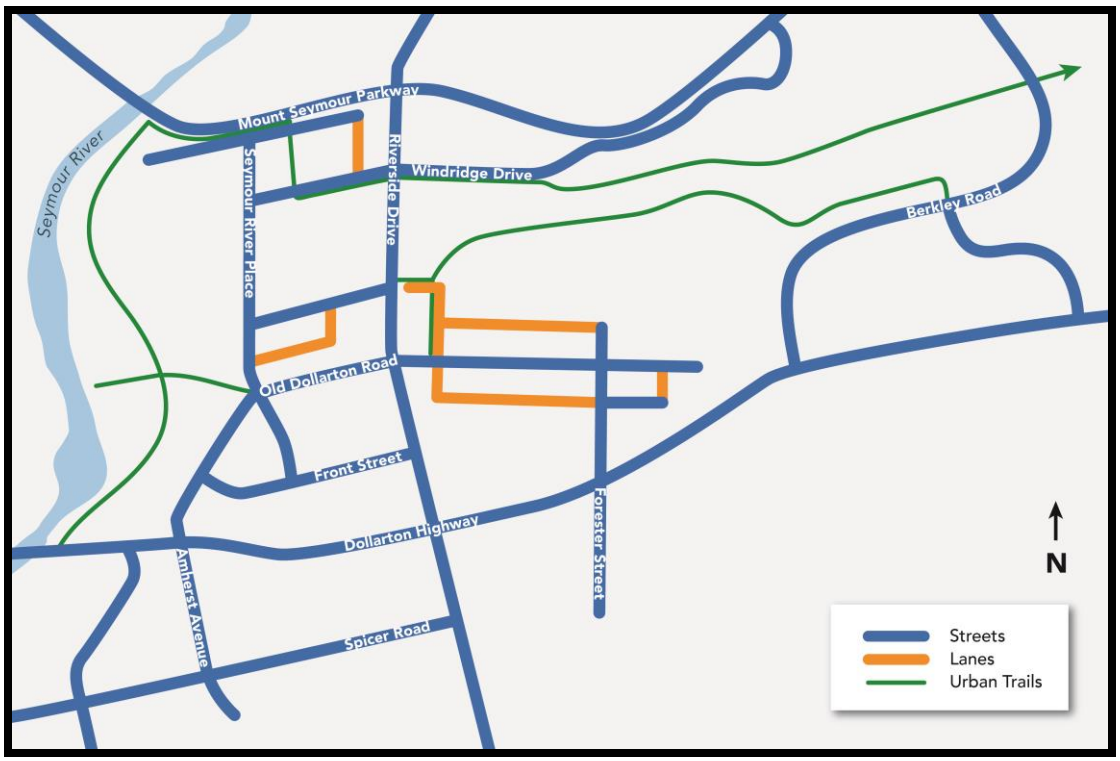
Maplewood Village Transportation Study Update (December 2017)
Maplewood Village Functional Design Report (April 2018)

The District of North Vancouver (DNV) undertook an implementation planning and engagement process for Maplewood to develop a detailed design concept and design guidelines to guide development, the form and character of buildings and public realm elements in Maplewood. Council approved the *Maplewood Village Centre and Innovation District Implementation Plan & Design Guidelines* (Implementation Plan) on November 6, 2017.The growth and revitalization anticipated in the Implementation Plan to 2030 triggered the need to update the transportation study to ensure the transportation network aligns with the community vision for Maplewood. The transportation analyses completed as part of this work includes: *Maplewood Village Transportation Study Update* (Study, 2017) and *Maplewood Village Functional Design Report* (Design Report, 2018).

The Study addresses the transportation system to accommodate all users - people walking, cycling, taking transit and driving. The Study includes an analysis of existing conditions, future base conditions, options analysis and recommendations. The consultant conducted the traffic analysis based on land use assumptions developed by DNV staff. These assumptions were based on the information available at the time. Outcomes of the Study include new walking, cycling and road connections needed to support the vision and goals outlined in the Implementation Plan as well as providing traffic data (e.g., volumes, queues) to guide the functional design.

Figure 1: Maplewood Transportation Network



In addition to cross-sections and conceptual plans for key roads, the Design Report contains information about the design principles, including key considerations about lane configuration, cycling network, transit facilities, cross-section requirements, etc. The Design Report also includes issues and constraints uncovered through the process, and cost estimates.

It is intended that these two documents are to be used in conjunction with one another.

Key Findings from the Study include:

- Extending Berkley Road from Mount Seymour Parkway to Dollarton Highway, prioritizing through movements for all users by minimizing intersections and no driveways. The new connection accommodates transit, and provides high quality walking and cycling facilities. The new facility provides an alternative to using Riverside Drive, allowing Riverside Drive to be redesigned for the village.

- Extending Seymour River Place from Old Dollarton Road to Front Street as a shared street. Traffic volumes on this facility should be slow moving to allow for all users to share the same space.

- The proposed land use changes enable improvements for active and healthy transportation. The Study identifies improvements for walking and cycling, including all-ages-and-ability cycling facilities on Old Dollarton Road, Dollarton Highway, Berkley Road and Riverside Drive.

- Extending the Spirit Trail from Lynn Creek Town Centre through the Village and Innovation District east towards Deep Cove.

Highlights from the Design Report include:

- Traffic signals assumed in several locations. Formal warrant analysis will be required to verify the level of traffic control needed.

- Level of traffic control (e.g., 2-way stop, all way stop, pedestrian signal) assumed at specific locations. Formal analysis will be required to verify level of traffic control needed.

- Identifies key laning and recommended turn lanes with associated storage lengths.

- Supports the extension of B-Line service to the Village and Innovation District by identifying and accommodating B-Line bus stations along Old Dollarton Road in the Village. All roads were also designed to accommodate articulated buses used by B-Lines.

A full copy of the Functional Design follows.

URBAN systems

MAPLEWOOD VILLAGE
FUNCTIONAL DESIGN REPORT

FINAL REPORT
April 27, 2018

1333.0040.03

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Maplewood Village Transportation Functional Design Report

Final Report

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Date issued: April 27, 2018

Project No.: 1333.0040.03

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LIST OF APPENDICES

DEFINITIONS

95th Percentile Queues – Length of vehicle queue that has a 5% chance of being exceeded during the peak hour.

All Ages and Abilities (AAA) – Infrastructure designed to make cycling comfortable and safe for ages ranging from 8-80 and from beginners to advanced.

Computer Aided Design (CAD) – drafting program used to develop road design drawings.

Class D Cost Estimate – Preliminary or Order-of-Magnitude Cost Estimate for proposed project. Typically used for long term capital plans for municipalities. 40% contingency used.

Curb Bulges – Curb extensions at intersections and midblock crossings that reduce crossing distance of roadway for pedestrians.

Design Criteria – Developed criterion used to design each roadway. Typically includes lane uses, widths, design vehicle, alternative uses (bicycles, pedestrians, etc.).

Design Vehicles – Anticipated largest vehicle that will regularly use the infrastructure or roadway.

District of North Vancouver (DNV, District) – District Municipality located on the north shore of the Metro Vancouver region in British Columbia.

Functional Design – Geometric focus designed to accommodate specified users and design vehicles.

Greater Vancouver Regional District (GVRD) –. Political body and service provider that oversees the Greater Vancouver region's 21 municipalities, one Treaty First Nation, and one electoral area including the District of North Vancouver.

Innovation District – The subarea of the Maplewood Area defined in the ***Maplewood Village Centre and Innovation District Implementation Plan & Design Guidelines***. This new district is located on the eastern border of the Maplewood Area in the currently undeveloped lands.

Maplewood Area – Area defined in the Official Community Plan and ***Maplewood Village Centre and Innovation District Implementation Plan & Design Guidelines***. Located south of Mount Seymour Parkway and east of the Seymour River.

Maplewood Village – Area defined in the ***Maplewood Village Centre and Innovation District Implementation Plan & Design Guidelines*** (area surrounding Seymour River Place and Old Dollarton Road).

Maplewood Village Centre and Innovation District Implementation Plan & Design Guidelines (2017) (Implementation Plan) – Document intended to guide development and regulate the design of elements within the Maplewood Area.

Maplewood Village Transportation Study Update (2017) (Transportation Study Update) - Document summarizing the transportation planning and traffic engineering completed to identify the recommended transportation network for the Maplewood Area.

Medium Single Unit (MSU) – Heavy vehicle without articulation, with dimensions as defined by ***TAC Geometric Design Guidelines for Canadian Road (2017)*** Chapter 2.

National Association of Transportation City Officials (NACTO) – North American association that publishes design guidelines related to complete streets and pedestrian, cycling, and transit facilities.

Official Community Plan (OCP) – District wide document that sets the direction for future growth and change in the District.

Protected Bicycle Lane – A bicycle lane that is physically separated from traffic by a curb or median.

Road A – Proposed new road to connect Berkeley Road to Dollarton Highway and provide access to development within the Innovation District.

Road B – Proposed new road connected to Road A intended to provide access to development within the Innovation District

Signal Timing – The time-based distribution of right-of-way at a signalized intersection.

Transportation Association of Canada (TAC) – National association that develops roadway guidelines for Canada.

TAC Geometric Design Guide for Canadian Roads (2017) – Design guidelines published by TAC for urban and rural Canadian Roads.

Wheelbase-20 (WB-20) – Tractor semitrailer with dimensions defined by ***TAC Geometric Design Guidelines for Canadian Road (2017)*** Chapter 2.

1.0 INTRODUCTION

The Maplewood Area is located east of Seymour River between Mount Seymour Parkway and Dollarton Highway in the District of North Vancouver (District). This location is illustrated in Figure 1-1. On November 6, 2017, District Council approved the ***Maplewood Village Centre and Innovation District Implementation Plan & Design Guidelines*** (2017) (Implementation Plan). The Implementation Plan identifies the vision, principles and policies for the Maplewood Area and will guide local development. To achieve the vision requires substantial improvements to the existing transportation network, as well as the development of new multimodal corridors. This report documents the functional design of the transportation network, which outlines the approach to the development of an improved transportation network, confirms feasibility, and identifies property requirements, as well as constraints.

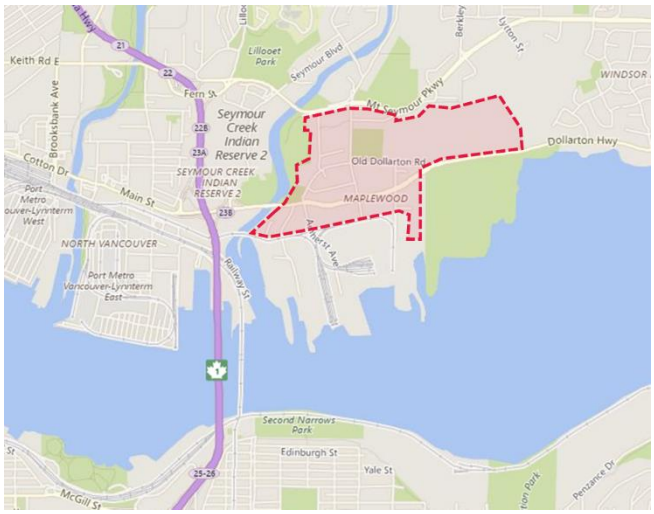


Figure 1-1: Maplewood Area

The **Maplewood Village Transportation Study Update** (2017) (Transportation Study Update) was developed in parallel with the Implementation Plan in order to identify a recommended transportation network in the Maplewood Area, including within the Maplewood Village Centre and the proposed Innovation District. The recommendations identified infrastructure to continue to develop a more livable and walkable Village Centre, improved bicycle connections that accommodate all ages and abilities, convenient access to transit, accommodate goods movement, and a balanced transportation system.

1.1 EXISTING CONTEXT

The Maplewood area is divided into three sub-areas: the Maplewood Village, which is the existing community surrounding Riverside Drive; the Undeveloped Lands (future Innovation District) in the east side of the study area; and Dollarton Highway Light Industrial, south of Dollarton Highway. Approximately 1,000 people live in Maplewood today in a mix of older, more affordable rental townhouses and low-rise apartments, and a blend of old single-family homes. Maplewood is a significant North Shore employment node, with established industrial and commercial uses to the south and with established and recently developed business parks along the new Dollarton Highway. Over 220 businesses are located here and contribute significantly to the District's job base and economy. The area includes — and is bordered by — significant green spaces and ecological areas including Maplewood Flats Conservation Area.

The Maplewood Area is bounded by two east-west four lane arterial roads: Mount Seymour Parkway to the north and Dollarton Highway to the south. These roads connect the east of the District to the west, to Highway 1, and on to the remainder of the Lower Mainland and beyond. They are important east-west links for many residents in Maplewood and in eastern areas of the District. A north-south arterial, Riverside Drive, bisects the village centre. This is the only north-south arterial between the eastern edge

of the District (where Mount Seymour Parkway and Dollarton Highway connect) and Highway 1 and carries through traffic travelling between the two east-west arterials, as well as local traffic.

The existing developed area is served by a network of local roads with a mix of sidewalk facilities. Cycling facilities are limited throughout the area. The undeveloped lands are largely unconnected, with Berkley Road terminating around 100 m south of Mount Seymour Parkway. The roadway characteristics in the study area are illustrated in **Figure 1-2.** A more detailed description of the existing road network, including characteristics and anticipated performance in a future base condition are summarized in the ***Transportation Study Update***.

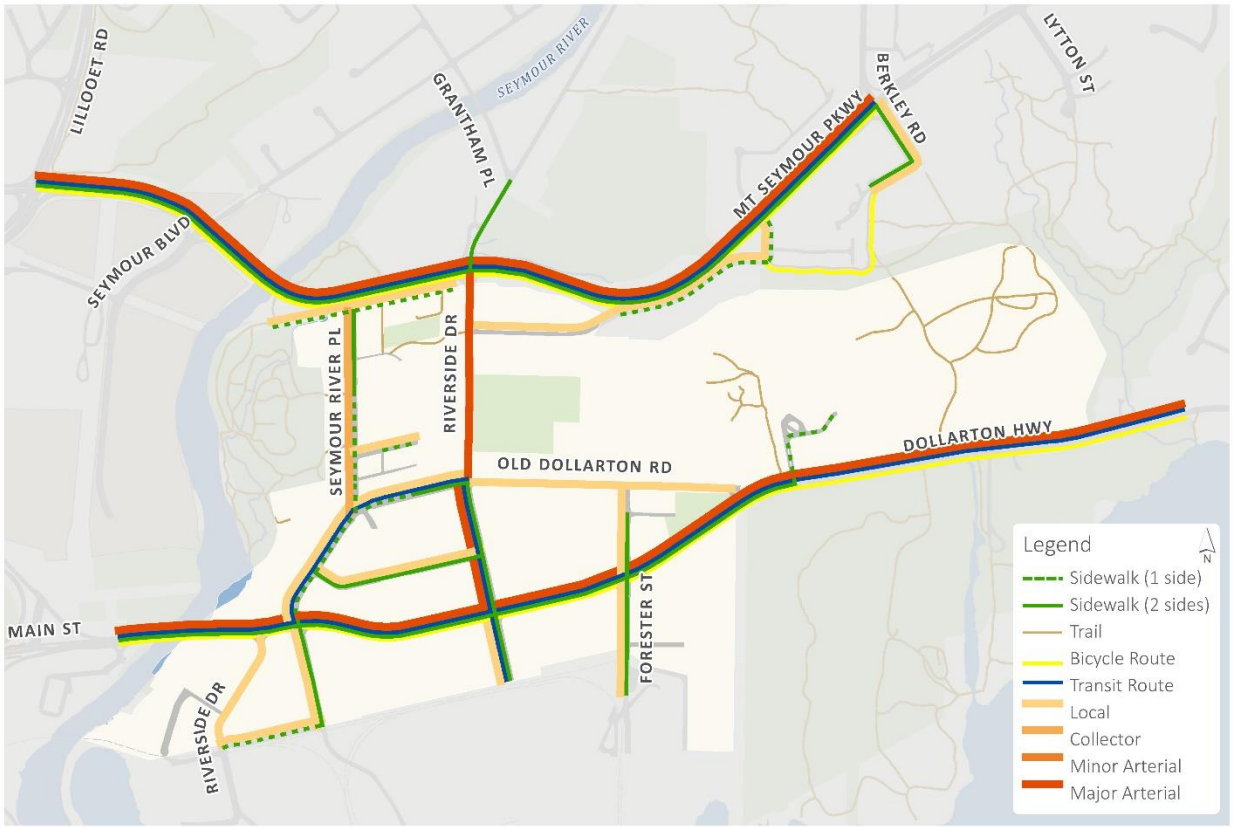


Figure 1-2: Existing Transportation Network

1.2 STUDY SCOPE & METHOD

This functional design included the design of transportation corridors within the Maplewood Area, including both roadways and trails. Design decisions were made collaboratively with the District based on the intent of the roadway, modes to be accommodated, and property constraints. The project included the following parts:

A. Develop Design Criteria – the project team proposed design criteria and typical cross-sections for each roadway based on the findings of the ***Transportation Study Update.*** These were presented to the District and refined based on feedback.
B. Develop Options and Determine Impacts – this phase included the development of proposed alignments for the transportation network in the future Innovation District. It also included the

development and assessment of options at key intersections and the identification of constraints and trade-offs.

C. Preliminary Functional Work – this phase included finalization of cross-sections, alignments, and right-of-way widths, as well as preliminary design work for intersections.
D. Cost Estimates – the study team prepared cost estimates for roadway and trail segments.
E. Final Functional Design and Functional Design Report – in this phase, the functional design for roadways and key trails were finalized. The work confirmed the feasibility of the proposed infrastructure, including confirming vertical profiles where changes were planned, and identifying property constraints. In this phase, other infrastructure, such as lanes and other trails were added at a conceptual level.

This report is the culmination of this work. It is organized into the following sections:

1. Introduction – outlines the study context and scope.
2. Planned Transportation Network – provides information about the principles that guided the development of the functional design, including key decision making about lane configuration, the cycling network, transit facilities, cross-section requirements, intersection control and configuration, and other elements that were developed through the ***Implementation Plan*** and ***Transportation Study Update***.
3. Design Approach and Criteria – summarizes the sources of overall design criteria, as well as the approach and specific criteria used for Maplewood. This section provides general information about how criteria were applied to different types of roadways, as well as more specific examples of how criteria deviated from the standard or where specific approaches were used to accommodate the District's needs or address key constraints.
4. Functional Design –presents the plans and cross-sections
5. Issues and Impacts – summarizes issues and impacts uncovered through the functional design. Some of these must be investigated further by others through other processes.
6. Class 'D' Cost Estimates- presents the cost estimates associated with the proposed infrastructure.
7. Closing – concludes the report.

This report also includes a number of Appendices that are instrumental to understanding the functional design and are intended to be used as a guide for the development of future work, including detailed design. The Appendices include:

- Appendix A: Summary of Roadway Characteristics
- Appendices B – R: These appendices provide the design criteria, design notes, functional design plans, profiles (where applicable), cross-sections, and cost estimates for each section of roadway.

2.0 PLANNED TRANSPORTATION NETWORK

In 2015, the District undertook a new study to develop an Implementation Plan for the Maplewood Area and Village Centre. This plan is intended to implement the direction set out in the Official Community Plan (OCP) and include design guidelines for the area. The intent of the ***Implementation Plan*** is to create a community with diverse employment opportunities and community amenities, a walkable core, and access to the natural environment, which remains connected to the urban streetscape. As part of the development of the ***Implementation Plan*** the District held a design charrette to develop a concept plan for the Maplewood Village and surrounding area. The process included representation from the design and planning team, community stakeholders that represent a variety of interests, and District staff. The concept plan was presented to the public and modified by technical experts and District staff to create a 'refined concept' plan for Maplewood. This 'refined concept' is shown in **Figure 2-1** and was used as a basis for the development of the recommended transportation network.

The plan shows the concentration of commercial / mixed use and live work land use around Old Dollarton Road and Front Street in the Village Heart, an 'artisan industrial' area around Old Dollarton Road east of Riverside Drive, and a diverse mix of residential uses through the neighbourhood. It also shows an emerging Innovation District with light industrial & commercial businesses and employee dedicated housing in the east portion of the neighbourhood along with a new District fire facility.

Through the work completed and documented in the ***Transportation Study Update*** and the functional design, this network proposed as part of the 'refined concept' and illustrated in **Figure 2-1**, the transportation network evolved. This included changes to road alignments in the Innovation District, the conceptual location of trails throughout the study area, and the locations and connectivity of lanes. This work also developed the network in more detail, including identifying intersection configurations, identifying a AAA cycling network, located potential future bus stops and stations, and identifying high priority pedestrian areas where wider sidewalks are required. More detail about the transportation planning and traffic engineering work required to develop the recommended network can be found in the ***Transportation Study Update***. The recommended network is illustrated in **Figure 2-2** and a high-level summary of proposed features and improvements is included below. A detailed summary of the planned features of each roadway is included in Appendix A.

The recommended network has been developed to meet the functional transportation needs of the Maplewood Area based on the information available at the time of the analysis. It is provided for guidance. Changes to land use density and / or composition will require additional transportation planning, traffic engineering, and design work to confirm the continued relevance of the original recommendations. As plans and proposals within the neighbourhood evolve and detailed designs are developed for individual blocks and corridors, alternative solutions may be explored. These alternatives may be warranted and / or desirable but should be subject to rigorous consideration of the constraints and objectives outlined in this report.

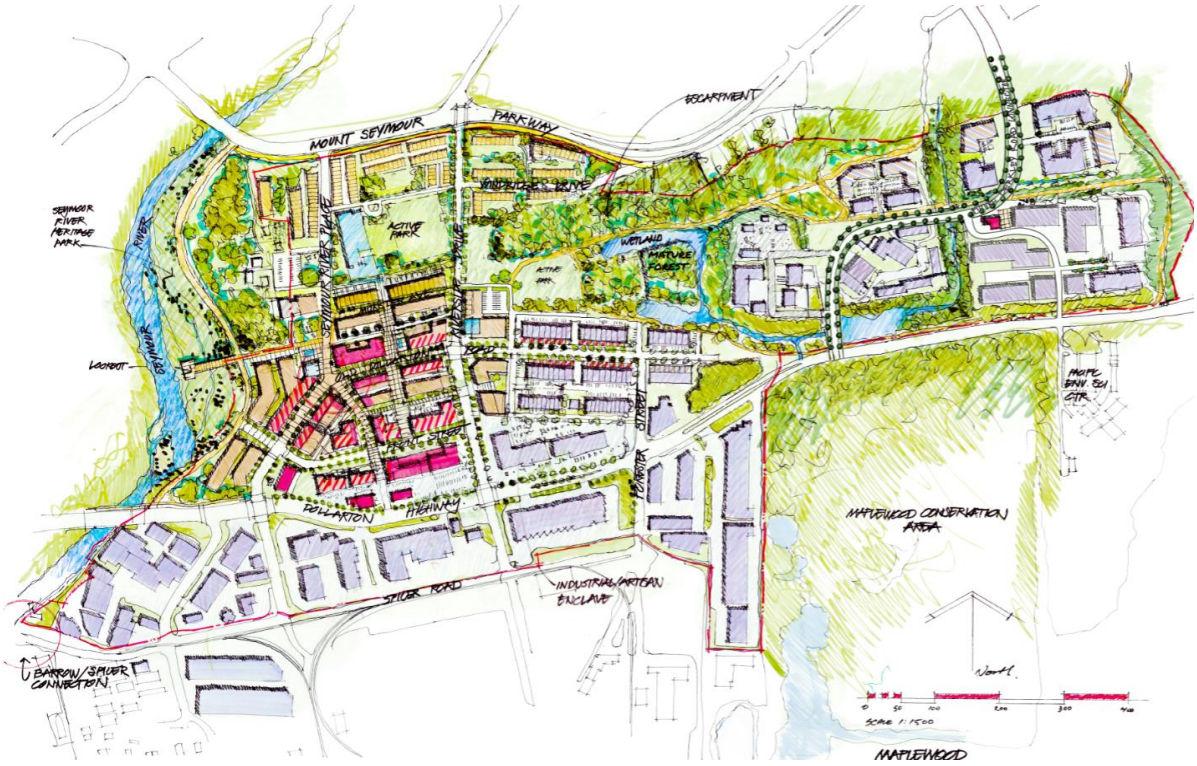


Figure 2-1: Maplewood Concept Plan

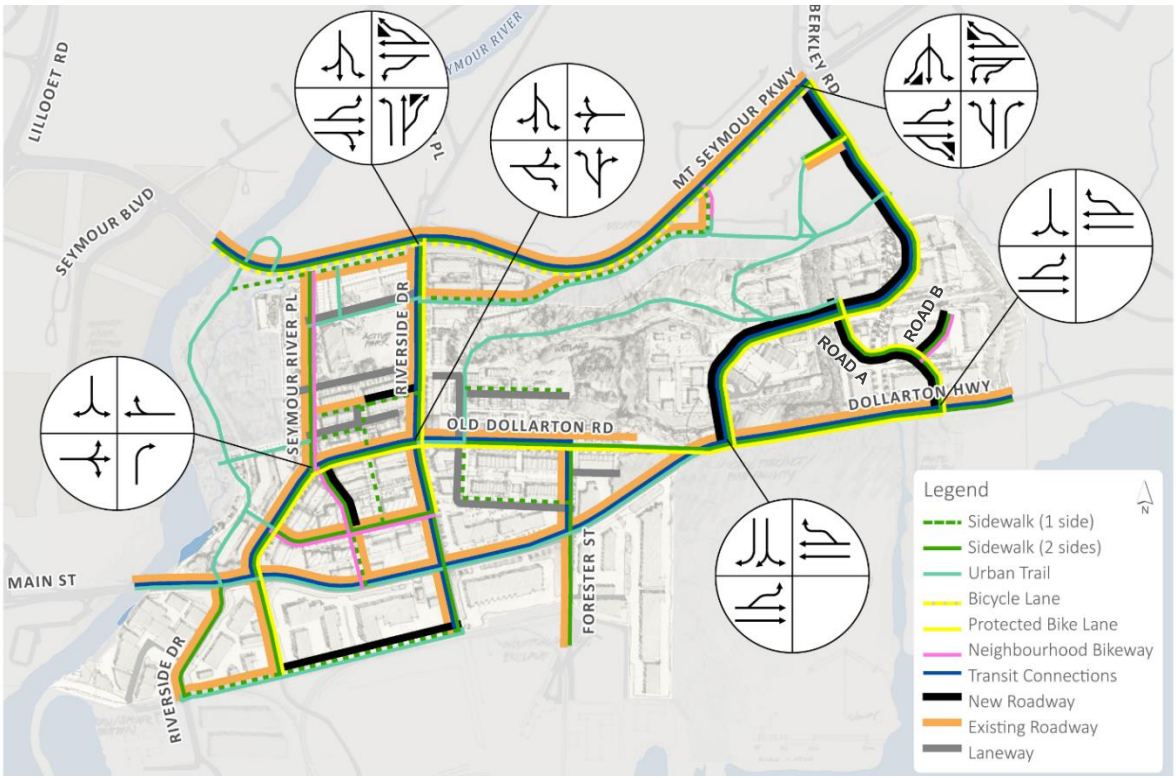


Figure 2-2: Recommended Transportation Network with Improvements

The overall network for driving and goods movement prioritizes east-west through movements past Maplewood in order to decrease overall delay in regional transportation, including delay to trucks and buses. Specific improvements that contribute to this approach include the following:

- Developing Berkley Road – this roadway was designed as a two-lane roadway with full separation of vehicles from cyclists and pedestrians, no access to private development, a limited number of intersections, and no on-street parking. The median provides sufficient space to develop future left turn lanes and the design accommodates future four-laning of the roadway. This will result in a new connection with limited delay. The roadway adds capacity to the overall network, as well as network redundancy. Drivers travelling east-west will be able to chose the most efficient route without incurring delay on Riverside Drive. To support this, dual westbound left turn lanes are recommended at the intersection of Berkley Road and Mount Seymour Parkway and dual southbound right-turns are recommended at the intersection of Berkley Road and Dollarton Highway.
- Widening Dollarton Highway. The recommended network includes widening Dollarton Highway to four lanes from the east end of the Study Area to the existing four lane section. This will increase the capacity of Dollarton Highway and allow traffic to be more effectively distributed between Dollarton Highway and Mount Seymour Parkway, reducing overall delays.
- Updating signal timings and configurations to prioritize east-west movements on Dollarton Highway and Mount Seymour Parkway. The ***Transportation Study Update*** recommended that signals on Dollarton Highway and Mount Seymour Parkway prioritize east-west travel and accept increasing delay on north-south roadways and for left turn movements. In conjunction with the prioritization of east-west movements, the study found that some changes to the intersection configuration at Mount Seymour Parkway and Riverside Drive were required to avoid undesirable impacts throughout the network. As a result, the recommended improvements at this intersection include separate northbound left, northbound through, and northbound right lanes, with a merge lane on Mount Seymour Parkway for the northbound right turn movement.
    - The northbound right turn movement is anticipated to be around 500 vehicles per hour in the afternoon peak in the future horizon (2031); without an exclusive lane, this volume is expected to result in 95th percentile queues that exceed 200 m, which would result in a queue that regularly extends past Windridge Drive.
    - A short northbound left turn lane separates northbound left and northbound through vehicles. This reduces the likelihood that northbound through vehicles queue behind northbound left vehicles, which have a permissive movement and must yield to southbound traffic. This further limits delays and minimizes the total anticipated northbound queue. In the recommended configuration, northbound queues are not expected to block the intersection with Windridge Drive.

The recommended improvements discourage through movements in the Maplewood Village through the following mechanisms:

- Metering traffic entering Maplewood from westbound Mount Seymour Parkway. The recommended network includes a single westbound left turn lane from Mount Seymour Parkway to Riverside Drive. The recommended signal timings de-prioritize this movement, resulting in a delay that exceed a LOS ‘F’. In combination with the dual westbound left turn lanes from Mount

Seymour Parkway to Berkley Road, little to no through traffic is expected to use Riverside Drive.1 The Transportation Study Update found that the existing left turn lane was a sufficient length to accommodate the anticipated 95th percentile queues for the recommended network in future horizon (2031).

- Providing a planted boulevard along Riverside Drive and limit the number of lanes – the recommend cross-section on Riverside Drive includes two through lanes, a painted median, and planted boulevards. The small cross-section combined with the planted boulevards is expected to encourage slower traffic movements and reduced through traffic.
- Developing a pedestrian-oriented environment in the Village Core – the recommended design includes curb bulges and frequent pedestrian crossings of Dollarton Highway. On-street parking is expected to protect pedestrians and increase the activity on the street, discouraging through traffic.

The recommended transportation network included a new network to serve the Innovation District and proposed District Fire Hall. This network was developed based on the following principles:

- Providing excellent connectivity to the proposed Fire Hall and Fire Training Site. The District is planning a Fire Hall and Fire Training Site north of Dollarton Highway and west of the existing school site. General access to the proposed site is planned to be taken from the terminus of Old Dollarton Road. Egress for fire trucks is proposed to be directly to Berkley Road. This requires signal pre-emption at the egress and at the intersection with Dollarton Highway and Berkley Road. It also indicates a no stopping zone at the egress. The recommended configuration of the intersection of Dollarton Highway and Berkley Road includes a southbound right turn lane and a southbound shared right / left turn lane. This increases the capacity of the southbound movement and decreases the likelihood that the Fire Hall egress will be blocked during times of congestion.
- Providing two connections to Dollarton Highway in order to improve circulation for all modes.
- Restricting direct access to Berkley Road in order to reduce delay and conflict. All access to development parcels in the Innovation District is expected to be taken from Road A or Road B.
- Locating the intersection of Road A and Dollarton Highway at a new signalized intersection at the existing access to the Pacific Environment Science Centre to reduce the number of accesses to

[1] Note that the proposed approach is contingent on the development of Berkley Road, including the provision of dual westbound left turn lanes from Mount Seymour Parkway to Berkley Road. This approach will not operate as recommended without the new capacity and network redundancy provided by Berkley Road. If Berkley Road is not constructed as proposed, dual westbound left turn lanes will be required at the intersection of Mount Seymour Parkway and Riverside Drive. This will require additional property. Also note that there is a possibility of increased high-risk maneuvers at permitted left-turns that are subjected to increased delay. The ***Transportation Study Update*** did not find westbound left turn collisions to be problematic at this intersection historically. If collisions and / or near-misses increase at this intersection, the District may consider eliminating the permitted phase and operating this intersection with a protected-only westbound left phase.

Dollarton Highway. This will allow for a single signal controlled intersection and is expected to reduce conflict and the risk of collisions along Dollarton Highway.

- Maintaining the desired design criteria, as discussed later in the report.

Transit accommodation in the recommended network include ensuring both conventional and articulated buses can complete turning movements along potential routes, as well as planning for potential future stops and stations. These improvements include:

- Ensuring that the following intersections can accommodate both conventional and articulated buses:
    - Old Dollarton Road and Dollarton Highway
    - Old Dollarton Road and Seymour River Place (east-west movements only)
    - Old Dollarton Road and Riverside Drive
    - Riverside Drive and Dollarton Highway
    - Berkley Road and Dollarton Highway
    - Berkley Road and Road A
    - Dollarton Highway and Road A.
- Ensuring that both conventional and articulated buses can navigate Road A, which has multiple adjacent curved sections.
- Identifying locations that can accommodate a future bus stop or station with storage for up to three articulated buses on Old Dollarton Road west of Riverside Drive and on Berkley Road west of Road A.

Note that further improvements may be warranted to accommodate rapid transit. This may include transit priority lanes, changes to proposed signal timings, or changes to intersection control. In particular, a four-way stop is currently recommended at the intersection of Old Dollarton Road and Seymour River Place. The District may consider maintaining this intersection as two-way stop control for north-south traffic in order to reduce the delay to east-west transit.

The recommended trail network builds on the existing trail network to connect key destinations. The recommended network includes the following improvements:

- Extension of the Spirit Trail along Windridge Drive
- A new wide multi-use pathway along Spicer Road.
- A new wide multi-use pathway connecting the Village Centre to the Innovation District.
- Trails connecting the existing upper level trails and Windridge Drive to the core of the Innovation District.

The cycling network includes a strong local network suitable for cyclists of all ages and abilities with good connections to the surrounding regional cycling network. The trail network proposed above is one part of this network, which also includes a number of cycle tracks. Cycle tracks are recommended along

Riverside Drive, Old Dollarton Road, Berkley Road, and Road A, as well as the portion of Dollarton Highway where widening is recommended.

A system of lanes is recommended to provide direct access to parcels in order to limit parking and loading / unloading activities on the roadway network. These lanes are also intended to improve circulation.

The transportation planning and traffic engineering work resulted in a recommended network, which includes both new facilities and improvements to existing roadways. The next section explores the design criteria and design approach used to develop these facilities.

3.0 DESIGN APPROACH & CRITERIA

This section provides an overview of the approach taken to the design of the transportation network in the Maplewood Area, as well as the general design criteria. This section also identifies corridors or locations that required an alternative approach or deviation from the common criteria. More specific information for each corridor can be found in Appendices B through R, as follows:

- Appendix C - Amherst Avenue
- Appendix D - Berkley Road
- Appendix E - Bridge Street
- Appendix F - Dollarton Highway
- Appendix G - Forester Street
- Appendix H - Front Street
- Appendix I - Mount Seymour Parkway
- Appendix J - Munster Avenue
- Appendix K - Old Dollarton Road
- Appendix L - Riverside Drive
- Appendix M - Road A and Road B
- Appendix N - Seymour River Place
- Appendix O - Spicer Road
- Appendix P - Windridge Drive
- Appendix Q - Trails
- Appendix R - Laneways

3.1 BASE PLANS

To facilitate a review of the road network, including long-term needs and potential phasing options, base plans were generated for the neighbourhood using information provided by the District. Information provided included cadastral mapping, such as property lines, approximate street light and utility pole locations, and orthophotos for background images. The orthophotos were used to determine the approximate locations of existing curbs, sidewalks, and other obstructions. It is noted that the information provided cannot be guaranteed for accuracy but is generally suitable at this level of functional design and cost estimating. A detailed survey is recommended to be completed during the detailed design phase of these projects and that the information and assumptions provided in this report be confirmed with the District prior to finalizing the design.

3.2 ASSUMPTIONS AND EXCLUSIONS

This exercise was done to provide the District with a geometric design that incorporates the District's vision for the Maplewood Area and will guide future redevelopment projects in the area and determine potential property acquisitions. As such, many aspects that are reviewed during the design phase of developments or are typically included in detailed design were excluded from this exercise. These assumptions and exclusions are:

- Focused exclusively on roadworks design and property impacts. Impacts to utilities due to redevelopment or due to roadway reconstruction were not included. It is understood that the District is considering those impacts internally;
- Did not include detailed drainage design information. While vertical alignments were reviewed for a few key roads, they were examined primarily from a sight distance and design grade perspective. Drainage was considered only at a high-level;
- Grading impacts on adjacent properties were assumed to be considered during the redevelopment stage and therefore was not assessed during this exercise. Impacts were assumed to stop at the property line, with any slopes are retaining walls required to meet original ground assumed to be accommodated on private property or outside of the road right-of-way;
- Existing landscaping was not accounted for in this exercise. It was assumed that impacts on existing landscaping will be determined during the redevelopment stage. Proposed landscaping costs were included in the cost estimate for budgeting purposes;
- A GVRD trunk sanitary sewer crosses the new Berkley Road alignment south of the Road A intersection. The design of Berkley Road will add approximately 0.5m of fill onto the GVRD trunk sanitary sewer. The District and GVRD should review the impacts of this additional fill on the trunk sanitary sewer prior to the roadway being built; and
- No street lighting analysis was conducted for the roadways. Allowances for street lighting were included in the cost estimates.

3.3 REFERENCE DESIGN GUIDELINES

The following design guidelines were consulted to develop the design criteria for the functional design:

- TAC Geometric Design Guide for Canadian Roads (2017)
- District of North Vancouver Development Services Bylaw (2017)
- TransLink Infrastructure Design Guidelines (2010)

3.4 ROADWAY CHARACTERISTICS

Horizontal and vertical alignments, lane widths and other cross-sectional elements, and intersection designs were developed using the above guidelines. Specific roadway classifications and intents for each roadway were developed through ***Transportation Study Update*** and are explored in the previous section and documented in more detail in Appendix A. The majority of roadways were designed to accommodate 50km/h posted speeds, as indicated for by the British Columbia Motor Vehicle Act for roadways within a municipality where the municipality has not designated another speed via bylaw. Reduced design speeds were used in commercial areas and on local roads or where topography posed challenges (Road A). These design speeds should be adopted by municipal bylaw to be used as posted speeds throughout the neighbourhood.

Turning movements were evaluated for key intersections during the development of these functionals designs. Major arterials such as Dollarton Highway, Mount Seymour Parkway, Riverside Drive and Berkley Road and roadways in industrial areas, including Road A, were developed using semi-trucks (WB-20) as the design vehicle. Proposed transit routes such as Old Dollarton Road and Road A were confirmed to accommodate both conventional and articulated buses. Local roads and pedestrian focused areas were designed using a standard medium delivery truck (MSU). In all cases, it was assumed that the design vehicle can use multiple lanes without crossing the centreline, including straddling the through lane when making a right turn. It was assumed that MSU vehicles may cross the centreline when turning between local roads and lanes.

The following subsections present a discussion of the general characteristics that informed the design. Additional notes are included where specific roadways differ from the standards.

