Chapter 3 The Built Environment – Effects on People and Community Resources

What is addressed in this chapter?

This chapter describes the community's existing built environment and how the alternatives may impact that built environment. This chapter specifically addresses the following elements:

- Land Use
- Transportation
- Noise
- Public Utilities (water supply, wastewater, stormwater)
- Visual and Aesthetics
- Historic and Cultural Resources
- Public Services (parks and recreation, schools, public safety)
- Fiscal Analysis

Transportation

1 What roadways currently serve the area?

The roadway transportation system is composed of a variety of different roadway types, each with a different intended use and different characteristics. For example, some roads have several lanes, relatively high speed limits, longer distances between intersections, and are generally used for long-distance trips.

Where is the technical analysis?
A detailed Transportation Technical Report is available in Appendix B.

The different categories of roads, based on their intended uses and characteristics, are called "functional classifications." The functional classifications in the study area can be generally defined as:

- ***Principal Arterials*** – Roadways that typically connect two or more communities, primarily serving through traffic, having the highest speed limits, and having limited direct access to abutting properties.
- ***Minor Arterials*** – Roadways that typically connect areas within a community and slightly favor through traffic, having relatively high speed limits, and having infrequent and controlled access to abutting properties.
- ***Collectors*** – Roadways that connect residential neighborhoods with other areas within a community, serving through and cross street traffic equally, having lower speed limits, and prioritizing property access over through traffic.
- ***Local Access Streets*** – Roadways that are within neighborhoods primarily serving traffic to and from driveways, having the lowest speed limits, and frequent direct access to individual residential or commercial properties.

What are roadway design standards?
"Design standards" refer to a variety of roadway attributes, such as grades, curves, lane and shoulder widths, and speed limits. These standards are different for different roadway types to ensure the safety of the intended users.

Two important state routes serve the City of Black Diamond:

- ***SR 169*** (also known as Maple Valley Black Diamond Road SE and 3rd Avenue within the City) is an urban principal arterial that serves as a primary north-south route for commuters traveling between Renton, Maple Valley, Covington, Black Diamond, and Enumclaw. The majority of trips along SR 169 are long-distance "regional" trips. The WSDOT classifies SR 169 as a Highway of Statewide Significance.
- ***SR 516*** (also known as SE Kent Kangley Road) is an urban minor arterial in the study area, though it is outside Black Diamond's city limits. This important east-west route connects SR 18 and SR 169 and is an important route for the communities of Maple Valley, Covington, Black Diamond, and Ravensdale.

The remaining roadways within the study area consist of minor arterials, collector arterials, and local access streets. These roadway types generally accommodate moderate- to short-distance trips and connect the regional roadways, such as SR 169, to businesses and residences.

What is delay?
Delay is the average amount of time experienced by a driver in congestion, compared to the time the same trip would take under uncongested traffic conditions. For this study, the delay is measured as the average time a driver waits at a traffic signal or stop sign. The amount of delay, as a weighted average, determines the LOS grade.

2 What is level of service and what are "acceptable" levels of service?

Level of service (LOS) is an estimate of the quality and performance of the transportation system operations. Traffic conditions are assessed with respect to the average intersection delay, which is measured in seconds per vehicle. The letter "A" is used to describe the least amount of congestion and best (quickest) operations and the letter "F" indicates the most congestion and worst (slowest) operations. Exhibit 3-3 provides a description of the amount of delay corresponding to each LOS grade.

Exhibit 3-3
Level of Service Criteria

LOS Rating	Average Delay for Signalized Intersections (seconds/vehicle)	Average Delay for Two-Way Stop Control (TWSC) Intersections (seconds/vehicle)a
A	0 – 10	0 – 10
B	> 10 – 20	> 10 – 15
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	> 80	> 50

Source: Highway Capacity Manual 2000, modified from Exhibits 16-2 and 17-2; TWSC: two-way stop control

[a] *LOS ratings for TWSC and three-legged stop-control intersections are based on the worst movement average delay; LOS is not defined for the overall intersection.*

Different jurisdictions set different LOS standards for the intersections they are responsible for. Acceptable LOS standards for intersections in the study area include:

