City of Duvall
2017 Transportation Plan
Adopted December 5, 2017

PREPARED BY

Transpo Group
12131 113th Ave NE, Ste. 203
Kirkland, WA 98034

Public Works Department
15535 Main Street NE
PO Box 1300
Duvall, Washington 98019
www.Duvallwa.gov

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Abbreviations

AASHTO: American Association of State Highway and Transportation Officials
ADA: American with Disability Act
AWC: Association of Washington Cities
CFP: Capital Facilities Plan
CPPs: Countywide Planning Policies
CTR: Commute Trip Reduction
FGTS: Freight and Goods Transportation System
FHWA: Federal Highway Administration
FMSIB: Freight Mobility Strategic Investment Board
GMA: Growth Management Act
HCM: Highway Capacity Manual
HSS: Highways of Statewide Significance
LOS: Level of Service
MEV: Million Entering Vehicles
NHS: National Highway System
NUGA: North Urban Growth Area
PSRC: Puget Sound Regional Council
PTOS: Park, Trails, and Open Space
ROW: Right-of-Way
RTPO: Regional Transportation Planning Organization
SeaTac: Seattle-Tacoma International Airport
SEPA: State Environmental Protection Act
SVT: Snoqualmie Valley Transportation
TBD: Transportation Benefit District
TDM: Transportation Demand Management
TIF: Transportation Impact Fee
TIP: Transportation Improvement Program
UGA: Urban Growth Area
VPD: Vehicles per Day
WSDOT: Washington State Department of Transportation

1. Introduction

The transportation system supports nearly all aspects of the City of Duvall – from land use, housing, employment and jobs, recreation, and day-to-day activities such as shopping and going to school. The Transportation Plan is the background and companion document to the Transportation Element of the City's Comprehensive Plan. This Plan will assist the City in advancing its multi-modal transportation system objectives to address existing needs and support the land use plan and overall vision of the community.

1.1 Purpose and Intent

The City of Duvall Transportation Plan provides the framework to guide the growth and development of the City's transportation infrastructure. It integrates land use and the transportation system, responding to current needs and ensuring that all future developments are adequately served. The Transportation Plan addresses the development of a balanced, multi-modal transportation system for the City and adjacent Urban Growth Area (UGA) and recognizes the regional nature of the transportation system and the need for continuing interagency coordination.

This Transportation Plan is based on a 2015 study of Duvall's existing transportation network, combined with a 20-year (2035) projection of future growth and transportation needs. The document includes the following sections:

- Community Transportation Issues
- Existing Transportation Services and Facilities
- Forecast Transportation Conditions
- Transportation Systems Plans
- Transportation Finance and Implementation Program

As a companion document, the Transportation Plan implements the Transportation Element of the Comprehensive Plan. The Transportation Element establishes a goal and policy framework for making decisions consistent with other elements of the Comprehensive Plan to describe a strategy for accomplishing the City's vision over the 20-year planning horizon. Based on the goals and policies in the Transportation Element, the Transportation Plan is intended to serve as a guide for transportation decisions to address both short and long term needs. To meet Growth Management Act (GMA) requirements, the Transportation Element and Transportation Plan must identify existing transportation system characteristics, establish standards for levels of service, and identify existing and future deficiencies based on land use growth projections. The Transportation Plan also discusses roadway mobility and accessibility needs, identifies improvements necessary to enhance safety, bicycle and pedestrian travel, and public transit.

1.2 Regulatory Setting

Development of an updated Transportation Plan was commissioned by the City Council in 2016 to replace the 2009 Transportation Plan which previously served as an Element of the

Comprehensive Plan (City of Duvall, 2010). The Plan addresses transportation needs, improvement projects, and funding sources to support the projected population and employment growth through the year 2035 in accordance with the City of Duvall Comprehensive Plan, as adopted on June 7, 2016 (Resolution No. 16-09) or as amended. The Plan is also intended to satisfy GMA requirements.

The following summarizes the regulatory setting and regional planning efforts that guided the development of the Transportation Plan.

GROWTH MANAGEMENT ACT

The Transportation Plan is intended to satisfy GMA requirements for long range planning and to supplement information and implement goals and policies within the Transportation Element of the Comprehensive Plan. Under GMA (RCW 36.70A.070), the Transportation Element is required to assess the needs of a community and determine how to provide appropriate transportation facilities for current and future residents. The Element, and this supplemental Transportation Plan, contain:

- Existing travel conditions and land use assumptions used in estimating future travel conditions;
- Estimated travel impacts on state-owned transportation facilities;
- Inventory of existing facilities;
- Assessment of future facility needs to meet current and future demands;
- Multi-year plan for financing proposed transportation improvements;
- Forecasts of traffic for at least 10 years based on adopted land use plan;
- Level of Service (LOS) standards for arterials and public transportation, including actions to bring deficient facilities into compliance;
- Transportation Demand Management (TDM) strategies;
- Identification of intergovernmental coordination efforts;
- A multiyear funding and financing program, and;
- Pedestrian and bicycle components to encourage enhanced access and healthy communities.

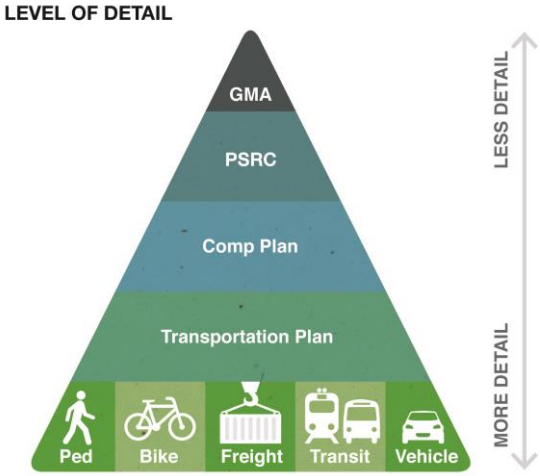
Additionally, under the City's concurrency management policy, development may not occur if the development causes the transportation facility to decline below the City's adopted LOS standard unless existing infrastructure exists or strategies to accommodate the impacts of the development are made within six years of the development. Finally, the Plan must include a reassessment strategy to address how the plan will respond to potential funding shortfalls.

Concurrency is one of the goals of the Growth Management Act and refers to the timely provision of public facilities and services relative to the demand for them. To maintain concurrency means that adequate public facilities are in place to serve new development as it occurs or within a specified time period (PSRC, 2017)

PUGET SOUND REGIONAL COUNCIL (PSRC)

VISION 2040 was adopted in 2008 as the central Puget Sound region's long-range strategy for growth management, the environment, economic development, and transportation. While *VISION 2040* builds on previous regional plans for King, Kitsap, Pierce, and Snohomish counties, including the *VISION 2020* (1995) and *VISION 2030* (2001) updates, it also introduces new provisions to guide and coordinate regional and local planning. Successful implementation of *VISION 2040* relies on successful implementation of local comprehensive plans.

TRANSPORTATION 2040 was adopted in 2014 and updated in 2015 as the region's long-range transportation plan. *TRANSPORTATION 2040* builds upon *VISION 2040* strategies and including strategies to address congestion and mobility, environment, and funding.



This graphic illustrates the relative context and level of detail from local modal plans up to state GMA requirements.

COUNTYWIDE PLANNING POLICIES

The King County Countywide Planning Policies (CPPs) are a series of policies that address growth management issues in King County. Adopted in 2013, the CPPs provide a countywide vision to serve as a framework for local comprehensive plans, which must be consistent with the overall vision. The CPPs require that local jurisdictions develop a balanced transportation plan that is consistent with the Regional Growth Strategy in *VISION 2040.* An essential component of the Regional Growth Strategy is an efficient transportation system that provides multiple options for moving people and goods into and among various centers. The CPPs promote a multimodal approach to serving growth, with additional emphasis on transit and non-motorized modes to support land use plans. The overarching CPPs goal is defined thusly; *the region is well served by an integrated, multimodal transportation system that supports the regional vision for growth, efficiently moves people and goods, and is environmentally and functionally sustainable over the long term*.

CLEAN AIR CONFORMITY ACT

The Transportation Element is also subject to the Washington State Clean Air Conformity Act that implements the directives of the Federal Clean Air Act. Because air quality is a region wide issue, the City of Duvall's Comprehensive Plan must support the efforts of state, regional, and local agencies as guided by WAC 173-420-080.

HEALTHY COMMUNITIES

Recognizing the growing need for physical activity among citizens, the Washington State Legislature amended the GMA in 2005 with the Healthy Communities Amendment, ESSB 5186. Comprehensive plans are directed to address the promotion of Healthy Communities through

urban planning and transportation approaches. The two amendments to the GMA require that communities:

1. Consider urban planning approaches that promote physical activity in the Land Use Element of a comprehensive plan, and:
2. Include a bicycle and pedestrian component in the Transportation Element of a comprehensive plan. Information within this Plan supplements that presented within the Transportation Element of the Comprehensive Plan.

OTHER CITY POLICIES AND PLANS

Projects and programs summarized within the Transportation Plan are subject to other City plans and requirements. Transportation infrastructure planning and projects consider Economic Vitality, Social Interaction, and Duvall's unique identity as addressed in the City of Duvall Economic Development Strategic Action Plan (City of Duvall, 2005). Land Use Goals and Policies along with land use assumptions from the Comprehensive Plan and Duvall Municipal Code Title 14 (Unified Development Regulations) are also considered.

Aesthetics are sometimes considered to be a relatively minor aspect of transportation projects. However, the City of Duvall promotes aesthetics and artistic improvements that, combined with good engineering planning, result in livable streets that function well and serve all users effectively. Landscaping and street trees, streetscape materials, parks and trails, wayfinding signs, effective illumination, safety features, dedicated parking, and street furniture installed in accordance with Duvall Municipal Code Title 14 (Unified Development Regulations), Public Works Development Design Standards, and other City requirements create complete streets for all users.

OTHER REGIONAL POLICIES AND PLANS

Recognizing transportation issues beyond city limits is an important part of transportation planning and will help mitigate congestion and traffic between and through Duvall and neighboring Counties and Cities as regional population increases. The City of Duvall is active in regional transportation efforts and supports projects and programs that improve transportation within the greater Puget Sound area including the 2017 Regional Transportation System Initiative Planning, Snoqualmie Valley trail and pedestrian planning, PSRC transportation planning, and other projects and programs.

2. Community Transportation Issues

As part of the 2003 City-Wide Visioning Plan, Duvall residents identified the conditions and issues that face the City of Duvall's transportation system. A primary concern of community residents is how future growth will affect the City and how to preserve the small town feeling as traffic growth continues and the need for transportation improvements increase. A focus of the community's concern surrounded the future of the SR-203/Main Street corridor and the improvements necessary to accommodate future traffic growth.

Although traffic capacity was an issue of concern, traffic calming measures, rather than high-speed capacity improvements, were considered the top priority by planning participants to mitigate traffic along Main Street. Some of the issues identified by the participants in the visioning process include:

- Community Character – retaining the look and feel and pedestrian scale of "Old Town";
- Truck Traffic – reducing the number of trucks and the impact of truck traffic in Old Town pedestrian areas, either by creating mechanisms to slow traffic or considering alternate routes;
- Economic Preservation – ensuring that future economic viability is maintained for businesses, including the retention of parking on Main Street;
- Safety – providing safe crossings for pedestrians and vehicles;
- Operations – allowing for the efficient movement of local and through traffic, including facilities for non-motorized vehicles and pedestrians;
- Connectivity – providing strong access to parks, the Snoqualmie River, and old and new parts of town. Ensuring connected bicycle and pedestrian facilities throughout the City, and;
- Environmental – preserving air and water quality.

Main Street improvements were completed from NE Bird Street to NE Ring Street in 2009 and improvements from NE Ring Street to NE Big Rock Road were completed in 2017. The improvements included traffic calming medians, curb extensions, dedicated parking, and new bike lanes and sidewalks. Utility improvements, undergrounding of overhead utilities, way-finding signs, and art elements were also completed as part of the improvements.

The City of Duvall completed "Town Hall" style meetings in 2017 to promote public discussion about issues related to Development and Transportation in Duvall and the surrounding region. The Town Hall meetings included members of the public, elected officials from the City of Duvall, County and State partners and elected officials, representatives from neighboring jurisdictions and partners, and City, County, and State staff. Transportation congestion and increased travel time within and immediately adjacent to Duvall were identified as primary concerns during the Town Hall. SR-203 impacts from out-of-town pass-through trips, pedestrian crossing safety, and limited road ingress/egress during flood events were also identified as concerns. Maintenance and funding mechanisms for local, county, and state transportation programs were also identified

as a region-wide challenge. Community issues including elements of the City of Duvall American with Disability Act (ADA) transition plan, the Healthy Communities public involvement process, and Complete Streets program were also discussed and are incorporated into the plan along with visioning for non-motorized transportation.

3. Existing Transportation Services and Facilities

The assessment of existing transportation services and facilities allows the identification of transportation issues and needs. An inventory of these facilities provides a reference point of the operation of transportation facilities and services and allows identification of where needs exist. This inventory updates the 2009 Transportation Element Update and includes the following areas:

- **Roadway System**
- **TDM**
- **Pedestrian Facilities**
- **Air Services**
- **Transit**
- **Parking**
- **Bicycle Facilities**
- **Freight Movement**

3.1 Roadway System & Traffic Controls

ROADWAY CLASSIFICATIONS

Streets function as a network. The efficiency of the street network system is dependent upon how streets move traffic through the system. Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. The main classes of streets in Duvall include: principal arterials, minor arterials, and collector arterials along with residential and commercial access streets. The City of Duvall's functional classification system is set forth in the *City of Duvall Development Design Standards Update* (2013). These standards provide detailed specifications for the use and construction of roadways.

Both existing and future arterials are shown on Figure 3-1.

Principal Arterial

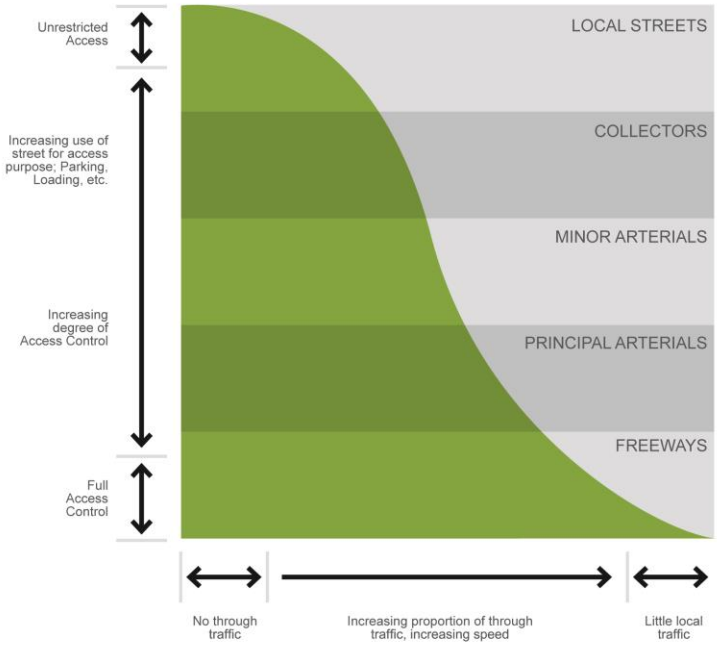
Principal arterials are highways connecting major community centers and outlying areas, or roads that have relatively high traffic volumes within the City, often constructed with partial limitations on access through intersections and common driveways. Principal arterials can have between two and five lanes and are generally intended to serve "through" traffic. Principal arterials in the Duvall area include Main Street (SR-203) and NE Woodinville-Duvall Road.

Minor Arterial

Minor arterials are roads and highways that connect centers and facilities within the community, provide connections to outlying areas of the community, and distribute traffic to/from principal arterials. Minor arterials can vary from two to five travel lanes. Cherry Valley Road and Big Rock Road are classified as minor arterials within the City. East of the City, these two roads are classified as collector arterials by King County.

Collector Arterial

Collector arterials connect two or more neighborhoods, carry traffic within neighborhoods and provide connections to principal and minor arterials. Collector arterials are limited to a maximum of three lanes. NE 143rd Place, NE 145th Street, NE Stephens Street, NE 150th Street, NE Bruett Road (NE 152nd Street), 275th Avenue NE, Batten Road (284th Avenue) NE, 1st Avenue NE, 3rd Avenue (268th Avenue) NE, NE Kennedy Drive, NE Roney Road, NE Valley Street, and NE Virginia Street are classified as collector arterials.



ROADWAY CLASSIFICATION RELATIONSHIPS BETWEEN MOBILITY AND ACCESS

OTHER CLASSIFICATION SYSTEMS

In addition to the Functional Classification system adopted by the City of Duvall, there are federal and state roadway designations. Federal and state grant programs provide funding for improvement projects that are on streets that have been classified with the federal or state roadway designations.

National Highway System (NHS)

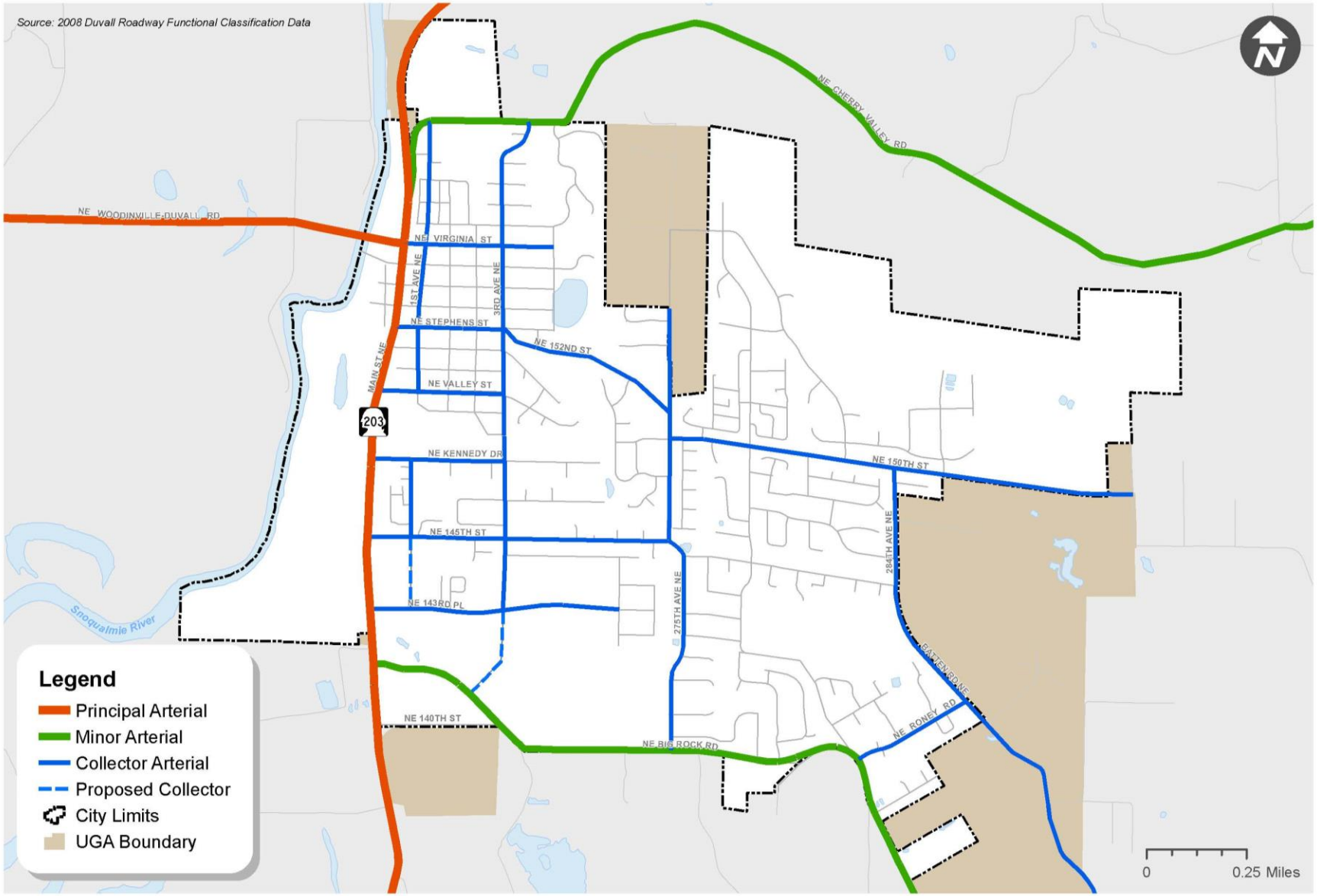
The NHS includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility as defined by the Federal Highway Administration (FHWA). There are no NHS facilities within the City of Duvall.

Federal Functional Classification

The Federal Functional Classification system provides a hierarchy of roadways as defined by the FHWA. This classification system defines the role of travel through a network of roadways, rather than focusing on individual roadways. As a result, the Federal Functional Classification differs in several ways from the City's Functional Classification. Changes to the Federal Functional Classification may be submitted through the Washington State Department of Transportation (WSDOT).

Highways of Statewide Significance

WSDOT designates interstate highways and other principal arterials that are needed to connect major communities in the state as Highways of Statewide Significance (HSS). This designation assists with the allocation of some state and federal funding. These roadways typically serve corridor movements having travel characteristics indicative of substantial statewide and interstate travel. There are no HSS facilities within the City of Duvall.



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Roadway Functional Classifications

City of Duvall Transportation Plan

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FIGURE
3-1

M:\16\16110.00 - Duvall 2016 Transportation Element Update\GIS\Maps\MXD\Fig 3-1 Roadway Functional Classification.mxd

3.2 Roadway Descriptions

The following section describes the use and function of the principal, minor, and collector arterial roadways around and within the City of Duvall. Specific information is provided about current features within the roadway Right-of-Way (ROW) for each of the facilities.

PRINCIPAL ARTERIALS

Main Street/SR-203

Main Street/SR-203 is a 2-lane principal arterial highway that connects the City of Monroe and US-2 in Snohomish County, through the City of Duvall, to its terminus at the junction with SR-202 at Fall City. SR-203 attracts a high volume of truck traffic connecting to SR-522 or I-90 because its route roughly parallels I-405 and the presence of nearby gravel pits, Main Street functions as the primary north-south corridor for both local and regional traffic within City limits.

Channelization and non-motorized improvements along Main Street/SR-203 from NE Ring Street to NE Big Rock Road were completed in 2017. The improvements connected to previous work from NE Bird Street to NE Ring Street completed in 2009 and the WSDOT Coe-Clemons Creek culvert improvement project completed in 2015. Improvements from these projects generally includes two 11-foot wide travel lanes, 12-foot wide two way turn lanes, 2- to 10-foot wide medians, bike lanes, limited dedicated on-street parking, and pedestrian improvements on both sides of the road.

Traffic signals are located along Main Street at the intersections Woodinville-Duvall Road (NE Virginia Street), NE Stephens Street, and NE Big Rock Road.

Woodinville-Duvall Road

Woodinville-Duvall Road is a 2-lane, 24-foot wide principal arterial under King County jurisdiction connecting the cities of Woodinville and Duvall. The roadway generally consists of 2-lanes with unimproved shoulder except at the bridge section with curb, narrow sidewalk, and railing on both sides immediately west of City limits. This road carries high traffic volumes from Main Street westbound through King County to the Woodinville area. NE Virginia Street extends east from the Main Street intersection and is slightly offset from Woodinville-Duvall Road to the west. The signalized intersection at Main Street has poor turning characteristics, particularly for trucks turning west from the southbound direction. The City will support the County and the State when those agencies secure funding for improvements to the Woodinville-Duvall Bridge and access to Main Street.

MINOR ARTERIALS

Cherry Valley Road

Cherry Valley Road is a 2-lane collector arterial primarily under King County jurisdiction. The roadway is classified as a minor arterial within City limits and includes travel lanes that are generally 10 to 11 feet wide. Cherry Valley Road Improvement projects completed in 2012 and 2014 included the addition of bike lane and sidewalk along the west/south-bound travel lane from 3rd Avenue NE to Main Street. Storm and surface water management improvements, including

installation of biofiltration and bioretention facilities, were also completed as part of the projects. The intersection of Cherry Valley Road and SR-203/Main Street was improved to provide safer turning characteristics as part of the 2014 project.

Big Rock Road

Big Rock Road is a 2-lane, 22-foot wide collector arterial with narrow shoulders and limited sidewalks within City limits. Big Rock Road has experienced increased volumes as more residential development is built in the eastern portions of Duvall and unincorporated King County. Proposed developer-driven improvements include construction of sidewalks, bike lanes, and a traffic circle at the 3rd Avenue NE intersection.

COLLECTOR ARTERIALS

NE 143rd Place

NE 143rd Place is a 2-lane, 22-foot wide residential access street. The roadway is characterized by unimproved shoulder and roadside ditches except for recently developed portions with sidewalk west of 3rd Avenue NE (north side only) and east of 272nd Place NE (both sides).

NE 145th Street

NE 145th Street is a 2-lane, 20-foot wide residential access street with short sections of sidewalk between Main Street and 3rd Avenue, sidewalk between 3rd Avenue NE and 275th Avenue NE (north side only), and sidewalk between approximately 272nd Place NE and 275th Place NE (north side only).

NE Stephens Street and NE Bruett Road

NE Stephens Street is a 2-lane collector arterial providing the primary east-west connection within Duvall. The roadway is generally 26 feet wide with sidewalks (both sides) and a bike lane (south side only) west of 3rd Avenue NE. The roadway angles and intersects with Bruett Road (NE 152nd Street) at 3rd Avenue NE. The roadway is 30 feet wide and generally includes sidewalk and bike lanes on both sides east of 3rd Avenue NE. The 2013 Centennial Project west of Main Street included undergrounding utilities, installation of sidewalks, bike lanes (both sides), water main extension, improved surface and stormwater management, and public art. The roadway was renamed “NE Burhen Way” west of Main Street in 2016 to honor long-time residents and philanthropists Ray and Tova Burhen.

NE 150th Street

NE 150th Street extends east from the intersection of Bruett Road and 275th Avenue NE to residential development on the eastside of the City and Cedarcrest High School. NE 150th Street consists of 2-lanes with sidewalks on both sides of the roadway, except for some sections of the south side of the roadway.

275th Avenue NE

275th Avenue is classified as a collector arterial that has developed as the central north-south arterial spine in Duvall, serving many of the new housing developments in the City. The roadway varies in width and features a curvilinear alignment that provides vehicle traffic calming.

Sidewalks are located along the west side of 275th Avenue NE from NE 145th Street to just north of NE 155th Place to the north city limit. Sidewalks were constructed in 2009 and 2010 to provide sidewalk connections on both sides of the roadway from NE 145th Street to NE Big Rock Road. 275th Avenue NE north of NE 150th Street will be classified as a minor arterial upon annexation of the North UGA.

Batten Road NE (284th Ave NE)

Batten Road NE (284th Ave NE) is a 2-lane, 22-foot wide collector arterial with no sidewalks or curbs, except intermittently where development has occurred. The road is the primary eastern connection between NE 150th Street and NE Big Rock Road. The road is primarily under King County jurisdiction within the UGA.

1st Avenue NE

1st Avenue NE is a 2-lane, approximately 20- to 32-foot wide collector arterial. 1st Avenue NE extends from NE Cherry Valley Road to NE Valley Street, is not present within Taylor Park, and extends from NE Kennedy Drive to NE 145th Street. Sidewalks and curbs are generally absent along 1st Avenue NE except for the recently improved section of roadway between NE Virginia Avenue and NE Cherry Valley Road.

3rd Avenue (268th Ave NE)

3rd Avenue NE is considered as an important north-south connection between Cherry Valley Road and NE 143rd Place. The road is 25 feet wide with 2-lanes with curb, gutter, and sidewalk on both sides from NE Virginia Street to NE Stephens Street. 3rd Avenue NE is characterized by a narrow, 20- to 22-foot wide roadway with sidewalk on the east side only between NE Stephens Street and NE Kennedy Drive. The remaining ROW has either an informal paved or dirt path except for sidewalk (west side only) between NE 145th Street and NE 143rd Place.

Proposed developer-driven improvements include construction of the 3rd Avenue extension from NE 143rd Place south to NE Big Rock Road. The 3rd Avenue extension will include sidewalks, bike lanes, and intersection improvements at NE Big Rock Road.

NE Kennedy Drive

NE Kennedy Drive is a 2-lane, 18-foot wide residential access street with limited sidewalks and curbs between Main Street and 3rd Ave NE. The road grade is steep at approximately 14 percent between Main Street and 1st Avenue NE.

