Lynn Valley Town Centre
Transportation Study
2013

In 2013, Urban Systems consultants completed a comprehensive Transportation Study for Lynn Valley Town Centre. The study assessed worst case scenario of development-generated traffic in the peak hour in the year 2030. **Based on the outcome of the study, the District is confident that there is a sound transportation plan for the area for the coming years.**

Key findings:

- The Lynn Valley Transportation study identified opportunities for enhanced traffic operations through better lane continuity and an improved grid network. With the planned improvements, the overall network is expected to experience minimal additional delay. Under the worst case scenario of development in 20 years, no operational issues are expected for any intersections within the area. For the average trip in the Town Centre area, the **total increase in delay per vehicle would be less than 30 seconds in the worst case scenario in 20 years**.

- As a result of signal operation improvements, lane continuity, removal of turning restrictions, and overall circulation enhancements, **safety benefits at intersections** are anticipated.

- The proposed land use changes enable **improvements for active and healthy transportation**. The study identified opportunities for **new walkways and improved facilities for cyclists** of all ages and abilities, including a separated two-way cycle track along E 27 Street and bike lanes on the high street.

- The North Shore Area Transit Plan identifies **future frequent transit corridors** serving the Town Centre. To support these transit improvements, the study identifies a multimodal on-street transit exchange on 27th Street.

- The study is based on the **conservative assumption** that 20 percent of trips will be made by walking, cycling and transit (consistent with the 21 percent of trips by walking, cycling and transit across the District of North Vancouver). The actual proportion of people that choose to walk, cycle or take transit will likely be higher because of the quality of the pedestrian and cycling infrastructure in the Town Centre.

- **Parking** levels would be matched with demand and generally provided underground. On-street parking would also be available to support vibrant retail.

- Each development will be responsible for establishing a **construction management plan** to minimize the impacts of development on traffic in the area.

A full copy of the study follows.

URBAN systems

REPORT

District of North Vancouver

Lynn Valley Town Centre

Transportation Assessment

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2013

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Contents

Executive Summary

In June 2011, the District of North Vancouver adopted a new Official Community Plan (OCP), with a vision of establishing a 'network of centres' to manage expected growth over the next 20 years. Lynn Valley Town Centre, a deep-rooted community within the District, has been identified as one of two designated Town Centres within the OCP. With steady growth anticipated over the next two decades, the OCP calls for a revitalization of Lynn Valley Town Centre that will increase residential density, while providing more pedestrian-friendly roadways and housing options that maintain and enhance the community's overall vibrancy. This revitalization is possible only through redevelopment, which will make land and funds available for key improvements. Prior to approval of any future development projects, the Lynn Valley Town Centre Transportation Assessment was a necessary step to further understand the implications of such development on the transportation network, a vital component of any vibrant community.

The Lynn Valley Town Centre Transportation Assessment examines existing contexts, including roadway characteristics and an analysis of existing conditions. The analysis creates a better understanding of existing network deficiencies. Through this understanding, existing network issues and the resulting impacts can be mitigated.

Furthermore, a snapshot of Lynn Valley Town Centre by 2031 has been developed and included within this assessment. Future growth and land use as well as eight (8) mobility network policies, as described in the OCP, have been outlined for reference. Some of the benefits within this snapshot include a more walkable environment within a safe transportation network with strong connectivity, the establishment of a new pedestrian and vehicle oriented street within the core of the Town Centre, and opportunities for improvements to parking. Other plans and studies that will influence future transportation in Lynn Valley, including the North Shore Area Transit Plan, the District of North Vancouver Transportation Plan, and the North Vancouver Bicycle Master Plan have been considered and summarized to include relevant highlights complimentary to this report.

Building on the vision for the future, an assessment of future conditions was completed for two separate timelines, a 20-year horizon and an unlimited horizon, which will account for additional development not anticipated within the 20-year timeframe of the OCP. Future traffic forecasts indicate that the increase in new vehicle trips due to redevelopment will be small and may be further mitigated by increasing internal trips and non-auto mode share. These are both expected to increase over time as a result of a more vibrant, pedestrian focused Town Centre, with minimal impacts to its users. In line with the North Shore Transit Plan, an assessment of future transit needs shows an outlook of improved transit exchanges with more frequent service as well as better connectivity east and west. As identified within the OCP, the ability for the District to increase sustainable forms of transportation will result in a more liveable Town Centre. As a result, the transportation study has carefully considered the future needs of both pedestrians and cyclists in order to enable a safer environment for users of all ages and skill levels.

Also identified in this report are a number of guiding principles that will further improve accessibility for pedestrians, cyclists, transit users, and motorists. These guiding principles help inform improvement options, ultimately transforming Lynn Valley Town Centre into a complete community where people want to live, work, and play. The guiding principles align well with the final recommendations, included in

summary, of the impact future development will have on area residents over the next 20 years and beyond. A brief summary follows.

Impact of future growth on pedestrians could include:

- More walkable neighbourhoods,
- Improved connectivity and well designated spaces for pedestrians,
- Wider sidewalks,
- A new residential corridor within the core of the Town Centre,
- A safer, more comfortable walking environments for residents of all ages and mobilities, and
- A reduction in intersection crossing distances.

Impact of future growth on cyclists could include:

- Improved facilities for cyclists of all ages and abilities,
- A separated two-way cycle track along an important connection for area cyclists,
- Improved connectivity for cyclists traveling east-west,
- Decreased travel time and distance, and
- Clear signage that will help to direct users to their intended destinations.

Impact of future growth on drivers could include:

- An improved grid network that will lessen the impacts on the road network as vehicle trips increase,
- Continued access for commercial industries,
- New roadways to improve circulation,
- Safer intersection operations,
- Minor increase in travel time for some vehicle trips with all intersections operating at an acceptable level of service
- Minimal delays to through traffic on Mountain Highway and Lynn Valley Road, and
- Parking improvements.

Impact of future growth on transit users could include:

- Improved service, including increases in frequency and routes, for an exceptional overall experience, and
- Improved accessibility resulting in an increase in ridership.

With all change and growth cultivates a need to better understand the surrounding area and how certain regeneration will impact others. The report has considered the impact of future development on the residents who call the District of North Vancouver home and how best to mitigates any potential impacts. The recommended changes are expected to provide a better function while balancing the needs of both vehicular traffic and other sustainable modes of transportation now and into the future.

1.0 Introduction

1.1 Lynn Valley

Lynn Valley Town Centre is a long-established community in the District of North Vancouver, located amongst a beautiful, natural setting. In the core of the community there are retail establishments and civic uses, including the new Lynn Valley Main Library. In 2011, District of North Vancouver Council adopted a new Official Community Plan (Bylaw 7900). This OCP establishes a 'network of centres' to manage growth within a defined urban structure over the next 20 years. Lynn Valley Town Centre is one of two Town Centres identified in the OCP and is the designated Municipal Town Centre under the *Metro Vancouver 2040: Shaping Our Future (2011)* Regional Growth Strategy. In particular, the OCP calls for the revitalization of the Lynn Valley Town Centre and provides land uses that increase residential density, making the community more pedestrian-oriented, vibrant and with more housing choices.

1.2 Project Rationale

Before development projects are approved under the scope of the new OCP, the implications on the transportation network must first be well understood. As such, a major component of the Transportation Study has been to examine the future transportation conditions that are anticipated as a direct result of future land use plans. Once the impacts of the land use changes on the transportation system were identified, required multi-modal transportation improvements were developed in consultation with the District of North Vancouver.

In addition to land use and density projections, the Transportation Study required an update to the existing Synchro model, local area traffic projections and the development of a new Synchro model. The project included an assessment of alternative modes and planning for transit stops, pedestrian, and cycling connectivity. Goods movement access and internal study area configuration were also considered. Finally, a number of alternatives for various segments of the transportation network were developed and assessed. The recommended scenario is a transportation network that accommodates growth while supporting mobility for all modes.

The overall purpose of this study is to ensure that the community's vision for a vibrant and complete Town Centre is upheld. The functionality of the transportation network is a major factor in achieving this objective.

1.3 Report Outline

This report is divided into eight sections that describe the study processes, analysis, and recommendations. The sections are as follows:

1. **Introduction**
2. **Scope of Work**: Description of the approach to the study, including the area and time horizons considered.
3. **Existing Context**: Summary of the existing pedestrian, cycling, transit, and road networks, including analysis of existing intersection operations.

4. **Lynn Valley Town Centre by 2031**: Presentation of the anticipated growth and land use patterns based on the OCP. The vision for Lynn Valley is summarized along with the planned transportation network for all modes.
5. **Future Conditions Assessment**: Summary of forecast conditions for the roadway network and analysis of roadway operations. Description of future transit, cycling, and pedestrian needs.
6. **Guiding Principles**: Identification of the guiding principles that informed the design. These principles are based on the vision and conditions outlined in previous sections.
7. **Recommendations by 2031**: Presentation of the recommended transportation network for 2031 and beyond.
8. **Conclusion**

2.0 Scope of work

2.1 Deliverables

In pursuing the objectives of this Transportation Study, two major deliverables have been completed by the consulting team with guidance from the District. These deliverables include:

1. The traffic model, to provide developers with assistance in identifying development impacts and solutions that will mitigate these impacts.
2. The recommended improvements to the transportation network, illustrated in plan view, with cross-sections showing laning, road classification, traffic control, bus stops, parking, cycling and pedestrian accommodation, as well as other road elements.

2.2 Time Horizon

The scope of the Transportation Study includes two future horizons, one for 2031 (20 year horizon) and one for full build-out, which would occur in the future after 2031 (ultimate horizon). The timing of the ultimate horizon is unknown and would be subject to future assessment of long term market conditions. The purpose of modelling two future horizons is to assess the impact on the transportation network of a partial mall redevelopment (within the timeframe of the OCP) and the impact on the network when the remainder of the mall redevelops (anticipated at some point after 2031). One analysis period (P.M. peak hour) was used to assess impacts. The A.M. peak hour impacts are estimated at a high level by comparing trip generation rates to the P.M. peak. This provides a rough gauge of the difference between the two peaks.

2.3 Study Area

The Transportation Study addresses the road network surrounding the Lynn Valley Town Centre area. The Town Centre area, as identified in the Official Community Plan, is shown in Figure 2-1**.**

Figure 2-1: *Lynn Valley Town Centre*

2.4 Analysis

In order to achieve the vision of a vibrant, mixed use centre with sustainable modes of transportation (walking, cycling, transit), a balance must be achieved between accommodating vehicular traffic and supporting these sustainable modes. Because of these diverse objectives, it was determined that traditional measures of effectiveness, such as level of service and volume to capacity ratios, do not necessarily indicate whether the transportation network will meet future needs. This is especially important for the internal road network in the Study Area because the community's vision is for a pedestrian, cycling and transit-friendly, vibrant mixed use centre. Achieving this vision may result in an internal network with reduced vehicular capacity. Along the adjacent arterial and collector roads, the priority is to maintain lower delays and limit queues. Traditional measures of effectiveness and analysis tools were used to measure changes in mobility along these corridors.

In keeping with the vision for the Lynn Valley Town Centre and the analysis boundaries described above, the Study Area intersections were divided into two categories:

1. **Connectivity intersections**: these intersections are important for connectivity within the broader road network. The analysis includes turning movement forecasts and assessment in Synchro.

Analysis is completed for the 2031 build-out scenario (i.e. with upper shopping mall site not redeveloped, and using design concept road network) and for an ultimate future build-out (i.e. with upper shopping mall site redeveloped and OCP road network).

2. **Vision intersections**: it is most important for these intersections to be designed consistently, with the sustainable-mode vision. As described above, analysis tools like Synchro are not an effective tool to determine if these intersections meet their intended purpose. Instead, recommendations are made based on best practices for sustainable modes, urban livability, and the vision for the community.

In Figure 2-2 below, the key connectivity intersections are identified in blue and the vision intersections are highlighted in orange.

Figure 2-2: *Proposed Intersections for Analysis*

3.0 Existing Context

Traffic counts were collected in the autumn of 2012 to confirm existing traffic volumes within the study area. The counts are summarized in Table 3-1.

Table 3-1: Intersection Count Locations

Intersection Location	Count Date
Fromme Road and E 29th Street	September 19, 2012
Mountain Highway and Lynn Valley Road	September 20, 2012
Mountain Highway and E 27th Street	September 25, 2012
Mountain Highway and Ross Road	September 26, 2012
Mountain Highway and Emery Place	September 27, 2012
Mountain Highway and Existing Mall Entrance	October 2, 2012
Fromme Road / E 27th Street and Lynn Valley Road	September 26, 2012
Whiteley Court and E 27th Street	October 3, 2012
Lynn Valley Road and Ross Road	October 4, 2012

Existing traffic count volumes were balanced within the study area to ensure consistency between intersections prior to commencing evaluation of existing traffic conditions. Traffic volumes at some intersections were not available. For connectivity intersections where traffic volumes were not available (including Lynn Valley Road at E 29th Street) were estimated based on the best available information and engineering judgement.

3.1 Roadway Characteristics

The study area road network consists of almost a dozen different streets as summarized in the following table:

Road	Class	Number of Lanes	Existing Transit Service	Existing Bicycle Facilities	Existing Pedestrian Facilities	On Street Parking
Lynn Valley Road (LVR)	Major Arterial	5 lanes – two per direction + left turn lane	Route 228 Route 255 Route 229 (N of 29th St) Bus lay-by on south side of LVR by Main Library	Northbound shared lanes between Molly Nye way and E. 29th Street	Sidewalks on north and south sides	Small pocket of on street parking on south side at Ross Road
Mountain Highway	Major Arterial	3 lanes – one per direction + left turn lane	Route 209 Route 210 Route 255	Northbound and southbound painted bike lanes from E. 27th St to E. 29th St	Continuous Sidewalk on west side. Sidewalk on portions of east side, some on private property.	Small pocket of on street parking on east side north of Lynn Valley Road
E 27th Street	Collector	3 lanes – one per direction + left turn lane	None	None	Sidewalks on north and south sides	On street parking on south side of E 27th Street
Fromme Road (North of LVR)	Collector	2 lanes – one per direction	None	None	Sidewalks on east and west sides	On street parking on east and west sides
Fromme Road (South of LVR)	Local Road	2 lanes – one per direction	None	None	Sidewalk on east side	On street parking on west side
Ross Road (East of Mountain Hwy)	Collector	2 lanes – one per direction	None	None	Sidewalk on south side	On street parking on north and south sides
Ross Road (West of LVR)	Local Road	2 lanes – one per direction	None	None	Sidewalk on south side	On street parking on south side
Whiteley Court	Local Road	2 lanes – one per direction	None	None	Sidewalks on east and west sides	On street parking on east and west sides
E 29th Street (West of LVR)	Major Arterial	2 lanes – one per direction	Route 229	None	Sidewalks on portion of north and south sides	On street parking on north and south sides
E 29th Street (East of Mountain Hwy)	Local Road	2 lanes – one per direction	None	None	None	On street parking on north and south sides
Emery Place / E 24th Street	Local Road	2 lanes – one per direction	None	None	None	On street parking on north and south sides

3.2 Existing Conditions Analysis

Existing traffic volumes were obtained at key intersections in the study area and modeled to identify existing network issues and deficiencies. Traffic operations at key street intersections within the Study Area were evaluated using the Synchro 7 traffic analysis software package. This operational analysis included calculation of volume-to-capacity (v/c) ratios, and predicted delay based Level of Service (LOS) for each traffic movement at each intersection assessed.

At signalized intersections, the v/c ratio is used as a measurement of the traffic congestion for a particular traffic lane, lane group, or entire intersection. Generally, values up to 0.85 are considered appropriate for the intersection and up to 0.90 for individual lanes or lane groups. A v/c ratio of 1.0 or greater indicates that the traffic operation is over-capacity. The traffic LOS indicator ranges from the ideal LOS A condition with minimal or no delay through to the LOS F condition with extensive delay.

For unsignalized intersections, the LOS is based on the estimated average control delay per vehicle for each crucial movement. A control delay less than 10 seconds indicates sufficient capacity and good traffic conditions. A calculated control delay value that is greater than 50 seconds is assigned a LOS F performance measure. Balanced existing traffic volumes at key Study Area intersections are shown in Figure 3-1**.** The results of the Synchro analysis of signalized intersections are shown in Figure 3-2**.** All individual movements at signalized and unsignalized key connectivity intersections operate with LOS D or better and volume to capacity (v/c) ratio less than 0.90.