3.4.1 Alignments

For most of the roadways in the Maplewood Area, the horizontal and vertical alignments were maintained as per existing. Horizontal and vertical alignments were conceptually developed for the new roadways, Berkley Road, Road A, and Road B on the east end of the neighbourhood. The overarching design criteria for horizontal and vertical alignments are summarized in Table 3-1 and Table 3-2.

Berkley Road was developed using a 50km/h design speed while Road A and Road B were developed using a 40km/h design speed. The horizontal alignments worked in conjunction with the vertical alignments to provide appropriate grades and sightlines. The Berkley Road alignment was developed to connect Mount Seymour Parkway and Dollarton Highway. The horizontal alignment was created with the two large curves to maximum the length of the roadway due to the grade differences between the two roadways. Several horizontal alignments options were developed and reviewed during the process but

the preferred option provided the best solution for sight distances and proposed grading. Road A intersects Berkley Road and Dollarton Highway in a location that provides intersection spacing that is greater than 200 m, per TAC guidelines for minor arterial roadways. Curves were designed to a 40km/h design speed to help slow down traffic and keep the main through traffic on Berkley Road. Road B was development to bisect the proposed development but has flexibility to be revised as necessary to suit the proposed development desires. Windridge Drive was also designed to a 40km/h design speed as the curves were tightened up to provide a slower roadway. The recommended posted speed for Windridge is 30km/h because of its nature as a residential roadway and potential for shortcutting traffic.

Table 3-1: Minimum Horizontal Curves by Design Speed

Design Speed (km/h)	Minimum Horizontal Radii (m)		
	DNV/ MMCD (2014)	TAC (2017)	Project
50	85	115	115
40	N/A	65	65
30	25	30	30

Most vertical alignments were maintained for existing roadways. During the development of the Berkley horizontal alignment, the vertical alignment was reviewed to confirm that the max grade attained was 8%. The proposed alignment was determined because it provided adequate horizontal sight distances and curves and achieved grades lower than the maximum desired of 8%. Further, grades were reduced to less than 4% through intersections. The vertical alignment was developed to follow existing ground as closely as possible to minimize the amount of earthworks needed during construction.

Similarly, with the Road A alignment was developed in order to meet horizontal sight distance requirements and achieved grades lower than the maximum desired. A slope of less than 5% was achieved for Road A with this proposed alignment.

The existing vertical alignment along Riverside Drive at Windridge Drive was reviewed and decreased to help increase sight distances due to the crest on the roadway. The vertical alignment was reduced at Windridge Drive by approximately 1m in elevation. This resulted in the vertical alignment on Windridge Drive to increase to 8% which ended up being the determining factor for the Riverside Drive vertical alignment.

Table 3-2: Maximum Vertical Profile Grade by Roadway Classification

Road Classification	Maximum Vertical Profile Grade (%)		
	DNV/ MMCD (2014)	TAC (2017)	Project
Arterial (Major and Minor)	8	6-10	8
Collector	10	6-12	10
Local	12	6-12	12
Laneways	12	8-15	12

Note that all work completed in this memo assumes that Dollarton Highway has been raised to a design minimum elevation of 4.7m from the planned future berm alignment at the Old Dollarton Road east end termination until it meets existing grade along Dollarton Highway east of the conservation area. The roadway was developed a minimum 0.5% grade to provide adequate drainage therefore the maximum elevation of Dollarton Highway at the crest is approximately 5.8m.

3.4.2 Intersection Design

Intersection locations have been maintained where they currently exist wherever possible. Intersection configurations were determined through the ***Transportation Study Update*** and integrated into this project. Where possible, small changes to the intersection design or the approach alignment were made to improve turning movements or operations while minimizing property impacts.

Curb returns radii were developed based on the design vehicle chosen for each of the roadways. Standard radii and project specific design vehicles are included in Table 3-3. These were used as a basis for the design; however, the new TAC Geometric Design Guide does not specify minimum radii at intersections. Instead, it indicates that radii are to be developed using the preferred design vehicle. Key intersections were reviewed using the design vehicle to confirm that crossing distances were minimized while providing safe access for the design vehicle.

Table 3-3: Curb Return Radii and Design Vehicle by Road Classification

Road Classification	Minimum Curb Return Radii (m)		Design Vehicle
	DNV (2017)	MMCD (2014)	Project
Arterial	7.5	11	WB-20
Arterial (transit)	7.5	11	WB-20/Articulated Bus
Collector	6	10	WB-20/DNV Fire Truck
Collector (transit)	6	10	DNV Fire Truck/ Articulated Bus
Local (Residential)	6	9	DNV Fire Truck
Local (Commercial)	6	10	DNV Fire Truck
Lane	6	3	MSU

Pedestrian and cyclist safety was prioritized at each of the intersections. Crossings were provided on all legs of each intersection unless there was specific rational to eliminate one or more crossings. For pedestrian crossings, standard crossings were used at controlled intersections and zebra crossings were used at uncontrolled intersections. A standard protected treatment for cyclists and curb extensions were provided wherever possible in order to make the crossings safer. In general, crossing distances were minimized as possible for safety.

New intersections on Dollarton Highway for Berkley Road and Road A were spaced a minimum 200m from each other. The location of the intersection of Dollarton Highway and Road A was selected to align with the existing access to the Pacific Environmental Science Centre, while the intersection with Berkley Road was aligned to straddle the existing property line between the District's future Fire Hall site and the existing International school, with approximately 12.5 m of Berkley road accommodated on the District's property. This design minimizes impacts to the environmentally sensitive area that identified through other work. The Road A intersection was also placed on the straight portion of Berkley to provide the required sight distances to the intersection.

The access to the Canlan Ice Sports Complex was shifted south to produce a greater offset intersection with Burr Place. This allowed a left turn lane to be included in the design to the sports complex.

3.4.3 Turn Lanes and Storage Lengths

Left turn lanes have been included where recommended in the ***Transportation Study*** *Update*, with storage lengths for all turn lanes designed based on the 95th percentile queue. Storage lengths are shown on the functional design drawings in Appendices B through R.

3.4.4 Traffic Control & Crossings

Generally, locations of existing traffic signals were maintained during the development of the functional design. New traffic signals were added at the following locations:

- Dollarton Highway and Road A
- Dollarton Highway and Berkley Road (full replacement of existing signals)

- Windridge Drive and Riverside Drive (new pedestrian and cyclist half signal)
- Berkley Road at Fire Hall Access (new signal with pre-emption, possible pedestrian half signal depending on location of pedestrian destinations)

All signalized intersections will include pedestrian phases and it is recommended that bicycle signals are installed included where bicycle lanes are present. The District is to determine the exact requirements for each signal.

3.4.5 Access Requirements

Accesses to private properties have been restricted, consolidated, or removed from arterial roads wherever possible. The District requires new developments to provide accesses from laneways.

3.5 CONSTRAINTS

There were a number of constraints that limited the overall design. These must be considered in any future development of detailed designs or proposed changes to the functional design identified here:

- Property constraints – throughout the area, it was assumed that where properties that have recently been developed, additional land is not easily available. In these locations property lines were held constant, resulting in some locations with constrained cross-sections and others with slight adjustments to the horizontal alignment. In some cases, road realignment would have been desirable to improve intersection off-sets; however, property requirements made changes infeasible.
- Environmentally sensitive areas – two environmentally sensitive areas influenced the design:
    - It was determined that no widening would be permissible at the northeast corner of the intersection of Mount Seymour Parkway and Riverside Drive for social and environmental reasons.
    - The District identified environmentally sensitive areas that are undevelopable within the undeveloped lands. The roadway network in that area was designed to minimize impacts to these areas.
- BC Hydro transmission line poles – there is an existing east-west transmission line along Old Dollarton Road. It was assumed that moving these transmission lines is not feasible at this time due to cost. The design worked to reduce or eliminate the need to relocate these poles. Should the transmission lines be removed, the design should be revisited to remove curved sections from the protected bicycle path and ensure parking locations are optimized.

4.0 FUNCTIONAL DESIGN

This section provides the functional design resulting from the criteria and approach summarized above. It is presented in two sections: first is an introduction to the typical sections and second is the plan drawings.

4.1 TYPICAL SECTIONS

The typical sections for each roadway are included in Appendices B through R. Most standard roadway elements are included for each roadway cross section including travel lanes, parking (where required or able), cycle tracks, landscaped boulevards and sidewalks. Travel lanes vary from 3.0m to 3.7m as per guidelines set out by the District and TAC and the intended use of the roadway, as outlined in Table 4-1. Guiding principles that were applied to the development of cross-sections include:

- Narrower lanes are regulated to local, low speed roadways while wider lanes are used on transit routes, industrial roads, and arterials;
- Parking lanes are included on commercial focused streets and local streets but have been removed where property is limited and on arterial roadways to reduce delay;
- Protected cycle tracks have been included as indicated by the transportation network plan discussed earlier. Protected cycle tracks are at sidewalk elevation and offset a minimum 0.8m from parking bays. Special considerations have been included at intersections to prioritize safety;
- Landscaped boulevards have been included where space requirements allow. Urban design hardscape features such as tactile surfaces have been included in high-pedestrian areas such as Old Dollarton Road and Seymour River Place;
- Sidewalks have been included on each roadway (one side only for laneways and Windridge Drive (between Seymour River Place and Riverside Drive) and Munster Avenue) and are designed to a standard minimum width of 1.8m (preferred 2.0m). Wider sidewalk (up to 3.0m) are provided in the pedestrian village centre where pedestrian activity is anticipated to be higher.

Table 4-1: Lane Widths* by Road Class

Class	Lane Widths*		
	DNV/ MMCD (2014)	TAC (2017)	Project
Arterial	3.7m	3.0m-3.7m	3.5m-3.7m
Arterial (transit)	3.7m	3.0m-3.7m	3.5m-3.7m
Collector	3.7m	3.0m-3.7m	3.5m
Collector (transit)	3.5m	3.0m-3.7m	3.5m
Local (Residential)	3.0m-3.35m	3.0m-3.7m	3.0m – 3.3m
Local (Commercial)	3.6m	3.0m-3.7m	3.5m

*Lane Widths identified by TAC (2017) and through DNV / MMCD are exclusive of gutter widths. Proposed project lane widths are inclusive of gutter widths.

4.2 ROAD NETWORK PLAN

The plan drawings of the functional design were developed based on the planned transportation network, design criteria and approach, and typical cross-sections described above. The overview of this plan is shown in Figure 4-1 and Appendix B.

As discussed, the network generally follows the existing network within the Maplewood Village. The intention was to create a village node around the network of Front Street, Seymour River Place, Old Dollarton Road, and Riverside Drive. These roadways have been developed to be more pedestrian, bicycle, and transit focused. Currently Riverside Drive is used as the main connection between Mount Seymour Parkway and Dollarton Highway. After the redevelopment of this neighbourhood, the goal is to reduce speeds and volumes on Riverside Drive as it passes through the village centre and shift the majority of the through traffic to Berkley Road.

A new network was developed in the Innovation District. Berkley Road provides a new connection between Mount Seymour Parkway and Dollarton Highway. Road A was developed as a secondary access to the new network and connects to Berkley Road.

Functional roadway designs for each roadway within Maplewood are included in Appendices C through R.

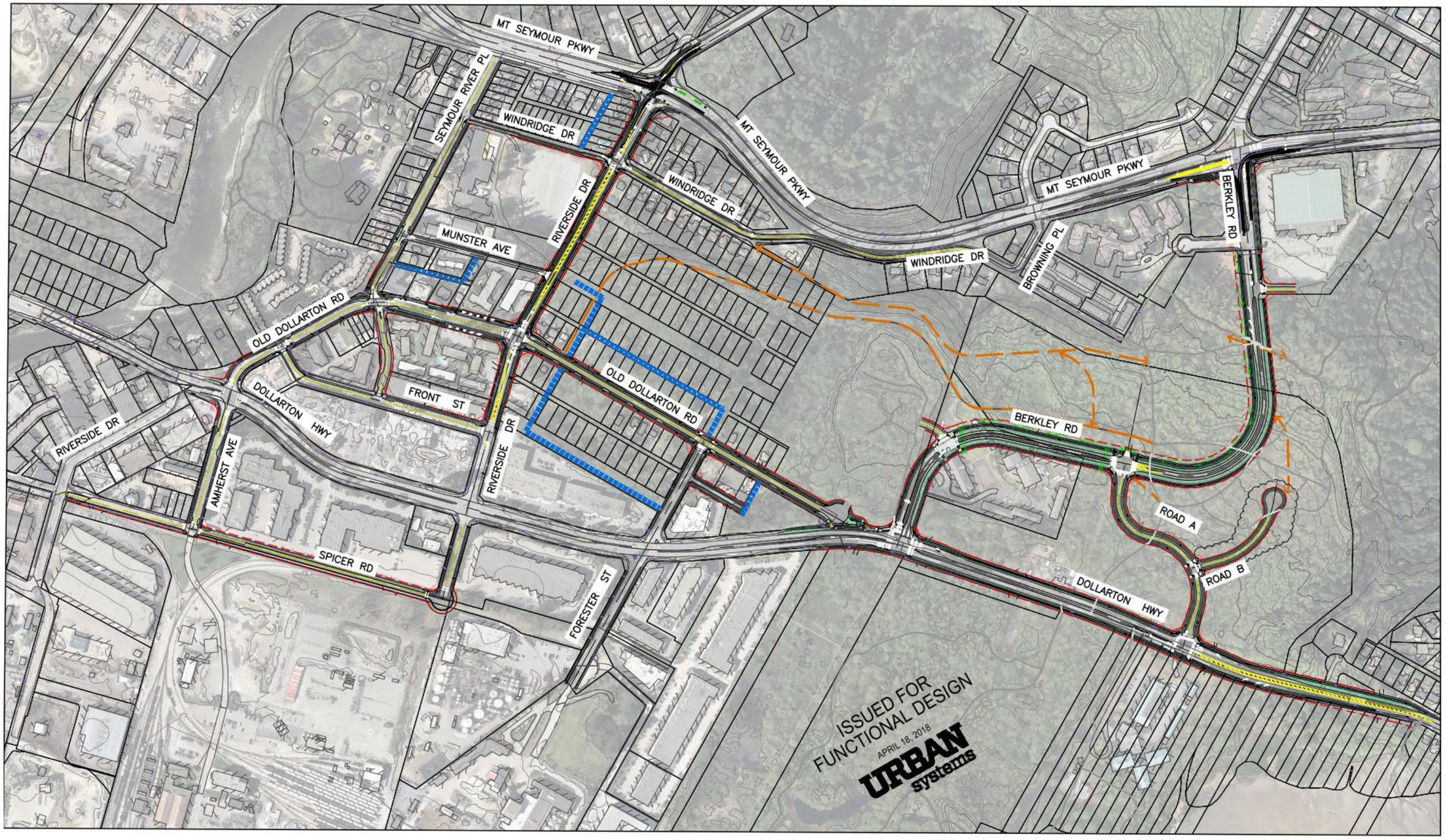


Figure 4-1:Maplewood Neighbourhood Road Network

5.0 ISSUES AND IMPACTS

5.1 PROPERTY REQUIREMENTS

Property acquisition will be required during the development of the Maplewood Area. The functional design drawings show the minimum amount of property acquisition required for each roadway. Actual property rights-of-way dimensions will be confirmed during the detailed design phase. More statutory right-of-way may be required from adjacent properties.

It is expected that grading considerations are to be accommodated on private property. This may include retaining structures, fills, or cuts.

5.2 UTILITIES

No considerations were given to the utility design or upgrades in the Maplewood Area. The District is developing utility designs that will be supplemental to this report.

No consideration has been given to the management of roadway drainage or development of specific catchment areas. Any future drainage works shall incorporate best practices for sustainable rainwater management principals and developed in coordination with the District.

5.2.1 Existing GVRD Sewer

There is an existing GVRD trunk sanitary sewer in the east of the neighbourhood that will cross the proposed Berkley Road alignment below the Road A intersection. The proposed vertical alignment of Berkley Road will add approximately 0.5m of fill onto this trunk sanitary sewer. The District will need to review the potential impacts on this trunk sanitary sewer of this additional fill with the GVRD. The approximate location of the GVRD trunk sanitary sewer is shown on the appropriate drawings.

5.3 GRADING IMPLICATIONS

The functional design does not account for grading implications on private property. It is understood that the developments will be designed in a way to accommodate any elevations differences between the roadway and the property. No side slopes or retaining structure were included in the cost estimates; if these are required, it is assumed that they will be accommodated outside of the road right-of-way.

5.4 PAVEMENT STRUCTURE

Pavement structure for all roadways to follow District standards. Geotechnical analysis to be considered as directed by the District.

5.5 DRAINAGE SWALE

The District has expressed interest in developing a drainage swale along Berkley Road which will cross from the west side of the street to the west side. A potential alignment of the drainage swale and culverts was shown on the drawings for conceptual purposes. However, no design thought has been given to the drainage swale or corresponding culverts. The developer will need to accommodate the slope consideration due to the drainage swale and culverts into their developments. The District is to provide direction on the design of the drainage swale and culverts.

5.6 LAND RASING FOR COASTAL FLOOD PROTECTION

The District plans to raise the elevation of Dollarton Highway east of Forester Street in order to install a berm to provide coastal flood protection for the adjacent lands. The District provided Urban Systems with a desired elevation for the coastal flood protection and a corresponding conceptual profile was developed for raising Dollarton Highway to meet this elevation. The proposed profiles for Berkley Road and Road A were tied into this raised profile for Dollarton as it is anticipated that this work to coincide with the development of the Innovation District.

6.0 'CLASS D' COST ESTIMATES

Class 'D' cost estimates were prepared for each block (including intersections and signals) The limits of each block were developed in coordination with the District. A summary of the cost estimates for each segment including engineering (15%) and contingency (40%) allowances is provided in **Table 1**. More detail about each block is included in the Appendix for the relevant roadway.

Table 1: Cost Estimate

Street Name/Block Extents	Cost Estimate (incl Contingency and Engineering)
Amherst Avenue: Spicer Road to Dollarton Highway	$ 593,000
Spicer Road: Amherst Avenue to Riverside Drive	$ 1,525,000
Spicer Road: Riverside Drive to Amherst Avenue	$ 267,000
Dollarton Highway: Old Dollarton Road Intersection	$ 168,000
Old Dollarton Road: Dollarton Highway to Front Street	$ 579,000
Old Dollarton Road: Front Road to Seymour River Place	$ 899,000
Old Dollarton Road: Seymour River Place to Riverside Drive	$ 2,037,000
Old Dollarton Road: Riverside Drive to Forester Street	$ 1,935,000
Old Dollarton Road: Forester Street to End of Roadway	$ 1,302,000
Front Street: Old Dollarton Road to Seymour River Place	$ 494,000
Front Street: Seymour River Place to Riverside Drive	$ 394,000
Seymour River Place: Front Street to Old Dollarton Road	$ 414,000
Seymour River Place: Old Dollarton Road to Munster Avenue	$ 561,000
Seymour River Place: Munster Avenue to Heritage Park Lane	$ 1,054,000
Riverside Drive: Spicer Road to Dollarton Highway	$ 382,000
Riverside Drive: Front Street to Old Dollarton Road	$ 959,000
Riverside Drive: Old Dollarton Road to Windridge Drive	$ 1,669,000
Riverside Drive: Windridge Drive to Mount Seymour Parkway	$ 3,090,000
Munster Avenue: Seymour River Place to Riverside Drive	$ 531,000
Windridge Drive: Seymour River Place to Riverside Drive	$ 635,000
Windridge Drive: Riverside Drive to End of Roadway	$ 2,193,000
Multiuse Path Trail: Old Dollarton Road to Berkley Road	$ 1,135,000
Dollarton Highway: Old Dollarton Road to East Extent	$ 9,626,000

Berkley Road: Dollarton Highway to Fire Station Access	$ 2,713,000
Berkley Road: Fire Station Access to Mount Seymour Parkway	$ 12,403,000
Road A: Dollarton Highway to Berkley Road	$ 2,355,000
Road B: Road A to End of Roadway	$ 1,054,000
Total	**$ 50,955,000**

The following assumptions and limitations are noted as part of the design and cost estimating:

- All costs included in this cost estimate are in 2017 dollars. Proper escalation due to inflation, market conditions, economies of scale will need to be calculated into the costs at a later date;
- Estimates do not include property acquisition;
- A generic per metre lane cost has been developed as per DNV's request. The standard District commercial lane was used for costing purposes. Lane cost approximate $1,500/m including contingency and engineering fees;
- Designs were prepared using available cadastral and contour information provided by the District. No topographic survey information was available as part of this assignment.
- No geotechnical or environmental investigations or assessments were completed as part of this assignment. Effort to minimize potential environmental impacts was used in functional design, however this will need to be assessed further to confirm actual impacts and costs.
- It is assumed that the existing roadway asphalt, curbs, and sidewalks (including gravels) will be removed prior to construction of the new roadway except when the adjacent properties have recently been redeveloped. Where properties have been recently redeveloped the goal is to maintain the roadway from the centreline to the property where possible.
- Site preparation is assumed to include localized compaction and minor grading. Where profiles of roadways are changing significantly due to the functional design, cut and fill volumes have been calculated and costed separately. A geotechnical investigation will be required to confirm these assumptions;
- Bulk tree removal was included in the cost estimate for Berkley Road, Road A, Road B, and the multiuse trail. Isolated tree clearing, including existing trees in the boulevards or road rights-of-way, was not included in the cost estimate;
- The cost of the berm construction was not included for Dollarton Highway. Cost estimate for Dollarton Highway included raising the profile to the new elevation, but not additional geotechnical works suitable to use as a berm for coastal flood protection.
- No costs have been included regarding utility upgrades, replacements, or relocations. This includes watermains, storm sewers, sanitary sewers and their appurtenances, including catch basins, as well as 3rd party utilities such as BC Hydro lines and poles, TELUS conduit, etc. Based on information communicated by the District during preparation of the functional design, it is assumed that existing BC Hydro distribution lines will be removed. It is assumed that the District will determine these costs separately from the roadworks costs. Effort to accommodate existing BC Hydro distribution lines was included in the functional design; however, precise impacts will be confirmed during detailed design and may impact final costs.

- Grading calculations are assumed to end at the property line. No side slopes, retaining structures, or grading beyond the property line were taken into consideration during the preparation of these cost estimates. These works are expected to be determined by the adjacent developments;
- Boulevard landscaping varies throughout the project between sodding and hardscape pavers. A premium hardscape cost was included for cost estimating purposes only as the type of hardscape has yet to be determined. Street trees have been included in the cost estimate where boulevard dimensions and landscaping allow. Street trees have also been assumed at a standard 10m spacing along the corridors and have been included on roadways where shown in the typical section;
- Traffic signals (including pedestrian half signals) were included in the estimate as per the functional design and existing conditions. An allowance was included for a complete upgrade to the traffic signals where current signals exist;
- New streetlighting was assumed along the corridor. Streetlighting was assumed to be standard style lights and was assumed to match existing spacing along the corridor. No lighting analysis was conducted as part of the analysis. No lighting was included along the next multi-use trail from Old Dollarton Road to Berkley Road. Upgrading standard street lights to ornamental street lights would cost approximately $2,000 per street light. Total cost for project (all roadways) to upgrade to ornamental street lights would cost approximately $700,000;
- Allowances for pavement markings and signage are included in the estimates;
- Municipal and utility type charges, legal and topographic surveys, property acquisition, permit charges, sub-consultant design and reporting, inspection, and certification fees (electrical, geotechnical, environmental, landscape architect) as well as any legal fees are not included in this cost estimate;
- Cost estimates include a 10% allowance for Mobilization, Survey Layout, Traffic Management, and Quality Management.
- Cost estimates include a 40% contingency, and 15% for Engineering and Supervision.

It is understood that District staff will use this information to prepare their submission to Council and for future developments in the neighbourhood. These materials should be used with developments as a way to determine approximate costs of new roadways in the neighbourhood.

7.0 CLOSING

Achieving the long-term vision and developing a multi-modal community is achievable for the Maplewood neighbourhood, and can be phased with possible interim strategies in the near to mid-term scenarios. This study and report builds off previously completed works by Urban Systems and others and provides a basic framework to help implement the vision for this neighbourhood. This functional design report develops the general roadway geometrics and considerations that should be implemented during the development of the Maplewood neighbourhood. Further stages of detailed design and traffic analysis, whether by the District or through development applications, will continually help guide and focus the implementation and requirements to achieve the vision.

LIST OF APPENDICES

APPENDIX A - PROPOSED ROADWAY CHARACTERISTICS AND PRIORITIES

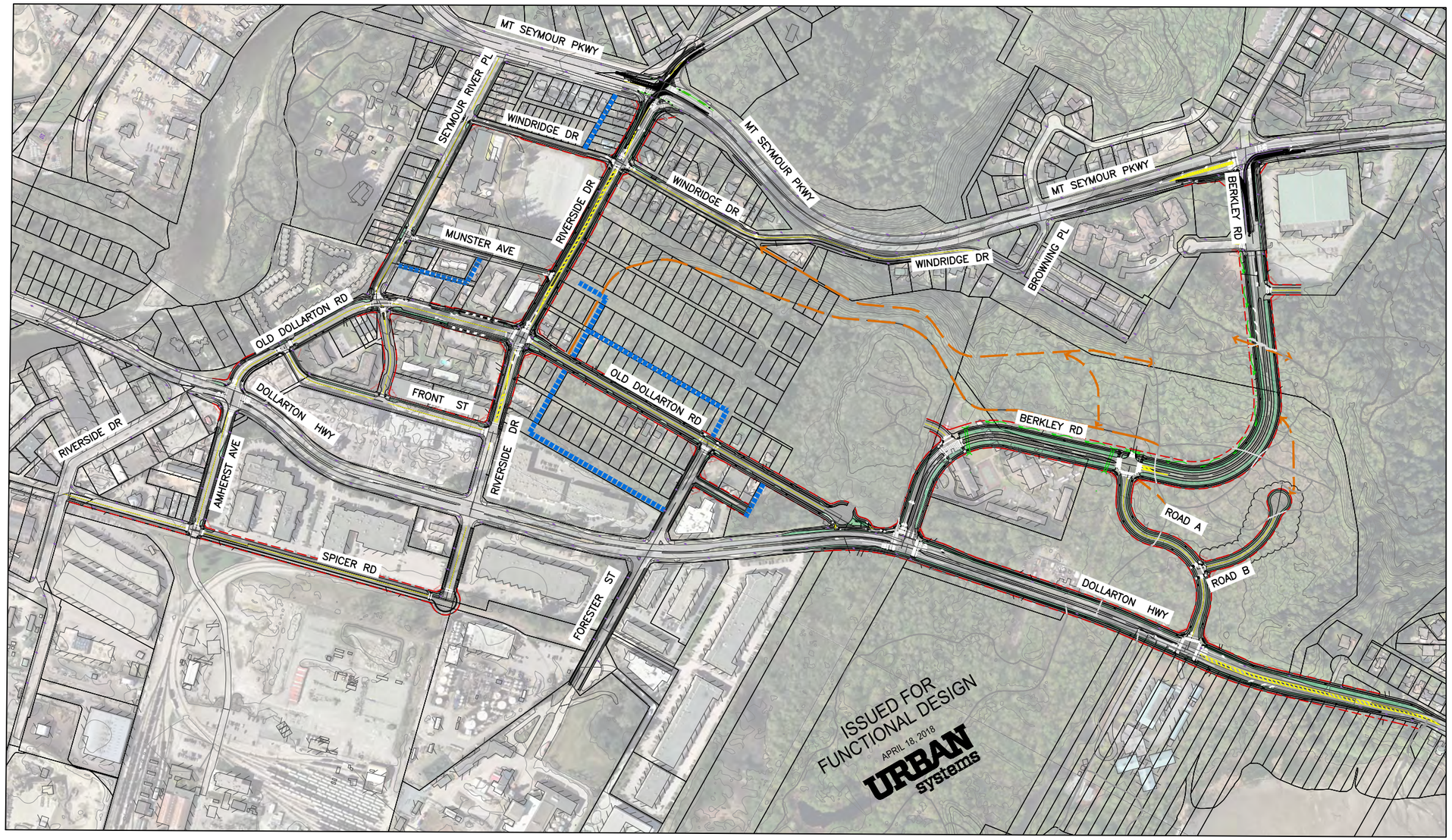
Street	Class	Road Characteristics	Transit Service	Bicycle Facilities	Pedestrian Facilities	On Street Parking	Purpose and Priorities
Mount Seymour Parkway	*Major Arterial and Major Road Network (MRN)*	4 lanes (two per direction) with left and right turn lanes No direct access for private properties	Route 211, Route 214, Route 880	Eastbound and westbound painted bike lanes from Riverside Drive to east end of Study Area	Sidewalks on north and south sides throughout Study Area	No	Intended for regional movement of goods, transit, vehicles, cyclists, and pedestrians. All modes to be accommodated with focus on regional travel.
Dollarton Highway	*Major Arterial and MRN (west of Berkley Road)* *Minor Arterial and MRN (east of Berkley Road)*	4 lanes - two per direction with left turn and right turn lanes Limited direct private and business access	Route 212, C15 Proposed route for future frequent or rapid transit	Old Dollarton Road to west of Berkley Road - Off street adjacent paths on north and south side of Dollarton Hwy for eastbound and westbound cyclists West of Berkley Road to east end of Study Area – separated off-street cycle track	Off street paths adjacent to street on north and south sides from Old Dollarton Road to Road A	No	Intended for regional movement of goods and people. Planned disaster response route. All modes to be accommodated with focus on regional travel, especially transit and all ages and abilities cycling.
Riverside Drive	*Major Arterial, MRN** **Future design criteria based on assumption that Berkeley Road is constructed before Riverside Drive can be reclassed as a minor arterial.*	Mount Seymour Parkway to Front Street - 2 lanes with left turn lanes and select right turn lanes Front Street to Dollarton Hwy – 4 lanes Limited direct access	Route 211, Route 214, C15 Possible route for future frequent or rapid transit (south of Old Dollarton Road)	High priority regional and local cycling connection separated from traffic and suitable for all ages and abilities (based on this arterial's role in the regional cycling network) No cycling facility from Spicer Road to Front Street based on space constraints Cycling accommodated on parallel route	Sidewalks on both sides of road High priority pedestrian zone around Old Dollarton Road	No	All modes to be accommodated. Focus on connections to local destinations and slow speed movements through village core. Potential to consider removing MRN designation and dangerous goods route designation at some point in the future through consultation with TransLink. Possible through replacement in network with Berkley Road. High priority regional and local cycling connection separated from traffic and suitable for all ages and abilities. High priority pedestrian zone around Old Dollarton Road.
Berkley Road Extension	*Possible Major Arterial (to be confirmed) with potential for MRN and Dangerous Goods Route designation*	2 lanes – one per direction with left and right turn lanes at major intersections Centre median / left turn lane throughout Designed to accommodate potential future 4 lanes No direct access except where existing or as fourth leg of planned intersections	Possible future route for community, frequent, or rapid transit Consideration for future bus stop or station near intersection with Road A	High priority regional and local cycling connection separated from traffic and suitable for all ages and abilities (based on this arterial's role in the regional cycling network) Strong connection to local and regional trail network is important	Will support infrastructure for walking and provide an additional north-south connection in the Maplewood area Strong connection to local and regional trail network is important	No	Potential to become new dangerous goods route to transition heavy trucks and dangerous goods away from Riverside Drive. All modes to be accommodated. Maintain wider through lanes and left turn pockets to better accommodate goods movement and traffic. Design vehicle to be appropriate for industrial area. Separated cycling facilities high priority due to likely vehicle mix and grades.

Street	Class	Road Characteristics	Transit Service	Bicycle Facilities	Pedestrian Facilities	On Street Parking	Purpose and Priorities
Old Dollarton Road	*Local*	2 lanes - one per direction along the entirety of Old Dollarton Road, with right turn lanes at Dollarton Highway	Route 211, 214, C15 Possible future route for frequent or rapid transit Consideration for future bus stop or station near intersection with Riverside Drive	Separated bicycle facility throughout	Sidewalks on both sides throughout	Design to accommodate parking pockets wherever possible	Local shopping street with pedestrian-focused street-facing commercial. Local roadway with access to developments. On-street parking permitted where applicable. Cycling connection into the community to provide access to local shops and services. Goods movement restricted to local deliveries. East of Riverside, design to support 'artisan industrial' land use. No raised curbs. Tactile pavement desirable.
Front Street	*Local*	2 lanes - one per direction along all of Front Street	None	Neighbourhood bikeway	Sidewalks along north and south side throughout	On street parking on north and south sides throughout	Local shopping street with some pedestrian-focused street-facing commercial. Local roadway with access to developments. Local movement for deliveries. Slow moving traffic with target operating speed of 30 km/h. Goods movement restricted to local deliveries. Pedestrians, cyclists, goods movements, and vehicles to be accommodated. Cyclists, vehicles and goods movement are served within the same-right-of-way.
Windridge Drive	*Lane / Local*	1 lane – eastbound one-way street between Seymour River Place and Riverside Drive 2 lanes - one per direction east of Riverside Drive	None	Wide MUP on south side MUP narrows to where property is not available Marked shared cycle / vehicle lanes on-street	Wide MUP on south side from Seymour River Place to Browning Place Sidewalk on north side east of Riverside Drive unless restricted by property	Potential for school drop-off and off-hours parking bordering school between Seymour River Place and Riverside Drive On street parking pockets on north and south sides of Windridge Drive in residential areas east of Riverside Drive	Local road intended to provide access to properties for vehicle traffic. Cycling roadway with traffic calming and posted speed of 30 km/h. Intended to serve local and regional cyclists and pedestrians. Pedestrians and cyclists have first priority but fire truck capability for emergencies. Local traffic second priority. Goods movement restricted to local deliveries. Transit not permitted.
Munster Avenue	*Local (Designed to Lane Standard)*	2 lanes – one per direction throughout	None	Neighbourhood bikeway	Sidewalk on one side	No	Local road providing improved east-west connectivity of road network between Seymour River Place and Riverside Drive. Pedestrians and cyclists have first priority. Local traffic second priority. Goods movement restricted to local deliveries. Transit not permitted.
Seymour River Place	*Collector / Local*	2 lanes - one per direction throughout	None	Heritage Park Lane to Old Dollarton Road - Shared bicycle lanes Old Dollarton Road to Front Street - Neighbourhood bicycle route	Sidewalk on both sides throughout	On street parking pockets throughout	Heritage Park Land to Old Dollarton Road - Collector road providing access to the school and local properties. Old Dollarton Road to Front Street - Target operating speed of 30 km/h. Pedestrians and cyclists have first priority. Local traffic second priority. Shared street. No raised curbs. Tactile pavement desirable.

Street	Class	Road Characteristics	Transit Service	Bicycle Facilities	Pedestrian Facilities	On Street Parking	Purpose and Priorities
Forester Street	*Local*	2 lanes - one per direction throughout	None	None	Sidewalk on east and west sides throughout	On street parking from on east and west sides throughout	Local road providing access to local properties for all modes. Provides a key access point for businesses and industries south of Dollarton Highway. Includes access for trucks, commercial vehicles, and employees.
Amherst Avenue	*Local*	2 lanes – one per direction throughout	None	Separated	Sidewalk on both sides throughout	To be determined	Local road providing access to local properties for all modes. Separated cycling to connect Village Centre to potential future water crossing and Spirit Trail.
Browning Place	*Local*	2 lanes- one per direction throughout	None	None	Sidewalk on east side south of Mount Seymour Parkway	Parking on east side between Windridge Drive and Mount Seymour Parkway	No changes proposed to Browning Place.
Heritage Park Lane	*Local*	2 lanes – one per direction	None	None	Sidewalk on north side throughout	No	No changes proposed to Heritage Park Lane.
Spicer Road	*Local*	2 lanes – one per direction	None	Planned multi-use pathway on south side	Sidewalk on north side Planned multi-use pathway on south side	Parking on both sides of the road	Planed local road to provide improved east-west connectivity of road network south of Dollarton Highway from Amherst Avenue to Riverside Drive. Goods movement and business/port access priority on the road portion – may have parallel MUP or protected bike facility.
Road A	*Possible Collector (to be confirmed)*	2 lanes – one per direction	Possible future route for community, frequent, or rapid transit	Separated bicycle facility throughout	Sidewalks on both sides	Yes	Provides access for all modes to local properties and secondary connection between Berkley and Dollarton Highway. Terminates at intersection with Berkley. Direct access to underground parking of development may be provided on north side.
Road B	*Local*	2 lanes – one per direction	None	None	Sidewalks on both sides	To be determined	Alignment and design to be proposed by developer.

APPENDIX B - OVERALL NETWORK

Maplewood Phase 3



SITE LOCATION
NOT TO SCALE

*LANEWAYS ARE SHOWN FOR SCHEMATIC PURPOSES. EXACT LOCATION TO BE DETERMINED DURING DEVELOPMENT

URBAN systems

DISTRICT OF NORTH VANCOUVER / MAPLEWOOD PHASE 3 / 1333.0040.03 / APRIL 18, 2018

DRAFT FOR CONSTRUCTION

APPENDIX C - AMHERST AVENUE

Amherst Avenue

Amherst Avenue was developed to follow the existing alignment. The roadway width was maintained as existing, with two travel lanes and parking on both sides. Sidewalks were normalized with a landscaping buffer. Curb extensions were added at the intersection with Spicer Road. Curb extensions were also included at the driveway to the Tim Hortons drive-thru and at the beginning of the northbound right turn lane before Dollarton Highway to slow vehicles and provide greater sight distances. Street light poles will need to be relocated to the landscape zone.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Amherst Avenue (Spicer Road to Dollarton Highway)

Length: 200m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	20.0m	-	20.0m	
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	DNV Fire Truck	
Basic Lanes	2	2	2	
Lane Width	3.5m	3.0m – 3.7m (TAC)	3.5m	
Parking Including	Yes	Yes	Yes	
Bike Facilities	No	-	No	
Sidewalks	Yes	Yes	Yes	Min 1.8m Sidewalks
Transit Facilities	No	-	No	
Access Conditions	Commercial	-	Commercial	

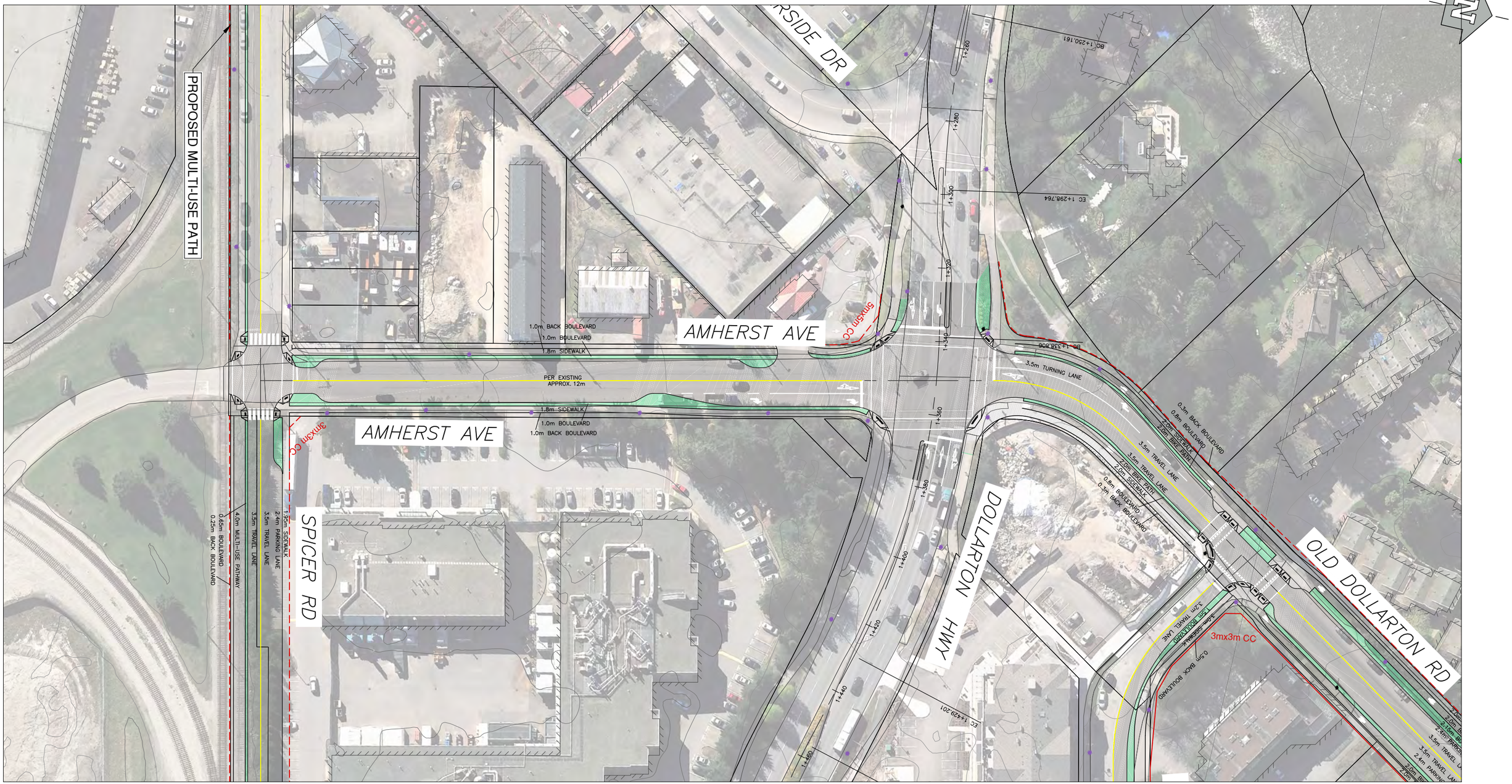
General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Existing profile to be maintained. No profile developed for this roadway.