NE Roney Road

NE Roney Road is a 2-lane, 30-foot wide residential access street with sidewalks, curbs and gutters on both sides, including a 5-foot wide bike lane on both sides. This road connects NE Big Rock Road and Batten Road NE in the far southeast corner of the City.

NE Valley Street

NE Valley Street is a 2-lane, 18- to 22-foot wide residential access street with sidewalks, curbs and gutters up to approximately 2nd Avenue NE. This road serves the southern business district and residential areas of Old Town.

NE Virginia Street

NE Virginia Street between Main Street and 3rd Avenue NE is a 2-lane collector arterial with a sidewalk on the north side of the road from Main Street to 1st Avenue NE and intermittent sidewalks on the north side from 1st Avenue NE to 2nd Avenue NE. The roadway is approximately 43 feet wide from Main Street to 1st Avenue NE and then narrows to 22-feet to the east. The road grade is steep at approximately 15 percent between Main Street and 2nd Avenue NE.

3.3 Traffic Volumes

DAILY

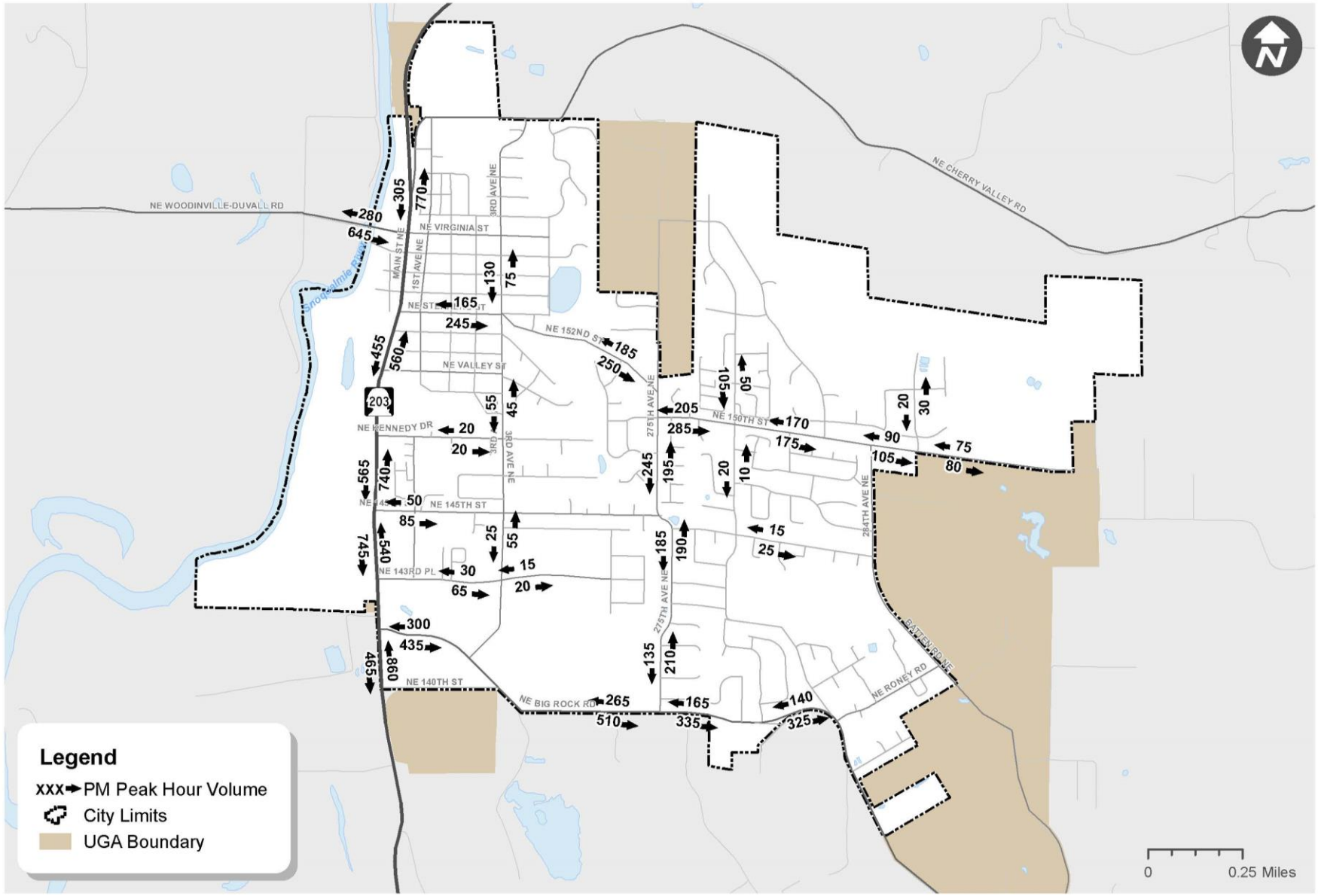
Daily traffic volumes along SR-203 were obtained from counts in 2014. Approximately 14,000 Vehicles per Day (vpd) travel on SR-203 south of the City. This compares to 12,200 vpd in 2008, and is consistent with historical trends: between 1998 and 2002, WSDOT data show an annual increase of approximately 1,000 vpd over a five-year period. Daily truck classification counts show truck traffic represents approximately 9 percent of daily traffic on SR-203 south of the City. Around 3 percent of the total traffic along SR-203 south of the City is double unit trucks, and approximately 6 percent is single unit trucks.

Daily counts in 2014 show 13,500 vpd on SR-203 south of Woodinville-Duvall Road. SR-203 north of Cherry Valley Road had a traffic volume of approximately 10,900 vpd in 2014. Weekly 2017 traffic counts using the City of Duvall Police Department Speed Trailer suggest an average of approximately 11,000 to 12,000 vpd at three SR-203 locations in April 2017. These informal counts occurred during varied traffic conditions (School District Spring Break, Main Street construction) and are for informational purposes only.

PM PEAK HOUR

PM Peak Hour is defined as the 60-minute interval that contains the largest volume of traffic during the PM time period. Recent PM peak hour traffic volumes were assembled from available count data. The traffic counts are from 2009 to 2016. Figure 3-2 shows the existing PM peak hour traffic volumes at several locations throughout the City. The PM peak hour volumes account for approximately 8-10 percent of the total daily traffic, which is typical of outlying areas of an urbanized area.

Approximately one-third of the PM peak hour traffic on Main Street is in the northbound direction. Eastbound traffic on Woodinville-Duvall Road comprises 42 percent of the total PM peak hour traffic on the bridge entering Duvall. These values are indicative of the travel patterns due to regional jobs and other activities being located west or southwest of the City.



Legend

xxx➡ PM Peak Hour Volume

City Limits

UGA Boundary

0 0.25 Miles

Existing PM Peak Hour Weekday Traffic Volumes

City of Duvall Transportation Plan

FIGURE **3-2**

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M:\16\16110.00 - Duvall 2016 Transportation Element Update\GIS\Maps\MXD\Fig 3-2 Existing PM Peak Hour Weekday Traffic Volumes.mxd

3.4 Level of Service Standards

LOS standards establish the basis for the concurrency requirements in the GMA, while also being used to evaluate impacts as part of the State Environmental Protection Act (SEPA). Agencies are required to "adopt and enforce ordinances which prohibit development approval if the development causes the LOS on a transportation facility to decline below the standards adopted in the Transportation Element of the Comprehensive Plan, unless transportation improvements or strategies to accommodate the impacts of development are made concurrent with development" (RCW 36.70A.070(6)(b)). Therefore, setting the LOS standard is an essential component of regulating development and identifying planned improvements for inclusion in the Transportation Element of the Comprehensive Plan.

LOS is a measure of the quality of traffic flow and operations. It can be described in terms of speeds, travel times, delays, convenience, interruptions, and comfort. The Highway Capacity Manual (HCM) (Transportation Research Board, 2010), provides methodologies for evaluation of LOS for transportation facilities and services. The HCM criteria range from LOS A indicating free-flow conditions with minimal delays, to LOS F indicating extreme congestion and long vehicle delays. In addition to LOS analysis, the City also requires the implementation of street standards for urban developments. These include sidewalks and other facilities to support pedestrians and bicycles.

Signalized intersection LOS is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control and provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle.

Unsignalized intersection LOS criteria can be further reduced into two intersection types present within the City of Duvall: all-way stop and two-way stop control. All-way stop control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns.

CITY'S LEVEL OF SERVICE STANDARDS

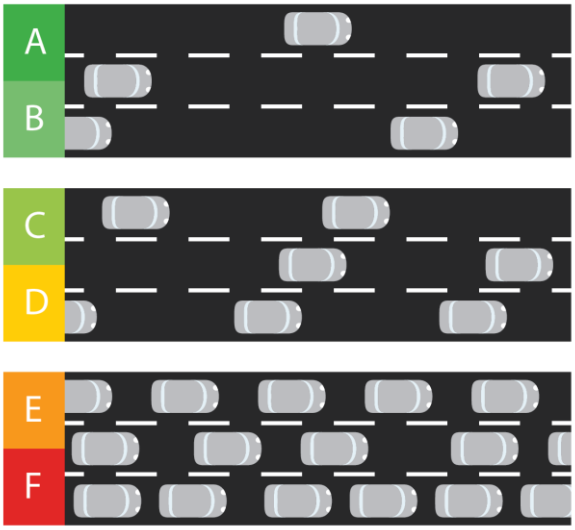
The City has established the following LOS standards for intersections, using methodologies identified in the latest edition of the HCM. The adopted LOS standards for all arterials, including Main Street/SR-203 are as follows:

Traffic Signals, Roundabouts, and All-Way Stop Controlled Intersections – LOS C or better based on overall average delay per vehicle.

- LOS C or better for principal, minor, collector arterials and lower classified roadways;
- LOS D or better for Main Street/SR-203

Unsignalized Two-Way Stop Controlled Intersections – LOS C or better for worst traffic movement. On a case-by-case basis, the City may allow the LOS for traffic movements from the minor streets at two-way stop controlled intersections to operate below the adopted standard, if the City determines that no significant safety or operational issues will result.

- LOS C or better for principal, minor, collector arterials and lower classified roadways;
- LOS D or better for Main Street/SR-203



LOS	CONTROL DELAY (per vehicle)		DESCRIPTION OF OPERATIONS AT SIGNALIZED INTERSECTIONS
	signalized	unsignalized	
A	≤10	≤10	Free flow
B	>10-20	>10-15	Stable flow (slight delays)
C	>20-35	>15-25	Stable flow (acceptable delay)
D	>35-55	>25-35	Approaching unstable flow (tolerable delay, occasional wait through more than one signal)
E	>55-80	>35-50	Unstable flow
F	>80	>50	Forced flow (jammed)

The lower LOS standard for unsignalized, two-way stop controlled intersections reflects the desire to minimize delays on the major street and through street traffic, while supporting safe and efficient operations from the minor streets.

The City typically will apply the intersection LOS standard to the weekday PM peak hour. The City may, however, define additional evaluation periods for intersection review in order to identify if potential impacts would occur. These could include weekday AM peak hour, weekends, or other time periods depending on the type and location of a proposed development.

STATE HIGHWAY LEVEL OF SERVICE STANDARDS AND CONCURRENCY

LOS

The 1998 GMA amendment, also known as the "LOS" bill (passed as HB 1487 and codified as RCW 47.06.140), required the Washington State Transportation Commission to designate and the Legislature to adopt HSS. The bill exempts HSS facilities from concurrency. SR-203 is not an HSS. Levels of service standards for other state-owned (regionally significant) facilities are jointly set by WSDOT and the Regional Transportation Planning Organization (RTPOs).

The PSRC is designated as the RTPO for the Puget Sound region. In October 2003, PSRC adopted LOS standards for regionally significant State highways, including SR-203. The full length of SR-203 between Fall City and Monroe is classified by PSRC as a Tier 2 state highway. Tier 2 highways serve the "outer" urban area, which are beyond a three-mile buffer of major regional highways, such as I-405 or designated urban centers. The PSRC adopted standard for SR-203 is LOS D or better. The PSRC has identified that the standard shall apply to the PM peak hour. WSDOT will use the LOS D standard for SR-203 to evaluate capacity deficiencies. This analysis will be used to identify improvement strategies for the highway including capacity enhancements, access management, or operations/safety improvements.

Concurrency

The City of Duvall has no authority to alter the LOS on SR-203 nor does the City have the responsibility to make ultimate decisions concerning improvements to the state highway system or to raise needed funding. The City of Duvall will not apply concurrency regulations to SR-203 in the City. This is a reflection of the state's authority over SR-203 and also reflects the City's desire to:

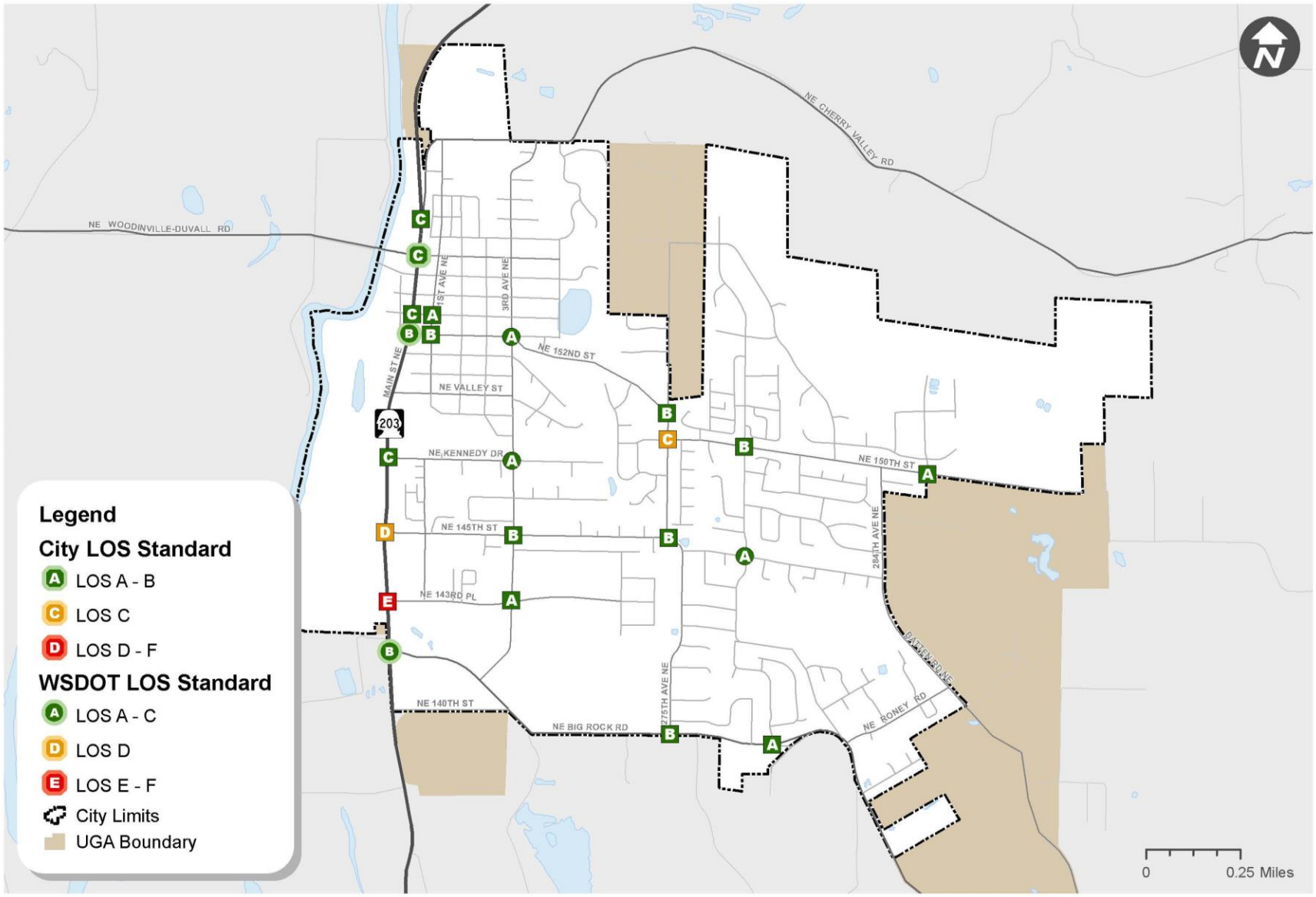
- Retain the look and feel of "Old Town";
- Reduce the volume and impacts of trucks through town;
- Retain parking on Main Street to support economic growth, and;
- Recognize that regional traffic increases will adversely affect levels of service at intersections along Main Street, even with no additional development in Duvall.

3.5 Existing Traffic Operations

For the City's Transportation Plan update, 20 study intersections were evaluated to determine existing traffic operations at major intersections within the City as shown on Figure 3-3 and Table 3-1. Intersection operations were evaluated during the weekday PM peak hour, which represents worse-case traffic conditions for a typical weekday. All the study intersections are stop-controlled, except for three signalized intersections along Main Street/SR-203.

Select unsignalized intersections were evaluated in 2016 as summarized in the memorandum titled "Final Intersection Control Screening Process and Analysis" (Transpo Group, January 5, 2017). Ten stop-controlled intersections were evaluated with respect to roadway classification, collision data, traffic volume, and sight distance. Intersection improvements recommended within the memorandum included intersection control revisions primarily based on sight-distance limitations and road classification hierarchy.

All study intersections operated at or above the City's LOS standard, with the exception of the NE 143rd Place/Main Street intersection. NE 143rd Place/Main Street operated at LOS E, exceeding the SR-203 LOS standard of D. The sub-standard LOS at this location is due to higher Main Street traffic, reducing opportunities for side-street traffic to enter Main Street and creating delays. RCW 36.70A.070(3) requires that the capital facilities element include a six-year plan for financing needed improvements. Because the City of Duvall is not applying concurrency to Main Street/SR-203, such a financing plan is not required for the state-owned Main Street/SR-203. Traffic impacts on SR-203 and its intersections will be evaluated through the SEPA review process with appropriate mitigation determined at the project review level.



Existing (2015) Levels of Service

City of Duvall Transportation Plan

FIGURE **3-3**

M:\16\16110.00 - Duvall 2016 Transportation Element Update\GIS\Maps\MXD\Fig 3-3 Existing Intersection Levels of Service.mxd

Table 3-1 Existing Conditions LOS Summary

Intersection	Control Type[1]		2009 PM Peak Hour		2015 PM Peak Hour	
		LOS Standard	LOS[2]	Delay[4]	LOS[3]	Delay
NE Cherry Valley Road & SR-203	TWSC	D	N/A	N/A	C	20.0
NE Woodinville-Duvall Road & SR-203	Signal	D	D	38.7	C	29.0
SR-203 & NE Stella Street	TWSC	D	N/A	N/A	C	18.6
NE Stephens Street & SR-203	Signal	D	D	10.2	B	10.3
NE Kennedy Drive & SR-203	TWSC	D	D	25.1	C	22.7
NE 145th Street & SR-203	TWSC	D	D	18.5	D	32.8
NE 143rd Place & SR-203	TWSC	D	D	46.4	E	39.8
NE Big Rock Road & SR-203	Signal	D	D	21.0	B	13.7
NE Stephens Street & 3rd Avenue NE	AWSC	C	C	9.0	A	9.6
NE Kennedy Drive & 3rd Avenue NE	AWSC	C	C	7.2	A	7.1
NE 143rd Place & 3rd Avenue NE	TWSC	C	C	8.7	A	8.7
275th Avenue NE & NE 152nd Street	TWSC	C	C	10.2	B	12.0
NE 150th Street & 275th Avenue NE	TWSC	C	C	13.1	C	17.7
NE 145th Street & 275th Avenue NE	TWSC	C	C	10.2	B	12.3
NE 150th Street & 278th Avenue NE	TWSC	C	C	11.2	B	11.6
NE 144th Street & 278th Avenue NE	AWSC	C	C	7.1	A	7.1
151st Street & 286th Avenue NE	Yield	C	C	7.0	N/A	N/A
NE 150th Street & 286th Avenue NE	TWSC	C	C	8.7	A	8.8
NE Big Rock Road & 275th Avenue NE	TWSC	C	C	10.6	B	11.4
NE Big Rock Road & 279th Lane NE	TWSC	C	C	10.6	A	9.0

[1] – Signal = Signalized intersection; AWSC = All-Way Stop Controlled intersection; TWSC = Two-Way Stop Controlled intersection;
[2] – Level-of-service based on *2000 HCM* methodology.
[3] – Level-of-service based on *2010 HCM* methodology.
[4]– Average delay in seconds per vehicle

3.6 Traffic Safety

Collision rates are another means of measuring the adequacy of roadways in the City of Duvall. Collisions are an indication of where safety issues may exist within a transportation system. The data shown in Table 3-2 summarizes reported collisions within the City of Duvall between the most recent full three-year period (2014-2016). A review of historical collisions was completed to identify potential safety issues for vehicles, pedestrians, and cyclists. Intersections included below in Table 3-2 represent intersections that have experienced more than two collisions over the course of the three-year period.

The majority of collisions occurred along Main Street between NE Woodinville-Duvall Road and NE Valley Street. Of those, the majority (roughly 45 percent) are rear-end type collisions. It should be noted that five collisions involving pedestrians or bicyclists were reported over the three-year

period with four occurring at two intersections along Main Street/SR-203. No fatalities due to collisions occurred in the City of Duvall during the 2014-2016 study period.

Multiple municipalities in Washington have begun approving a more nuanced method to estimate collision rates and identify safety consistent with guidance provided in Chapter 4 of the *Highway Safety Manual* (AASHTO, 2010). An analysis of crash rates for the study intersections was completed to identify the average crash frequency based on the number of vehicles traveling through the study intersections. In addition to calculating the typical observed crash rate per Million Entering Vehicles (MEV), this individual intersection-specific crash rate was compared to a critical crash rate calculated for each intersection as a means of comparison among study intersections that have similar characteristics. This comparison is used to determine if further evaluation is needed to identify if there are any consistent types of collisions that would indicate a site-specific safety issue. Table 3-2 summarizes the factors and calculations to determine the critical crash rate for the noted intersections.

Table 3-2 Summary of Intersections' Observed and Critical Crash Rate

Intersection	PM Peak Hour TEV[1]	Observed Crash Rate[2]	Critical Crash Rate[3]	Observed Greater than Critical?
Signalized				
2. Main Street (SR-203)/ NE Woodinville-Duvall Road	1,655	0.72	0.78	No
5. Main Street (SR-203)/ NE Stephens Street	1,225	0.67	0.84	No
9. Carnation Duvall Road (SR-203)/ NE Big Rock Road	1,635	0.11	0.78	No
Weighted Average Crash Rate		*0.49*		
Two-Way Stop-Controlled				
1. Main Street (SR-203)/ NE Cherry Valley Road	1,130	0.57	0.76	No
3. Main Street (SR-203)/ NE Stewart Street	1,211	0.23	0.74	No
4. Main Street (SR-203)/ NE Cherry Street	1,183	0.69	0.75	No
6. Main Street (SR-203)/ NE Valley Street	1,249	0.58	0.74	No
7. Main Street (SR-203)/ NE Kennedy Drive	1,335	0.21	0.73	No
8. Main Street (SR-203)/ NE 145th Street	1,305	0.14	0.73	No
10. 1st Avenue NE/ NE Stewart Street	179	1.02	1.43	No
11. 1st Avenue NE/ NE Stella Street	145	1.26	1.57	No
13. 3rd Avenue NE/ NE 145th Street	240	0.76	1.26	No
14. 275th Avenue NE/ NE 145th Street	480	0.38	0.97	No
15. 275th Avenue NE/ NE 150th Street	625	0.44	0.89	No
16. 275th Avenue NE/ NE Big Rock Road	810	0.23	0.83	No
Weighted Average Crash Rate		0.42		
All-Way Stop-Controlled				
12. 2nd Avenue NE/ NE Stephens Street	589	0.31	0.91	No
Weighted Average Crash Rate		*0.31*		

1. TEV= Total Entering Volume
2. Observed crash rate per MEV is the average number of crashes in the 3-year period divided by total number of MEV for the intersection. Crashes per MEV.
3. Critical crash rate is calculated based on Equation 4-11 in the Highway Safety Manual, 2010 and represents a threshold for comparison among sites with similar characteristics.
4. Weighted average crash rate is calculated per Equation 4-10 in the *Highway Safety Manual* (2010) and represents an average crash rate weighted by the traffic volumes. This value is used to calculate the critical crash rate for each individual intersection.

As shown in Table 3-2, none of the identified Duvall study intersections have critical crash rates above their corresponding observed crash rates. Consistent with guidance provided in the *Highway Safety Manual*, no further examination is necessary.

3.7 Complete Streets

The Complete Streets Policy (Ordinance 1200, adopted September 20, 2016) established guiding goals, principles, and practices to promote an interdisciplinary approach in a transportation

system that provides increased access, mobility, and health for all users. The policy: 1) applies to transportation planning and projects; 2) promotes cooperation between public, private, non-profit organizations; 3) applies to a variety of enhancements such as non-motorized improvements as aesthetics; and 4) shall be considered in development of plans, policies, codes, and standards. Projects may exclude components of the Complete Streets Policy only upon Public Works Director and City Administration approval.

3.8 Healthy Communities

This Transportation Plan promotes bicycles, pedestrians, and public transit to support a physically active population. Street system design including connectivity, traffic calming, parking, and a grid system provide multiple options for non-motorized modes of transport. Such design is included in this plan and is supported by the Duvall Municipal Code, City of Duvall Complete Streets Policy, 2015 City Comprehensive Plan, and development design standards. The amount of available parking affects the decision to walk, bicycle, or drive and is considered for both private development and development of public rights-of-way. Other facilities such as bicycle racks, public art, educational signage (interpretive and way finding), and resting or plaza stops with benches or other amenities also support Healthy Communities. Education regarding pedestrian and bicycle safety and enforcement of traffic laws for bicycles, pedestrians, and drivers is also stressed within this Plan to support Healthy Communities.

The key policy areas in the Healthy Communities portion of this Plan are:

- Plan for all users;
- Plan complete streets for all users;
- Require connectivity;
- Create a safe pedestrian network;
- Consider multimodal concurrency;
- Identify and develop safe routes to school;
- Use parking management strategies to enhance bicycling and walking;
- Provide facilities to support bicyclists and pedestrians, and;
- Provide encouragement, education, and law enforcement to support bicyclists and pedestrians.

As part of the Healthy Communities concept, the City held public hearings during Planning Commission and City Council meetings in 2008 and Town Hall Development and Transportation meetings in 2017. Planning Commissioners, City Councilpersons, and residents identified healthy community issues to be addressed following a staff presentation.

Primary concerns included:

- Walkability and pedestrian safety along Main Street and other pedestrian corridors;

- Low Impact Development approaches where appropriate and alternative road standards to promote non-motorized transportation and healthy communities;
- Signage and Education to promote healthy use, self-education, and interest. Specifically increase education for pedestrian, parking, and cross-walk safety, and;
- Expand existing sidewalk and bicycle trail network and connections. Specific requested connections included a pathway within the PSE corridor located along the west side of 275th Avenue NE from NE Big Rock Road to NE 145th Street and the east side of 275th Avenue NE from 145th Street NE to the north City limits, pedestrian pathway connections to Taylor Park and other park and recreation areas, and bicycle lanes on 145th Street NE and 3rd Avenue NE. ADA provisions were also identified as important improvements.

3.9 Active Non-Motorized Transportation

The non-motorized transportation network consists of facilities for residents and visitors to participate in active transportation modes and recreational activities in the City of Duvall. A combination of on-street facilities and off-street pathways provide the core network for walkers, cyclists, and other non-motorized users to travel. These facilities can be used for many of the same purposes as personal vehicles and transit, including commuter travel, grocery store trips, and other errands within the City. Non-motorized facilities, particularly off-street pathways, are also used for recreational trips or for access to parks and other destinations.

A well-established system encourages healthy recreational activates, reduces travel demand on City roadways, and enhances safety within a livable community. Pedestrian and bicycle facilities also provide access to/from transit stops. Good transit access can increase the use of non-auto modes.

The City's existing transportation system includes a variety of pedestrian and bicycle facilities. The core facilities are located along arterials or collectors, with sidewalks existing on one or both sides of many of these study area roadways. The City has developed standards for the implementation and design of pedestrian and bicycle facilities including sidewalks, bike lanes, wider roadway shoulders, and multi-use pathways. The City encourages retail and commercial developers to design new facilities in a pedestrian and bicycle friendly way. Non-motorized facilities in the City of Duvall include multi-use pathways that connect parks and neighborhoods.

