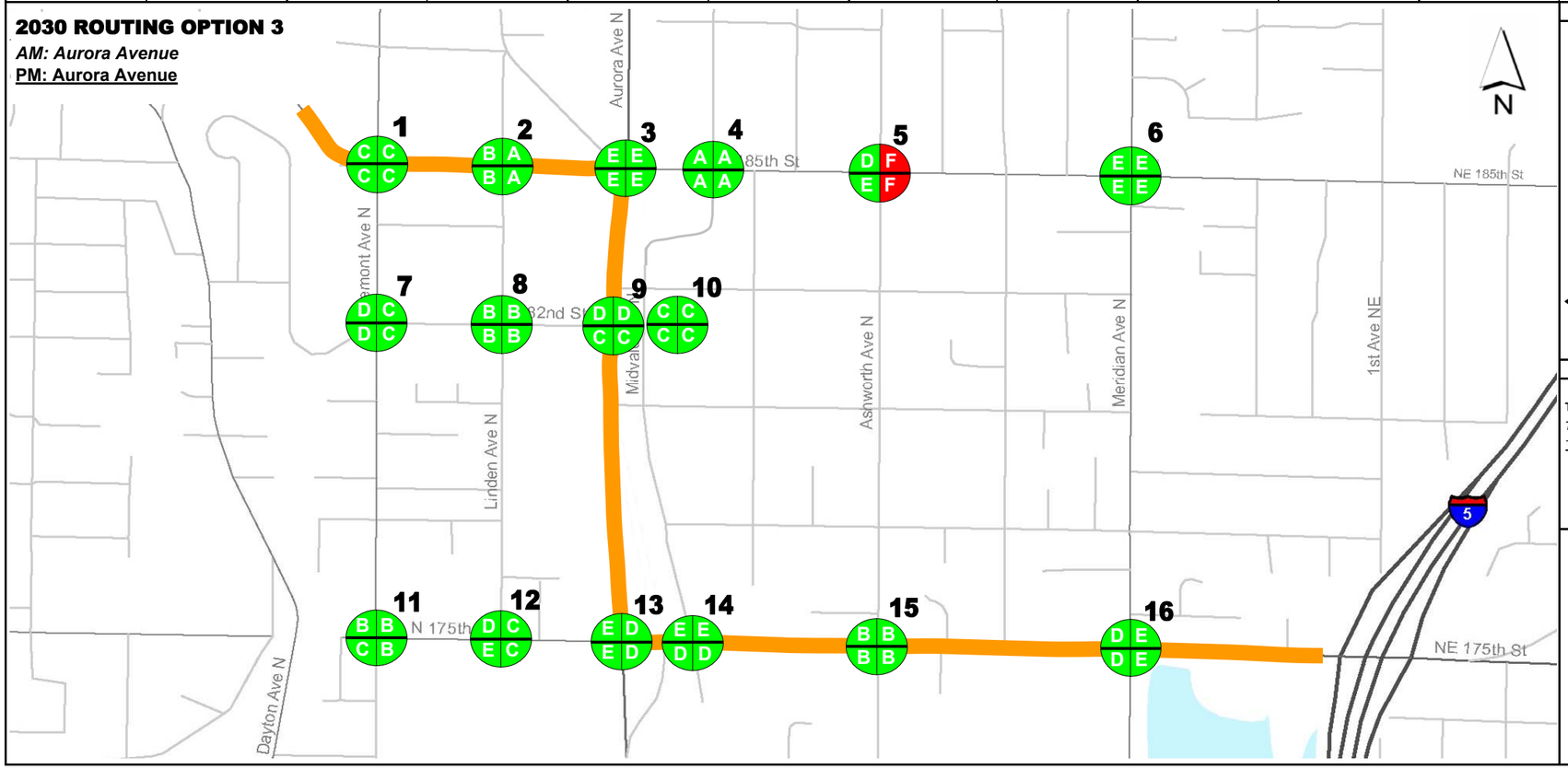
	AM Peak		PM Peak	
2030 Option 3	*D*	*52*	E	76
2030 Prel Build	*D*	*48*	E	77



2030 ROUTING OPTION 3

AM: Aurora Avenue

PM: Aurora Avenue



LEGEND

AM PM

2030 Option 3 / 2030 Prel Build: D D / F F

2 ← Intersection Number

Intersection not applicable.

LOS A - E

LOS F

XXX Indicates that movement is not allowed.

LOS Level-of-Service

Signalized intersection

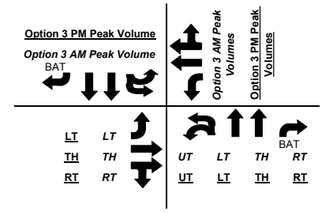
Stop-controlled approach

Preliminary Build Lane Channelization

BAT Business Access and Transit Lane

Lane(s) effected by Routing Option 3

Example AM and PM Peak Traffic Volumes



KEY

UT: U-turn volume TH: Through volume

LT: Left-turn volume RT: Right-turn volume

NOTES

* Worst minor street stopped delay reported for unsignalized intersections.

Text Bold represents traffic volumes, levels-of-service, and delay for 2030 Routing Option 3.

Text Italics represents traffic volumes, levels-of-service, and delay for all AM Peak Hour scenarios.

Text Underline represents traffic volumes, levels-of-service, and delay for all PM Peak Hour scenarios.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

FIGURE 5
2030 Build Intersection Volumes and LOS
AM and PM Peak Hours

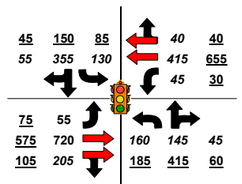
Routing Option 3: Aurora Avenue

SHORELINE

CH2MHILL

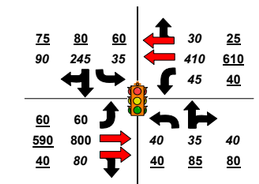
1 Fremont Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 4	*C*	*34*	C	34
2030 Prel Build	*C*	*33*	C	33



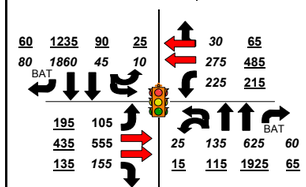
2 Linden Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 4	*B*	*12*	A	6
2030 Prel Build	*B*	*12*	A	7



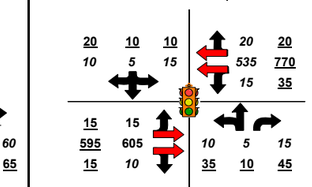
3 Aurora Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 4	*F*	*82*	E	64
2030 Prel Build	*E*	*74*	E	60



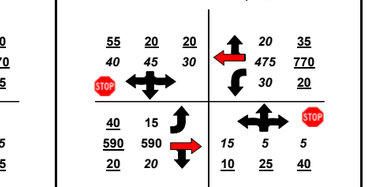
4 Midvale Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 4	*A*	*4*	A	5
2030 Prel Build	*A*	*4*	A	5



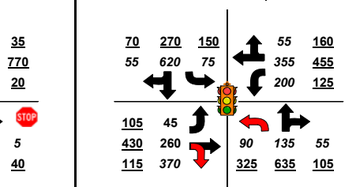
5 Ashworth Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 4	*F*	*55*	F	128
2030 Prel Build	*E*	*40*	F	89



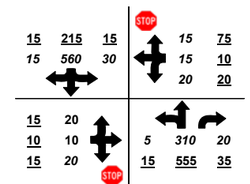
6 Meridian Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 4	*E*	*77*	E	79
2030 Prel Build	*E*	*65*	E	78



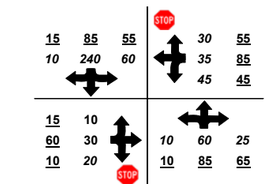
7 Fremont Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 4	*D*	*28*	C	19
2030 Prel Build	*D*	*32*	C	21



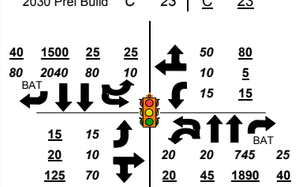
8 Linden Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 4	*B*	*14*	B	14
2030 Prel Build	*B*	*14*	B	15



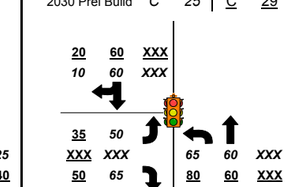
9 Aurora Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 4	*C*	*21*	C	23
2030 Prel Build	*C*	*23*	C	23



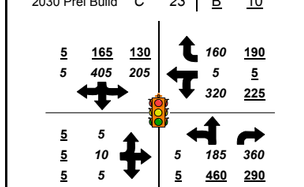
10 Midvale Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 4	*B*	*17*	B	11
2030 Prel Build	*C*	*25*	C	29



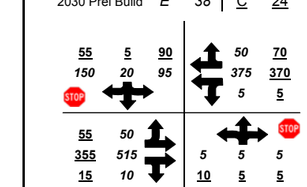
11 Fremont Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 4	*D*	*34*	C	23
2030 Prel Build	*E*	*38*	C	24



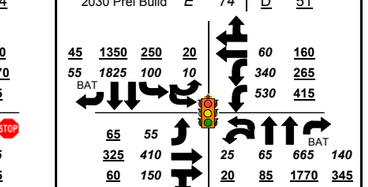
12 Linden Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 4	*E*	*60*	D	49
2030 Prel Build	*E*	*74*	D	51



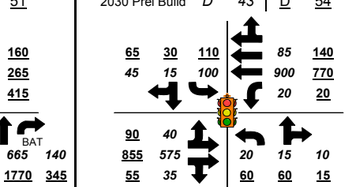
13 Aurora Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 4	*E*	*60*	D	54
2030 Prel Build	*D*	*43*	D	54



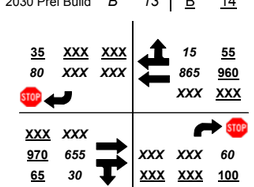
14 Midvale Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 4	*E*	*70*	D	54
2030 Prel Build	*D*	*43*	D	54



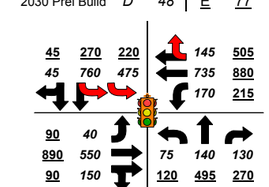
15 Ashworth Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 4	*B*	*13*	B	13
2030 Prel Build	*B*	*13*	B	14