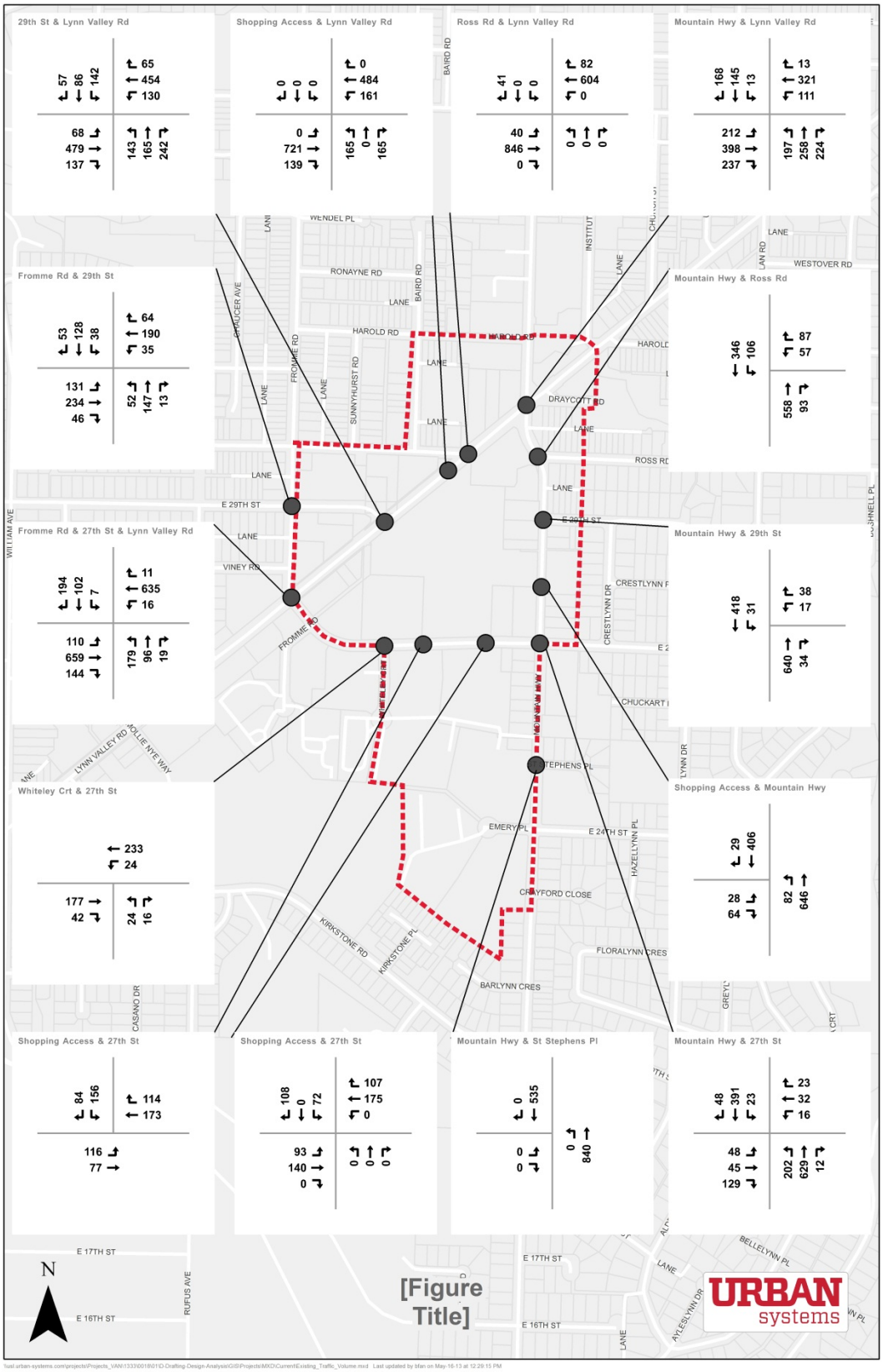


Figure 3-1: Existing traffic volumes (PM Peak)

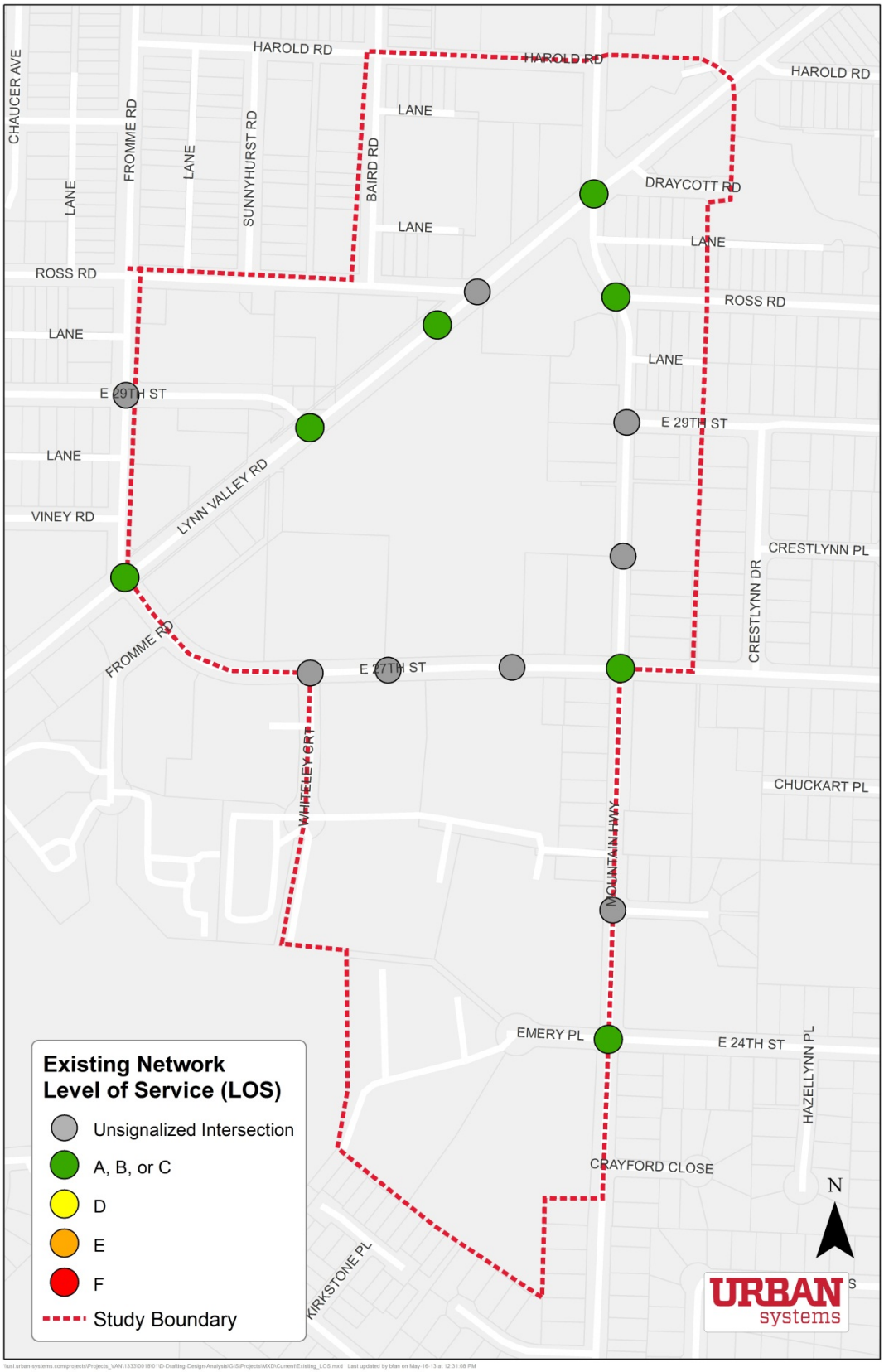


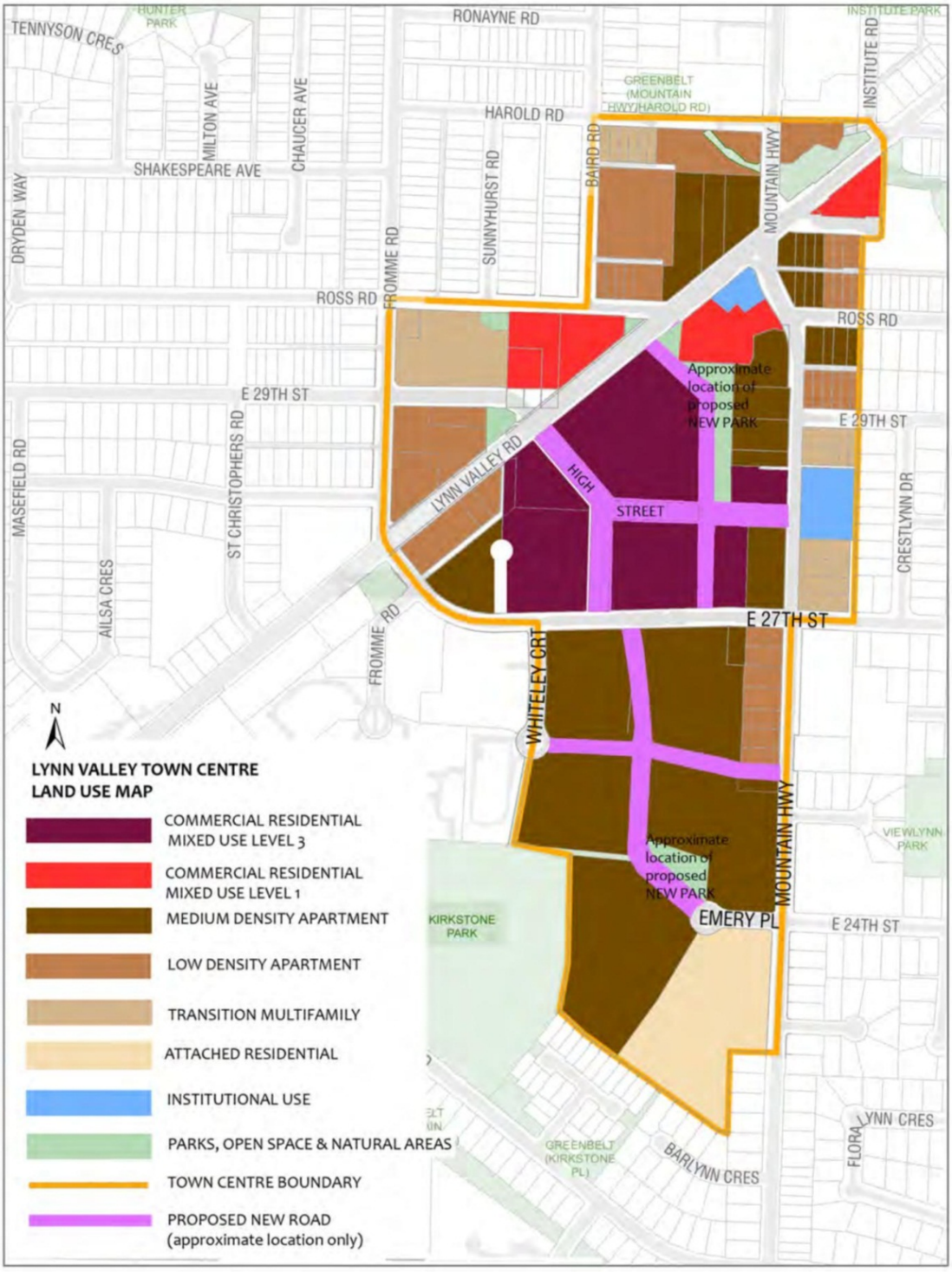
Figure 3-2: Existing traffic level of service (PM Peak)

4.0 Lynn Valley Town Centre by 2031

4.1 Growth and Land Use

The District's Official Community Plan (OCP) was approved by Council in June 2011. The OCP identifies two Town Centres in the District, Lynn Valley and Lower Lynn, both of which will experience growth, development and redevelopment over the next 20 years. Medium and higher densities in Lynn Valley will be located in the core area of the Town Centre and will include commercial, employment, recreational and civic uses as well as approximately 2,500 new residential units by 2031. Because of the growth that is expected, Lynn Valley is also a focus for potential frequent transit service.

According to the OCP, higher densities will be located in the Town Centre core in order to create a walkable environment. Near the outward areas of the Town Centre, the focus will be on ground-oriented multi-family housing. The OCP establishes East 27th Street as a predominantly residential street with the potential for limited retail on the north side. Finally, according to the plan, a gateway to Lynn Valley is to be established at the intersection of Mountain Highway and Lynn Valley Road. The Lynn Valley Town Centre Land Use Map, which also shows the approximate locations of proposed roads, is provided in Figure 4-1**.**



Source: DNV Official Community Plan

Figure 4-1: Lynn Valley Town Centre Land Use Map

The proposed changes in land use for the interim and ultimate horizons are summarized in Table 4-1. These land use changes were used to estimate future traffic in order to complete the future conditions assessment.

Table 4-1: Proposed changes in Study Area land use

	Residential	Gas Station	Commercial
	Units)	(pumps)	(sq ft)
20 Year Horizon			
New development	3,910	-	253,049
Existing to be removed	546	22	238,823
Net development	3,365	(22)	14,226
Ultimate Horizon			
New development	4,633	-	320,062
Existing to be removed	546	22	306,961
Net development	4,088	(22)	13,101

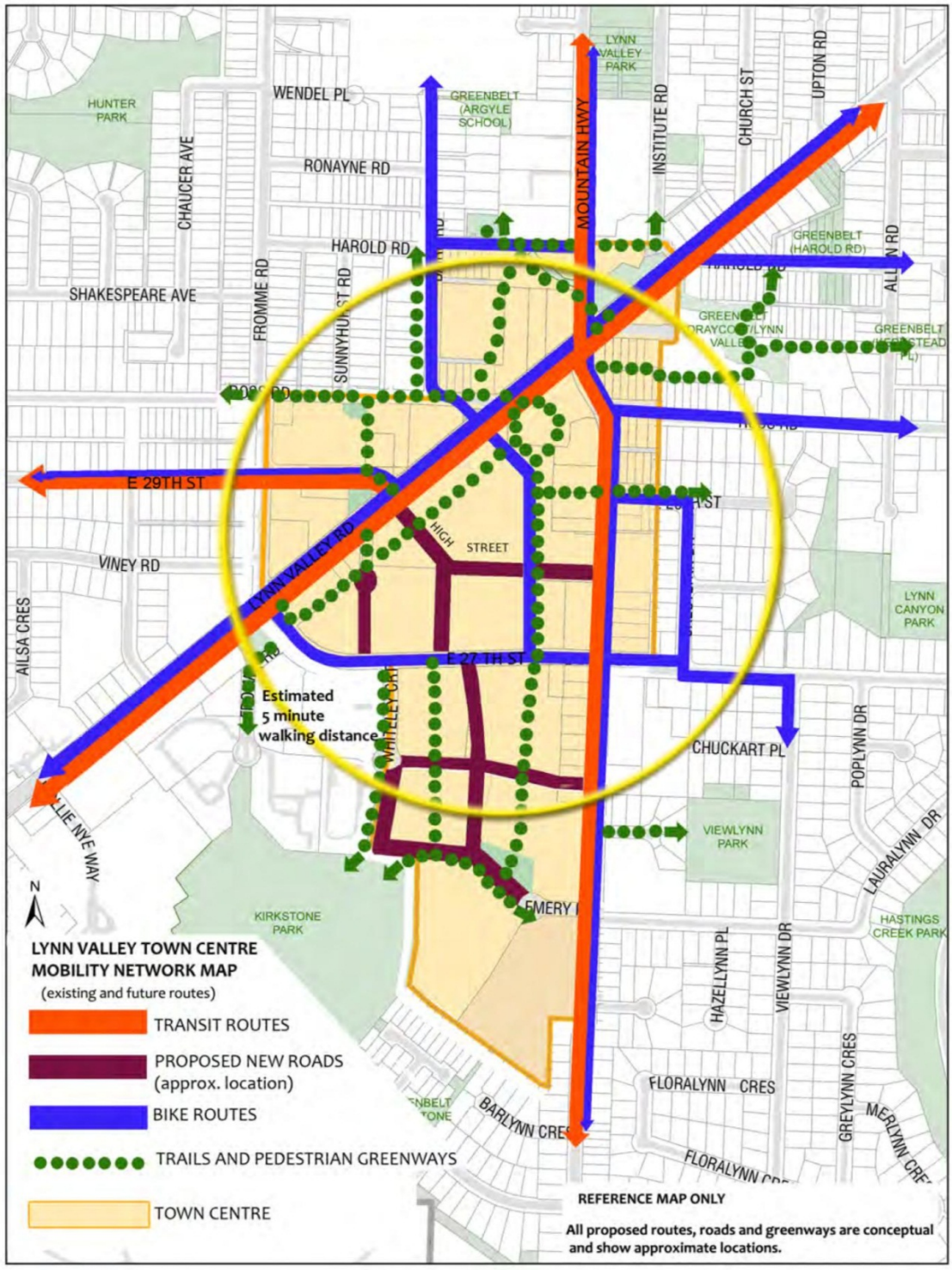
The summary above shows that growth in commercial is expected to increase modestly as commercial uses transition over time from large format retail with no residential to mixed use with the inclusion of residential components, while the number of residential units is expected to grow more significantly within the study area. This will allow for improved neighbourhood and economic vibrancy by increasing the number of residents, pedestrians, cyclists, and local shoppers in the area. At the same time, existing low-density “big box” commercial is expected to be augmented with higher value street-facing commercial along the High Street. For both the residential and commercial space, existing land uses that are high trip generators per unit are being replaced with more sustainable land use that typically generates fewer trips per unit. This type of development also typically results in a higher mode share for walking, cycling, and transit and a lower mode share for driving.

4.2 Vision and Mobility Network

Part of the Vision for the community, as described in the OCP, includes well-designed pedestrian and cycling facilities as well as transit-oriented mixed uses in the heart of the community. In order to achieve its transportation-related vision, Mobility Network Policies and a Mobility Network Map were prepared for the OCP. The policies are listed below and the Mobility Network Map is provided in Figure 4-2**.**

Mobility Network Policies – DNV Official Community Plan

1. Support a safe and integrated transportation network that includes all modes of transportation with an emphasis on walkability and strong pedestrian connections and plan road, transit, bike and pedestrian routes in accordance with the Lynn Valley Town Centre Mobility Network Map
2. Connect the Town Centre to outside destinations and explore opportunities to establish a north-south pedestrian/cycle route east of Mountain Highway
3. Maintain Lynn Valley Road and Mountain Highway as primary vehicular routes for Lynn Valley
4. Establish a pedestrian and vehicle oriented High Street in the core of the Town Centre to include generous sidewalks, weather protection, bike facilities and on-street parking
5. Encourage the majority of parking to be located underground, and explore opportunities for reduced parking standards and shared residential/commercial parking in concert with enhanced pedestrian, cycling and transit facilities
6. Work with the regional transportation authority to support the provision of frequent transit service to and from the Town Centre and support transit service with appropriately located lay-by areas and accessible, safe and attractive transit stops
7. Provide accessible and comfortable sidewalks in the Town Centre and provide safe and attractive pedestrian crossings of Lynn Valley Road, Mountain Highway and East 27th Street at strategic locations
8. Continue to explore innovative transit choices in the long-term



Source: DNV Official Community Plan

Figure 4-2: Lynn Valley Town Centre Mobility Network Map

The OCP acknowledges that implementation plans may be required in order for the District to achieve the concepts and objectives in the OCP. This Transportation Assessment is a key input into the development of the Lynn Valley implementation plan, which is being developed to align with the policies and objectives set out in the OCP.

Other plans and visions influence the future of transportation in Lynn Valley. These include the North Shore Area Transit Plan, the District of North Vancouver Transportation Plan, and the North Vancouver Bicycle Master Plan. The application of these plans is outlined in the paragraphs below.

The North Shore Area Transit Plan was completed by TransLink in consultation with the North Shore communities between fall 2010 and fall 2012. The report was finalized in October 2012. Through investigation of existing conditions, anticipated growth, and the community vision identified, a 2040 transit network vision for the north shore was developed. Relevant highlights from this plan for Lynn Valley Town Centre are as follows:

- New or Improved Transit Exchange located at Lynn Valley Town Centre
- Frequent Transit Service along Lynn Valley Road
- Frequent Transit Service along Mountain Highway
- Frequent Transit Service along E 29th Street west to Lonsdale Avenue
- Rapid Transit Service along E 29th Street west to Capilano Road

The District's vision for future bus routes and stop locations, which has been developed in consultation with TransLink, is shown in Figure 4-3 below.