PEDESTRIAN FACILITIES

Every trip begins and ends with a walk trip. People walk to their cars and drive somewhere where they will walk into a building, facility, or transit station. The City hopes to connect more destinations with walking paths and encourage walking between destinations. The City of Duvall will continue to develop pedestrian facilities as part of its transportation system improvements.

The City has worked to enhance pedestrian corridors and sidewalk improvements as part of roadway projects. Newer developments are required to build sidewalks, providing mobility within developments; however, there is currently little connectivity to areas outside of developments and the Arterial Sidewalk network. Where sidewalks are not available, pedestrians must use roadway shoulders, if available.

The existing *City of Duvall Development Design Standards* require that concrete sidewalks be constructed on both sides of all arterials, neighborhood collectors, subcollectors, subaccess, multiple-dwelling and business access streets. Sidewalks are required to be a minimum of five feet wide in residential areas, and 8 to 12 feet wide in business/commercial districts in accordance with the Unified Development Regulations.

Missing major sidewalk links include, but are not limited to:

- South side of NE 150th Street;
- Big Rock Road from Safeway to 275th Avenue NE (both sides) and from NE 138th Place to Big Rock Ballfields (west side) and from Safeway to Big Rock Ballfields (south side);
- 1st Avenue NE south of NE Virginia Street;
- 3rd Avenue NE south of NE Kennedy Drive;
- 275th Avenue NE (east side), north of NE 145th Lane to northern City limit;
- Majority of NE 143rd Place;
- Batten Road;
- Cherry Valley Road (north side), and;
- Connections from neighborhoods to Snoqualmie Valley Trail.

As part of the plan update, the City conducted a sidewalk inventory of classified streets. Based on City measurements, there are sidewalks along 60 percent of the 36.4 miles of roadway within the City. Table 3-3 summarizes the miles of pedestrian facilities along the selected streets within the City and the adjacent UGA. To calculate the mileage, a roadway having a walkway on at least one side is counted as a street with pedestrian facility.

Table 3-3 Pedestrian Facilities Located Along Select Arterials

Street	Functional Classification	Length of Street (miles)	Length with Ped. Facilities (%)	Length without Ped. Facilities (%)
Main Street	Principal Arterial	1.52	100%	0%
NE Big Rock Road	Minor Arterial	1.64	53%	47%
3rd Avenue NE	Collector Arterial	1.25	87%	13%
NE 143rd Place	Collector Arterial	0.70	12%	88%
NE 145th Street	Collector Arterial	0.75	85%	15%
275th Avenue NE	Collector Arterial	1.10	100%	0%
NE 150th Street	Collector Arterial	1.30	100%	0%
Stephens/152nd	Collector Arterial	0.75	100%	0%
NE Virginia Street	Collector Arterial	0.38	14%	86%

The Public Health Department, Seattle and King County published a Duvall Walking Map in December 2003 which was updated in 2014. The map identifies numerous walking routes within the City as a way to improve community connections and promote health and wellness for Duvall

residents. Those walking routes are identified on the Existing Trails and Sidewalks Figure RR-2, from the Parks and Recreation Element of the 2015 City of Duvall Comprehensive Plan.

BICYCLE FACILITIES

Bicycling is an important and growing mode of travel for people in the region. When appropriately planned, bicycle routes have a role in reducing congestion, improving air quality, providing travel choices, encouraging exercise and recreation, and providing greater mobility for those without access to a vehicle. The City encourages the use of bicycles; endeavors to coordinate linkages; considers impacts on bicycles when designing and engineering roadways and emphasizes continuous bicycle linkages to existing facilities. The City is interested in incorporating adjacent bicycle lanes or other design treatments, as appropriate, into roadway construction projects whenever the ROW is sufficient and funding can be secured.

Bicyclists generally share the roadway with automobiles in the City of Duvall. King County has identified SR-203, Big Rock Road, Cherry Valley Road and Woodinville-Duvall Road as preferred routes in its *Bicycling Guidemap*. These facilities are identified by King County as low to moderate traffic roadways without a curb lane or shoulder. As discussed above, these roads have the highest volumes of traffic in the City. General non-motorized (bicycling and pedestrian) routes have also been identified in Figures 5-2 and 8-6 of the 2008 Parks, Trails and Open Space Plan. In addition to the routes identified above, the Snoqualmie Valley Trail provides an excellent opportunity for non-motorized recreation, including off-road bicycling. This trail passes through the City of Duvall and traverses south through the cities of Carnation, Fall City, and North Bend, and will eventually connect to the Mountains to Sound Greenway located along Interstate 90.

The *City of Duvall Development Design Standards* sets specific standards for the development of bicycle facilities, varying from bicycle lanes to shared roadway bicycle ways. Figure 3.5, Bicycle Facility Network, indicates the existing bicycle facilities within Duvall, which are generally limited to marked bike lanes along NE Main Street, NE Cherry Valley Road, NE Stephens Street, NE Bruett Road, 275th Avenue NE, and NE Big Rock Road. Many of the proposed routes are located along roadways that have sufficient paved width for bicycle lane but lack appropriate channelization and marking. Some of the proposed routes depict climbing lanes or shared facilities where sufficient ROW widths cannot be provided. Due to steep slopes, these routes are typically east-west corridors and commonly restricted to climbing or shared use lanes only. Climbing (uphill) or shared use lanes are identified along NE 145th Street, NE 143rd Place, and part of NE Roney Road,

As commercial, industrial and residential development occurs, the need for walking, biking and jogging paths must be monitored and the smaller systems should be incorporated into the City and regional trail facilities system.

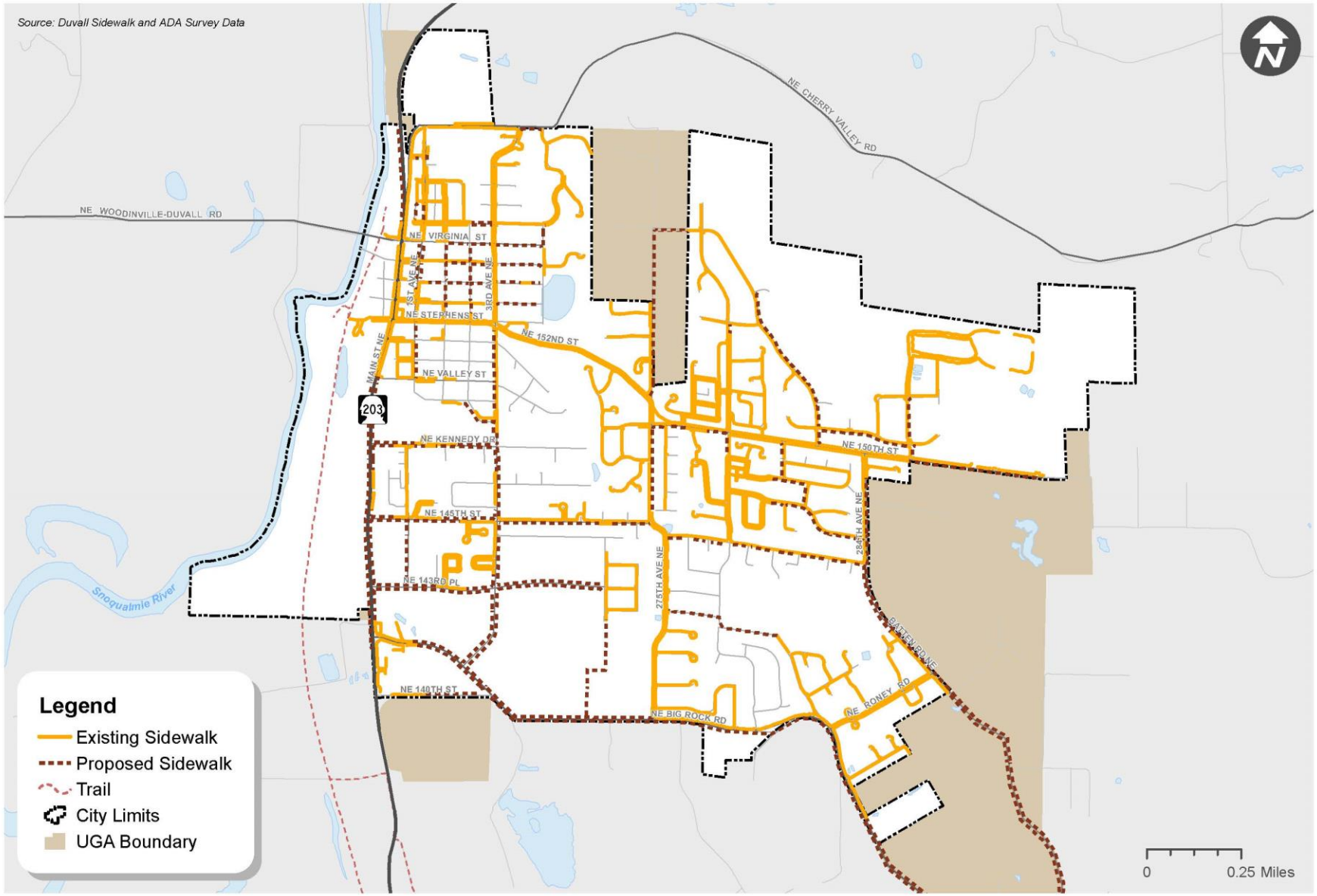
Bicycle routes are missing or deficient on the following roadways/areas:

- NE Big Rock Road east of Safeway;
- 284th Avenue NE and Batten Road NE
- NE 150th Street;

- 3rd Avenue NE;
- NE 143rd Place
- NE 145th Street, and;
- Connections to the Snoqualmie Valley Trail

EQUESTRIAN FACILITIES

The Snoqualmie Valley Trail serves local and regional equestrian needs within the City and surrounding area as depicted on Figure 3-4.



City of Duvall
Small Town. Real Life.

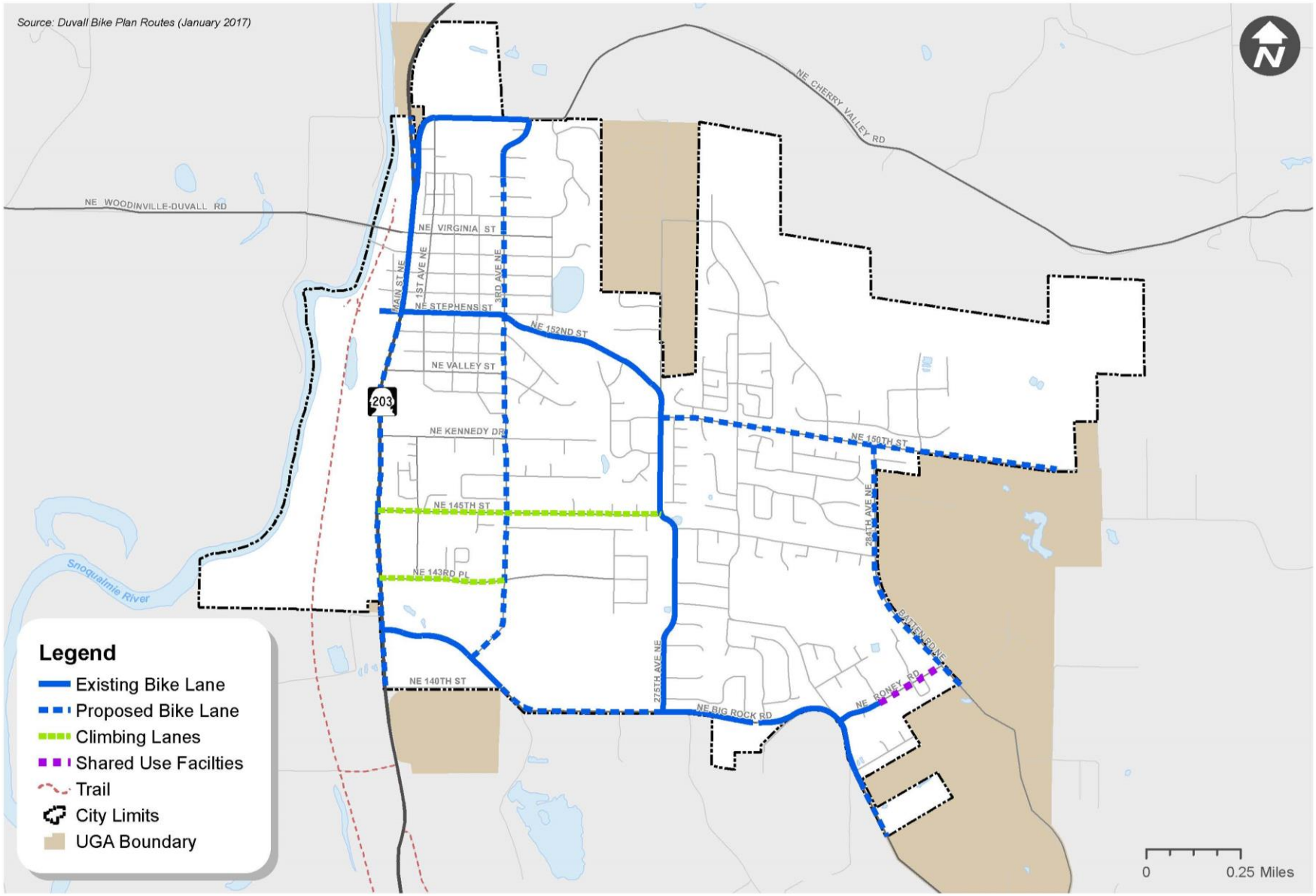
Pedestrian Facility Network

City of Duvall Transportation Plan

transpogroup

FIGURE
3-4

M:\16\16110.00 - Duvall 2016 Transportation Element Update\GIS\Maps\MXD\Fig 3-4 Pedestrian Facility Network.mxd



City of Duvall
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Bicycle Facility Network

City of Duvall Transportation Plan

transpogroup

FIGURE
3-5

M:\16\16110.00 - Duvall 2016 Transportation Element Update\GIS\Maps\MXD\Fig 3-5 Bicycle Facility Network.mxd

TRAIL NETWORK

Duvall's developing trail network provides local and regional connections for recreational use, commuting and travel in general. The City has a two tiered trail system; local trails and regional trails. Local trails are single or multi-purpose soft or hard surfaced trails located within parks, open spaces, or connecting neighborhoods. Local trails also include connector trails between parks or other community features. Regional trails are single or multi-purpose hard or soft surface trails that cross community boundaries and connect significant recreational facilities. Currently the only regional trails that have been developed are the Snoqualmie Valley Trail and the Tolt Pipeline Trail (south of City limits). The Snoqualmie Valley Trail is located to the west of SR-203 and was once the Burlington Northern Railroad ROW. The county owns and maintains the trail. A non-motorized network analysis was conducted on existing Duvall trails and sidewalks to determine key linkages in 2008 as part of the 20-Year Park, Trails, and Open Space Plan (PTOS). Figure PR-2 in the Parks and Recreational Element of the 2015 City Comprehensive Plan illustrates existing trails and sidewalks.

ACCESSIBLE ROUTES OF TRAVEL

The ADA requires that all new public, commercial and institutional facilities meet ADA standards. Furthermore, existing public buildings, public outdoor facilities, and public ROW should be retrofitted to achieve accessibility under certain conditions. An accessible route of travel is designated to accommodate the needs of many different people including those who are blind, using wheelchairs, pushing a stroller or cart, or are injured. The law requires municipalities to have a transition plan in place to address ADA issues. The City of Duvall details the ADA design specifications in the City's Development Design Standards.

In addition, Title II of ADA requires local agencies to conduct what is known as a Self-Evaluation and Transition Plan. The City is in the process of developing an ADA Transition Plan, which will develop an inventory of existing barriers in the pedestrian network, and recommendations for upgrading pedestrian ramps, pedestrian pushbuttons at signals, and relocation of objects within the minimum space for pedestrians.

SCHOOL ACCESSIBILITY

School safety is a major concern for parents, students, the school district, and the City. The City will encourage Riverview School District to maintain walking routes for Cherry Valley Elementary and Cedarcrest High schools based on the presence of sidewalks or walking paths; the safety on neighborhood streets; availability of safe street crossings and the traffic conditions in the surrounding neighborhoods. These routes would be designated as part of the "safe route to school" program and the City would prioritize improvements or completion of missing sidewalk links along these routes to improve school accessibility and safety.

3.10 Transit Services

King County Metro and Snoqualmie Valley Transportation (SVT) provides transit service to the City of Duvall. Transit is currently limited to weekday service and primarily focused on commuter services based on the Winter 2016 service program.

Route 232 provides peak period commute service from Duvall to Bellevue. In addition to Duvall and Bellevue, other points served by this route include the King County communities of Cottage Lake, Avondale, Overlake, and Redmond.

Route 224 provides peak period commute service from Duvall to Redmond Transit Center. The route also provides a connection to Redmond Ridge.

SVT is a non-profit project of Mt Si Senior Center and the Snoqualmie Tribal Nation. SVT provides transportation on demand Monday – Friday for anyone ages 13+ within the Snoqualmie Valley. The route also provides connections to the cities of Snoqualmie, Fall City, and Carnation.

Table 3-4, Existing Transit Service, summarizes the routes in Duvall served by King County Metro.

Table 3-4 Existing Transit Service

Route No.	Route	Service	Number of Buses	Frequency (Peak)	Frequency (Midday)	Average Weekday Trips (Duvall bus stops)
232	Duvall to Bellevue	Peak	5 morning inbound 5 evening outbound	30 – 60 minutes	N/A	10 trips/day
224	Duvall to Redmond TC	Peak	4 morning inbound 5 evening outbound	90-100 minutes	N/A	19 trips/day
SVT	Duvall to North Bend	All Day	3 morning inbound 5 evening outbound	90 minutes	90 minutes	18 trips/day

THE MICROSOFT CORPORATION

The Microsoft Corporation “Connector” bus service provides private transit services to the large Microsoft employee population within Duvall. Currently, the Connector provides daily service during weekdays at various pick-up and drop-off times. The “Connector” currently collects passengers at the Holy Innocents Catholic Church parking lot and elsewhere within the City. Expanded Connector service is being considered by Microsoft if additional parking can be accommodated at existing or future pick-up locations.

PARK-AND-RIDE FACILITIES

There is currently one park-and-ride facility in Duvall, located in the northwest corner of Main Street and Woodinville-Duvall Road. The Duvall Community Car Park has 48 spaces and is jointly operated by King County Metro and the City of Duvall, who owns the facility. This parking facility is also used as a community parking facility for residents and visitors to McCormick Park, the Snoqualmie Valley Trail and downtown Duvall businesses.

3.11 Freight Mobility

The movement of freight is a major issue for the City of Duvall. Trucks from as far away as British Columbia and eastern Washington use SR-203 to bypass congestion on I-5 and I-405. The Washington State Freight and Goods Transportation System (FGTS) is used to classify state highways, county roads, and city streets according to average annual gross truck tonnage they carry as directed by RCW 47.05.021. The FGTS is primarily used to establish funding eligibility

for the Freight Mobility Strategic Investment Board (FMSIB) grants. In addition, it also supports HSS designations, pavement upgrades, traffic congestion management, and other State investment decisions.

The FGTS classifies roadways using five freight tonnage classifications, T-1 through T-5. Routes classified as T-1 and T-2 are considered strategic freight corridors and are given priority for receiving FMSIB funding. The classifications are as follows:

T-1: Over 10 million annual gross tonnage (over approximately 800 trucks per day);

T-2: 4 million to 10 million annual gross tonnage (approximately 320 to 800 trucks per day);

T-3: 300,000 to 4 million annual gross tonnage (approximately 24 to 320 trucks per day);

T-4: 100,000 to 300,000 annual gross tonnage (approximately 8 to 24 trucks per day), and;

T-5: Over 20,000 gross tonnage in a 60 day period.

Within the City of Duvall vicinity, the following roadways are classified as T-2 and T-3 facilities:

T-2

- SR-203 (north of NE Woodinville-Duvall Road)

T-3

- SR-203 (south of NE Woodinville-Duvall Road);
- NE Cherry Valley Road;
- NE Woodinville-Duvall Road, and
- NE Big Rock Road (Kelly Road NE to Batten Road NE).

Of these facilities, SR-203 carries the most tonnage with an average of approximately 980 trucks per day and 3.6 million annual tons north of NE Woodinville-Duvall Road and 840 trucks per day and 3.1 million annual tons south of NE Woodinville-Duvall Road based on WSDOT data for 2015. The 2015 values are less than those for 2013 which were approximately 1,400 trucks per day and 4.5 million annual tons north of NE Woodinville-Duvall Road and 960 trucks per day and 3.3 million annual tons south of NE Woodinville-Duvall Road based on WSDOT data for 2013.

Within Duvall, Main Street, NE Big Rock Road, NE Stephens Street, Bruett Road (NE 152nd Street), portions of 3rd Avenue NE, and NE Cherry Valley Road see the highest truck volumes. Primary issues related to truck traffic include (1) pedestrian safety; (2) noise; (3) the configuration of the Woodinville-Duvall Bridge at Main Street; and (4) the alignment of the intersection of NE Cherry Valley Road/Main Street. The geometrics of these intersections, along with truck turning characteristics, often result in trucks blocking travel lanes and even may require backing movements to negotiate the turns.

The Duvall City-Wide Visioning Plan identifies truck traffic as a primary issue of the community and supports efforts to reduce the impact and the volume of trucks within the City limits. The City recommends cooperation with King County and WSDOT to develop near and long term solutions

to truck traffic within and adjacent to the City, including the investigation into a bypass route for trucks.

AIR SERVICES

The City of Duvall does not have either freight or passenger airplane facilities within or adjacent to the City limits. The nearest airport facility is a general aviation facility in Monroe, located approximately 15 miles north of Duvall. King County International Airport (Boeing Field) is the closest facility that provides national and international airfreight services. Boeing Field is located approximately 25 miles southwest of Duvall. Seattle-Tacoma (SeaTac) International Airport is the closest facility that provides regional, national, and international passenger services. SeaTac is located approximately 35 miles southwest of Duvall.

4. Forecast Transportation Conditions

This section describes the expected impact of future development and region wide growth on the transportation system. The analysis builds on the 2009 Transportation Element Update, revising regional transportation forecasts and the Transportation Improvement Program (TIP). For this update, the travel forecasts are based on the land use assumptions found in the Land Use Element and the land use forecast presented in the June 14, 2017 memorandum titled "City of Duvall 2015 Capacity and Transportation Analysis Study/EIS Alternatives" (See Appendix A). The analysis focuses on growth up to 2035, providing an indication of the expected travel needs within the next 18 years.

4.1 Forecast Land Use

The travel forecasts presented in the Transportation Element were developed using a travel demand forecasting model. The model uses anticipated land use growth to estimate future traffic volumes. To provide the best estimates for these volumes, the City used a rigorous process to forecast future land uses.

The land use forecast process used in the 2015 Comprehensive Plan Update is presented in the June 14, 2017 report titled "City of Duvall 2015 Capacity and Transportation Analysis Study/EIS Alternatives" (See Appendix A). The land use forecast was completed by the City of Duvall Public Works and Planning Departments in conjunction with the City's transportation consultant. The land use forecast includes baseline measurements of existing residential and commercial uses within the City. Forecasts of future growth were developed using analysis of vacant land, land that is likely to redevelop, current "pipeline" project (entitled but not built), and current zoning. The report compares estimates with past forecasts and regional forecasts.

The number of residential units for the City and UGA are forecast to increase from 2,657 to 3,844 by 2035. Most of these units will develop as part of known "pipeline" projects or within UGA areas around the City. Within current City limits, the number of employees is forecasted to increase from 1,169 to 2,623 by 2035, the largest portion of employment growth anticipated to be office or office related. Detailed land use model information can be found in *City of Duvall Travel Demand Model Documentation* (Transpo Group, September 2016).

4.2 External Traffic Forecasts

External traffic represents trips that start or stop outside the City, and may not be reflected in land use estimates. A previous 2008 origin-destination survey was reviewed and compared to existing traffic counts to understand changes in volume and the level of traffic that travels through the City without stopping. Based on this effort, approximately 41 percent of SR-203 traffic north of NE Woodinville-Duvall Road are external trips that do not stop in the City while approximately 16 to 19 percent of SR-203 traffic south of NE Woodinville-Duvall Road are external trips that do not stop in the City.

4.3 Forecast Traffic Volumes

Applying the land use forecasts and external traffic forecast to the travel demand model provided future traffic volumes for study intersections and roadways. Detailed model information can be found in *City of Duvall Travel Demand Model Documentation* (Transpo Group, September 2016).

Figure 4-1 shows the resulting 2035 PM peak hour traffic forecasts for key streets in the City. The baseline forecasts assume several planned network improvements. These include:

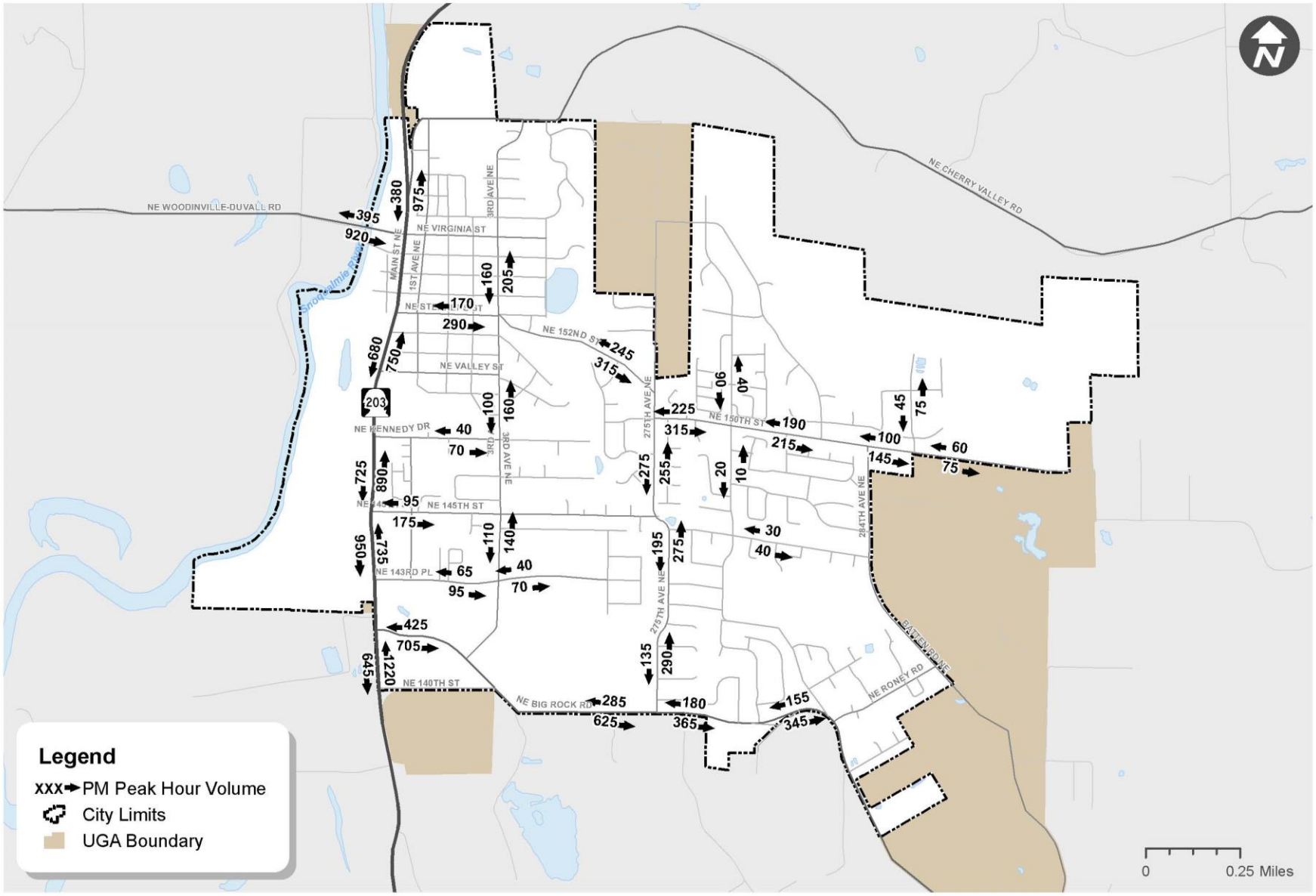
- Extend 1st Avenue NE north to NE Cherry Valley Road (completed in 2017)
- Connect 275th Avenue NE to Manion Way NE
- Connect 1st Avenue NE between NE 145th Street and NE 143rd Street
- Connect 2nd Avenue NE (265th Avenue NE, location approximate) between NE 143rd Street and NE Big Rock Road.
- Connect 3rd Avenue NE between NE 143rd Street and NE Big Rock Road
- Connect 5th Avenue NE (273rd Avenue NE, location approximate) between NE 143rd Street and NE Big Rock Road
- Upgrade capacity at Woodinville-Duvall Road/SR-203 intersection
- New signal at NE 145th Street/SR-203
- New roundabout at NE Big Rock Road/3rd Avenue NE

Table 4-1 shows the 2015 traffic volumes and the resulting 2035 PM peak hour forecasts along SR-203, NE Woodinville-Duvall Road, and NE Big Rock Road. The resulting growth rates are higher than the PSRC or King County models since they account for additional growth at a more refined level within the City as estimated in the Land Use forecast in Appendix A.