16 Meridian Ave N & N. 175th Street

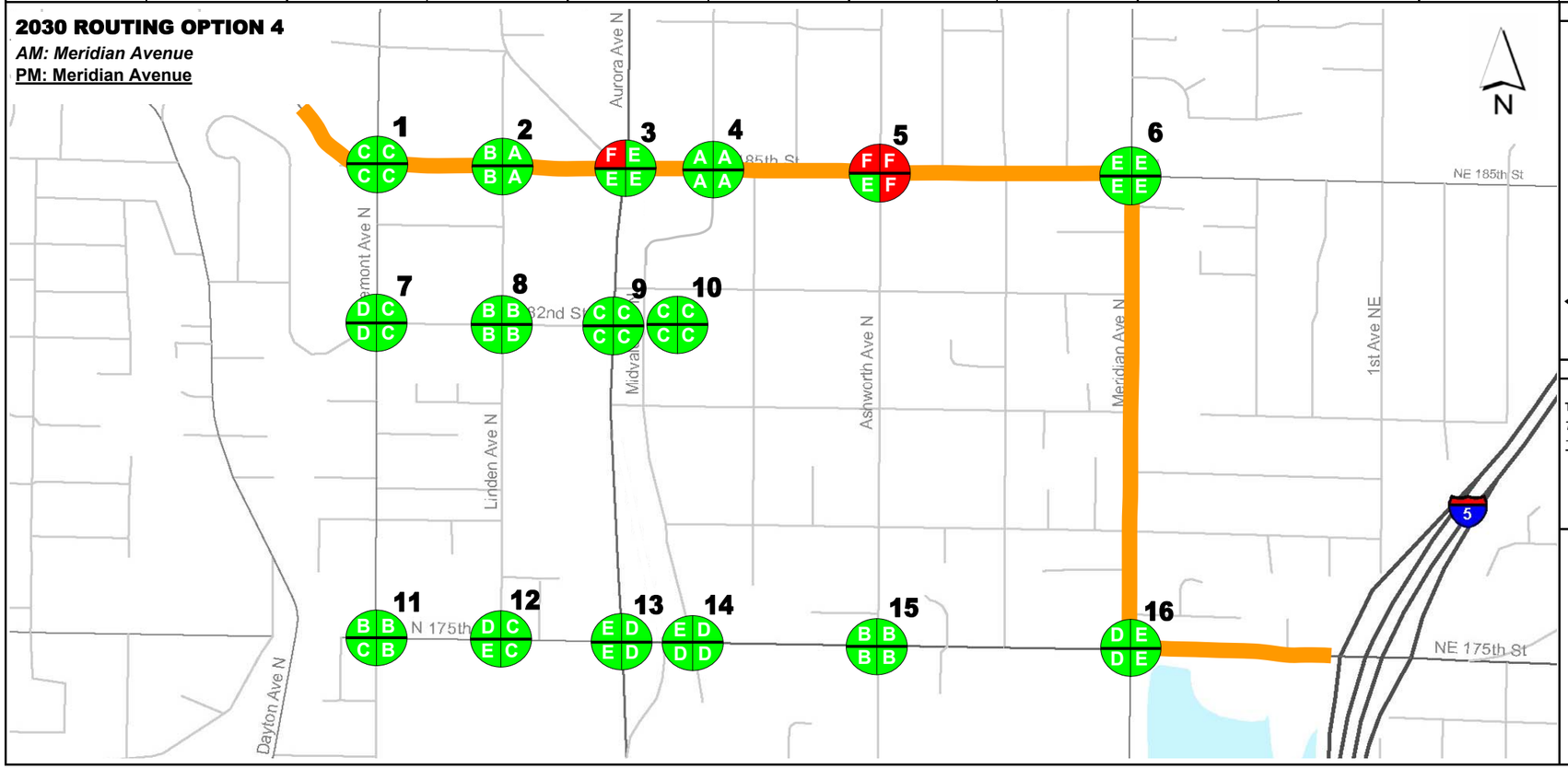
	AM Peak		PM Peak	
2030 Option 4	*D*	*47*	E	76
2030 Prel Build	*D*	*48*	E	77



2030 ROUTING OPTION 4

AM: Meridian Avenue

PM: Meridian Avenue



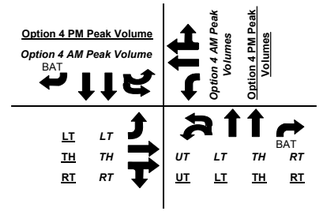
LEGEND

AM PM — 2030 Option 4 / 2030 Prel Build: D D / F F

2 ← Intersection Number

- Intersection not applicable.
- LOS A - E
- LOS F
- XXX Indicates that movement is not allowed.
- LOS Level-of-Service
- Signalized intersection
- Stop-controlled approach
- Preliminary Build Lane Channelization
- BAT Business Access and Transit Lane
- Lane(s) effected by Routing Option 4

Example AM and PM Peak Traffic Volumes



KEY

UT: U-turn volume	TH: Through volume
LT: Left-turn volume	RT: Right-turn volume

NOTES

* Worst minor street stopped delay reported for unsignalized intersections.

Text Bold represents traffic volumes, levels-of-service, and delay for 2030 Routing Option 4.

Text Italics represents traffic volumes, levels-of-service, and delay for all AM Peak Hour scenarios.

Text Underline represents traffic volumes, levels-of-service, and delay for all PM Peak Hour scenarios.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

FIGURE 6
2030 Build Intersection Volumes and LOS
AM and PM Peak Hours

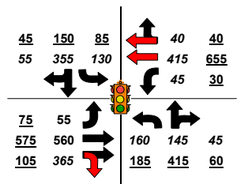
Routing Option 4: Meridian Avenue

SHORELINE

CH2MHILL

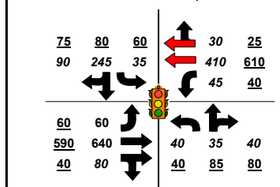
1 Fremont Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 5	*C*	*32*	C	34
2030 Prel Build	*C*	*33*	C	33



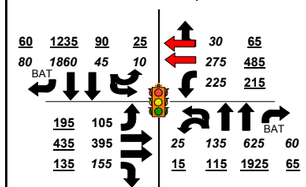
2 Linden Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 5	*B*	*13*	A	6
2030 Prel Build	*B*	*12*	A	7



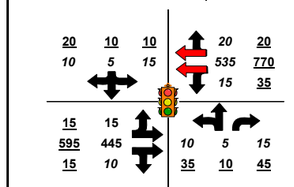
3 Aurora Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 5	*E*	*70*	E	64
2030 Prel Build	*E*	*74*	E	60



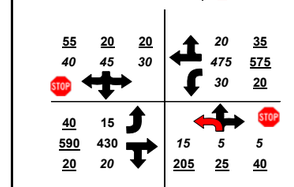
4 Midvale Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 5	*A*	*4*	A	5
2030 Prel Build	*A*	*4*	A	5



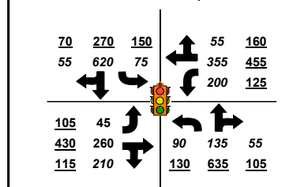
5 Ashworth Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 5	*D*	*32*	F	>150
2030 Prel Build	*E*	*40*	F	89



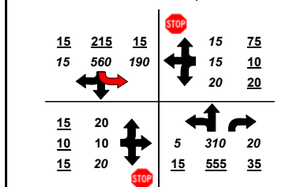
6 Meridian Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 5	*E*	*55*	E	78
2030 Prel Build	*E*	*65*	E	78



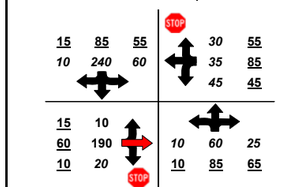
7 Fremont Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 5	*F*	*74*	C	19
2030 Prel Build	*D*	*32*	C	21



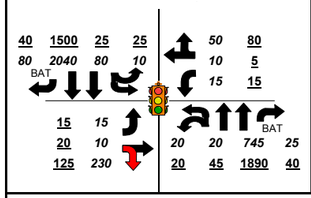
8 Linden Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 5	*C*	*21*	B	14
2030 Prel Build	*B*	*14*	B	15



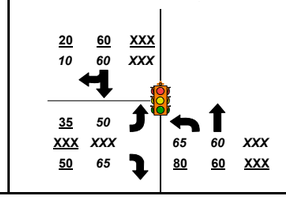
9 Aurora Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 5	*C*	*28*	C	23
2030 Prel Build	*C*	*23*	C	23



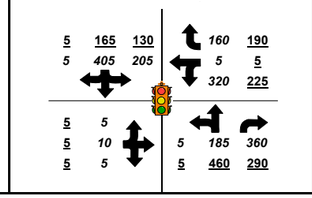
10 Midvale Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 5	*B*	*17*	B	11
2030 Prel Build	*C*	*25*	C	29



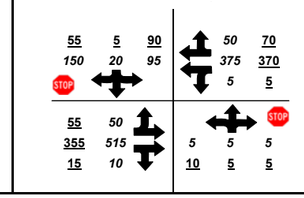
11 Fremont Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 5	*D*	*33*	C	23
2030 Prel Build	*E*	*38*	C	24



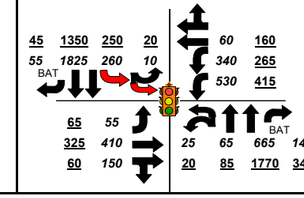
12 Linden Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 5	*E*	*58*	D	49
2030 Prel Build	*E*	*74*	D	51



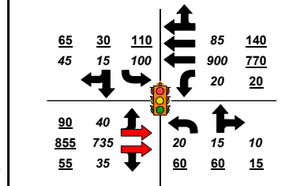
13 Aurora Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 5	*E*	*62*	D	54
2030 Prel Build	*D*	*43*	D	54



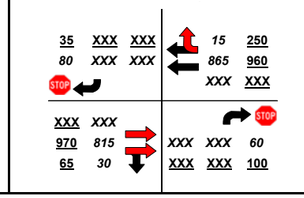
14 Midvale Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 5	*B*	*13*	B	15
2030 Prel Build	*B*	*13*	B	14



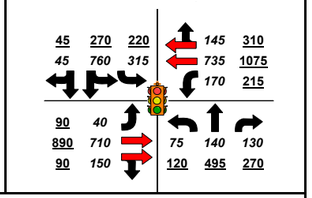
15 Ashworth Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 5	*B*	*13*	B	15
2030 Prel Build	*B*	*13*	B	14