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APRIL 18, 2018
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PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	AA-01
1333.0040.03		Title

Amherst Avenue
Plan

Appendix p-9

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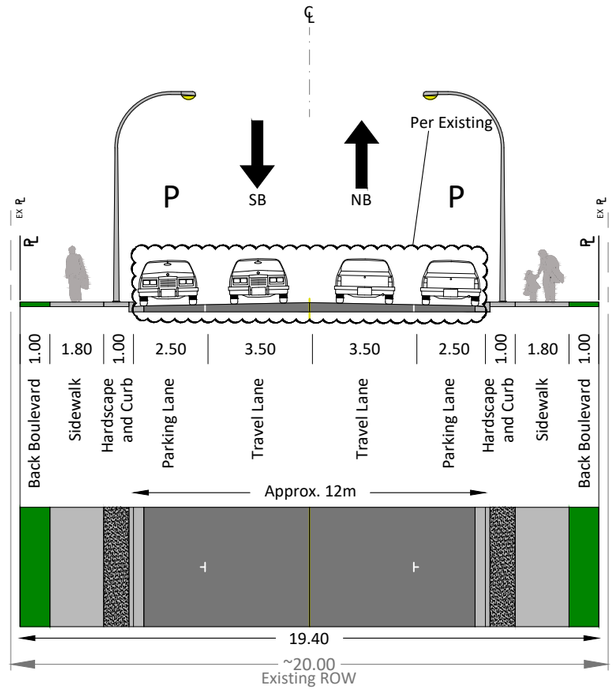

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AMHERST AVENUE

SPICER ROAD TO DOLLARTON HWY

URBAN systems

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Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:200	18-04-2018	AA-T1
1333.0040.03		Title

Amherst Avenue
Typical

Roadway Amherst Avenue
Extents Spicer Road to Dollarton Highway
Right-of-Way Width 20.03
Length 185
Existing Roadway 12
Proposed Roadway 12

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	1486	$ 14,900
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	1486	$ 59,500
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	370	$ 3,700
Pavement Structure (Collector)	m2	$ 95	0	$ -
Mill and Overlay	m2	$ 30	111	$ 3,400
Extruded Curb	m	$ 130	370	$ 48,100
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	370	$ 55,500
2.0m Hardscape Blvd	m	$ 200	185	$ 37,000
Sod (1.2m Blvd)	m	$ 18		$ -
Sod (2.2m Blvd)	m	$ 33	185	$ 6,200
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	203	$ 12,200
Street Light Relocation	ea	$ 12,000	7	$ 84,000
New Street Light	ea	$ 10,000	2	$ 22,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 34,700
SUBTOTAL COST ESTIMATE				**$ 381,700**
Contingency	40%			153,000
Engineering & Project Management (w/o contingency)	15%			58,000
TOTAL ROADWAY COST ESTIMATE				**$ 593,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX D - BERKLEY ROAD

Berkley Road (Dollarton Road to Mount Seymour Parkway)

Berkley Road was designed as a new roadway connection between Dollarton Highway and Mount Seymour Parkway. The design included two thru lanes, expandable to a future four lane cross-section. No parking was included. Berkley road was joined with the existing alignment in the north. In the south, it was designed to meet Dollarton Highway at the boundary of the property line between the District's proposed Fire Hall and the existing International School. The design of the intersection and the horizonal alignment minimized impacts to the environmentally sensitive area on the northwest corner of this intersection. The horizontal and vertical alignments were developed to provide a maximum 8% grade along Berkley Road. The curves were developed based on a 50km/h design speed and sight distances were reviewed to establish intersection points for the fire hall egress and the Road A intersection that meet minimum sight distance requirements. The number of intersections was minimized to meet the maximum grade and to reduce impacts to environmentally sensitive areas throughout the undeveloped areas.

Protected cycling and pedestrian facilities were provided for Berkley Road with connections to the existing trail network at various location. There is an opportunity to connect the existing trail network at the north end of Berkley Road with a pedestrian overpass due to the proposed cut at this location. Future conventional and rapid transit access was accommodated on Berkley Road. Turning movements were tested using an articulated bus, conventional bus, and WB-20 because of the surrounding industrial land uses. The location of the future bus stops will need to be coordinated with the District and TransLink; however, the boulevard is sufficient to accommodate a bus stop or station.

Direct access to Berkley Road is not permitted, with the exception of the fire hall egress, Road A and the Canlan Ice Rink access. The Canlan access has been offset from Burr Place to allow for a left turn lane to be added for southbound traffic.

The design for Berkley Road crossed an existing GVRD sanitary sewer main west of Road A. The area will add approximately 1m of fill on the sewer pipe. Further analysis is needed by the District and GVRD.

Street lights and utilities will need to be added to this roadway (by others). A proposed swale was included on the north / west side of Berkley. This was requested by the District. Stormwater analysis has not been completed.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Profile
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Berkley Road (Dollarton Road to Mount Seymour Parkway)

Length: 925m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	-	Arterial	Major Arterial	
Right-of-Way	-	-	35.4m	Note 4
Posted Speed	-	50 km/h	50 km/h	
Design Speed	-	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	-	N/A	8%	Note 3
Design Vehicle	-	-	WB-20/ Articulated Bus	Note 5
Basic Lanes	-	4	2-4	Note 6
Lane Width	-	3.0m – 3.7m (TAC)	3.5m	
Parking Including	-	No	No	
Bike Facilities	-	-	Yes	Note 7
Sidewalks	-	Yes	Yes	Note 7
Transit Facilities	-	-	Yes	Note 8
Access Conditions	-	-	Limited	Note 9

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. No grading impacts on private property were developed as the development is assumed to determine the impacts.

Note 4: Right-of-way includes space for a drainage swale on the east side of the roadway. District to determine the design of the swale. Right-of-way width could change once design is completed.

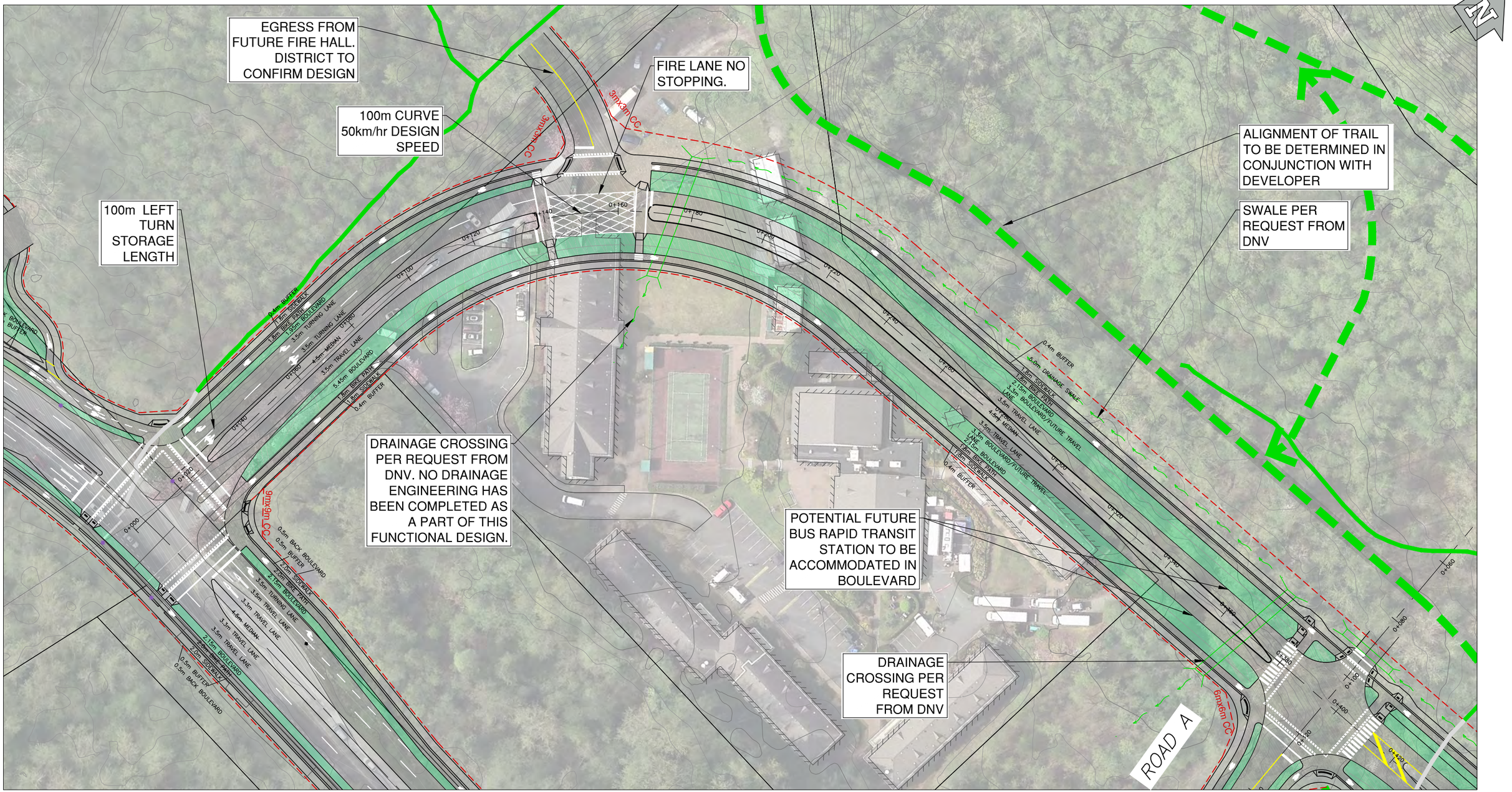
Note 5: As per the Districts request, we ran a double right turning movement from Berkley Road to Dollarton Highway using a MSU on the inner lane and a WB-20 on the outer lane. The geometric for the curb return is designed to satisfy this movement.

Note 6: Proposed design is for 2 lanes but is designed to accommodate a widening to 4 lanes if traffic volumes require it.

Note 7: Protected bicycle facilities and sidewalks are provided on both sides of roadway.

Note 8: Potential bus layby needed at Berkley Road and Road A intersection. To be confirmed by TransLink and District of North Vancouver.

Note 9: Accesses have been included at existing access points, Road A, and the future fire station. No other accesses are allowed from Berkley Street. Access to developments to come off of Road A and Road B.



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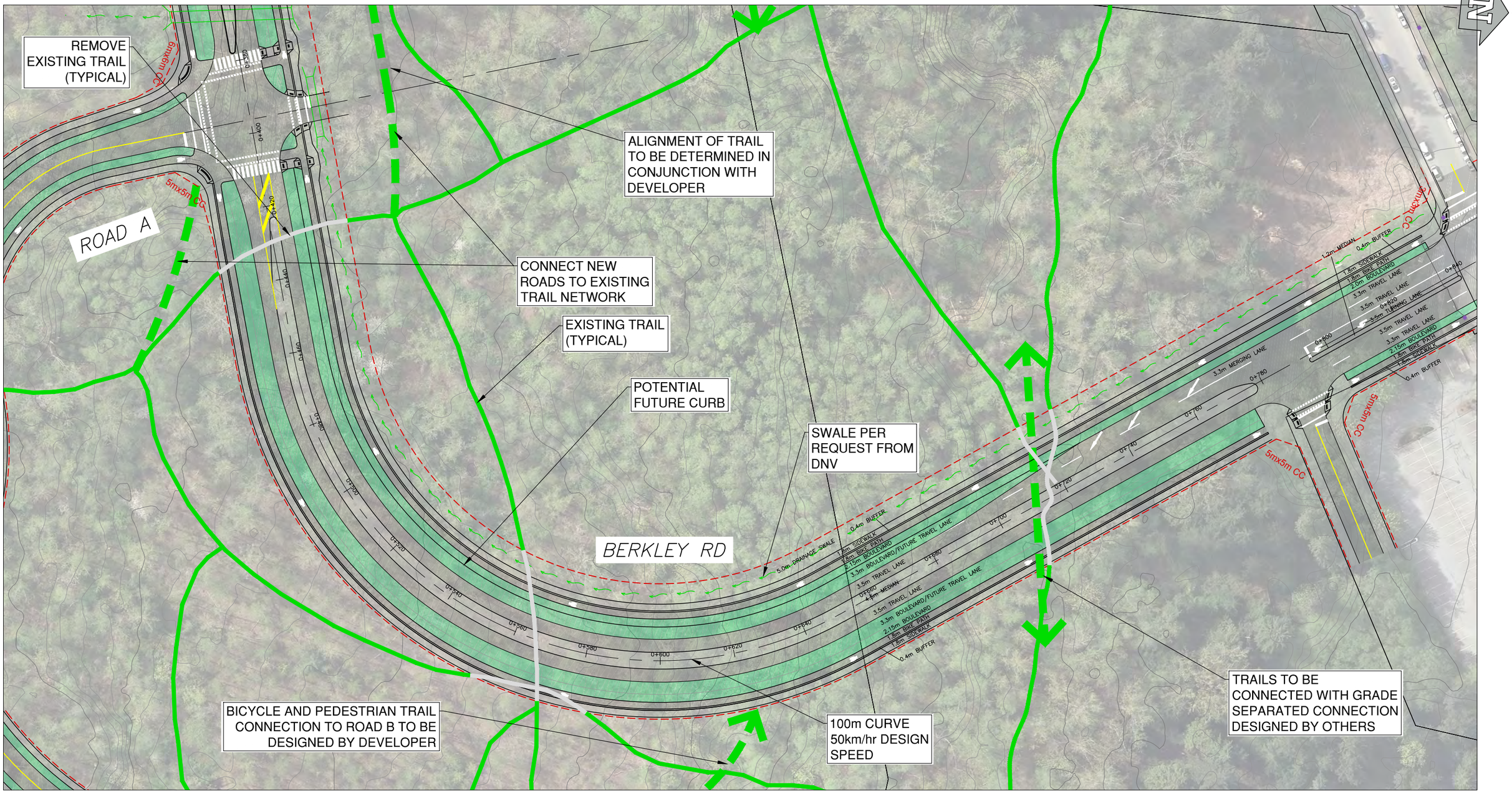
PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	BR-01
1333.0040.03		Title

Berkley Road
Plan
Appendix p-15



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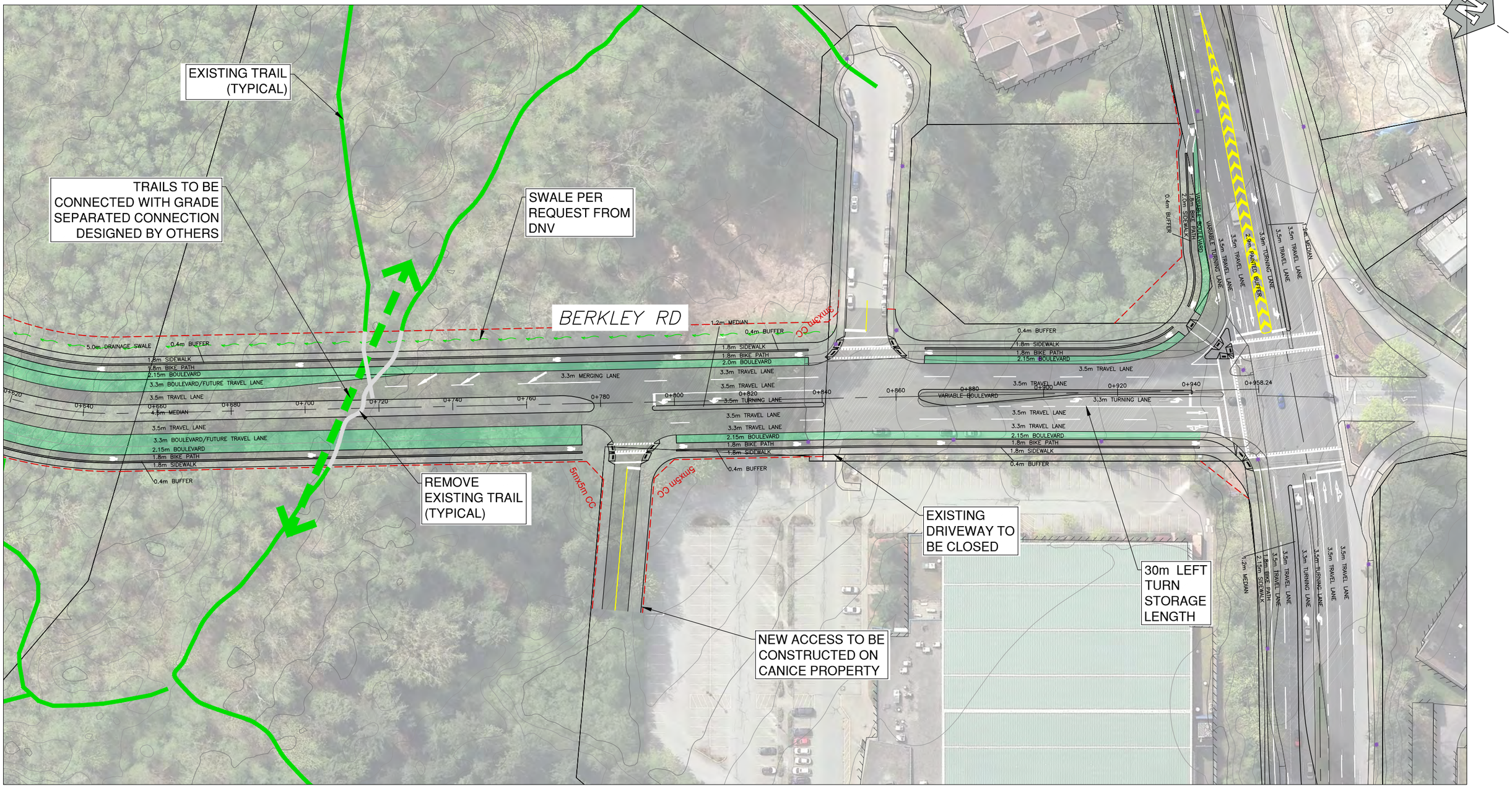
Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	BR-02
1333.0040.03		Title

Berkley Road
Plan



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PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	BR-03
1333.0040.03		Title

Berkley Road
Plan

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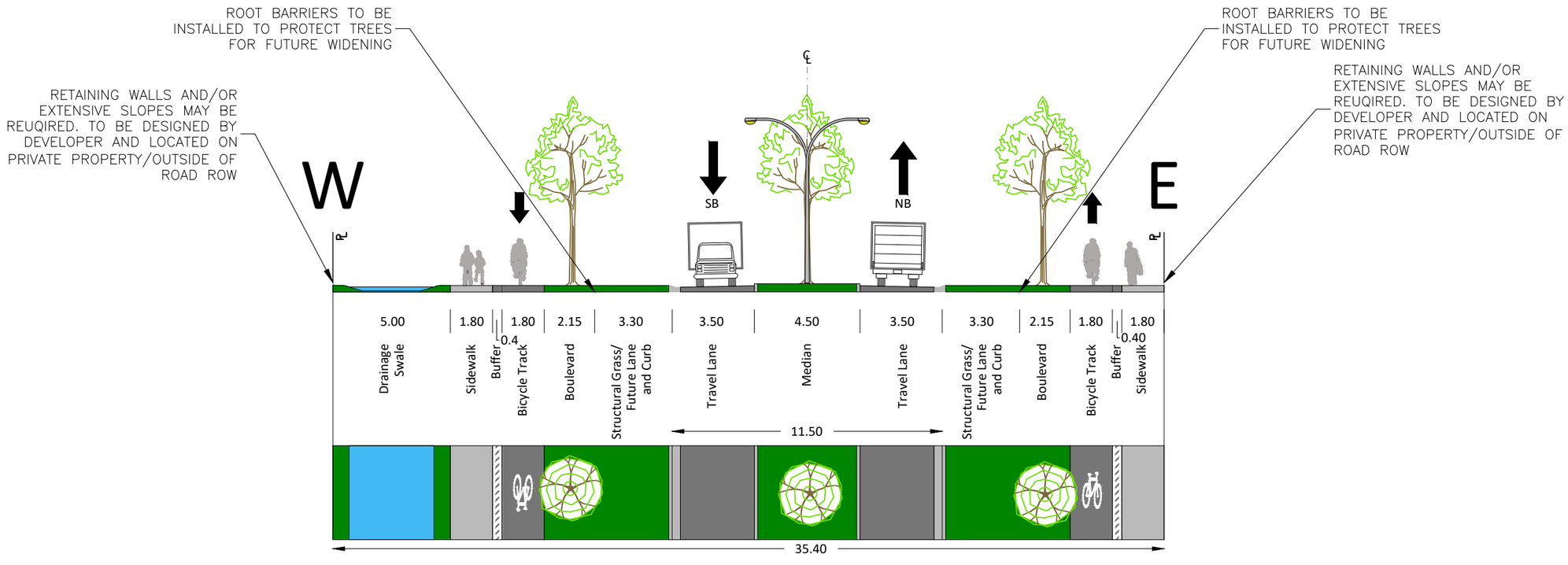

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BERKLEY ROAD

MOUNT SEYMOUR PARKWAY TO DOLLARTON HWY (MID-BLOCK)

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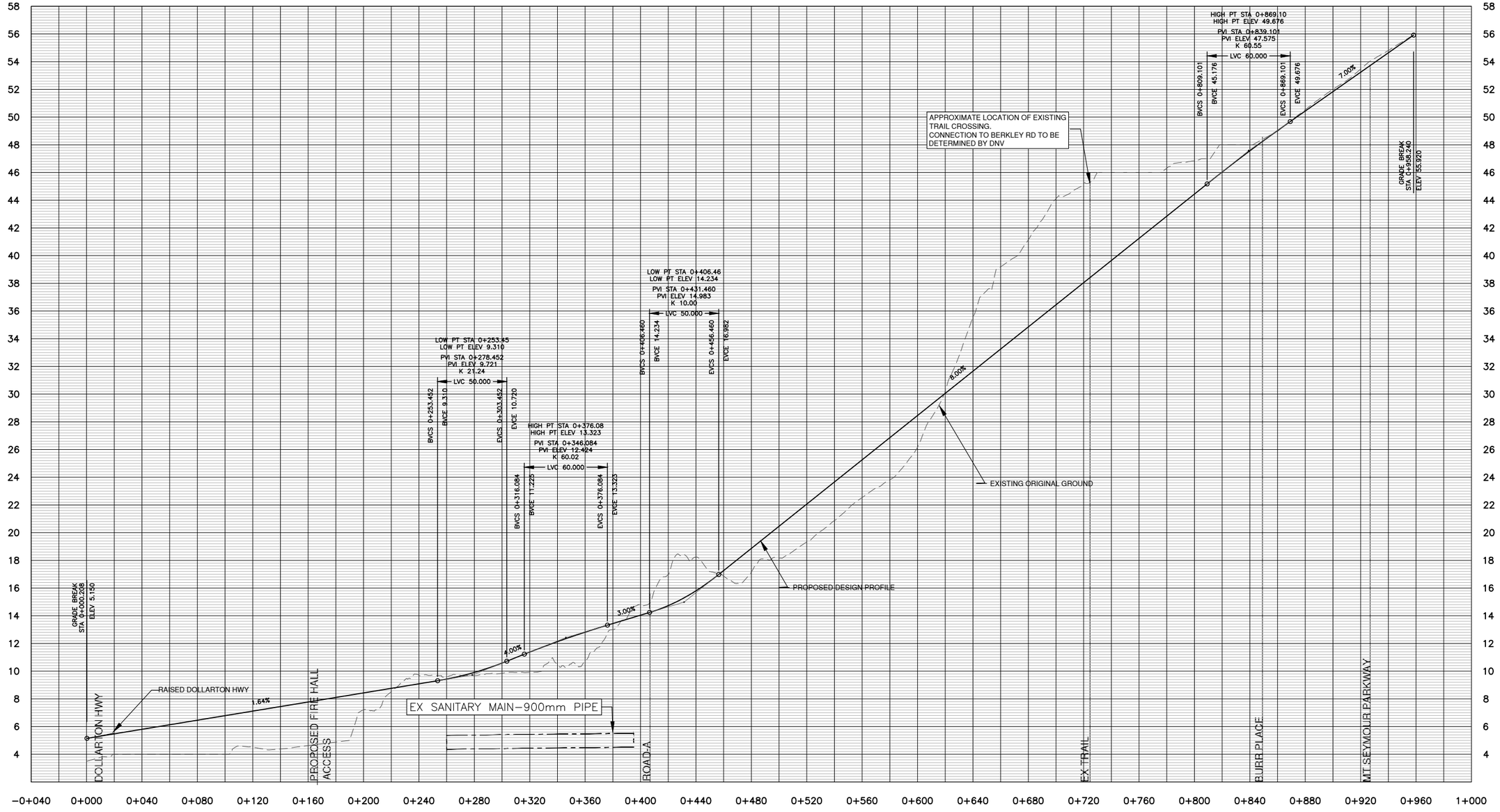
Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:200	18-04-2018	BR-T1
1333.0040.03		Title

Berkley Road
Typical

BERKLEY RD -0+040 to 1+000



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APRIL 18, 2018
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Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
H:1:3000	18-04-2018	BR-04
1333.0040.03		Title

Berkley Road Profile

Roadway Berkley Road
Extents Dollarton Highway to Fire Station Access
Right-of-Way Width 30.4
Length 165
Existing Roadway 0
Proposed Roadway 11.5

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	5016	$ 50,200
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	0	$ -
Bulk Tree Removal	m2	$ 2	5016	$ 10,100
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	15382	$ 615,300
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Arterial)	m2	$ 120	1898	$ 227,700
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	660	$ 85,800
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	330	$ 49,500
Sod (1.2m Blvd)	m	$ 54	330	$ 17,900
Sod (2.2m Blvd)	m	$ 66	165	$ 10,900
Trees	ea	$ 700	49	$ 34,300
Asphalt Multiuse Path/Bike Path	m2	$ 70	660	$ 46,200
Pavement Markings	m	$ 60	165	$ 9,900
Street Light Relocation	ea	$ 12,000	0	$ -
New Street Light	ea	$ 10,000	8	$ 82,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	1	$ 350,000
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 159,030
SUBTOTAL COST ESTIMATE				**$ 1,749,300**
Contingency	40%			700,000
Engineering & Project Management (w/o contingency)	15%			263,000
TOTAL ROADWAY COST ESTIMATE				**$ 2,713,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Berkley Road
Extents Fire Station Access to Mount Seymour Parkway
Right-of-Way Width 35.4
Length 800
Existing Roadway 0
Proposed Roadway 11.5

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	28458	$ 284,600
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	138	$ 5,600
Bulk Tree Removal	m2	$ 2	28320	$ 56,700
Excavation (Cut)	m3	$ 70	28178	$ 1,972,500
Subgrade Fill and Compaction	m3	$ 40	32639	$ 1,305,600
Sawcutting	m	$ 10	460	$ 4,600
Pavement Structure (Arterial)	m2	$ 120	9338	$ 1,120,600
Mill and Overlay	m2	$ 30	138	$ 4,200
Extruded Curb	m	$ 130	4580	$ 595,400
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	1600	$ 240,000
Sod (1.2m Blvd)	m	$ 54	1600	$ 86,400
Sod (2.2m Blvd)	m	$ 66	800	$ 52,800
Trees	ea	$ 700	49	$ 34,300
Asphalt Multiuse Path/Bike Path	m2	$ 70	3200	$ 224,000
Pavement Markings	m	$ 60	800	$ 48,000
Street Light Relocation	ea	$ 12,000	27	$ 324,000
New Street Light	ea	$ 10,000	25	$ 245,000
Drainage Swale	lm	$ 250	475	$ 118,800
Pedestrian Half Signal	ea	$ 200,000	1	$ 200,000
Full Traffic Signal	ea	$ 350,000	1	$ 350,000
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 727,310
SUBTOTAL COST ESTIMATE				**$ 8,000,400**
Contingency	40%			3,201,000
Engineering & Project Management (w/o contingency)	15%			1,201,000
TOTAL ROADWAY COST ESTIMATE				**$ 12,403,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

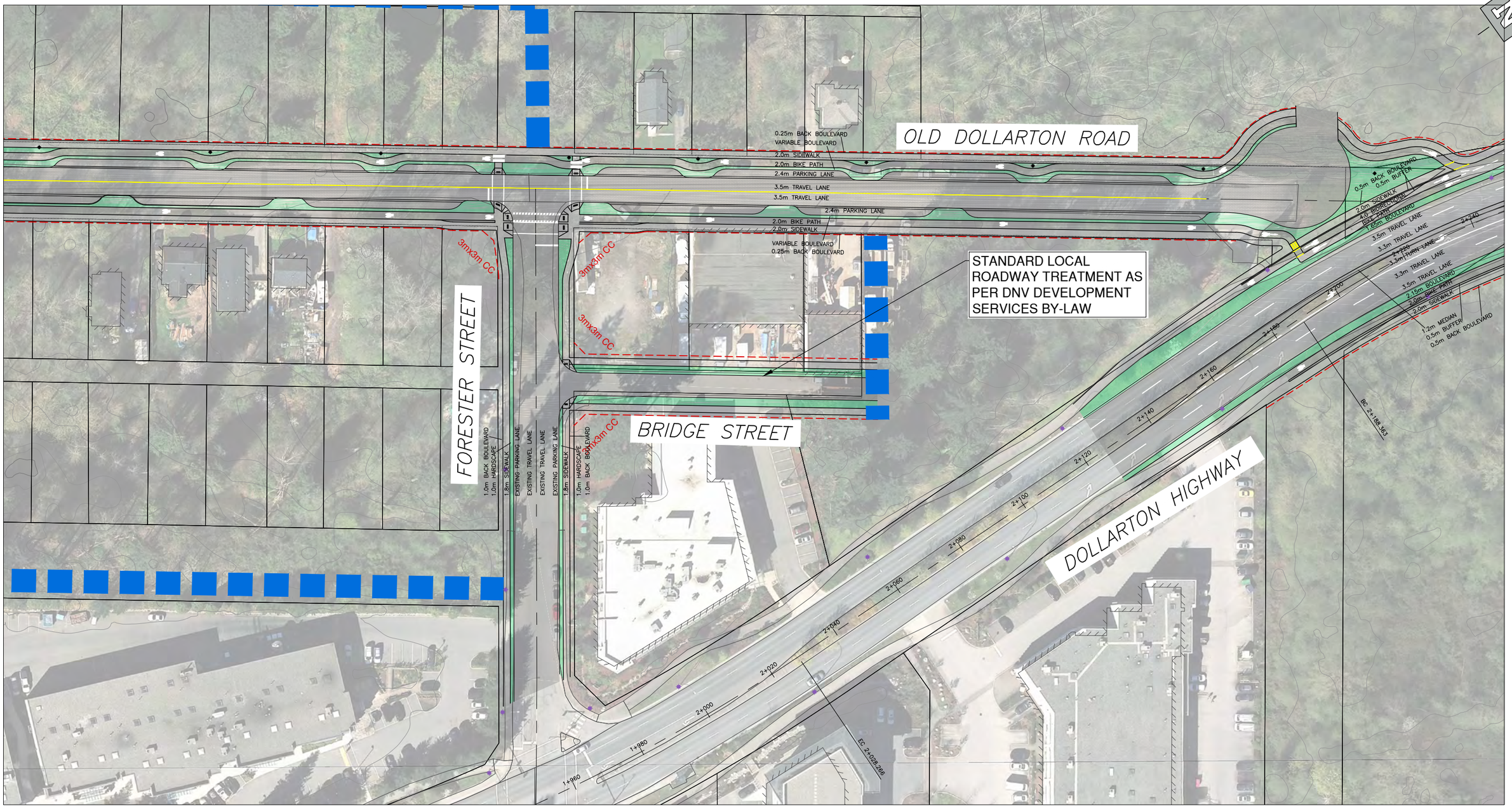
APPENDIX E - BRIDGE STREET

Bridge Street

Bridge Street will be designed as per the District's Development Services By-law (2017) for local streets. Travel lanes, parking lanes, and sidewalks will be provided for Bridge Street. A laneway connection between Bridge Street and Old Dollarton at the east end will be needed for circulation purposes.

This appendix includes the following materials:

- Functional Plan Drawings
    - For Typical Section refer to the District's Development Services By-Law (2017)



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PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	BS-01
1333.0040.03		Title

Bridge Street Plan

Roadway Bridge Street
Extents Forester Street to End
Right-of-Way Width 15.9
Length 100
Existing Roadway 6
Proposed Roadway 6.4

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	1590	$ 15,900
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	0	$ -
Bulk Tree Removal	m2	$ 2	1590	$ 3,200
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	1590	$ 63,600
Sawcutting	m	$ 10	16	$ 200
Pavement Structure (Local - Commercial/Industrial)	m2	$ 85	640	$ 54,400
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	200	$ 26,000
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	200	$ 30,000
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	200	$ 6,600
Trees	ea	$ 700	20	$ 14,000
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	100	$ 6,000
Street Light Relocation	ea	$ 12,000	0	$ -
New Street Light	ea	$ 10,000	5	$ 50,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 26,990
SUBTOTAL COST ESTIMATE				**$ 296,900**
Contingency	40%			119,000
Engineering & Project Management (w/o contingency)	15%			45,000
TOTAL ROADWAY COST ESTIMATE				**$ 461,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX F - DOLLARTON HIGHWAY

Dollarton Highway (Old Dollarton Road to Ellis Street)

Dollarton Highway was developed to follow the existing alignment. The roadway was widened to 4 lanes from 2 with a centre median, east of Forester Street to east of the Road A intersection. Dollarton Highway was tied into the existing condition approximately 300m east of Road A. The roadway was raised to minimum elevation of 4.7m to provide coastal flood protection for the adjacent properties. The increase in elevation and widening may result in some changes to grading on the north and south sides of the roadway. All existing access can be maintained at the new elevation and width, although consolidation of the accesses to the Pacific Environmental Science Centre is recommended.

Intersections were added at Berkley Road and Road A to facilitate access to the new development of the Innovation District. The intersection with Berkley Road is located at the existing access to the International School. The design and cost estimate assumed the existing signals at this location will require replacement. The new signals will require signal prioritization for fire truck egress, as well as possible signal priority for transit. A new signal was included at the intersection with Road A. Turning lanes have been included where indicated by the traffic engineering work completed as part of the ***Transportation Study Update (2017).***

The existing multi-use paths found on both sides Dollarton Highway were transitioned to uni-directional bike path and sidewalk through this segment. These facilities will be extended east to the roadway tie-in. The bike lanes transition to on road shared use facilities at the tie in point east of Road A. Crossings for pedestrians and bicycles have been included at both intersections. The existing street lights will need to be relocated to facilitate the new roadway.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Profiles
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Dollarton Highway (Old Dollarton Road to Ellis Street)

Length: 1.1km

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Major Arterial	Major Arterial	Major Arterial	
Right-of-Way	24.4m	-	32.4m	Note 4
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	N/A	N/A	8%	Note 3
Design Vehicle	-	-	WB-20	
Basic Lanes	2	4	4	
Lane Width	3.3m-3.5m	3.0m – 3.7m (TAC)	3.3m-3.5m	
Parking Including	Yes	Yes	Yes	
Bike Facilities	Yes	-	Yes	Note 5
Sidewalks	Yes	Yes	Yes	Note 5
Transit Facilities	Yes	-	Yes	
Access Conditions	None	-	None	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

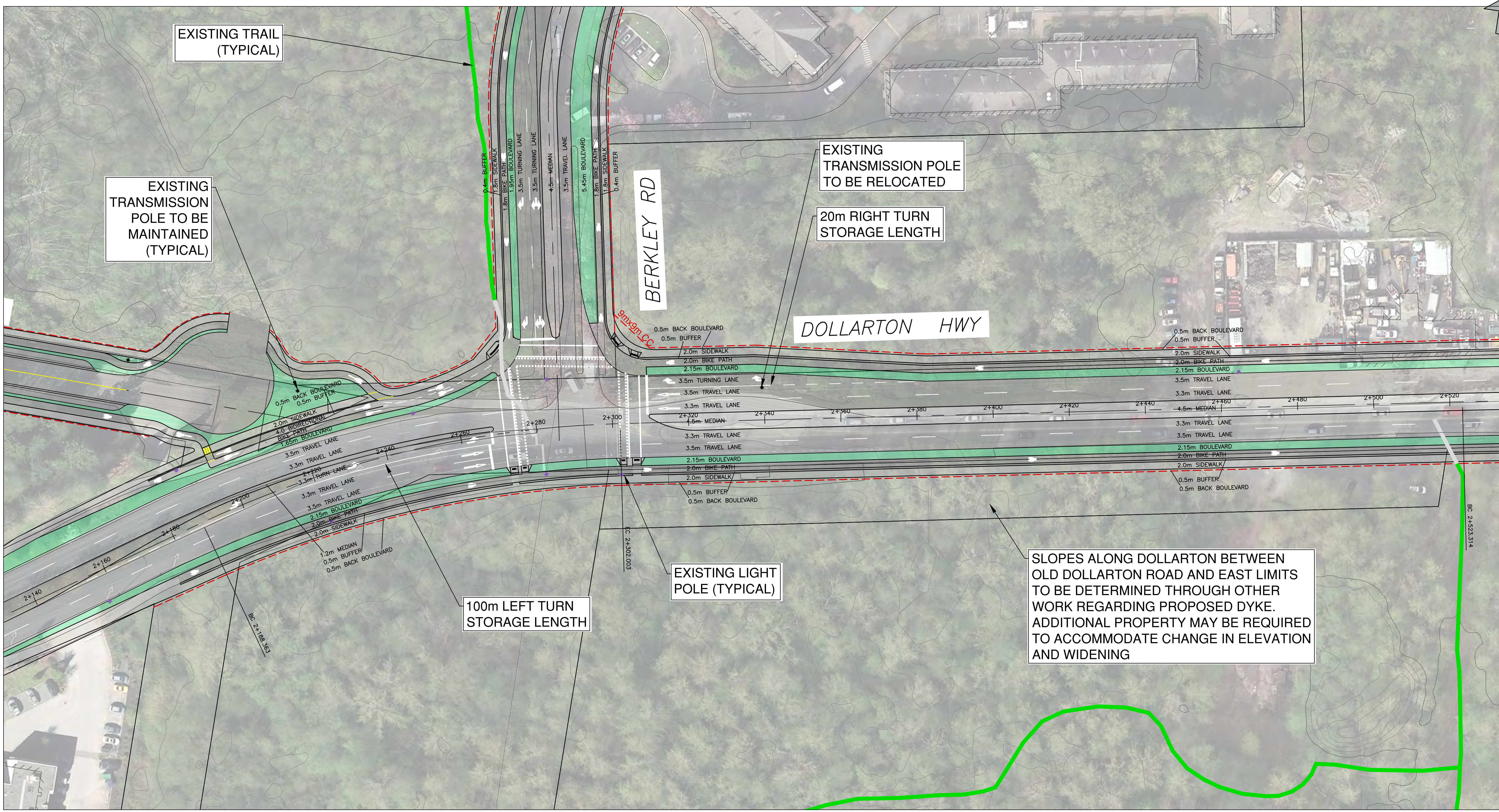
Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Dollarton Highway to be raised to provide flood control protection.