- City of Black Diamond – LOS C standard (except for SR 169 which is LOS D)
- City of Maple Valley – LOS D standard
- City of Covington – LOS D standard
- King County – LOS E standard
- WSDOT – LOS D standard

3 What is traffic currently like in the study area?

SR 169 is the only regional north-south roadway that connects areas with high levels of employment and services. As a result, a majority of commuters utilize SR 169 during some point of their trip. Peak hour traffic along SR 169 is highly "directional" because there is little employment in the Black Diamond area. During the AM peak hour, approximately 72 percent of travel is northbound, compared to only 30 percent during the PM peak hour. SR 169 becomes moderately congested, due to the lack of alternative north-south routes and the highly directional distribution of traffic during the peak hours.

What does the traffic analysis tell us?
The traffic analysis provides us with a good representation of how traffic conditions would be in the future without or with a project. However, the emphasis should be placed on the relative differences between alternatives, rather than focus on any single alternative.

SR 516, SE Kent Kangley Road, Roberts Drive, and Lawson Street provide the primary east-west connections to SR 169. Despite having low roadway capacities and being affected by SR 169 operations, the relatively low volumes along these roadways results in low to moderate levels of congestion.

A total of 46 intersections were selected to be studied for this project, covering a large geographic area ranging across Maple Valley, Covington, Black Diamond, and other areas within King County.

During the PM peak hour, three study intersections currently operate worse than their LOS standards:

- SE 288th Street/216th Avenue SE – LOS D (LOS C is the City of Black Diamond standard)
- SR 169/Black Diamond Ravensdale Road – LOS F (LOS D is the City of Black Diamond standard along SR 169)
- SR 169/SR 516 – LOS E (LOS D is the City of Maple Valley standard)

The existing PM peak hour traffic operations are shown in Exhibit 3-4.

Why is the PM peak hour studied?
The PM peak hour represents the period when traffic is heaviest. We use this time of day in our planning to ensure that future conditions won't be worse than what we study. Key intersections near the project vicinity were also studied for the AM peak hour and this analysis is provided in the Transportation Technical Report in Appendix B.

4 What future scenarios were analyzed?

A buildout year of 2025 was analyzed as the "future year" condition. The analysis assumes that all roadway improvements as listed in the City's Transportation Element of the Comprehensive Plan, including new alignments, are constructed. No "interim" year analysis was conducted; therefore all impacts are based upon the assumption that at buildout, all planned improvements are in place. It should not be overlooked that the City's Transportation Element includes a substantially revised network from today's existing conditions. Many of the new roadways are developer-driven projects, which would be required as a result of development. No environmental analysis has been conducted on any of the potential new alignments – upon receipt of specific applications for development, the City will need to determine if additional impacts could occur, and what appropriate mitigation may be necessary.

How was the analysis conducted?
The traffic analysis is provided in detail in Appendix B of this EIS. This analysis includes a description of the methodology and assumptions that went into the analysis. For a complete assessment of the potential traffic impacts, please review the Transportation Technical Reports.