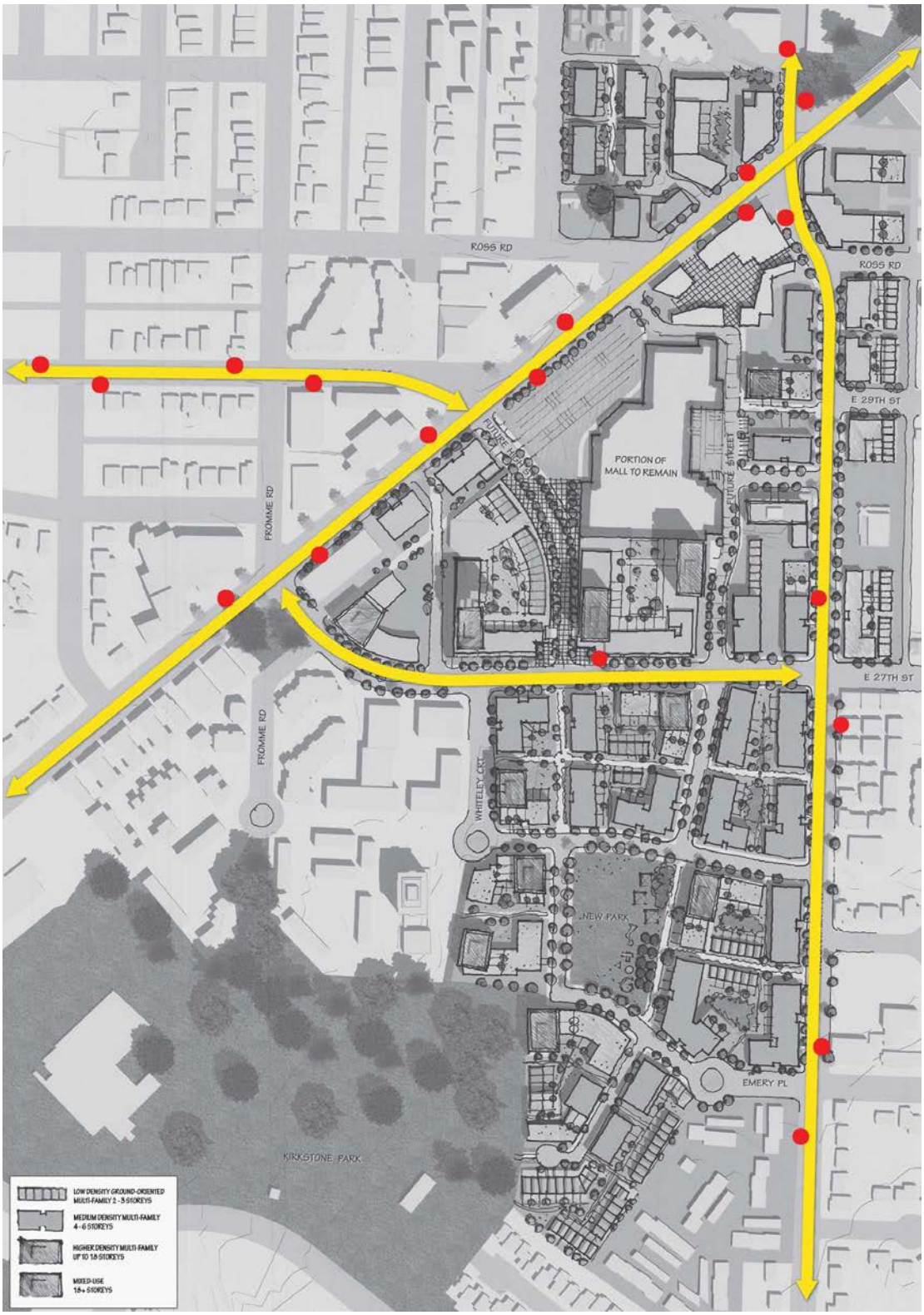


Figure 4-3: District's Vision for Future Route and Stop Locations

Outlining priorities for improving the transportation network in support of the OCP, the District of North Vancouver Transportation Plan was approved by Council in 2012. As part of this study of the Lynn Valley Town Centre, consideration was provided to how the transportation priorities identified within this plan could be incorporated into the Lynn Valley Town Centre network. Relevant outcomes were identified in the pedestrian, bicycle, and road safety sections of the transportation plan, and are summarized as follows:

High priority sidewalks were identified as part of the transportation plan in the following locations:

- Ross Road, east of Mountain Highway
- Mountain Highway, north of E 27th Street to E 29th Street
- E 29th Street, west of Fromme Road

High priority bike improvements were identified as part of the transportation plan in the following locations:

- E 27th Street between Mountain Highway and Lynn Valley Road
- Lynn Valley Road, south of Mountain Highway
- E 29th Street, west of Lynn Valley Road

These cycling improvements are integral to the implementation of the North Vancouver Bicycle Master Plan. As shown in Figure 4-4, these improvements are particularly important in a regional context, as they connect missing linkages in both the east-west and north-south directions to enable greater accessibility by bicycle for all residents and visitors in the District of North Vancouver. The improved on street connection along E 27th Street will connect to both Mountain Highway and Viewlynn Drive, important north-south corridors within the region. E 27th Street also provides an important connection for less confident cyclists who may use the trail network to connect to Fromme Road and on to the Lynn Valley Main Library and other destinations in Lynn Valley. The improved on street connection along Lynn Valley Road will provide a future connection from Dempsey Road in the north of the District all the way to Grand Boulevard south of Highway 1.The improved connection to E 29th Street will provide an east-west linkage in the northern segment of the district.

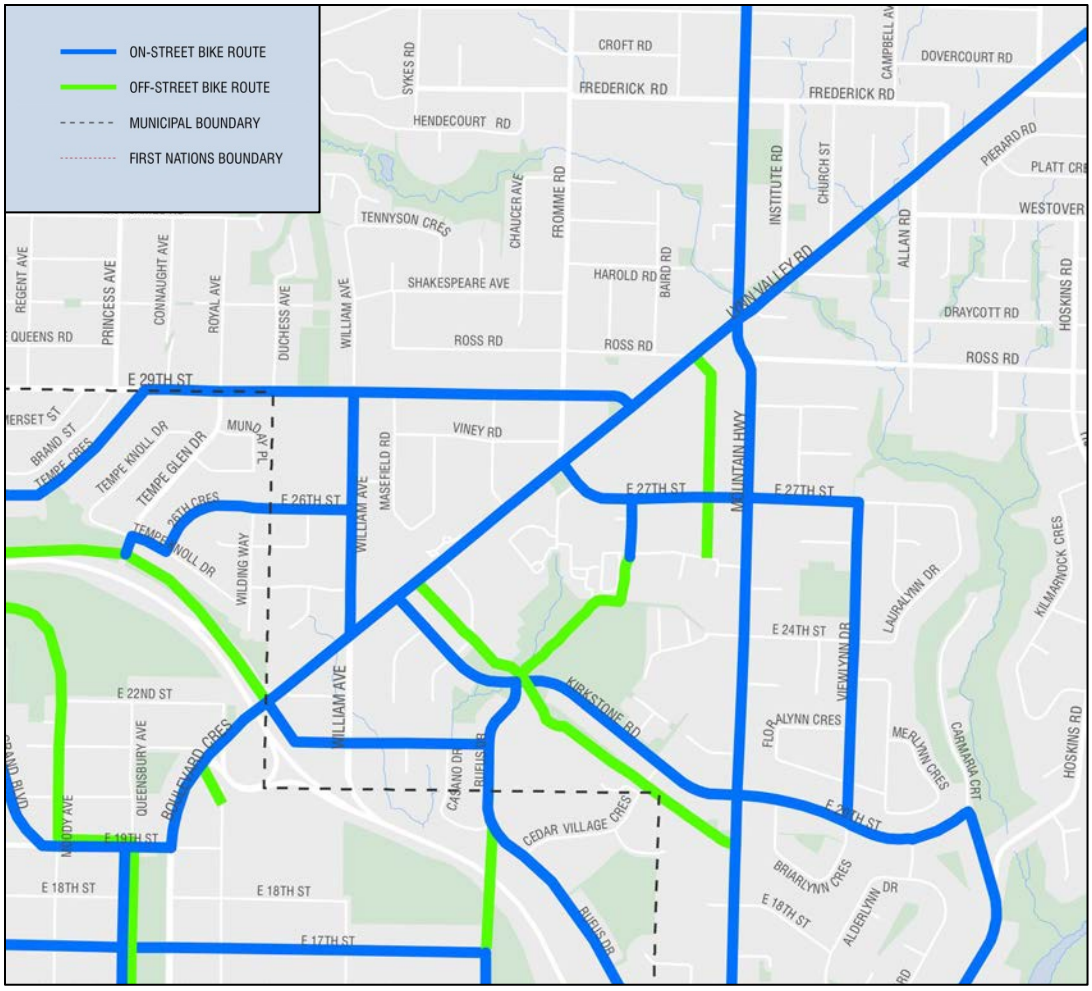


Figure 4-4: Portion of North Vancouver Bicycle Master Plan

High priority intersection improvements were identified as part of the transportation plan in the following locations:

- Lynn Valley Road and Mountain Highway
- Lynn Valley Road and E 29th Street
- Lynn Valley Road and E 27th Street/Fromme Road

The vision and priorities set forth in the Transportation Plan, North Shore Area Transit Plan, and North Vancouver Bicycle Master Plan were all incorporated into the study process to enable redevelopment within the Lynn Valley Town Centre to help achieve community aspirations already identified.

5.0 Future Conditions Assessment

The future conditions assessment included a review of all modes along the corridors in the Study Area. The assessment included traffic forecasting, intersection operations, bicycle and pedestrian connectivity, site access, internal circulation, and other measures.

5.1 Background Traffic Conditions

A growth rate of 0.3% was determined based on a review of the District's EMME transportation demand forecasting model and was applied to existing traffic in order to determine background traffic volumes in the 20 year horizon. The background was modified to reflect the redevelopment of Lynn Valley as an infill area. Because Lynn Valley has existing development that will be transformed and replaced over time, some existing trips must be removed from the network. The trips associated with these buildings must be deleted from the analysis. The existing built area expected to be removed to permit new development is summarized in Table 5-1. Trips generated by this built area were estimated using the methodology summarized in Appendix A. No internal trip reduction factor was applied, however a non-auto mode share shift of 20% was applied to the total person trips to reflect the District's current share of sustainable modes. Pass-by was assumed to be 30% for retail uses. Pass-by trips are those that would have travelled on the study area road network without the development being in place. For example, a driver that stops to get a coffee at a local shop on their way to work is a pass-by trip; they are not a "new" trip generated by the development, they are an existing trip that is 'passing by' and decides to stop at the development. A value of 30% was chosen based on information provided in the Institute of Transportation Engineers (ITE) Trip Generation reference book. The total trips deleted from the background condition to account for existing buildings that will be removed by 2031 are summarized in Table 5-2. These are the total vehicle trips, adjusted for mode share and pass-by assumptions.

Table 5-1: Existing built area to be removed

Land Use	Unit	Total Built Area to be Removed
Single Family Dwelling	(Dwelling Units)	32
Low Density Apartment	(Dwelling Units)	435
Mid-Rise Apartment	(Dwelling Units)	64
Low Rise Residential Condominium/Townhouse	(Dwelling Units)	9
Residential Condominium/Townhouse	(Dwelling Units)	6
Gasoline/Service Station w/ Convenience Market	(Vehicle Fueling Positions)	14
Gasoline/Service Station with Convenience market and Car Wash	(Vehicle Fueling Positions)	8
Old Lynn Valley Library[1]	(sq ft)	19,443
Shopping Centre[2]	(sq ft)	154,110
Supermarket	(sq ft)	33,274
Church	(sq ft)	8,271
Specialty Retail Centre	(sq ft)	5,545
Nursery (Garden Centre)	(sq ft)	14,168
Walk in Bank	(sq ft)	5,214
Coffee Shop	(sq ft)	6,685
Building Materials and Lumber Store	(sq ft)	9,519
Fast food restaurant	(sq ft)	2,037

Table 5-2: Trips to be deleted from background

Horizon	Inbound	Outbound	Total
20 Year	877	818	1,695
Ultimate	941	885	1,826

As discussed earlier, a number of land uses with high trip generation per unit are expected to be removed to allow for more compact development, which is expected to generate fewer trips per unit For example, low density apartments typically generate around 0.58 trips per unit in the p.m. peak period, while medium and high density apartments typically generate about 65% of that (0.38 trips per unit). This is because people living in medium and high density apartments are less likely to drive or own vehicles. These types of residential developments may also have a different mix of demographics, with fewer people per household and more seniors and / or students; all of these factors may result in fewer trips per

[1] The Old Lynn Valley Library was already closed at the time of the traffic counts and no trips were removed from the network to account for the redevelopment of this site. It is listed here for completeness.
[2] This is the full amount to be removed to accommodate the Ultimate horizon. Approximately 68,128 square feet of Shopping Centre Land Use is expected to remain in the 20 Year horizon, but be removed before the Ultimate horizon.

unit More information about expected future traffic is provided in the next section. As noted above, 1,826 existing trips were deleted from the network in the Ultimate horizon to account for the removal of these existing land uses.

5.2 Future Traffic Forecast

Traffic forecasts were completed for the 20-year and ultimate horizons in the p.m. A four-step traffic forecast model was used to complete the analysis. This model was based on a number of key assumptions at each step. The trip generation for the 20 year and Ultimate horizons are shown in Table 5-3 and Table 5-4. The trip generation is based on the land use shown earlier in Table 4-1. The trip generation assumptions included an internal reduction of 10% to account for travel within the Study Area that will not result in vehicle trips on the road network. They also include a non-auto mode share reduction of 20% of person-trips, which is the same reduction that was used in the estimation of existing network trips to be removed. This non-auto modes share is consistent with the existing non-auto mode share of 21% across the District of North Vancouver. This estimate is conservative, as the percentage of internal trips and the non-auto mode share are both expected to increase over time as Lynn Valley develops into a more vibrant, pedestrian focused village centre. Increases in either the internal trip share or the non-auto mode share will decrease the total number of trips generated by the site. Pass-by trips were assumed to be 30% for the shopping centre land use. This is consistent with the rate used for the existing network trips to be removed. Future trip distribution was estimated using the District of North Vancouver's EMME model and engineering judgement. Trip distribution assumptions are summarized in Error! Reference source not found.. Finally, trips were assigned based on most likely route.

Table 5-3: 20 Year horizon trip generation summary (PM Peak)

	Quantity	Units	Total Trips	Reduction	Pass-by	New Trips	
						IN	OUT
Low Density Apt	425	# of dwelling units	247	54	-	126	67
Medium Density Apt	2,494	# of dwelling units	973	178	-	461	333
Medium Rise Apartment	188	# of dwelling units	73	18	-	32	23
High Rise Townhouse	691	# of dwelling units	263	64	-	123	75
Shopping Centre	253	1000 sq ft	1,625	328	388	448	461
Transition Multifamily	111	# of dwelling units	42	10	-	20	12
TOTAL			3,222	651	388	1,210	973

Table 5-4: Ultimate Horizon trip generation summary (PM Peak)

	Quantity	Units	Total Trips	Reduction	Pass-by	New Trips	
						IN	OUT
Low Density Apt	425	# of dwelling units	247	54	-	126	67
Medium Density Apt	2,494	# of dwelling units	973	178	-	461	333
Medium Rise Apartment	188	# of dwelling units	73	18	-	32	23
High Rise Townhouse	691	# of dwelling units	263	64	-	123	75
Shopping Centre	320	1000 sq ft	1,855	364	446	514	531
Transition Multifamily	111	# of dwelling units	42	10	-	20	12
TOTAL			3,452	688	446	1,276	1,042

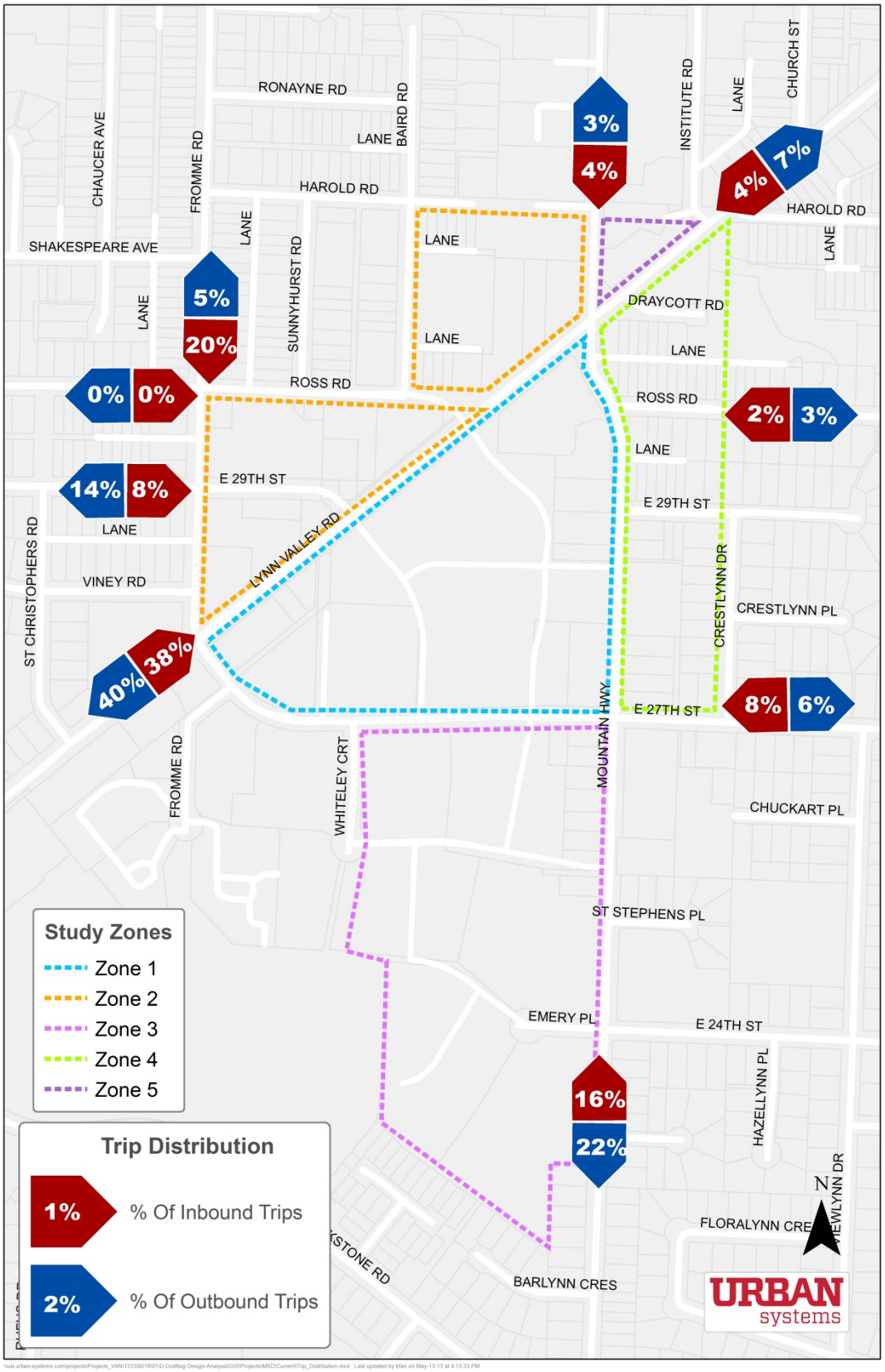


Figure 5-1: Trip distribution assumptions (PM Peak)

The new trips generated by the study area in the 20-year and Ultimate Horizons are shown in Figure 5-2 and Figure 5-3. The new trips are added to the modified background trips to determine future total trips for analysis. The future total trips are illustrated in Figure 5-4 and Figure 5-5**.**