Note 4: Property acquisition required for additional lanes and extending pedestrian and bicycle facilities east.

Note 5: Currently a Multi-use path is provided on both sides of Dollarton Highway west of Old Dollarton Road. Multi-use paths are recommended to be split into uni-directional cycling facilities and sidewalks.



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PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:1000	18-04-2018	DH-01
1333.0040.03		Title
Dollarton Highway Plan		

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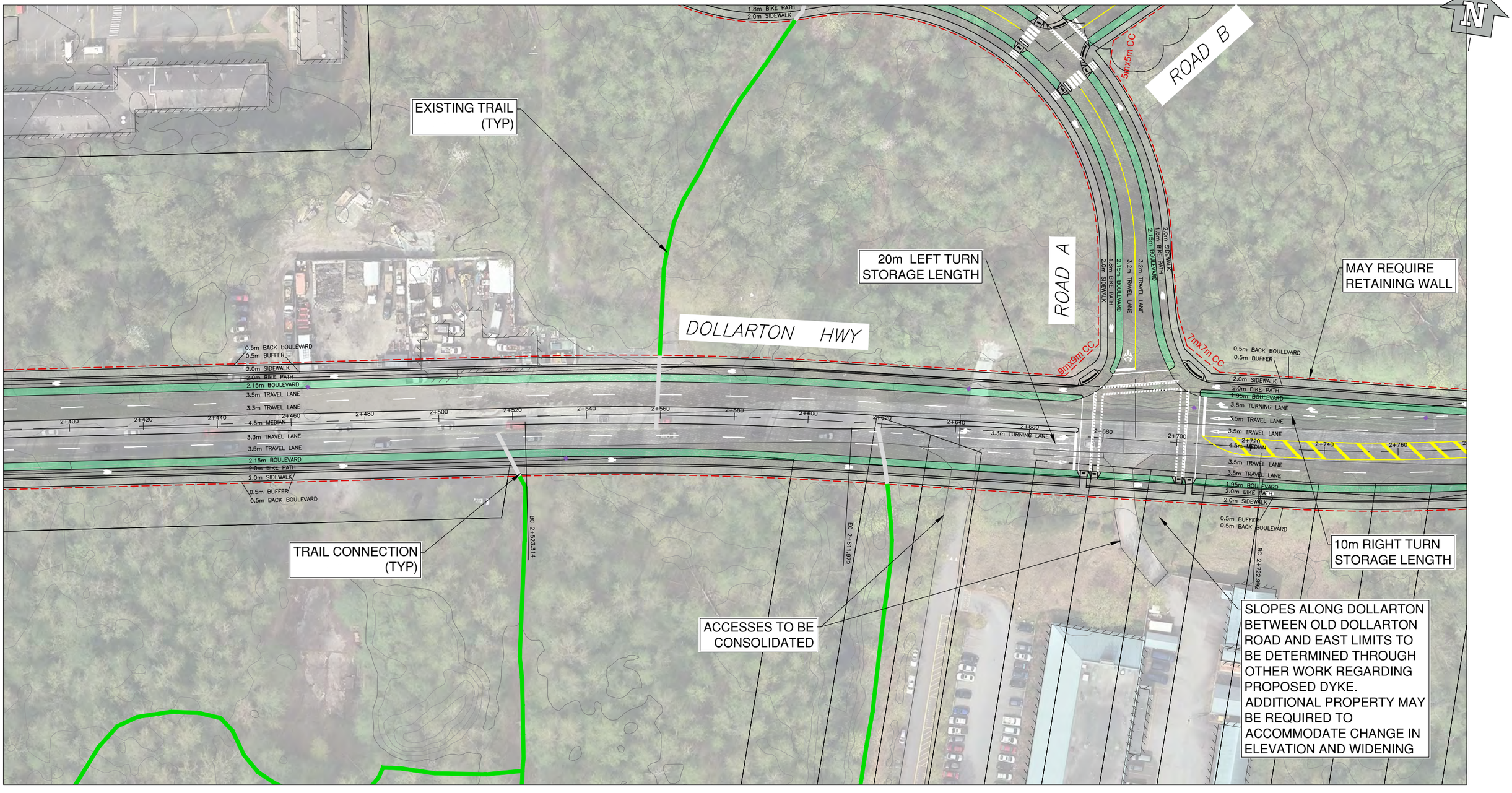

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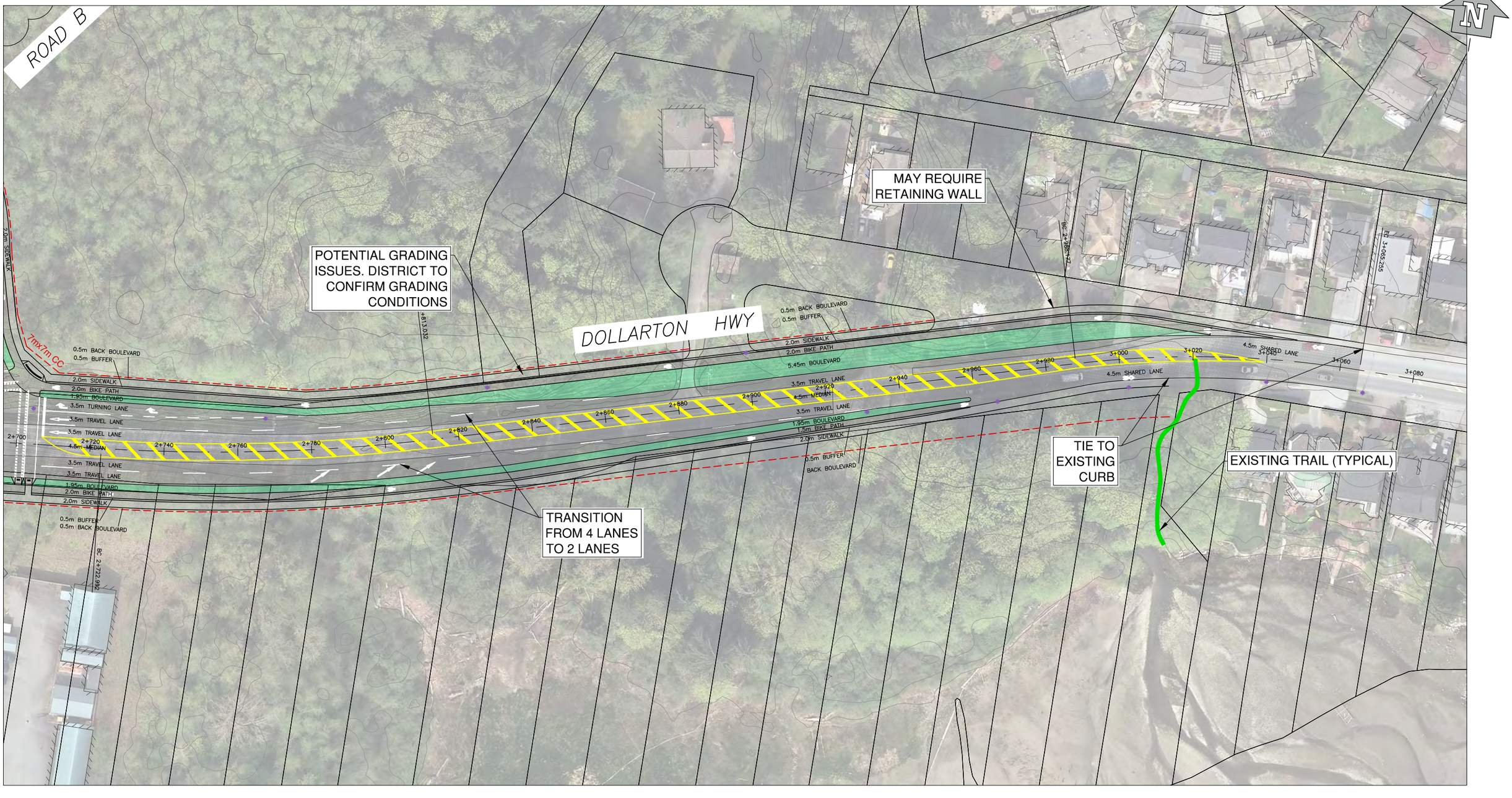
Client/Project
District of North Vancouver Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	DH-02
1333.0040.03		Title

Dollarton Highway
Plan



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Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	DH-03
1333.0040.03		Title

Dollarton Highway
Plan

Appendix p-30

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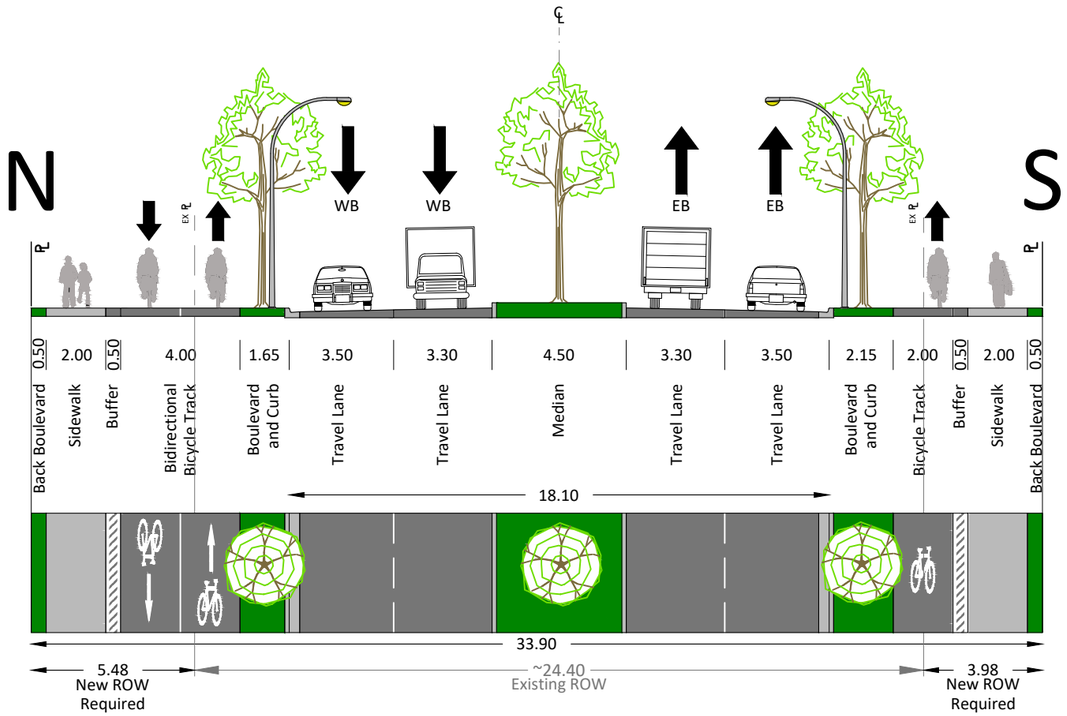
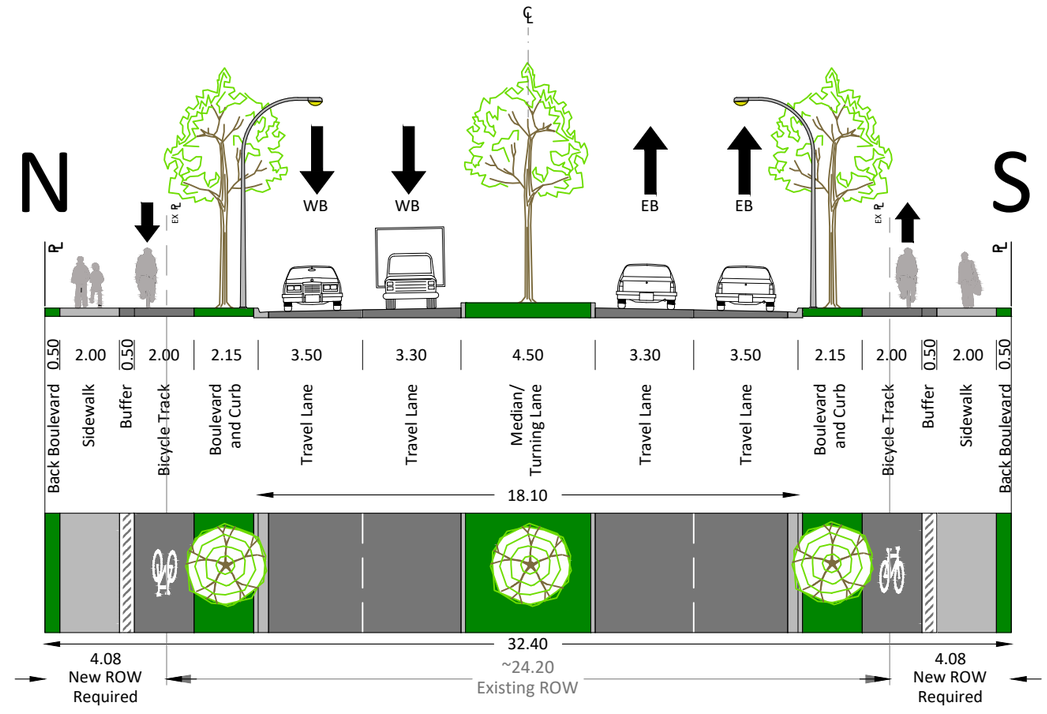


DH 1 DOLLARTON HIGHWAY

OLD DOLLARTON ROAD TO BERKLEY ROAD



DH 2 DOLLARTON HIGHWAY

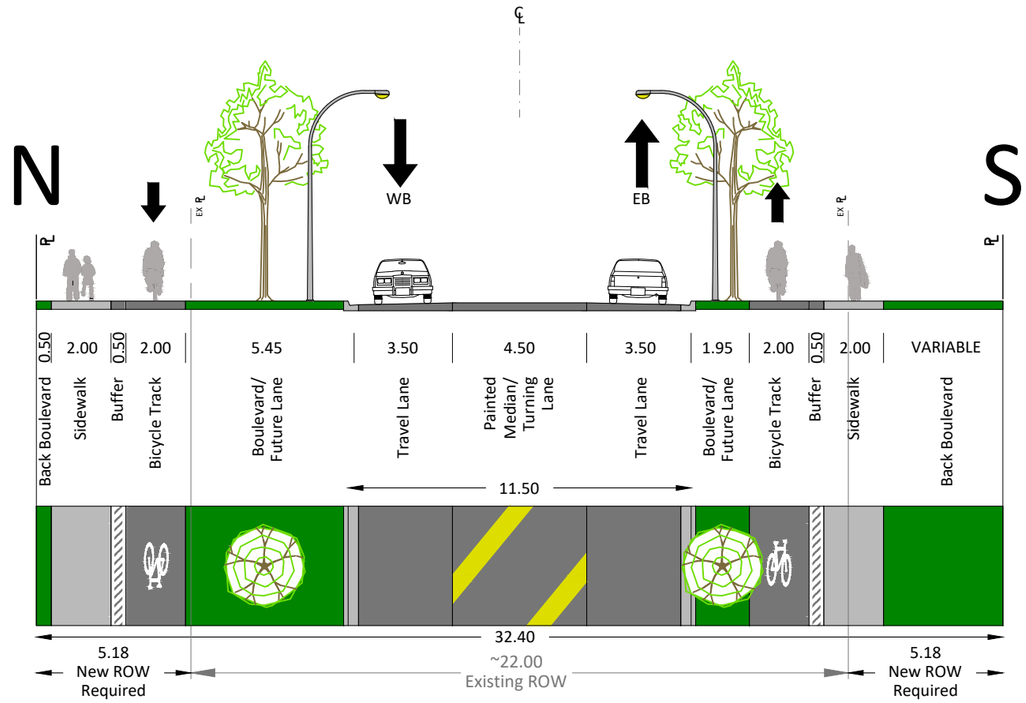
BERKLEY ROAD TO ROAD A

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date	Figure
1:200	18-04-2018	DH-T1
1333.0040.03		Title

Dollarton Highway
Typical



DH 3 DOLLARTON HIGHWAY
EAST OF ROAD A

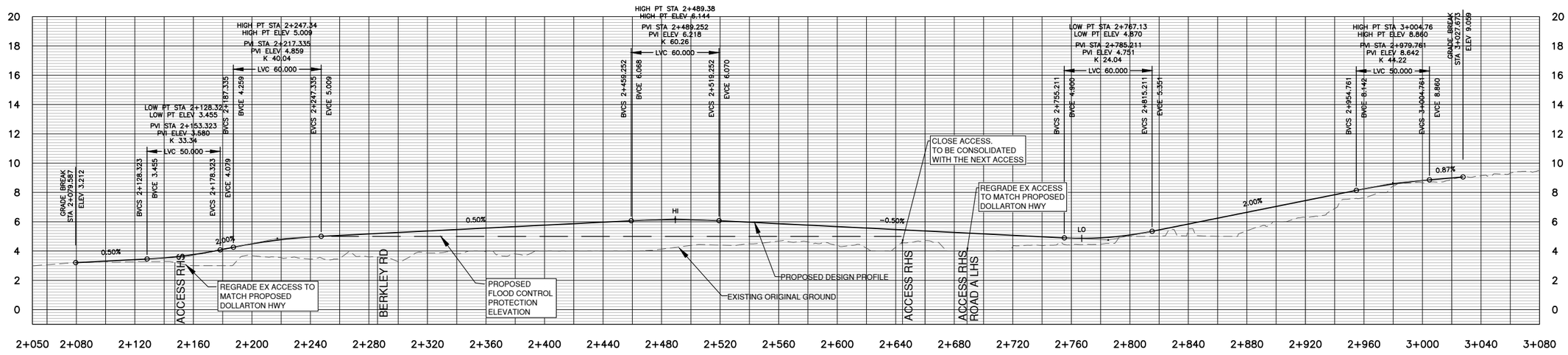
URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:200	18-04-2018	DH-T2
1333.0040.03		Title

Dollarton Highway
Typical

DOLLARTON HWY 2+050 to 3+080



URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
H:1:3000	18-04-2018	DH-04
1333.0040.03		Title

Dollarton Highway Profile

Roadway Dollarton Highway
Extents Old Dollarton to East Extent
Right-of-Way Width 33.9,32.4
Length 895
Existing Roadway 19.0,8.3
Proposed Roadway 13.6,11.5

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	29148	$ 291,500
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	29148	$ 1,166,000
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	30661	$ 1,226,500
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Arterial)	m2	$ 120	10815	$ 1,297,800
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	2890	$ 375,700
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	1790	$ 313,300
Sod (1.2m Blvd)	m	$ 36	1790	$ 64,500
Sod (2.2m Blvd)	m	$ 66	550	$ 36,300
Trees	ea	$ 700	100	$ 70,000
Asphalt Multiuse Path/Bike Path	m2	$ 70	3780	$ 264,600
Pavement Markings	m	$ 60	895	$ 53,700
Street Light Relocation	ea	$ 12,000	19	$ 228,000
New Street Light	ea	$ 10,000	26	$ 257,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 564,540
SUBTOTAL COST ESTIMATE				**$ 6,209,900**
Contingency	40%			2,484,000
Engineering & Project Management (w/o contingency)	15%			932,000
TOTAL ROADWAY COST ESTIMATE				**$ 9,626,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX G - FORESTER STREET

Forester Street (Spicer Road to Old Dollarton Road)

Forester Street was developed to follow the existing alignment. The roadway width was maintained as existing two travel lanes and parking of both sides. Sidewalks were normalized with a landscaping buffer. Street light poles will need to be relocated to the landscape zone.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Forester Street (Spicer Road to Old Dollarton Road)

Length: 300m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	20.0m	-	20.0m	
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	DNV Fire Truck	
Basic Lanes	1	4	2-4	
Lane Width	3.5m	3.0m – 3.7m (TAC)	3.5m	
Parking Including	No	No	Yes	
Bike Facilities	No	-	No	
Sidewalks	No	Yes	Yes	
Transit Facilities	No	-	No	
Access Conditions	Commercial	-	Commercial	

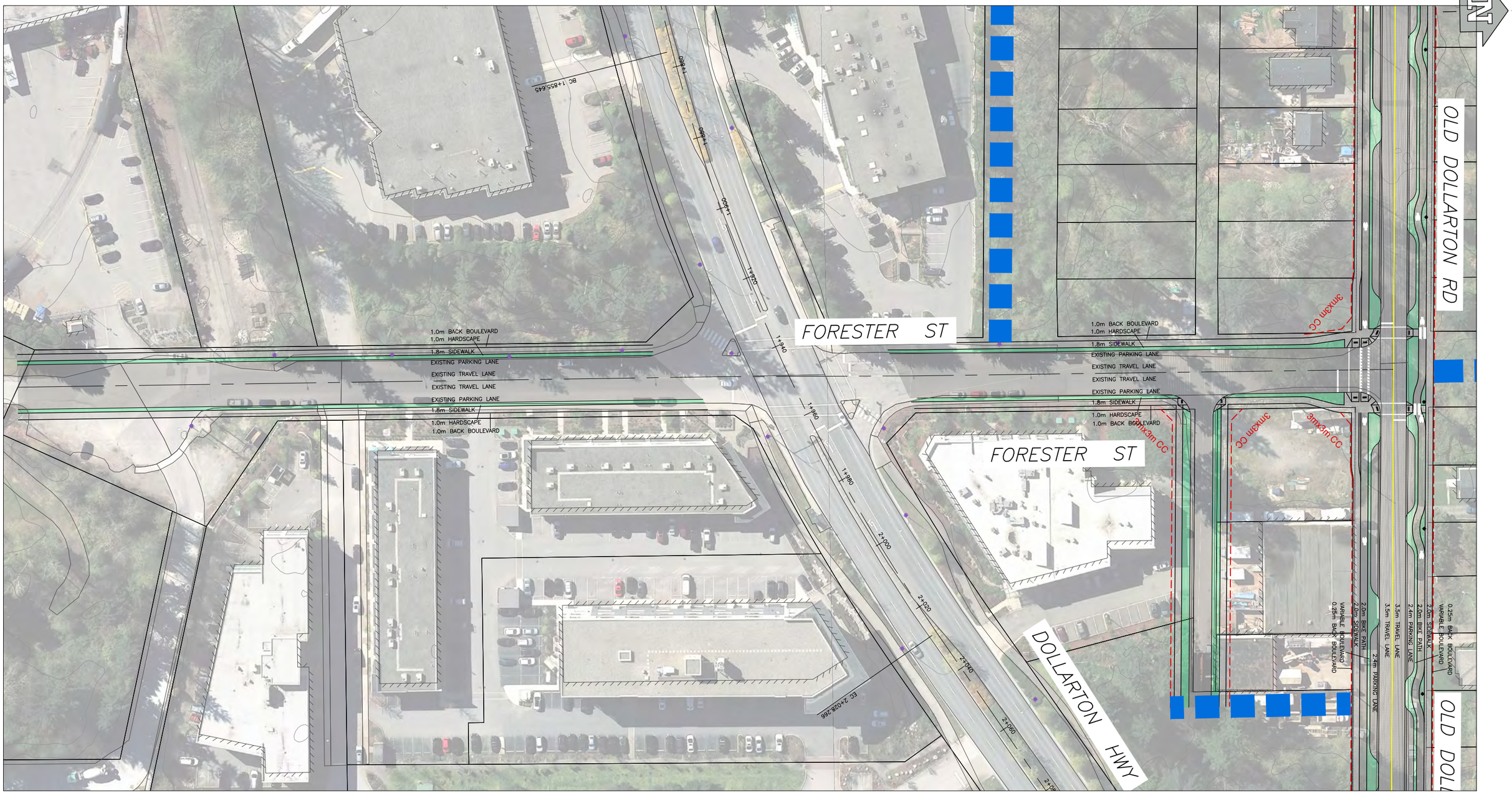
General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%.



URBAN systems

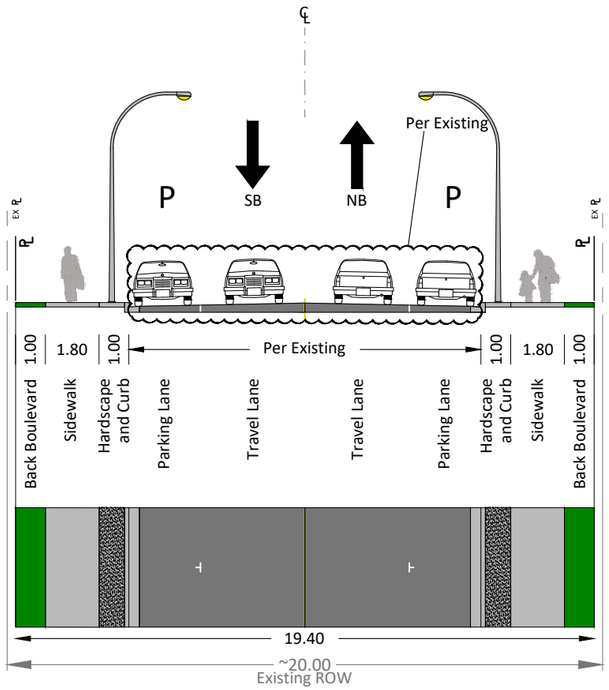
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date	Figure
1:1000	18-04-2018	FoS-01
1333.0040.03		Title

Forester Street
Plan
Appendix p-38

W

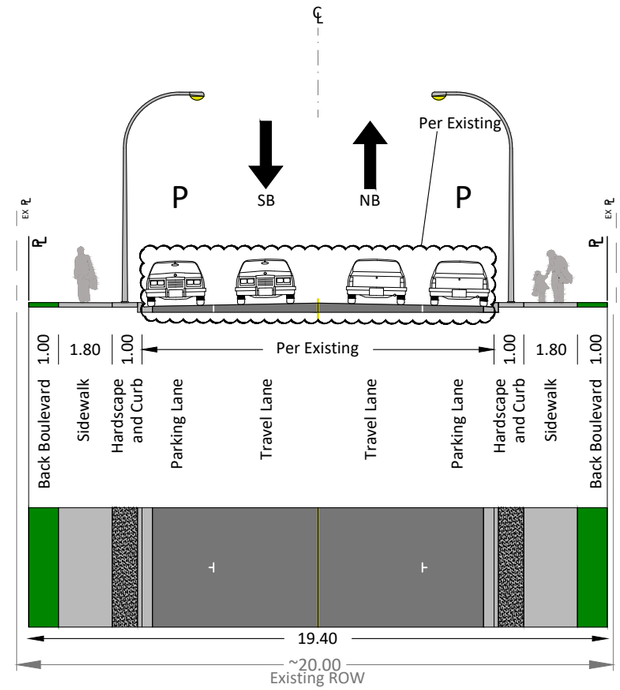


E

FoS 1 FORESTER STREET

SOUTH OF DOLLARTON HWY (MID-BLOCK)

W



E

FoS 2 FORESTER STREET

DOLLARTON HWY TO OLD DOLLARTON ROAD (MID-BLOCK)

URBAN systems

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APRIL 18, 2018
URBAN systems

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date / Figure
1:200	18-04-2018 / FoS-T1
1333.0040.03	Title

Forester Street
Typical

APPENDIX H - FRONT STREET

Front Street (Old Dollarton Road to Riverside Drive)

Front Street was developed along the existing alignment. The south side of Front Street was maintained as existing due to it being recently constructed with the development to the south. A wide sidewalk (2.0m – 3.0m) was provided on the north side due to the commercial activity expected on this frontage. Parking was eliminated west of Seymour River Place on the north due to property constraints. Parking was included east of Seymour River Place. No cycling facilities are included on the roadway but curb extensions are included at pedestrian crossing for safety. Street light poles will need to be relocated to the landscape zone.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Front Street (Old Dollarton Road to Riverside Drive)

Length: 315m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	~20.0m	-	22.0m	Note 4
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	DNV Fire Truck	
Basic Lanes	2	2	2	
Lane Width	3.5m	3.0m – 3.7m (TAC)	3.5m	
Parking Including	Yes	Yes	Yes	Note 5
Bike Facilities	No	-	No	
Sidewalks	Yes	Yes	Yes	
Transit Facilities	No	-	No	
Access Conditions	Limited	-	Limited	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

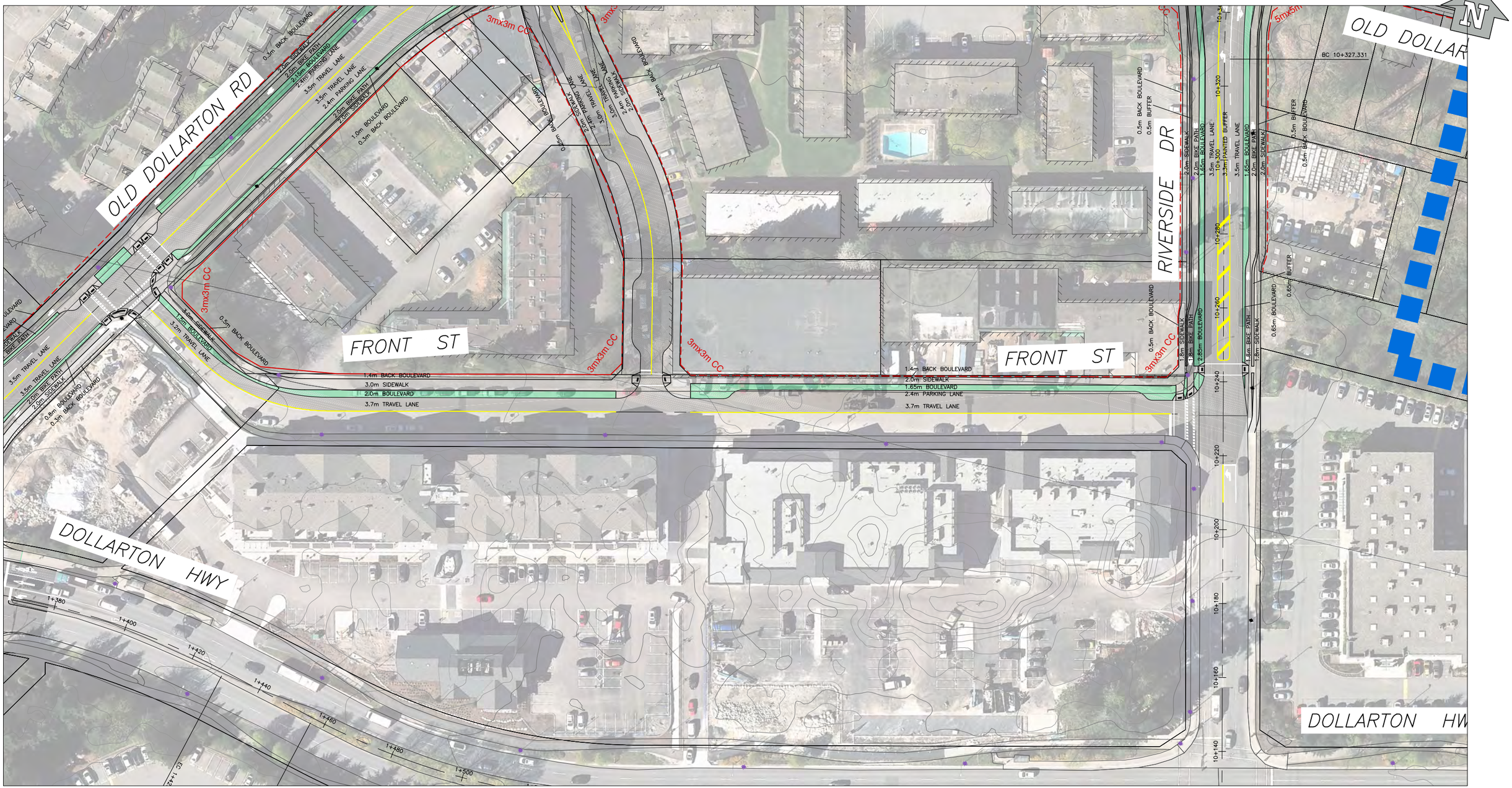
Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Existing profile to be maintained. No profile developed for this roadway.

Note 4: South side of Front Street to remain as is. Development on south side of Front Street was recently completed

Note 5: Parking is included on the north side of the street at various intervals as the dimensions allow.