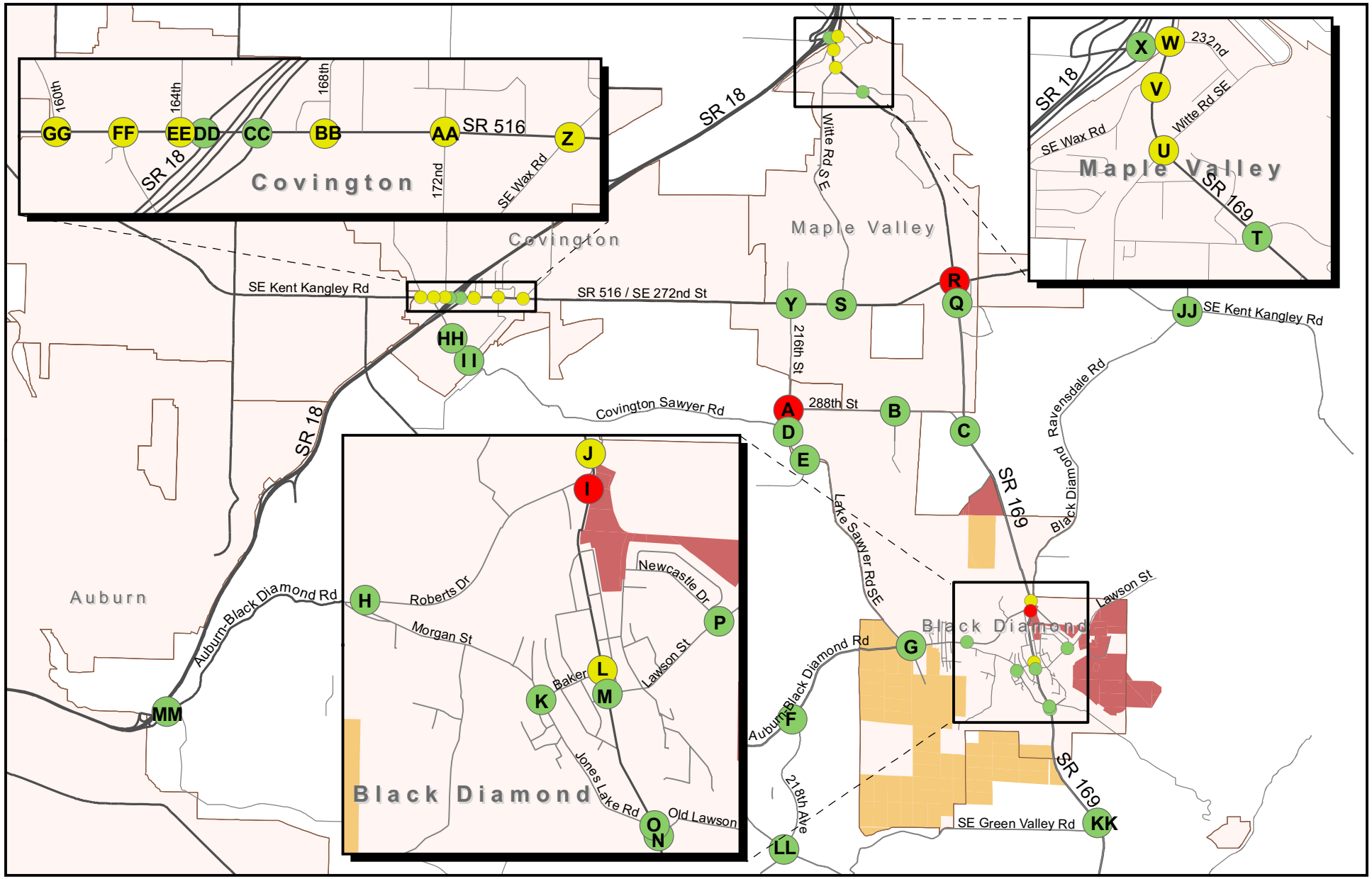

Exhibit 3-4
2007 Existing PM Peak Hour Traffic Conditions

The Villages
Lawson Hills
City Boundaries

Intersection operates better than LOS standard
Intersection operates at LOS standard
Intersection operates worse than LOS standard

Exhibits in this EIS are intended to provide a general graphical depiction of built and natural environment conditions and may not be accurate to the parcel level.

5 How would the alternatives impact traffic operations in the future?

All future alternatives are expected to increase delays as a result of increased traffic volumes. At some locations the increases in delay would also result in a worse level of service than is considered unacceptable. The number of intersections expected to operate below their respective LOS standards in 2025 are:

- Alternative 1 – 18 of 46 intersections would fail
- Alternative 2 – 22 of 46 intersections would fail
- Alternative 3 has roughly half the amount of residential units and office and retail square footage compared to Alternative 2. With 42 percent fewer trips on the network, it can be assumed that there could be substantially fewer intersections that will degrade below their accepted LOS.
- Alternative 4 has the same amount of office/retail square footage as Alternative 2, but approximately 61 percent less dwelling units. As a result, the impacts to intersections would be the least.

Although ten intersections would fail under Alternative 1, only eight of these intersections would need improvements. This is because two intersections (SR 169/Witte Road and SR 169/Wax Road) would continue to operate below their respective LOS standards, but the amount of delay under Alternative 1 would be less than Baseline conditions.

The intersections that are expected to degrade worse than their respective LOS standards are shown on Exhibits 3-5 and 3-6.