16 Meridian Ave N & N. 175th Street

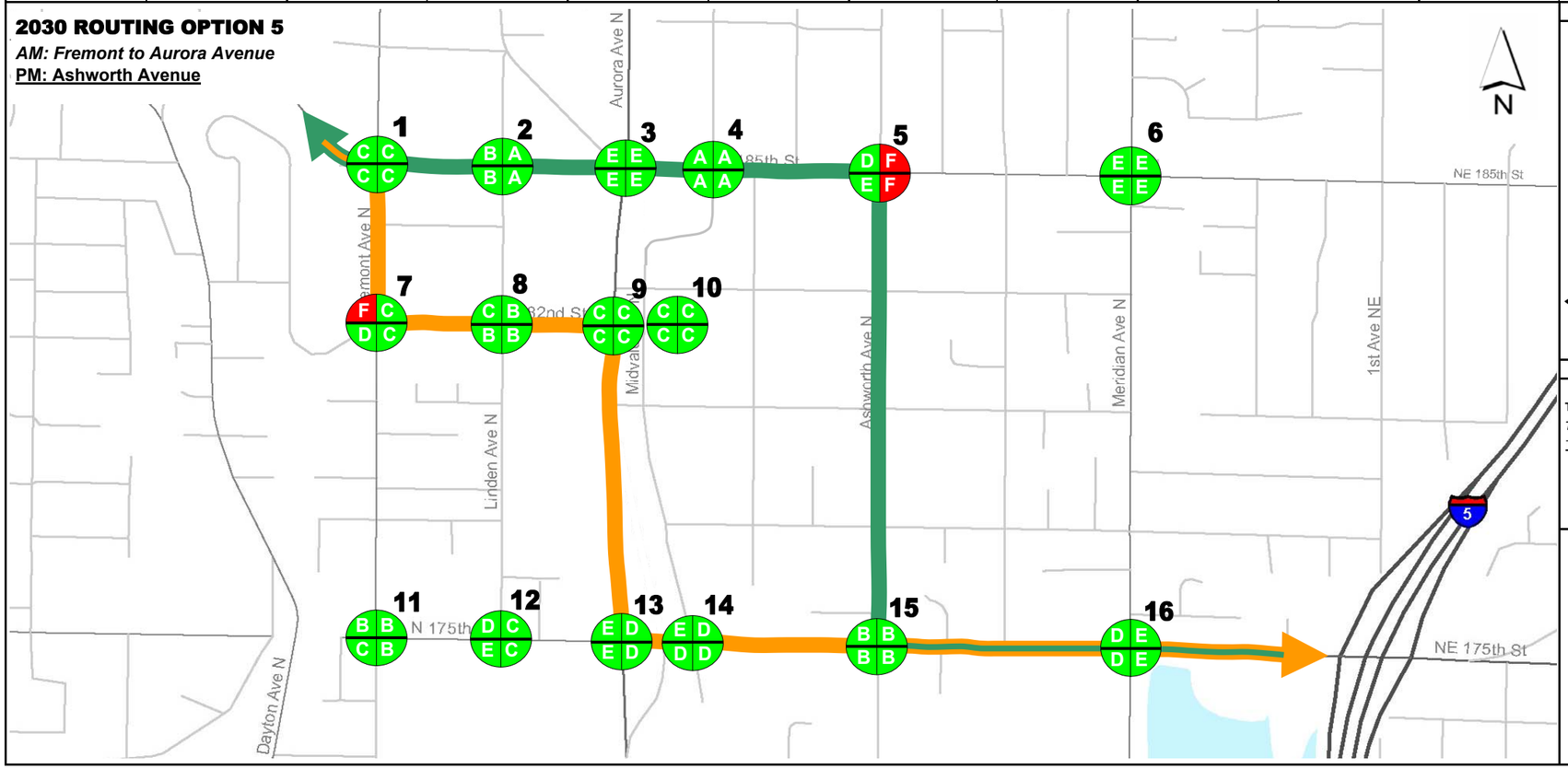
	AM Peak		PM Peak	
2030 Option 5	*D*	*52*	E	76
2030 Prel Build	*D*	*48*	E	77



2030 ROUTING OPTION 5

AM: Fremont to Aurora Avenue

PM: Ashworth Avenue



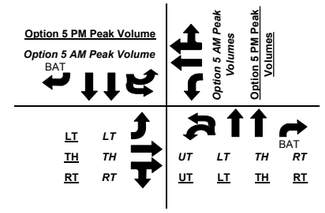
LEGEND

AM PM — 2030 Option 5 / 2030 Prel Build: D D / F F

2 ← Intersection Number

- Intersection not applicable.
- LOS A - E
- LOS F
- XXX Indicates that movement is not allowed.
- LOS Level-of-Service
- Signalized intersection
- Stop-controlled approach
- Preliminary Build Lane Channelization
- BAT Business Access and Transit Lane
- Lane(s) effected by Routing Option 5

Example AM and PM Peak Traffic Volumes



KEY

UT: U-turn volume	TH: Through volume
LT: Left-turn volume	RT: Right-turn volume

NOTES

* Worst minor street stopped delay reported for unsignalized intersections.

Text Bold represents traffic volumes, levels-of-service, and delay for 2030 Routing Option 5.

Text Italics represents traffic volumes, levels-of-service, and delay for all AM Peak Hour scenarios.

Text Underline represents traffic volumes, levels-of-service, and delay for all PM Peak Hour scenarios.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

FIGURE 7
2030 Build Intersection Volumes and LOS
AM and PM Peak Hours

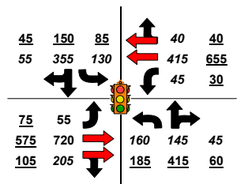
Routing Option 5: Fremont-Aurora Avenue (AM) and Ashworth Avenue (PM)

SHORELINE

CH2MHILL

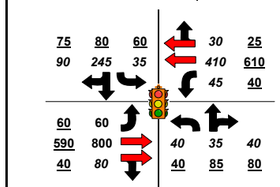
1 Fremont Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 6	*C*	*34*	**C**	**34**
2030 Prel Build	*C*	*33*	C	33



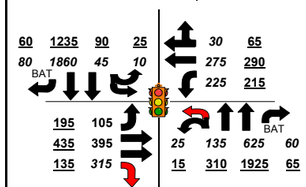
2 Linden Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 6	*B*	*12*	**A**	**6**
2030 Prel Build	*B*	*12*	A	7



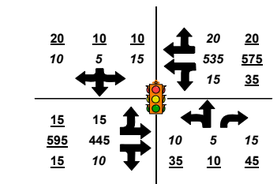
3 Aurora Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 6	*E*	*76*	**E**	**60**
2030 Prel Build	*E*	*74*	E	60



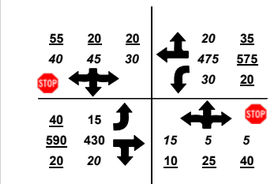
4 Midvale Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 6	*A*	*4*	**A**	**5**
2030 Prel Build	*A*	*4*	A	5



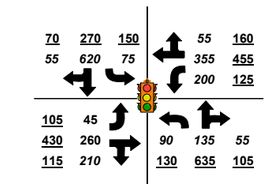
5 Ashworth Ave N & N. 185th Street*

	AM Peak		PM Peak	
2030 Option 6	*D*	*32*	**F**	**58**
2030 Prel Build	*E*	*40*	F	89



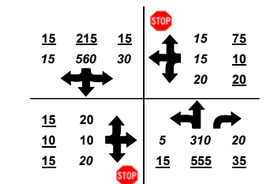
6 Meridian Ave N & N. 185th Street

	AM Peak		PM Peak	
2030 Option 6	*E*	*55*	**E**	**78**
2030 Prel Build	*E*	*65*	E	78



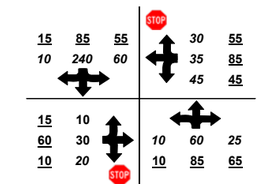
7 Fremont Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 6	*D*	*28*	**C**	**19**
2030 Prel Build	*D*	*32*	C	21



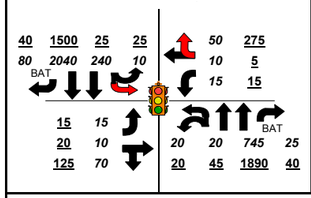
8 Linden Ave N & N. 182nd Street*

	AM Peak		PM Peak	
2030 Option 6	*B*	*14*	**B**	**14**
2030 Prel Build	*B*	*14*	B	15



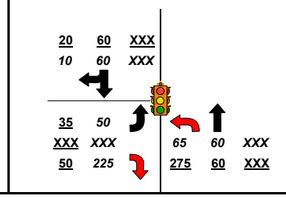
9 Aurora Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 6	*D*	*35*	**D**	**40**
2030 Prel Build	*C*	*23*	C	23



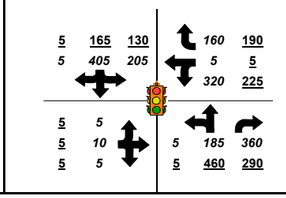
10 Midvale Ave N & N. 182nd Street

	AM Peak		PM Peak	
2030 Option 6	*B*	*17*	**B**	**11**
2030 Prel Build	*C*	*25*	C	29



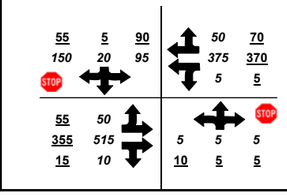
11 Fremont Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 6	*B*	*17*	**B**	**11**
2030 Prel Build	*C*	*23*	B	10



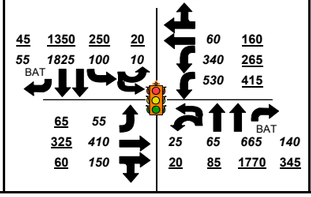
12 Linden Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 6	*D*	*33*	**C**	**23**
2030 Prel Build	*E*	*38*	C	24



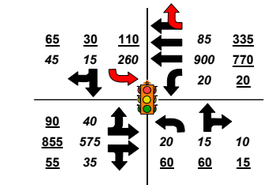
13 Aurora Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 6	*E*	*62*	**D**	**48**
2030 Prel Build	*E*	*74*	D	51



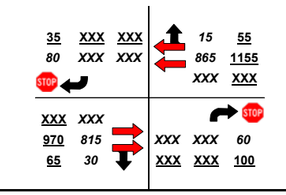
14 Midvale Ave N & N. 175th Street

	AM Peak		PM Peak	
2030 Option 6	*E*	*68*	**D**	**53**
2030 Prel Build	*D*	*43*	D	54



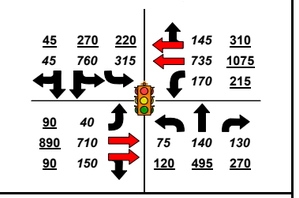
15 Ashworth Ave N & N. 175th Street*

	AM Peak		PM Peak	
2030 Option 6	*B*	*13*	**B**	**14**
2030 Prel Build	*B*	*13*	B	14