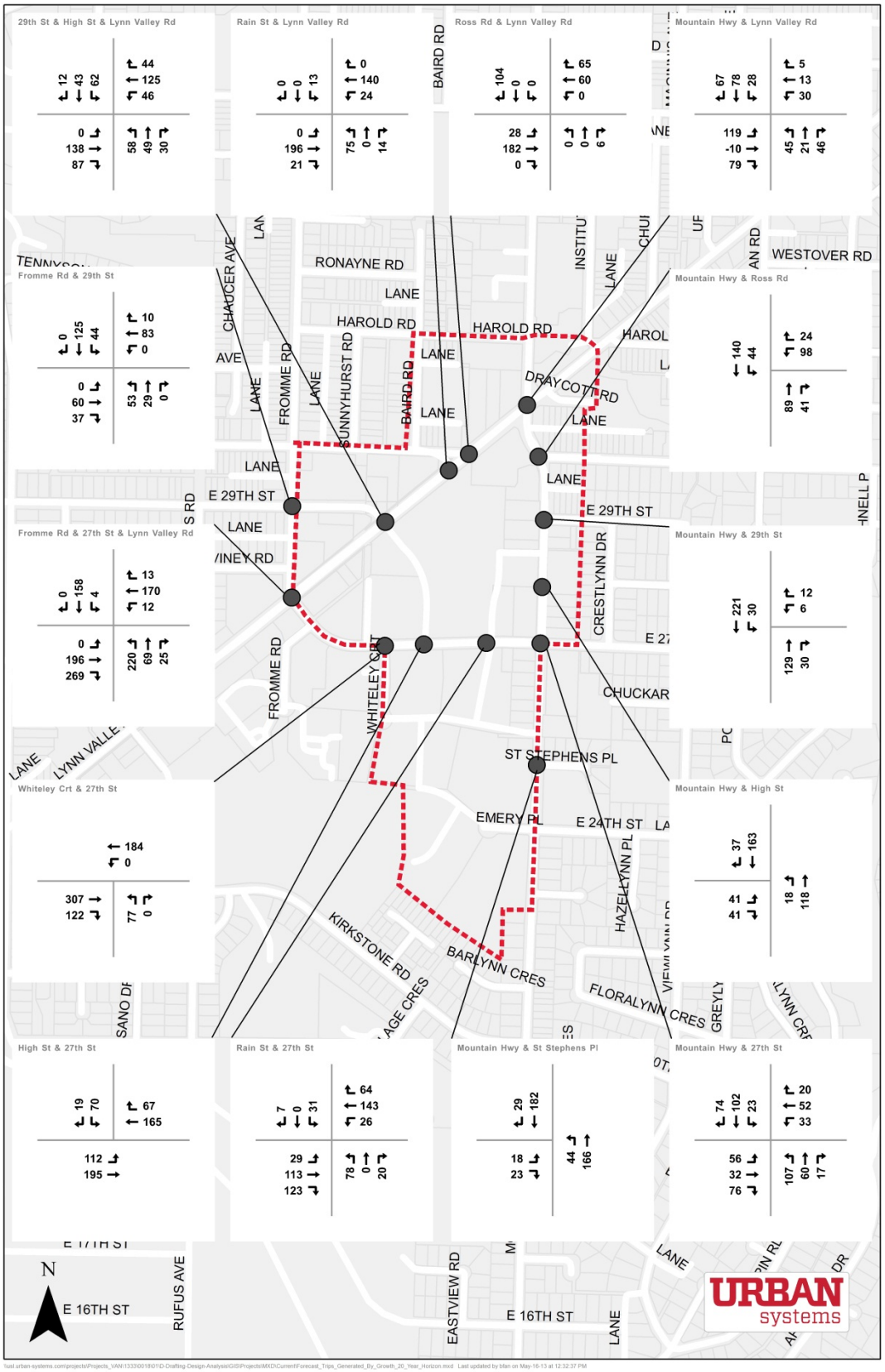


Figure 5-2: Forecast Trips Generated by Growth – 20 Year Horizon (PM Peak)

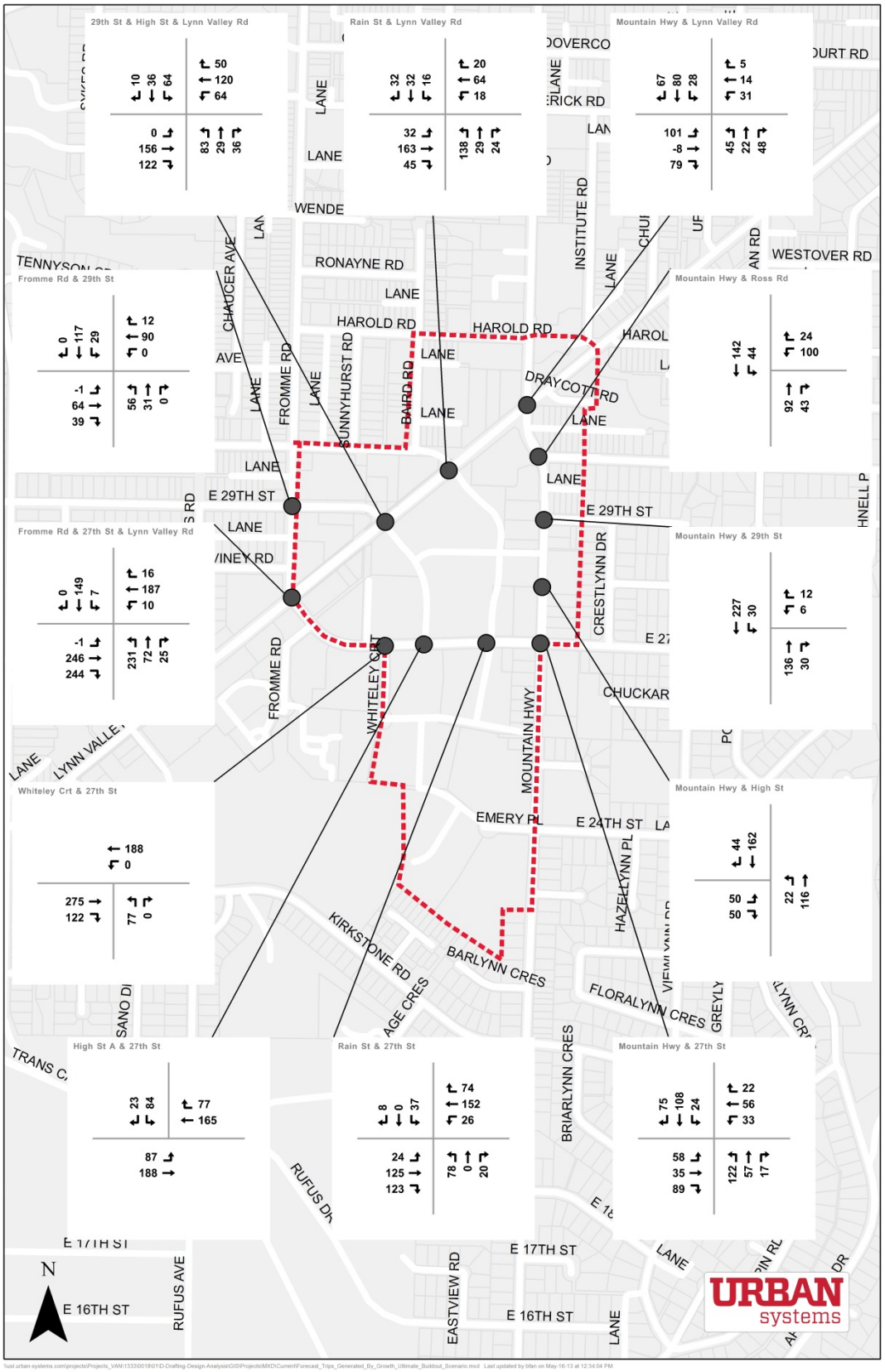


Figure 5-3: Forecast Trips Generated by Growth – Ultimate Horizon (PM Peak)

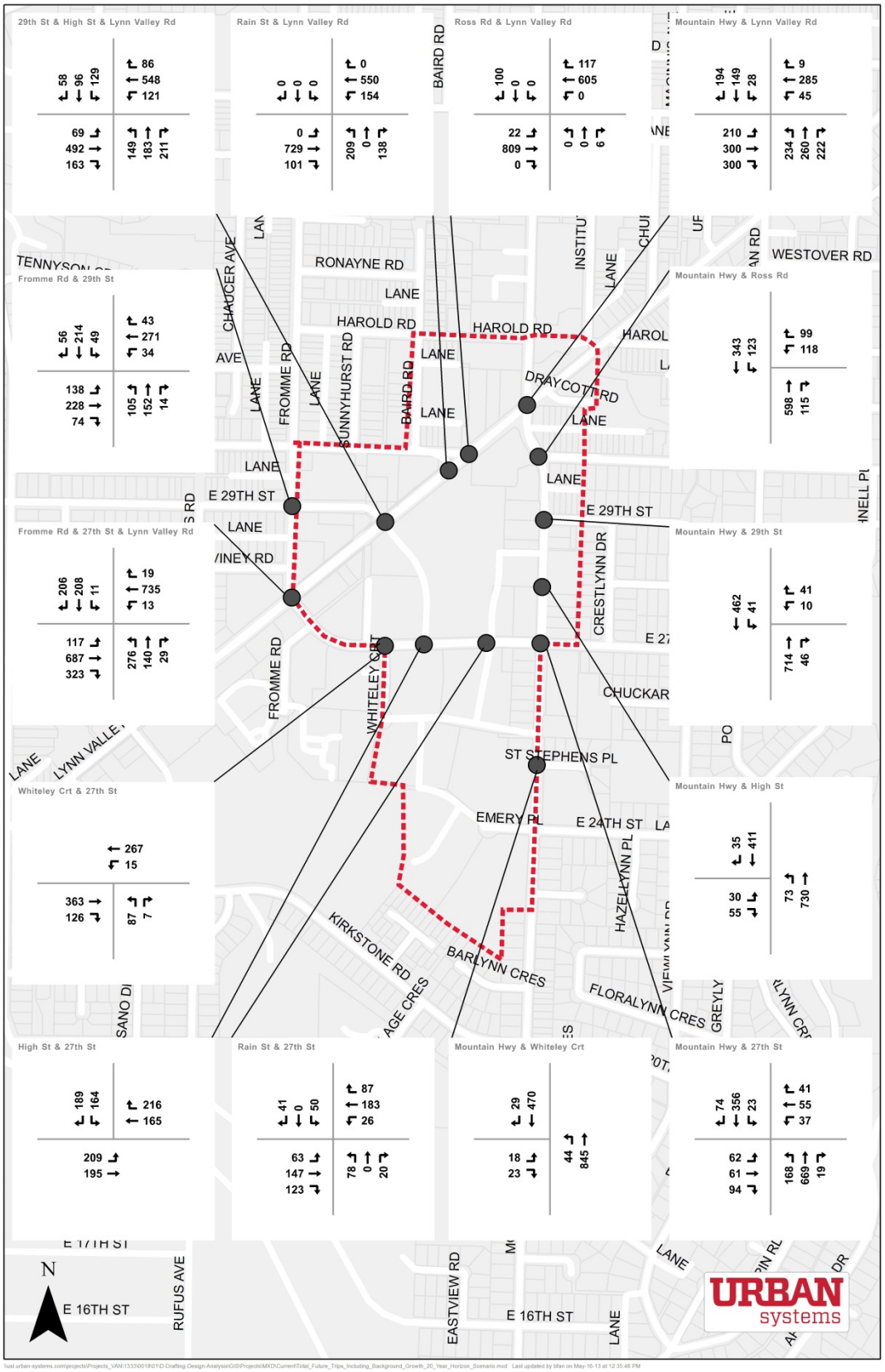


Figure 5-4: Total Future Trips (Including Background Growth) – 20 Year Horizon (PM Peak)

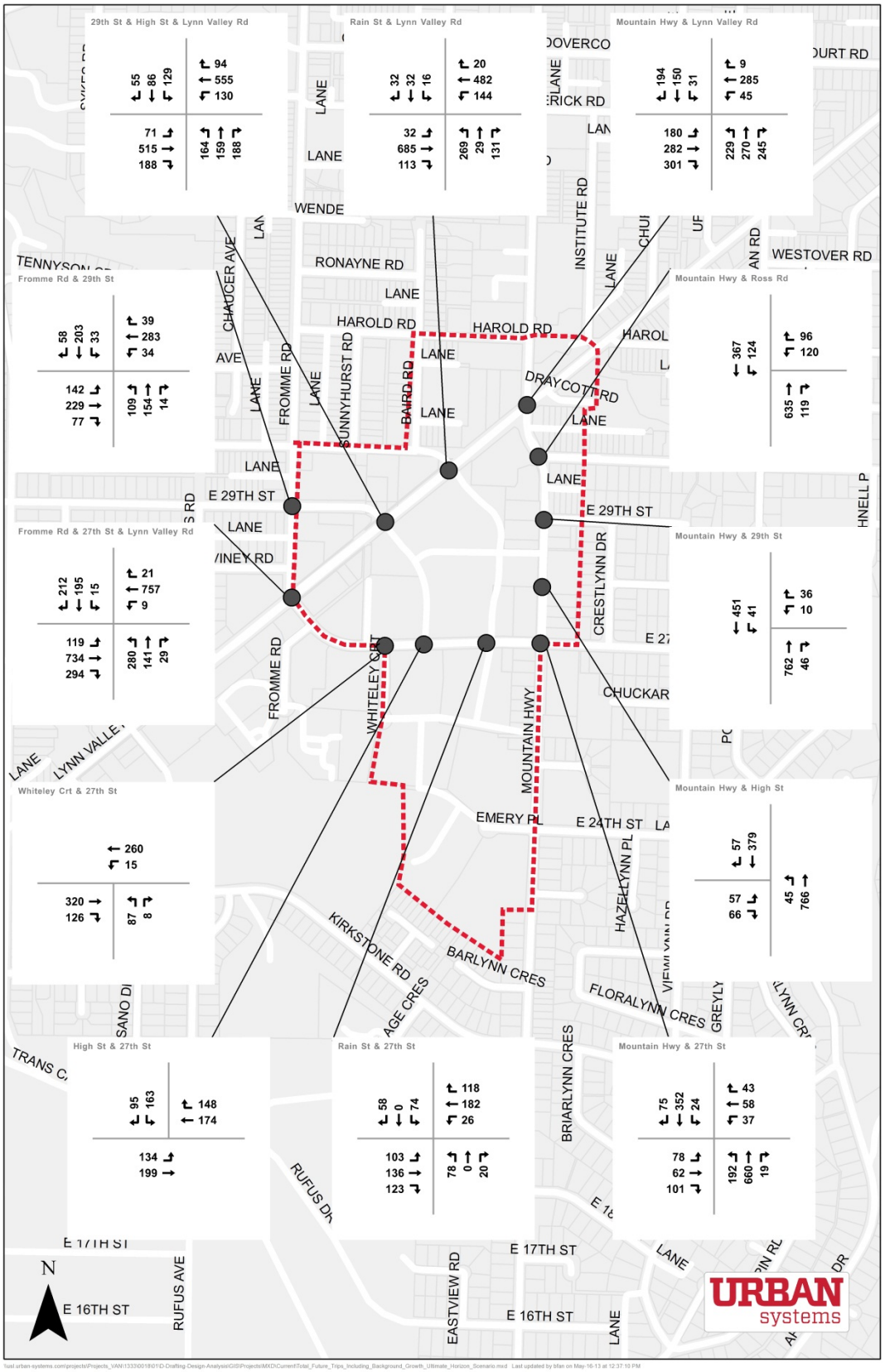


Figure 5-5: Total Future Trips (Including Background Growth) – Ultimate Horizon (PM Peak)

5.3 Future Transit Needs

As previously discussed, the North Shore Area Transit Plan was completed in 2012 after extensive consultation with the North Shore Communities. Through this process, a network vision was identified to serve projected land use on the North Shore and achieve a 50 percent increase in transit mode share from 10 to 15 percent for the entire North Shore by 2040. The vision for the North Shore Area Transit Network is illustrated in Figure 5-6.

Based on the projected population growth at Lynn Valley Town Centre, substantial transit improvements connecting to this area were prioritized as part of the plan. These improvements can be summarized into three categories as noted below:

- **Improved transit exchanges.** Lynn Valley Town Centre has been designated with an improved transit exchange. This should provide appropriate transit infrastructure to facilitate efficient exchange operation, along with urban design and land use to provide a high quality customer experience

- **Frequent transit service**. Metro Vancouver's Frequent Transit Network (FTN) is a network of corridors where transit service runs at least every 15 minutes in both directions throughout the day and into the evening, every day of the week. . Lynn Valley Road, Mountain Highway, and E 29th Street (west to Lonsdale Avenue) have all been designated as frequent transit service routes as part of this plan.
- **Rapid transit service.** The North Shore Area Transit Plan defines rapid transit service as frequent transit service with faster, more reliable travel times in order to be more competitive with the private automobile. E 29 Street was identified in the long-term vision as a potential corridor for east-west transit service.
- **Improved east-west mobility.** A new route connecting Lynn Valley Town Centre to Park Royal via Edgemont Village has been identified as a priority to facilitate the demand for an additional east-west connection within the area. This will introduce additional transit arrivals and departures terminating at Lynn Valley Town Centre to the frequent transit service routes already identified.

Through District discussions with TransLink representatives in December 2011, it was identified that an on-street transit exchange along the north side of E 27th Street would be desirable. This would involve reintroducing transit service on 27th Street to better integrate with a clockwise delivery and departure of buses arriving from and departing to Lynn Valley Road, Mountain Highway, and E 29th Street. Room for two standard 12.44 m buses complete with bike rack installation independently arriving and departing from the on-street transit exchange is likely needed. The space should be flexible to also potentially accommodate an 18.50 m articulated bus, should longer buses be introduced on buses servicing Lynn Valley Town Centre.

In addition to the forecast improvements to service identified, it is expected that existing local bus routes with stops in the study area will be maintained.