It should not be overlooked that the City's Transportation Element includes a substantially revised network from today's existing conditions. Many of the new roadways are developer-driven projects, which would be required as a result of development.

No environmental analysis has been conducted on any of the potential new alignments – upon receipt of specific applications for development, the City will need to determine if additional impacts could occur, and what appropriate mitigation may be necessary.

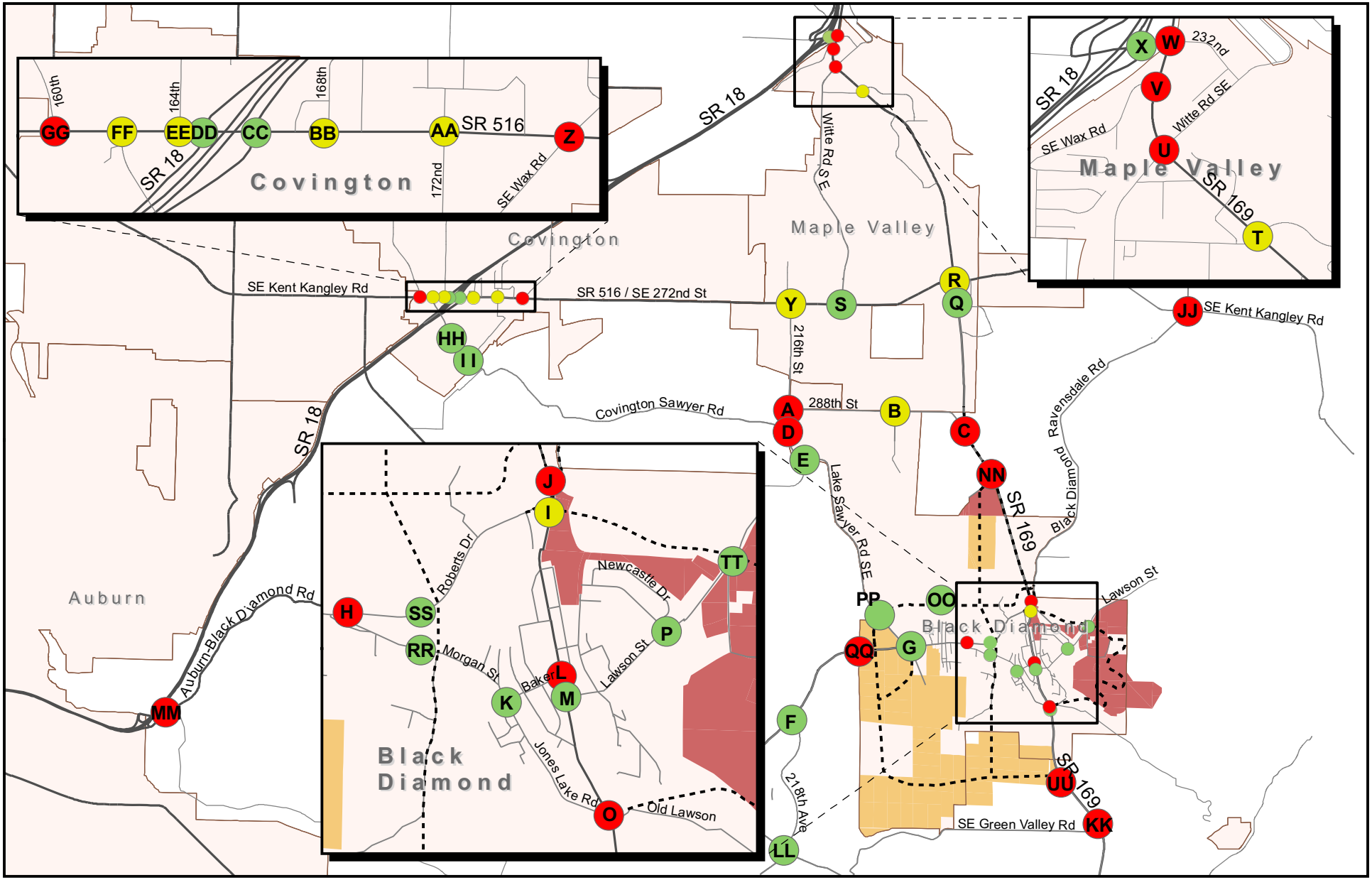

Exhibit 3-5
2025 Alternative 1
PM Peak Hour Traffic Conditions

- Lawson Hills
- The Villages
- City Boundaries
- Intersection operates better than LOS standard
- Intersection operates at LOS standard
- Intersection operates worse than LOS standard
- Planned Roadways

0 0.6 1.2
Miles

Exhibits in this EIS are intended to provide a general graphical depiction of built and natural environment conditions and may not be accurate to the parcel level.