16 Meridian Ave N & N. 175th Street

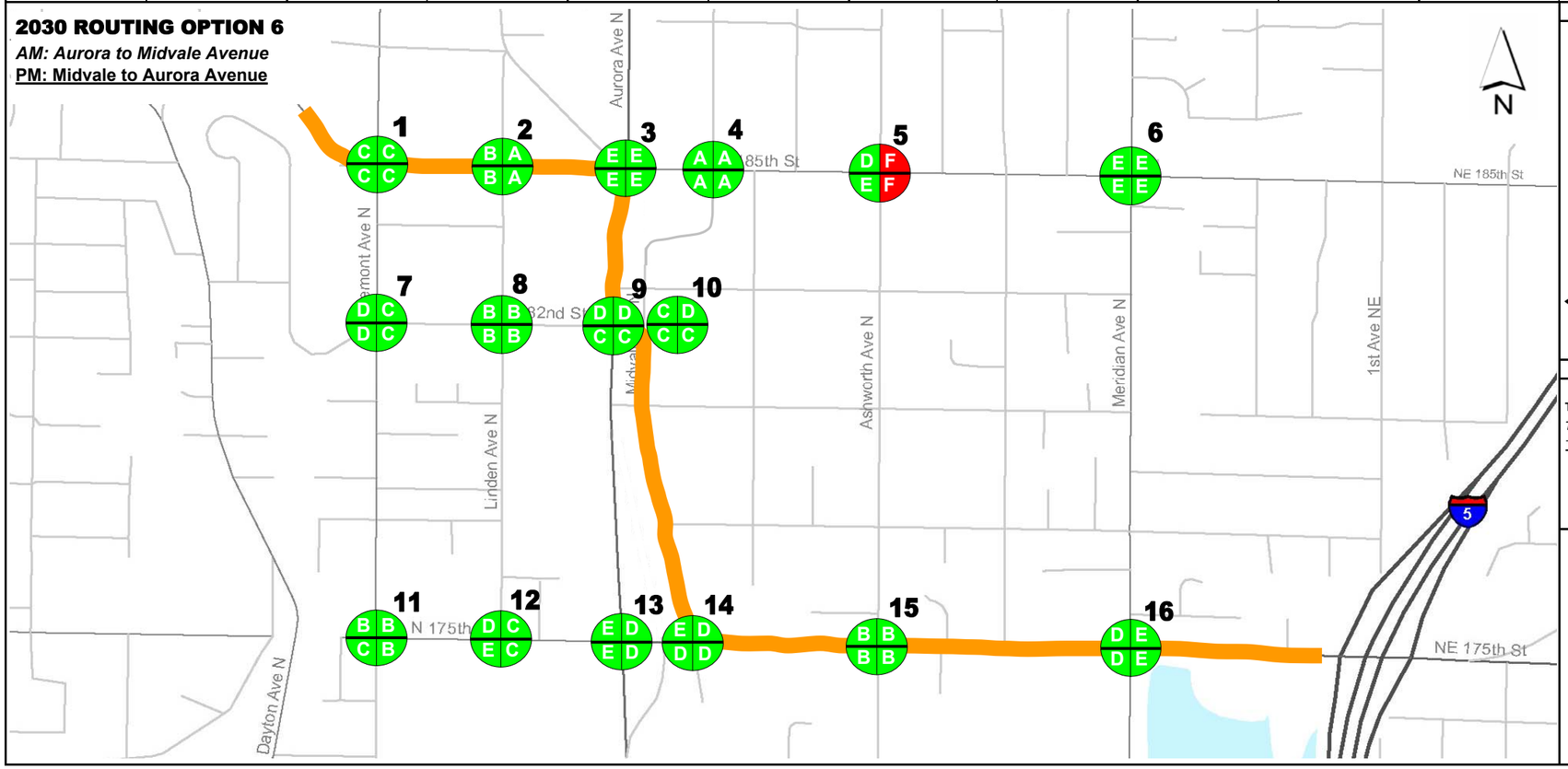
	AM Peak		PM Peak	
2030 Option 6	*D*	*52*	**E**	**76**
2030 Prel Build	*D*	*48*	E	77



2030 ROUTING OPTION 6

AM: Aurora to Midvale Avenue

PM: Midvale to Aurora Avenue



LEGEND

AM PM — 2030 Option 6 / 2030 Prel Build: D D / F F

2 ← Intersection Number

Intersection not applicable.

LOS A - E

LOS F

XXX Indicates that movement is not allowed.

LOS Level-of-Service

Signalized intersection

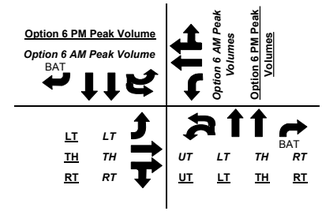
STOP Stop-controlled approach

Preliminary Build Lane Channelization

BAT Business Access and Transit Lane

Lane(s) effected by Routing Option 6

Example AM and PM Peak Traffic Volumes



KEY

UT: U-turn volume	TH: Through volume
LT: Left-turn volume	RT: Right-turn volume

NOTES

* Worst minor street stopped delay reported for unsignalized intersections.

Text Bold represents traffic volumes, levels-of-service, and delay for 2030 Routing Option 6.

Text Italics represents traffic volumes, levels-of-service, and delay for all AM Peak Hour scenarios.

Text Underline represents traffic volumes, levels-of-service, and delay for all PM Peak Hour scenarios.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

FIGURE 8
2030 Build Intersection Volumes and LOS
AM and PM Peak Hours

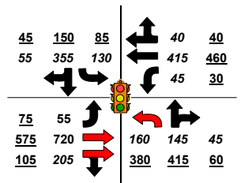
Routing Option 6: Aurora-Midvale Avenue

SHORELINE

CH2MHILL

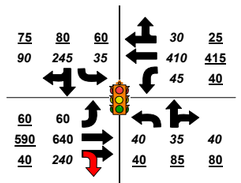
1 Fremont Ave N & N. 185th Street

	AM Peak			PM Peak		
2030 Option 7	*C*	*33*		*C*	*33*	
2030 Prel Build	*C*	*33*		*C*	*33*	



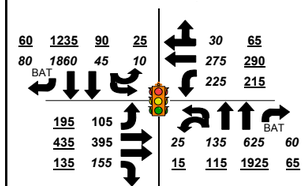
2 Linden Ave N & N. 185th Street

	AM Peak			PM Peak		
2030 Option 7	*B*	*13*		*A*	*6*	
2030 Prel Build	*B*	*12*		*A*	*7*	



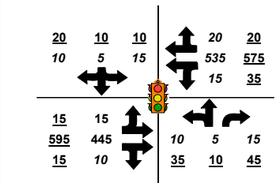
3 Aurora Ave N & N. 185th Street

	AM Peak			PM Peak		
2030 Option 7	*E*	*74*		*E*	*58*	
2030 Prel Build	*E*	*74*		*E*	*60*	



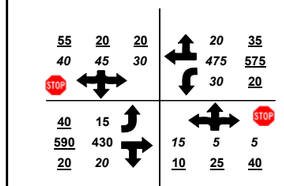
4 Midvale Ave N & N. 185th Street*

	AM Peak			PM Peak		
2030 Option 7	*A*	*4*		*A*	*5*	
2030 Prel Build	*A*	*4*		*A*	*5*	



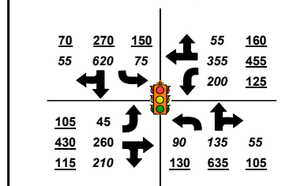
5 Ashworth Ave N & N. 185th Street*

	AM Peak			PM Peak		
2030 Option 7	*D*	*32*		*F*	*58*	
2030 Prel Build	*E*	*40*		*F*	*89*	



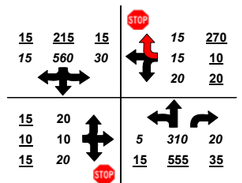
6 Meridian Ave N & N. 185th Street

	AM Peak			PM Peak		
2030 Option 7	*E*	*55*		*E*	*78*	
2030 Prel Build	*E*	*65*		*E*	*78*	



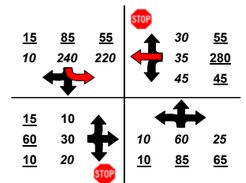
7 Fremont Ave N & N. 182nd Street*

	AM Peak			PM Peak		
2030 Option 7	*D*	*28*		*E*	*37*	
2030 Prel Build	*D*	*32*		*C*	*21*	



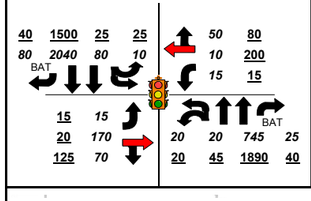
8 Linden Ave N & N. 182nd Street*

	AM Peak			PM Peak		
2030 Option 7	*D*	*26*		*D*	*25*	
2030 Prel Build	*B*	*14*		*B*	*15*	



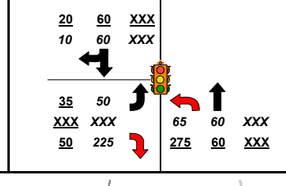
9 Aurora Ave N & N. 182nd Street

	AM Peak			PM Peak		
2030 Option 7	*D*	*51*		*C*	*32*	
2030 Prel Build	*C*	*23*		*C*	*23*	



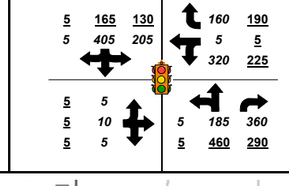
10 Midvale Ave N & N. 182nd Street

	AM Peak			PM Peak		
2030 Option 7	*C*	*24*		*D*	*52*	
2030 Prel Build	*C*	*25*		*C*	*29*	



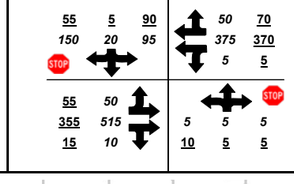
11 Fremont Ave N & N. 175th Street

	AM Peak			PM Peak		
2030 Option 7	*B*	*17*		*B*	*11*	
2030 Prel Build	*C*	*23*		*B*	*10*	



12 Linden Ave N & N. 175th Street*

	AM Peak			PM Peak		
2030 Option 7	*D*	*33*		*C*	*23*	
2030 Prel Build	*E*	*38*		*C*	*24*	