Table 4-1 Existing and Forecast PM Peak Hour Traffic Volumes at Key Intersections

	2015 Actual Volumes	2035 Forecast Volumes	Annual Growth Rate[1]
Main Street (SR-203) north of Woodinville-Duvall Road			
Northbound	590	830	2.0%
Southbound	780	985	1.3%
Main Street (SR-203) south of Big Rock Road			
Northbound	860	1,220	2.1%
Southbound	475	620	1.5%
Woodinville-Duvall Road west of Main Street (SR-203)			
Eastbound	280	395	2.1%
Westbound	645	920	2.1%
Big Rock Road east of Main Street (SR-203)			
Eastbound	435	705	3.1%
Westbound	300	425	2.1%

[1]Compunding annual growth rate



2035 PM Peak Hour Weekday Traffic Volumes

City of Duvall Transportation Plan

FIGURE **4-1**

M:\16\16110.00 - Duvall 2016 Transportation Element Update\GIS\Maps\MXD\Fig 4-1 2035 PM Peak Hour Weekday Traffic Forecasts.mxd

4.4 Forecast Traffic Operations

Based on the 2035 forecast, PM peak hour traffic volume intersection LOS were calculated at study intersections. The LOS analysis was used to identify needed improvements. Results for the LOS analysis are summarized in Table 4-2.

MAIN STREET (SR-203) INTERSECTIONS:

As part of its vision process and Downtown Sub-Area Plan development, the City has adopted a policy for maintaining Main Street as a 2-lane roadway. Traffic signals and turn lanes could be located at five intersections:

- Woodinville-Duvall Road/Virginia Street;
- NE Stephens Street;
- NE Big Rock Road;
- NE 143rd Place;
- NE 145th Street.

Woodinville-Duvall Road/Virginia Street: The signalized intersection of Main Street at Woodinville-Duvall Road/Virginia Street would operate at LOS F during the 2035 PM peak hour. The poor LOS is due to the high volume of traffic trying to use a limited number of lanes at the intersection. During the PM peak hour, the single eastbound approach lane is the bottleneck that demands a high portion of intersection green time. Providing exclusive left- and right-turn lanes would alleviate this bottleneck, but would require changes to the bridge structure. Aligning the eastbound and westbound approaches would also help to remove the split signal phasing at the intersection, providing more green time to north-south movements. The Downtown Plan identifies addition of a south-to-east left turn lane to provide access to the downtown business district via 1st Avenue NE. The south-to-east left turn lane also would provide access to residential areas in the east part of the City via NE Virginia Avenue and 3rd Avenue NE. This would reduce the volume of traffic on Main Street traveling through downtown. The City will support the County and the State when those agencies secure funding for improvements to the Woodinville-Duvall Bridge, the bridge access to Main Street, and this intersection.

NE Stephens Street: The signalized intersection of Main Street/NE Stephens Street is forecast to operate at LOS B by 2035.

NE Big Rock Road: The signalized intersection at Main Street/NE Big Rock Road is forecast to operate at LOS C during the 2022 PM peak hour.

NE 145th Street: The City has identified a new traffic signal for Main Street/NE 145th Street. The NE 145th Street intersection currently operates at LOS C. When signalized, this intersection would operate at LOS A during 2035 PM peak hour. Based on the 2035 forecast, this intersection will operate at a LOS F without a signal. A project to add a signal at this location has been added to the 2017 TIP.

NE 143rd Place: The City has previously identified a new traffic signal for Main Street/NE 143rd Place. This intersection currently operates at LOS E. However, signal installation was not supported during consultation with the WSDOT for the 2016-2017 City of Duvall Main Street Channelization and Non-motorized Improvements project or the "Duvall Village" development project located west of the intersection. If signalized, this intersection would operate at LOS A during 2035 PM peak hour.

OTHER SR 203 INTERSECTIONS:

Generally, the high volume of north-south through traffic along Main Street would result in traffic delays for side street traffic entering Main Street at unsignalized intersections, resulting in LOS E to LOS F However, parallel streets such as 3rd Avenue NE would provide alternate routes to several signalized Main Street intersections, particularly for left-turning traffic. If excessive delays occur at unsignalized locations, traffic would likely shift to the signalized intersections. The Downtown Sub-Area Plan identifies monitoring of traffic operations and safety along Main Street. If problems develop, left-turn restrictions could be implemented at unsignalized intersections. Restriction of left turns would generally result in less delay.

As previously noted, PSRC has established LOS D for the SR-203 corridor, including Main Street in Duvall. Based on the 2035 PM peak hour traffic forecasts, three of the five signalized intersections will meet the standard. In addition, side streets accessing Main Street would also operate below LOS D during the 2035 PM peak hour. The City acknowledges the increased congestion along SR-203 as noted on Page VI-17, and will exempt the State highway from its concurrency program.

OTHER ROADWAY INTERSECTIONS

A new intersection will create the 3rd Avenue NE extension south to NE Big Rock Road. This will provide an important alternate route, reducing the need for Main Street to accommodate local traffic circulation. Improving this intersection to a roundabout or signal would improve operations. A traffic circle or signalized intersection, as opposed to all-way stop control, will likely be constructed at this location to minimize delays associated with high east-west traffic volumes and address pedestrian safety concerns.

The 2035 PM peak hour levels of service at remaining study intersections are forecast to be LOS C or better with the completion of improvements identified in the Transportation Plan. Depending on the pace of development versus completion of identified improvements, some locations may fall below the LOS C standard between 2017 and 2035. The intersections that would fall below LOS C if improvements are not completed by 2035 are intersections with SR-203, which are exempt from the City's concurrency requirements.

Table 4-2 forecasted PM Peak Hour Intersection Level-of-Service

	2015 LOS			2035 LOS with Improvements		
Intersection	**LOS[1]**	**Delay[2]**	**WM[3]**	**LOS**	**Delay**	**WM**
Cherry Valley Road & SR-203	C	20.0	WB	D	30.6	WB
Woodinville-Duvall Road & SR-203	C	29.0	-	C	27.1	-
SR-203 & Stella Street	C	18.6	WB	F	137.8	EB
NE Stephens Street & SR-203	B	10.3	-	B	13.2	-
NE Kennedy Drive & SR-203	C	22.7	WB	E	46.0	WB
NE 145th Street & SR-203	D	32.8	WB	A	7.1	-
NE 143rd Place & SR-203	E	39.8	WB	F	>200	WB
NE Big Rock Road & SR-203	B	13.7	-	C	23.3	-
NE Stephens Street & 3rd Avenue NE	A	9.6	-	B	11.7	-
NE Kennedy Drive & 3rd Avenue NE	A	7.1	-	A	8.0	-
NE 143rd Place & 3rd Avenue NE	A	8.7	SB	A	9.0	SB
275th Avenue NE & NE 152nd Street	B	12.0	WB	C	15.5	WB
NE 150th Street & 275th Avenue NE	C	17.7	WBL	C	22.2	WBL
NE 145th Street & 275th Avenue NE	B	12.3	EB	B	13.0	EB
NE 150th Street & 278th Avenue NE	B	11.6	NB	B	11.8	NB
NE 144th Street & 278th Avenue NE	A	7.1	-	A	7.2	-
151st Street & 286th Avenue NE	N/A	N/A	N/A	N/A	N/A	N/A
NE 150th Street & 286th Avenue NE	A	8.8	SB	A	8.8	SB
NE Big Rock Road & 275th Avenue NE	B	11.4	SB	B	11.8	SB
NE Big Rock Road & 279th Lane NE	A	9.0	SB	A	9.1	SB

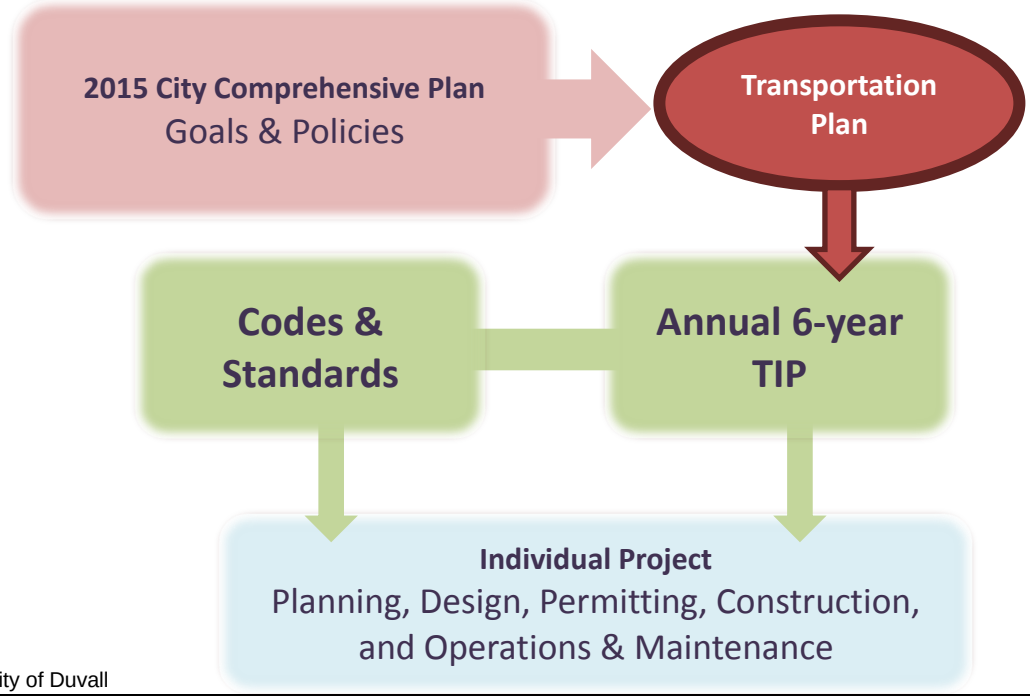
1. LOS, based on 2010 HCM methodology.
2. Average delay in seconds per vehicle.
3. Worst movement reported for unsignalized intersections.

5. Transportation Systems Plan

5.1 Transportation System Planning

Planning for an active transportation system includes a variety of efforts from general goals and policies to specific project implementation and construction. A general overview of Duvall's approach to transportation planning program is presented below:

- Comprehensive Plan: High-level (City Council and public) guiding goals and polices to guide transportation improvements with respect to development and other factors over a 20-year planning horizon.
- This Transportation Plan: analysis to develop strategies and development of a 20-year project list required to implement the high-level efforts of the Comprehensive Plan and other local, state, and federal requirements.
- Duvall Municipal Code and Standards: Specific Code and Standards are developed derived from information within the Comprehensive Plan, this Transportation Plan, technical and regulatory updates such as Federal ADA guidelines, and other plans and polices.
- Annual 6-year TIP project planning: Budgeting and planning to complete individual projects from the 20-year project list over a 6-year planning period. Projects included in the 6-year TIP project list are selected based on priority, safety, grant potential, potential for developer-driven improvements, and other factors including the potential for consolidation with other projects (sewer, water, storm, etc.) to provide efficiencies and cost savings.
- Individual project planning, design, permitting, and construction: completion of projects in accordance with 6-year TIP and Transportation Plan.
- Day-to- day Operations and Maintenance of the Transportation System.



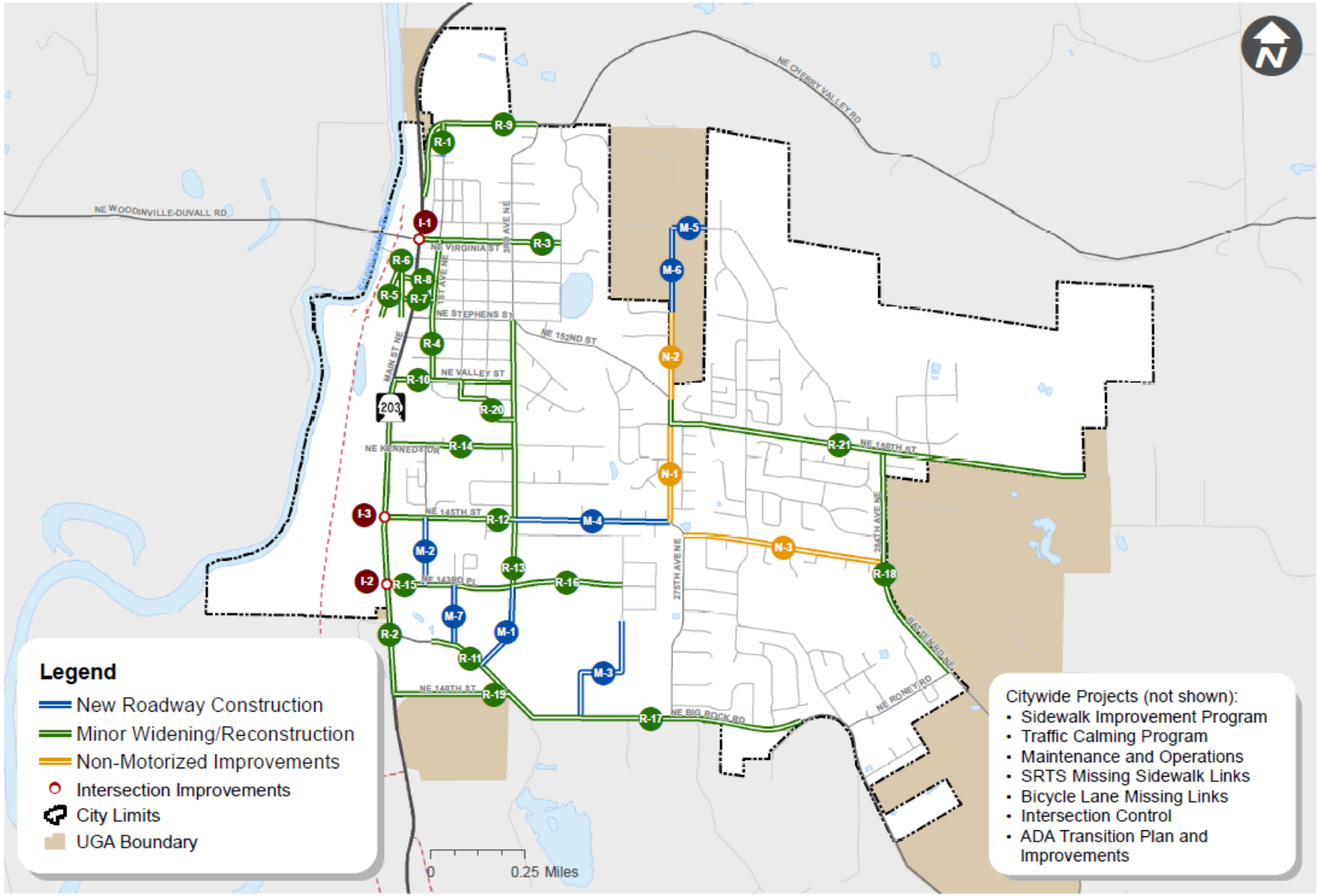
5.2 Transportation Improvements

Based on existing and forecast traffic volumes, operations, and safety, a comprehensive package of transportation improvement projects and programs was identified. The improvement projects and program will help the City implement the vision of the overall Comprehensive Plan.

The core part of the improvement projects and program are related to street and highway improvements. The street system provides for most travel to/from, within, and through the City. The street system also provides the general framework for other travel modes including transit, pedestrians, and bicyclists. The following highlights key improvement projects and strategies. Main Street improvements were completed in 2017. The following improvement strategies will be presented in more detail for Old Town/Riverfront/North Duvall, South Duvall, East Duvall, and other City-wide transportation programs.

Annexation and Development of the North Urban Growth Area (NUGA) is included within the 2035 projection within the 2015 Comprehensive Plan and this Transportation Plan. Projects M-5 and M-6 along the 275th Avenue NE corridor are planned within the NUGA. These projects are currently located outside of Duvall City Limits and will only be completed following annexation. Specific traffic analyses will be completed as part of the annexation and development processes and identified LOS deficiencies will be addressed as part of development. Additional improvements, including possible safety and operational improvements to the 275th Ave NE/NE 152nd Street intersection (Project M-6 boundary) and traffic calming measures at the connection to Manion Way (Project M-5), may also be required as a City Council Annexation Condition to address pedestrian safety and neighborhood concerns.

Figure 5-1 and Table 5-1 summarize the recommended Transportation Improvement Projects and Programs organized by project type.



City of Duvall
Small Town. Real Life.

Long Range (2015-2035) Transportation Improvement Projects

City of Duvall Transportation Plan

transpogroup

FIGURE
5-1

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Table 5-1 Long Range (2015-2035) Transportation Improvement Projects

Project Group	Map ID	Project Name	Project Limits	Project Description	Total Project Cost ($1,000s) Estimated [1]	TIF Eligible?	TIF % [2]	Impact Fee Share ($1,000s)	Grant % [3]	Grant Share ($1,000s)	City Share ($1,000s)[4]	Time Frame
INTERSECTION IMPROVEMENTS	I-1	Main Street NE (SR-203) at Woodinville-Duvall Road / NE Virginia Street	Intersection	Reconstruct intersection to align Virginia Street with Woodinville-Duvall Road at Main Street in conjunction with King County improvements to the Snoqualmie River Bridge to accommodate growth. Construct south-to-east left-turn lane, improve turning radii, and modify traffic signal.	$1,978	Yes	50%	$989	25%	$494	$494	Mid
	I-2	Main Street NE at NE 143rd Place	Intersection	Install turn lanes and traffic signal to improve channelization and level of service to serve growth	$846	Yes	50%	$423	25%	$212	$212	Developer-Driven
	I-3	Main Street NE at NE 145th Street	Intersection	Install traffic signal and channelization improvements as needed to accommodate growth.	$1,318	Yes	50%	$659	25%	$330	$330	Developer-Driven
NEW ROADWAYS AND MAJOR WIDENING OR RECONSTRUCTION IMPROVEMENTS	M-1	3rd Avenue NE Extension (South Improvements)	NE 143rd Place to NE Big Rock Road	Construct new collector arterial segment to provide connection and capacity to serve growth including two travel lanes, curb, gutter, sidewalk, curb-bulbs, bike lanes and on-street parking/turn lanes/medians within commercial or residential areas as required. Project will include storm drainage system improvements	$2,014	Yes	75%	$1,510	20%	$403	$101	Developer-Driven
	M-2	1st Avenue NE Extension (South Improvements)	NE 145th Street to NE 143rd Place	Construct new collector arterial segment to provide connection and capacity to accommodate growth including acquisition of right-of-way, road, parking, curb, gutter, sidewalk, and storm drainage system. Alignment will need to consider wetlands and property ownership.	$2,126	Yes	75%	$1,595	0%	$0	$532	Developer-Driven
	M-3	5th Avenue NE Corridor	NE 143rd Place to NE Big Rock Road	Construct new access/circulation roadway to provide connection and capacity to accommodate growth including two travel lanes, curb, gutter, sidewalks, and drainage. Specific alignment to be defined.	$4,260	Yes	75%	$3,195	0%	$0	$1,065	Developer-Driven
	M-4	NE 145th Street	3rd Avenue NE to 275th Street NE	Widen roadway to collector arterial standards to accommodate growth and serve east-west travel, including bike climbing lane.	$2,696	Yes	75%	$2,022	20%	$539	$135	Developer-Driven
	M-5	NE 160th Street	275th Ave NE to Manion Way	Construct new neighborhood collector to accommodate growth and provide access and circulation to developing properties. Roadway would include two travel lanes, curbs, gutter, and sidewalks.	$1,527	Yes	75%	$1,145	0%	$0	$382	Developer-Driven
	M-6	275th Avenue NE	NE 155th Place to NE Manion Way	Construct new roadway to collector arterial standards to accommodate growth including bike lanes, curb, gutter, sidewalk, and storm drainage system.	$1,387	Yes	75%	$1,040	0%	$0	$347	Developer-Driven
	M-7	2nd Avenue NE Extension	NE 143rd Place to NE Big Rock Road	Construct new collector arterial segment to provide connection and capacity to accommodate growth including acquisition of right-of-way, road, parking, curb, gutter, sidewalk, and storm drainage system. Alignment will need to consider wetlands and property ownership.	$1,894	Yes	75%	$1,421	0%	$0	$474	Developer-Driven
MINOR WIDENING AND RECONSTRUCTION IMPROVEMENTS	R-1	1st Avenue NE Extension (North Improvements)	NE Allen Court to NE Cherry Valley Road	Construct new 1st Avenue NE connection from NE Allen St to NE Cherry Valley Road to improve local vehicular and non-motorized circulation and accommodate growth.	$186	Yes	100%	$186	NA[1]	NA[1]	NA[1]	Completed (2017 Balance)
	R-2	Main Street NE (SR-203) South Improvements	South City Limits to NE Ring Street	The City will work with WSDOT to define and construct improvements to accommodate growth and channelization, signalization, and safety, including construction of curb, gutter, sidewalk, curb bulbs, bike lanes, medians, storm drainage system, and repair/reconstruction of the Coe-Clemmons Culvert. City will maintain a two-lane roadway, with turn lanes at signalized intersections. The roadway will include on-street parking and gateway treatments and speed transition areas at the south end of the City.	$1,005	Yes	100%	$1,005	NA[2]	NA[2]	NA[2]	Completed (2017 Balance)
	R-3	NE Virginia Street	Main Street NE to 4th Avenue NE	Reconstruct roadway to collector arterial standards to improve channelization to accommodate growth and capacity including two-travel lanes, curb, gutter, sidewalk, curb-bulbs, bike climbing lane, and on-street parking. Project will include storm drainage system improvements and may require retaining walls.	$2,482	Yes	20%	$496	50%	$1,241	$745	Mid
	R-4	1st Avenue NE	NE Valley Street to NE Virginia Street	Reconstruct to collector arterial standards to improve channelization and capacity to accommodate growth including two-travel lanes, on-street parking, sidewalks, and curb bulbs. Street will serve north-south local access and circulation east of Main Street.	$2,881	Yes	20%	$576	25%	$720	$1,584	Mid

Project Group	Map ID	Project Name	Project Limits	Project Description	Total Project Cost ($1,000s) Estimated [1]	TIF Eligible?	TIF % [2]	Impact Fee Share ($1,000s)	Grant % [3]	Grant Share ($1,000s)	City Share ($1,000s)[4]	Time Frame
MINOR WIDENING AND RECONSTRUCTION IMPROVEMENTS	R-5	Railroad Avenue NE	NE Stephens Street to NE Stewart Street	Where feasible, reconstruct to improve channelization and capacity to accommodate growth including two-travel lanes, on-street parking, and sidewalks. Street will serve north-south local access and circulation west of Main Street.	$1,693	Yes	20%	$339	25%	$423	$931	Mid
	R-6	Riverside Avenue NE	NE Stephens Street to NE Stewart Street	Where feasible, reconstruct to improve channelization and capacity to accommodate growth including two-travel lanes, on-street parking, and sidewalks. Street will serve north-south local access and circulation west of Main Street.	$1,217	Yes	20%	$243	25%	$304	$669	Mid
	R-7	NE Stella Street	1st Avenue NE to Railroad Avenue NE	Where feasible, reconstruct to improve channelization and capacity to accommodate growth including two-travel lanes, on-street parking, and sidewalks. Project will improve local circulation and serve as pedestrian travel in downtown.	$916	Yes	20%	$183	25%	$229	$504	Mid
	R-8	NE Cherry Street	1st Avenue NE to Railroad Avenue NE	Where feasible, reconstruct to improve channelization and capacity to accommodate growth including two-travel lanes, on-street parking, and sidewalks. Project will improve local circulation and serve as pedestrian travel in downtown.	$823	Yes	20%	$165	25%	$206	$453	Mid
	R-9	NE Cherry Valley Road	Main Street NE to 3rd Avenue NE	Reconstruct road to minor arterial standards to improve channelization and capacity to accommodate growth including two travel lanes, curbs, gutters, sidewalks, bike lanes.	$1,641	Yes	20%	$328	25%	$410	$903	Mid
	R-10	NE Valley Street	Main Street NE to 3rd Avenue NE	Reconstruct roadway to collector arterial standards to improve channelization and capacity to accommodate growth including two-travel lanes, curb, gutter, sidewalk, curb-bulbs, and on-street parking.	$2,437	Yes	20%	$487	25%	$609	$1,341	Long
	R-11	NE Big Rock Road	Main Street NE to 3rd Avenue NE	Reconstruct roadway to minor arterial standards to improve channelization and capacity to accommodate growth including curb, gutter, sidewalk, curb-bulbs, bike lanes, and on-street parking/turn lanes/medians within commercial or residential areas as required. Project will include storm drainage system improvements	$1,256	Yes	20%	$251	25%	$314	$691	Short
	R-12	NE 145th Street	Main Street NE to 3rd Avenue NE	Reconstruct roadway to collector arterial standards to improve channelization and capacity to accommodate growth including two travel lanes, curb, gutter, sidewalks, bike climbing lane.	$3,352	Yes	20%	$670	25%	$838	$1,844	Mid
	R-13	3rd Avenue NE	NE Stephens Street to NE 143rd Place	Reconstruct roadway to collector arterial standards to improve channelization and capacity to accommodate growth including two travel lanes, curb, gutter, sidewalks, bike lanes.	$5,466	Yes	20%	$1,093	50%	$2,733	$1,640	Short
	R-14	NE Kennedy Drive	Main Street NE to 3rd Avenue NE	Reconstruct roadway to collector arterial standards to improve channelization and capacity to accommodate growth including two travel lanes, curb, gutter, sidewalks, and drainage system improvements.	$2,172	Yes	20%	$434	25%	$543	$1,195	Mid
	R-15	NE 143rd Place	Main Street NE to 3rd Avenue NE	Reconstruct roadway to collector arterial standards to improve channelization and capacity to accommodate growth including two travel lanes, curb, gutter, sidewalks.	$2,280	Yes	20%	$456	25%	$570	$1,254	Developer-Driven
	R-16	NE 143rd Place	3rd Avenue NE to 272nd Pl NE	Reconstruct roadway to collector arterial standards to improve channelization and capacity to accommodate growth. Project will include curbs, gutters, sidewalks, and drainage.	$1,996	Yes	20%	$399	25%	$499	$1,098	Developer-Driven
	R-17	NE Big Rock Road	3rd Avenue NE to 279th Lane NE	Reconstruct roadway to arterial standards to improve channelization and capacity to serve growth including roadway realignment, curb, gutter, sidewalk, curb-bulbs, bike lanes, and on-street parking/turn lanes/medians within commercial or residential areas as required. Project to serve increased traffic and to improve sight distance, visibility and safety of non-motorized travel.	$8,827	Yes	20%	$1,765	25%	$2,207	$4,855	Developer-Driven
	R-18	Batten Road NE	NE 150th Street to NE Roney Road	Reconstruct roadway to collector arterial standards to accommodate growth including curb, gutter, sidewalk, bike lanes, and storm drainage system.	$5,119	Yes	20%	$1,024	25%	$1,280	$2,815	Mid
	R-19	Old Big Rock Road (NE 140th Street)	3rd Avenue NE to SR-203	Where feasible, reconstruct to improve channelization and capacity to accommodate growth including two-travel lanes and sidewalks. Project will improve local circulation and serve as pedestrian travel.	$186	Yes	20%	$37	25%	$47	$102	Developer-Driven
	R-20	NE Park Street	2nd Avenue NE to 3rd Avenue NE	Where feasible, reconstruct to improve channelization and capacity to accommodate growth including two-travel lanes and sidewalks. Project will improve local circulation and serve as pedestrian travel.	$638	Yes	20%	$128	25%	$159	$351	Developer-Driven
	R-21	NE 150th/NE 152nd Street Intersections, Traffic Calming, and Parking	275th Avenue NE/NE 152nd Street to east City Limits	Reconstruct to improve channelization and capacity to accommodate growth including traffic calming elements (traffic circles, chicanes, median) along with bike lanes, dedicated parking, and improved pedestrian crossings. Project will improve local circulation and serve as pedestrian travel.	$5,438	Yes	20%	$1,088	50%	$2,719	$1,631	Mid

Project Group	Map ID	Project Name	Project Limits	Project Description	Total Project Cost ($1,000s) Estimated [1]	TIF Eligible?	TIF % [2]	Impact Fee Share ($1,000s)	Grant % [3]	Grant Share ($1,000s)	City Share ($1,000s)[4]	Time Frame
NON-MOTORIZED IMPROVEMENTS	N-1	275th Avenue NE	NE 145th Lane to NE 150th Street	Construct remaining segments of sidewalk or pedestrian pathway to accommodate growth and increased pedestrian requirements along collector arterial and curb extensions/parking as possible.	$227	Yes	15%	$34	50%	$113	$79	Short
	N-2	275th Avenue NE	NE 152nd Street to City Limits	Construct sidewalk or pedestrian pathway on east side of roadway to accommodate growth and increased pedestrian requirements.	$604	Yes	15%	$91	50%	$302	$211	Mid
	N-3	NE 144th Street	275th Ave NE to 284th Ave NE	Construct roadway to accommodate growth and construct sidewalk or pedestrian pathway on both sides of roadway, and bike lane.	$4,232	Yes	15%	$635	50%	$2,116	$1,481	Mid
CITYWIDE NON-MOTORIZED IMPROVEMENTS	C-1	Sidewalk Improvement Program	Citywide	Annual program to construct missing sidewalk links not covered by specific improvement projects to accommodate growth.	$669	Yes	15%	$100	50%	$334	$234	On-going
	C-2	Safe Routes to School Missing Sidewalk Links	Citywide	Construct remaining segments of sidewalk, pedestrian pathway, pedestrian crossing improvements, and bicycle lane missing links within designated school "Walk Route" areas (does not include improvements associated with projects listed above).	$7,200	Yes	15%	$1,080	50%	$3,600	$2,520	On-going
	C-3	Bicycle Lane Missing Links	Citywide	Construct remaining bicycle lane segments (does not include improvements associated with projects listed above).	$929	Yes	15%	$139	50%	$464	$325	On-going
	C-4	Traffic Calming Program	Citywide	Annual program to construct curb bulbs or other traffic calming on collector arterials to accommodate growth and improve pedestrian safety and neighborhood quality.	$780	No	15%	$117	50%	$390	$273	On-going
CITYWIDE PROGRAMS	O-1	Intersection Control	Citywide	Complete intersection control improvements associated with the Memorandum titled "Intersection Control Screening process and Analysis" (Transpo Group, September 27, 2016)	$20	No	0%	-	0%	-	$20	On-going
	O-2	Maintenance and Operations	Citywide	Complete maintenance and operations include overlay, repair, cleaning, striping, sealing, crack repair, and other activities	$6,162	No	0%	-	0%	-	$6,162	On-going
	O-3	ADA Transition Plan and Improvements	Citywide	Complete ADA and crossing improvements not associated with above listed projects. Costs based on Document titled "City of Duvall ADA Transition Plan" (Transpo Group, November 2017 Draft)	$6,381	No	NA	-	50%	$3,191	$3,191	On-going

Notes:

1 Represents planning level project cost estimates. Project costs will be refined during the project design phase.

2 Impact Fee Share based on type of improvement and estimate of developer-generated trips from project specific distributions from the 2009 Transportation Plan

3 Grant Share based on type of improvement and historical data for projects should the City take lead status as opposed to developer-driven (no grant or City funds assumed for developer-completed improvements)

4 City Share based on total cost minus developer & grant share should the City take lead status as opposed to developer-driven (no grant or City funds assumed for developer-completed improvements)

NA[1] Project M-1 completed in 2017 with remaining uncollected Traffic Impact Fee Share of $185,500

NA[2] Project R-2 completed in 2017. Impact Fee Share of $1,572,000 (2009 methodology), $506,500 in Traffic Impact Fees applied to project, and remaining eligible $1,065,500 in Traffic Impact Fees to be applied to loan repayment

5.3 Improvement Programs

OLD TOWN/RIVERFRONT/NORTH DUVALL IMPROVEMENTS

The Transportation Plan incorporates several improvements identified in the Downtown Sub-Area Plan. These include realigning/reconstructing the intersection of Main Street with NE Woodinville-Duvall Road/Virginia Street. This improvement is needed to improve safety and traffic operations. It will also facilitate traffic access and circulation to 1st Avenue NE and residential areas east of 3rd Avenue NE, resulting in decreased traffic volumes using Main Street for local access and circulation.