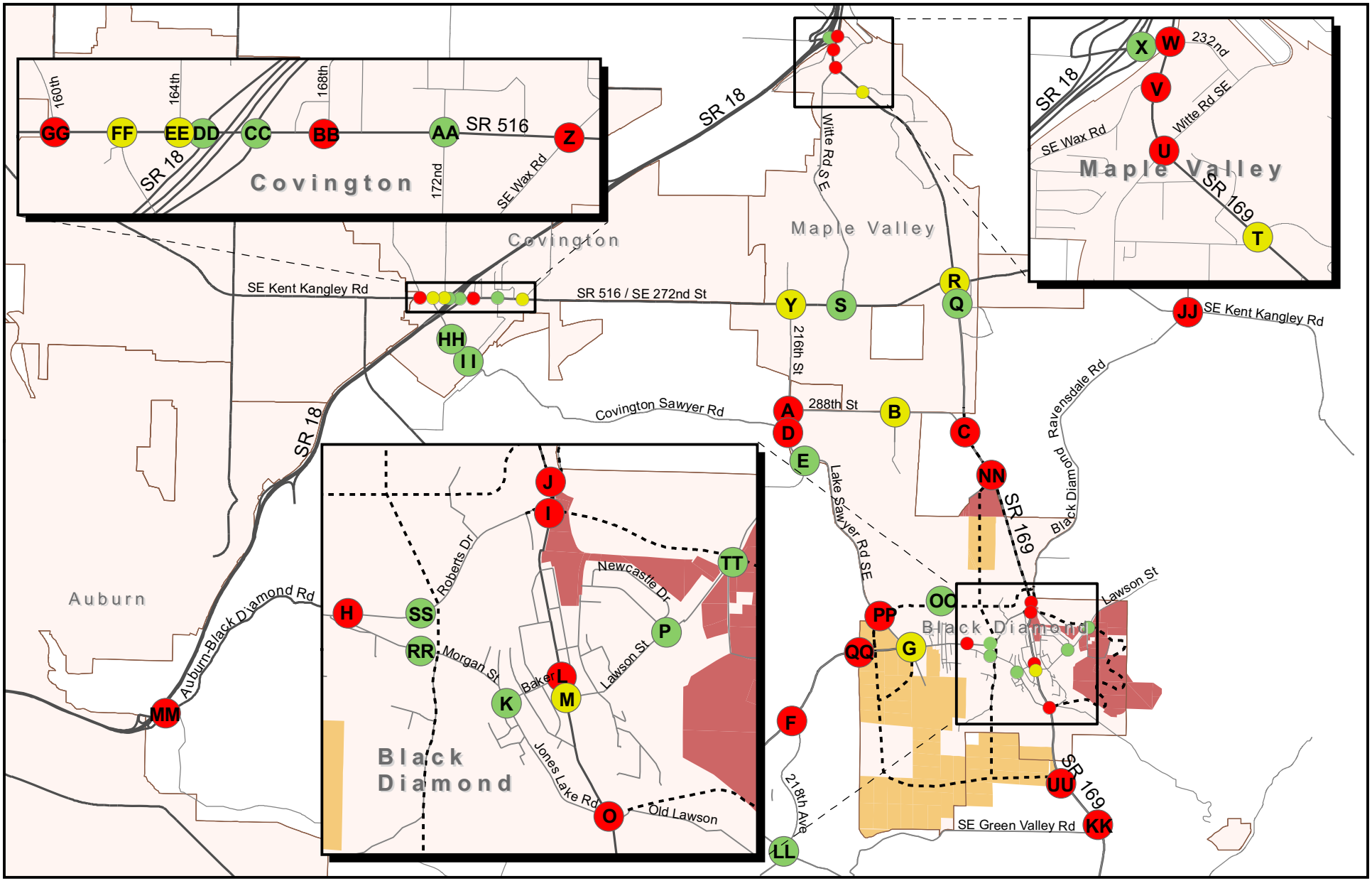

Exhibit 3-6
2025 Alternative 2
PM Peak Hour Traffic Conditions

Lawson Hills
The Villages
City Boundaries

Intersection operates better than LOS standard
Intersection operates at LOS standard
Intersection operates worse than LOS standard