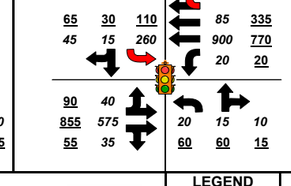


13 Aurora Ave N & N. 175th Street

	AM Peak			PM Peak		
2030 Option 7	*E*	*65*		*D*	*48*	
2030 Prel Build	*E*	*74*		*D*	*51*	

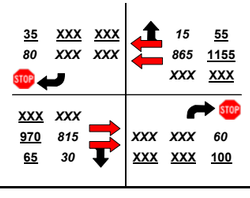
14 Midvale Ave N & N. 175th Street

	AM Peak			PM Peak		
2030 Option 7	*E*	*72*		*E*	*56*	
2030 Prel Build	*D*	*43*		*D*	*54*	



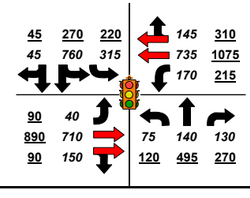
15 Ashworth Ave N & N. 175th Street*

	AM Peak			PM Peak		
2030 Option 7	*B*	*13*		*B*	*15*	
2030 Prel Build	*B*	*13*		*B*	*14*	



16 Meridian Ave N & N. 175th Street

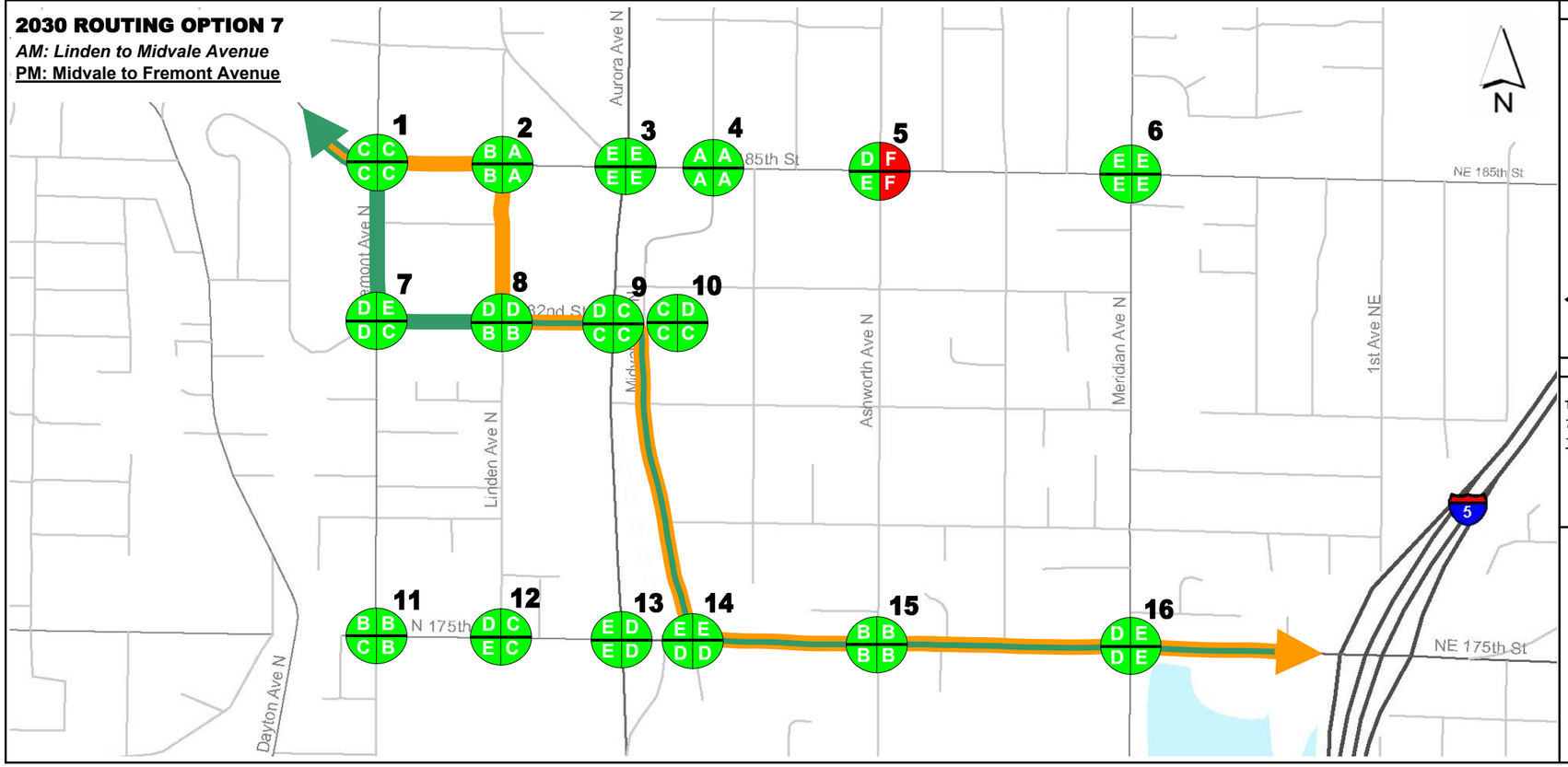
	AM Peak			PM Peak		
2030 Option 7	*D*	*52*		*E*	*76*	
2030 Prel Build	*D*	*48*		*E*	*77*	



2030 ROUTING OPTION 7

AM: Linden to Midvale Avenue

PM: Midvale to Fremont Avenue



LEGEND

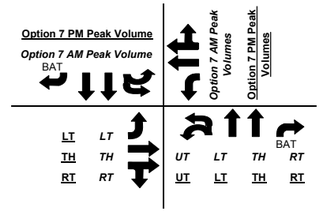
AM PM
2030 Option 7 / 2030 Prel Build: D D / F F

2 ← Intersection Number

Intersection not applicable.
LOS A - E
LOS F
XXX Indicates that movement is not allowed.
LOS Level-of-Service

Signalized intersection
Stop-controlled approach
Preliminary Build Lane Channelization
BAT Business Access and Transit Lane
Lane(s) effected by Routing Option 7

Example AM and PM Peak Traffic Volumes



KEY

UT: U-turn volume	TH: Through volume
LT: Left-turn volume	RT: Right-turn volume

NOTES

* Worst minor street stopped delay reported for unsignalized intersections.

Text Bold represents traffic volumes, levels-of-service, and delay for 2030 Routing Option 7.

Text Italics represents traffic volumes, levels-of-service, and delay for all AM Peak Hour scenarios.

Text Underline represents traffic volumes, levels-of-service, and delay for all PM Peak Hour scenarios.

This analysis is based on Synchro, version 6. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

FIGURE 9
2030 Build Intersection Volumes and LOS
AM and PM Peak Hours

Routing Option 7: Linden-Midvale Avenue (AM) and Midvale-Fremont Avenue (PM)