URBAN systems

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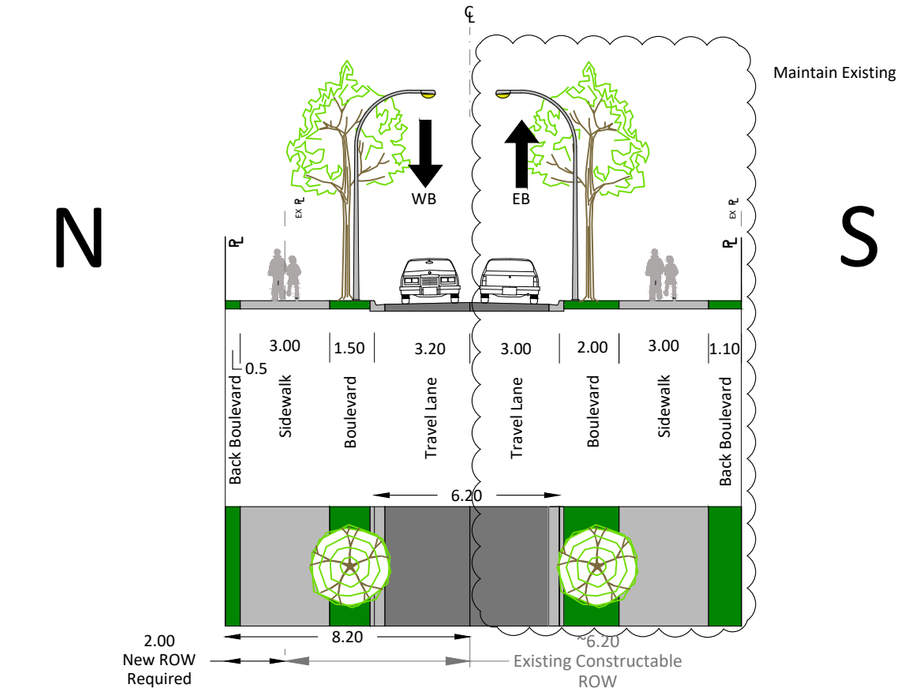
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

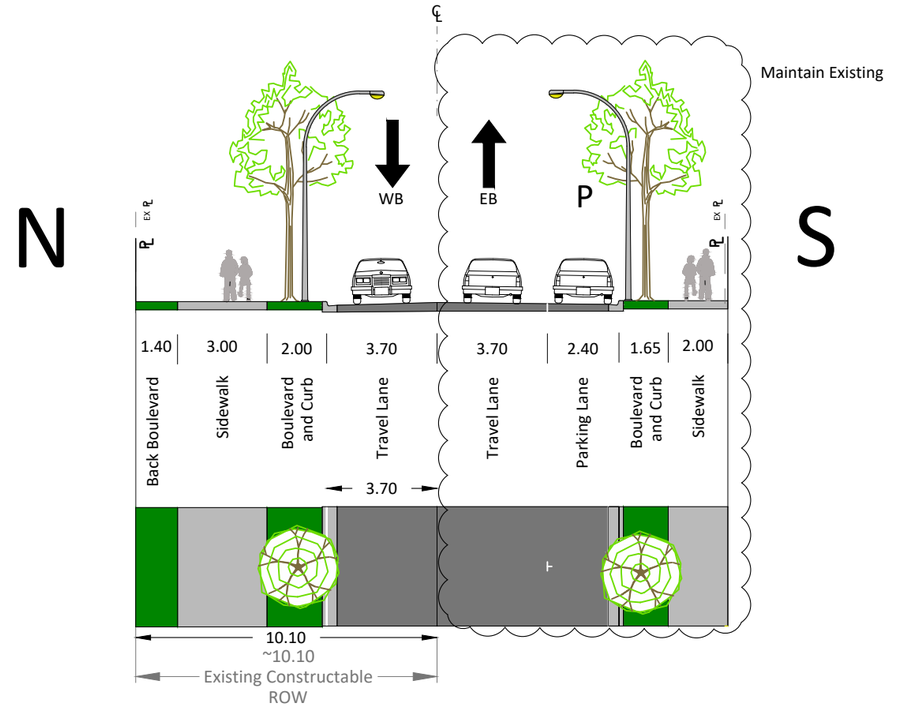
Scale	Date	Figure
1:1000	18-04-2018	FrS-01
1333.0040.03		Title

Front Street
Plan
Appendix p-43



FrS 1 FRONT STREET

OLD DOLLARTON ROAD TO 90m WEST OF SEYMOUR RIVER PLACE



FrS 2 FRONT STREET

90m WEST OF SEYMOUR RIVER PLACE TO SEYMOUR RIVER PLACE

URBAN systems

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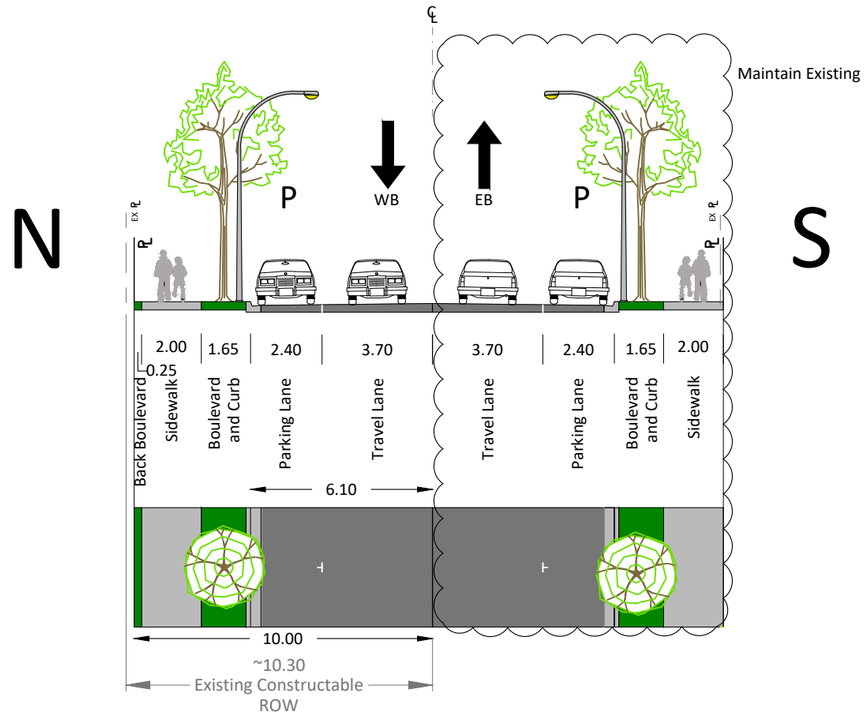
APRIL 18, 2018
URBAN systems

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:200	18-04-2018	FrS-T1
1333.0040.03		Title

Front Street
Typical



FrS 3

FRONT STREET

SEYMOUR RIVER PLACE TO RIVERSIDE DRIVE

URBAN systems

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APRIL 18, 2018
URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:200	18-04-2018	FrS-T2
1333.0040.03		Title

Front Street
Typical

Roadway Front Street
Extents Old Dollarton Way to Seymour River Place
Right-of-Way Width 19.8
Length 155
Existing Roadway 9.8
Proposed Roadway 6.4

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	1535	$ 15,400
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	1535	$ 61,400
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	155	$ 1,600
Pavement Structure (Local - Commercial/Industrial)	m2	$ 85	496	$ 42,200
Mill and Overlay	m2	$ 30	47	$ 1,400
Extruded Curb	m	$ 130	155	$ 20,200
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 263	155	$ 40,700
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	165	$ 5,500
Trees	ea	$ 700	11	$ 7,700
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	155	$ 9,300
Street Light Relocation	ea	$ 12,000	3	$ 36,000
New Street Light	ea	$ 10,000	5	$ 47,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 28,890
SUBTOTAL COST ESTIMATE				**$ 317,800**
Contingency	40%			128,000
Engineering & Project Management (w/o contingency)	15%			48,000
TOTAL ROADWAY COST ESTIMATE				**$ 494,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Front Street
Extents Seymour River Place to Riverside Drive
Right-of-Way Width 19.5
Length 115
Existing Roadway 11.3
Proposed Roadway 12

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	1121	$ 11,300
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	1121	$ 44,900
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	115	$ 1,200
Pavement Structure (Local - Commercial/Industrial)	m2	$ 85	690	$ 58,700
Mill and Overlay	m2	$ 30	35	$ 1,100
Extruded Curb	m	$ 130	115	$ 15,000
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	115	$ 20,200
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	115	$ 3,800
Trees	ea	$ 700	11	$ 7,700
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	115	$ 6,900
Street Light Relocation	ea	$ 12,000	1	$ 12,000
New Street Light	ea	$ 10,000	5	$ 47,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 23,030
SUBTOTAL COST ESTIMATE				**$ 253,300**
Contingency	40%			102,000
Engineering & Project Management (w/o contingency)	15%			38,000
TOTAL ROADWAY COST ESTIMATE				**$ 394,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX I - MOUNT SEYMOUR PARKWAY

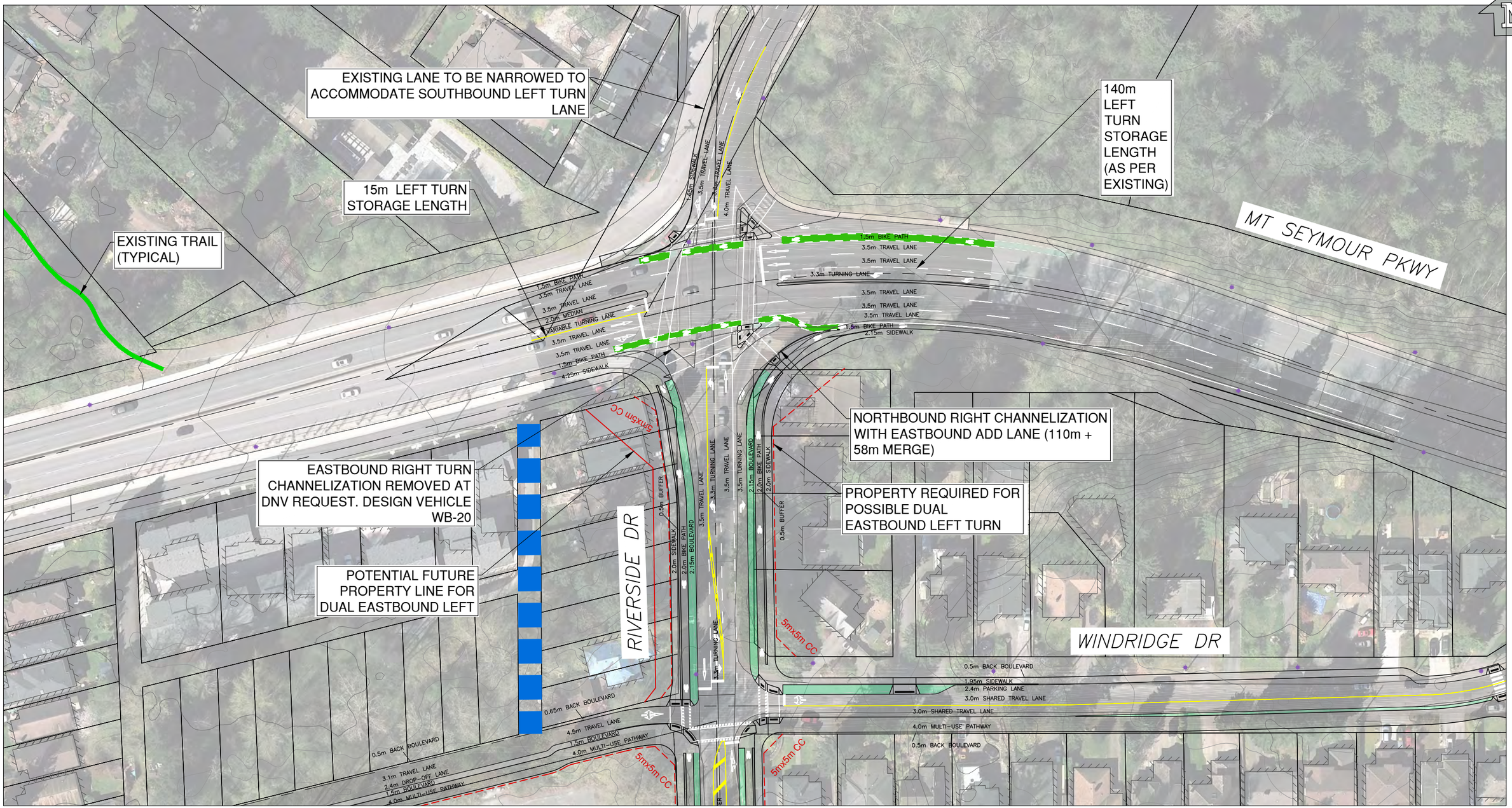
Mount Seymour Parkway

Mount Seymour Parkway will be upgraded at key intersections as part of the cross-street works. These intersections include Riverside Drive and Berkley Road. These improvements are to accommodate the changes being made on the cross-streets. Geometry at curb returns has also been updated to increase safety for pedestrian and cyclists at these intersections. The design at Berkley Road accommodates a potential future expansion to double left turn lanes.

Please refer to Appendix L - Riverside Drive and Appendix D - Berkley Road for more information on these designs.

This appendix includes the following materials:

- Functional Plan Drawings



URBAN systems

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APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	MSP-01
1333.0040.03		Title

Mount Semour Parkway
Plan

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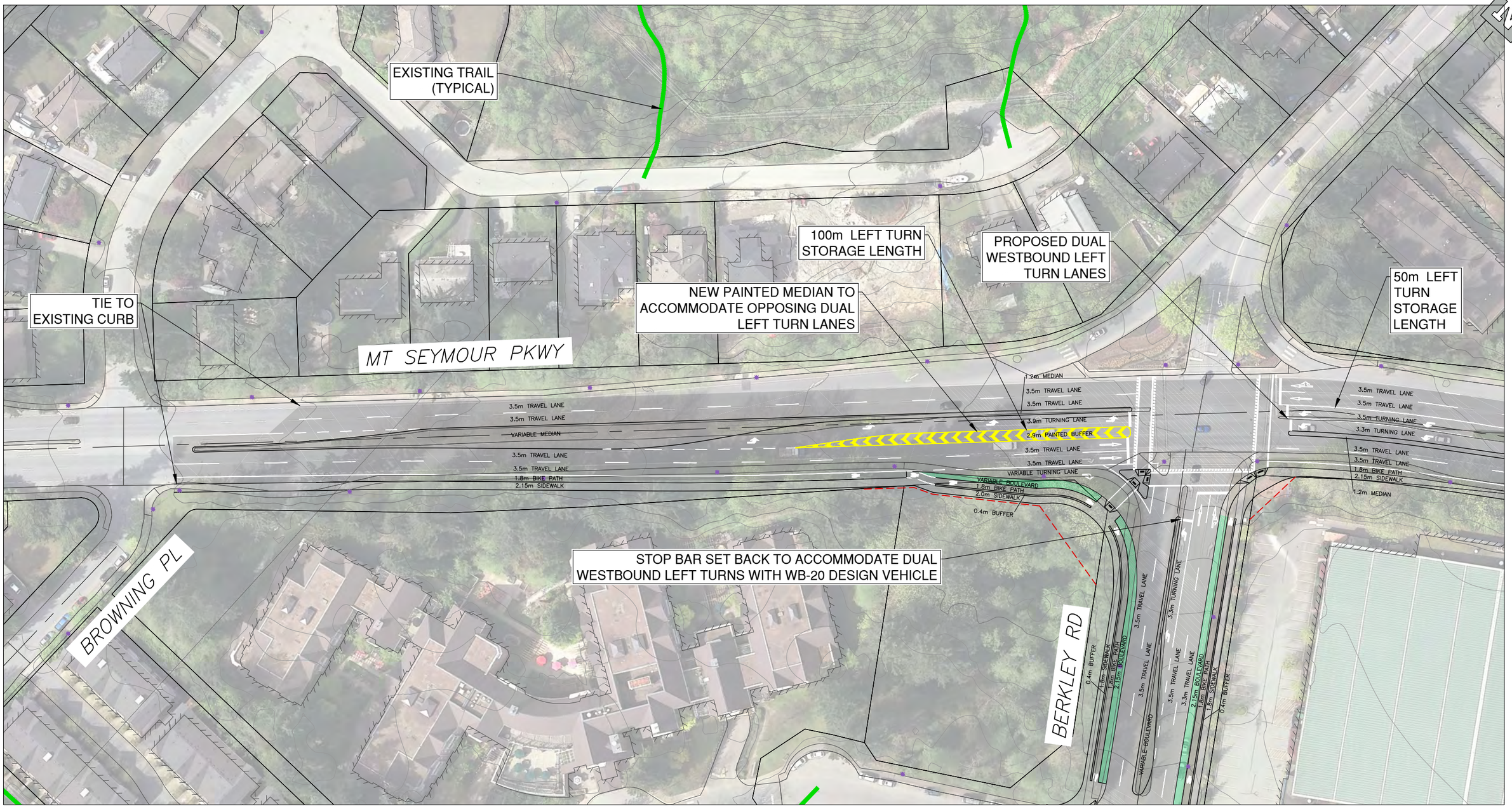

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:1000	18-04-2018	MSP-02
1333.0040.03		Title

Mount Semour Parkway
Plan

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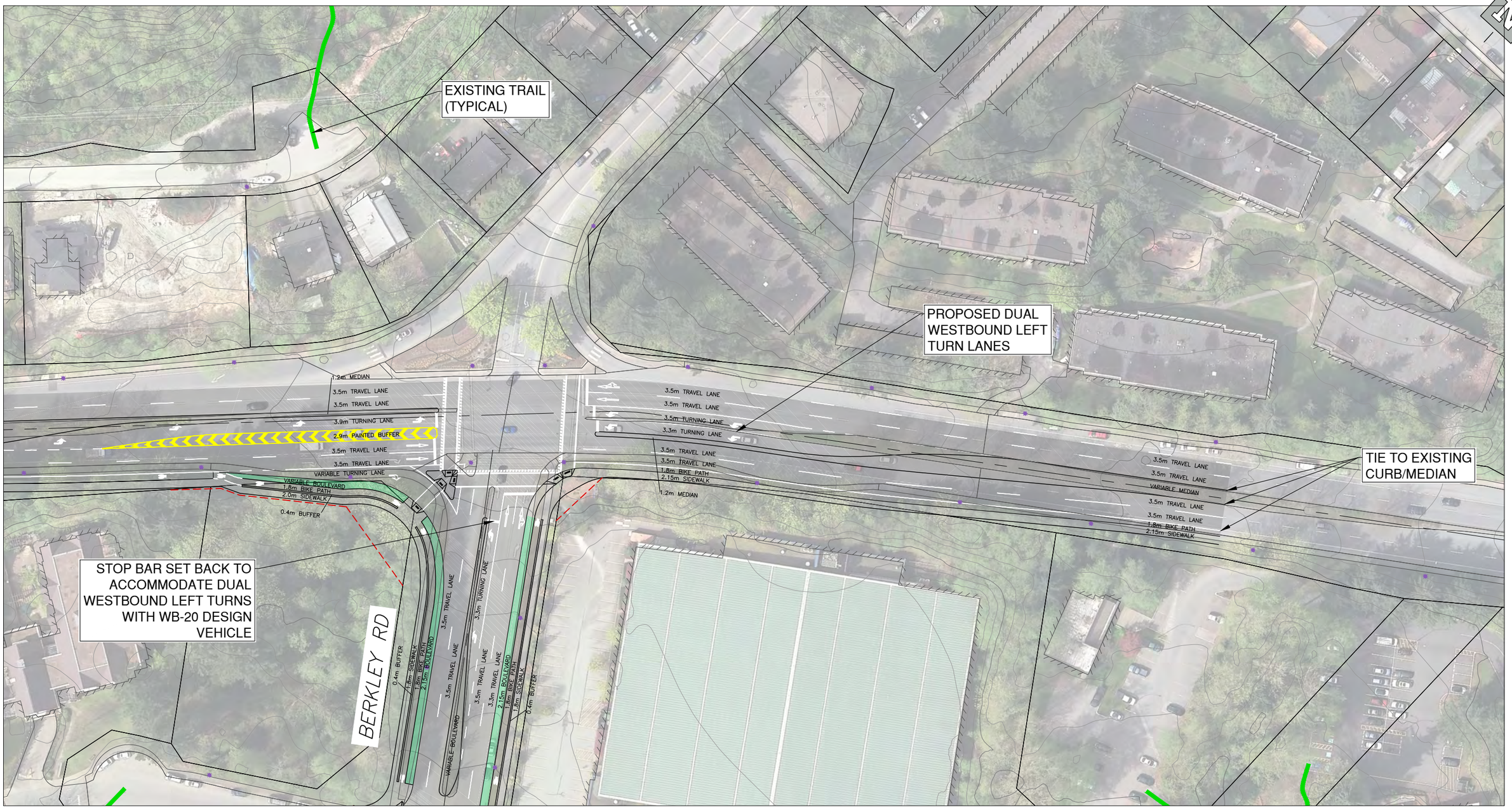

URBAN systems

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APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:1000	18-04-2018	MSP-03
1333.0040.03		Title

Mount Semour Parkway Plan

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APPENDIX J - MUNSTER AVENUE

Munster Avenue (Seymour River Place to Riverside Drive)

Munster Avenue will provide a new connection between Seymour River Place and Riverside Drive. It will consist of two thru lanes and sidewalk on one side of the roadway (either side works). The roadway will be right in/right out at Riverside Drive. Lane accesses will be tied in to Munster Avenue during the development process.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Munster Avenue (Seymour River Place to Riverside Drive)

Length: 210m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	8.4m	-	8.4m	
Posted Speed	N/A	30 km/h	30 km/h	
Design Speed	N/A	30 km/h	30 km/h	
Design Radius	-	25m – 30m	30m	Note 2
Design Stopping Sight Distance (SSD)	-	45m	45m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	MSU	Note 4
Basic Lanes	2	2	2	
Lane Width	3.5m	3.0m – 3.7m (TAC)	3.5m	
Parking Including	No	No	No	
Bike Facilities	No	-	No	Note 5
Sidewalks	No	Yes	Yes (1 Side)	Note 5
Transit Facilities	No	-	No	
Access Conditions	Residential	-	Residential	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

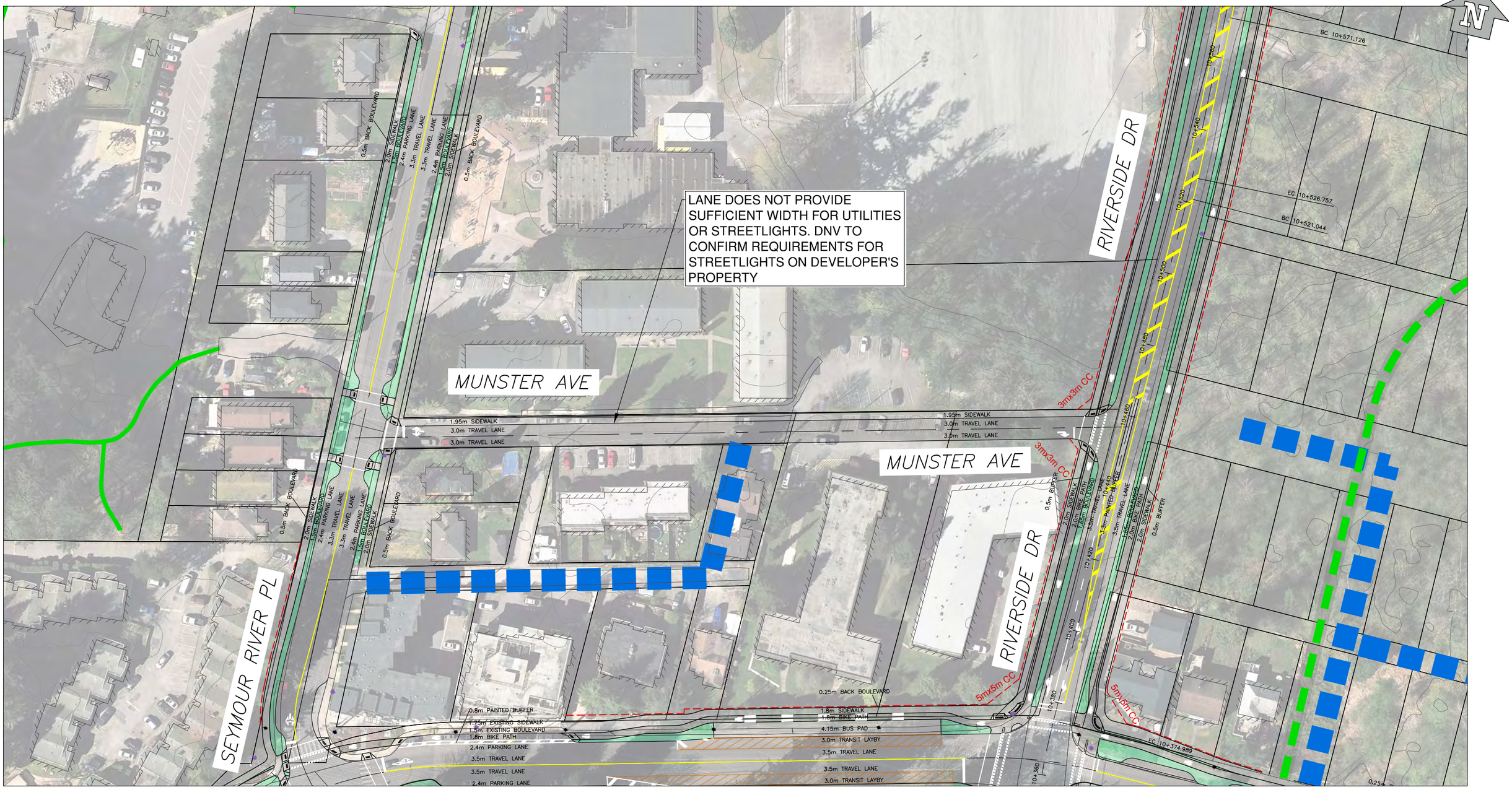
Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Profile to be developed by development and approved by District.

Note 4: The access to Munster Avenue from Riverside Drive is developed as a right/right out only. A median has been included on Riversdie Drive to prevent left turns. Curb returns radii have been designed at 7.5m to accommodate MSU turning movements.

Note 4: Sidewalk to be provided on 1 side of roadway. District to confirm side with developer. No physical bicycle facilities included but roadway is low speed and low volume therefore roadway is to be shared facility.



URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date	Figure
1:1000	18-04-2018	MA-01
1333.0040.03		Title

Munster Avenue Plan

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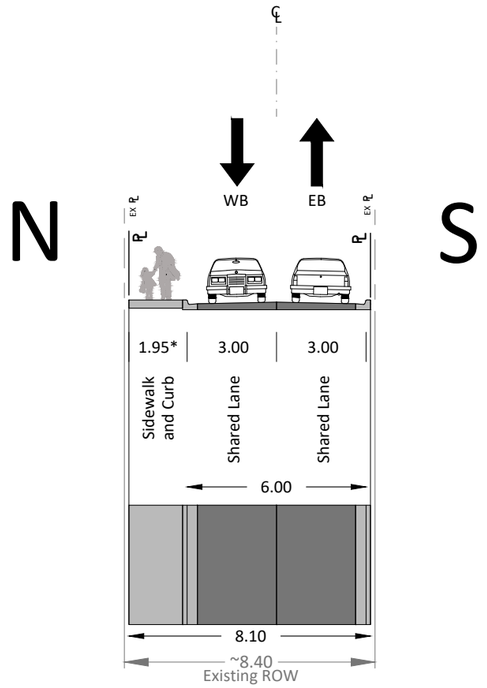


* SIDEWALK CAN BE PLACED ON NORTH OR SOUTH SIDE OF ROADWAY
** STREET LIGHTS TO BE PROVIDED AND MAY BE ACCOMMODATED OUTSIDE OF ROADWAY

MA 1

MUNSTER AVENUE

SEYMOUR RIVER PLACE TO RIVERSIDE DRIVE (MID–BLOCK)

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:200	18-04-2018	MA-T1
1333.0040.03		Title

Munster Avenue
Typical

Roadway Munster Avenue
Extents Seymour River Place to Riverside Drive
Right-of-Way Width 8.1
Length 170
Existing Roadway 0
Proposed Roadway 6

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	1377	$ 13,800
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	1377	$ 55,100
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Local - Residential)	m2	$ 75	1020	$ 76,500
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	340	$ 44,200
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	170	$ 25,500
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	170	$ 10,200
Street Light Relocation	ea	$ 12,000	0	$ -
New Street Light	ea	$ 10,000	9	$ 85,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 31,030
SUBTOTAL COST ESTIMATE				**$ 341,300**
Contingency	40%			137,000
Engineering & Project Management (w/o contingency)	15%			52,000
TOTAL ROADWAY COST ESTIMATE				**$ 531,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX K - OLD DOLLARTON ROAD

Old Dollarton Road (Dollarton Highway to Riverside Drive)

Old Dollarton Road was maintained along the existing alignment. Two thru lanes were maintained along the length with 2 parking lanes where space and constraints allow. A dedicated right turn lane was maintained at Dollarton Highway. A four-way stop was added to the Seymour River Place intersection with the south leg restricted to right-in / right-out with a median on Seymour River Place. The four-way stop was recommended in the ***Transportation Study Update (2017)***. The District may decide to maintain the existing two-way stop in order to reduce delay for east-west transit and increase delay for southbound traffic.

Protected cycletracks and sidewalks were included on both sides of the roadway. Curb extensions were added at appropriate locations to help facilitate pedestrian and cycling crossings. The curb and sidewalk recently installed on the southside of Old Dollarton Road near Dollarton Highway will need to be reconstructed to accommodate a cycling facility. The recently constructed curb north of Old Dollarton Road east of Seymour River Place was maintained resulting in an alternate design featuring a parking buffered cycle lane for this segment.

Transit lay over facilities were included west of the Riverside Drive intersection. These layovers are designed to accommodate three articulated buses, if required. Street lights will need to be relocated. The design incorporated existing transmission hydro poles to remain.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Old Dollarton Road (Dollarton Highway to Riverside Drive)

Length: 450m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Collector	
Right-of-Way	~20.0m	-	20.7m – 26.6m	Note 4
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	N/A	N/A	10%	Note 3
Design Vehicle	-	-	DNV Fire Truck/ Articulated Bus	Note 5
Basic Lanes	2	2	2	
Lane Width	3.5m	3.0m – 3.7m (TAC)	3.5m	
Parking Including	Yes	Yes	Yes	
Bike Facilities	No	-	Yes	Note 6
Sidewalks	Yes	Yes	Yes	Note 6
Transit Facilities	Yes	-	Yes	Note 7
Access Conditions	Limited	-	Limited	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Existing profile to be maintained. No profile developed for this roadway.

Note 4: Right-of-way varies along corridor due to proposed facilities and existing conditions. See proposed cross sections for clarifications.

Note 5: Articulated bus turning movements accommodated at Dollarton Highway and Riverside Drive intersections.

Note 6: Protected bicycle lanes with minimum 2.0m width are provided. Sidewalk varies from 1.8m to 3.0m in more commercial areas.

Note 7: Transit layover station proposed at Old Dollarton Road west of Riverside Drive. Transit layover has been design to accommodate three (3) articulated buses.

Old Dollarton Road (Riverside Drive to cul-de-sac)

Old Dollarton Road followed the existing alignment. High-quality materials, including tactile paving, are recommended for this section of Old Dollarton to improve the urban design impression of the roadway. The design included rollover curb with parking pockets to enhance the narrow roadway feel. Protected cycletracks and sidewalks were included on both sides of the roadway. The design included asphalt paving for the cycletracks. On the north side, cycle tracks, boulevard, and parking pockets were varied to accommodate the existing hydro transmission poles, which will remain. Lane connections were shown in the design; however, these will need to be revisited based on parcel consolidation and located to avoid hydro transmission poles.

Curb extensions were added at appropriate locations to help facilitate pedestrian and cycling crossings. The cycling and pedestrian facilities tie into the proposed separated facilities on Dollarton Highway at the cul-de-sac. A general purpose access to the future fire station is included in the cul-de-sac. Street lights will need to be relocated.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Old Dollarton Road (Riverside Drive to cul-de-sac)

Length: 480km

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	~20.1m	-	21.90m	
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	DNV Fire Truck	
Basic Lanes	2	2	2	
Lane Width	3.5m	3.0m – 3.7m (TAC)	3.5m	Note 4
Parking Including	Yes	Yes	Yes	
Bike Facilities	No	-	Yes	Note 5
Sidewalks	Yes	Yes	Yes	Note 5
Transit Facilities	No	-	No	
Access Conditions	Limited	-	Limited	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

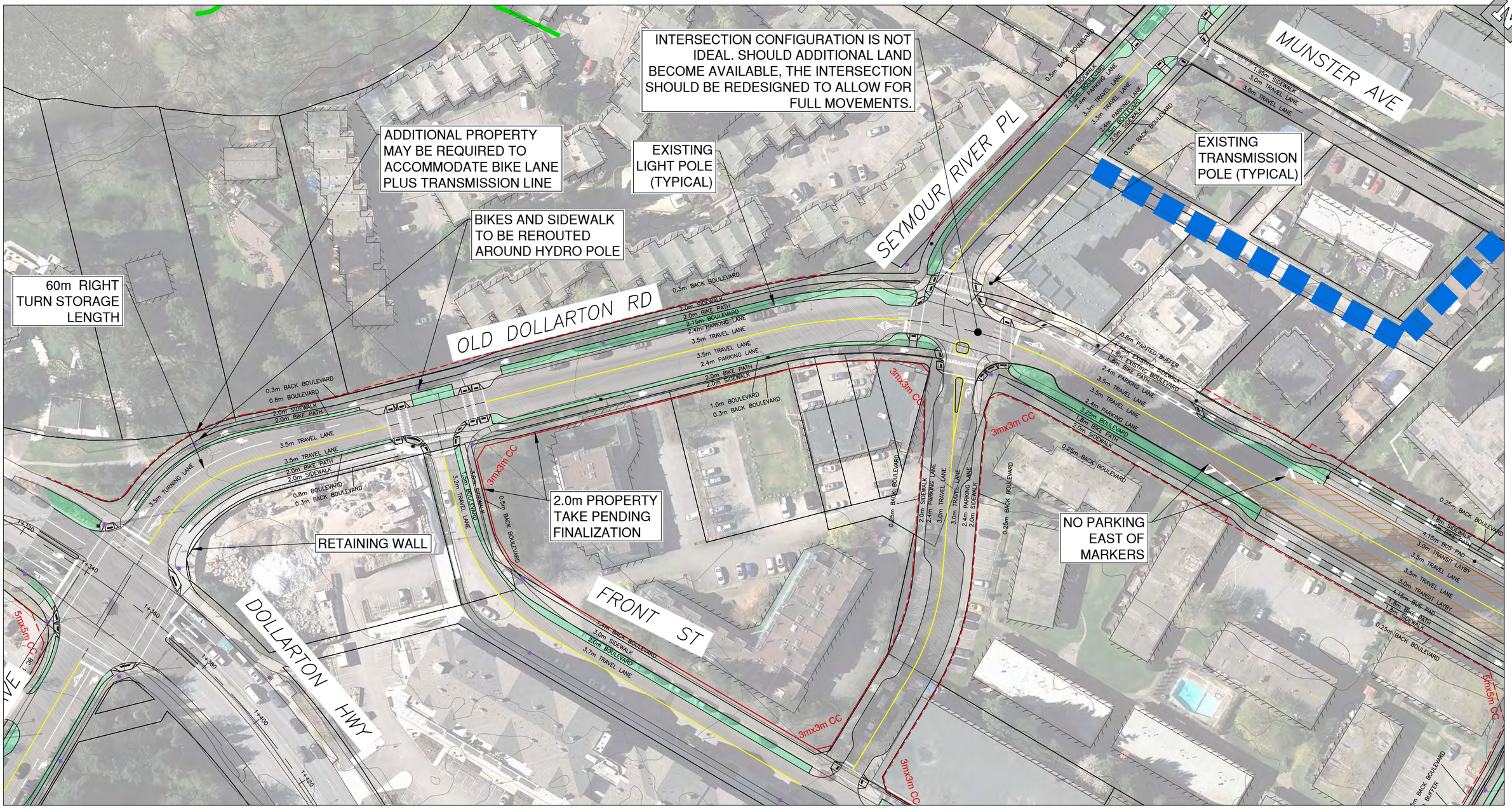
Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Existing profile to be maintained. No profile developed for this roadway.

Note 4: This roadway segment is to be designed to a high urban design standard. Tactile pavement surfaces are to be used throughout the corridor for travel lanes and boulevard facilities.

Note 5: Protected bicycle facilities with minimum 2.0m width will be included on both sides of the roadway. Special considerations to connecting to facilities on Dollarton Highway. A minimum 2.0m sidewalk has been included for the roadway.



URBAN systems

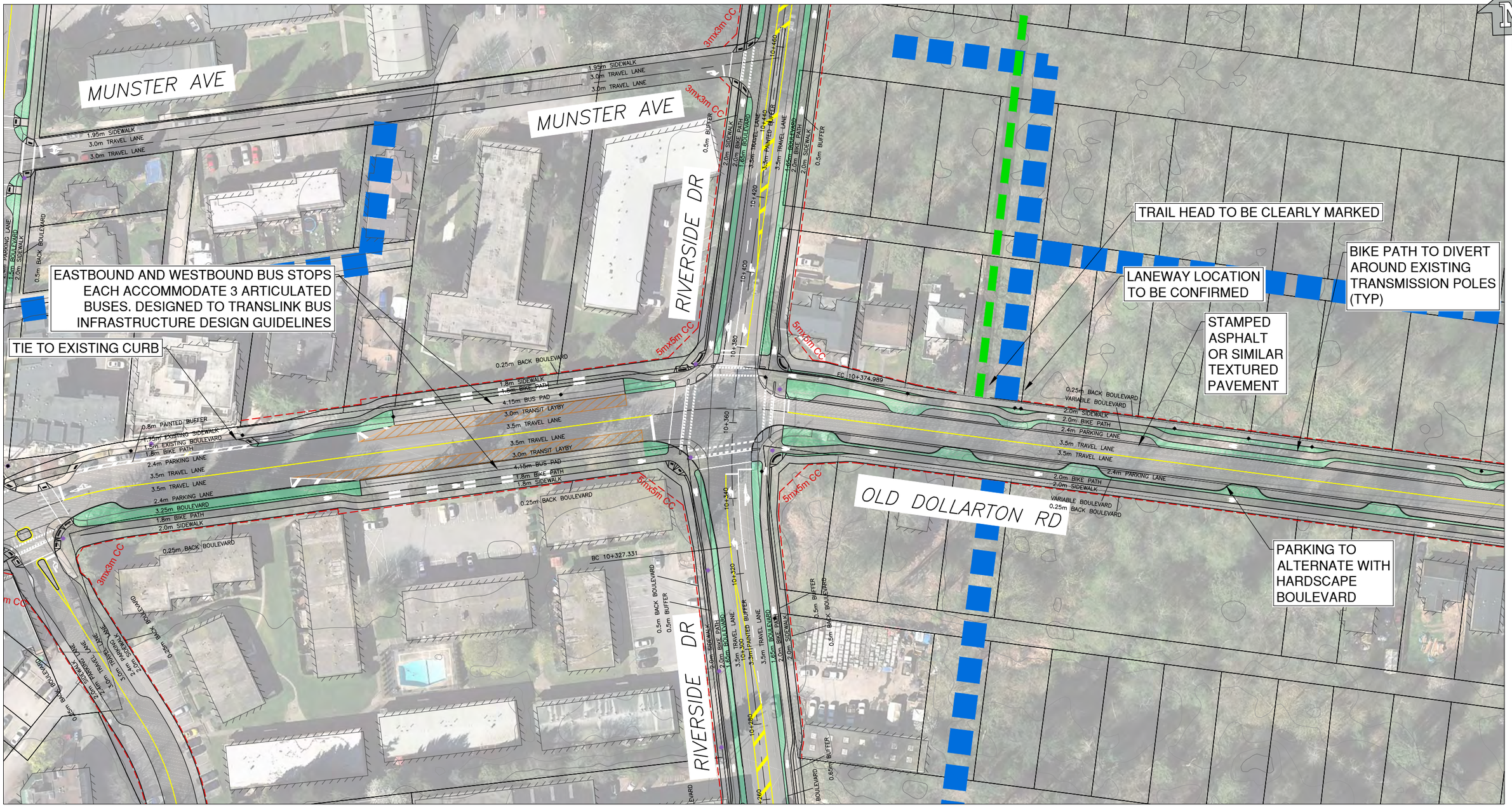
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:1000	18-04-2018	ODR-01
1333.0040.03		Title

Old Dollarton Road
Plan

Appendix p-63



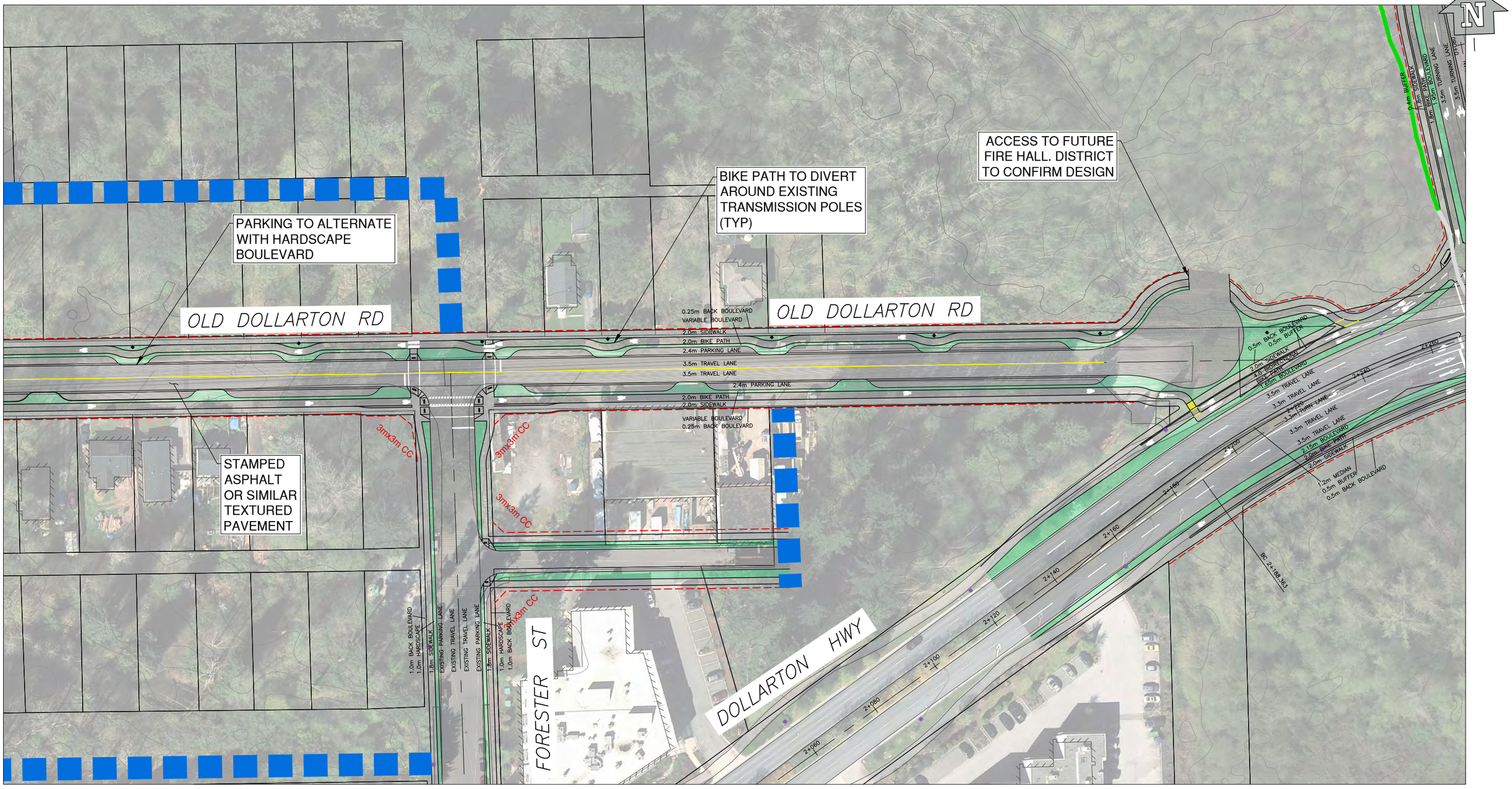
URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:1000	18-04-2018	ODR-02
1333.0040.03		Title