The Transportation Plan also calls for reconstructing NE Virginia Street, 1st Avenue NE, Railroad Avenue NE, Riverside Avenue NE, and NE Valley Street in the downtown area. These collector arterials will provide alternative routes for access and circulation to the expanding business district and new mixed-use developments envisioned for downtown Duvall. Other local streets, such as NE Stella Street and NE Cherry Street, would also be improved to serve pedestrian circulation and provide access to on-street and private parking.

3RD AVENUE IMPROVEMENTS

Extension of 3rd Avenue NE from NE 143rd Place to NE Big Rock Road will provide alternatives for local traffic circulation and access to areas identified for substantial growth in the Comprehensive Plan. A new north-south corridor alignment between NE 143rd Place and NE Big Rock Road and an internal east-west corridor alignment are needed to provide access/circulation for growth in the south Duvall area. For the purposes of this plan, the south Duvall area is defined as the area bounded by NE 143rd Place to the north, NE Big Rock Road to the south, 3rd Avenue NE to the west, and 275th Avenue NE to the east. These alignments would provide access to properties through a localized circulation system which would minimize direct access to NE Big Rock Road, the north-south corridor, and NE 143rd Place. The road systems (M-2 and M-4) shown in Figure 5-1 for South Duvall is conceptual only; specific road locations will be determined at time of development.

Other transportation improvements identified in the plan call for reconstructing several east-west collector arterials to handle higher volumes of traffic and also include pedestrian facilities. These include NE 145th Street, NE Kennedy Drive, and NE 143rd Place. In addition, 3rd Avenue NE would be reconstructed between NE Stephens Street and NE 143rd Place to improve north-south traffic flows. These 3rd Avenue NE improvements will likely be completed in phases and may include:

- Full frontage improvements including curb, gutter, sidewalk, landscape strip, and bicycle lane where sufficient ROW exists, and;
- Reduced frontage improvements in areas of reduced ROW widths, adverse (steep) topography, or environmental constraints such as the reduced-width Coe-Clemons Creek crossing located immediately north of NE Kennedy Drive. The reduced frontage improvements will likely be located between NE Stephens and NE Kennedy Streets and may include joint use pedestrian/bicycle paths, reduced roadway width, reduced landscaping, and possibly limiting non-motorized improvements to only one side of the ROW.

Pedestrian improvements are identified for NE Big Rock Road between Main Street and 3rd Avenue NE. Additional localized pedestrian and non-motorized improvements would serve properties within the South UGA.

EAST DUVALL IMPROVEMENTS

Improvements east of 3rd Avenue NE primarily include reconstructing existing roadways to better accommodate increased volumes of traffic and to provide pedestrian facilities. Other improvements include construction of needed circulation roads as development occurs.

As shown in Table 5-1 and Figure 3-4, the plan calls for reconstructing and improving pedestrian facilities along sections of NE Big Rock Road, NE 145th Street, NE Batten Road, NE Virginia Street, and 275th Avenue NE.

A new neighborhood collector would connect 275th Avenue NE to the existing Manion Way NE and would be constructed as part of developer improvements. These streets will provide the basic circulation system for anticipated future growth in that part of the City.

CITY-WIDE IMPROVEMENT PROGRAMS

The Transportation Plan includes five City-wide improvement programs:

- Street Overlay, Maintenance, and Operations Program;
- Sidewalk Improvements Program,
- Safe Routes to School Improvements Program,
- ADA Improvements,
- Intersection Improvements Program, and;
- Traffic Calming Program.

The S*treet Overlay, Maintenance, and Operations Program* will be used to preserve and enhance the City's existing and planned transportation system. The program provides the City with a systematic approach for evaluating arterials and local roadways for pavement conditions, signage, sight distance restrictions, and other similar issues. Traffic control devices, such as traffic signals, will be monitored. To ensure that the transportation infrastructure is preserved in a cost-effective manner, the City will need to consider allocating a significant annual budget including funding for staff resources to administer the maintenance, operations, and capital programs. For regional improvements, staff resources will be used to prepare grants and coordinate with WSDOT and King County.

The *Sidewalk Improvement Program* will be used by the City to maintain and enhance pedestrian routes in the City. The program will focus on locations not covered by a specific capital project shown in Table 5-1. The program will allow the City to fill in missing gaps in sidewalks or pathways that are needed to provide a continuous route to parks, commercial areas, and other pedestrian destinations. The City will have new developments construct the sidewalk system as part of their frontage improvements. In some locations, developments have already been constructed without the improvements, which will require the City to fund and construct the missing links. The program

can also be used to construct wheelchair ramps, school routes, or other projects to improve existing sidewalks.

Safe Routes to School Improvement Program includes pedestrian, bicycle, and safety improvements that are located along Riverview School District Walking Routes. These improvements are specifically identified as high-priority improvements to promote school accessibility and safety.

ADA Improvements include access improvements as identified within the City of Duvall ADA Self-Assessment and Transition Plan (Transpo Group, 2017). The improvements addressed public rights-of-way barriers including sidewalks, curb ramps, crosswalks, communication devices (pedestrian signal actuators), and other public pedestrian amenities.

The *Intersection Improvements Program* includes intersection improvements identified, or per the criteria within the memorandum titled, "Final Intersection Control Screening Process and Analysis" (Transpo Group, January 5, 2017). The improvements include sign-controlled revisions primarily based on sight-distance limitations and road classification hierarchy.

A *Traffic Calming Program*, providing safe and convenient local streets, is important to the City. This involves assuring that travel speeds are kept at or below the adopted/posted speed limits and is intended to address the impacts of cut-through traffic within its neighborhoods. Traffic Calming includes measures to reduce traffic speeds with consideration to potential safety and mobility impacts. Existing Traffic Calming requirements for new projects or development including reduced road widths, curb-delineated dedicated parking, compressed intersection size including curb-delineated pedestrian crossing, and other measures should be continued. The Transportation Plan acknowledges that congestion will result along Main Street which could result in drivers taking alternative routes using neighborhood streets or collector arterials. The program is intended to provide a consistent, equitable, and comprehensive approach for addressing these issues.

5.4 Development Review and Concurrency Management

As part of the review of development applications, the City will apply its LOS standards and other regulations related to transportation impacts of new growth. The City has identified general guidelines for traffic impact studies for development applications. The guidelines identify the general requirements for scoping the traffic analyses needs to assess potential traffic impacts and mitigation. In order to ensure fair and equitable review of development application, the City will work to refine the guidelines into a more formal program.

Key elements of the traffic analysis process under SEPA covers:

- Evaluation of impacts on LOS (LOS D for Main Street; LOS C for all other arterials);
- Transportation concurrency; and;
- Mitigation of off-site impacts through impact fees, Local Improvement Districts, and/or direct developer mitigation.

The City will implement its concurrency requirements through the SEPA review process for development applications. This process is used since the City has limited availability of staff and limited technical resources to implement systems that are more complex and found in larger jurisdictions. The SEPA process also ties the concurrency to specific development applications, instead of applying it City-wide or sub-areas of the City.

The following summarizes the framework for the SEPA-based concurrency review:

- Traffic study required, scope to be based on traffic thresholds and impacts;
- Baseline traffic forecasts to be developed and based on existing traffic, historical growth rates, and pipeline development traffic;
- Project traffic based on trip generation, distribution, and assignment;
- Future conditions evaluated based on City or other agency improvements that are funded for construction within six years;
- Assess project impacts at locations that fall below the City's adopted LOS standard;
- Require mitigation to resolve LOS deficiencies, unless exempt from concurrency based on policies; concurrency will not be applied to Main Street or intersections along Main Street;
- If a deficient location is exempt from concurrency, require appropriate mitigation (such as payment of impact fees or proportionate share mitigation, construct partial improvements to offset project impacts, or reduce development impacts through phasing or TDM programs);
- If adequate mitigation is not defined to resolve the LOS deficiency, then the City will deny the development, and;
- Identified LOS deficiencies will be used to seek grants or other funding and as an input to the annual Six-Year TIP process.

5.5 Complete Streets

A Complete Streets Policy was adopted in Ordinance 1200, (September 20, 2016). The intention of the program is to establish goals, principles, and practices that will empower and direct residents and stakeholders to use an interdisciplinary approach in the creation of complete streets that will result in increased access, mobility, and health for all users. The following provides a summary of the policy implementation strategies:

- Inventory - The City will maintain an inventory of the pedestrian and bicycling facility infrastructure and will prioritize projects to eliminate gaps in the sidewalk and bikeways networks.
- Capital Improvement Project Prioritization - The City will encourage implementation of bicycle, pedestrian, and transit improvements as part of the Capital Improvement Project Prioritization.
- Revisions to Existing Plans and Policies - The City will incorporate Complete Streets principles into relevant comprehensive plans, manuals, rules, regulations and programs as they are updated.

- Other Plans - Implementation activities will consider sidewalk, bicycle, and trail planning documents and recommended improvements within the City of Duvall Transportation Plan (Duvall, 2010) and the City of Duvall Parks, Trails and Open Space Plan (Duvall, 2008). Local trail improvements, along with regional trail improvements along the Snoqualmie Valley Trail (SVT) shall be implemented in general accordance with City plans and the King County Comprehensive Plan (2016).
- Stormwater Management - The City will identify and implement sustainable stormwater management techniques along streets and roadways.
- Pavement Management - Ordinary maintenance paving projects should include evaluating the condition of existing facilities supporting non-motorized and transit transportation modes as well as modifying existing pavement markings and signage that supports such modes as appropriate.
- Environment and Sustainability - The City will implement improvements with consideration to the environment and sustainability in general accordance with the City of Duvall Watershed Plan (Duvall, 2015), Sustainability Program Resolution (Duvall 2010), and the Tree Retention Policy/Plan (Duvall, 2017 DRAFT).
- Staff Training - The City will train pertinent City staff on the content of the Complete Streets principles and best practices for implementing the Policy.
- Coordination - The City will utilize inter-departmental and inter-agency project coordination to promote the most responsible and efficient use of fiscal resources for activities that occur within the public right of way.
- Funding - The City will actively seek sources of appropriate funding for implementation of this Policy.

5.6 Access Management

Access management is the control of the number and location of access points along a roadway in order to provide for the following: access to property, maximize safety for all roadway users, optimize roadway operations, and protect the public's roadway investment. Access management is a primary focus of WSDOT's Department of Urban Mobility and is supported by RCW 47.50 and RCW 47.52.

Access management focuses on the number, location, and size of roadway access points such as driveways and streets. To maximize roadway capacity on major roadways, driveways should be consolidated, located on side streets, and controlled through driveway standards designating the number, spacing, and width.

Development along the Main Street corridor will continue to occur. Access management policies, standards, and strategies will best protect the operation of this facility from poorly located or too numerous access points. While Old Town generally has few driveways onto the state route, its tightly spaced blocks often can result in high levels of turning movements, impacting pedestrian crossing safety, reducing traffic flows, and creating conflict points.

The City should continue to work with WSDOT and King County to implement access management along the Main Street/SR-203 corridor. The Transportation Element identifies extension/completion of additional north-south streets to help reduce the impacts of development on Main Street.

The access management program will identify where traffic mobility could be improved using access management techniques. The City needs to balance access management with economic development.

5.7 Truck Traffic

Truck traffic will remain an issue within the City of Duvall for the foreseeable future. Some of the causes for high truck volumes include sand and gravel operations in the area, and high volumes on regional roadways such as I-5 and I-405 that result in drivers using SR-203 as an alternative route from I-90 to US-2.

The City, in conjunction with WSDOT and King and Snohomish counties, should investigate the feasibility of improving roadways such as SR-522, US-2, or other regional corridors. Another approach would be to designate a truck route that would re-route trucks from SR-203 in Duvall. One potential route would cross the Snoqualmie Valley near the Reformatory Farm on the High Bridge north of Duvall or at Woodinville-Duvall Road, or both, and continue on West Snoqualmie Valley Road to 124th Street, crossing the Novelty Bridge to re-connect to SR-203. Truck route signs would inform drivers of the appropriate routing. This route would require extensive improvements/upgrades to High Bridge Road in Snohomish County and West Snoqualmie Valley Road in King County.

5.8 Regional Impacts

The future operation and adequacy of the City of Duvall transportation system and nearby growth within adjacent land in King County are closely linked. As population continues to grow throughout the region beyond the 2035 study year, traffic pressures may result in congestion at critical locations along the regional travel facilities.

Through the inclusion of PSRC model data, the future regional growth and its impact is considered within the parameters of the analysis and is expected to meet regional travel needs. The City of Duvall has been an active participant in past, current, and future regional planning efforts and will continue a high level of involvement with nearby communities.

5.9 Regional Traffic Improvements

There has been much discussion in past years about the possible construction of a new north-south regional facility in eastern King County to bypass the congested I-5 and I-405 corridors; however, no action is likely to occur within the next 20 years. In addition, the County has voiced concerns regarding a regional bypass route because of issues regarding wildlife habitat, development sprawl, and project viability.

The WSDOT Office of Urban Mobility's *Corridor Needs Study for East King County* (December 1999) investigated three scenarios to relieve traffic on major state facilities, while improving

mobility within eastern King County. The three scenarios were a North-South Freeway, an Arterial Parkway System, and a Major Transit Investment Strategy. While the study did establish the need for additional north-south capacity, the regional benefits of the capacity improvements in east King County may be lower than improvements to existing transportation facilities. Results of the scenario analysis are as follows:

- A new north-south freeway would have little travel time savings for through trips due to longer travel distances and expected congestion on US 2 and SR-18;
- Development of the Arterial Parkway System scenario would improve local mobility, but have substantially longer travel times for through trips, and;
- The Major Transit Investment Strategy would increase ridership and have similar mobility and congestion characteristic to the Arterial Parkway scenario.

The plan asserts that action should be taken to meet the future travel needs of the region; however, these improvements may be more focused on existing congested corridors than in the development of new corridors. The City should continue to participate and follow discussions about regional transportation strategies.

5.10 Transportation Demand Management

TDM consists of strategies that seek to maximize the efficiency of the transportation system by reducing the number, length and need of private automobile trips. Typically, TDM measures include provision of park-and-ride lots, improvements to pedestrian and bicycle facilities, and promotion of ridesharing activities. The City of Duvall worked closely with King County and WSDOT to develop a park-and-ride facility to encourage the formation of carpooling and the use of transit. The Duvall Community Car Park, on the northeast corner of the intersection of Woodinville-Duvall Road and Main Street, was completed in 2001.

Within the State of Washington, alternative transportation solutions are necessitated by the objective of the Commute Trip Reduction (CTR) Law, which applies to employers with 100 or more employees. The purpose of CTR is to help maintain air quality in metropolitan areas by reducing congestion and air pollution. Currently, the City does not have any employer with 100 or more employees working during a shift between 6am and 9am. When such an employer does exist, the City would develop a CTR Ordinance consistent with the CTR Act. The ordinance should include TDM actions for employers, such as carpool matching, transit pass subsidies, and bicycle parking to discourage employees from commuting alone.

Duvall is a growing community in a rural area. TDM strategies are typically most effective in denser and larger urban areas. However, strategies coordinated with King County, WSDOT and PSRC can provide alternatives for residents and employees in Duvall. Potential TDM strategies the City could promote through policy or investment include, but are not limited to:

- Transit-oriented and pedestrian friendly street design;
- Transportation coordinators for large employers;
- Telecommuting;

- Flexible/Alternative work schedules;
- Additional Park & Ride facilities, and;
- Ridesharing/Carpooling.

6. Transportation Finance and Implementation Program

The list of transportation improvement projects must be funded and implemented to meet existing and future travel demands in and around the City of Duvall. Estimated project costs and future revenues are presented and options to fund the projects are described in this chapter. Implementation strategies are discussed and include items such as coordination with WSDOT and King County to prioritize and fund regional improvements. Other strategies include strengthening the transportation concurrency and impact fee programs to ensure development helps fund transportation improvements necessary to support new growth. The implementation plan sets up the framework for the City to prioritize and fund the improvements identified in the transportations systems plan.

6.1 Financing Program

The GMA requires the Transportation Element of the Comprehensive Plan to include a multi-year financing plan based on the identified improvement needs in the transportation systems plan. The financing plan is to be the basis in developing the required annual Six-Year TIP. If projected funding is less than the identified needs, then the transportation financing program must also include a discussion of how additional funding will be raised or how land use assumptions will be reassessed to assure that the LOS standards will be met. Alternatively, the City can adjust its LOS standards.

The transportation financing program becomes a subset of the City's Capital Facilities Plan (CFP). The GMA requires the CFP to include at least a six-year plan that finances capital facilities and identifies the sources of public money for the projects.

Based on the travel forecasts and the City's LOS standards, the comprehensive list of transportation improvement projects was defined (see Table 5-1). Planning level cost estimates were prepared for each project and program. Analysis of the City's capability to fund the projects was also conducted. This included review of existing and projected revenues and potential grants or other agency funding. In addition, the Plan provides a strategy for adjusting the funding program over time if identified revenues fall short of expectations.

6.2 Project Cost Summary

Table 6-1 provides a summary of the project costs including total Capital Improvements and on-going Citywide Programs. The improvement projects and programs are estimated to cost approximately $99.2 million in 2017 dollars. Approximately $27.6 million of the total project costs are associated with future development trips and are considered as the basis for calculation of the Transportation Impact Fee (TIF). The remaining $71.7 million of total project costs represents the City's portion of the costs. This requires an average of approximately $3.6 million per year of City and/or grant funds over the 20-year life of the plan.

Table 6-1 2015 to 2035 Project Cost Summary

Capital Improvements		Citywide Programs		Total
Description	**Costs ($1,000's)**	**Description**	**Costs ($1,000's)**	**Costs ($1,000's)**
Intersections	$4,142	Sidewalk and Bicycle Lane Improvement Program	$8,797	
New Roadways & Major Widening/Reconstruction	$15,905	Traffic Calming and Intersection Program	$800	
Minor Widening/Reconstruction	$52,011	Maintenance & Operations	$6,162	
Non-Motorized	$5,063	ADA Transition Plan and Improvements	$6,381	
Subtotal	**$77,121**		**$22,140**	**$99,261**

The highest costs for major roadway improvements include widening and reconstruction work on NE Big Rock Road, NE 150th Street, and 3rd Avenue NE. Additional high costs associated with sidewalk and bicycle lane projects include Safe Routes to School missing sidewalk links

Approximately $2.9 million is identified for improvements to areas within the City's North UGA along and adjacent to 275th Avenue NE. That accounts for approximately three percent of all identified transportation capital improvements.

6.3 Developer Improvements

The City has adopted specific development related requirements which will help fund the planned improvements. These include frontage improvements and mitigation under the State Environmental Policy Act (SEPA) or concurrency. The City requires developments to fund and construct certain roadway improvements as part of their projects. These typically include constructing or improving abutting local streets and arterials to meet the City's design standards. These improvements can include widening of pavement, drainage improvements, and curbs, gutter, and sidewalks.

Developers pay a TIF which accounts for the developer portion of the cost associated with the TIP. TIFs can only be used to help fund improvements that are needed to serve future growth. The project list can include recently completed projects to the extent that they serve future growth and did not solely resolve existing deficiencies. The cost of projects needed to resolve existing deficiencies cannot be included.

The TIF program allows developers to receive credits if they are required to construct all or a portion of TIP improvements to the extent that the required improvements were included in the TIF calculation. For example, if development completes improvements identified on the TIP, then TIF credits would be provided up to, but not exceeding, the TIF associated with the development. Each TIP project has a specific percent credit available based on the percent of developer growth trips related to total growth trips for the project. Actual TIF credit shall be provided in accordance with the project percent credit of the actual improvement cost or City estimated cost in the TIF

calculation, whichever is smaller. If a developer completes improvements not included in the TIP, then credits applied against the TIF would not be provided.

The City also evaluates impacts of development projects under SEPA. The SEPA review may identify adverse transportation impacts that require mitigation beyond payment of the TIF. These could include impacts related to safety, traffic operations, non-motorized travel, or other transportation issues. The needed improvements may or may not be identified as specific projects in the Plan. As with frontage improvements, if the required improvements are included in the TIF, then the City must provide credits to the extent that the costs are included in the impact fee.

The City also requires an evaluation of transportation concurrency for development projects. The concurrency evaluation may identify impacts to facilities that operate below the City's LOS standard. To resolve that deficiency, the applicant may fund and/or construct improvements to provide an adequate LOS.

6.4 Transportation Impact Fees

The GMA allows agencies to develop and implement a TIF program to help fund some of the costs of transportation facilities needed to accommodate growth. State law (RCW 82.02) requires that TIFs are:

- Related to improvements to serve new developments and not existing deficiencies;
- Assessed proportional to the impacts of new developments;
- Allocated for improvements that reasonably benefit new development, and;
- Spent on facilities identified in the adopted CFP.

Traffic Impact Fees were developed based on a total of 3,374 new PM Peak Hour new (growth) trips generated by forecasted residential, commercial, and industrial development in accordance with the June 14, 2017 report titled "City of Duvall 2015 Capacity and Transportation Analysis Study/EIS Alternatives" (See Appendix A). The portion of TIP project costs associated with new development were generated based on the ratio (percent) of these new trips with respect to background (existing) trips for each type of improvement based on City of Duvall Traffic Model results (Transpo Group, 2016, Appendix B), origin-destination studies completed in 2009, and generally accepted ranges based on information from other Cities and information from the City's transportation Consultant. The total developer (TIF) share of the 20-year TIP is $27.55 million. The Traffic Impact Fee cost is calculated as total the total developer fee share divided by the total new (growth) trips and equates to:

$27,550,680 ÷ 3,374 Trips = $8,166/Trip

6.5 Existing Revenues and Projections

The City utilizes several fees and tax revenues to construct and maintain their transportation facilities. The description of available funding sources and projected average yearly revenue is listed in Table 6-2. The revenue projections were estimated based upon the City's 2017 budget, historical revenues, and input from the City's finance department. Based on recent historical data,

it is estimated that annual revenues will be approximately $3.1 million if an average of approximately $1.27 million in grant funding is collected each year over the 20-year period. City generated revenue sources also include property taxes and fuel taxes. The TIF revenues for the approximately 3,374 trips are estimated at an annual average of $1.38 million over the 20-year period.

Table 6-2 Projection of Existing Transportation Revenues

Revenue Category	Estimated Annual Revenues[1]	2015-2035 Revenues[1]
Motor Vehicle Fuel Taxes	$159,900	$3,198,000
Property Taxes	$274,320	$5,486,400
General Fund and/or Other Utility Fund	$50,000	$1,000,000
Street Use Permits, Inspection Fees, Misc.	$10,000	$200,000
Traffic Impact Fees	$1,377,534	$27,550,680
Grant Funding	$1,426,985	$28,539,707
Total	**$3,298,739**	**$65,974,786**

[1]Costs in 2017 Dollars

6.6 Funding Options

Funding options include the use of existing revenue sources such as motor vehicle taxes and other City revenues identified in Table 6-2. Grant programs will continue to be another funding component of the City. Developers will also continue to contribute through frontage improvements, environmental mitigation, and TIFs. To help cover the $99.3 million in total project costs, additional revenue will need to be generated from these sources.

Other agencies such as WSDOT will need to share the cost of state highway improvements to meet regional transportation needs. The City and King County also should continue to work together to fund transportation projects within the UGA. Other options to generate more revenue may include further increasing TIFs, requiring developers to contribute through SEPA or other mitigation programs, or seeking additional grants. Even with increased fees or new revenues sources, several projects could be unfunded during the life of the Plan. However, the Plan will provide capacity for growth beyond 2035.

6.7 Tax Revenues

The existing tax revenues, general funds, and fees identified in Table 6-2 will need to be maintained as one source of revenue to fund transportation projects and programs. These revenue sources include the motor vehicle fuel excise tax, property taxes, and other tax revenues that support the City's general fund. These sources of revenue contribute approximately $9.9 million over the life of the Plan as shown in Table 6-3. An increase in tax revenues to support implementation of the Plan is not assumed. The majority of existing tax revenue sources will be used for maintenance, providing the match funds for grants, or to complete a portion of the roadway projects not covered by other agencies.

6.8 Grants

Over the past several years the City has secured grants for transportation improvements. Based on the recent grant revenues, this source could provide up to $28.5 million in revenues to fund the Plan.

Grant funding is typically tied to specific improvement projects and distributed on a competitive basis. Given the types and costs of improvements, the City will need to secure a higher level of grant funding in the future. Regional transportation grants may be available for major Main Street (SR-203) intersection improvements including the NE Woodinville-Duvall Road corridor. Several Local, Regional, State, and Federal transportation grants may be available for other projects on the TIP.