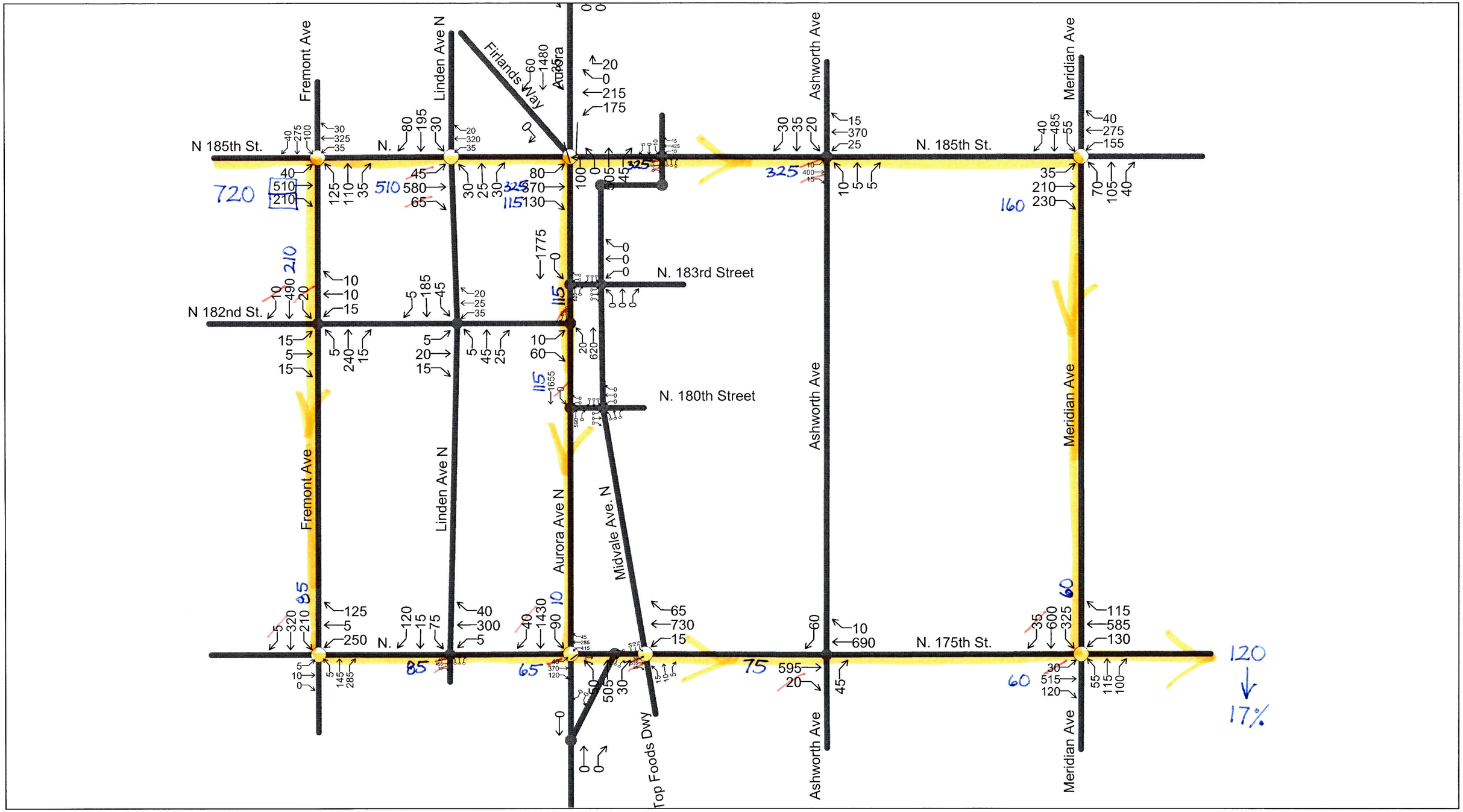
SHORELINE

CH2MHILL

ATTACHMENT 1

Map - SR-99, Aurora Avenue North, 165th to 205th
Volumes

2005_Existing
AM PEAK



CH2M HILL

4/26/2006

Map - SR-99, Aurora Avenue North, 165th to 205th
Volumes

2005_Existing
PM Peak

CH2M HILL

4/25/2006

ATTACHMENT 2

ORDER OF MAGNITUDE COST

Project Description: **175TH ST & MERIDIAN AVE** **Date: MARCH 01, 2007**

Location: **175th Street and Meridian Avenue**

	Unit	Quantity	Cost	Total		
I. RIGHT OF WAY						
1 Land Purchase	SF	4,291.13	$ 55.00	$ 236,012		
2 Costs - to - Cure (per Parcel)	EA	3	$ 35,000.00	$ 105,000		
3 Partial Building Take	SF		$ 90.00	$ -		
4 Demolition/Business Relocation	EA		$ 500,000.00	$ -		
5 Acquisition/Admin. Costs (per Parcel)	EA	5	$ 10,000.00	$ 50,000		
6 Condemnation Contingency	EST	10%	of above	$ 39,101		
7 Right-of-Way Total (Lines 1-6)						**$ 430,113**
II. CONSTRUCTION	Unit	Quantity	Cost	Total		
8 Demolition/Clearing/Earthwork	SF	17,400.00	$ 3.00	$ 52,200		
9 New Bridge and Bridge Widening	SF	-	$ 150.00	$ -		
10 New Pavement	SF	0.12	$ 300,000.00	$ 36,000		
11 Sidewalks	SY	625.00	$ 55.00	$ 34,375		
12 Curb and Gutter	LF	1,150.00	$ 18.00	$ 20,700		
13 Bus Shelters	EA	-	$ 14,000.00	$ -		
14 Walls	SF	2,000	$ 60.00	$ 120,000		
15 Noise Walls	SF	-	$ 30.00	$ -		
16 Drainage System	LANE MILE	0.12	$ 185,000.00	$ 22,200		
17 Landscaping and Irrigation	MILE	0.16	$ 350,000.00	$ 56,000		
18 Utility Modification	MILE	0.16	$ 400,000.00	$ 64,000		
19 Temporary Water Pollution Control	SF	17,400.00	$ 1.00	$ 17,400		
20 Traffic Signal New	EA	-	$ 250,000.00	$ -		
21 Traffic Signal Modification	EA	1	$ 200,000.00	$ 200,000		
22 ITS	MILE	-	$ 120,000.00	$ -		
23 Traffic Striping/Signage/Channelization	MILE	0.16	$ 80,000.00	$ 12,800		
24 Illumination System	MILE	0.16	$ 500,000.00	$ 80,000		
25 Construction Traffic Control	%	12%	of Lines 8-24	$ 85,881		
26 Miscellaneous Items	%	20%	of Line 8-25	$ 160,311		
27 Construction Subtotal (Lines 8 - 26)			(Round to nearest 1000)		$ 962,000	
28 Mobilization			10% of Line 27		$ 96,200	
29 Subtotal (Lines 27 and 28)					$ 1,058,000	
30 Sales Tax			included in unit prices		$ -	
31 Construction Total (Lines 29 and 30)						**$ 1,058,000**
III. PROJECT DEVELOPMENT						
32 Design Total (Environmental & Permits, Preliminary Engineering, Final Design, Assist During Bidding)			14% of Line 29			**$ 148,120**
33 Construction Management Total (Engineering Assistance During Construction, Construction Administration, Inspection)			11% of Line 29			**$ 116,380**
IV. ESTIMATED COST (2007 Dollars)			Lines 7, 31, 32, and 33		$ 1,750,000	
34 Contingencies Total (applied to all cost items)			30% of Line IV			**$ 525,000**
V. Overall Total Cost			Line IV and 34			**$ 2,275,000**

The above cost opinion is in 2007 dollars for Order-of-Magnitude Estimate based on schematic design. The cost does not include escalation, permitting, financial costs or operations and maintenance costs. In addition, there are no costs for the mitigation or remediation associated with the potential discovery of hazardous materials. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule and other variable factors. As a result, the final project costs will vary from the estimate presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

ORDER OF MAGNITUDE COST

Project Description: **185TH ST & MERIDIAN AVE (GREATEST IMPACT)** **Date: MARCH 01, 2007**

Location: **185th Street and Meridian Avenue**

	Unit	Quantity	Cost	Total		
I. RIGHT OF WAY						
1 Land Purchase	SF	5,733.39	$ 55.00	$ 315,336		
2 Costs - to - Cure (per Parcel)	EA	4	$ 35,000.00	$ 140,000		
3 Partial Building Take	SF		$ 90.00	$ -		
4 Demolition/Business Relocation	EA		$ 500,000.00	$ -		
5 Acquisition/Admin. Costs (per Parcel)	EA	6	$ 10,000.00	$ 60,000		
6 Condemnation Contingency	EST	10%	of above	$ 51,534		
7 Right-of-Way Total (Lines 1-6)					**$**	**566,870**
II. CONSTRUCTION	Unit	Quantity	Cost	Total		
8 Demolition/Clearing/Earthwork	SF	26,800.00	$ 3.00	$ 80,400		
9 New Bridge and Bridge Widening	SF	-	$ 150.00	$ -		
10 New Pavement	SF	0.18	$ 300,000.00	$ 54,000		
11 Sidewalks	SY	440.00	$ 55.00	$ 24,200		
12 Curb and Gutter	LF	1,340.00	$ 18.00	$ 24,120		
13 Bus Shelters	EA	-	$ 14,000.00	$ -		
14 Walls	SF	-	$ 60.00	$ -		
15 Noise Walls	SF	-	$ 30.00	$ -		
16 Drainage System	LANE MILE	0.18	$ 185,000.00	$ 33,300		
17 Landscaping and Irrigation	MILE	0.22	$ 350,000.00	$ 77,000		
18 Utility Modification	MILE	0.22	$ 400,000.00	$ 88,000		
19 Temporary Water Pollution Control	SF	26,800.00	$ 1.00	$ 26,800		
20 Traffic Signal New	EA	-	$ 250,000.00	$ -		
21 Traffic Signal Modification	EA	1	$ 200,000.00	$ 200,000		
22 ITS	MILE	-	$ 120,000.00	$ -		
23 Traffic Striping/Signage/Channelization	MILE	0.22	$ 80,000.00	$ 17,600		
24 Illumination System	MILE	0.22	$ 500,000.00	$ 110,000		
25 Construction Traffic Control	%	12%	of Lines 8-24	$ 88,250		
26 Miscellaneous Items	%	20%	of Line 8-25	$ 164,734		
27 Construction Subtotal (Lines 8 - 26)			(Round to nearest 1000)		$ 988,000	
28 Mobilization			10% of Line 27		$ 98,800	
29 Subtotal (Lines 27 and 28)					$ 1,087,000	
30 Sales Tax			included in unit prices		$ -	
31 Construction Total (Lines 29 and 30)						**$ 1,087,000**
III. PROJECT DEVELOPMENT						
32 Design Total (Environmental & Permits, Preliminary Engineering, Final Design, Assist During Bidding)			14% of Line 29			**$ 152,180**
33 Construction Management Total (Engineering Assistance During Construction, Construction Administration, Inspection)			11% of Line 29			**$ 119,570**
IV. ESTIMATED COST (2007 Dollars)			Lines 7, 31, 32, and 33		$ 1,930,000	
34 Contingencies Total (applied to all cost items)			30% of Line IV			**$ 579,000**
V. Overall Total Cost			Line IV and 34			**$ 2,509,000**

The above cost opinion is in 2007 dollars for Order-of-Magnitude Estimate based on schematic design. The cost does not include escalation, permitting, financial costs or operations and maintenance costs. In addition, there are no costs for the mitigation or remediation associated with the potential discovery of hazardous materials. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule and other variable factors. As a result, the final project costs will vary from the estimate presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

ORDER OF MAGNITUDE COST

Project Description: **185TH ST & MERIDIAN AVE (LEAST IMPACT)** **Date: MARCH 01, 2007**

Location: **185th Street and Meridian Avenue**

	Unit	Quantity	Cost	Total		
I. RIGHT OF WAY						
1 Land Purchase	SF	3,468.29	$ 55.00	$ 190,756		
2 Costs - to - Cure (per Parcel)	EA	3	$ 35,000.00	$ 105,000		
3 Partial Building Take	SF		$ 90.00	$ -		
4 Demolition/Business Relocation	EA		$ 500,000.00	$ -		
5 Acquisition/Admin. Costs (per Parcel)	EA	4	$ 10,000.00	$ 40,000		
6 Condemnation Contingency	EST	10%	of above	$ 33,576		
7 Right-of-Way Total (Lines 1-6)						**$ 369,332**
II. CONSTRUCTION	Unit	Quantity	Cost	Total		
8 Demolition/Clearing/Earthwork	SF	17,000.00	$ 3.00	$ 51,000		
9 New Bridge and Bridge Widening	SF	-	$ 150.00	$ -		
10 New Pavement	SF	0.13	$ 300,000.00	$ 39,000		
11 Sidewalks	SY	370.00	$ 55.00	$ 20,350		
12 Curb and Gutter	LF	850.00	$ 18.00	$ 15,300		
13 Bus Shelters	EA	-	$ 14,000.00	$ -		
14 Walls	SF	-	$ 60.00	$ -		
15 Noise Walls	SF	-	$ 30.00	$ -		
16 Drainage System	LANE MILE	0.13	$ 185,000.00	$ 24,050		
17 Landscaping and Irrigation	MILE	0.16	$ 350,000.00	$ 56,000		
18 Utility Modification	MILE	0.16	$ 400,000.00	$ 64,000		
19 Temporary Water Pollution Control	SF	17,000	$ 1.00	$ 17,000		
20 Traffic Signal New	EA	-	$ 250,000.00	$ -		
21 Traffic Signal Modification	EA	1	$ 200,000.00	$ 200,000		
22 ITS	MILE	-	$ 120,000.00	$ -		
23 Traffic Striping/Signage/Channelization	MILE	0.16	$ 80,000.00	$ 12,800		
24 Illumination System	MILE	0.16	$ 500,000.00	$ 80,000		
25 Construction Traffic Control	%	12%	of Lines 8-24	$ 69,540		
26 Miscellaneous Items	%	20%	of Line 8-25	$ 129,808		
27 Construction Subtotal (Lines 8 - 26)			(Round to nearest 1000)		$ 779,000	
28 Mobilization			10% of Line 27		$ 77,900	
29 Subtotal (Lines 27 and 28)					$ 857,000	
30 Sales Tax			included in unit prices		$ -	
31 Construction Total (Lines 29 and 30)						**$ 857,000**
III. PROJECT DEVELOPMENT						
32 Design Total (Environmental & Permits, Preliminary Engineering, Final Design, Assist During Bidding)			14% of Line 29			**$ 119,980**
33 Construction Management Total (Engineering Assistance During Construction, Construction Administration, Inspection)			11% of Line 29			**$ 94,270**
IV. ESTIMATED COST (2007 Dollars)			Lines 7, 31, 32, and 33		$ 1,440,000	
34 Contingencies Total (applied to all cost items)			30% of Line IV			**$ 432,000**
V. Overall Total Cost			Line IV and 34			**$ 1,872,000**