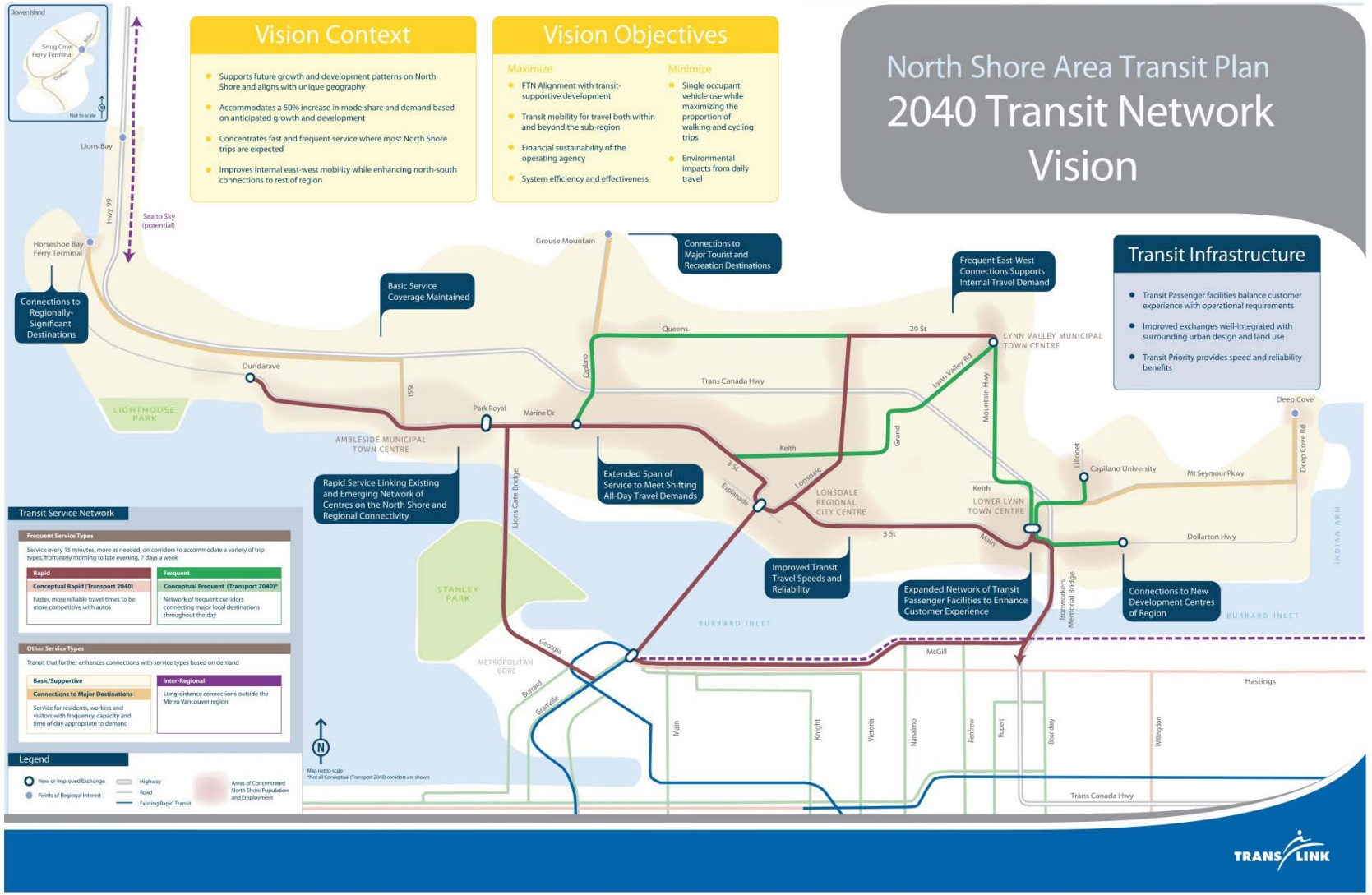


Figure 5-6: North Shore Transit Vision

5.4 Future Pedestrian and Cycling Needs

As previously identified, the OCP, Transportation Plan, and North Vancouver Bicycle Master Plan all emphasize infrastructure improvements for pedestrians and bicycles within the Town Centre. The specific road, sidewalk, and intersection upgrades identified in these studies should be paired with a design philosophy which emphasizes consideration for vulnerable road users. This approach will encourage multiple modes of transportation utilized within the town centre. Regionally, Lynn Valley Road, E 29th Street, E 27th Street, and Mountain Highway are all designated as important bicycle connections. Therefore, incorporating road network improvements which will encourage bicycle users of all ages and abilities along these improved routes will enable a safer and more comfortable environment.

The proposed land use changes are expected to result in an improved pedestrian and cycling environment and related infrastructure. Within the existing road right-of-way, there is minimal space to provide improved walking and cycling connectivity or to improve quality of experience and safety for cyclists and pedestrians. The proposed land use changes add new trips to this area, but they also provide property and resources to allow for improved cycling and pedestrian space. Density is also expected to increase the number of pedestrians and cyclists in the area. Simply increasing the number of cyclists is known to make cycling safer. Increasing the number of pedestrians improves livability, safety, and community vibrancy.

5.5 Future Goods Movement and Access Needs

Lynn Valley will continue to be a hub of commercial and economic activity for the area and access for goods movement and passenger vehicles to individual parcels and underground parking lots will continue to be important. Small retail uses and grocery uses have different goods movement needs. Grocery providers typically use large tractor-trailer units and require access to loading bays. Smaller retailers require single unit truck access. To ensure effective goods movement in Lynn Valley, a WB-20 tractor-trailer unit was used as the design vehicle. A travel path for these vehicles was provided via Lynn Valley Road / E 27 Street, with direct access from the lane between Lynn Valley Road and High Street. Access for a Heavy Single Unit (HSU) design vehicle was maintained from Mountain Highway to E 27th Street and Rain Street.

Accesses to underground parking should be concentrated to four-way intersections wherever possible. Accesses should be provided midblock to reduce conflicts with intersection traffic operations and queues.

6.0 Guiding Principles

A number of guiding principles were established to help inform the development of improvement options for the Town Centre. These principles were considered across the four main transportation modes within this area: pedestrians, cyclists, transit and motor vehicles.

6.1 Pedestrians

- **Improve permeability and connections to the town centre.** Greater connectivity through safe and appealing pedestrian crosswalks shall be established along the appropriate desire lines to connect pedestrians from surrounding neighbourhoods to the Town Centre.
- **Ensure safe and comfortable mobility for all road users.** The road cross section features and landscape improvements should consider the safety and comfort of the most vulnerable road users. This should emphasize children, elderly people, and those with mobility impairments.
- **Transform the network into a great space.** In line with the District's vision to create a well-designed pedestrian, biking and transit-oriented mixed use centre in the heart of Lynn Valley that celebrates its natural and cultural setting and strong sense of community, Lynn Valley Town Centre should become an attraction and destination in and of itself to live, work, play and learn.
- **Reduce crossing distances at all intersections.**

6.2 Cyclists

- **Complete the envisioned bicycle network.** Improvements to transportation infrastructure should incorporate routes identified in the North Vancouver Bicycle Master Plan (2012). Where applicable, and in conjunction with the redevelopment taking place, regional connections on 27th Street, 29th Street, Mountain Highway, and Lynn Valley Road should be made more direct ; considering major road crossings, left turns, and route continuity.
- **Ensure a safe and comfortable transportation network for both commuter and recreational cyclists.** Provisions should be made to attract recreational cyclists with pleasing pathways that allow for "conversational cycling" at moderate travel speeds. In addition, consideration of connection for higher speed cyclists should be provided for daily commuter needs within the area.
- **Design bicycle facilities to attract new riders of all ages and abilities.** All bicycle facilities should be designed to attract new cyclists and increase cycling mode share within the District. Where possible, facilities should be physically separated from automobile traffic and wide enough to allow for safe passing.
- **Incorporate clear and consistent wayfinding signage for bicycle users.** As part of the implementation of the enhanced bicycle network within the Town Centre, clear signage

should be introduced along all routes and at all decision points to direct cyclists to their intended destination in a safe and direct manner. Where changes to existing travel routes are introduced, additional temporary signage is recommended to emphasize new routes within the transportation network. Signage should be consistent in format and approach with the remainder of the District; however, it is recommended that signage provides direction, distance, and time to reach important destinations on the North Shore.

6.3 Transit

- **Facilitate efficient transit vehicle operation.** Design transit facilities in accordance with TransLink's Bus Infrastructure Design Guidelines.
- **Create an exceptional customer service experience for transit passengers.** This includes developing livable communities and supportive cycling and pedestrian infrastructure around transit centres. The Transit-Oriented Communities Design Guidelines shall be used as a basis for design.
- **Establish a short connection between the transit exchange and the town centre.** Through consideration of any alternate location for a transit exchange along 27th Street, prioritization should be given to maintain a short walking distance between the intersection of High Street and High Street B.
- **Facilitate intermodal travel.** Accommodation should be provided within the transit passenger area for different means of access to the transit exchange. Referencing TransLink's Transit Passenger Facility Design Guidelines (201X) Strategy 02: Support transit by integrating with other modes, enhanced access for pedestrians, cyclists, taxis, and drop off should be considered. This includes the provision of convenient, multiple, and direct pedestrian access points for all origins and destinations; both short term and long term bicycle parking in safe and well-lit areas; and clear signage for separate passenger pick-up and drop off areas for taxis and private vehicles.

6.4 Motor Vehicles

- **Provide satisfactory level of service for all vehicle movements at all Town Centre intersections.** Maintain level of service (LOS) D or better for all signalized intersections with volume to capacity (v/c) ratios for all individual movements less than or equal to 0.90. Minimize delays at unsignalized intersections.
- **Establish safe intersection operations through laning, geometry, and signalization.**
- **Ensure turning movements accommodate the appropriate design vehicles at all locations.** Provide access to the site for appropriate design vehicles through specified routes. Accommodation for a WB-20 Tractor-Semitrailer should be provided only for access to the laneway immediately east Lynn Valley Road on 27th Street. Accommodation for a Heavy Single Unit (HSU) truck should be provided only for access to Rain Street.

7.0 Recommendations by 2031

7.1 Planned Network

A planned network was developed based on the Guiding Principles above and the analysis presented in earlier sections.

The recommended network provides a number of key benefits, while mitigating the impacts of increased traffic due to development. Some of these benefits are:

- Walkable neighbourhood with improved pedestrian connectivity and urban streetscape. The increase in residents, combined with street-facing shops and well designed pedestrian spaces will contribute to a vibrant community.
- Improved facilities for cyclists of all ages and abilities, including a separated two-way cycle track along E 27 Street, an important connection for local and regional cyclist.
- Better intermodal and transit facilities, with an accessible bus exchange area that can accommodate TransLink's plans for increased service to Lynn Valley.
- Continued access for local delivery of goods.
- Enhanced traffic operations through better lane continuity and the introduction of an improved grid network. Although the number of vehicle trips is expected to increase, the impacts on the road network are expected to be minimal.

The proposed Study Area network with all improvements is illustrated in Exhibit 1. More detailed plans are included in Exhibit 2**,** Exhibit 3**,** and Exhibit 4. This is the ultimate concept, which includes a realigned Ross Road / Rain Street & Lynn Valley Road intersection. The full extension of Rain Street and completion of High Street B will not be complete within the 20 Year horizon. A memo describing the typical cross sections for streets within the Study Area is included as Appendix B.

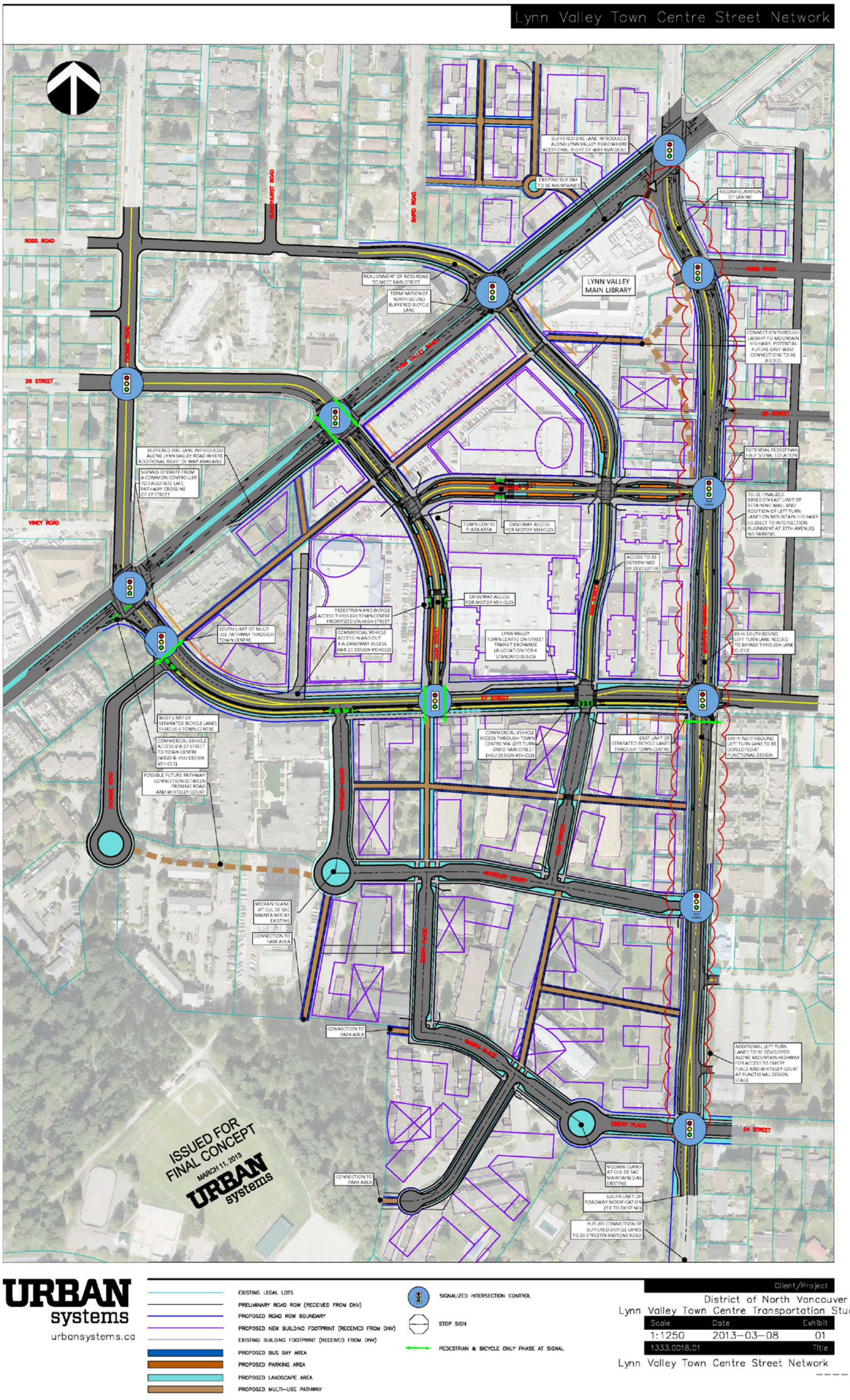
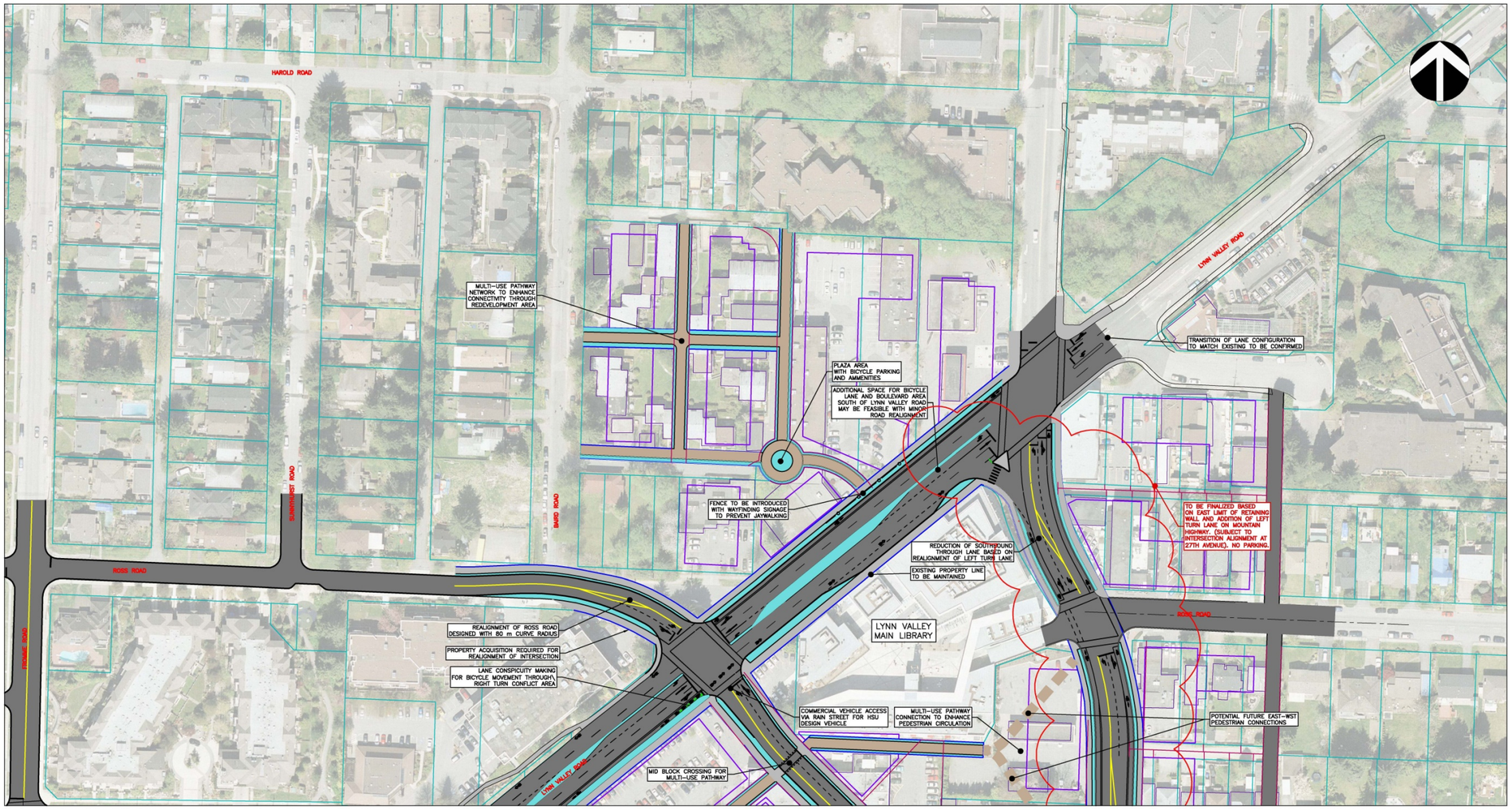


Exhibit 1: Proposed Study Area transportation network

Street Network – North



URBAN systems
urbansystems.ca

EXISTING LEGAL LOTS
PRELIMINARY ROAD ROW (RECEIVED FROM DNV)
PROPOSED ROAD ROW BOUNDARY
PROPOSED NEW BUILDING FOOTPRINT (RECEIVED FROM DNV)
EXISTING BUILDING FOOTPRINT (RECEIVED FROM DNV)
PROPOSED BUS BAY AREA
PROPOSED PARKING AREA
PROPOSED MULTI-USE PATHWAY
PROPOSED LANDSCAPE AREA
STOP SIGN

ISSUED FOR FINAL CONCEPT
MARCH 11, 2013
URBAN systems

Client/Project
District of North Vancouver
Lynn Valley Town Centre Transportation Study