Old Dollarton Road
Plan
Appendix p-64



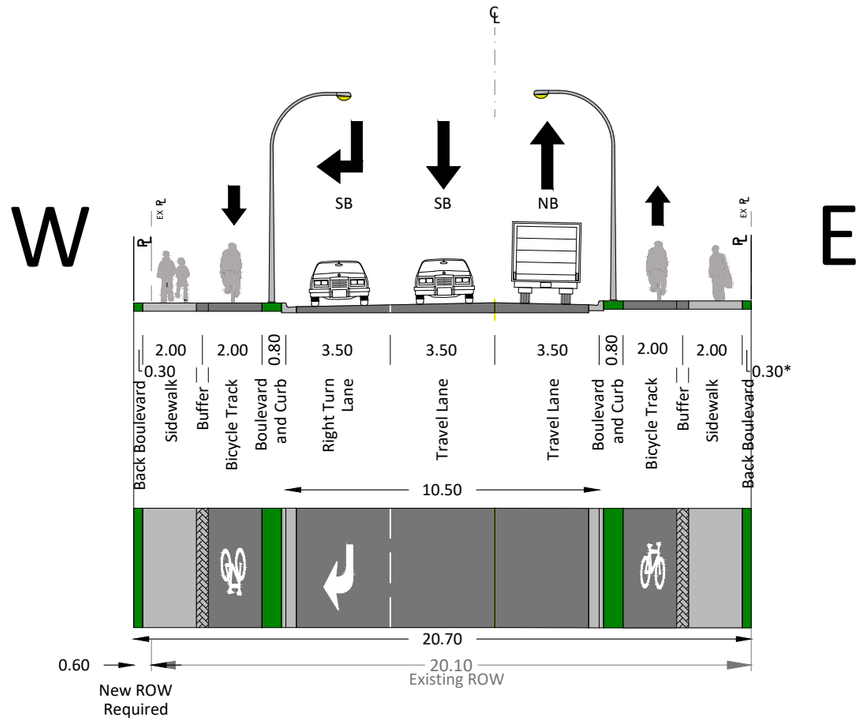
URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date / Figure
1:1000	18-04-2018 / ODR-03
1333.0040.03	Title

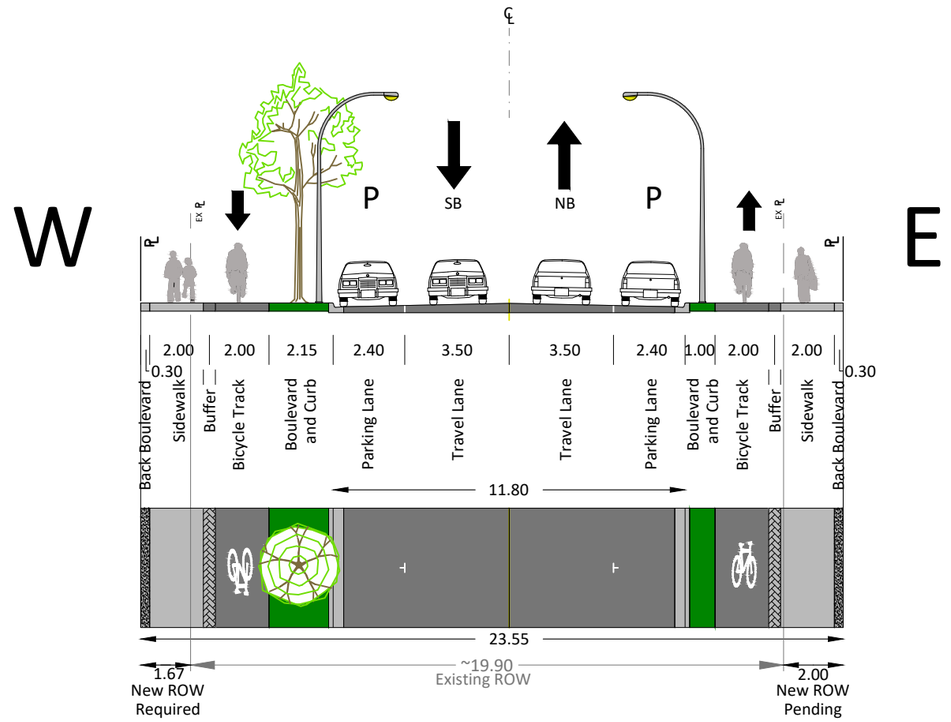
Old Dollarton Road
Plan



* BACK BOULEVARD VARIES WITH LOCATION OF RETAINING WALL

ODR 1 OLD DOLLARTON ROAD

DOLLARTON HWY TO FRONT STREET (MID-BLOCK)



* LOCATION OF HYDRO ON THE EAST SIDE TO BE DETERMINED

ODR 2 OLD DOLLARTON ROAD

FRONT STREET TO SEYMOUR RIVER PLACE (MID-BLOCK)

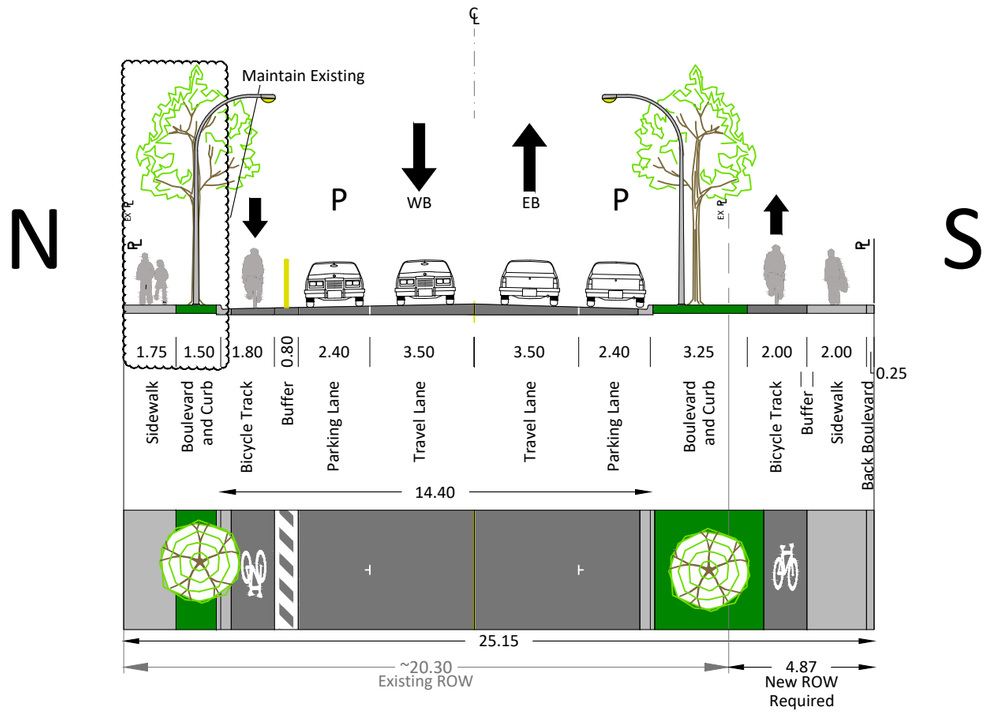
URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:200	18-04-2018	ODR-T1
1333.0040.03		Title

Old Dollarton Road
Typical

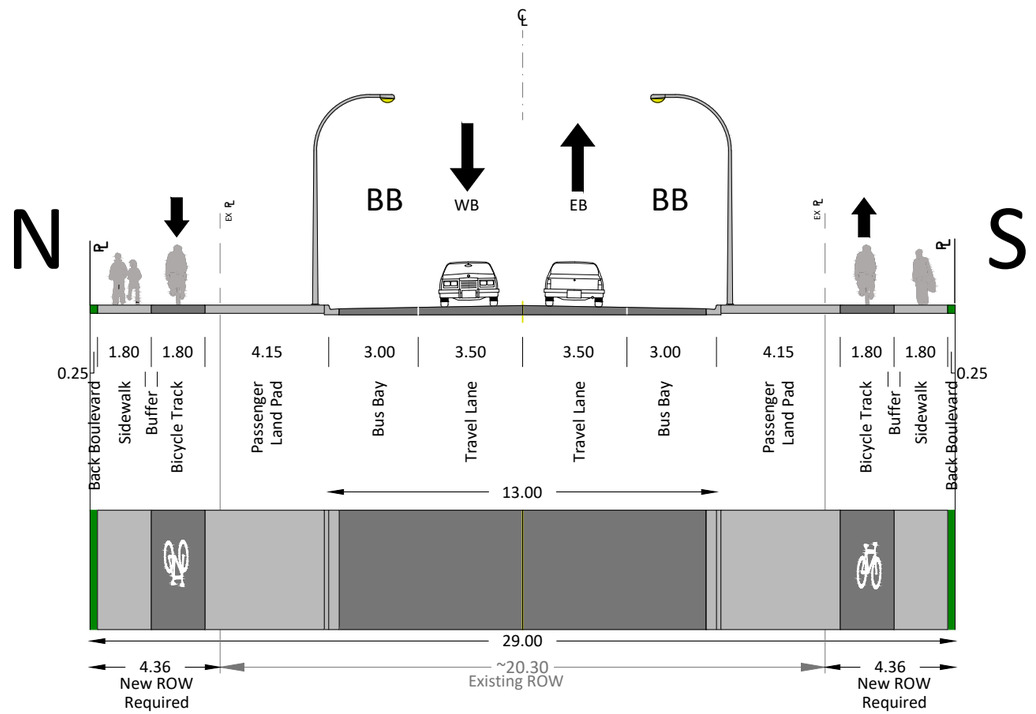


* LOCATION OF EXISTING TREES TO BE CONFIRMED FOR HEALTH AND SUITABILITY

ODR 3

OLD DOLLARTON ROAD

SEYMOUR RIVER PLACE TO RIVERSIDE DRIVE (WEST SEGMENT MID-BLOCK)



ODR 4

OLD DOLLARTON ROAD

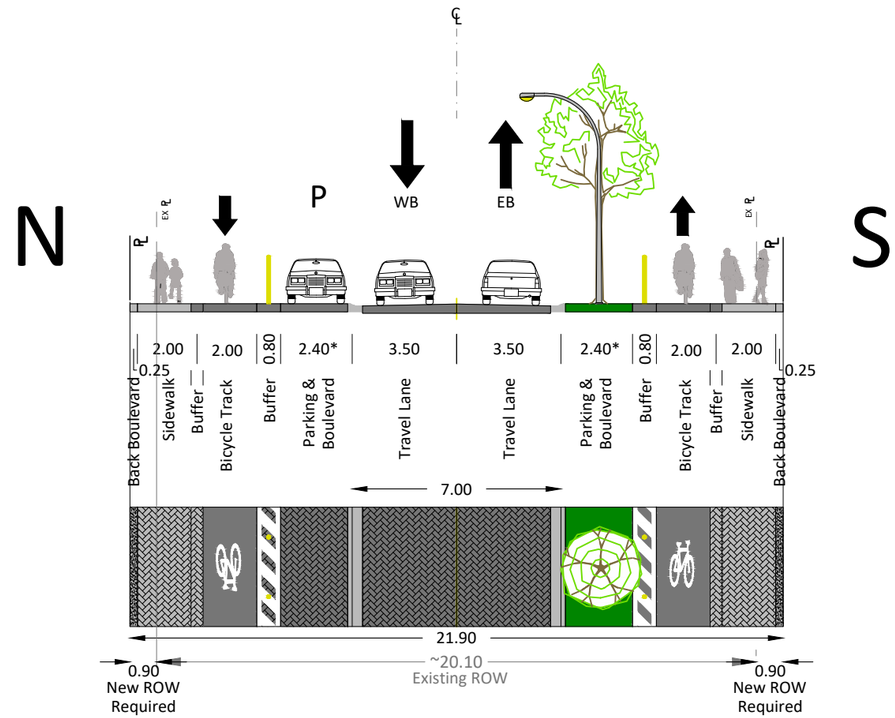
SEYMOUR RIVER PLACE TO RIVERSIDE DRIVE (EAST SEGMENT MID-BLOCK)

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:200	18-04-2018	ODR-T2
1333.0040.03		Title

Old Dollarton Road
Typical



* PARKING POCKETS AND LANDSCAPED BOULEVARDS WILL ALTERNATE ON BOTH SIDES OF THE ROADWAY

ODR 5

OLD DOLLARTON ROAD

RIVERSIDE DRIVE TO CUL-DE-SAC

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:200	18-04-2018	ODR-T3
1333.0040.03		Title

Old Dollarton Road
Typical

Roadway Dollarton Highway
Extents Old Dollarton Road Intersection
Right-of-Way Width 33
Length 55
Existing Roadway 18.3
Proposed Roadway 18.3

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	0	$ -
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	0	$ -
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	66	$ 700
Pavement Structure (Arterial)	m2	$ 120	0	$ -
Mill and Overlay	m2	$ 30	20	$ 600
Extruded Curb	m	$ 130	66	$ 8,600
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	0	$ -
Street Light Relocation	ea	$ 12,000	0	$ -
New Street Light	ea	$ 10,000	0	$ -
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0.25	$ 87,500
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 9,740
SUBTOTAL COST ESTIMATE				**$ 107,100**
Contingency	40%			43,000
Engineering & Project Management (w/o contingency)	15%			17,000
TOTAL ROADWAY COST ESTIMATE				**$ 168,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Old Dollarton Road
Extents Dollarton Highway to Front Street
Right-of-Way Width 20.7
Length 100
Existing Roadway 13.5
Proposed Roadway 10.5

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	2070	$ 20,700
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	2070	$ 82,800
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Collector)	m2	$ 95	1050	$ 99,800
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	200	$ 26,000
1.5m Sidewalk (100mm)	m	$ 130		$ -
1.8m Sidewalk (100mm)	m	$ 150	200	$ 30,000
Sod (1.2m Blvd)	m	$ 18	200	$ 3,600
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	200	$ 14,000
Pavement Markings	m	$ 60	100	$ 6,000
Street Light Relocation	ea	$ 12,000	3	$ 36,000
New Street Light	ea	$ 10,000	2	$ 20,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 33,890
SUBTOTAL COST ESTIMATE				**$ 372,800**
Contingency	40%			150,000
Engineering & Project Management (w/o contingency)	15%			56,000
TOTAL ROADWAY COST ESTIMATE				**$ 579,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Old Dollarton Road
Extents Front Road to Seymour River Place
Right-of-Way Width 23.55
Length 140
Existing Roadway 10.5
Proposed Roadway 11.8

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	3297	$ 33,000
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	3297	$ 131,900
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Collector)	m2	$ 95	1652	$ 157,000
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	280	$ 36,400
1.5m Sidewalk (100mm)	m	$ 130		$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	280	$ 49,000
Sod (1.2m Blvd)	m	$ 18	130	$ 2,400
Sod (2.2m Blvd)	m	$ 33	190	$ 6,300
Trees	ea	$ 700	14	$ 9,800
Asphalt Multiuse Path/Bike Path	m2	$ 70	234	$ 16,400
Pavement Markings	m	$ 60	140	$ 8,400
Street Light Relocation	ea	$ 12,000	3	$ 36,000
New Street Light	ea	$ 10,000	4	$ 40,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 52,660
SUBTOTAL COST ESTIMATE				**$ 579,300**
Contingency	40%			232,000
Engineering & Project Management (w/o contingency)	15%			87,000
TOTAL ROADWAY COST ESTIMATE				**$ 899,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Old Dollarton Road
Extents Seymour River Place to Riverside Drive
Right-of-Way Width 25.18/26.60
Length 200
Existing Roadway 13.8
Proposed Roadway 17/11.8

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	5844	$ 58,500
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	5844	$ 233,800
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	55	$ 600
Pavement Structure (Collector)	m2	$ 95	2878	$ 273,400
Mill and Overlay	m2	$ 30	17	$ 500
Extruded Curb	m	$ 130	372	$ 48,400
1.5m Sidewalk (100mm)	m	$ 130		$ -
1.8m Sidewalk (100mm)	m	$ 150	366	$ 54,900
Sod (1.2m Blvd)	m	$ 18	80	$ 1,500
Sod (2.2m Blvd)	m	$ 33	290	$ 9,600
Trees	ea	$ 700	12	$ 8,400
Asphalt Multiuse Path/Bike Path	m2	$ 70	380	$ 26,600
Pavement Markings	m	$ 60	225	$ 13,500
Street Light Relocation	ea	$ 12,000	7	$ 84,000
New Street Light	ea	$ 10,000	3	$ 30,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	1	$ 350,000
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 119,370
SUBTOTAL COST ESTIMATE				**$ 1,313,100**
Contingency	40%			526,000
Engineering & Project Management (w/o contingency)	15%			197,000
TOTAL ROADWAY COST ESTIMATE				**$ 2,037,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Old Dollarton Road
Extents Riverside Drive to Forester Street
Right-of-Way Width 21.9
Length 285
Existing Roadway 8
Proposed Roadway 7

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	6242	$ 62,500
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	6242	$ 249,700
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Collector)	m2	$ 95	1995	$ 189,600
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	570	$ 74,100
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	684	$ 119,700
2.0m Hardscape Blvd	m	$ 300	570	$ 171,000
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	29	$ 20,000
Asphalt Multiuse Path/Bike Path	m2	$ 70	1140	$ 79,800
Pavement Markings	m	$ 60	285	$ 17,100
Street Light Relocation	ea	$ 12,000	4	$ 48,000
New Street Light	ea	$ 10,000	10	$ 102,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 113,400
SUBTOTAL COST ESTIMATE				**$ 1,247,400**
Contingency	40%			499,000
Engineering & Project Management (w/o contingency)	15%			188,000
TOTAL ROADWAY COST ESTIMATE				**$ 1,935,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Old Dollarton Road
Extents Forester Street to End of Roadway
Right-of-Way Width 21.9
Length 195
Existing Roadway 8
Proposed Roadway 7

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	4271	$ 42,800
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	4271	$ 170,900
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Collector)	m2	$ 95	1365	$ 129,700
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	390	$ 50,700
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	390	$ 68,300
2.0m Hardscape Blvd	m	$ 300	390	$ 117,000
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	20	$ 13,700
Asphalt Multiuse Path/Bike Path	m2	$ 70	780	$ 54,600
Pavement Markings	m	$ 60	195	$ 11,700
Street Light Relocation	ea	$ 12,000	3	$ 36,000
New Street Light	ea	$ 10,000	7	$ 67,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 76,290
SUBTOTAL COST ESTIMATE				**$ 839,200**
Contingency	40%			336,000
Engineering & Project Management (w/o contingency)	15%			126,000
TOTAL ROADWAY COST ESTIMATE				**$ 1,302,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX L - RIVERSIDE DRIVE

Riverside Drive (Spicer Road to Dollarton Highway)

The existing roadway alignment was maintained for this roadway. The existing facilities of two thru lanes and two parking lanes were also maintained. A half cul-de-sac was added to the intersection of the future Spicer Road and Riverside Drive to assist turning vehicles. The sidewalks were relocated to include a landscaping zone. A letdown was included at the north end of the cul-de-sac to provide a transition from the multi-use path to the roadway for cyclists. Street light poles will need to be relocated to the landscape zone.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Riverside Drive (Spicer Road to Dollarton Highway)

Length: 130m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	15.4m – 20.1m	-	20.0m – 23.6m	
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	WB-20	
Basic Lanes	2-4	4	2-4	
Lane Width	3.5m	3.0m – 3.7m (TAC)	3.5m	
Parking Including	Yes	Yes	Yes	
Bike Facilities	No	-	No	
Sidewalks	Yes	Yes	Yes	
Transit Facilities	Yes	-	No	
Access Conditions	Commercial	-	Commercial	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Existing profile to be maintained. No profile developed for this roadway.

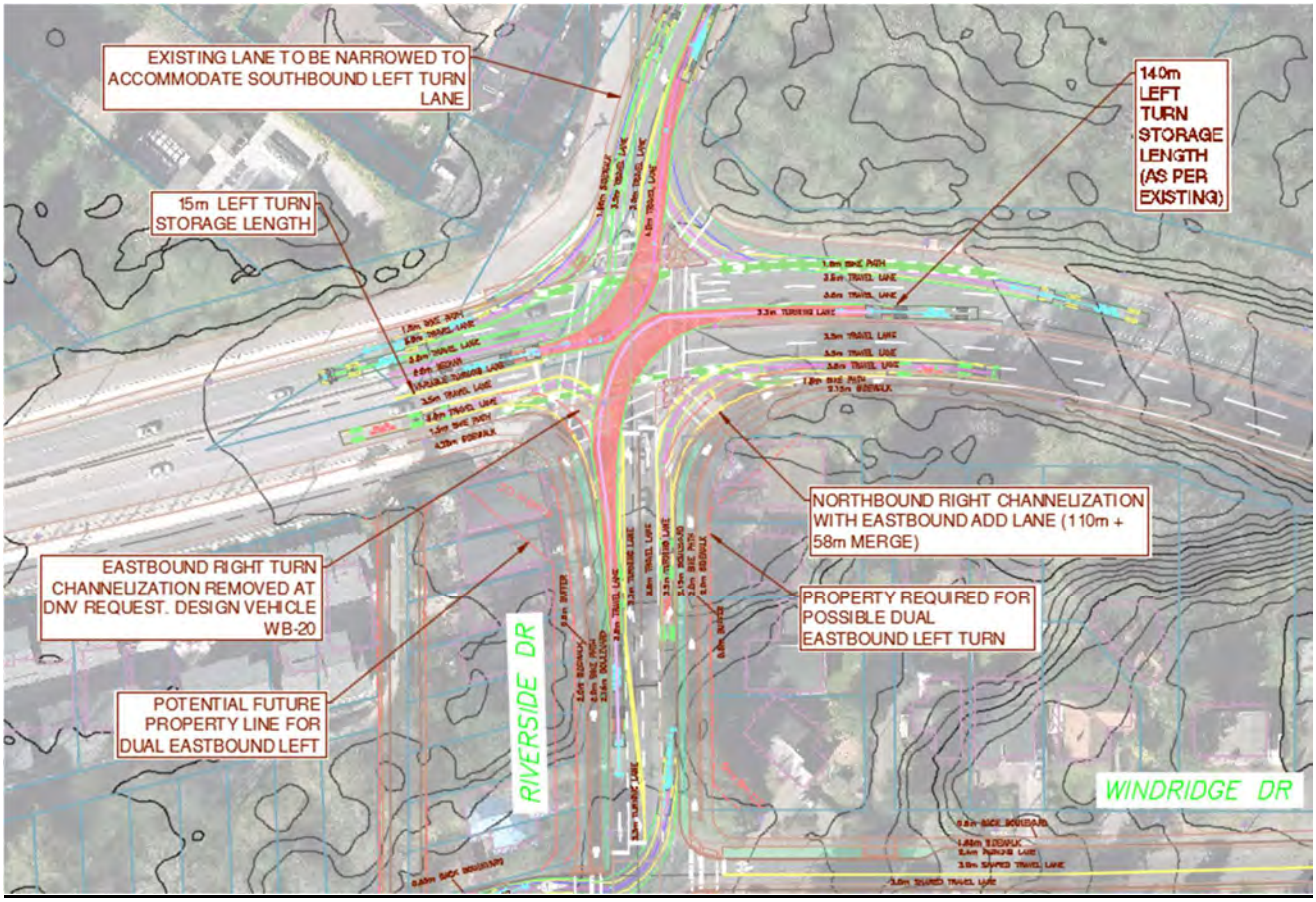
Riverside Drive (Dollarton Highway to Mount Seymour Parkway)

The existing horizontal alignment was maintained for this roadway. No parking facilities were included along this roadway.

Four lanes were included south of Front Street as per existing conditions. A left turn lane at Front Street was included for northbound traffic. No cycling facilities were provided due to property constraints, but sidewalks are existing on both side of the roadway.

The roadway was reduced to two lanes north of Front Street with a centre painted median. Left turn lanes were included at Old Dollarton Road (northbound and southbound), and Windridge Drive (southbound). Treed boulevards were provided between Front Street and Riverside Drive. The profile of Riverside Drive was revised to reduce to crest south of Windridge Drive. This was done to increase stopping sight distance to Windridge Drive and Mount Seymour Parkway. The profile grade of Windridge Drive (8%) was the limiting factor. Protected cycling and pedestrian facilities were provided north of Front Street. A median was included at Munster Avenue to prevent left turns and discourage pedestrian crossings. The crossing on the north side of Windridge Drive has been removed due to safety concerns and focusing people to the multi-use path on the south side of Windridge Drive.

The intersection at Mount Seymour Parkway was developed to allow for turning movements of a WB-20 semi-truck (show below). Slip lanes and wide throats at intersections are included to allow these turning movements.



This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Profiles
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Riverside Drive (Dollarton Highway to Mount Seymour Parkway)

Length: 750m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Major Arterial	Arterial	Minor Arterial	
Right-of-Way	15.4m – 20.1m	-	20.0m – 23.6m	
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	Note 4
Maximum Grade	N/A	N/A	8%	Note 3
Design Vehicle	-	-	WB-20/ Articulated Bus	
Basic Lanes	2-4	4	2-4	
Lane Width	3.5m	3.0m – 3.7m (TAC)	3.5m	
Parking Including	No	No	No	
Bike Facilities	No	-	Yes	Note 5
Sidewalks	Varies	Yes	Yes	Note 5
Transit Facilities	Yes	-	No	
Access Conditions	None	-	None	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

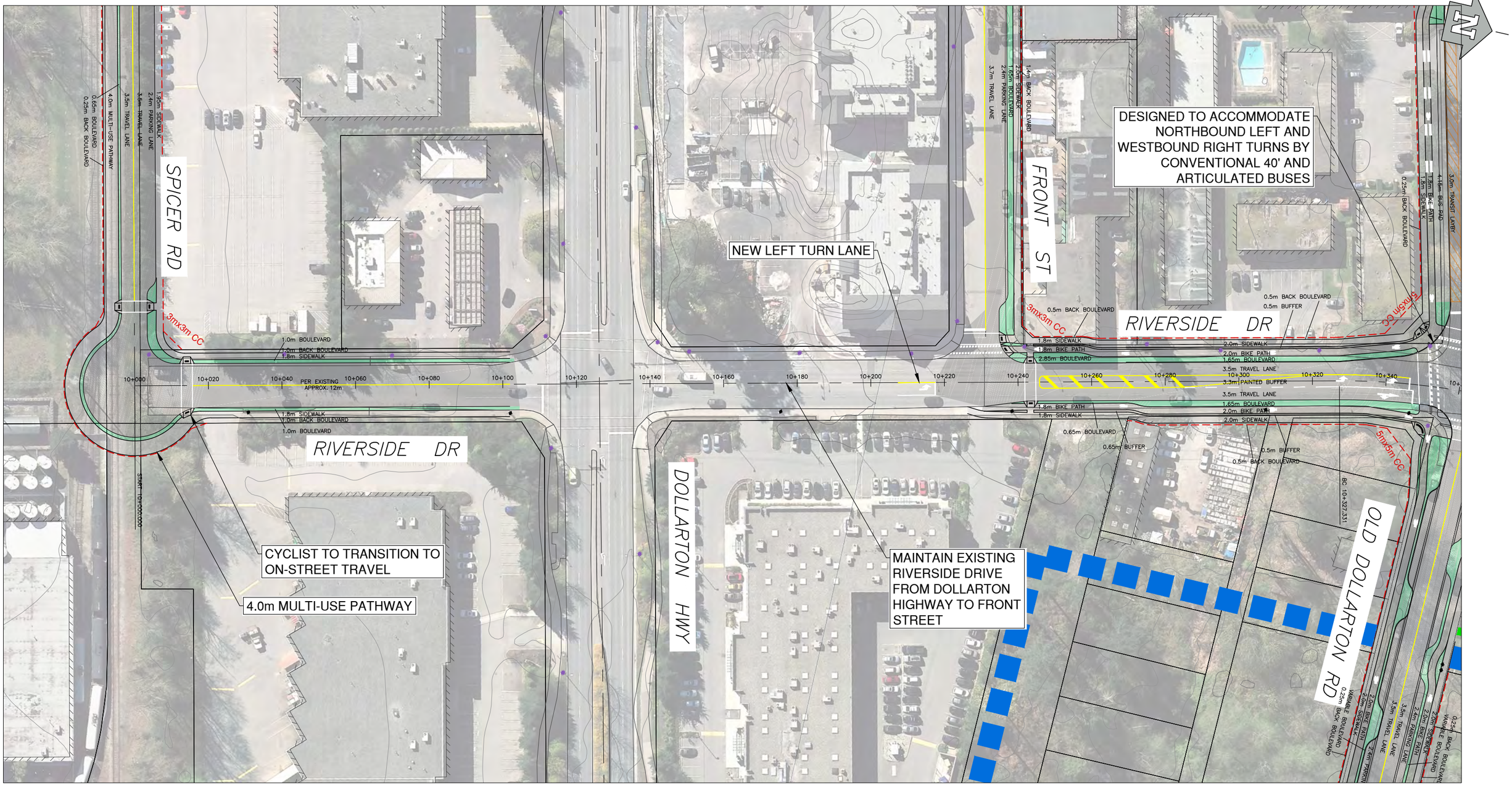
Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%.

Note 4: The vertical curve on Riverside Drive was lower slightly to improve the stopping sight distance to the Windridge Drive and Mount Seymour Parkway intersections. The limiting factor for the modification was the resultant grade on Windridge Drive which is proposed at 8%.

Note 5: Protected bicycle facilities with minimum 2.0m width and a minimum 2.0m sidewalk on both sides of the roadway have been proposed.



URBAN systems

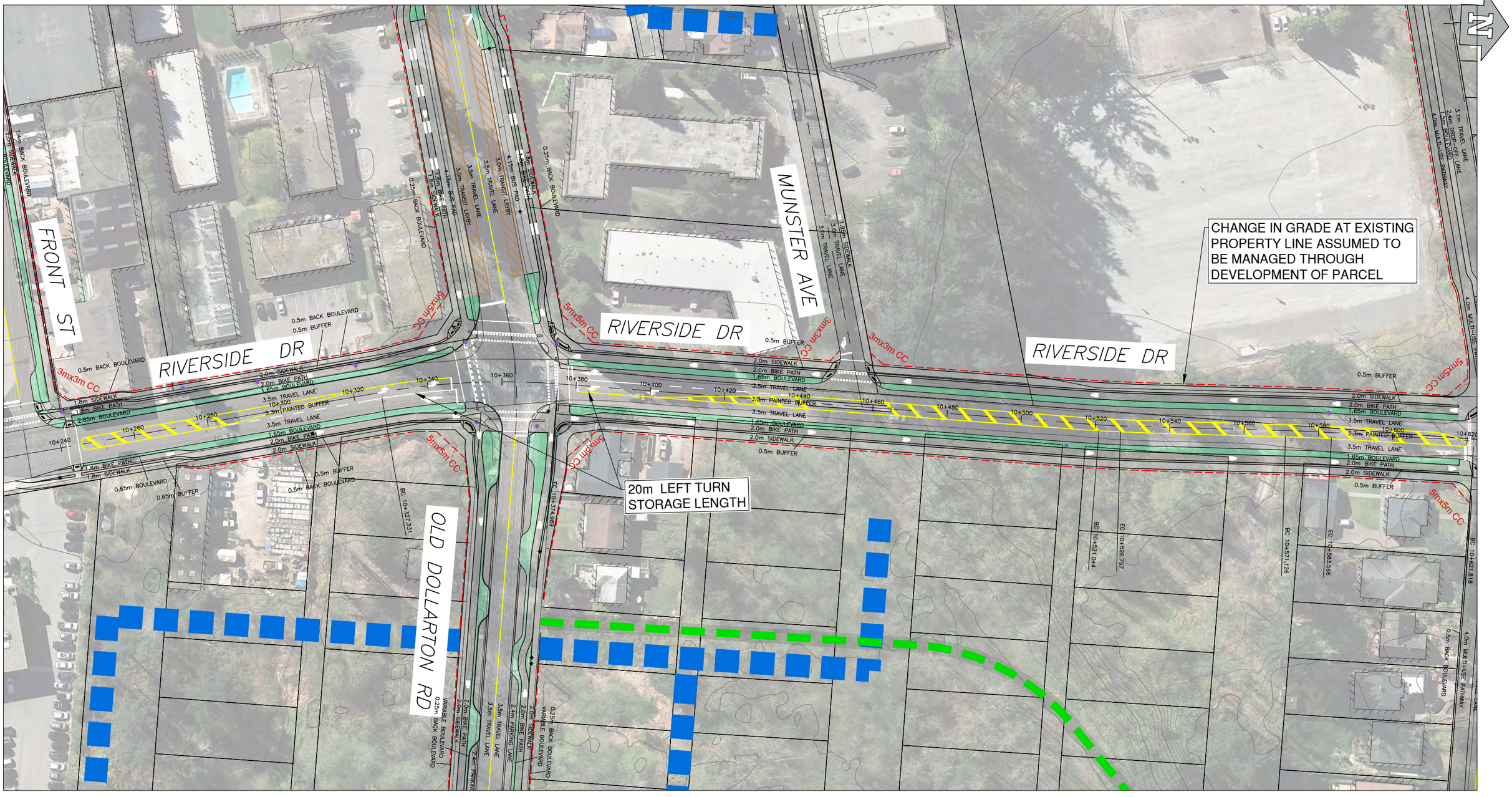
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	RD-01
1333.0040.03		Title

Riverside Drive Plan



URBAN systems

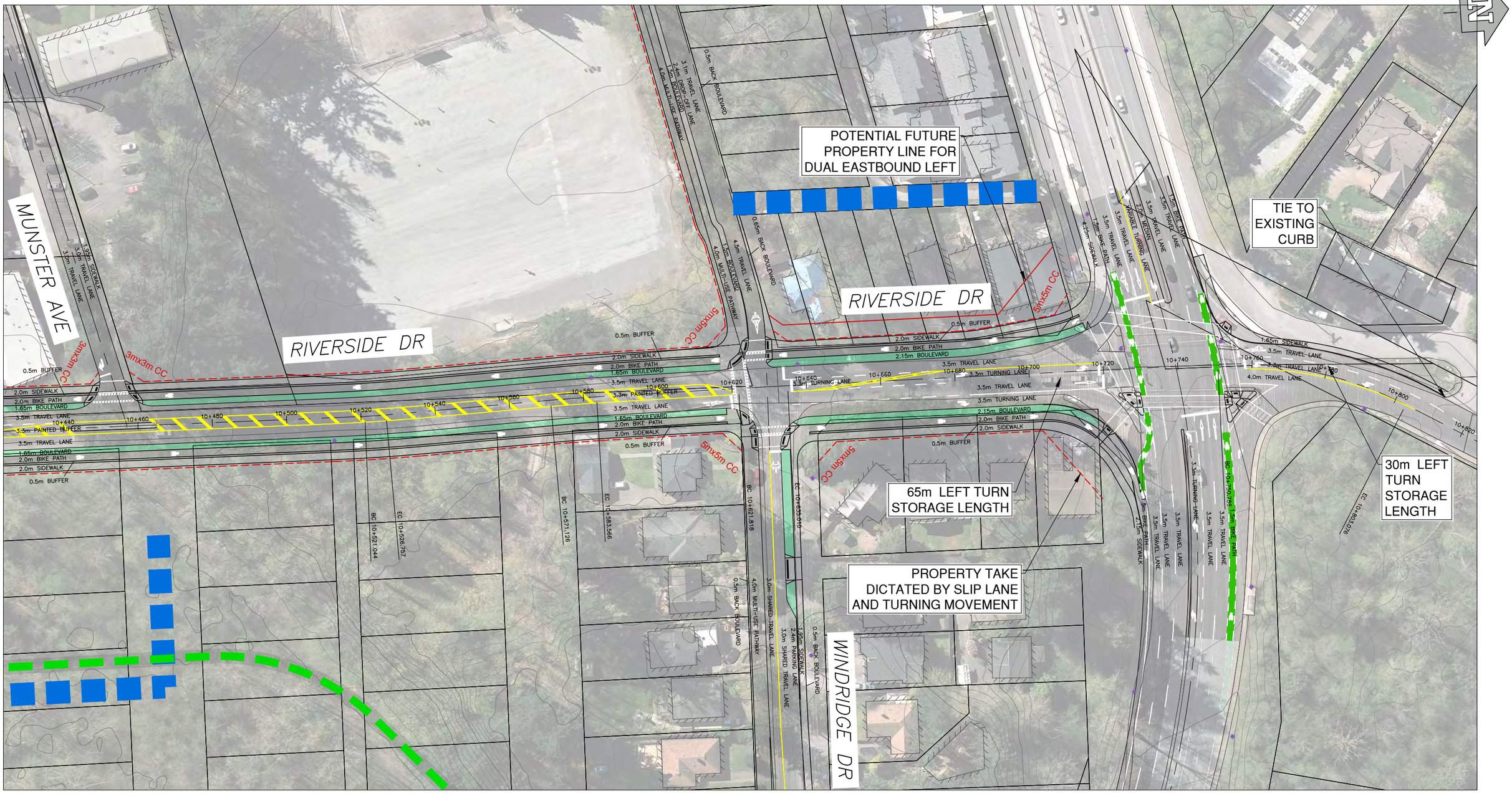
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	RD-02
1333.0040.03		Title

Riverside Drive
Plan



URBAN systems

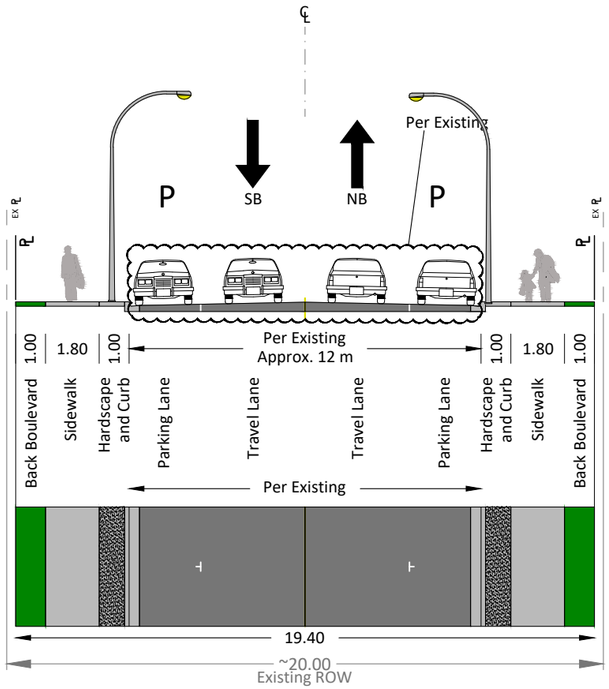
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date	Figure
1:1000	18-04-2018	RD-03
1333.0040.03		Title

Riverside Drive Plan

W

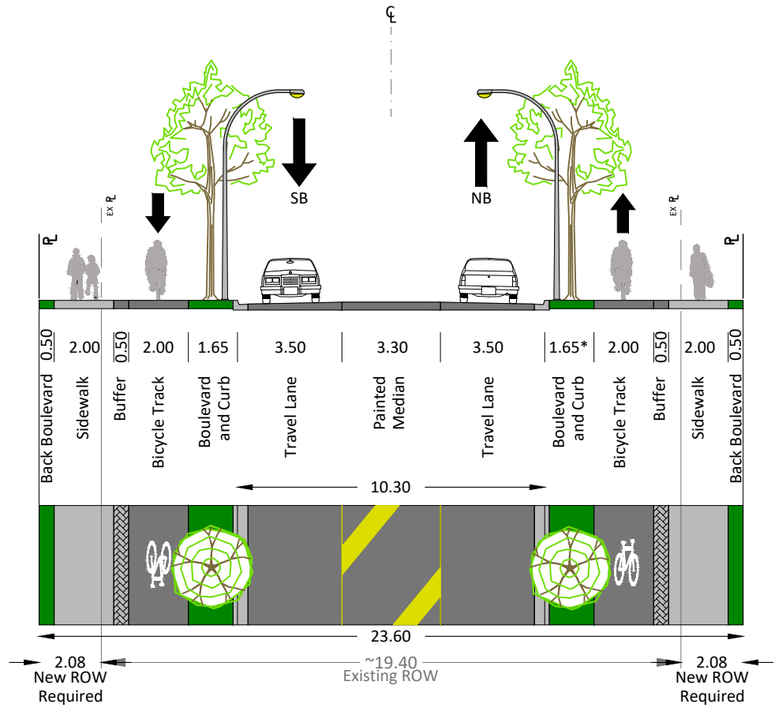


E

RD 1 RIVERSIDE DRIVE

SOUTH OF DOLLARTON HWY (MID–BLOCK)