The above cost opinion is in 2007 dollars for Order-of-Magnitude Estimate based on schematic design. The cost does not include escalation, permitting, financial costs or operations and maintenance costs. In addition, there are no costs for the mitigation or remediation associated with the potential discovery of hazardous materials. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule and other variable factors. As a result, the final project costs will vary from the estimate presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

ORDER OF MAGNITUDE COST

Project Description: **185TH ST & ASHWORTH TRAFFIC SIGNAL** **Date: MARCH 01, 2007**

Location: **185th Street and Meridian Avenue**

	Unit	Quantity	Cost	Total		
I. RIGHT OF WAY						
1 Land Purchase	SF	-	$ 55.00	$ -		
2 Costs - to - Cure (per Parcel)	EA	-	$ 35,000.00	$ -		
3 Partial Building Take	SF		$ 90.00	$ -		
4 Demolition/Business Relocation	EA		$ 500,000.00	$ -		
5 Acquisition/Admin. Costs (per Parcel)	EA	0	$ 10,000.00	$ -		
6 Condemnation Contingency	EST	10%	of above	$ -		
7 Right-of-Way Total (Lines 1-6)						**$ -**
II. CONSTRUCTION	Unit	Quantity	Cost	Total		
8 Demolition/Clearing/Earthwork	SF	2,000.00	$ 3.00	$ 6,000		
9 New Bridge and Bridge Widening	SF	-	$ 150.00	$ -		
10 New Pavement	SF	-	$ 300,000.00	$ -		
11 Sidewalks	SY	420.00	$ 55.00	$ 23,100		
12 Curb and Gutter	LF	400.00	$ 18.00	$ 7,200		
13 Bus Shelters	EA	-	$ 14,000.00	$ -		
14 Walls	SF	-	$ 60.00	$ -		
15 Noise Walls	SF	-	$ 30.00	$ -		
16 Drainage System	LANE MILE	-	$ 185,000.00	$ -		
17 Landscaping and Irrigation	MILE	-	$ 350,000.00	$ -		
18 Utility Modification	MILE	-	$ 400,000.00	$ -		
19 Temporary Water Pollution Control	SF	2,000	$ 1.00	$ 2,000		
20 Traffic Signal New	EA	1	$ 250,000.00	$ 250,000		
21 Traffic Signal Modification	EA	-	$ 200,000.00	$ -		
22 ITS	MILE	-	$ 120,000.00	$ -		
23 Traffic Striping/Signage/Channelization	MILE	0.10	$ 80,000.00	$ 8,000		
24 Illumination System	MILE	0.10	$ 500,000.00	$ 50,000		
25 Construction Traffic Control	%	12%	of Lines 8-24	$ 41,556		
26 Miscellaneous Items	%	20%	of Line 8-25	$ 77,571		
27 Construction Subtotal (Lines 8 - 26)			(Round to nearest 1000)		$ 465,000	
28 Mobilization			10% of Line 27		$ 46,500	
29 Subtotal (Lines 27 and 28)					$ 512,000	
30 Sales Tax			included in unit prices		$ -	
31 Construction Total (Lines 29 and 30)						**$ 512,000**
III. PROJECT DEVELOPMENT						
32 Design Total (Environmental & Permits, Preliminary Engineering, Final Design, Assist During Bidding)			14% of Line 29			**$ 71,680**
33 Construction Management Total (Engineering Assistance During Construction, Construction Administration, Inspection)			11% of Line 29			**$ 56,320**
IV. ESTIMATED COST (2007 Dollars)			Lines 7, 31, 32, and 33		$ 640,000	
34 Contingencies Total (applied to all cost items)			30% of Line IV			**$ 192,000**
V. Overall Total Cost			Line IV and 34			**$ 832,000**

The above cost opinion is in 2007 dollars for Order-of-Magnitude Estimate based on schematic design. The cost does not include escalation, permitting, financial costs or operations and maintenance costs. In addition, there are no costs for the mitigation or remediation associated with the potential discovery of hazardous materials. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule and other variable factors. As a result, the final project costs will vary from the estimate presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

ORDER OF MAGNITUDE COST

Project Description: **LINDEN AVENUE SIDEWALKS** **Date: MARCH 01, 2007**

Location: **185th Street and Meridian Avenue**

	Unit	Quantity	Cost	Total			
I. RIGHT OF WAY							
1 Land Purchase	SF	-	$ 55.00	$ -			
2 Costs - to - Cure (per Parcel)	EA	-	$ 35,000.00	$ -			
3 Partial Building Take	SF		$ 90.00	$ -			
4 Demolition/Business Relocation	EA		$ 500,000.00	$ -			
5 Acquisition/Admin. Costs (per Parcel)	EA	0	$ 10,000.00	$ -			
6 Condemnation Contingency	EST	10%	of above	$ -			
7 Right-of-Way Total (Lines 1-6)							**$ -**
II. CONSTRUCTION	Unit	Quantity	Cost	Total			
8 Demolition/Clearing/Earthwork	SF	68,900.00	$ 3.00	$ 206,700			
9 New Bridge and Bridge Widening	SF	-	$ 150.00	$ -			
10 New Pavement	SF	-	$ 300,000.00	$ -			
11 Sidewalks	SY	3,830.00	$ 55.00	$ 210,650			
12 Curb and Gutter	LF	3,450.00	$ 18.00	$ 62,100			
13 Bus Shelters	EA	-	$ 14,000.00	$ -			
14 Walls	SF	-	$ 60.00	$ -			
15 Noise Walls	SF	-	$ 30.00	$ -			
16 Drainage System	LANE MILE	0.65	$ 185,000.00	$ 120,250			
17 Landscaping and Irrigation	MILE	0.33	$ 350,000.00	$ 115,500			
18 Utility Modification	MILE	-	$ 400,000.00	$ -			
19 Temporary Water Pollution Control	SF	68,900	$ 1.00	$ 68,900			
20 Traffic Signal New	EA	1	$ 250,000.00	$ 250,000			
21 Traffic Signal Modification	EA	-	$ 200,000.00	$ -			
22 ITS	MILE	-	$ 120,000.00	$ -			
23 Traffic Striping/Signage/Channelization	MILE	0.33	$ 80,000.00	$ 26,400			
24 Illumination System	MILE	-	$ 500,000.00	$ -			
25 Construction Traffic Control	%	12%	of Lines 8-24	$ 127,260			
26 Miscellaneous Items	%	20%	of Line 8-25	$ 237,552			
27 Construction Subtotal (Lines 8 - 26)			(Round to nearest 1000)			$ 1,425,000	
28 Mobilization			10% of Line 27			$ 142,500	
29 Subtotal (Lines 27 and 28)						$ 1,568,000	
30 Sales Tax			included in unit prices			$ -	
31 Construction Total (Lines 29 and 30)							**$ 1,568,000**
III. PROJECT DEVELOPMENT							
32 Design Total (Environmental & Permits, Preliminary Engineering, Final Design, Assist During Bidding)			14% of Line 29				**$ 219,520**
33 Construction Management Total (Engineering Assistance During Construction, Construction Administration, Inspection)			11% of Line 29				**$ 172,480**
IV. ESTIMATED COST (2007 Dollars)			Lines 7, 31, 32, and 33			$ 1,960,000	
34 Contingencies Total (applied to all cost items)			30% of Line IV				**$ 588,000**
V. Overall Total Cost			Line IV and 34				**$ 2,548,000**

The above cost opinion is in 2007 dollars for Order-of-Magnitude Estimate based on schematic design. The cost does not include escalation, permitting, financial costs or operations and maintenance costs. In addition, there are no costs for the mitigation or remediation associated with the potential discovery of hazardous materials. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule and other variable factors. As a result, the final project costs will vary from the estimate presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

Appendix B

Methods and Assumptions Technical Memorandum

DRAFT

City of Shoreline
Aurora Avenue North Multimodal Corridor Project, N. 165th Street to N. 205th Street – Transportation Analysis Methods and Assumptions

PREPARED FOR: Kirk McKinley/City of Shoreline
Kris Overleese/City of Shoreline
PREPARED BY: Tim Newkirk/CH2M HILL
DATE: February 2007

This memorandum outlines the methods and assumptions that will be used for the Aurora Avenue North Multimodal Corridor (165-205) project. One goal of this memo is to achieve consensus within the project team which will help produce consistent and defensible analysis. This memo will identify the analysis years and study area limits. Travel demand forecasting and modeling methodologies will be defined. In addition, traffic analysis scenarios and the software that will be used to support design decisions will be identified. Finally, the operations parameters and assumptions will be outlined.

Analysis Years

The AM and PM peak hours will be analyzed for each scenario in Table 1. The possible conditions for each scenario include Existing, No-Build, and Build with Alternatives A, B, and C.