Scale	Date	Exhibit
1: 750	2013-03-13	02
1333.0018.01		Title

Street Network – North

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Exhibit 2: North Section

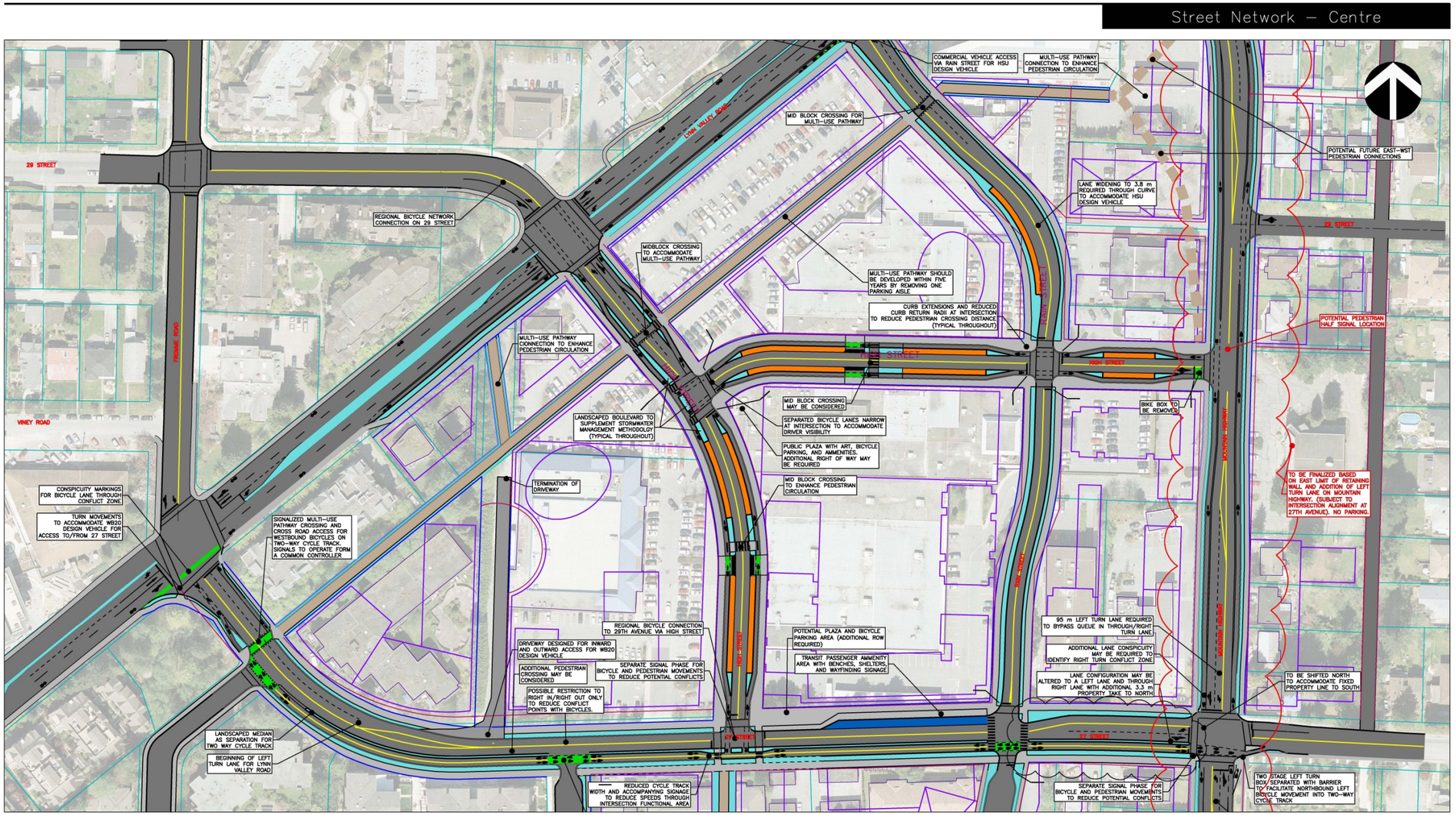


Exhibit 3: Central Section

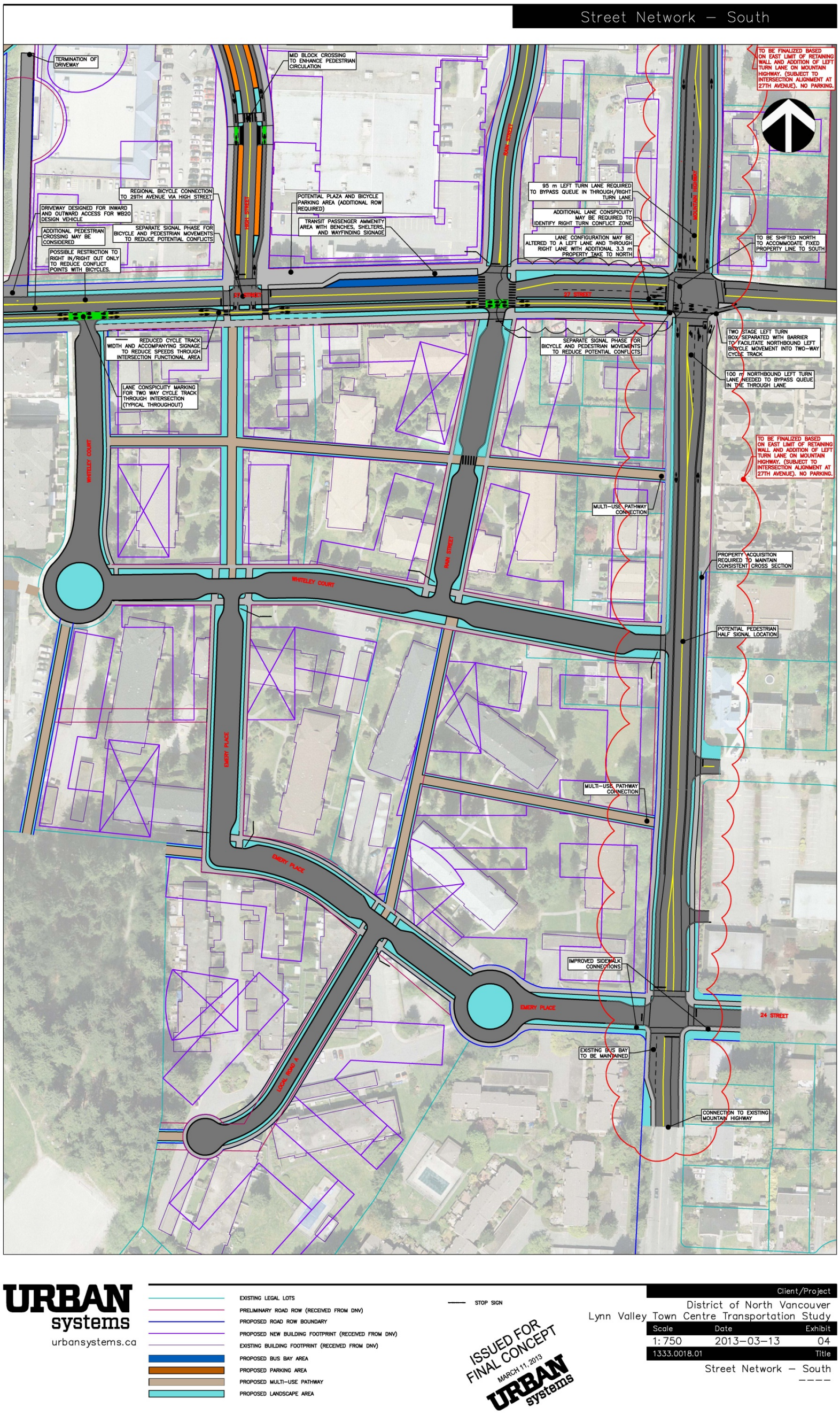


Exhibit 4: South Section

7.1.1 *PEDESTRIANS*

Specific changes/enhancements for pedestrians.

- Improved access and shorter walking distances due to grid network of new local streets and a multi-use pathway network.
- Two new pedestrian signals crossing Mountain Highway – one midblock between Lynn Valley Road and E 27th Street and a second between E 27th Street and E 24th Street – shortening long blocks for pedestrian, and connecting anticipated desire lines to the Lynn Valley Town Centre with the surrounding residential areas.
- New crossing of E 27th Street at Fromme Road facilitates pedestrian connectivity. Provide a pedestrian and cyclist-activated signal at Fromme Road and E 27th Street. This signal facilitates safe pedestrian crossing from the park connections at Fromme Road and Whiteley Court to the proposed pathway that connects to the Lynn Valley Main Library. Enabling safe crossing at this location is an important component of the pedestrian network. The signal must be operated jointly with Lynn Valley Road / E 27 Street / Fromme Road from a single controller. This is the recommended configuration for this crossing location and will require further study to confirm sight lines and traffic operation details.
- Reduced crossing distances through the use of curb bulges.
- Crosswalks on both sides of all intersection crossings.

7.1.2 *CYCLISTS*

Specific changes/enhancements for bicycles include:

- Two-way cycle track on south side of E 27th Street connects cyclists to Lynn Valley Town Centre and provides an essential link in the North Shore cycling network. This treatment is recommended for two reasons:
    - To provide maximum separation from motor vehicle traffic to encourage bicycle travel to Lynn Valley Town Centre for riders of **all ages and abilities.** A fully separated link is essential over this short stretch. E 27 Street is a key link in the cycling network. In addition to its function joining two commuter cyclist routes (Mountain Highway and Lynn Valley Road), it also serves a special function for less confident cyclists. Fromme Road and Whiteley Crescent, two low volume, local roads, connect E 27 Street to the network of trails in Kirkstone Park. With a separated facility on E 27 Street, residents between Kirkstone Road and Lynn Valley can easily travel without being exposed to vehicles on a major road. E 27 is an important link in the District of North Vancouver's network for cyclists of all ages and abilities and must be constructed in a way that maximizes separation from vehicle traffic.

- To significantly reduce the number of conflict points with vehicles on the north side of E 27th Street. The specific treatment proposed for Lynn Valley is a two-way separated cycle track; although this type of facility is less common, this configuration provides special benefits in the context of E 27 Street. In particular, it is anticipated that a bike lane or separated bike lane on the north side of the road would experience a high level of conflict with buses and pedestrians at the on street transit exchange. By providing a separated facility with appropriate traffic controls, signage, and travel space, 27th Street will become a more attractive corridor for cyclists, pedestrians, and transit passengers.

- New crossing of E 27th Street at Fromme Road facilitates pedestrian connectivity. Provide a pedestrian and cyclist-activated signal at Fromme Road and E 27th Street. This signal facilitates safe cyclist crossing from the park connections at Fromme Road and Whiteley Court to the proposed pathway that connects to the Lynn Valley Main Library. Enabling safe crossing at this location is an important component of the cycling network. The signal must be operated jointly with Lynn Valley Road / E 27 Street / Fromme Road from a single controller. Operation of the joint controller may present a challenge for the District. The recommended configuration for this crossing location requires further study to confirm sight lines and traffic operation details.
- One way cycle tracks on High Street provide access from bike routes south of Lynn Valley to the key E 29th Street bicycle route.
- Opportunities for improved bicycle parking in public areas due to the creation of parks and plazas.

7.1.3 *Transit Users*

Specific changes/enhancements for transit include:

- New bus layover area on north side of E 27th Street can accommodate up to 4 standard buses (12.4 metres) and provides sufficient space for two articulated buses (18.6 metres).
- A total width of 3.0 m provided for passenger waiting areas within the bus exchange area on E 27th Street provides the preferred space identified in TransLink's Bus Infrastructure Design Guidelines to ensure accessibility, waiting areas, and wayfinding features.
- More street facing commercial will improve 'eyes on the street' and augment services available for transit passengers.
- Street-side space was designed utilizing five zones of the sidewalk as recommended in TransLink's Transit Oriented Development Design Guidelines. This provides space for an edge zone, extension zone, furnishings, throughway, and frontage.
- Existing bus pull-out on Lynn Valley Road in front of the Lynn Valley Main Library will be maintained for future use.
- Intersections were designed to accommodate articulated buses moving clockwise around the Study Area along Lynn Valley Road, Mountain Highway and E 27th Street. All right turn

movements in the clockwise direction around the town centre accessing the E 27th Street Bus Stop were designed using the most conservative bus turn template; the 12.4 m Standard Bus with a bike rack in use. (It is noted that articulated bus turn templates are less restrictive than the standard bus turn template).

- Lane width and length for the on-street transit exchange were developed based on guidance from the TransLink Bus Infrastructure Design Guidelines. A minimum width of 6.5 m from the edge of curb to the centreline was used as the guiding criteria for the on-street bus space allocation. This includes both the bus layover width as well as through lane width. Existing bus stops for local transit access will be maintained on Lynn Valley Road, Mountain Highway and E 29th Street. Required stop locations for frequent transit service envisioned within the area outside of the E 27th Street Transit Exchange should be confirmed with TransLink at the next stage of design.
- Enhance opportunities for bike and ride with secure bike parking.

7.1.4 *MOTORISTS*

Specific changes/enhancements for motorists include:

- New signal at Fromme Road and E 29th Street improves operations and safety at this key intersection. This signal could be coordinated with the signal at the intersection of Lynn Valley Road and Fromme Road; however, further study is needed.
- New signal at High Street and E 27th Street provides access to the main commercial area.
- New protected / permitted left turn phases to improve safety and operations at E 29th Street and Lynn Valley Road (southbound left) and at Fromme Street and Lynn Valley Road (eastbound left). The protected / permitted left turn phases for the opposing movements (northbound left at E 29 Street and Lynn Valley Road and westbound left at Fromme Street and Lynn valley Road) are not required from an operational perspective, but may be included to improve safety.
- Overall improvement in access due to the new internal grid network created by High Street and Rain Street.
- Consolidated intersection of Ross Road (west) and Rain Street allows for removal of turning restrictions, better circulation, and improved operations.
- Improved lane continuity throughout, with existing shared through-left lanes replaced by exclusive left turn lanes with accompanying shared through-right lanes.
- Signal timing improvements as required to accommodate forecasted traffic volumes.
- Reconfiguration of Mountain Highway to reduce driver confusion and provide road space for cyclists. The recommended configuration for Mountain Highway requires further study at the feasibility and functional design stages to resolve challenges related to retaining walls, road space, and property needs.

Assessing future total trips on the planned network shows that all intersections operate with LOS D or better, in accordance with the design principles. LOS for signalized intersections for the 20 Year and Ultimate horizons are shown in Figure 7-1 and Figure 7-2. All individual movements at signalized intersections are expected to operate with v/c less than or equal to 0.90. All movements at unsignalized intersections also operate with v/c less than or equal to 0.90. The LOS for the eastbound movement at the unsignalized intersection of Mountain Highway and E 29th Street operates with LOS 'E'. Operations for this movement should be improved with the planned addition of a pedestrian half-signal (described below) and vehicles have the option of using alternative signalized accesses. All other movements at unsignalized intersections operate with LOS 'D' or better.

Despite the addition of density to the Lynn Valley area, traffic operations are expected to improve at some locations and the overall network is expected to experience minimal additional delay. As discussed above, no operational issues are expected for any movements within the study area. SimTraffic analysis for the network as a whole shows a reduction in stops per vehicle from 2.02 in the Existing horizon to 1.97 in the Ultimate. Delay per vehicle is expected to increase from 85.2 second to 114.5 seconds, which is acceptable given background growth of 0.3% annually.

As a result of the signal operation improvements, lane continuity, removal of turning restrictions, and overall circulation enhancements, it is anticipated that safety benefits will result at many intersections within the study area. Further evaluation of safety benefits may be undertaken at the functional design stage. This is in alignment with the vision for intersection safety improvement set forth in the District of North Vancouver Transportation Plan.

The analysis does not show the need to provide left turn bays for unsignalized intersections on Mountain Highway; however, these may be added at the functional design stage to remove left turning vehicles from the path of through traffic and provide a separate queuing zone for these vehicles. The District prefers to provide left turn bays at unsignalized intersections. The final alignment and cross-section of Mountain Highway should be determined at the functional design stage.

Figure 7-1: 20 Year Signalized Intersection LOS

Figure 7-2: Ultimate Signalized Intersection LOS

7.1.5 *Goods Movement and Access Needs*

Specific changes/enhancements for goods/vehicle movement include:

- WB-20 design vehicle used to secure access to loading bays between High Street and Lynn Valley Road. Intersections designed to provide sufficient space for WB-20 vehicles. The access path to the site was assumed to be on / off of Lynn Valley Road.
- Access to Rain Street designed to permit minor truck access (HSU) to Rain Street from Mountain Highway.

7.2 Design Outcomes

Some key design outcomes will influence the District's approach as this area develops. The Ultimate network is not possible in the short-term, as it requires a new north-south road through the site of the existing mall. The full network will not be possible until that site redevelops. Development of the full Ultimate network also requires land acquisition along key roadways. Land acquisition for the Ultimate network is illustrated in

Improvements to the transportation network in the Study Area should be made as developers come forward and land is available. The final steps in the completion of the Ultimate Network rely on the redevelopment of the Lynn Valley Mall and will be:

- Development of High Street B
- Development of Rain Street north of High Street B
- Realignment of the intersection of Ross Road / Rain Street & Lynn Valley Road

All other improvements can be completed over time as land becomes available. When the southern portion of Lynn Valley Mall redevelops, it may be possible to replace one row of above ground parking with a multiuse trail parallel to Lynn Valley Road. This will allow for early completion of a pedestrian and cycling connection from 27th Street to the Lynn Valley Library parallel to Lynn Valley Road.

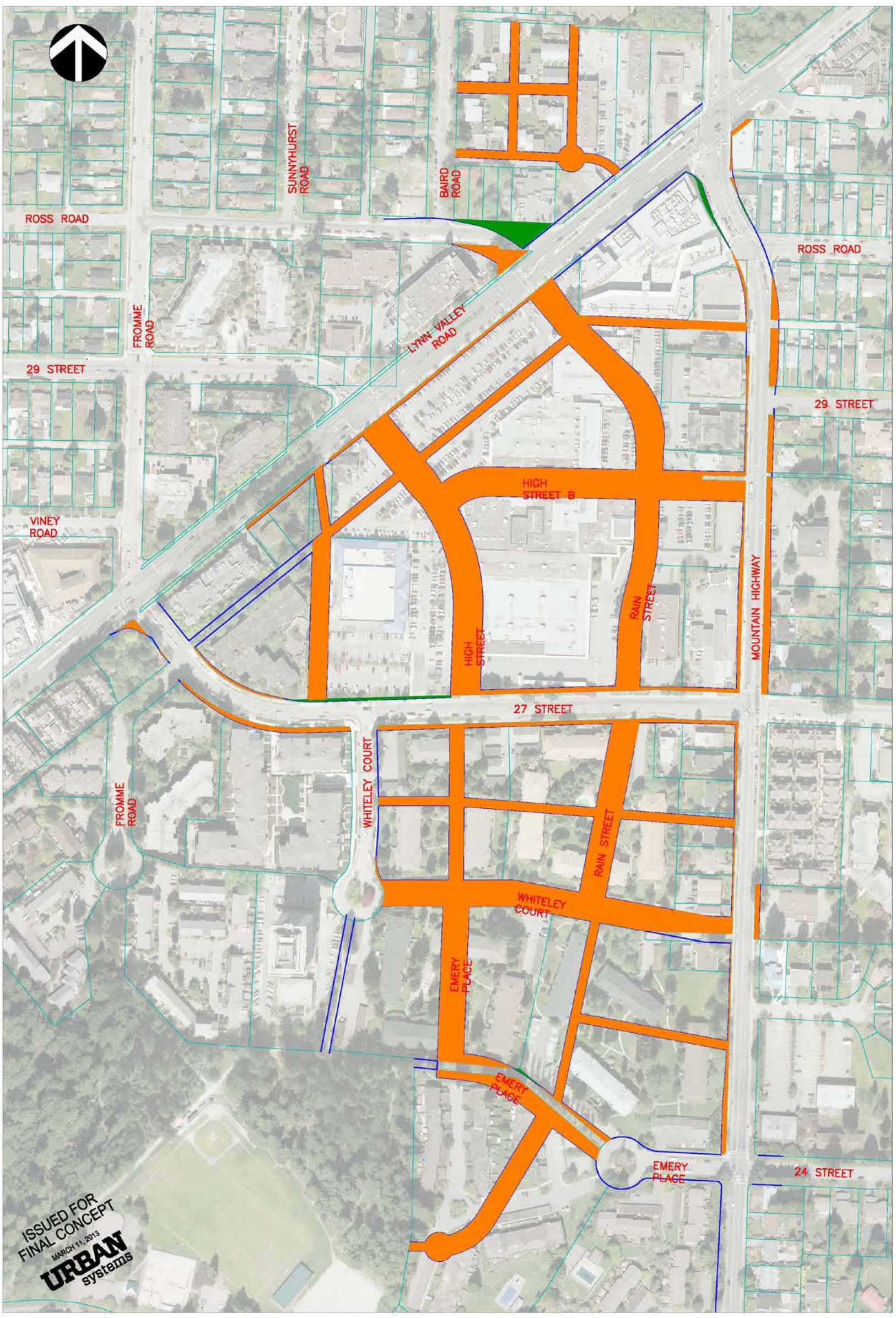


Exhibit 5: Property Acquisition

7.3 Impacts and Further Consideration

The revised Synchro networks containing the 20-Year and Ultimate networks are available for use by developers in the preparation of their Traffic Impact Assessments within the Study Area. Precise locations of accesses and the final design of Mountain Highway are subject to further design and considerations as the Study Area develops.