Planned Roadways

0 0.5 1
Miles

Exhibits in this EIS are intended to provide a general graphical depiction of built and natural environment conditions and may not be accurate to the parcel level.

6 What measures could mitigate impacts on future traffic conditions?

The identified intersection mitigation measures are similar in nature amongst all of the alternatives, but differ in the number of locations and magnitude that would require mitigation. Mitigation measures generally consist of channelization improvements, such as left- and right-turn pockets, acceleration lanes in the median, signal phasing and timing updates, and adding through lanes. In all cases, the 2025 planned network is assumed as a condition of the alternatives. Since the planned network includes many new alignments that would be needed as a result of development, Exhibit 3-7 should not be assumed to be a comprehensive list of all transportation mitigation needed to support the alternatives–it only addresses additional mitigation needs beyond the planned improvements depicted in the City's Transportation Element.

Exhibit 3-7 summarizes the intersection mitigation measures for Alternatives 1 and 2. Although Alternative 3 was not analyzed in detail, it assumes approximately 42 percent less trips than Alternative 2, and would likely require similar mitigation as described below. Some intersections may not need improving to the level required in Alternative 2. Alternative 4 was created as a "fiscally balanced" alternative only, and was therefore not analyzed for transportation impacts.

It is important to note that in the case of intersection improvements where control beyond a four-way stop is needed, the City will strongly encourage the consideration of roundabouts.

It is important to note that in the case of intersection improvements where control beyond a four-way stop is needed, the City will strongly encourage the consideration of roundabouts. The mitigation table in this chapter does not consider if a roundabout or signal would be the preferred control device at a specific intersection.

However, in cases where the mitigation indicates that a signal be installed, every effort should be made to first determine if a roundabout is appropriate.

Exhibit 3-7

Mitigation Measures

Study Intersection	Alternative 1	Alternative 2
SE 288th Street/216th Avenue SE	Signalize.	Signalize.
SR 169/SE 288th Street	Signalize.	Signalize. Add NBL turn pocket.
SE Covington Sawyer Road/ 216th Avenue SE	Add NBL turn pocket.	Add EBL, NBL, SBL, and SBR turn pockets.
SE Auburn Black Diamond Road/ 218th Avenue SE	NA	Provide a refuge on EB approach for NBL turning vehicles.
SE Auburn Black Diamond Road/ Morgan Street	Provide a refuge on EB approach for NBL turning vehicles.	Provide a 100-foot refuge on EB approach for NBL turning vehicles.
SR 169/Roberts Drive	NA	Add SBL, SBR, NBL, and EBL turn pockets.
SR 169/SE Black Diamond Ravensdale Road (Pipeline Road)	Add SBR turn pocket.	Add SBR and WBL turn pockets.
SR 169/Baker Street	Add EBL turn pocket.	Add EBR and SBR turn pockets.
SR 169/Jones Lake Road (SE Loop Connector)	Signalize.	Signalize.
SR 169/SE 240th Street SR 169/Witte Road SR 169/SE Wax Road SR 169/SE 231st Street SR 169/SR 18 EB Ramps	Add third SB lane from Wax Road to Witte Road ending it as a right-only lane at Witte Road.	Add additional SBT lane on SR 169 from north of 231st Street to Witte Road. Add second shared NBTR lane at SR 169/240th Street.
SR 516/SE Wax Road	Add second SBL turn pocket.	Add second SBL and WBR turn pockets.
SR 516/168th Place SE	NA	Add NBL and EBR turn pockets.
SE 272nd Street/160th Avenue SE	Add SBR turn pocket. Provide a 100-foot refuge on WB approach for SBL turning vehicles.	Add SBR turn pocket. Provide a 100-foot refuge on WB approach for SBL turning vehicles.
SE Kent Kangley Road/ Landsburg Road SE	Add a SBL turn pocket.	Add SBL turn pocket and provide a refuge on WB approach for SBL turning vehicles.
SR 169/SE Green Valley Road	Provide a refuge on SB approach for EBL turning vehicles.	Add EBL turn pocket and provide a refuge on SB approach for EBL turning vehicles.
SE Auburn-Black Diamond Road/ SE Green Valley Road	Provide a refuge on EB approach for NBL turning vehicles.	Provide a refuge on EB approach for NBL turning vehicles.
SR 169/North Connector	Signalize. Add NBL and SBR turn pockets.	Signalize. Add NBL and EBR turn pockets.
Lake Sawyer Road/Pipeline Road	NA	Signalize. Add EBL, NBL, SBR turn pockets.
SE Auburn Black Road/ Annexation Road	Signalize.	Signalize. Add EBL, EBR, WBL, WBR, NBL and SBR turn pockets.
SR 169/South Connector	Add EBR turn pocket. Provide refuge on SB approach for EBL turning vehicles.	Signalize. Add NBL and SBR turn pockets.