6.9 Other Agency Funding

The City will need to partner with WSDOT and King County to fund and implement the Plan. Main Street (SR-203) and NE Woodinville-Duvall Road serve regional traffic. The traffic forecasts indicate that approximately 20 to 40 percent is related to through traffic growth. Therefore, a significant portion of the funding of improvements to the state highways should be allocated to WSDOT, King County, or grant funding.

6.10 Transportation Benefit District Funding

With the establishment of a Transportation Benefit District (TBD), the City can begin to replace transportation funding that has been lost over the years, reduce or eliminate the General Fund subsidy, and better preserve, maintain or expand the City's transportation infrastructure into the future. Statutory authority for TBD's have existed for 20 years. However, until 2007 establishing a TBD required a vote of the people. In 2008, the Association of Washington Cities (AWC) worked with the Legislature to provide some relief to cities and counties for traffic congestion. Per City Ordinance 1186 (January 9, 2016), no further legislation has been passed to date authorizing a funding mechanism for the TBD. One option for funding the TBD would be a $20 fee per vehicle with City Council approval under RCW 36.73 or an increased amount with a vote of the people. Based on 2016 estimates, funding of a TBD with a $20 fee would generate approximately $120,000 to $150,000 in funding per year ($2.4 to $3 million over a 20-year period).

6.11 Summary of Financing Strategy

Table 6-3 summarizes the City's proposed transportation financing strategy for TIP costs. All values are presented in 2017 dollars. The plan results in a potential shortfall of $33.3 million. This assumes that the level of grants and development impact fees will be generated as estimated in this Plan.

The deficit has been observed to be less than anticipated in the past when developer-driven projects are competed solely by development. Completion of these projects by development results in no use of grant dollars or City resources except for TIF credit (up to, but not exceeding, maximum TIF based on project trips) with a resulting decrease in total required City and Grant funds. Many of the TIP projects are located along properties with planned development or

redevelopment and the City The deficit could be greater if the level of development or the level of grant funding is less than forecasted. This would be offset by a reduced need for transportation improvements necessitated by growth. If the City is more successful in obtaining grants or other outside funding for projects, then the potential deficit could be reduced.

Table 6-3 Transportation Funding Strategy Summary

Revenue Sources	2015-2035 (in 2016 dollars)
Street and Arterial Funds	$9,884,400
Transportation Impact Fees	$27,550,680
Grant Funds	$28,539,707
Total Revenues	**$65,974,786**
Total Expenditures	**$99,261,430**
Estimated Shortfall	**($33,286,643)**

Source: City of Duvall Public Works Department

6.12 Monitoring, Evaluation, and Reassessment Strategy

The Transportation Element of the Comprehensive Plan and this Transportation Plan anticipate the needs and conditions of future transportation systems, which allows the City to plan until the 2035 horizon year. Nonetheless, the transportation network is dynamic with constantly changing circumstances beyond the scope and influence of this plan. Hence, regular updates are necessary to ensure the plan remains current and relevant. The financing strategy attempts a balance between revenues and expenditures over the life of the Plan. However, the City is committed to reassessing their transportation needs and funding sources each year as part of their annual Six-Year TIP update. This allows the City to match the financing program with the shorter-term improvement projects, funding, and grant opportunities. The Plan also identifies adopted LOS standards, concurrency requirements, and funding sources.

ANNUAL EVALUATION

The Transportation Plan should be evaluated annually as part of the Six-Year TIP process. This process is an opportunity to ensure that the Transportation Plan is consistent with other elements of the City's Comprehensive Plan, including the Land Use Element, Economic Development Element, the City's Parks and Recreation Plan and the CFP. Hence, as part of the amendment cycle, the City will ensure the plan components are consistent and supportive of each other and reflect the City's most recent assumptions about traffic patterns, growth and development.

MULTI-YEAR UPDATES

The City will go through a formal process of updating the Plan every five to eight years as part of the City's regular Comprehensive Plan amendment cycle, which ensures proposed changes go through a public review process before the amended plan is adopted by the City. In preparation for the amendment cycle, the City will review the plan and propose updates as needed. These proposed updates may be due to shifts in City priorities, the availability of new information, or the relevance of certain plan components.

This endeavor would include a broad public outreach effort with input from neighboring jurisdictions, state and regional agencies, and Duvall residents and businesses. Much like the current update, it would present an opportunity to holistically examine the current transportation system and lay the framework for the development of future systems.

REEVALUATION

During the re-evaluation process, the City can evaluate progress made with implementing the plan, as well as identifying new needs that have developed since the previous update. The City will review its street, non-motorized, and transit systems, and assess whether the Plan is adequately addressing the implementation strategies necessary to ensure the transportation infrastructure continues to grow in line with the City's objectives.

As part of this process, the City will review its future project list and update the CFP as needed. It will also review its future projects list in the policies and funding sections of the Plan, to remain consistent with the City's vision, and current with available funding strategies.

TECHNICAL INFORMATION

The Transportation Plan contains technical data which is used in other elements of the Comprehensive Plan. As part of the amendment cycle, the City will update technical information, such as traffic volumes, current LOS, roadway classifications, and transit route and ridership information and update other sections of the Comprehensive Plan. The evaluative process will make use of this new information and enable the City to measure system changes over time leading to informed decisions when planning future systems.

MODEL UPDATES

The City will update the traffic model every few years, as new land use, employment, and housing data becomes available. Model updates are important as they ensure the City has an accurate understanding of how land use patterns, employment, and other factors impact future transportation conditions. The model also provides an understanding of the impacts associated with different projects, allowing the City to develop a revised list of future projects to improve capacity and safety, as well as achieve other City priorities. The City can make informed policy decisions using the updated traffic model.

REASSESSMENT POLICY

In the event the City cannot fund the transportation capital improvements needed to maintain adopted transportation service standards, the City shall take one or a combination of the following actions:

1. Phase proposed developments that are consistent with the land use plan until adequate resources can be identified to provide adequate transportation improvements;
2. Reassess the City's transportation financing strategy to find additional opportunities with federal and regional grants, funding programs, and develop new partnerships with WSDOT, King County, and the private sector;
3. Reassess the City's adopted transportation service standards to reflect service levels that can be maintained given known financial resources. The LOS standard for SR-203, a regionally significant state highway, is set by PSRC. Therefore, the City cannot

independently adjust the LOS standard for Main Street (SR-203). The City would need to work with PSRC and other agencies served by SR-203 to address potential changes to LOS standards for SR-203, and;

4. Phase improvement projects to extend the funding needs beyond 2035. During the first five to ten years of the Plan, the City will focus on the highest priority improvements, unless specific developments trigger specific improvement needs. The City could also prioritize overlays and maintenance improvement projects to reduce annual costs.
5. The improvement program and financing strategy will be evaluated each year as part of the annual Six-Year TIP. This will allow the City to match available financing with specific near-term improvement needs. This will also consider the level and location of future development within the City consistent with concurrency requirements.

To maintain and develop the City's transportation system, the City will apply the following principles:

- Balance improvement costs with available revenues as part of the annual Six-Year TIP;
- Coordinate with WSDOT to secure grants and other funding for improvements to Main Street;
- Pursue transportation grants and economic assistance programs to improve downtown streets in accordance with the Transportation Element and Downtown Sub-Area Plan, and;
- Work with private developments to implement new access/circulation improvements identified in the TIP with respect to the Goals & Polices within the Transportation Element of the Comprehensive plans and other relevant Plans, Programs, Codes, and Standards.

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Appendices

Appendix A

City of Duvall 2015 Capacity and Transportation Analysis Study/EIS Alternatives Memorandum (City of Duvall, June 14, 2017)

FINAL MEMORANDUM

TO:	2015 Comprehensive Plan Update File
FROM:	Boyd Benson, Public Works Ben Swanson, Planning (Original Memo)
REVISION DATE:	**June 14, 2017 (revised total growth trips, Table 7)**
REVISION DATE:	September 19, 2016
REVISION DATE:	January 15, 2016
ORIGINAL DATE:	February 10, 2015
RE:	City of Duvall 2015 Capacity and Transportation Analysis Study/EIS Alternatives

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INTRODUCTION

The City of Duvall Public Works and Planning Departments completed a buildable lands and Transportation Analysis Zone (TAZ) study to support development of the 2015 Comprehensive Plan amendment. The study includes baseline measurements of residential and commercial uses within the City as of January 1, 2015 and forecasts for future growth used to support residential population growth estimates, transportation planning, and modeling efforts for a period of 20 years to the horizon year of 2035.

The information generated by this study is intended for a variety of planning purposes, including impacts evaluated under the Environmental Impact Statement (EIS) associated with the Comprehensive Plan Amendment. The 2015 residential count and the future residential estimate will assist in better understanding current residential uses, projecting potential additional residential and commercial development, and estimating future population. The information will also be used by the City's transportation consultant in updating the Transportation Plan Model and to forecast traffic, level of service, and required transportation improvements based on existing and future residential and commercial needs.

Prior to this analysis, a Housing Analysis Study was completed for the 2004 Comprehensive Plan update by the Planning Department (June 3, 2004). This information was used to develop the 2004 Comprehensive Plan update and the 2006 Transportation Comprehensive Plan Element update. The

information was further updated as part of the 2008 Transportation Element. The 2004 and 2008 studies assumed a horizon year of 2022. The current analysis assumes a 2035 horizon year but is otherwise consistent with the previous plans and updates.

Staff also completed a Transportation Analysis Zone (TAZ) study to support development of the 2008 Transportation Plan and 2015 update. Staff subdivided the City into a total of 80 geographic TAZs within the City based on zoning, transportation linkages, travel patterns, and other physical and modeling factors. The 2015 analysis used the same TAZs developed for the 2008 analysis with the addition of six new TAZs used to evaluate growth alternatives associated with the UGA and UGAR areas. Baseline measurements of residential and commercial uses were developed for each TAZ by City Staff in conjunction with the City's transportation consultant. The remainder of this memorandum documents the approaches and results of the 2015 study.

This study also includes analysis of five EIS alternatives proposed as part of the Comprehensive Plan Update. City limits, Urban Growth Areas (UGA), and Urban Growth Area Reserve (UGAR) areas considered in this evaluation are depicted on Figure 1.

BASELINE 2015 RESIDENTIAL AND COMMERCIAL USE RESULTS

Residential

City of Duvall staff completed a buildable lands analysis using a geographic information system (GIS) evaluation that included 2012 air photo images, King County parcel/assessor data, sensitive areas data, and current Duvall infrastructure information. In addition, staff completed field visits and utilized City records (building permits, land use permits including entitled and vested projects, and plats) to update the data.

Residential counts include existing single- and multi-family units within City limits and UGAs as of January 2015. Pipeline projects and entitled undeveloped lots not completed by January 2015 were included in the future residential calculation. Total residential counts for the 2015, 2008, and 2004 analyses are presented in Table 1, *Existing Residential Counts within 2015 City Limits* and Urban Growth Areas (UGA)

Table 1: Existing Residential Counts within 2015 City Limits and Urban Growth Areas (UGA)

Date	Multi-family Units	Single-Family Units
June 2004	256[1]	1,765[1]
July 2008	186[3]	2,154[2,3]
January 2015	213[3]	2,373[2,3]

[1]2004 numbers corrected to remove residences counted in the planning process but not completed at that time.

[2]Includes Mobile Homes

[3]Does not include UGAR area (2008 value recalculated to remove UGAR residences).

Commercial Floor Area

City of Duvall staff documented existing Commercial Floor Area within City Limits based on King County parcel/assessor data along with City updates based on building permit data and measurements. There was no significant commercial development between 2008 and 2015 and little change in the total commercial floor area as presented in Table 2a, *Commercial Floor Area within 2015 City Limits.* Details of existing commercial development within each zone are presented in Table 2b, *Commercial Floor Area by Zone within 2015 City Limits.*

Table 2a: Commercial Floor Area within 2015 City Limits

Date	Commercial Floor Area (SF)
June 2004	NA (poor Data)
July 2008	425,727[1]
January 2015	426,221[1]

[1]2008 to 2015 differences result from updated King County GIS building area data

Table 2b: Commercial Floor Area by Zone within 2015 City Limits

Zone	Existing Commercial Development			
	Total FA (SF)	Max FA/Gross Lot Area	Min FA/Gross Lot Area	Ave. FA/ Gross Lot Area
UT	12,259	31%	14%	18%
OT	101,908	191%	27%	65%
MT	138,715	88%	15%	42%
MU12	25,960	18%	16%	18%
LI	56,200	54%	15%	18%
CO	91,179	43%	1%	18%
Total	426,221			

Employment

The City of Duvall uses Puget Sound Regional Council's estimates to track employment data. These employment estimates are based on the Washington State Employment Security Department's (ESD) Quarterly Census of Employment and Wages (QCEW) series (formerly known as ES-202). This series consists of employment for those firms, organizations and individuals whose employees are covered by the Washington Unemployment Insurance Act. Covered employment excludes self-employed workers, proprietors, CEOs, and other non-insured workers. Typically, covered employment has represented 85 to

90 percent of total employment. Note that this includes part-time and temporary employment, and if a worker holds more than one job, each job would appear in the database. Total employment within City limits for 2004, 2008, 2013, and 2014 is presented in Table 3, *Existing Employment within 2015 City Limits*.

Table 3: Existing Employment within 2015 City Limits

Source	Count
Total PSRC Count (2004)	1,023
Total PSRC Count (2008)	1,165
Total PSRC Count (2013)	1,298
Total Employment Security Department (2014)[1]	1,169

[1]Percent attached is the minimum percentage of attached residential units with respect to the total residential units.

The following presents the approach used in this study, consistent with the 2008 update, to estimate future residential and commercial development.

Vacant and Redevelopable Residential Property and Capacity Analysis

Vacant and redevelopable residential properties within the City were identified by examining parcel maps with respect to existing uses to determine which properties are available for future development or redevelopment based on the existing zoning and code requirements (see Figure 2: 2015 Vacant and Redevelopable Property). Development within the southwest (Burhen) UGA and east UGAR was not included as part of the baseline calculation.

Identification of Vacant, Pipeline and Redevelopable Residential Property

Properties within the R-4 through R-12 zones were evaluated with respect to development or redevelopment potential based on the following:

- All vacant parcels were identified as developable.
- All pipeline parcels were identified as developable.
- Redevelopable parcels were identified as those parcels which would accommodate additional lots, assuming that the parcels were of sufficient area to provide additional lots based on the zoning classification. Per DMC, the unit count for a parcel is rounded from the number resulting from the parcel acreage multiplied by the residential count per acre (for example, a 0.3-acre parcel in R4 yields (0.3) X (4 units per acre) = 1.2 units rounded down to 1 unit and a 0.45 acre parcel in R4 yield (0.45) X (4 units per acre) = 1.8 units rounded up to 2 units).
- Non-redevelopable lots that have adequate area for additional unit(s) but are encumbered by mapped sensitive areas tracts.

- Non-redevelopable lots that have adequate area for additional unit(s) but are encumbered by access constraints including insufficient frontage width and/or existing home location.

Capacity of Vacant, Pipeline, and Redevelopable Residential Property

Properties identified as vacant or redevelopable within the R-4 through R-12 zones were evaluated with an approach generally consistent with that of the 2004 and 2008 studies. Pipeline projects, including existing entitled and preliminary projects, were used to forecast anticipated residential and commercial development. The method used to estimate future residential and commercial uses in areas with unknown development plans are presented in the following sections and are summarized along with Existing Zoning presented in Table 4, *2015 Existing Zoning*, and Table 5a, *FAR and Residential Development Assumptions*, and Table 5b, *2015 Vacant and Redevelopable Land within City Limits & North UGA.*

As in 2008, the 2015 capacity evaluation included revised assumptions that better reflect actual development trends. The 2008 and 2015 capacity evaluations are based on the following:

- Vacant and pipeline residential properties were anticipated to develop at 90 percent of maximum development potential to account for any yield reductions associated with critical areas.
- Redevelopable residential properties were anticipated to redevelop at 45 percent of maximum development potential to account for any yield reductions because of site constraints and the associated costs of redevelopment.
- The North UGA was estimated R-4 density consistent with the land use designation.

<u>Vacant and Redevelopable Commercial and Mixed-Use Property</u>

The 2008 and 2015 commercial, light industrial and mixed-use capacity evaluations are based on existing commercial Floor Area data summarized in Table 2b, the information in Table 5a, *FAR and Residential Development Assumptions*, and the following:

- Pipeline commercial, light industrial, and mixed-use properties were anticipated to develop at 90 percent of maximum development potential.
- Vacant commercial, light industrial, and mixed-use properties were anticipated to develop at 75 percent of maximum development potential to account for any yield reductions associated with development costs or critical areas.
- Redevelopable commercial, light industrial, and mixed-use properties were anticipated to develop at 45 percent of maximum development potential to account for any yield reductions associated with existing structures, development costs, or critical areas.

Mixed-Use 12 (MU12)

Based on the requirements in DMC 14.18.080, the Mixed-Use-12 Zone allows both commercial and residential uses. Based on proposed and past development within the City, development within this zone is estimated at:

- 25 percent commercial site area based on the gross site area.
- 20 percent commercial FAR based on the commercial site area.
- 8 units per non-commercial gross acre, including 20 percent attached per DMC 14.18.020.

- One residential unit per 1,000 square feet of mixed-use floor area.

Old Town (OT), Uptown (UT1), Midtown (MT), Riverside Village (RIV), Commercial (CO).

There are no minimum FAR requirements for these zones. However, based on past development within the City and the pre-application submittal for the Copper Hill Square Building D project, future use within these zones is estimated as:

- 75 percent commercial FAR based on the gross site area.
- One residential unit per 1,000 square feet of mixed-use floor area.

Mixed-Use Institutional (MUI)

Mixed-Use Institutional is located only within the south portion of the City along NE Big Rock Road and includes the proposed Tolle Brothers (CamWest)/Lake Washington Technical College project. Data from the 2014 Duvall Urban Village site plan was used to estimate potential commercial, residential, and educational growth in this zone:

- 15 percent commercial FAR based on the gross site area (Duvall Urban Village Proposal).
- Total of 91,000 square feet of education use (Riverview School District Property, based on previously proposed Lake Washington Technical College Parcel use).
- No residential use (Walden/Duvall Urban Village Proposal, residential use may occur above commercial uses).

Light-Industrial (LI)

There are no minimum FAR requirements for these zones. However, based on past development within the City use within this zone is estimated as:

- 30 percent commercial FAR based on the gross site area.

Table 5a: FAR and Residential Development Assumptions

Zone	Commercial Floor Area (FA)	Residential Portion
OT	(gross acreage) x (0.75)	(FA) x (1 unit/1,000SF)
UT-1	(gross acreage) x (0.75)	(FA) x (1 unit/1,000SF)
MT	(gross acreage) x (0.75)	(FA) x (1 unit/1,000SF)
RIV	(gross acreage) x (0.75)	(FA) x (1 unit/1,000SF)
MU12	(gross acreage) x (0.25) x (0.20)	(gross acreage) x (0.75) * (8 units/acre) + (FA) x (1
	See above text	unit/1,000SF)
MUI	(gross acreage) x (0.3)	See above text
CO	(gross acreage) x (0.3)	(FA) x (1 unit/1,000SF)
LI		None

Table 5b: 2015 Vacant and Redevelopable Land within City Limits & North UGA

	Total (City and North UGA) [1]	Vacant				Redevelopable				Total Vacant & Redevelopable	
		Residential		Commercial		Residential		Commercial			
		Value	% of Total	Value	% of Total	Value	% of Total	Value	% of Total	Value	% of Total
Number of Parcels (#)	2541	65	2.6%	44	1.7%	87	3.4%	30	1.2%	226	8.9%
Parcel Area (Acres)	1412	117	8.3%	87.7	6.2%	185	13%	59.3	4.2%	449	31.8%

[1]Includes Commercial, Residential, and Public Facilities Parcels.

RESULTS OF THE LAND USE FORECAST FOR 2015 ZONING

Land Use

The 2008 and 2015 Land Use Forecasts for current zoning were completed using the same methodology and had similar results with the following differences:

- Duvall Municipal Code change from 60 percent attached to 20 percent attached residential within the MU12 district (decrease in attached units).
- Removal of the UGAR from the 2015 analysis.
- The southwest (Burhen) UGA was not included in either analysis.

Both maximum and anticipated growth were calculated for the 2035 horizon year. Maximum growth is based on the penultimate development/redevelopment potential of the property as allowed by the Comprehensive Plan and Zoning regulations. Anticipated growth was calculated using the 90 percent, 75 percent, and 45 percent modifiers as earlier described in the Residential and Commercial capacity calculations. Anticipated growth, as opposed to Maximum Growth, was deemed a more realistic proxy for growth and was utilized for this study. Table 6, *Land Use Forecast for City Limits and North UGA*, *2015 Zoning*, summarizes the land use forecast for the City Limits/UGA using existing Comprehensive Plan and Zoning for the period between 2015 and 2035.

Table 6: Land Use Forecast for City Limits and North UGA, 2015 Zoning

USE	2015	2035 Anticipated	
		TOTAL	Percent Increase from 2015
SFR (Units)	2,373[1]	3,213[1]	840 (35%)
MFR (Units)	213	491	278 (131%)
Commercial FA (SF)	370,021	789,767	419,746 (113%)
Light Industrial FA (SF)	56,200	89,685	33,485 (60%)

[1]Includes Mobile Homes

EIS ALTERNATIVES

General

Four land use alternatives, along with a fifth preferred alternative, were evaluated as part of the EIS associated with the 2015 Comprehensive Plan Update. The EIS alternatives evaluate the proposal, the no-action alternative, and other "reasonable alternatives" [WAC 197-11-786, 197-11-440(5)]. A reasonable alternative is a feasible alternate course of action that meets the proposal's objective at a lower environmental cost. The EIS examines all areas of probable significant adverse environmental impact associated with the various alternatives. The Adopted Alternative of the final Comprehensive Plan was adopted as part of the 2015 Comprehensive Plan (Adopted June 7, 2016).

The 2015 EIS alternatives included:

- Alternative #1: Proposed 2015 comprehensive plan and zoning changes, annexation of the North UGA and the Southwest (Burhen) UGA.
- Alternative #2: Predesignating and annexation of the UGAR (Southeast UGA), predesignating and annexation of the North UGA.
- Alternative #3: Relocating some (or all) of the existing UGAR area to a new location south of Big Rock Road, predesignating and annexation of the North UGA.
- Alternative #4 (No Action Alternative): 2015 City limits and zoning, predesignating and annexation of the North UGA.
- 2015 Adopted Alternative: Alternative 1 with the following changes
    - Support annexation of three parcels adjacent to the Big Rock Ballfields complex within the UGAR.
    - The City would work with King County to remove the north portion of the UGAR from their boundaries and add an approximately equal area south of Big Rock Road that is currently outside of city limits and urban growth area.
    - The City would pre-designate the Riverview School District-owned parcel at the northeast corner of the UGAR to Public Facilities.

Existing and potential future residential and commercial uses for each EIS alternative were calculated using the methodology earlier described. For the purpose of this analysis, an evaluation area was developed that included the area common to all of the alternatives. This common area includes existing City Limits, North UGA, Southwest (Burhen) UGA, the 2015 UGAR, and the potential relocated UGAR south of Big Rock Road (see Alternative 3). This approach allows direct comparison of growth associated with each alternative without considering differences in land area. The evaluation also allows direct comparison of PM Peak hour trips, used to assess traffic impacts, for each alternative.

Employment growth for the Adopted Alternative within 2015 Comprehensive Plan was initially evaluated as a “worst-case” (maximum growth) scenario to understand the maximum potential traffic impacts associated with growth. However, transportation modeling completed in conjunction with the 2015 Comprehensive Plan revealed that there was little difference between the Transportation Improvement Program (TIP) projects required to accommodate growth impacts associated with maximum growth and TIP projects associated with lesser, anticipated growth. The worst-case

employment growth was commented on during Comprehensive Plan review and certification process by Puget Sound Regional Council (PSRC) staff. Residential growth, the majority of which is considered "pipeline" growth (residential growth associated with preliminary plat or development agreements), was considered to be a more realistic projection and was not adversely commented upon during PSRC review.

The City of Duvall revised the commercial growth model in 2016 to provide a better understanding of anticipated employment growth. The revision included evaluation of commercial and employment growth within each TAZ with respect to updated private development plans and potential sensitive area constraints. The results of the evaluation revealed less commercial and employment growth than previously reported in the 2015 Comprehensive Plan and associated Environmental Impact Statement (EIS) support documents. Table 7, *EIS Alternatives*, summarizes updated development and traffic attributes for existing 2015 development and 2035 development growth associated with the Adopted Alternative contained within the 2015 City of Duvall Comprehensive Plan.

Table 7: EIS Alternatives

Scenario[1]	Description	SFR DU	MFR DU	Total DU	LI (SF FA)	Commercial (SF FA)	Employees	PM Peak Hour trips SFR[3]	PM Peak Hour trips MRF[4]	PM Peak Hour trips Commercial[5]	Total PM Peak Hour Trips
2015 Baseline Model[2]	Existing City Limits plus all other UGA/UGAR areas within the study	2,268[6]	389[6]	2,657	56,200	370,021	1,169	2,268	350	2,990	5,608
(Adopted Alternative) 2035	Adopted Alternative (EIS Alt 1 with additional changes).	3,094	750	3,844	89,685	789,767	2,623	~~3,094~~[7]	~~675~~[7]	~~7,414~~[7]	8,982[7]

[1]Scenario includes count for entire study area (all possible UGA/UGAR's) so comparisons between scenarios.

[2]SFR DU count differs from Table 6 (see note 1, includes 71 existing homes within UGA/UGAR located outside of Table 6 area).

[3] SFR trip rate of 1.0 trips per unit.

[4]MFR trip rate averaged to 0.90 trips per unit.

[5] Commercial Trip rate varies with type of use.

[6] 176 mobile home included in MFR instead of SFR as reflected in Comprehensive Plan approach (151 units from TAZ 42, 25 units from TAZ 2) based on trip generation.

[7] June 14, 2017 revision: Actual growth trips developed from the Transportation Model are lower than sum of separate SFR, MFR, Commercial raw PM Peak Hour Trip (strike through numbers) rates because of:

- Raw PM Peak Hour Trips (strike through numbers) are based on trip generation rates only and do not account for combined trips
- Visum model results show a 2015-2035 increase of 3,374 PM Peak Hour trips (2035 total of 8,982 PM Peak Hour trips).
- Besides the Visum model balancing procedures, the main difference is likely due to the retail trip rate. The weighted average Visum model retail trip rate was 3.83 and 2.81 for 2015 and 2035 models, respectively. The future 2035 model rate of 2.81 is much lower than the default 3.99 in the spreadsheet (source of Table 7). When looking at just the retail growth employees, the retail trip rate is 2.19

Adopted Alternative #5 - 2015 Comprehensive Plan and Zoning Changes, North UGA annexation, Southwest (Burhen) UGA annexation, Annexation of three parcels adjacent to the Big Rock Ballfields complex within the UGAR, and pre-designate the Riverview School District-owned parcel at the northeast corner of the UGAR to Public Facilities

General

Staff proposed eliminating the Riverside Village (RIV) zone and reducing the Mixed-Use 12 zone (MU12), reducing the acreage of Residential 12 (R12) units per acre zoning and creating a Residential 20 (R20) units per acre zone as part of the 2015 Comprehensive Plan update. These proposed changes are in response to historically problematic zones, lack of housing options, or unnecessary hardships created by the existing 2015 Comprehensive Plan and Zoning designation. The proposed changes are not intended to increase or reduce the existing population projections or change the amount of land available for commercial development. The proposal includes predesignating the North UGA and Southwest (Burhen) UGA in anticipation of annexation. An element of the predesignation would include the addition of a new open space/parks comprehensive plan and zoning designation.

The results of these proposed changes and proposed actions are summarized in Table 7, *EIS Alternative Summary*, Figure 3, *Adopted Alternative, 2015 Comprehensive Plan*, and the text below.

Description of Adopted Alternative Action

Riverside Village (RIV)

The adopted rezone is in response to the sale of the existing manufactured home community which represents approximately three-fourths of the Riverside Village zone. Under the terms of the sale, the parcel must remain a manufactured home community (affordable housing) for well beyond the 20-year Comprehensive Plan cycle; therefore, no foreseeable commercial development will take place on this parcel.