W



E

* BLVD DIMENSION CARIRES TO ACCOMODATE EXISTING TRANSMISSION MAINS

RD 2 RIVERSIDE DRIVE

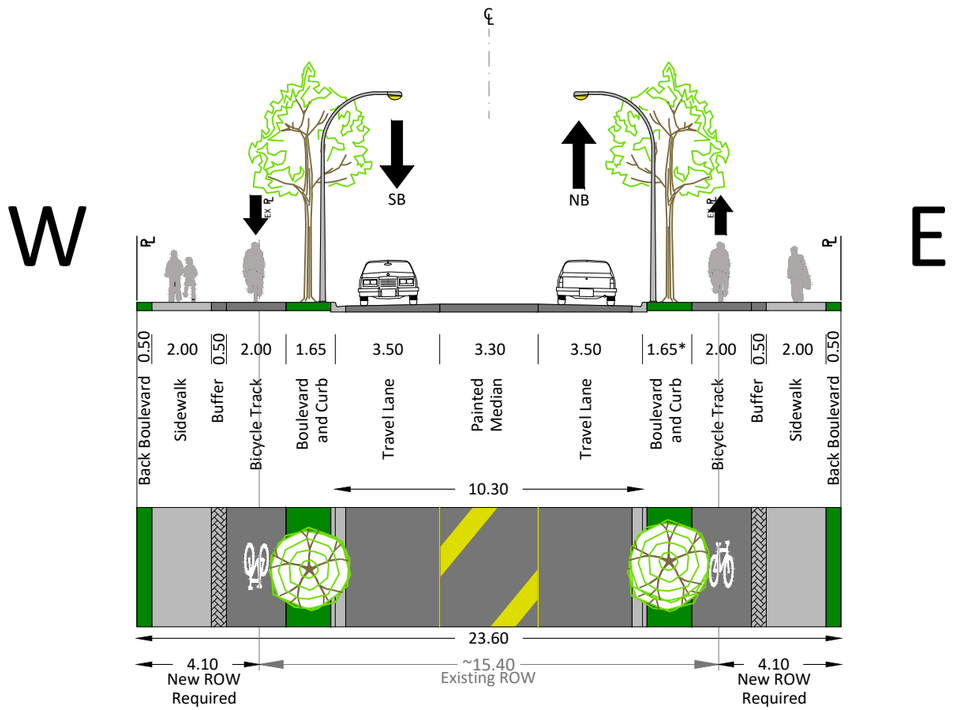
FRONT STREET TO OLD DOLLARTON ROAD

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date / Figure
1:200	18-04-2018 / RD-T1
1333.0040.03	Title

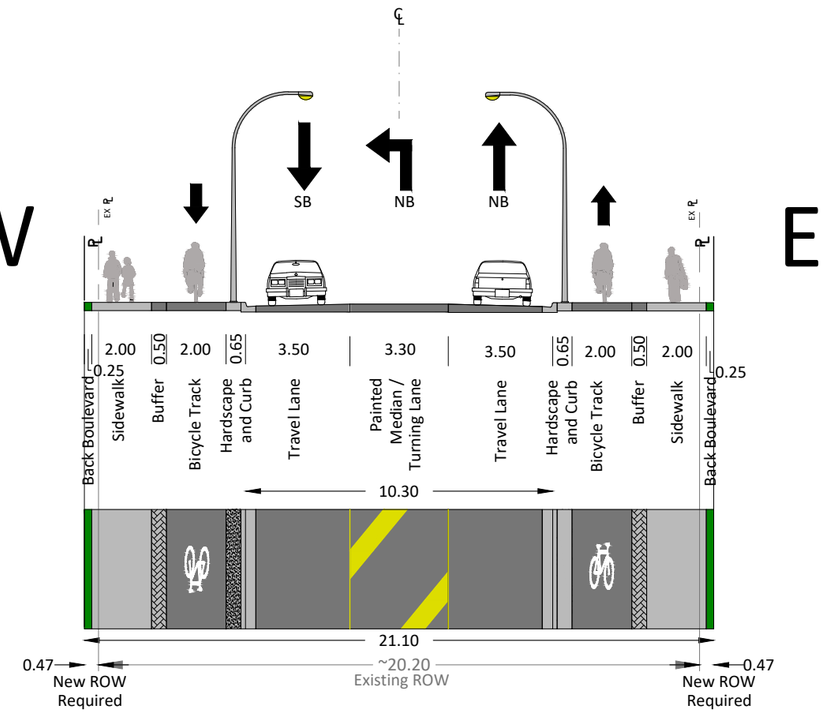
Riverside Drive
Typical



* BLVD DIMENSION CARIRES TO ACCOMODATE EXISTING TRANSMISSION MAINS

RD 3 RIVERSIDE DRIVE

OLD DOLLARTON ROAD TO WINDRIDGE DR



RD 4 RIVERSIDE DRIVE

WINDRIDGE DRIVE TO MOUNT SEYMOUR PARKWAY (MID-BLOCK)

URBAN systems

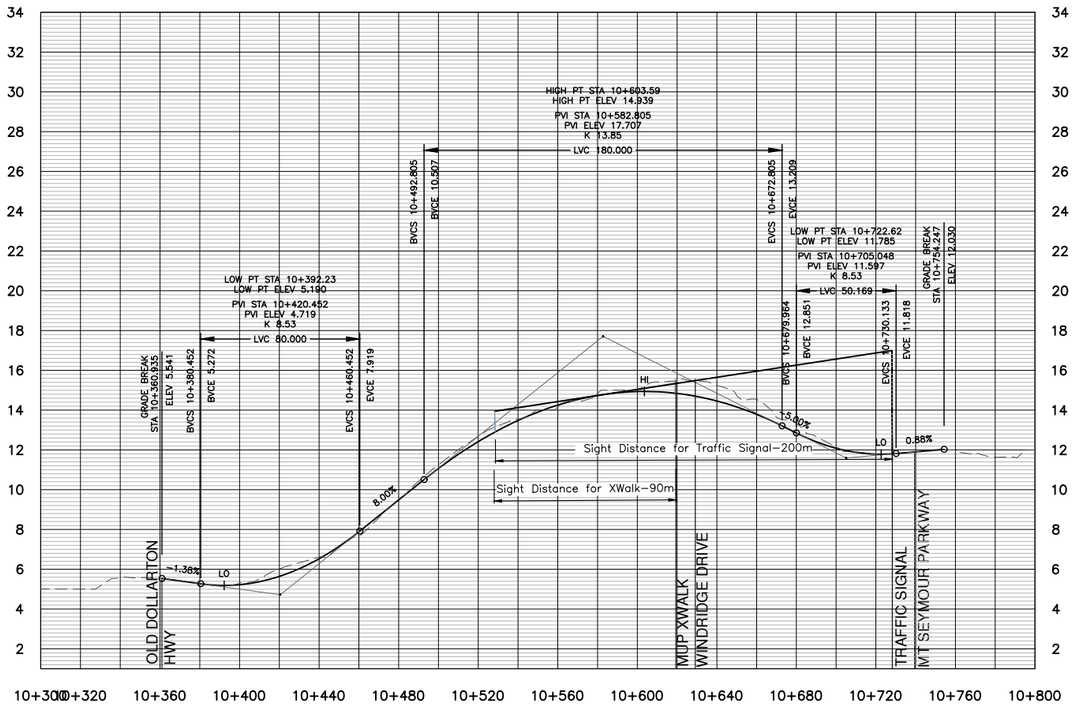
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

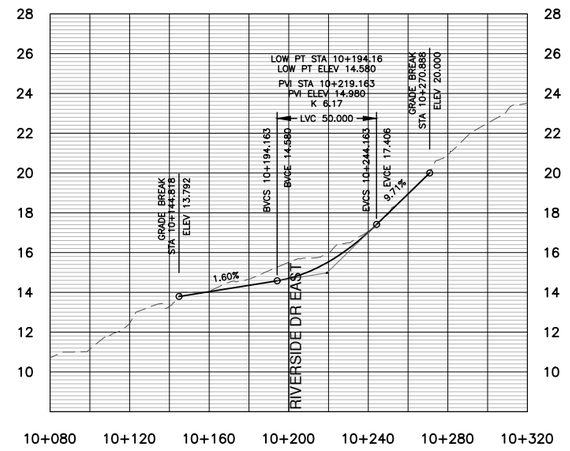
Scale	Date	Figure
1:200	18-04-2018	RD-T2
1333.0040.03		Title

Riverside Drive
Typical

RIVERSIDE DR EAST 10+300 to 10+800



WINDRIDGE DR 10+080 to 10+320



URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
H:1:3000 V:1:300	18-04-2018	RD-04

1333.0040.03 Title
Riverside Drive Profile

Roadway Riverside Drive
Extents Spicer Road to Dollarton Highway
Right-of-Way Width 20
Length 115
Existing Roadway 12
Proposed Roadway 12

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	920	$ 9,200
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	920	$ 36,800
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	230	$ 2,300
Pavement Structure (Collector)	m2	$ 95	0	$ -
Mill and Overlay	m2	$ 30	69	$ 2,100
Extruded Curb	m	$ 130	230	$ 29,900
1.5m Sidewalk (100mm)	m	$ 130	230	$ 29,900
1.8m Sidewalk (100mm)	m	$ 150	230	$ 34,500
Sod (1.2m Blvd)	m	$ 18	230	$ 4,200
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	115	$ 6,900
Street Light Relocation	ea	$ 12,000	5	$ 60,000
New Street Light	ea	$ 10,000	1	$ 7,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 22,330
SUBTOTAL COST ESTIMATE				**$ 245,600**
Contingency	40%			99,000
Engineering & Project Management (w/o contingency)	15%			37,000
TOTAL ROADWAY COST ESTIMATE				**$ 382,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Riverside Drive
Extents Front Street to Old Dollarton Road
Right-of-Way Width 23.6
Length 45
Existing Roadway 13.3
Proposed Roadway 10.3

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	1062	$ 10,700
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	1062	$ 42,500
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	12	$ 200
Pavement Structure (Arterial)	m2	$ 120	464	$ 55,700
Mill and Overlay	m2	$ 30	4	$ 200
Extruded Curb	m	$ 130	90	$ 11,700
1.5m Sidewalk (100mm)	m	$ 130	45	$ 5,900
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	0	$ -
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	90	$ 3,000
Trees	ea	$ 700	9	$ 6,300
Asphalt Multiuse Path/Bike Path	m2	$ 70	180	$ 12,600
Pavement Markings	m	$ 60	45	$ 2,700
Street Light Relocation	ea	$ 12,000	5	$ 60,000
New Street Light	ea	$ 10,000	0	$ -
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	1	$ 350,000
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 56,150
SUBTOTAL COST ESTIMATE				**$ 617,700**
Contingency	40%			248,000
Engineering & Project Management (w/o contingency)	15%			93,000
TOTAL ROADWAY COST ESTIMATE				**$ 959,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Riverside Drive
Extents Old Dollarton Road to Windridge Drive
Right-of-Way Width 23.6
Length 225
Existing Roadway 6.6
Proposed Roadway 10.3

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	5310	$ 53,100
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	5310	$ 212,400
Excavation (Cut)	m3	$ 70	663	$ 46,500
Subgrade Fill and Compaction	m3	$ 40	274	$ 11,000
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Arterial)	m2	$ 120	2318	$ 278,100
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	450	$ 58,500
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	450	$ 78,800
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	450	$ 14,900
Trees	ea	$ 700	45	$ 31,500
Asphalt Multiuse Path/Bike Path	m2	$ 70	900	$ 63,000
Pavement Markings	m	$ 60	225	$ 13,500
Street Light Relocation	ea	$ 12,000	2	$ 24,000
New Street Light	ea	$ 10,000	9	$ 92,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 97,780
SUBTOTAL COST ESTIMATE				**$ 1,075,600**
Contingency	40%			431,000
Engineering & Project Management (w/o contingency)	15%			162,000
TOTAL ROADWAY COST ESTIMATE				**$ 1,669,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Riverside Drive
Extents Windridge Drive to Mount Seymour Parkway
Right-of-Way Width 23.6
Length 230
Existing Roadway 10.3
Proposed Roadway 10.3

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	5428	$ 54,300
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	5428	$ 217,200
Excavation (Cut)	m3	$ 70	1376	$ 96,300
Subgrade Fill and Compaction	m3	$ 40	7	$ 300
Sawcutting	m	$ 10	240	$ 2,400
Pavement Structure (Arterial)	m2	$ 120	2369	$ 284,300
Mill and Overlay	m2	$ 30	72	$ 2,200
Extruded Curb	m	$ 130	750	$ 97,500
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	750	$ 131,300
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	460	$ 15,200
Trees	ea	$ 700	22	$ 15,400
Asphalt Multiuse Path/Bike Path	m2	$ 70	920	$ 64,400
Pavement Markings	m	$ 60	230	$ 13,800
Street Light Relocation	ea	$ 12,000	1	$ 12,000
New Street Light	ea	$ 10,000	11	$ 105,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	2	$ 700,000
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 181,160
SUBTOTAL COST ESTIMATE				**$ 1,992,800**
Contingency	40%			798,000
Engineering & Project Management (w/o contingency)	15%			299,000
TOTAL ROADWAY COST ESTIMATE				**$ 3,090,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX M - ROAD A AND ROAD B

Road A (Dollarton Highway to Berkley Road) and Road B

Road A and Road B were developed to provide accesses to the proposed developments and a secondary connection to Berkley Road. Both are design as low speed roadways with tight curves. Protected cycling and pedestrian facilities have been included on Road A and connect to Dollarton Highway and Berkley Road. Road A was also developed to allow for an articulated bus to connect to Berkley Road for a future rapid transit line and for a WB-20 to access surrounding industrial development. Road B was developed a standard District of North Vancouver local roadway therefore no design criteria or cross section as been included. The alignment and cross-section of Road B can be revised suit the development conditions. A pedestrian connection is required from the end of Road B to Berkley Road as shown on the drawings.

The alignments of both Road A and Road B were designed to minimize impacts to the environmentally sensitive areas.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Profile
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Road A (Dollarton Highway to Berkley Road)

Length: 350m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	-	Collector	Collector	
Right-of-Way	-	-	18.3m	
Posted Speed	-	40 km/h	40 km/h	
Design Speed	-	40 km/h	40 km/h	
Design Radius	-	65m (TAC)	65m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC)	60m-65m	
Maximum Grade	-	N/A	10%	Note 3
Design Vehicle	-	-	WB-20 Articulated Bus	
Basic Lanes	-	2	2	
Lane Width	-	3.0m – 3.7m (TAC)	3.2m	
Parking Including	-	No	No	
Bike Facilities	-	-	Yes	Note 4
Sidewalks	-	Yes	Yes	Note 4
Transit Facilities	-	-	Yes	Note 5
Access Conditions	-	-	None	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

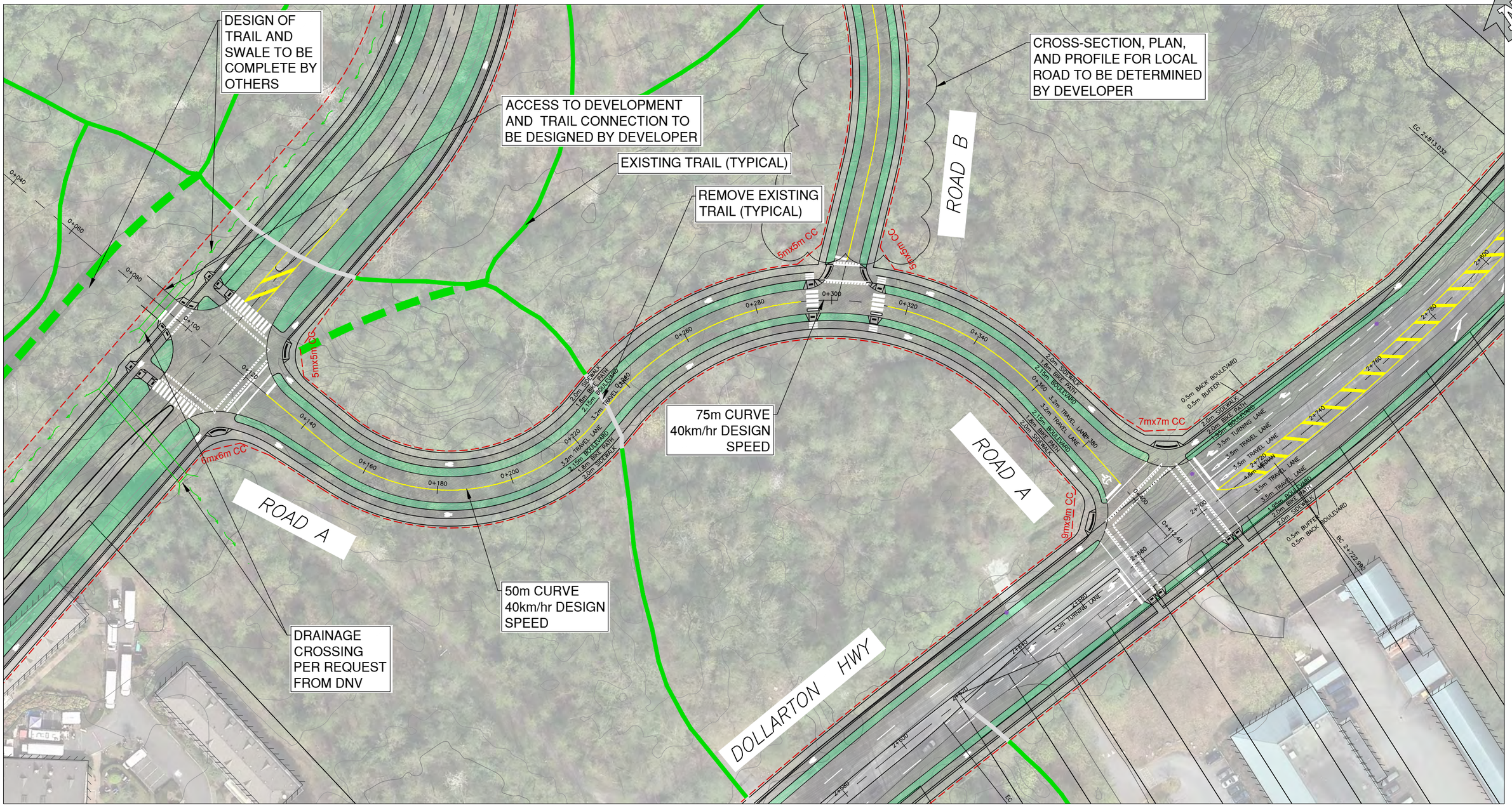
Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%.

Note 4: Protected bicycle facilities and sidewalks are provided on both sides of roadway.

Note 5: Articulated bus used for turning movements on roadway due to potential route of rapid transit. No bus stops accounted for in design.



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URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

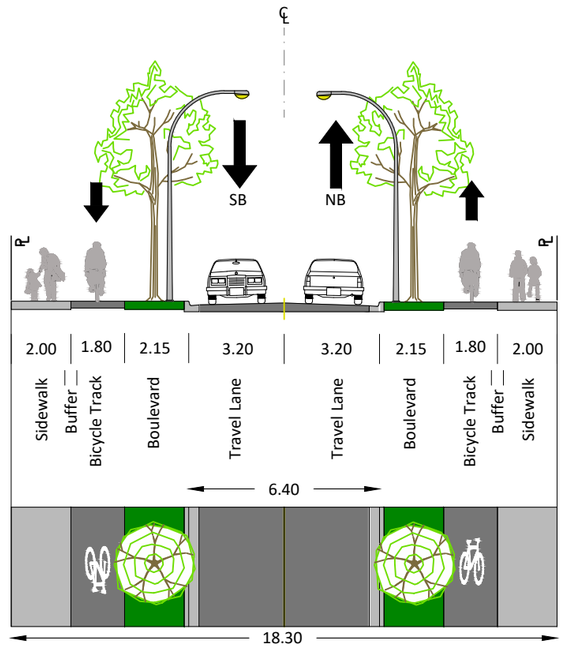
PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	RA-01
1333.0040.03		Title

Road A
Plan

W



E

* SOME SECTIONS MAY MERGE THE SIDEWALK AND A SHARED-USE PATH WHERE THE URBAN TRAIL PARALLELS THE ROAD

RA 1

ROAD A

DOLLARTON HWY TO BERKLEY ROAD (MID-BLOCK)

URBAN systems

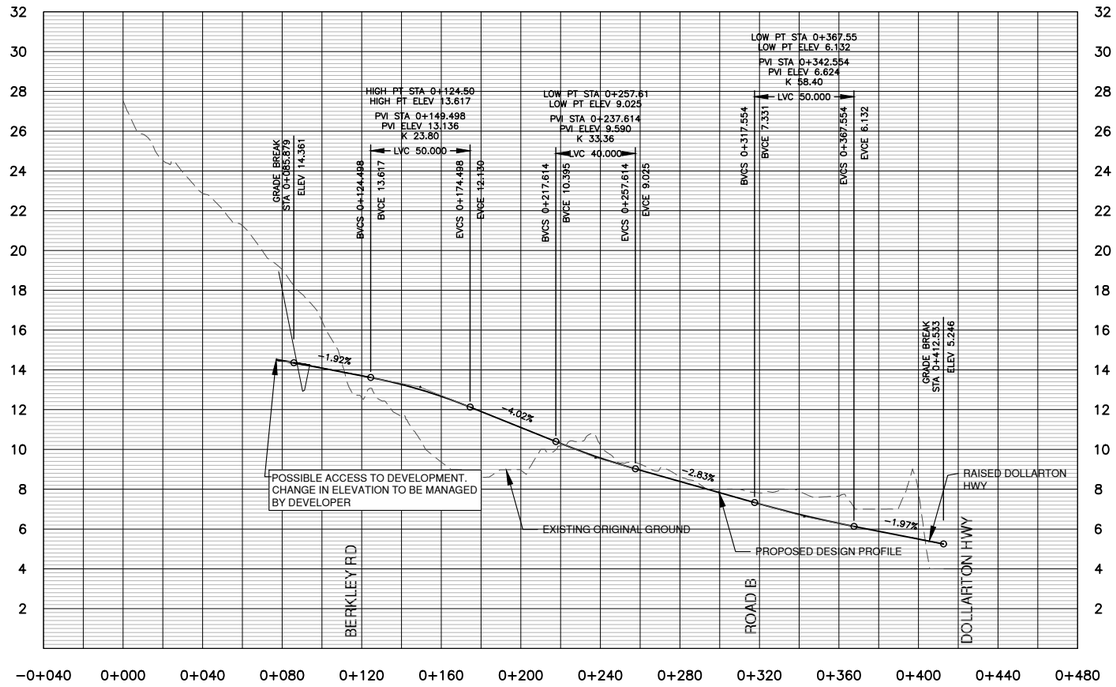
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:200	18-04-2018	RA-T1
1333.0040.03		Title

Road A
Typical

ROAD A -0+040 to 0+480



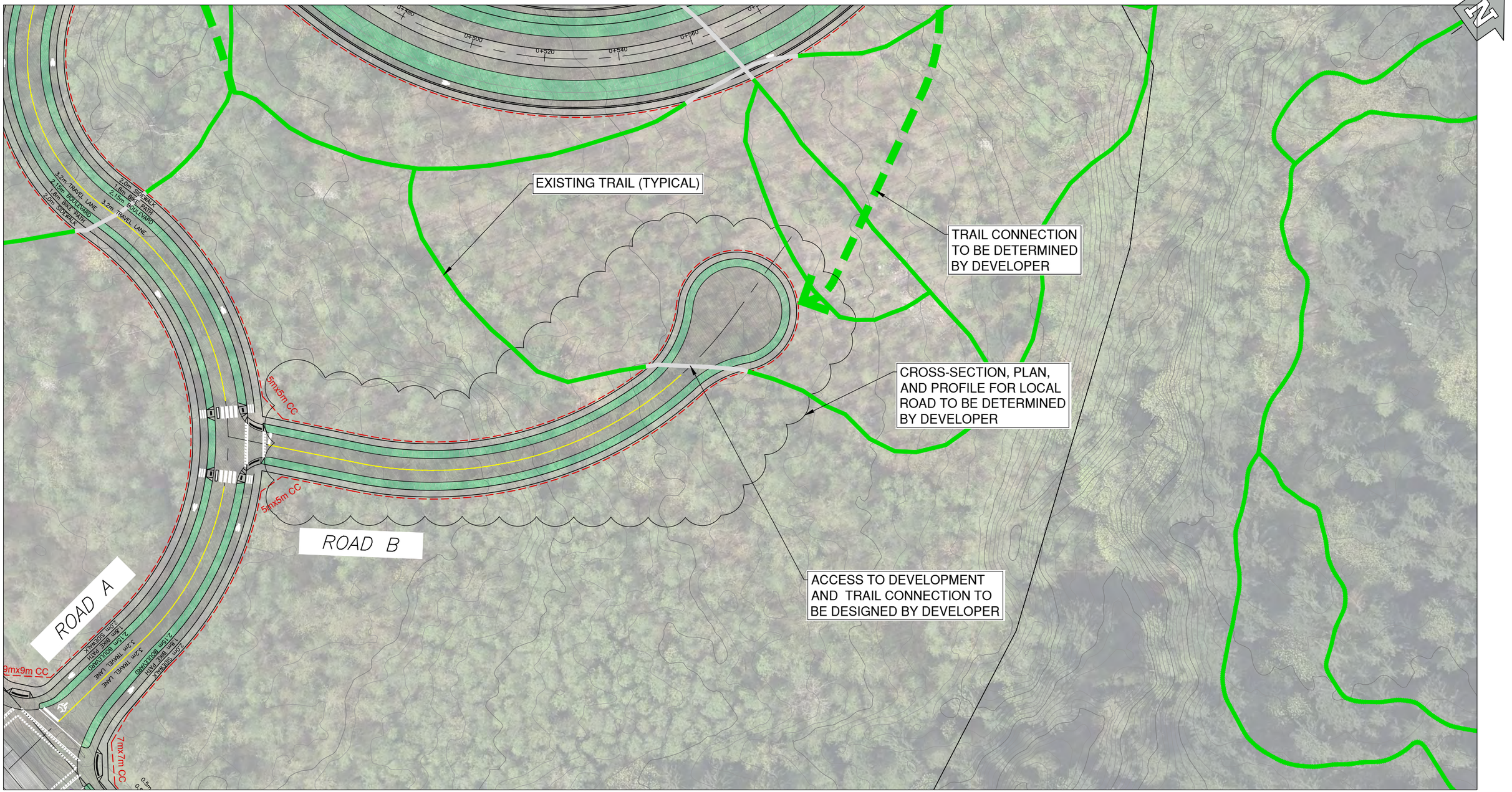
URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
H:1:3000	18-04-2018	RA-02
1333.0040.03		Title

Road A
Profile



URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:1000	18-04-2018	RB-01
1333.0040.03		Title

Road B
Plan

Appendix p-91

Roadway Road A
Extents Dollarton Highway to Berkley Road
Right-of-Way Width 18.3
Length 265
Existing Roadway 0
Proposed Roadway 6.4

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	4850	$ 48,500
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	0	$ -
Bulk Tree Removal	m2	$ 2	4850	$ 9,700
Excavation (Cut)	m3	$ 70	2635	$ 184,500
Subgrade Fill and Compaction	m3	$ 40	4868	$ 194,800
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Collector)	m2	$ 95	1696	$ 161,200
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	530	$ 68,900
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	530	$ 92,800
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	530	$ 17,500
Trees	ea	$ 700	53	$ 37,100
Asphalt Multiuse Path/Bike Path	m2	$ 70	954	$ 66,800
Pavement Markings	m	$ 60	265	$ 15,900
Street Light Relocation	ea	$ 12,000	0	$ -
New Street Light	ea	$ 10,000	13	$ 132,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	1	$ 350,000
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 138,020
SUBTOTAL COST ESTIMATE				**$ 1,518,200**
Contingency	40%			608,000
Engineering & Project Management (w/o contingency)	15%			228,000
TOTAL ROADWAY COST ESTIMATE				**$ 2,355,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Road B
Extents Road A to End of Roadway
Right-of-Way Width 15.35
Length 160
Existing Roadway 0
Proposed Roadway 6.4

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	2456	$ 24,600
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	0	$ -
Bulk Tree Removal	m2	$ 2	2456	$ 5,000
Excavation (Cut)	m3	$ 70	4068	$ 284,800
Subgrade Fill and Compaction	m3	$ 40	92	$ 3,700
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Local - Commercial/Industrial)	m2	$ 85	1024	$ 87,100
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	320	$ 41,600
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	320	$ 48,000
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	320	$ 10,600
Trees	ea	$ 700	32	$ 22,400
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	160	$ 9,600
Street Light Relocation	ea	$ 12,000	0	$ -
New Street Light	ea	$ 10,000	8	$ 80,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 61,740
SUBTOTAL COST ESTIMATE				**$ 679,100**
Contingency	40%			272,000
Engineering & Project Management (w/o contingency)	15%			102,000
TOTAL ROADWAY COST ESTIMATE				**$ 1,054,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX N - SEYMOUR RIVER PLACE

Seymour River Place (Front Street to Old Dollarton Road)

A horizontal alignment was developed for the new extension of Seymour River Place between Front Street and Old Dollarton Road. The horizontal alignment was developed to minimize travel speeds, with a design speed of 40 km/h. Planned posted speed for the extension is 15 km/h and it may be possible to reduce the design radius accordingly, subject to design vehicle requirements. The alignment also minimized property take on the southwest corner of the intersection of Seymour River Place and Old Dollarton Road. This property constraint made realignment of the intersection to better accommodate all movements infeasible and required that movements on the south leg of the intersection be limited to right-in/right-out. Should land assemblies change that provide additional land to be available, the intersection should be redesigned to allow for a full movement intersection with the realignment of Seymour River place south of the intersection as required.

The design included high-quality treatments with tactile pavement and parking pockets to enhance the urban design of the roadway. Wide sidewalks are shown for this segment to reflect the commercial frontages expected along this roadway. A right in/right out treatment is shown on the south leg of the intersection with Old Dollarton Road due to the offsetting alignment of Seymour River Place through the intersection.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Seymour River Place (Front Street to Old Dollarton Road)
Length: 140m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	N/A	Local	Local	
Right-of-Way	N/A	-	15.3m	Note 4
Posted Speed	N/A	40 km/h	40 km/h	Note 2
Design Speed	N/A	40 km/h	40 km/h	Note 2
Design Radius	-	65m (TAC)	65m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC)	60m-65m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	DNV Fire Truck	
Basic Lanes	-	2	2	
Lane Width	-	3.0m – 3.7m (TAC)	3.0m	
Parking Including	-	Yes	Yes	Note 5
Bike Facilities	-	-	No	
Sidewalks	-	Yes	Yes	
Transit Facilities	-	-	No	
Access Conditions	-	-	None	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Posted speed for shared street is planned at 15 km/h. Design speed and design radius may be lowered accordingly.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Existing profile to be maintained. No profile developed for this roadway.

Note 4: Road to be narrow roadway focused on low speeds and high-quality materials. Existing roadway doesn't connect to Front Street. Property acquisition will be required for roadway.

Note 5: Parking is included in pockets on both side of the roadway continuous north of Old Dollarton Road.

Seymour River Place (Old Dollarton Road to Heritage Park Lane)

Seymour River Place between Old Dollarton Road and Heritage Park Lane followed the existing alignment of the roadway. North of Old Dollarton Road, was maintained as a standard local roadway. Parking was provided on both sides on the roadway. Sidewalks were provided on both sides of the roadway. Cycling was accommodated as a neighbourhood bikeway, with no dedicated cycling facilities. A recently upgraded portion of the roadway will be maintained on the west side north of the access to Maplewood Farms. Curb extensions were included at crossings to improve pedestrian safety. At Windridge Drive, a crossing was provided on the south side only to focus pedestrian movements on the multi-use pathway.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Seymour River Place (Old Dollarton Road to Heritage Park Lane)
Length: 360m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	20.1m	-	20.1m	
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	DNV Fire Truck	
Basic Lanes	2	2	2	
Lane Width	-	3.0m – 3.7m (TAC)	3.0m	
Parking Including	Yes	Yes	Yes	Note 4
Bike Facilities	No	-	No	
Sidewalks	Yes	Yes	Yes	
Transit Facilities	No	-	No	
Access Conditions	Limited	-	Limited	

General Notes:

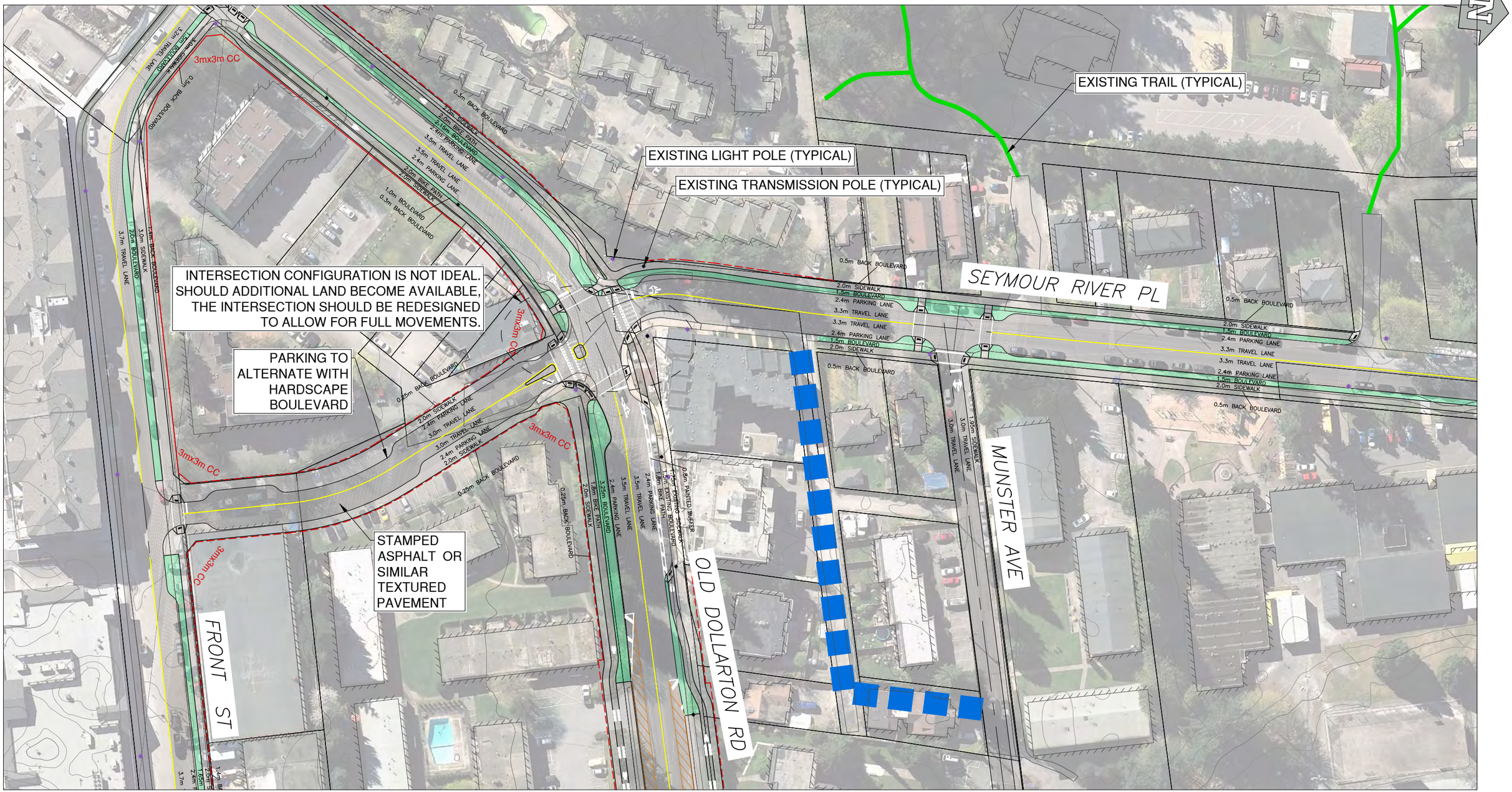
Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Existing profile to be maintained. No profile developed for this roadway.

Note 4: Parking is included on both sides of the roadway.