7 What transit routes currently serve the area?

Public transit within the study area is provided by King County Metro in the form of bus service. King County Metro provides transit service along the major roads in the study area and connects to several major activity areas, such as Renton, Seattle, Enumclaw, Kent, Timberlane, and Lake Meridian. Exhibit 3-8 summarizes the existing transit service.

What is headway?
A transit headway refers to how frequently a transit vehicle arrives at (or departs from) a given transit stop

Exhibit 3-8
2007 Existing Transit Service

Route	Weekday Headway (Min)			Service Areas
	AM Peak	Midday	PM Peak	
KC 143	20–30 (northbound only)	No service	20–30 (southbound only)	Downtown Seattle, Maple Valley, Renton, Black Diamond
KC 149	20–30 (southbound only)	120	20–30 (northbound only)	Black Diamond, Maple Valley, Renton, Downtown Seattle
KC 912	No service	120 (4 trips)	No service	Covington, Black Diamond, Enumclaw
KC 168	60	60	60	Kent, Covington, Timberlane
KC 159	20–30	No service	20–30	Downtown Seattle, Kent, Lake Meridian, Timberlane, Covington

Notes: KC = King County Metro route number
KC Route 168 is the only route in the area that provides weekend service with 60-minute headways throughout the day.

To complement the transit service described in Exhibit 3-8, the following park and ride facilities are provided in the study area:

- ***Black Diamond Masonic Lodge*** – Served by King County Metro Routes 143, 149, and 912.
- ***Cornerstone United Methodist Church*** – Served by King County Metro Route 912.
- ***Maple Valley Park and Ride*** – Served by King County Metro Routes 143 and 149.

8 How would the alternatives affect future transit service?

The demand for public transit can be expected to increase as population and congestion increase. None of the alternatives are expected to adversely affect transit service or facilities in the study area.

9 What pedestrian, bicycle, and other off-road facilities are currently available in the area?

Non-motorized travel, such as walking and biking, are important elements of the transportation system and the provision, extent, and quality of non-motorized facilities affect mode choice.

Off-Road Trails
For more information regarding off-road trails in Black Diamond, please see the Parks and Recreation section of this document.

The SR 169 and SR 516 corridors in the study area generally accommodate non-motorized travel with gravel or paved shoulders. Sidewalks are located along the majority of both corridors on at least one side of the road, except for the area between SR 516 and downtown Black Diamond along SR 169. Striped crosswalks with pedestrian call buttons are located at most of the signalized intersections. There are no formally designated (striped) on-street bicycle lanes within the study area. However, both routes have wide curb lanes or paved shoulders that can serve as informal bicycle routes.

10 How would the alternatives affect future pedestrian, bicycle, and other off-road facilities in the area?

The future alternatives would not affect the non-motorized system external to the specific project sites. On site, the master planned alternatives (2, 3, and 4) would all incorporate trails and sidewalks as part of their developments. This is the benefit of building as an MPD, rather than incremental development as described in Alternative 1, which would not necessarily provide for additional non-motorized travel opportunities.