As a result, a comprehensive plan amendment and rezoning of this parcel to Residential 6 units per acre (R6) was adopted to allow the existing manufactured home community to operate as a legal conforming use. The R6 designation was derived by averaging the existing units per acre at the community. The remaining seven parcels within the RIV zone was changed to an Old Town (OT) zone which is compatible with surrounding land uses. A Comprehensive Plan amendment is not required for the RIV to OT change because the RIV and OT designation are the same.

Mixed-Use 12 (MU12)

The adopted rezone of the majority of the Mixed-Use 12 was adopted based on challenges associated with the zone's location, required commercial element, and density.

- DMC 14.18 requires a minimum of 25 percent of the gross usable area be dedicated to commercial development, and this commercial development is constructed concurrently or phased through a development agreement. All MU12 development within the last decade requested phasing

(delaying the commercial development) through a developer agreement due to a greater demand for residential development in the Duvall area.

- A large portion of the land zoned MU12 is located along the NE 143rd Place corridor. This zoning designation is not appropriate at this location as it does not front a major or minor arterial and therefore limits traffic trips, access, and circulation.
- Density for the residential portion of MU12 development requires a minimum of 8 units per acre and a maximum of 12 units per acre, similar to the R12 zone. Developers have repeatedly stated that this density is too high for single-family development (difficult to meet design guidelines and open space requirements) and too low for multi-family development (not profitable for a developer to build based on number of allowed units).

Staff proposed and Council adopted that areas currently zoned MU12 and contiguous to arterial roads be zoned Commercial. MU12 properties near arterial road and adjacent to residential areas were rezoned to the new R20 zone described below. The remaining MU12 adjacent to lower density residential areas rezoned to the R8 zone or other transitional zoning that allows a gradual increase in residential density or use.

The Duvall Village and Duvall Urban Village properties remained under the MU12 zoning designation. These properties have preliminary plats that are approved or pending approval. Upon final plat approval, these properties will undergo comprehensive plan amendment and rezone in accordance with their established uses.

Residential 12 (R12)

The R12 zone has the same challenges described for the residential portion of the MU12 zone. The majority of the R12 zones build to the minimum requirement of eight units per acre based on existing preliminary plats and residential developments. Several existing developments are currently built at greater than R8 standards and technically meet the R12 density standards. Staff proposed and Council adopted that such developments are retained in the R12 zone to avoid creating legal nonconforming lots. All other vacant and redevelopable R12 properties were rezoned to an R8 to create a smoother transition between zones.

Residential 20 (R20)

Staff proposed and Council adopted a new R20 comprehensive plan designation and zone to satisfy the multi-family need in Duvall, specifically small unit condominiums and apartments that were not feasible in the R12 and MU12 zones. Additionally, the R20 zone will aid in compliance with the Growth Management Act by promoting a variety of residential densities and housing types. The new R20 zones provide housing options for existing residents looking to downsize, retirement communities, and potential affordable housing in Duvall.

Predesignation of Burhen Annexation Area and New Parks and Open Space

The Burhen annexation area consists of a 39-acre area south of Safeway on the corner of NE 140th Street and SR-203. The area is currently designated UGAR through an agreement between the City and King

County. The agreement stipulates the comprehensive plan and zoning designations that include a commercial allowance and a new open space/park designation. The new open space/park designation is a requirement of King County and is intended to limit the allowed uses to recreation. The County feels the existing Public Facilities designation is too liberal with the allowed uses. In accordance with the agreement, the two northern parcels are predesignated commercial, and the southern two parcels are designated open space/parks with a floating one-acre commercial designation to be determined at time of annexation.

Development within this area was estimated to include the following based on King County pre-zoning designation:

- North parcel: Full commercial development.
- South portion of property: One acre of floating commercial with the remaining to be open space or parkland.

Additional Annexation Areas

- The City would support annexation of two parcels north of Big Rock Ball Fields on Big Rock Road located in the UGA-Reserve South. The two parcels would receive a pre-designation of Residential 4-4.5 units per acre.
- The City would support annexation of one parcel south of Big Rock Ball Fields on Big Rock Road located in the UGA-Reserve South. The parcel would receive a pre-designation of Residential 4-4.5 units per acre and/or Public Facilities to support expansion of the Big Rock Ball Fields recreational complex.
- The City would work with the County to remove the north portion of the UGA-Reserve from their boundaries and add an approximately equal area south of Big Rock Road that is currently outside of city limits and not part of Duvall's urban growth area (similar to the proposal under Alternative 3). Twenty-five percent of the area south of Big Rock Road would be assigned a pre-designation of Commercial and 75 percent would be assigned a pre-designation of Residential 6 units per acre.
- The City would pre-designate the Riverview School District-owned parcel at the northeast corner of the UGA-Reserve to Public Facilities.

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Figure 1: Adopted 2015 Zoning Map, Duvall City Limits, UGA, and UGAR.

Figure 2: 2015 Vacant and Redevelopable Residential Property.

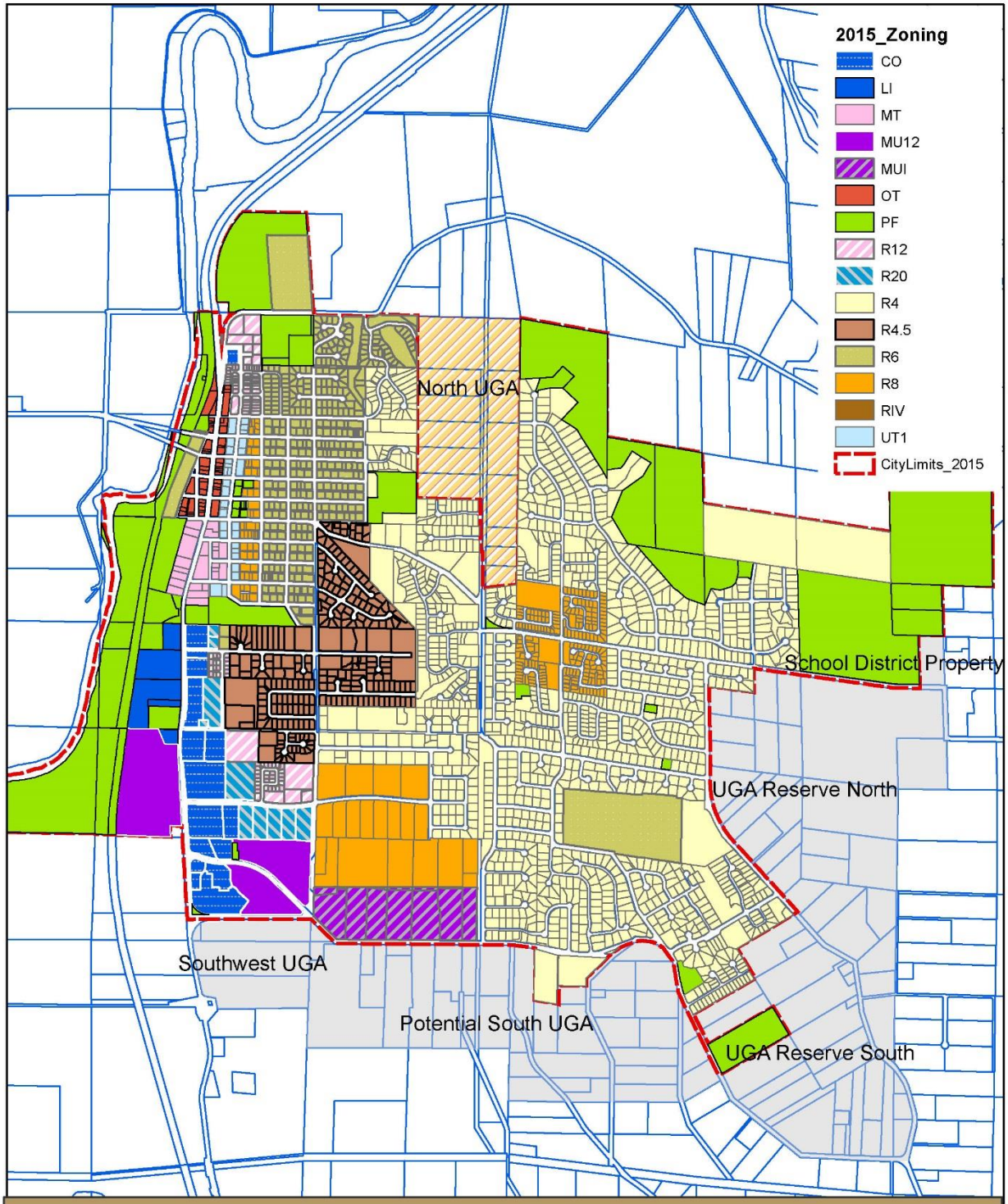

FIGURE 1. 2015 DUVALL CITY LIMITS, UGA, AND UGAR

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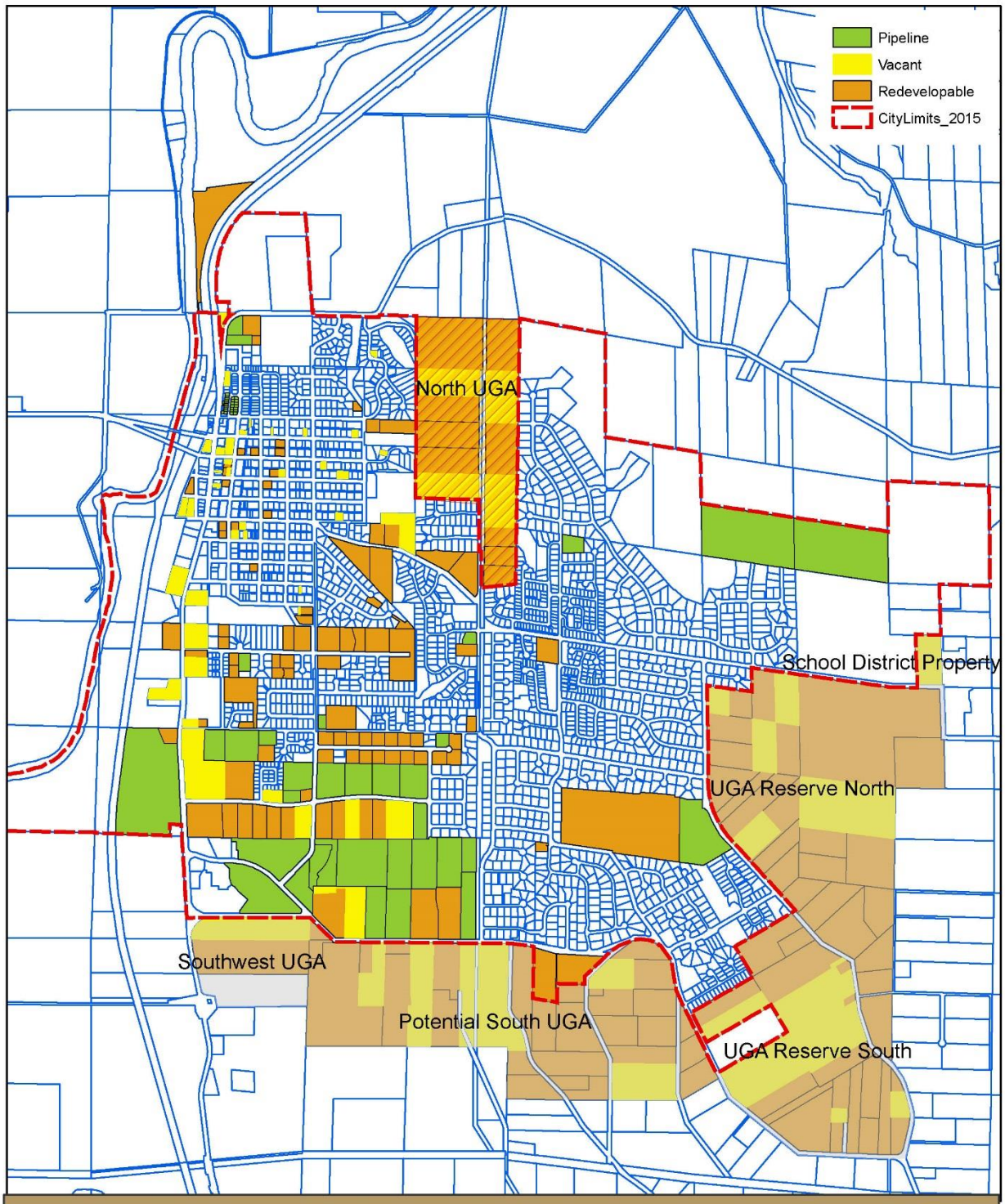

FIGURE 2. 2015 VACANT AND REDEVELOPABLE PROPERTY

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Appendix B

City of Duvall Traffic Model Results (Transpo Group, 2016)

City of Duvall

TRAVEL DEMAND MODEL DOCUMENTATION

September 2016

Prepared by:

transpogroup

11730 118th Avenue NE, Suite 600
Kirkland, WA 98034-7120
Phone: 425-821-3665
Fax: 425-825-8434
www.transpogroup.com

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Chapter 1. Introduction

The City of Duvall Travel Demand Model (Duvall Model) was developed to provide a solid technical basis for evaluating transportation system needs in coordination with long-term planning in the City of Duvall. The Duvall Model was built using Visum software and is consistent with local and regional growth plans within the region. The scope of the model is subarea of western King County generally east of the Snoqualmie River between NE Cherry Valley Road and NE Big Rock Road. Figure 1 illustrates the Duvall Model extents.

1.1 Model Overview

The Duvall Model has a base year of 2015 and a forecast horizon year of 2035. The model trip assignment represents the PM peak hour period (one-hour volumes) between 4 p.m. and 6 p.m. on a typical weekday. The model has a total of 86 Transportation Analysis Zones (TAZs), including 7 external TAZs. The 2015 Duvall Model has 53 lane miles coded that represent freeways, expressways, arterials, collectors, and a few local streets. Trip generation is performed directly within the Visum model software. This model documentation was developed based on the Visum 15.00-06 software version.

1.2 Model Documentation Outline

This report provides details about the structure of the model and the assumptions used in constructing the model.

Chapter 2 - Using the Model. This section explains the basics of the model and how to do routine analysis with the model. This includes quality control checklists to help confirm that the model will perform as designed. Specific model details are presented in later chapters and appendices.

Chapter 3 - Travel Demand Inputs. This section explains the various model inputs relative to estimating travel demands including land use, trip generation, trip distribution, mode choice, and other parameters.

Chapter 4 - Travel Supply Inputs. This section explains the various model inputs relative to the supply or capacity of the network including planned improvements, roadway capacities, and other parameters.

Chapter 5 - Validation and Reasonableness Checks. This section explains how existing data sets compare to the modeled travel conditions.

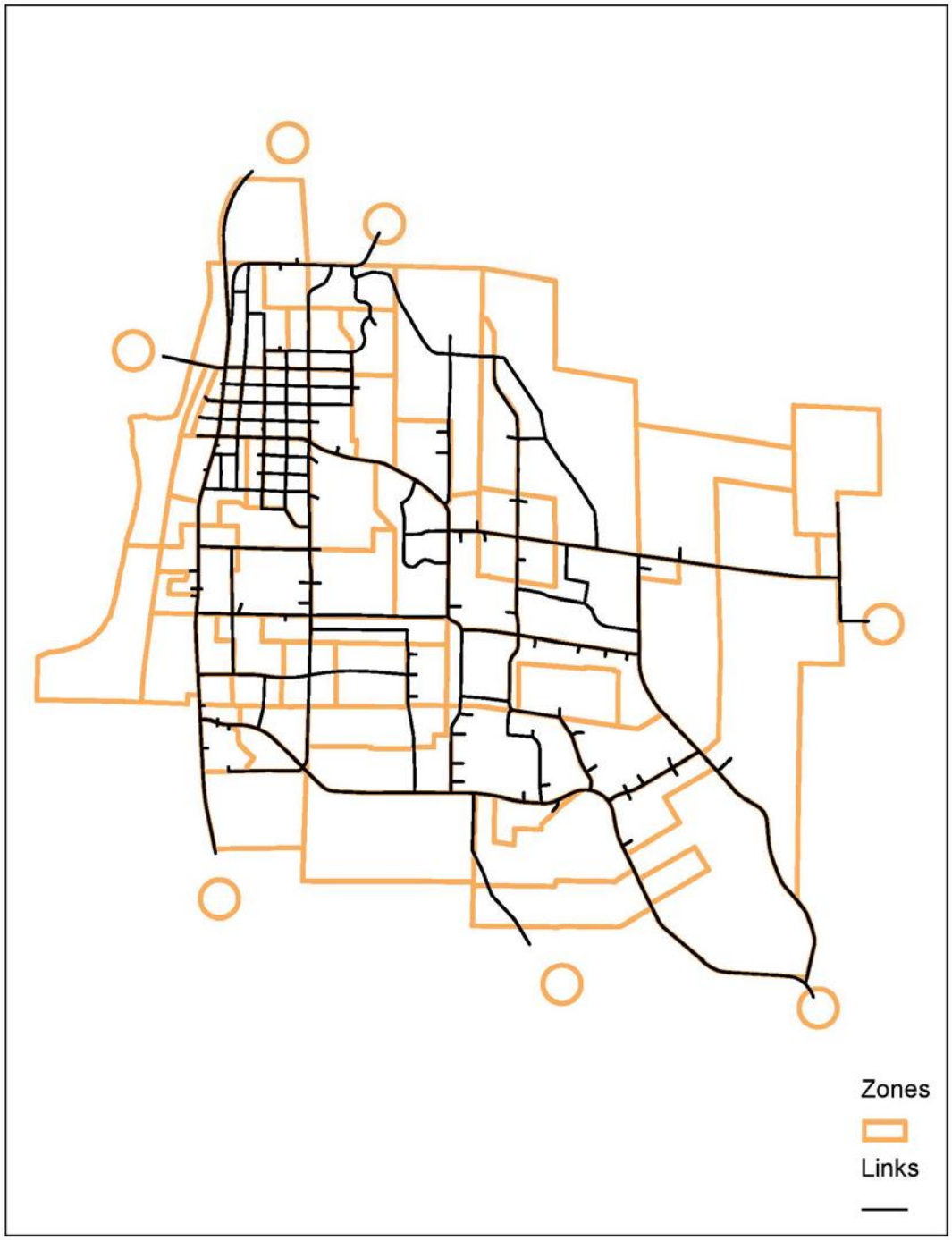


Figure 1. Duvall Travel Demand Model

Chapter 2. Using the Model

The main purpose of the model is to run various model scenarios to understand impacts and/or output traffic volume characteristics. Outlined below is how the model can be used or adapted for scenario testing or other analysis. This section describes how the model operates, how to use it when evaluating scenarios, and the method to post-process model volumes.

The anticipated model users of the Duvall Model fall into the two general categories below. Chapter 2 is intended primarily for the basic model user.

- **Basic Model User.** These model users are able to perform basic model analysis including select-link/select-zone analysis, small edits to the model network, land use updates to several TAZs, exporting volumes for post-processing, and model plots.
- **Advanced Model User.** These model users can perform all the basic model user tasks as well as changing the TAZ structure, developing a new analysis horizon year, and calibration/validation of the model.

2.1 Select-Link or Select-Zone Analysis

Using Visum's internal "flow bundle" application, trips using a specific link or zone can be isolated for review. The path volumes are saved for the PM peak period, so flow bundle analysis of the PM peak period does not require the model to be rerun.

Quality Control Tip:

Be sure to be careful on how multiple links or zones are selected. The order they are clicked as well as the "and" versus "or" parameters can have significant impacts on the resulting output. In addition, be sure that both origins and destinations are chosen when doing select- zone analyses.

2.2 Changing the Model Network

The model was developed with the anticipation that the model network would be changed to test various scenarios. Some of the network editing is streamlined so that when the model procedures are run, many network attributes are automatically updated.

2.2.1 Model Links

The model relies on "link types" to assist in link editing. Link types are based on the number of lanes and free-flow (posted) speeds. After editing a link, be sure that the link type attribute is correctly coded. The number of lanes, capacity, and speed are updated for every link when the model is run. **NOTE**: The "transport system" link attribute is also automatically set, so use the correct link type to disable links. See Appendix A for link types.

2.2.2 Model Nodes

The model relies on "node types" to help define intersection delays. When the model runs, the turn capacities, turn delays, and intersection capacities are automatically updated and applied based on node type. After editing the network, be sure that the node type attribute is correctly coded. **NOTE**: The "ControlType" node parameter is not used in the Duvall Model. See Appendix A for node types.

2.2.3 Model Turns

Model turn attributes need to be checked, because they can impact how the intersection delays are calculated. Besides two-way stop control (TWSC) intersections (Node Type 5), all node types assign turn capacities and delays based only on major-street/minor-street designations as well as turn types (1-left, 2-thru, 3-right, 4-u-turn). Be sure that the nodes "major flows" are correctly oriented, and that the turn type attribute is correctly coded.

In some cases the default turn capacity based on the node type may not best reflect unique circumstances at select intersection locations. The Duvall Model includes a turn attribute called "TurnCapFactor" that is used as a coefficient to increase or decrease the default turn capacity at specific turn locations. By default, this coefficient is set to 1.0 for turns. Typically, this adjustment is only used for less than ten percent of model intersections.

For two-way stop control intersections (Node Type 5), the intersection delay is based on intersection capacity and delays are only applied to the stopped approach. To make this work properly, the approach with the stop sign should have the link attribute "TModel delay link for turns" set to one (1). The rest of the approaches should be set to zero (0).

2.2.4 Running the Model

After making network edits, make sure to activate the procedure steps in "Group Set Network Attributes" when running the model. To run the full model, activate all the procedures. If only the trip assignment needs to be run, only activate the procedures in the "Group Trip Assignment" along with "Group Set Network Attributes."

Quality Control Checklist:

The following is a checklist to review after making any network edits. Using graphic parameters to illustrate the active parameters makes the review go quickly.

1. When editing the shape of a link, is the box to "take over length-polygon" checked?
2. Are the link types coded correct?
3. Are the node types coded correct?
4. Is the "TModel delay link for turns" set for stop-controlled approach links?
5. Are the major flows correctly oriented at nodes with traffic control?
6. Are turn type numbers correct at nodes with traffic control?
7. Does the "TurnCapFactor" coefficient factor need updating?
8. Are there any "prohibited turns" and "u-turns" in places not expected?
9. When running the model after network edits, were the procedure steps run in "Group Set Network Attributes"?

2.3 Changing Land Use

Land use inputs, trip generation, and trip balancing occur in the Visum software during the "Group Trip Generation" set of procedures.

2.3.1 Residential Land Use

Residential land use inputs are summarized by number of dwelling units per TAZ (See Appendix B for detailed map showing TAZ numbers and boundaries.) The dwelling units are subdivided into two categories, single-family dwelling units (SFDU) and multi-family dwelling units (MFDU).

To make residential land use changes, open the Visum model version file and then open a zone list (List>Network>Zone). Open the saved layout named "LandUseImport.lla" which clearly shows the land use categories used in the model. Make edits to the number of dwelling units for the appropriate TAZ directly in the list.

2.3.2 Employment Land Use

Employment land use inputs are summarized by number of employees per TAZ (See Appendix B for detailed map showing TAZ numbers and boundaries.) The employment is subdivided into several categories (see Chapter 3 for details).

To make employment land use changes, open the Visum model version file and then open a zone list (List>Network>Zone). Open the saved layout named "LandUseImport.lla" which clearly shows the land use categories used in the model. Make edits to the number of employees for the appropriate TAZ directly in the list.

2.3.3 Running the Model

After making the land use edits, make sure to activate all the procedure steps. All model steps should be run when making land use edits.

Quality Control Checklist:

The following is a checklist to review after making any land use edits.

1. Were the dwelling units and employees assigned to the correct categories and TAZs? Check after the trip assignment that the trips generated at the TAZ are consistent with the magnitude of land use adjustments.
2. For future horizon scenarios, remember that the land use in the zone list being edited represent totals, not growth only land use quantities.
3. When running the model after land use edits, were all the procedure steps run?

2.4 Changing the TAZ Structure

Given the complexity of model procedures, it is not recommended to change the TAZ structure (the number of TAZs). The model does use multipoint assignment (MPA), so an alternate method to control where trips enter/exit the model is to provide more TAZ centroid connectors and assign shares (weights) to each connector.

2.5 Changing Model Horizon Year

Changing the model horizon year involves both land use changes and changes to external TAZ assumptions. It is not recommended to change the model horizon year without careful adjustments to land use by TAZ, external traffic volume forecasts, and forecasts of the external-to-external trip table.

2.6 Post-Processing Model Volumes

Post-processing refers to adjusting raw future model volumes to account for model calibration or validation differences inherent in all travel demand models.

The “difference method” is the recommended method to estimate post-processed future turning movement volumes at study intersections. The difference method works by subtracting the existing model volume from the future model volume, and adding that difference to existing counts. The difference method does not produce reasonable results 100 percent of the time, so the results need to be checked for reasonableness, similar to all model post-processing methodologies.

A basic model user can easily copy a Visum listing of turns (or links) and paste into a premade spreadsheet to automate the bulk of the post-processing work.

Chapter 3. Travel Demand Inputs

Travel demand inputs relate to any element that places trips on study area roadways. Land use plans, trip generation rates, and trip distribution parameters are discussed. Trips linked to areas outside the model study area (external trips) are discussed, as well as traffic counts.

3.1 Land Use

Socio-economic information is the basis for estimating the quantity of travel activity in the study area. This land use information was summarized by the categories shown in Table 1. These land use categories are the basic building blocks of travel demand.

Table 1. Land Use Categories

Type	Code	Units	Description
Residential	SFDU	Dwelling Units	Single-family dwelling units
	MFDU	Dwelling Units	Multi-family dwelling units
Employment	NRC	Employees	Natural resources and construction Manufacturing,
	Manuf	Employees	warehouse, transportation, utilities Retail trade, food
	Retail-Low	Employees	services
	Retail-High	Employees	Retail trade, food services
	FIRE	Employees	Finance, insurance, real estate
	Edu	Employees	Education Medical/dental Office
	Med	Employees	Services
	Office	Employees	Government
Externals	XI-O	Peak Hour Trips	Trips entering the model from external TAZs
	IX-D	Peak Hour Trips	Trips exiting the model to external TAZs

Source: Transpo Group, 2016

To generalize travel activity by small areas, transportation analysis zones (TAZs) were developed. The Duvall Model has a total of 86 TAZs and are consistent with TAZs in the 2009 Duvall Travel Demand Model. Figure 1 show the general size and extents of the model TAZs, and Appendix B shows a more detailed TAZ map. Existing and future land use allocations to model TAZs are based on information developed by the City.

3.2 Trip Generation

Trips are generated by land uses and are assigned a trip type. In the Duvall Model, there are five basic trip types (or the general purpose of the trip):

- Home-to-Work (HW): Vehicle trips that have their origin at the place of residence and destination at the resident's place of employment.
- Work-to-Home (WH): Vehicle trips that have their origin at the resident's place of employment and destination at the place of residence.

- Home-to-Other (HO): Vehicle trips that have their origin at the place of residence and destination at somewhere other than the resident's place of employment.
- Home-to-Other (OH): Vehicle trips that have their origin at somewhere other than the resident's place of employment and destination at the place of residence.
- Non-Home Based (NHB): Vehicle trips with no residential trip end.

Trip generation rates used in the Duvall Model reflect weekday PM peak hour trips. Dwelling units generate a certain amount of weekday PM peak hour trips, and employment areas also generate trips. Trip rates were not changed from the ones used in the 2009 Duvall Model.

Trip rates for residential areas range from 0.69 to 0.90 depending on the dwelling unit category. Trip rates for employees range from 1.20 to 6.00 depending on the employee classification. Detailed trip generation rates by trip type are included in Table 2.

Table 2. Trip Generation Rates

		Productions[2]					Attractions[3]				
Code[1]	Total	HW	WH	HO	OH	NHB	HW	WH	HO	OH	NHB
SFDU	0.69	0.01		0.23				0.27		0.18	
MFDU	0.90	0.02		0.30				0.38		0.20	
NRC	1.25		1.04		0.06	0.03			0.02		0.10
Manuf	1.50		0.74		0.08	0.02	0.03		0.16		0.47
Retail-Low	1.97		0.20		0.40	0.31	0.04		0.32		0.70
Retail-High	6.00		0.61		1.21	0.94	0.13		0.97		2.14
FIRE	1.52		0.94		0.11	0.16	0.02		0.09		0.20
Edu	1.24		0.41		0.09	0.06	0.03		0.20		0.45
Med	4.25		1.95		0.62	0.11	0.08		0.61		0.88
Office	1.20		0.84		0.08	0.04	0.01		0.07		0.16
GOV	1.50		0.88		0.05	0.07	0.01		0.12		0.37
XI-O	1.00	0.03	0.30	0.10	0.24	0.33					
IX-D	1.00						0.03	0.30	0.35	0.18	0.14

Source: Transpo Group, 2016

1. Code represents the land use category. See Table 1 for land use definitions and units.
2. Productions represent trip origins, meaning where trips begin during weekday PM peak hour. This is slightly different to the generic model definition of productions (trips generated by residential land uses only).
3. Attractions represent trip distributions, meaning where trips end during weekday PM peak hour. This is slightly different to the generic model definition of attractions (trips generated by employment land uses only).