8.0 Conclusion

The Vision for the Lynn Valley community includes a vibrant and livable Town Centre. This vision can be achieved through changes in the land use and transportation network. This study examined the proposed land use changes and provided a recommended transportation network that provides many benefits, while mitigating the impacts of increased traffic. The overall effect of these changes will be a balanced impact on the vehicle network, with some improvements and some minimal negative impacts.

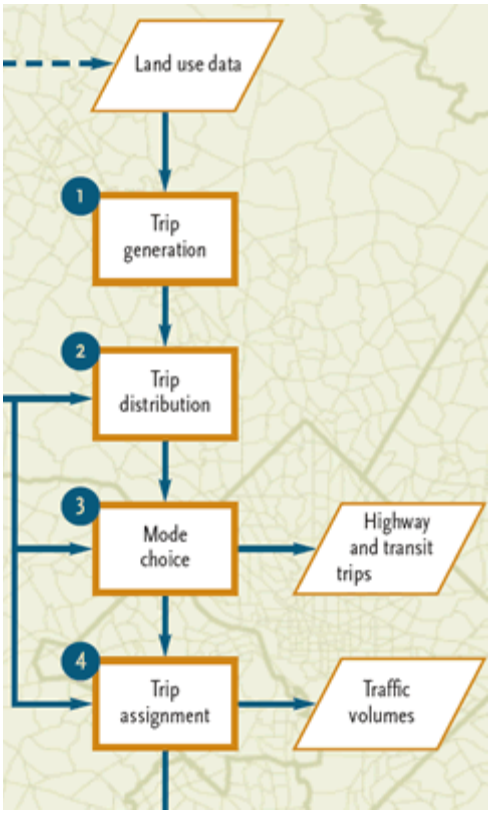
- With the type and levels of development analyzed in this report, the resulting growth in traffic can be accommodated within the proposed transportation network. This is a worst case scenario, as the auto mode share for external trips was not projected to decrease. If the auto mode share decreases, vehicle traffic will be even less than what is shown here.
- New roadways within the study area will improve circulation, allowing for more direct routing for vehicles. The new links will also decrease distance and travel time for pedestrians and cyclists.
- Delays for traffic travelling through Lynn Valley are expected to be minimal.
- The realignment of Ross Road to meet High Street at Lynn Valley Road is expected to improve access, circulation, and safety.
- Street-facing stores, combined with more residents and improved pedestrian space will create a more vibrant, livable neighbourhood.
- Cycling facilities suitable for all ages and abilities will encourage less confident cyclists to cycle more frequently, with positive impacts to access, health, and affordability.
- Transit accessibility will be improved and the changes to property and the road network will enable TransLink to move forward with plans for increased service. With more residents in the area, ridership can be expected to increase.

The changes to Lynn Valley enable valuable improvements to the pedestrian, cycling, transit, and roadway networks. In turn, these improvements will allow the District to achieve the vision for Lynn Valley; however, without development and densification, the improvements recommended here are difficult or impossible to attain.

Appendix A: Four Step Travel Model

The model consists of the following steps:

1. Trip generation;
2. Trip distribution;
3. Mode choice; and,
4. Trip assignment.



Trip Generation

Step one of the process is to determine the number of additional AM and PM peak hour vehicle trips added to the network by the change in land use. The *ITE Trip Generation Manual* were used to determine vehicle trip generation rates for different land use types. ITE trip rates represent land-use specific averages that have been determined through years of case studies and background research. Rates are tied to the number of dwelling units, square footage, acres of land, or employees (i.e. average number of trips per employee in the AM peak hour).

Directionality is also indicated in the *ITE Trip Generation Manual* and specifies what percentage of generated trips is heading into the development (inbound trips) versus how many trips are leaving the development (outbound trips). Generally residential land uses have significantly more outbound trips than inbound trips in the AM peak hour; the opposite is true for the PM peak hour. This phenomenon is generally reversed for employment-oriented land uses.

Trip Distribution

Step two of the process establishes where trips generated by the new development are coming from and going to (i.e. 20% of site trips are coming from the north, 30% from the south, 40% from the west, and 10% from the east). The trip distribution pattern for the Study Area was determined through assessment using the District's EMME model and then adjusted based on engineering judgement.

A distribution matrix determines the share of site generated traffic coming from/destined for various zones outside of the study area. Because Lynn Valley is a large area with many different planned land use types, a share of the total trips will be local – e.g. they will both begin and end within the Study Area itself. Because of the size and nature of the Study Area, local trips were assumed to be made by alternative modes (walking and cycling).

Mode Choice

Not all trips are made by automobile. Other modes, such as public transit, walking, and cycling can also be options for travelers, particularly within an urban context. Step three of the process factors in the effect of other modes on projected traffic. The *ITE Trip Generation Manual* trip rates, used in step 1 of the four step process, represent vehicle trips, not total person trips. Most of the survey data in the Trip Generation Manual was collected in suburban locations in North America. Generally, non-auto mode share of 5% and average vehicle occupancy of 1.2 persons per vehicle can be assumed for the rates within the manual. In many cases, the combined non-auto mode share in a study area is significantly higher than 5% and/or carpooling is more widespread.

In order to account for these differences, total vehicle trips generated are reduced to account for location-specific vehicle occupancy and non-auto trips to more accurately reflect the traffic generated by the proposed land use change. This was completed by converting the vehicle trips provide in the ITE Trip Generation Manual to person trips and then recalculating vehicle trips based on local conditions.

For the Study Area, future mode share was assumed to be the same as current mode share. The mode share for the District as a whole was used to complete this estimate. These estimates are conservative – vehicle trips generated by development will likely be lower than those estimated. Mode share is expected to shift away from single occupancy vehicles over time – this change is not reflected in the mode choice reductions in this analysis.

Trip Assignment

The final step in forecasting travel behaviour is determining which roads travelers use within the study area to reach the new site. This step is known as trip assignment. Trip assignment is distinctly different from trip distribution (step 2). While trip distribution determines where travelers are coming from/going to, trip assignment determines which roads travelers use to get between where they are coming from and the site. Once assigned, development traffic is then added to background traffic at the chosen horizon year. Intersection performance is then assessed to determine the impact of the land use change on the surrounding road network.

Appendix B: Supplemental Cross Section Appendix

MEMORANDUM

URBAN systems

Date:	March 13, 2013
To:	Erica Geddes
cc:	Tegan Smith, Annie Chung
From:	Allison Clavelle
File:	1333.0018.01
Subject:	Lynn Valley Road Typical Cross Sections

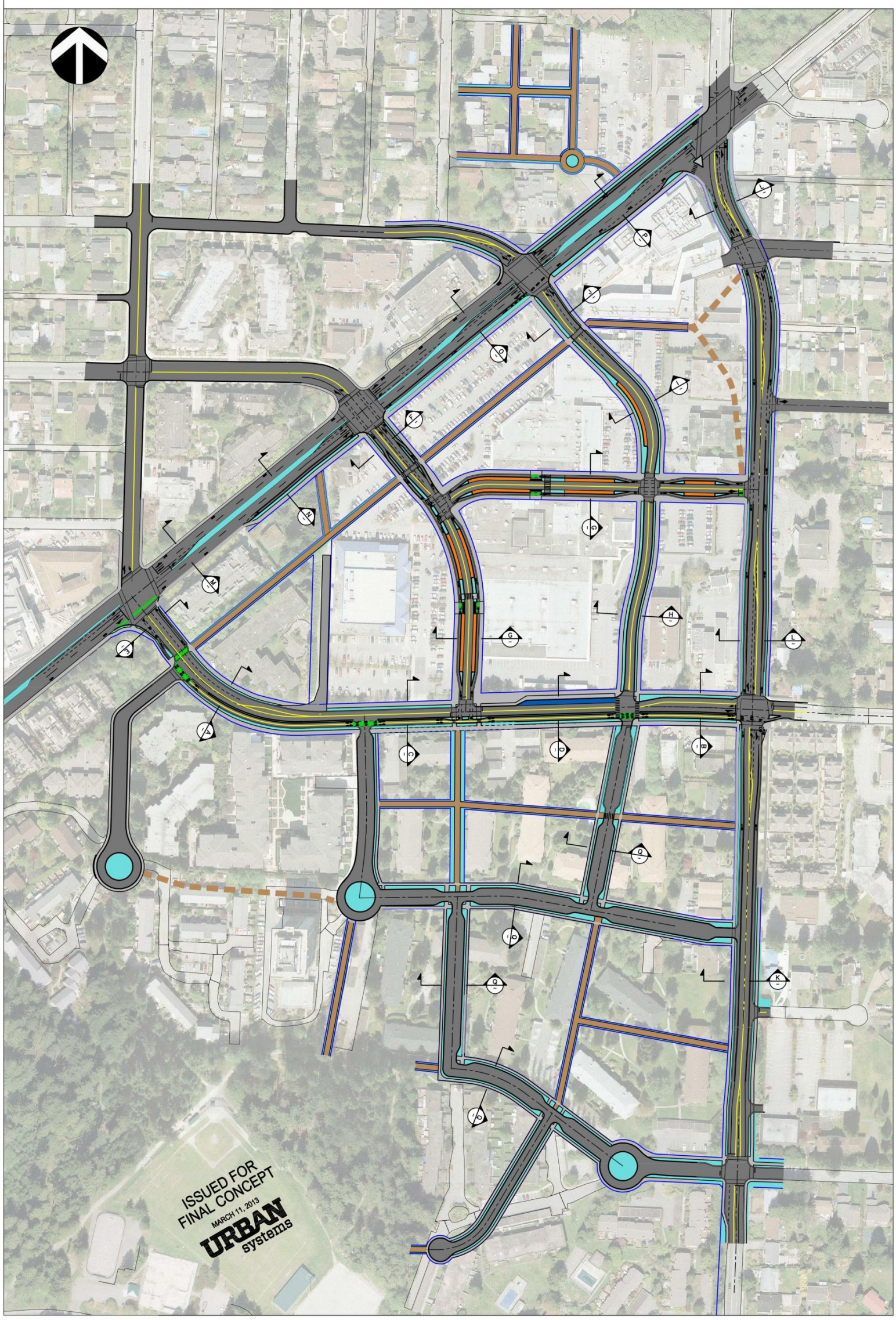
This memo provides additional detail to the *District of North Vancouver Lynn Valley Town Centre Transportation Assessment* (LVTC Transportation Assessment) completed by Urban Systems in March 2013. Typical cross sections are illustrated for streets within the study area. Cross sections for 27th Street, High Street, Rain Street, Mountain Highway, and Lynn Valley Road as well as a typical section that was utilized for all new local roads within the study area. These local roads include Whiteley Court, Rain Street south of 27th Street, and Emery Place.

The design philosophy and impacts associated with these cross sections are consistent with the discussion provided in the LVTC Transportation Assessment.

All cross sections provided herein are associated with Exhibit 1 – Cross Section Locations.

URBAN systems

Cross Section Locations



URBAN systems
urbansystems.ca

EXISTING LEGAL LOTS

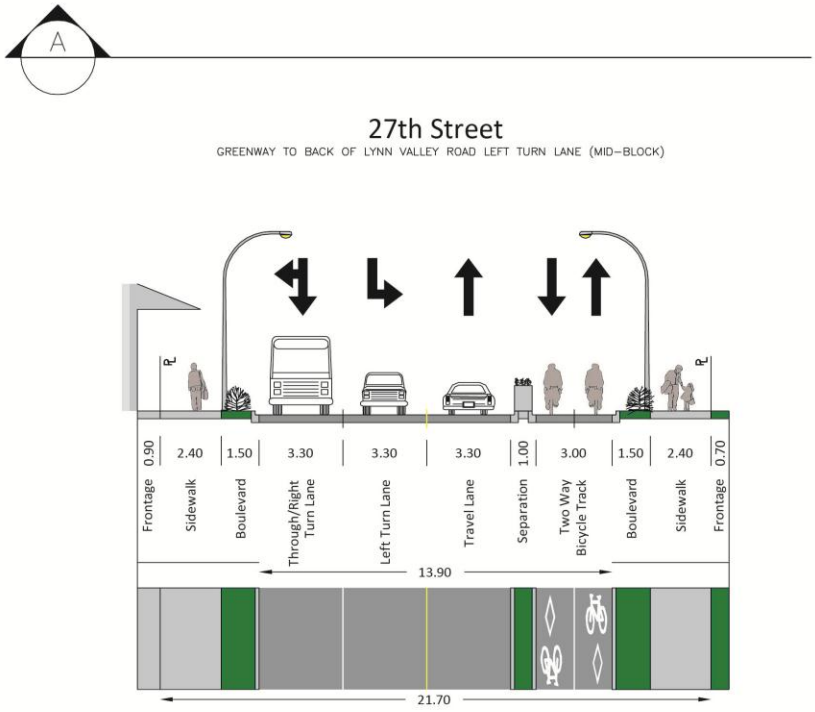
Client/Project
District of North Vancouver
Lynn Valley Town Centre Transportation Study

Scale	Date	Exhibit
1:1250	2013-03-08	01
1333.0018.01		Title

Lynn Valley Town Centre Street Network

\\sd.urban-systems.com\projects\projects_van\1333\0018\01\d-drafting-design-analysis\CADD\CURRENT\production\P09-1333-0018-01 - Cross Section Legend.dwg, P03-1, 2013/03/17 07:06 pm jworkman

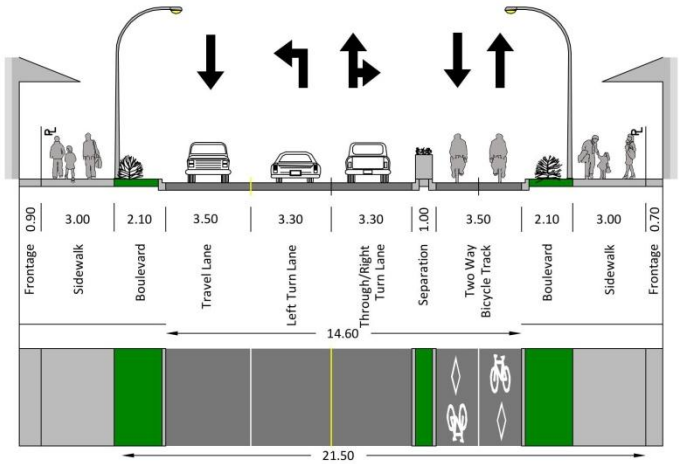
1.0 27TH STREET



B

27th Street

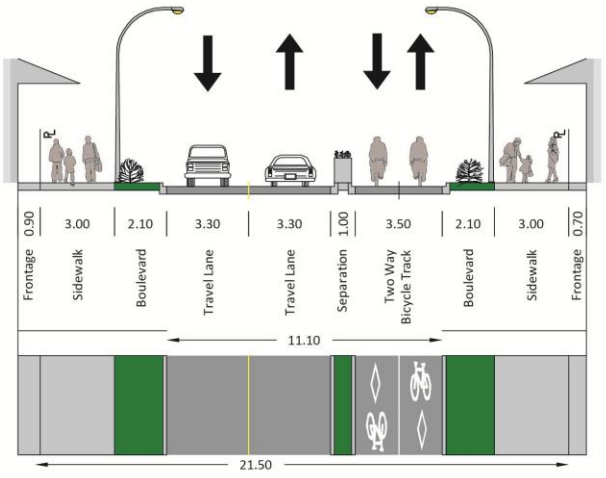
RAIN STREET TO MOUNTAIN HIGHWAY (INTERSECTION)



C

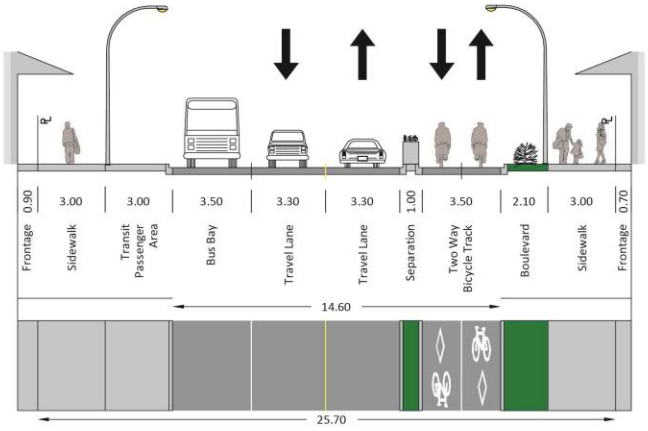
27th Street

LYNN VALLEY ROAD TO MOUNTAIN HIGHWAY (MID-BLOCK)



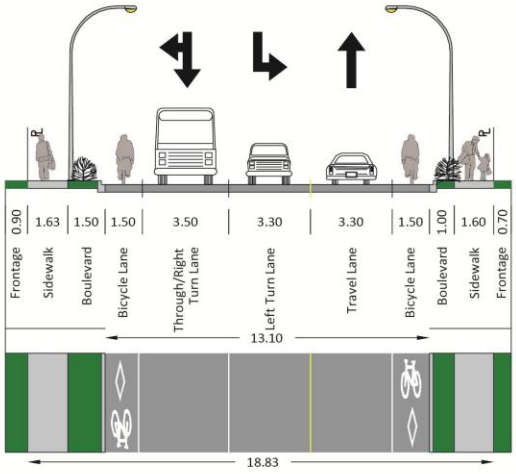
D

27th Street
LYNN VALLEY ROAD TO MOUNTAIN HIGHWAY (BUS BAY)



E

27th Street
LYNN VALLEY ROAD GREENWAY (INTERSECTION)