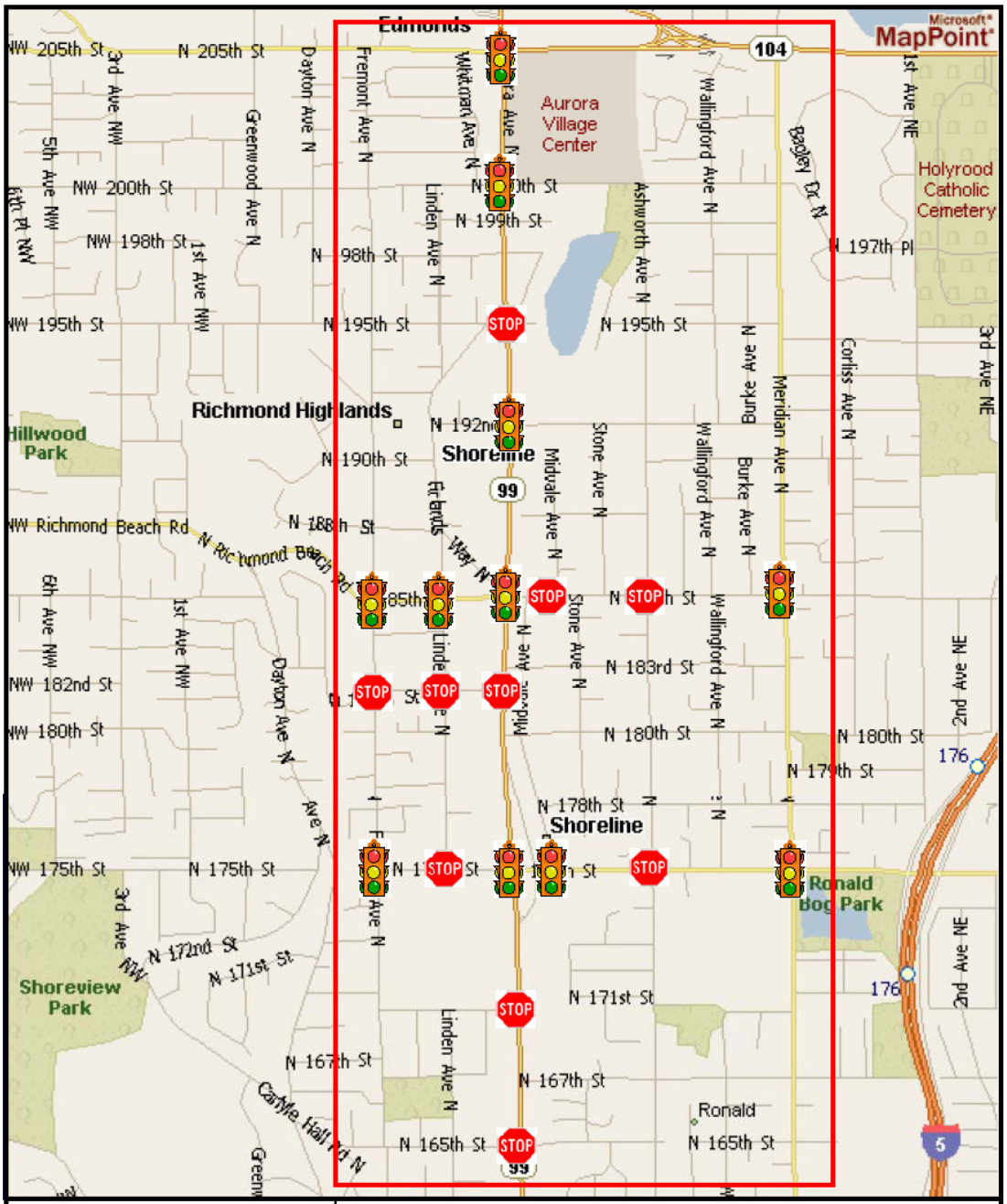
- Existing Year (2005)
- Year of Opening (2013)
- Design Year (2030)

TABLE 1
Traffic Analysis Scenarios

Condition	Existing	Year of Opening	Design Year
Existing	AM and PM		
No-Build		AM and PM	AM and PM
Build (A, B, C)		AM and PM	AM and PM

Study Area Limits

The study area for this project is defined as Aurora Avenue North between N. 165th Street and N. 205th Street in the City of Shoreline (see Figure 1). And between N. 175th Street and N. 185th Street the study area is extended to include intersections on Fremont Avenue, Linden Avenue, Midvale Avenue, Ashworth Avenue, and Meridian Avenue. This is approximately 2 miles and includes 21 study intersections.



LEGEND

- Signalized Study Intersection
- Unsignalized Study Intersection
- Study Area Boundary

FIGURE 1
AURORA MULTIMODAL CORRIDOR PROJECT
Signalized and Unsignalized Study Intersections
Corridor Study Area

Forecasting/Modeling Methodology

As directed by the Scope of Work (SOW), CH2M HILL obtained the City of Shoreline's latest calibrated EMME/2 travel demand model, the regional PSRC model, and forecasts from the Transportation Master Plan (TMP), dated July 11, 2005. Link volume based annual growth rates from the three were compared to verify the forecasts in the TMP. With verification from the travel demand models, a forecasted growth rate of **1.1** percent per year was used.

The growth rate was applied to the final 2005 AM and PM peak hour traffic volumes to reach forecasted 2013 and 2030 traffic volumes. The traffic volumes were rounded to the nearest 5 vehicles; if less than 5 vehicles were present it remained that value. The 2013 and 2030 traffic volumes were used for both Build and No-Build scenarios.

Operational Analysis Methods/Parameters

General Parameters

Existing conditions were represented by data from the year 2005. In addition, the City of Shoreline's model and TMP were used to forecast both AM and PM volumes for the year of opening (2013) and design year (2030).

Intersection Analysis

Study Area

Synchro results will be reported for 21 total intersections, eleven existing signalized intersections and ten existing unsignalized, within the Aurora Multimodal Corridor study area. The intersections are listed in Table 3.

TABLE 3
Study Intersections

Intersection Type	Intersection Name
Signalized (11)	Aurora Avenue N. @ N. 205th Street
	Aurora Avenue N. @ N. 200th Street
	Aurora Avenue N. @ N. 192nd Street
	Fremont Avenue N. @ N. 185th Street
	Linden Avenue N. @ N. 185th Street
	Aurora Avenue N. @ N. 185th Street
	Meridian Avenue N. @ N. 185th Street
	Fremont Avenue N. @ N. 175th Street
	Aurora Avenue N. @ N. 175th Street
	Midvale Avenue N. @ N. 175th Street
	Meridian Avenue N. @ N. 175th Street
Unsignalized (10)	Aurora Avenue N. @ N. 195th Street
	Midvale Avenue N. @ N. 185th Street

TABLE 3
Study Intersections

Intersection Type	Intersection Name
	Ashworth Avenue N. @ N. 185th Street
	Fremont Avenue N. @ N. 182nd Street
	Linden Avenue N. @ N. 182nd Street
	Aurora Avenue N. @ N. 182nd Street
	Linden Avenue N. @ N. 175th Street
	Ashworth Avenue N. @ N. 175th Street
	Aurora Avenue N. @ N. 170th Street
	Aurora Avenue N. @ N. 165th Street

Software

All intersection analysis will be performed using the Synchro software package (version 6). This software implements methods from the Highway Capacity Manual (HCM) and will be used to analyze both signalized and unsignalized intersections. The level-of-service (LOS), intersection delays (per vehicle), and lane group queuing results will be reported using Synchro methodology, which is accepted by WSDOT.

BAT Lane Coding

The curb lane (Lane #1) under the Build alternatives will be marked as a Business Access and Transit (BAT) lane in both directions along Aurora Avenue. This lane will operate as a normal right-turn lane for general purpose vehicles at controlled intersections, but transit vehicles will be allowed to continue through the intersection. Synchro does not have the ability to model a special use lane like a BAT lane, so this lane will be coded as a general purpose right-turn lane that drops at each study intersection, thereby not permitting vehicles to proceed through the intersection. While this does not reflect proposed operating conditions in the future, it should not significantly affect how the intersections are expected to operate. Future signal optimization will not include overlapping the Aurora Avenue right-turns. It is expected that the Synchro results will be sufficient for this project's design. Also, no adjustments will be made to the existing or forecasted approach volumes.

Intersection Parameters

Refer to Table 4 for a list of all intersection parameters/inputs that will be assumed for this project.

TABLE 4
Intersection Operations Parameters/Assumptions

Intersection Parameters	Condition		
	Existing (2005)	**Year of Opening (2013)**	**Design Year (2030)**
Peak Hour Factor	From traffic count and by approach, otherwise 0.90	Same as Existing	0.95 for intersection
Conflicting Bikes and Pedestrian per Hour	From traffic count, otherwise assume 20 peds/bikes	Same as Existing	Same as Existing
Area Type	"Other"	Same as Existing	Same as Existing
Ideal Saturation Flow Rate (for all movements)	1,900 passenger cars per hour green per lane	Same as Existing	Same as Existing
Lane Width	From basemap	No-Build: Same as Existing Build: Based on alternative design	No-Build: Same as Existing Build: Based on alternative design
Percent Heavy Vehicles	From traffic count, otherwise 2%	Same as Existing	Same as Existing
Percent Grade	SR 99: from WSDOT vertical alignment report Cross streets: basemap	No-Build: Same as Existing Build: Based on design	No-Build: Same as Existing Build: Based on design
Parking Maneuvers per Hour	No parking maneuvers	Same as Existing	Same as Existing
Bus Blockages	Headway information provided by transit agencies	Assume 1% annual growth in number of transit stops	Assume 1% annual growth in number of transit stops
Intersection signal phasing and coordination	From current timing plans provided by King County	No-Build: Same as Existing Build: Optimized by Synchro	No-Build: Optimized by Synchro Build: Optimized by Synchro
Intersection signal timing optimization limits	From current timing plans provided by King County	No-Build: Same as Existing Build: Optimized between 120-180 sec	No-Build: Optimized between 120-180 sec. Build: Optimized between 120-180 sec.
Minimum Green time	From current timing plans provided by King County	- Based on pedestrian times (7 sec. walk and 4 feet per second for FDW clearance) - 7 seconds, if no crosswalk - 7 sec. for protected LT phase	- Based on pedestrian times (7 sec. walk and 4 feet per second for FDW clearance) - 7 seconds, if no crosswalk - 7 sec. for protected LT phase
Yellow and all-red time	From current timing plans provided by King County	New signals: (Y) = 4.5 seconds and (R) = 0.5 second	New signals: (Y) = 4.5 seconds and (R) = 0.5 second
Right Turn on Red	Allow	Allow	Allow
Right Turn Overlaps	From current timing plans provided by King County	Not allowed for Aurora Avenue, otherwise identify if used	Not allowed for Aurora Avenue, otherwise identify if used

TABLE 4
Intersection Operations Parameters/Assumptions

Intersection Parameters	Condition		
	Existing (2005)	**Year of Opening (2013)**	**Design Year (2030)**
Level of service goal	N/A	LOS E (signalized intersections from Synchro, unsignalized intersections from the HCM)	LOS E (signalized intersections from Synchro, unsignalized intersections from the HCM)