3.3 Trip Distribution

Trips are distributed between TAZs using the "gravity" model, which is incorporated into the Visum software. This gravity model is built on the theory that, all else being equal, the attraction between two masses will be proportional to the size of the masses and inversely proportional to the distance between the masses. In the travel demand model, the number of trips in a TAZ is used to reflect the size of the mass, and route travel time is used to reflect the distance factor in the gravity model.

The gravity model has parameters to adjust these relationships for each trip purpose. Simply put, these parameters influence average trip lengths of each trip type. In the Duvall Model, the "Combined" utility function controls the impact of the distance factor in the gravity model. In equation form, the function is f(U) = a*(Ub)*(ecU) where U is travel time between zones.

Congested travel times are used for distributing trips. The parameters differ by trip type as shown in Table 3 and are based on guidance in NCHRP 716 Travel Demand Forecasting: Parameters and Techniques (TRB, 2012).

Table 3. Gravity Model Distribution Parameters

	Distribution Function Parameter		
Trip Type	a	b	c
Home-to-Work (HW)	100	-0.30	-0.125
Work-to-Home (WH)	100	-0.30	-0.125
Home-to-Other (HO)	100	-0.70	-0.10
Other-to-Home (OH)	100	-0.70	-0.10
Non-Home Based (NHB)	100	-0.60	-0.10

Source: Transpo Group, 2015

Trip distribution in the Duvall Model assigns productions (origins) to attractions (destinations) for PM peak hour trips, which creates origin-destination matrices. These origin-destination matrices are used directly in the model trip assignment steps.

3.4 Externals

External TAZs account for trips which start and/or end outside the model study area. The Duvall Model has 7 external TAZs. Trip generation for these TAZs is based on the following data sources:

- Current daily traffic volumes
- Historical traffic volumes
- Land use growth forecasts

Existing and forecasted external trips were converted to either productions or attractions by trip type in the trip generation process. Trips from both internal and external TAZs were then distributed according to the gravity model process. External-to-external trips were estimated separately, and were influenced by past Origin-Destination surveys in the area. The externals forecasts in the Duvall Model are very sensitive to the city land use forecasts and would need to be updated if land use forecasts changed significantly.

3.5 Mode Choice

Trip generation procedures produce vehicle trips directly from land use inputs. The conversion of daily person trips to vehicle trips by trip type is built into the trip generation rate.

3.6 Time-of-Day

Trip generation procedures produce weekday PM peak hour trips directly from land use inputs. The conversion of daily person trips to weekday PM peak hour trips by trip type is built into the trip generation rate.

3.7 Traffic Counts

Existing traffic counts are significant in the development of the model because they directly account for existing travel demands. These existing volume inputs are used in key metrics that determine the validation and reasonableness of the existing year model. Local and regional roadway counts (daily and hourly) were obtained from local agencies and WSDOT and represent year 2013 or later.

Chapter 4. Travel Supply Inputs

Travel supply inputs relate to any elements that process trips on study area roadways. Overall network structure is explained as well as link and node types. Volume-delay relationships for various link and nodes types are also discussed.

4.1 Existing Street Network

The street network models the available travel supply. In the travel demand model, the street network is composed of links (roadways segments) and nodes (intersections). At the nodes, capacities at turns (turning movements) are used to represent basic traffic control constraints. Travel demand enters and exits the street network at nodes called TAZ centroids. These centroids are connected to the network with links called connectors.

In the Duvall Model, the scope of the street network includes most major roads in the City of Duvall and nearby areas. Street alignments and attributes of the existing street network (such as posted speeds, lanes, and traffic controls) were obtained from GIS data sources and field observation in spot areas. Visum software allows direct integration with available GIS information. A map of the network is shown in Figure 1.

4.2 Future Baseline Street Network

Adapted from the existing street network, the future baseline street network typically includes various planned, programmed, or otherwise committed network improvements. As part of the Duvall Model development and planning process, the following future 2035 baseline network improvements were assumed.

- Extend 1st Avenue NE north to NE Cherry Valley Road.
- Connect 275th Ave NE to Manion Way NE (NE 175th Street)
- 1st Avenue NE connection between NE 145th Street and NE 143rd Street
- 265th Avenue NE (approximate) connection between NE 143rd Street and NE Big Rock Road
- 3rd Avenue NE connection between NE 143rd Street and NE Big Rock Road
- 273rd Avenue NE connection between NE 143rd Street and NE Big Rock Road
- Upgrade capacity at Wood-Duvall Road/SR 203 signal
- New signal at NE 145th Street/SR 203
- New roundabout at NE Big Rock Road/3rd Avenue NE

The Duvall Model is only sensitive to projects that make major changes to roadway capacities, roadway posted speeds, and intersection traffic controls. Projects with minor capacity changes or related only to safety, maintenance, and non-motorized facilities are not applicable for Duvall Model scenarios.

4.3 Link Types

Link types are used to define the basic roadway attributes assumed by the model. Specific link capacities are assigned to each link type based on access control type, posted speeds, restricted vehicle modes, and number of lanes. For consistency and quality control purposes, the Duvall Model automatically updates link speeds and capacities based on a link type lookup table (when the model runs). This

reduces the risk for link attribute errors in the model. The link type lookup table is provided in Appendix A.

4.4 Node Types and Turn Capacities

Similar to link types, node types are used to define basic intersection control types. These types account for most basic types of intersections. These node types set the assumed turn capacities and basic turn delays from the major and minor approaches. Specific turn capacities are assigned to each node type, based on whether the intersection is uncontrolled, stop-controlled, or controlled with a traffic signal or roundabout.

For consistency purposes, the Duvall Model automatically updates capacities and base delays of turns based on the node type. This reduces the risk for model coding error, and reduces the effort in maintaining the model. Node type descriptions are included in Appendix A.

4.5 Volume-Delay Functions

Volume-delay functions dictate the level of delay along roadways or at intersections as traffic volumes approach network capacity. In other words, they calculate traffic congestion.

Volume-delay functions were used to calculate both link (roadway) delays and turn (intersection-related) delays.

In the Duvall Model, link delays were calculated with "Conical" functions and generally follow the characteristics outlined below:

- Freeway Links. Congested speeds remained at freeway speeds until approximately 80 percent of capacity. At 90 percent, speeds drop close to 45 mph. At capacity, speeds represent stop and go conditions (about 30 mph).
- Non-Freeway Links. At 80 percent of capacity, congested speeds drop to about 60 to 70 percent of free-flow speeds. At capacity, congested speeds drop to about 30 to 35 percent of free-flow speeds.

In the Duvall Model, base turn delays were assigned to each turn based on intersection type. Additional turn delays were calculated with the "TModel Nodes" function. This function is sensitive to the volume-to-capacity ratios at the turning movement level. Characteristics of this function parameter set include:

- At 50 percent of turn capacity, additional delays are less than 5 seconds per vehicle.
- At 80 percent of capacity, additional delays are approximately 30 seconds per vehicle.
- At capacity, additional delays are approximately 75 seconds per vehicle.

4.6 Other Inputs

Multipoint assignment (MPA) was used for several TAZs in the Duvall Model. MPA refers to assigning a specific percentage of travel demand to a connector for TAZs that have multiple connectors, rather than allowing the shortest path to the centroid dictate connector traffic. However, the default setting for each TAZ is to not use MPA unless it is needed.

Chapter 5. Validation and Reasonableness Checks

The process of model validation and reasonableness checks confirms if the model building blocks, if correctly applied, reasonably predict real world travel patterns and is valid for forecasting and other transportation planning purposes. Several statistics were reviewed that were associated with screen line volumes and individual link volumes. Distribution and trip generation characteristics were reviewed using various checks.

5.1 Screen Line Analysis

Screen lines (a boundary line which identifies all links between two areas) were defined to compare model travel patterns to actual travel patterns between two areas. Screen line locations for each county model are shown in Figure 2.

Table 4 shows the screen line results for the Duvall Model. Percent difference maximums vary by volume and are based on guidance from *Travel Model Validation and Reasonableness Checking Manual* (FHWA, 2010), but generally anything less than 22 percent is acceptable.

Table 4. Screen Line Results

	Southbound / Eastbound [1]			Northbound/ Westbound [2]			Both Directions		
	Model[3]	Count[4]	Diff[5]	Model	Count	Diff	Model	Count	Diff
East of SR 203 (South)	728	625	16%	419	420	0%	1147	1045	10%
East of SR 203 (North)	569	505	13%	342	425	-20%	911	930	-2%
EW Central	759	865	-12%	890	985	-10%	1649	1850	-11%

1. Volumes crossing screenline going southbound or eastbound
2. Volumes crossing screenline going northbound or westbound
3. Represents the sum of all model volumes crossing the screen line in that direction
4. Represents the sum of all count volumes crossing the screen line in that direction
5. Represents to percent difference between the count and model volumes. Percent difference maximums vary by volume and are based on guidance from *Travel Model Validation and Reasonableness Checking Manual* (FHWA, 2010), but generally anything less than 22 percent is acceptable.

As shown in Table 4, all screen lines performed within an acceptable difference of 22 percent, based on recommendations in the FHWA Manual. Given overall model travel patterns, these results were considered acceptable.

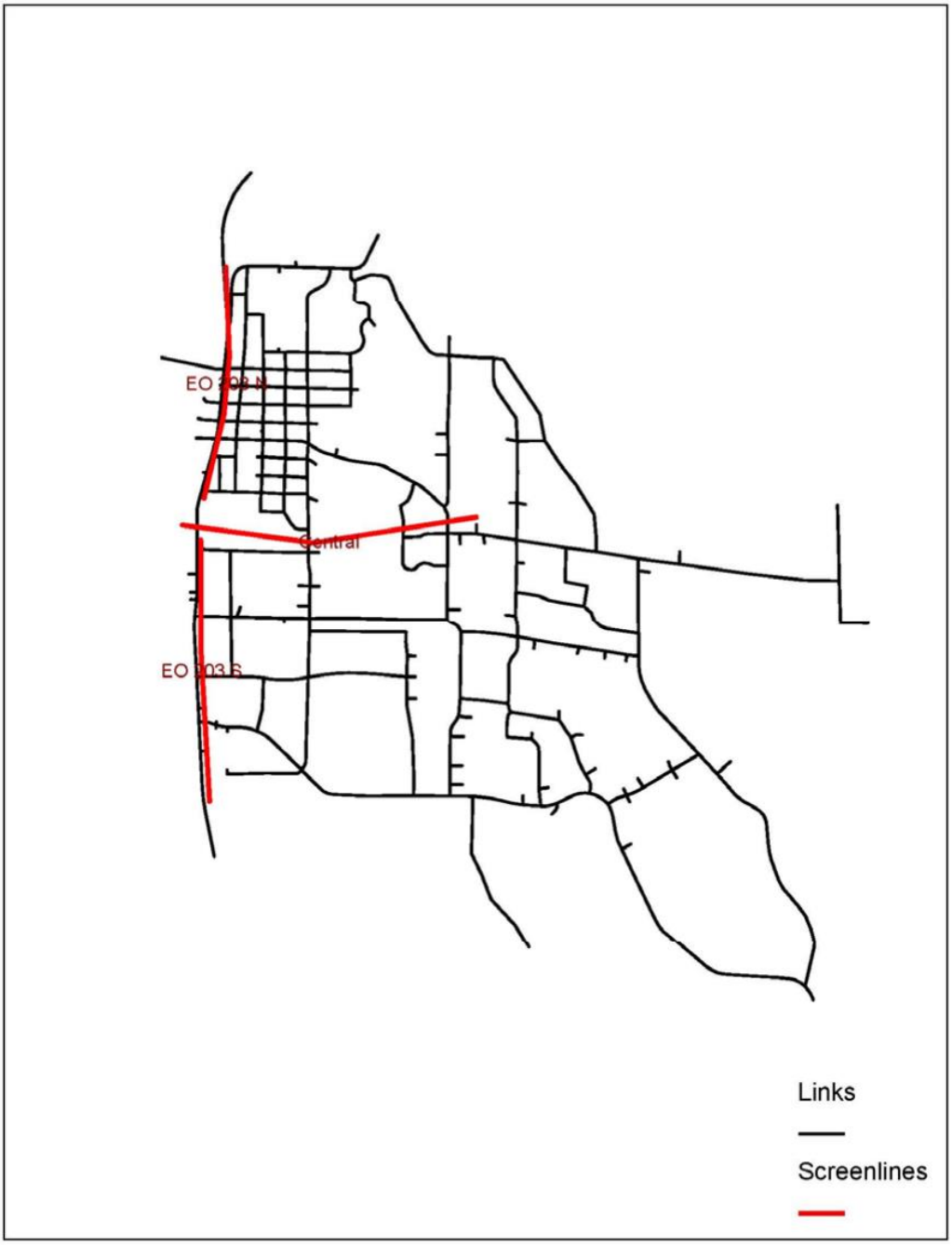


Figure 2: Screen Lines in Duvall Model

5.2 Link Volume Analysis

The analysis of roadway link volumes compares roadway model volumes to actual traffic counts, by direction, for all locations where actual traffic counts are provided. Two common link volume statistics were reviewed to evaluate the model validity: Percent Root-Mean- Square-Error (RMSE) and R-squared or "goodness of fit".

Percent RMSE was calculated by roadway group to understand model behavior on key facilities. Percent RMSE is essentially the average of all the link-by-link percent differences— a good statistic to understand percent difference variability on links of a particular functional class. Table 5 shows the percent RMSE results for the different roadway groups during each respective time period. Generally, results below 40 percent RMSE are considered acceptable.

R-squared indicates how well the model volumes represent the actual traffic counts. If model volumes exactly matched the actual counts, the R-squared value would be 1.00. For the Duvall Model, the overall R-squared value was 0.96, which is better than the maximum 0.88 suggested in the Travel Model Validation and Reasonableness Checking Manual (FHWA, 2010).

Table 5. Link Volume Statistics

	RMSE[1]	R-squared[2]	Difference[3]
State Routes	13%	0.82	9%
Arterial Streets	16%	0.93	12%
Collector Streets	34%	0.81	26%
Other Streets	36%	0.82	30%
Total	21%	0.96	14%

1. Percent Root-Mean-Square-Error (RMSE) refers to the percent difference on an average link-by-link basis.
2. R-squared indicates how well the model volumes represent the actual traffic counts. If model volumes exactly matched the actual counts, the R-squared value would be 1.00.
3. Refers to the percent difference on a total volume basis (sum total of all links).

Based on the data shown in Table 5 the Duvall Model link-by-link variability (Percent RSME and R-squared) was considered acceptable. Maximums were established based on guidance from FHWA (*Travel Model Validation and Reasonableness Checking Manual*, FHWA, 2010). The link analysis scatterplot is shown in Figures 3.

5.3 Distribution Checks

Distribution checks relate to how the model is distributing and assigning trips through the model. The following types of distribution checks were performed.

5.3.1 Average Trip Lengths

In large area travel demand models, the average trip lengths for the main trip types are compared back to regional travel survey results. In the Duvall Model, the geographic extents are too small to compare back to typical survey results. It is still useful to confirm that commute trips are longer than the typically short non-home based trips.

The average trips lengths were compiled for the main trip types: home-based work (HBW) which is composite of HW and WH trips; home-based other (HBO) which is composite of HO and OH trips; and non-home based (NHB). For the Duvall Model, average trip lengths were 4.2, 4.2, and 2.6 minutes for the HBW, HBO, and NHB trips, respectively. These average trip lengths are acceptable given the geographic extents of the model and the location of land uses.

5.3.2 Select-Link and Select-Zone Analysis

Select-link and select-zone refers to isolating a roadway or TAZ and flagging only those trips on the model network that are associated with that link or zone. This can identify problems with trip generation, trip distribution, and/or trip assignment model parameters. Select-link and select-zone analysis was performed at key roadways and TAZs to test the reasonableness of the model. This included major bridges, external TAZs, and major employment centers. In addition, select-link analysis was compared to past Origin-Destination surveys for major roadways in the Duvall area.

For the Duvall Model this process resulted in adjustments to external distribution parameters and improved network coding (nodes, links, and centroid connectors).

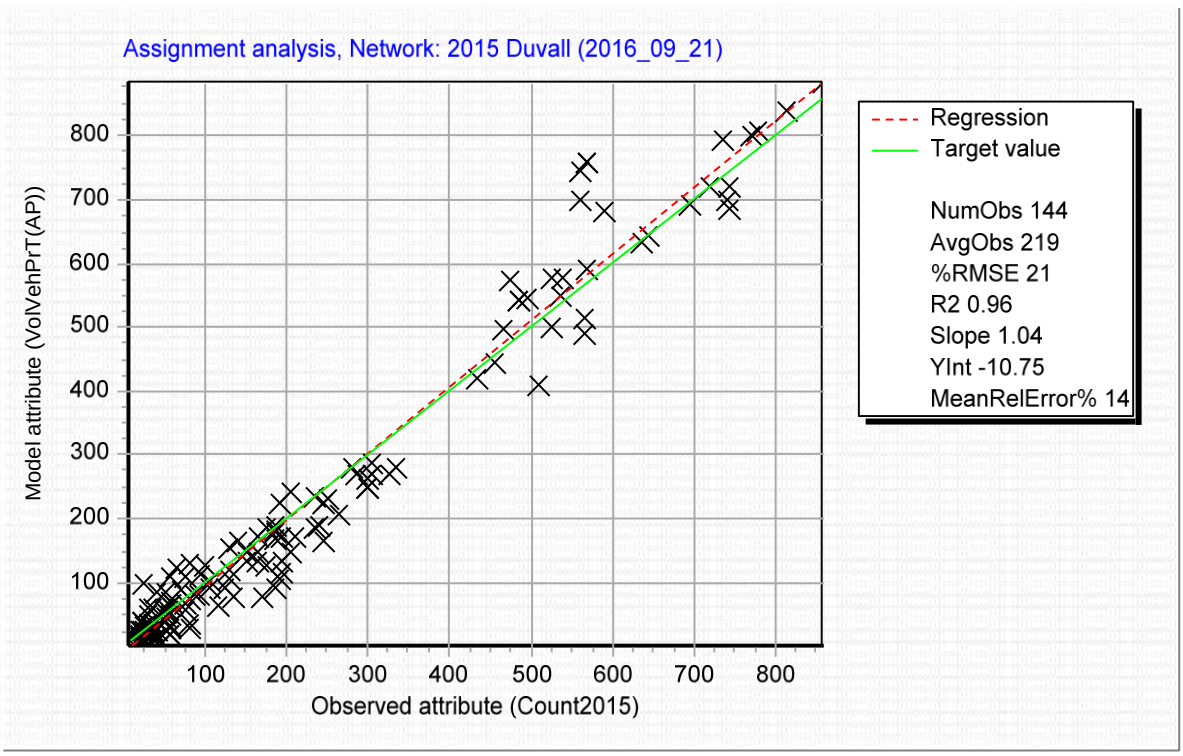


Figure 3: Link Analysis Scatterplot

Appendix A: Link and Node Types

Table 1: Link Type Descriptions

Link Type	Description	Number of Lanes (per direction)	Capacity (vehicles per hour)	Speed (mph)
1	Blocked	0	0	0
2	Freeway (60mph, 2ln per dir)	2	3,600	60
3	Freeway (60mph, 3ln per dir)	3	5,400	60
4	Freeway (60mph, 4ln per dir)	4	7,200	60
5	Freeway (60mph, 5ln per dir)	5	9,000	60
6	Freeway (60mph, 6ln per dir)	6	10,800	60
7	Freeway (70mph, 2ln per dir)	2	3,600	70
8	Freeway (70mph, 3ln per dir)	3	5,400	70
11	Ramps (45mph, 1ln per dir)	1	1,500	45
12	Ramps (45mph, 2ln per dir)	2	3,000	45
13	Ramps (45mph, 3ln per dir)	3	4,500	45
14	Ramps (35mph, 1ln per dir)	1	1,200	35
15	Ramps (35mph, 2ln per dir)	2	2,400	35
16	Ramps (35mph, 3ln per dir)	3	3,600	35
17	Ramps (25mph, 1ln per dir)	1	1,200	25
18	Ramps (25mph, 2ln per dir)	2	2,400	25
19	Ramps (25mph, 3ln per dir)	3	3,600	25
20	HOV (55mph, 1ln per dir)	1	1,600	55
21	HOV (55mph, 2ln per dir)	2	3,200	55
22	Non-Freeway (55mph, 2ln)	1	1,600	55
23	Non-Freeway (55mph, 3ln)	1	1,700	55
25	Non-Freeway (55mph, 5ln)	2	3,000	55
26	Freeway (55mph, 2ln per dir)	2	3,600	55
27	Freeway (55mph, 3ln per dir)	3	5,400	55
28	Freeway (55mph, 4ln per dir)	4	7,200	55
29	Freeway (55mph, 5ln per dir)	5	9,000	55
32	Non-Freeway (50mph, 2ln)	1	1,600	50
33	Non-Freeway (50mph, 3ln)	1	1,700	50
35	Non-Freeway (50mph, 5ln)	2	3,000	50
40	HOV (45mph, 1ln per dir)	1	800	45
42	Non-Freeway (45mph, 2ln)	1	1,350	45
43	Non-Freeway (45mph, 3ln)	1	1,500	45
44	Non-Freeway (45mph, 4ln)	2	2,700	45
45	Non-Freeway (45mph, 5ln)	2	3,000	45
47	Non-Freeway (45mph, 7ln)	3	4,500	45
50	HOV (40mph, 1ln per dir)	1	800	40
52	Non-Freeway (40mph, 2ln)	1	900	40
53	Non-Freeway (40mph, 3ln)	1	1,100	40
54	Non-Freeway (40mph, 4ln)	2	1,650	40
55	Non-Freeway (40mph, 5ln)	2	2,200	40
57	Non-Freeway (40mph, 7ln)	3	4,500	40
60	HOV (35mph, 1ln per dir)	1	800	35
62	Non-Freeway (35mph, 2ln)	1	900	35
63	Non-Freeway (35mph, 3ln)	1	1,100	35
64	Non-Freeway (35mph, 4ln)	2	1,650	35
65	Non-Freeway (35mph, 5ln)	2	2,200	35
67	Non-Freeway (35mph, 7ln)	3	3,300	35
68	Non-Freeway (35mph, 8ln)	4	4,500	35
70	HOV (30mph, 1ln per dir)	1	800	30
72	Non-Freeway (30mph, 2ln)	1	900	30
73	Non-Freeway (30mph, 3ln)	1	1,100	30
74	Non-Freeway (30mph, 4ln)	2	1,400	30
75	Non-Freeway (30mph, 5ln)	2	2,000	30
80	HOV (25mph, 1ln per dir)	1	800	25
82	Non-Freeway (25mph, 2ln)	1	550	25
83	Non-Freeway (25mph, 3ln)	1	825	25
84	Non-Freeway (25mph, 4ln)	2	900	25
85	Non-Freeway (25mph, 5ln)	2	1,300	25
90	HOV (60mph, 1ln per dir)	1	1,600	60
91	HOV (60mph, 2ln per dir)	2	3,200	60
92	Non-Freeway (20mph, 2ln)	1	350	20
93	Non-Freeway (20mph, 3ln)	1	550	20
99	Connector	1	99,999	25

Source: Transpo Group

Node Type Descriptions

Node Type	Description
1	*Shape node (no delay)*
5	TWSC (uses node delay, in addition to turn delay)
10	AWSC
20	Roundabout[1]
30	Traffic Signal[2]

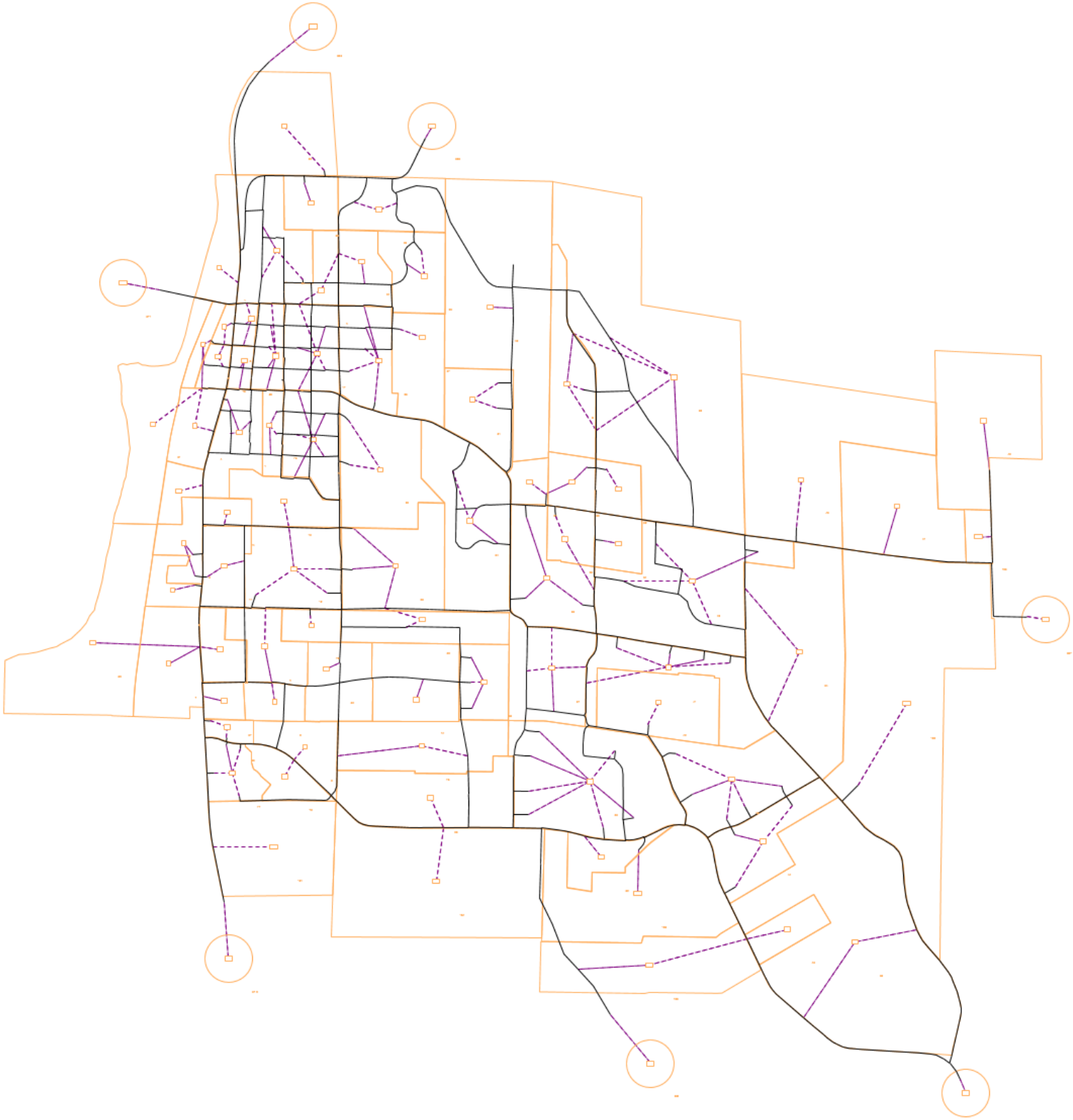
Source: Transpo Group

1. Roundabout default capacities reflect single-lane roundabout
2. Traffic signal default capacities reflect unbalanced major-minor volumes, and single left-turn lanes

Turn Capacities and Delays based on Node Types

	Turn Capacities (vehicles per hour)						*Initial Turn Delay*					
	(seconds) Major Approach						*Minor Approach*			*Major*		
	Approach			*Minor Approach*								
Node Type	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
1	99999	99999	99999	99999	99999	99999	0	0	0	0	0	0
5	800	99999	99999	800	500	500	5	2	5	15	15	8
10	500	500	500	500	500	500	15	15	15	15	15	15
20	800	800	800	800	800	800	5	5	5	5	5	5
30	300	2800	1000	300	1000	500	12	3	6	15	5	8

Source: Transpo Group

NOTE: Use the turn attribute "TurnCapFactor" to manually adjust any of the above default turn capacities.

Appendix B: Detailed TAZ Map