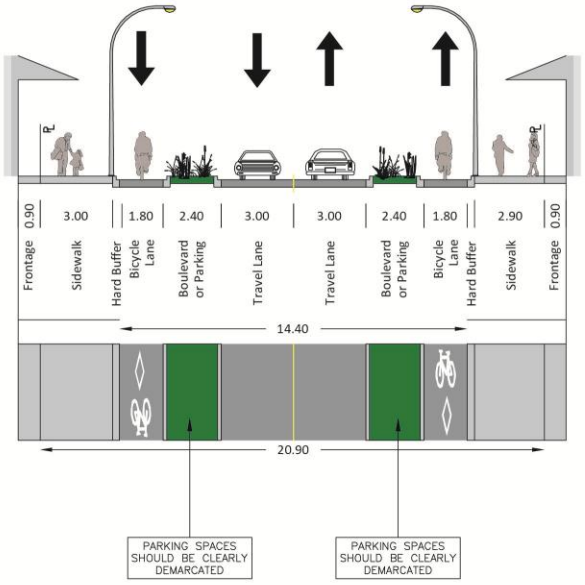


2.0 HIGH STREET

G

High Street

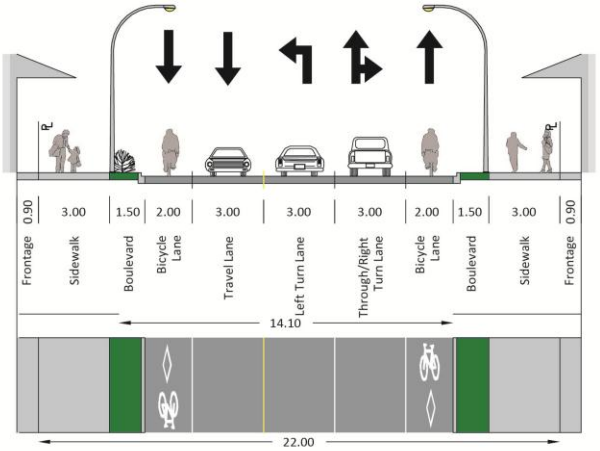
HIGH STREET A: 27th STREET TO HIGH STREET B (MID-BLOCK)
HIGH STREET B: HIGH STREET A TO MOUNTAIN HIGHWAY (MID-BLOCK)



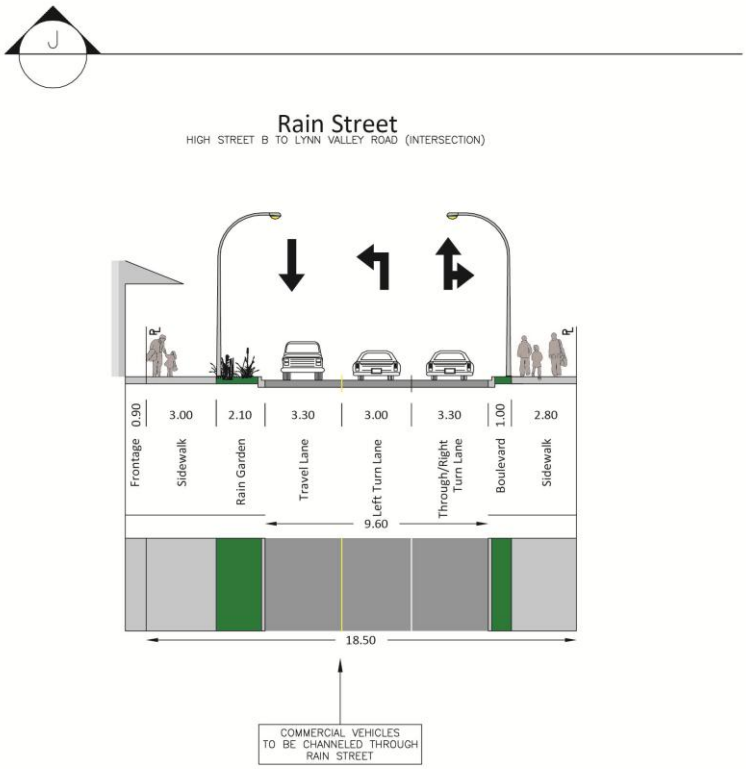
F

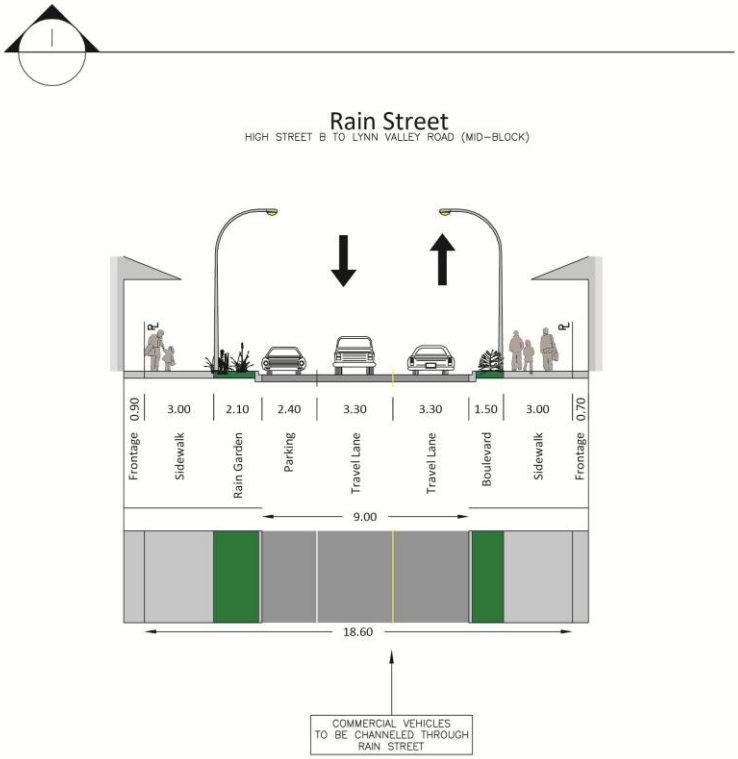
High Street A

HIGH STREET B TO LYNN VALLEY ROAD (INTERSECTION)

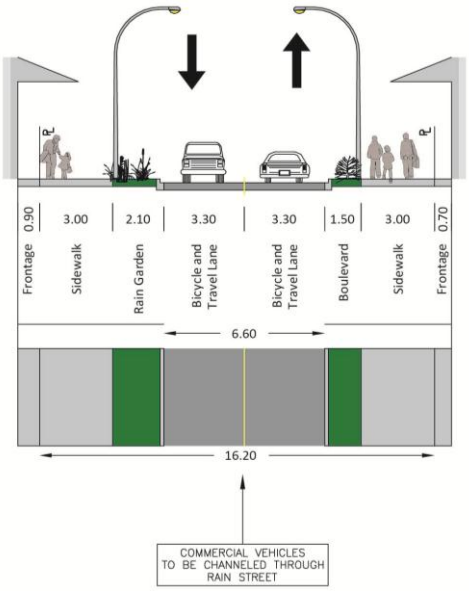


3.0 RAIN STREET



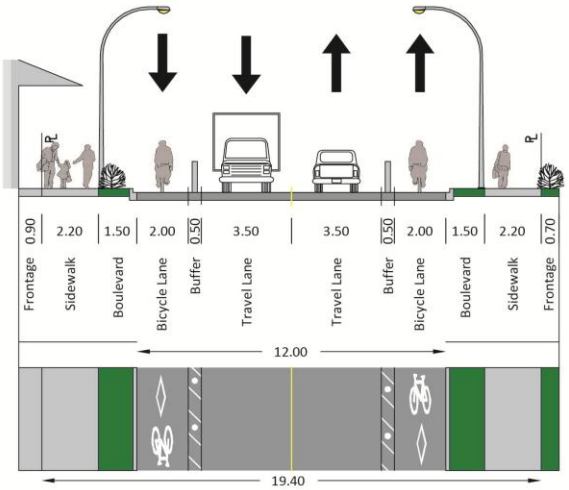


Rain Street
27TH STREET TO HIGH STREET B (MID-BLOCK)

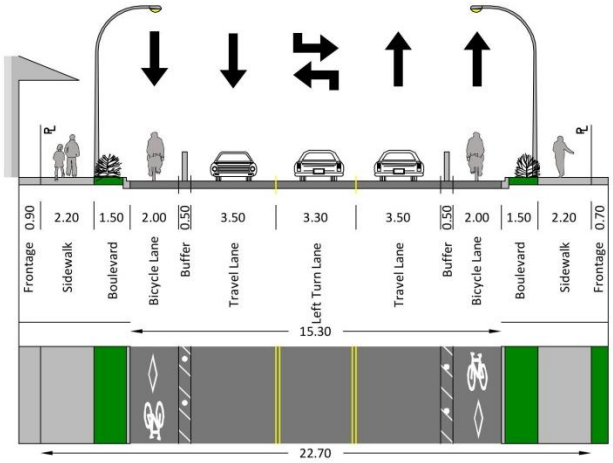


4.0 MOUNTAIN HIGHWAY

Mountain Highway
24TH STREET TO ROSS ROAD (MID-BLOCK)

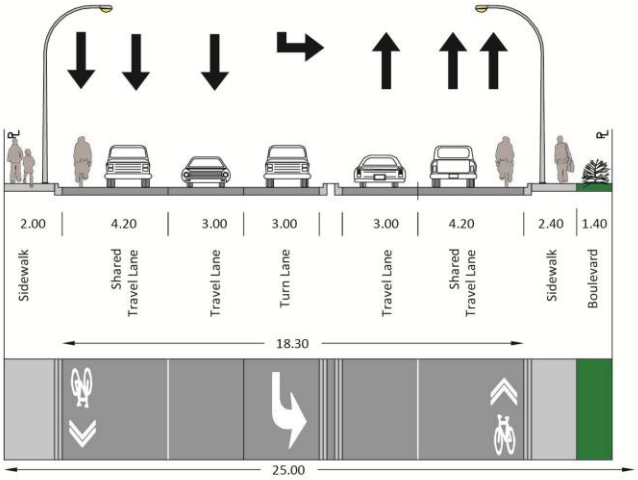


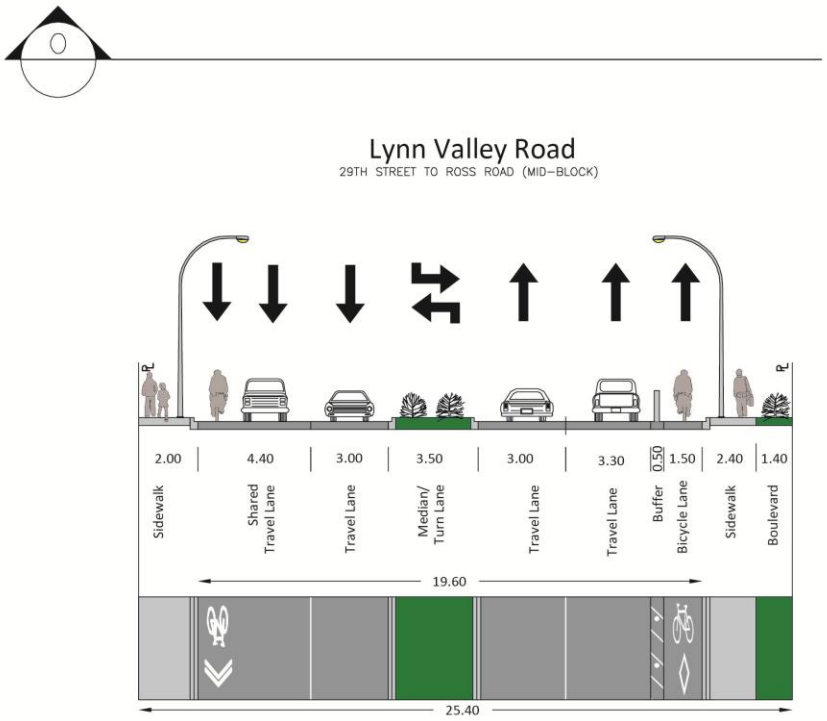
Mountain Highway
ROSS ROAD TO LYNN VALLEY ROAD (MID–BLOCK)
27th STREET TO HIGH STREET (MID BLOCK)

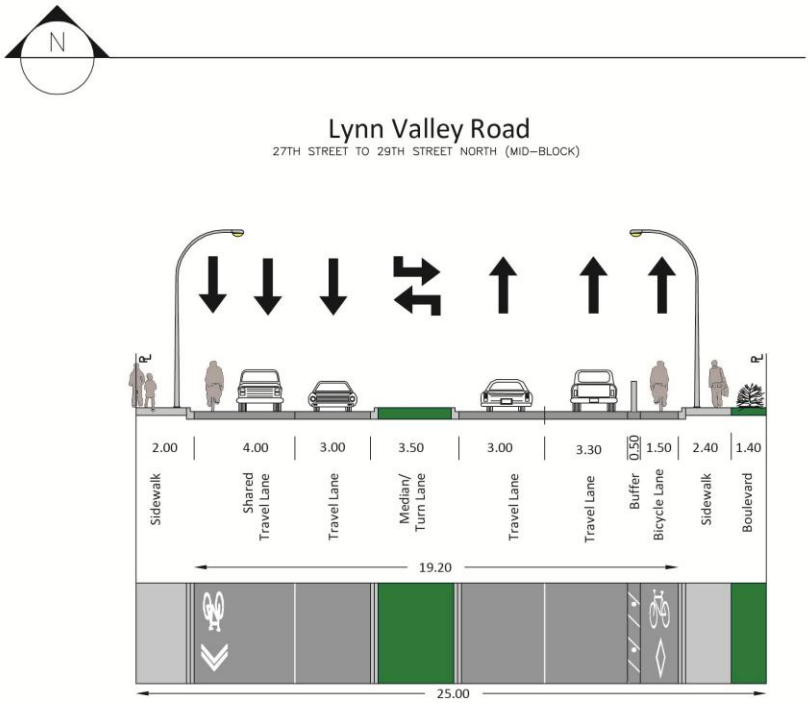


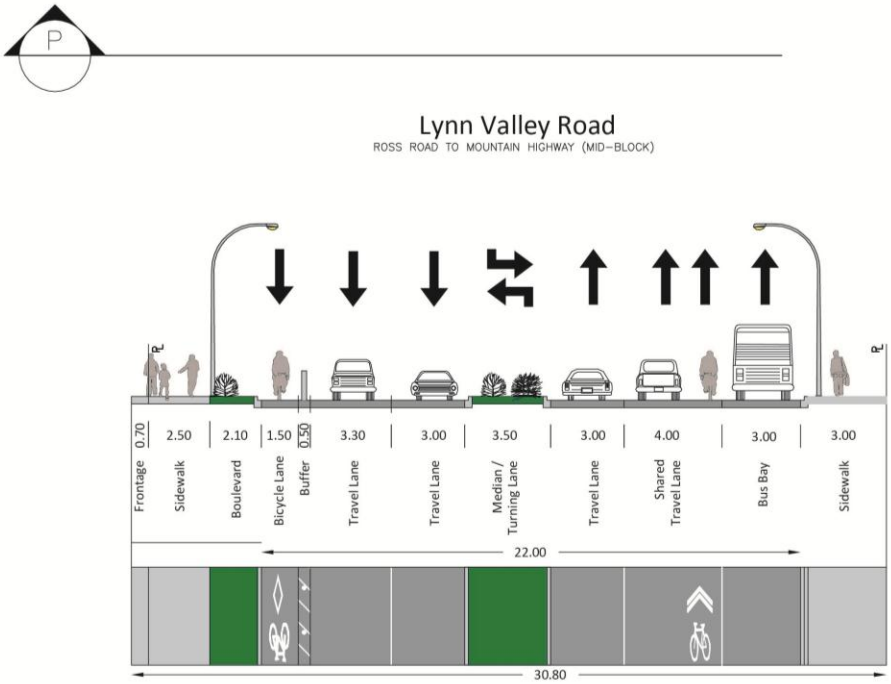
5.0 LYNN VALLEY ROAD

Lynn Valley Road
27TH STREET TO 29TH STREET SOUTH (MID–BLOCK)



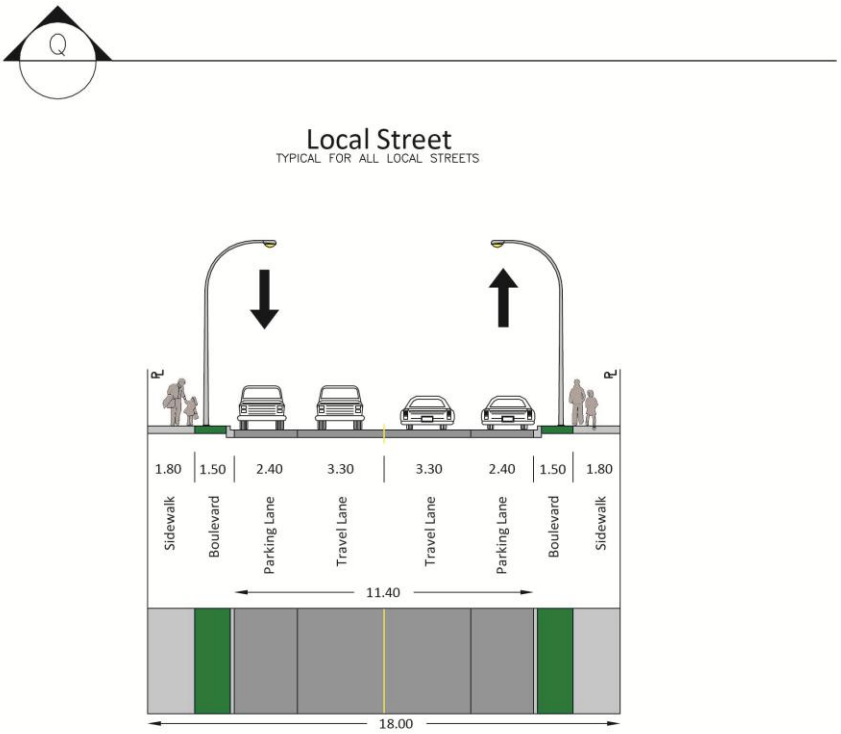

Lynn Valley Road
29TH STREET TO ROSS ROAD (MID–BLOCK)
2.00
4.40
3.00
3.50
3.00
3.30
0.50
1.50
2.40
1.40
Sidewalk
Shared Travel Lane
Travel Lane
Median/ Turn Lane
Travel Lane
Travel Lane
Buffer
Bicycle Lane
Sidewalk
Boulevard
19.60
25.40


Lynn Valley Road
27TH STREET TO 29TH STREET NORTH (MID–BLOCK)
2.00
4.00
3.00
3.50
3.00
3.30
0.50
1.50
2.40
1.40
Sidewalk
Shared Travel Lane
Travel Lane
Median/ Turn Lane
Travel Lane
Travel Lane
Buffer
Bicycle Lane
Sidewalk
Boulevard
19.20
25.00

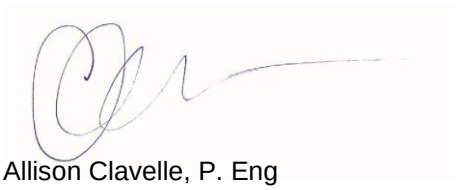


6.0 OTHER ROADS

As previously noted, a typical cross section was used for all new or modified local streets within the study area. It was assumed that the cross section for Fromme Road north of 27th Street, 29th Street, and Ross Road would all remain consistent with existing conditions.



URBAN SYSTEMS LTD.



Allison Clavelle, P. Eng
Transportation Engineer

/jw

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