URBAN systems

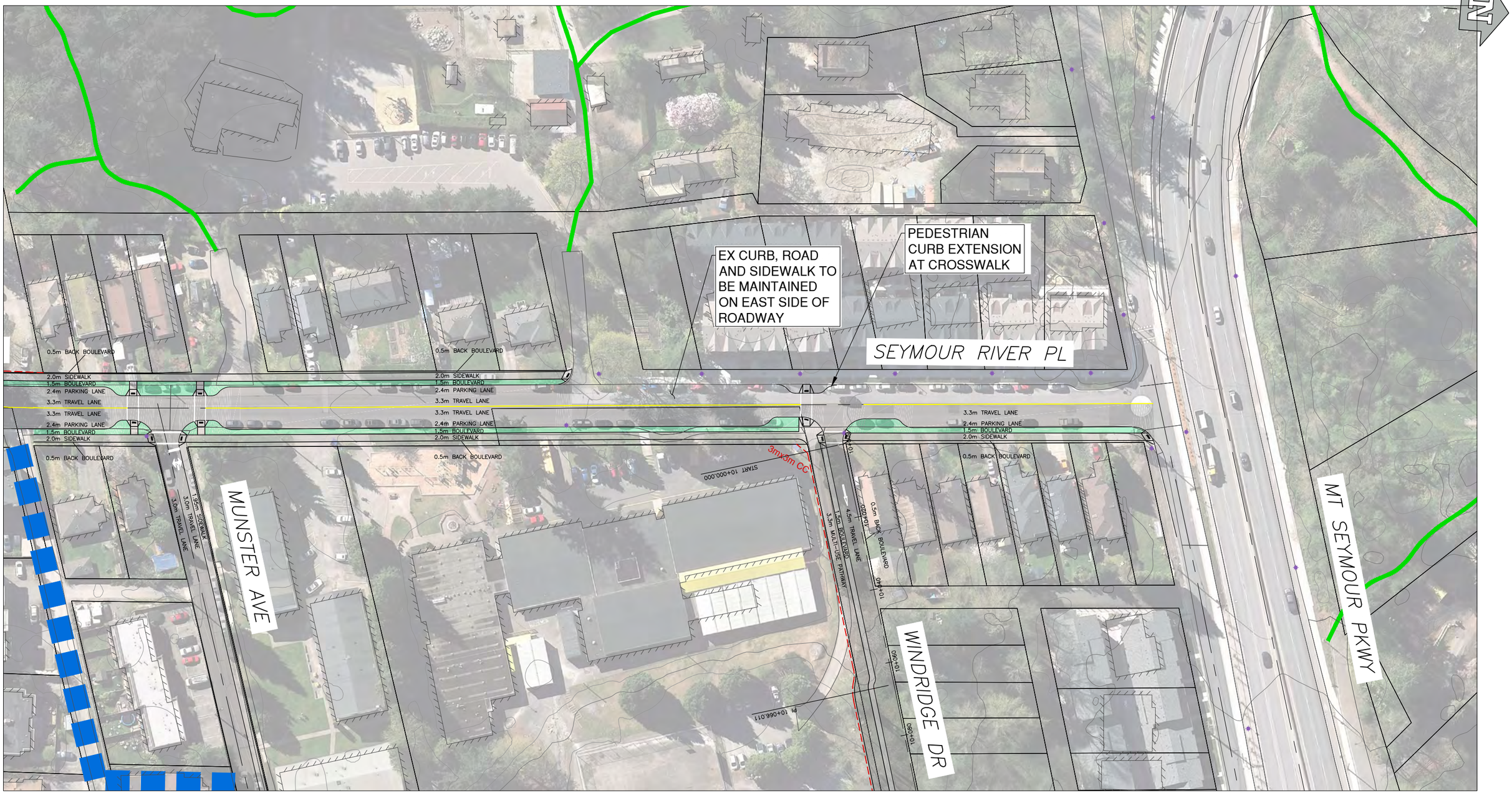
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	SRP-01
1333.0040.03		Title

Seymour River Place
Plan



URBAN systems

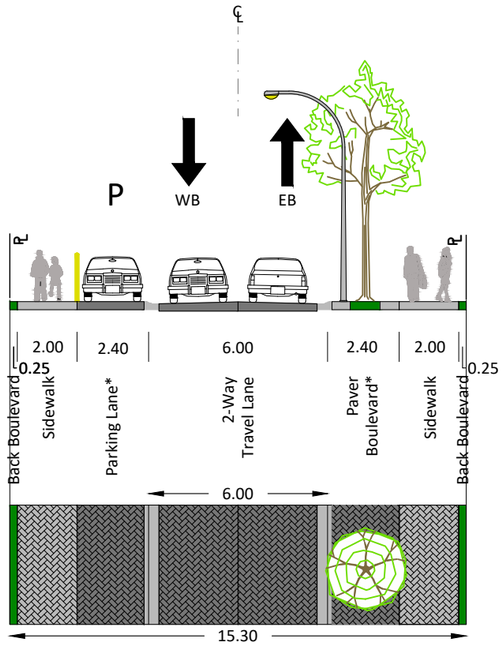
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date / Figure
1:1000	18-04-2018 / SRP-02
1333.0040.03	Title

Seymour River Place
Plan

N



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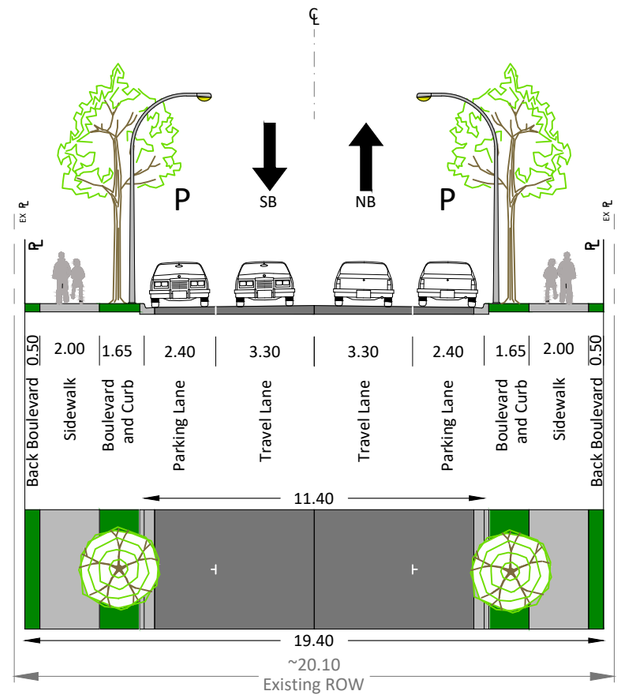

E

* ALTERNATE PARKING AND BOULEVAROAD ALONG ROAD

SRP 1 SEYMOUR RIVER PLACE

FRONT STREET TO OLD DOLLARTON ROAD (MID–BLOCK)

SRP 2 SEYMOUR RIVER PLACE

OLD DOLLARTON ROAD TO 50m SOUTH OF WINDRIDGE DR

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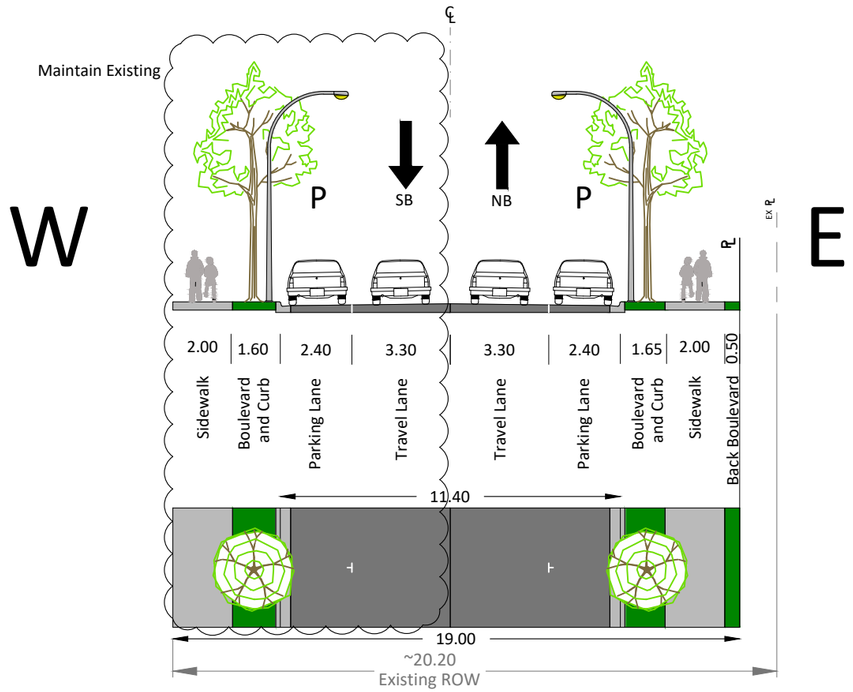
APRIL 18, 2018
URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:200	18-04-2018	SRP-T1
1333.0040.03		Title

Seymour River Place
Typical
Appendix p-100



SRP 3

SEYMOUR RIVER PLACE

50m SOUTH OF WINDRIDGE DRIVE TO MOUNT SEYMOUR PARKWAY

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APRIL 18, 2018
URBAN systems

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:200	18-04-2018	SRP-T2
1333.0040.03		Title

Seymour River Place
Typical

Roadway Seymour River Place
Extents Front Street to Old Dollarton Road
Right-of-Way Width 15.3
Length 95
Existing Roadway 0
Proposed Roadway 6

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	1454	$ 14,600
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	1454	$ 58,200
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Local - Commercial/Industrial)	m2	$ 85	570	$ 48,500
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	190	$ 24,700
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	190	$ 33,300
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	95	$ 3,200
Trees	ea	$ 700	9	$ 6,300
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	95	$ 5,700
Street Light Relocation	ea	$ 12,000	0	$ -
New Street Light	ea	$ 10,000	5	$ 47,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 24,200
SUBTOTAL COST ESTIMATE				**$ 266,200**
Contingency	40%			107,000
Engineering & Project Management (w/o contingency)	15%			40,000
TOTAL ROADWAY COST ESTIMATE				**$ 414,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Seymour River Place
Extents Old Dollarton Road to Munster Avenue
Right-of-Way Width 19.4
Length 100
Existing Roadway 11.7
Proposed Roadway 11.4

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	1940	$ 19,400
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	1940	$ 77,600
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Local - Residential)	m2	$ 75	1140	$ 85,500
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	200	$ 26,000
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	200	$ 35,000
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	200	$ 6,600
Trees	ea	$ 700	20	$ 14,000
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	100	$ 6,000
Street Light Relocation	ea	$ 12,000	4	$ 48,000
New Street Light	ea	$ 10,000	1	$ 10,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 32,810
SUBTOTAL COST ESTIMATE				**$ 360,900**
Contingency	40%			145,000
Engineering & Project Management (w/o contingency)	15%			55,000
TOTAL ROADWAY COST ESTIMATE				**$ 561,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Seymour River Place
Extents Munster Avenue to Heritage Park Lane
Right-of-Way Width 19.4/19.1
Length 255
Existing Roadway 11.5
Proposed Roadway 11.4

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	3420	$ 34,300
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	3420	$ 136,900
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	155	$ 1,600
Pavement Structure (Local - Residential)	m2	$ 75	2024	$ 151,800
Mill and Overlay	m2	$ 30	47	$ 1,400
Extruded Curb	m	$ 130	355	$ 46,200
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
2.0m Sidewalk (100mm)	m	$ 175	355	$ 62,200
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	355	$ 11,800
Trees	ea	$ 700	35	$ 24,500
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	255	$ 15,300
Street Light Relocation	ea	$ 12,000	2	$ 24,000
New Street Light	ea	$ 10,000	11	$ 107,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 61,750
SUBTOTAL COST ESTIMATE				**$ 679,300**
Contingency	40%			272,000
Engineering & Project Management (w/o contingency)	15%			102,000
TOTAL ROADWAY COST ESTIMATE				**$ 1,054,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX O - SPICER ROAD

Spicer Road

Spicer Road east of Amherst Avenue was developed to follow the existing alignment. The roadway width was narrowed but maintained two travel lanes and parking on the north side. A 4.0m wide multi-use path was added to the south side while the existing sidewalk was maintained on the north. Curb extensions were added to the north side at the intersections with Amherst Avenue and Riverside Drive. Additional road right-of-way will need to be dedicated for Spicer Road from Amherst Avenue to west Riverside Drive. Street light poles will need to be relocated on the south side of Spicer west of Amherst Avenue to allow for the construction of the multi-use path.

Spicer Road was extended west of Amherst Avenue to east Riverside Drive. This design is only implementable following the decommissioning or relocation of the existing railway spur. A half cul-de-sac was added to the intersection of Spicer Road and Riverside Drive to assist turning vehicles. Street lights will need to be added to the segment between Amherst Avenue and Riverside Drive.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Spicer Road (Riverside Drive to Riverside Drive)

Length: 525m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	17.42m	-	17.42mm	Note 4
Posted Speed	50 km/h	50 km/h	50 km/h	
Design Speed	Unknown	50 km/h	50 km/h	
Design Radius	-	85m – 115m	115m	Note 2
Design Stopping Sight Distance (SSD)	-	60m-65m (TAC), 75m-200m (DNV)	60m-65m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	DNV Fire Truck	
Basic Lanes	2	2	2	
Lane Width	3.5m	3.0m – 3.7m (TAC)	3.5m	
Parking Including	Yes	Yes	Yes	Note 5
Bike Facilities	No	-	Yes	Note 6
Sidewalks	Yes	Yes	Yes	Note 6
Transit Facilities	No	-	No	
Access Conditions	Commercial	-	Commercial	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

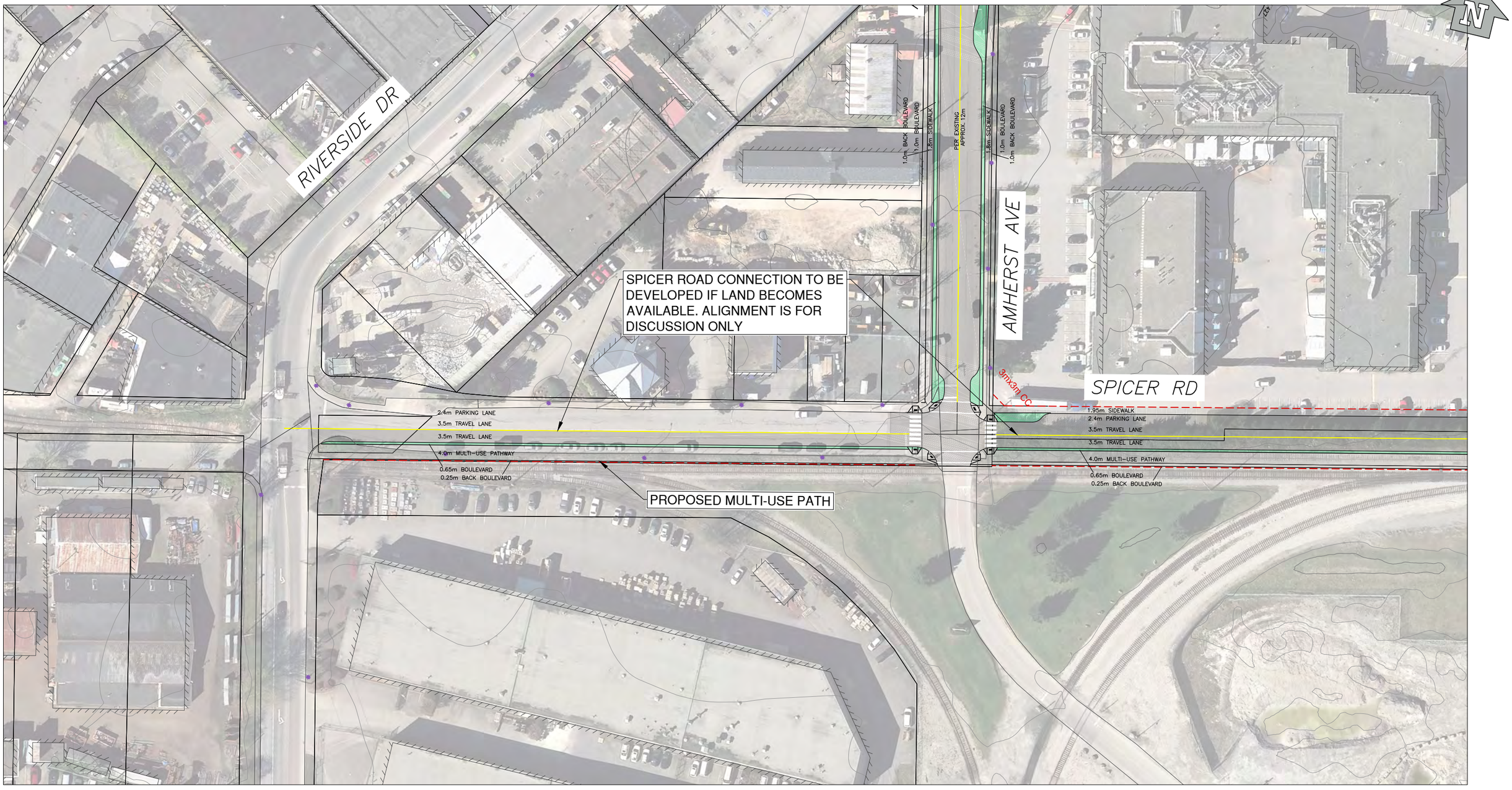
Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%. Existing profile to be maintained. No profile developed for this roadway.

Note 4: Spicer Road currently does not exist east of Amherst Avenue. District would need to dedicate road right-of-way for this section.

Note 5: Currently, parking is included on both sides of street. Proposed cross section would remove parking from south side.

Note 6: A 1.8m sidewalk is provided on north side and a 4.0m Multi-Use Path is included on the south side of the roadway.



URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

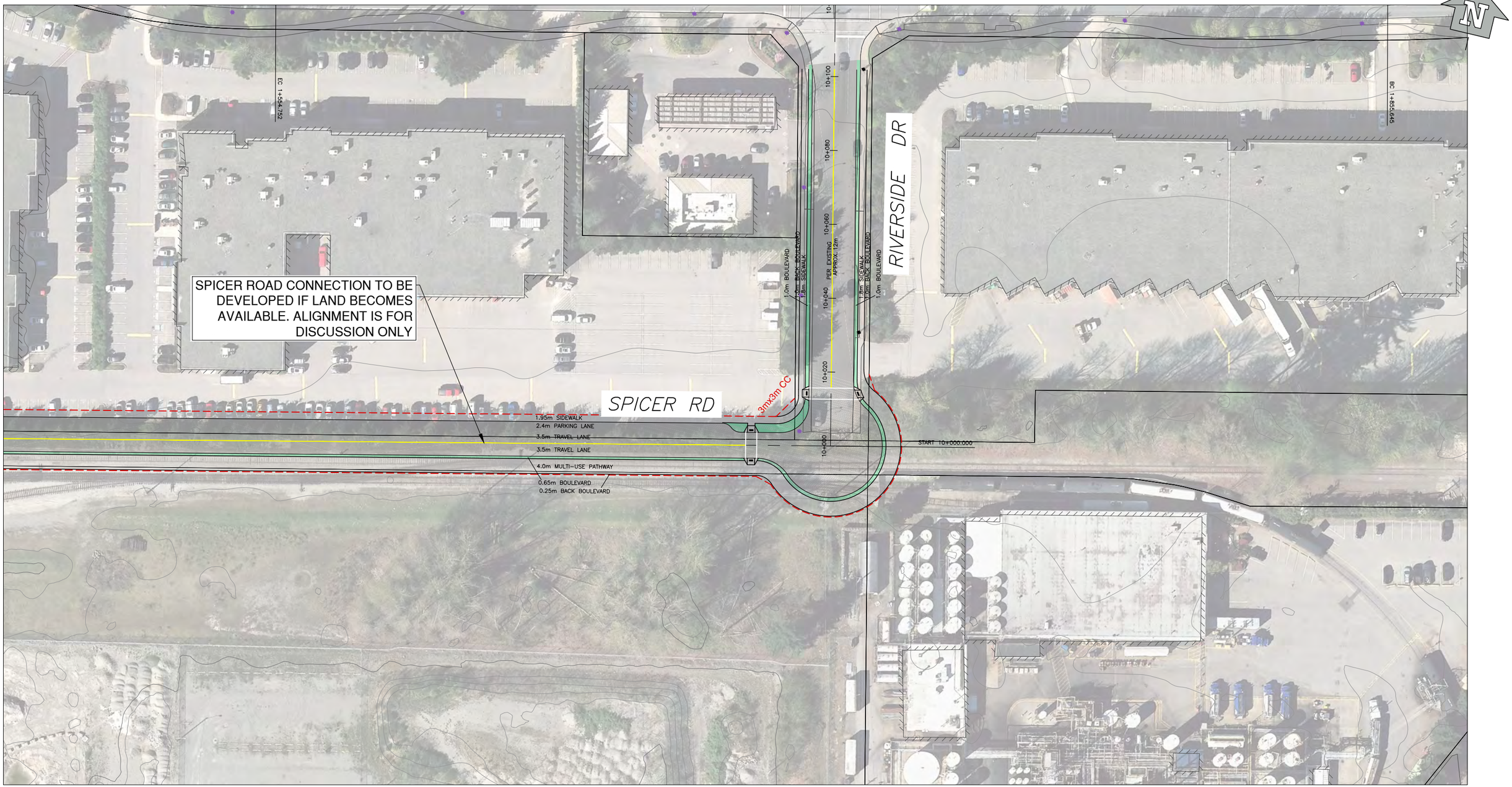
PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	SR-01
1333.0040.03		Title

Spicer Road
Plan

Appendix p-107



URBAN systems

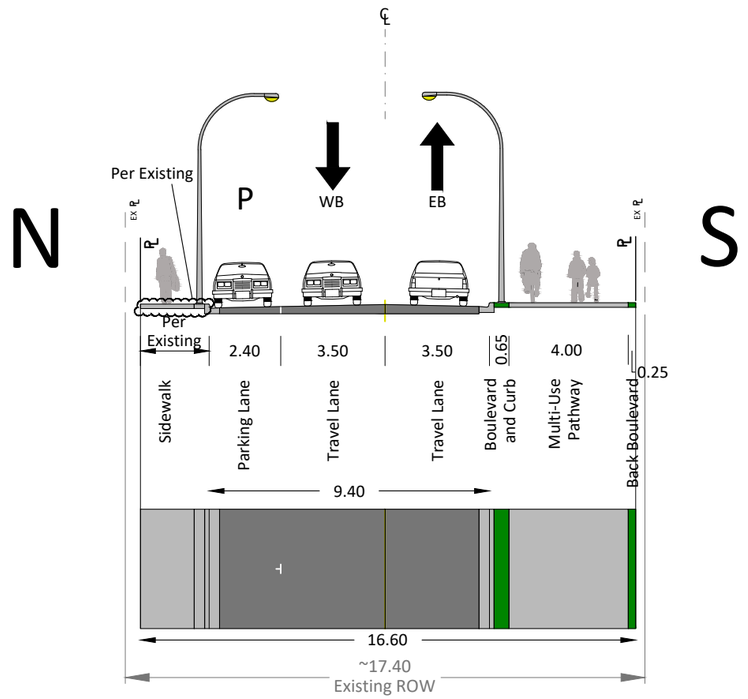
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

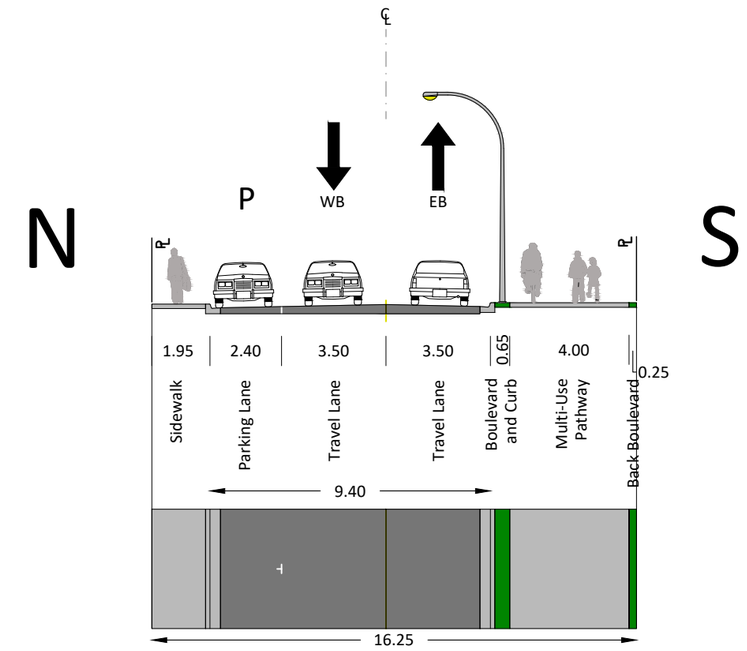
Scale	Date	Figure
1:1000	18-04-2018	SR-02
1333.0040.03		Title

Spicer Road
Plan
Appendix p-108



SR 1 SPICER ROAD

RIVERSIDE DRIVE TO AMHERST AVE



SR 2 SPICER ROAD

AMHERST AVE TO RIVERSIDE DR

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date / Figure
1:200	18-04-2018 / SR-T1
1333.0040.03	Title

Spicer Road
Typical

Roadway Spicer Road
Extents Amherst Avenue to Riverside Drive
Right-of-Way Width 17.42
Length 305
Existing Roadway 0
Proposed Roadway 9.4

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	5313	$ 53,200
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	5313	$ 212,600
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Local - Commercial/Industrial)	m2	$ 85	2867	$ 243,700
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	610	$ 79,300
1.5m Sidewalk (100mm)	m	$ 130		$ -
1.8m Sidewalk (100mm)	m	$ 150	305	$ 45,800
Sod (1.2m Blvd)	m	$ 18	153	$ 2,800
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	1220	$ 85,400
Pavement Markings	m	$ 60	305	$ 18,300
Street Light Relocation	ea	$ 12,000	0	$ -
New Street Light	ea	$ 10,000	15	$ 152,500
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 89,360
SUBTOTAL COST ESTIMATE				**$ 983,000**
Contingency	40%			394,000
Engineering & Project Management (w/o contingency)	15%			148,000
TOTAL ROADWAY COST ESTIMATE				**$ 1,525,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Spicer Road
Extents Riverside Drive to Amherst Avenue
Right-of-Way Width 17.42
Length 165
Existing Roadway 11.8
Proposed Roadway 9.4

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	858	$ 8,600
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	858	$ 34,400
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	165	$ 1,700
Pavement Structure (Local - Commercial/Industrial)	m2	$ 85	0	$ -
Mill and Overlay	m2	$ 30	50	$ 1,500
Extruded Curb	m	$ 130	165	$ 21,500
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
Sod (1.2m Blvd)	m	$ 18	83	$ 1,500
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	305	$ 21,400
Pavement Markings	m	$ 60	305	$ 18,300
Street Light Relocation	ea	$ 12,000	3	$ 36,000
New Street Light	ea	$ 10,000	1	$ 11,300
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 15,620
SUBTOTAL COST ESTIMATE				**$ 171,800**
Contingency	40%			69,000
Engineering & Project Management (w/o contingency)	15%			26,000
TOTAL ROADWAY COST ESTIMATE				**$ 267,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX P - WINDRIDGE DRIVE

Windridge Drive (Seymour River Place to Riverside Drive)

Windridge Drive will provide a new connection between Seymour River Place and Riverside Drive. It was designed as a one-way east bound lane to help with egress from the neighbourhood. A multi-use path was included on the south side. A pedestrian half-signal at Riverside Drive was included with crossing for pedestrian and cyclists on the south side of the intersection. A lane access was provided to connect to Windridge Drive allowing egress from Heritage Park Lane.

The design for this portion of Windridge Drive is 4.5 m wide in some sections and a combination of 3.1 m wide with a 2.4 m wide parking lane in other sections. This design does not meet District or TAC standards for lane width but was chosen in to allow a vehicle to pass while another parked. This was determined in previous work completed in 2013.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Windridge Drive (Seymour River Place to Riverside Drive)

Length: 210m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	N/A	-	20.0m – 23.6m	
Posted Speed	N/A	30 km/h	30 km/h	
Design Speed	N/A	30 km/h	30 km/h	
Design Radius	-	25m – 30m	30m	Note 2
Design Stopping Sight Distance (SSD)	-	45m	45m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	DNV Fire Truck	
Basic Lanes	1	2	1	Note 4
Lane Width	N/A	3.0m – 3.7m (TAC)	3.1m – 4.5m	
Parking Including	No	No	No	
Bike Facilities	No	-	Yes	Note 5
Sidewalks	No	Yes	Yes	Note 5
Transit Facilities	No	-	No	
Access Conditions	None	-	Limited	Note 6

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%.

Note 4: Windridge Drive between Seymour River Place and Riverside Drive will be one-way eastbound.

Note 5: A 3.3m – 4.0m wide Multi-Use Path is included on the south side of the roadway. No north crosswalk provided at Riverside Drive intersection due to safety and traffic concerns.

Note 6: Limited access will be allowed off of this roadway. A drop off zone will be included on the south side for a portion of this block.

Windridge Drive (Riverside Drive to End)

The horizontal alignment for Windridge Drive was developed to deviate from the existing alignment to tighten curves for lower speeds. The curves were developed to 40km/h design standards but we recommend a posted speed of 30km/h due to the roadway being a residential, local roadway. The vertical alignment was revised to 8% near the intersection with Riverside Drive to help reduce the crest on Riverside Drive. A multi-use path was included on the south side until approximately Sta 10+560 where cyclists will transition to shared use lanes. A sidewalk was shown on the north side of the roadway from the intersection with Riverside Drive to Sta 10+400 where a crossing is included to the south side of the roadway. This crossing aligns with the proposed multi-use trail connection to the east.

This appendix includes the following materials:

- Roadway Design Criteria
- Functional Plan Drawings
- Typical Sections
- Profile
- Cost Estimate Details

Project Design Criteria

Roadway Design & Geomatics Engineering

Project: **Maplewood Neighbourhood** **Proj.# 1333.0040.03**
Type of work: Functional Design
Client: District of North Vancouver

Windridge Drive (Riverside Drive to End)

Length: 510m

Item	Existing Conditions	Design Standards (TAC, DNV)	Project Design Criteria	Comments / Notes
Design Classification	Local	Local	Local	
Right-of-Way	19.9m	-	19.9m	
Posted Speed	50 km/h	40 km/h	30 km/h	
Design Speed	Unknown	40 km/h	40 km/h	
Design Radius	-	25m – 30m	30m	Note 2
Design Stopping Sight Distance (SSD)	-	45m	45m	
Maximum Grade	N/A	N/A	12%	Note 3
Design Vehicle	-	-	DNV Fire Truck	
Basic Lanes	2	2	2	
Lane Width	3.0m	3.0m – 3.7m (TAC)	3.0m	
Parking Including	No	No	Yes	Note 4
Bike Facilities	No	-	Yes	Note 5
Sidewalks	No	Yes	Yes	Note 5
Transit Facilities	No	-	No	
Access Conditions	None	-	Residential	

General Notes:

Existing conditions are approximate measurements taken from existing CAD base file.

Note 1: Industry standards and best practice design principles were used for this project depending on the feature (i.e. TAC, DNV Subdivision Bylaw, MMCD Design Guidelines (2014), NACTO Design Guidelines, TransLink Design Guidelines, etc.)

Note 2: Roadway alignment to match existing.

Note 3: Grades through intersections to be max 4%. Grades approaching intersections should be reduced to maximum 8%.

Note 4: Parking included on the north side of the roadway for the western half of this roadway. No north crosswalk provided at Riverside Drive intersection due to safety and traffic concerns.

Note 5: A 4.0m wide Multi-Use Path is included on the south side of the roadway. A 1.8m sidewalk is included on the north side of the roadway until the midblock crosswalk.

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	WD-01
1333.0040.03		Title

Windridge Drive Plan

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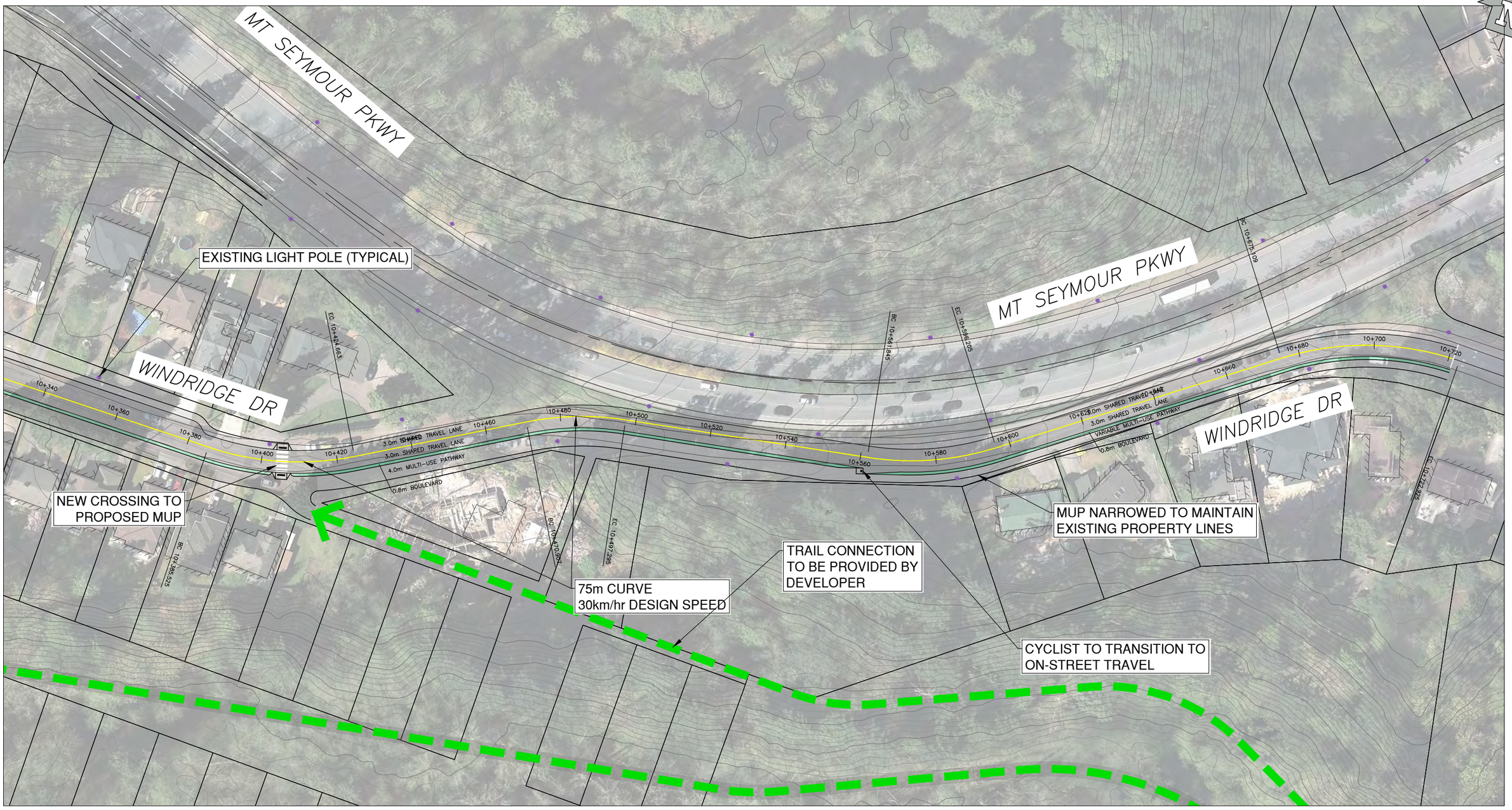


URBAN systems

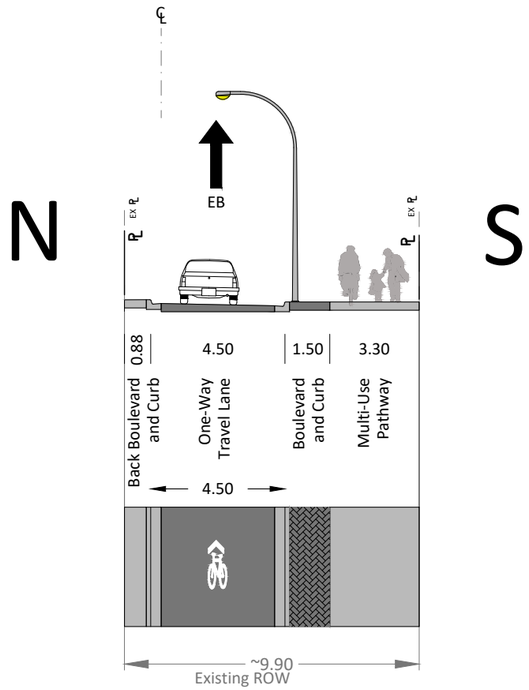
ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

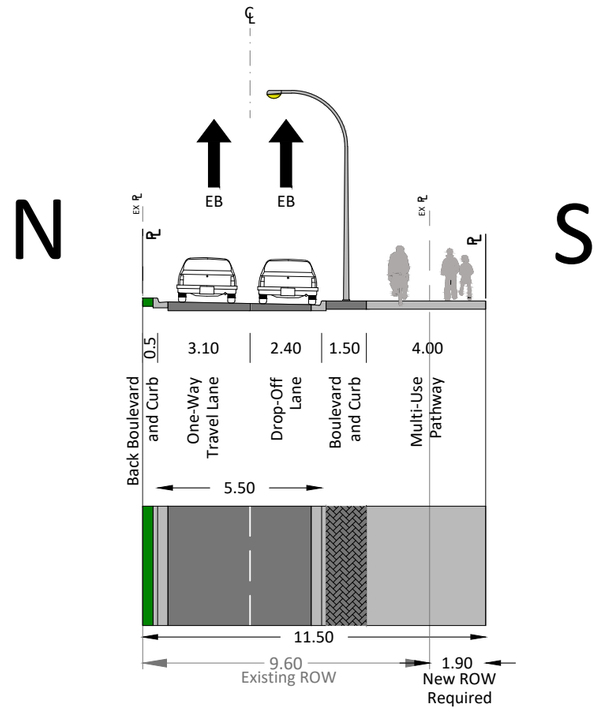
Scale	Date	Figure
1:1000	18-04-2018	WD-02
1333.0040.03		Title

Windridge Drive
Plan



WD 1 WINDRIDGE DRIVE

SEYMOUR RIVER PLACE TO RIVERSIDE DRIVE (SECTION 1 MID-BLOCK)



WD 2 WINDRIDGE DRIVE

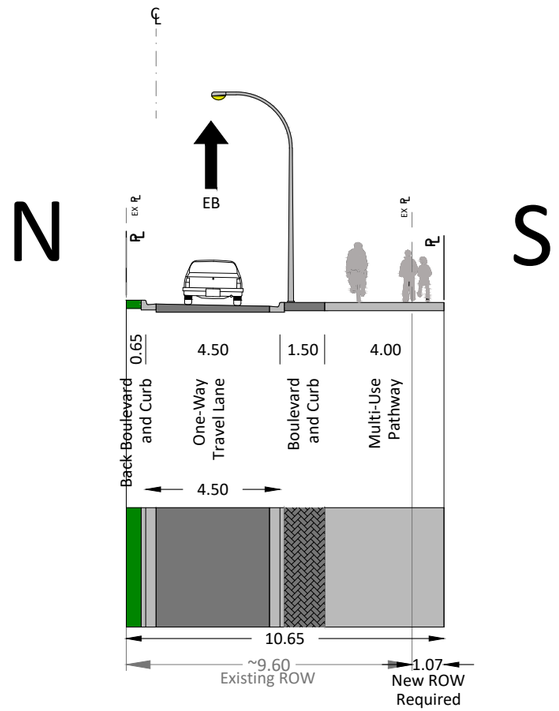
SEYMOUR RIVER PLACE TO RIVERSIDE DRIVE (SECTION 2 MID-BLOCK)

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

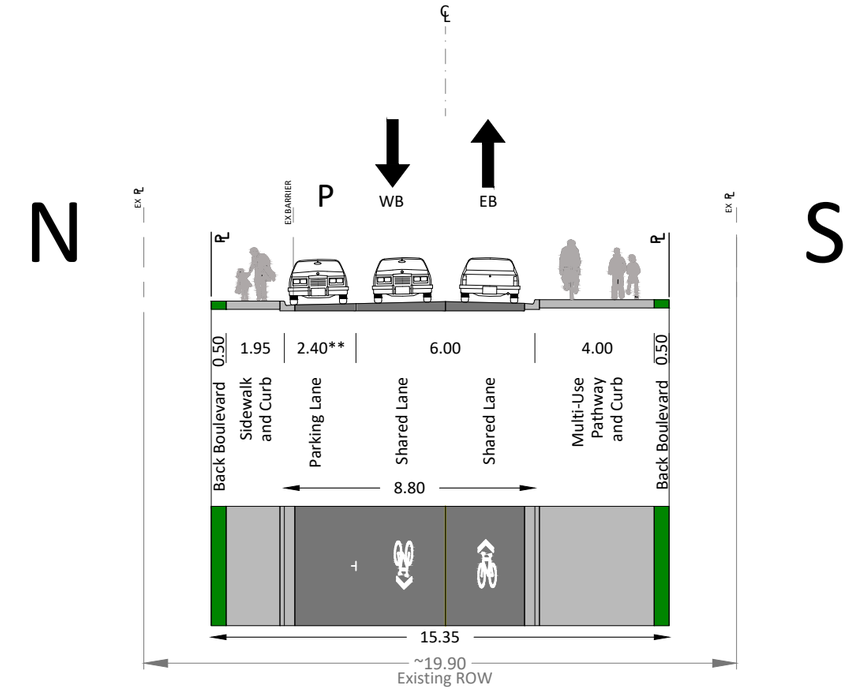
Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date / Figure
1:200	18-04-2018 / WD-T1
1333.0040.03	Title

Windridge Drive Typical



WD 3 WINDRIDGE DRIVE

SEYMOUR RIVER PLACE TO RIVERSIDE DRIVE (SECTION 3 MID-BLOCK)



** ADD 2.4m OF ALTERNATING PARKING WHERE WIDTH IS AVAILABLE

WD 4 WINDRIDGE DRIVE

RIVERSIDE DRIVE TO TRAILHEAD (MID-BLOCK)

URBAN systems

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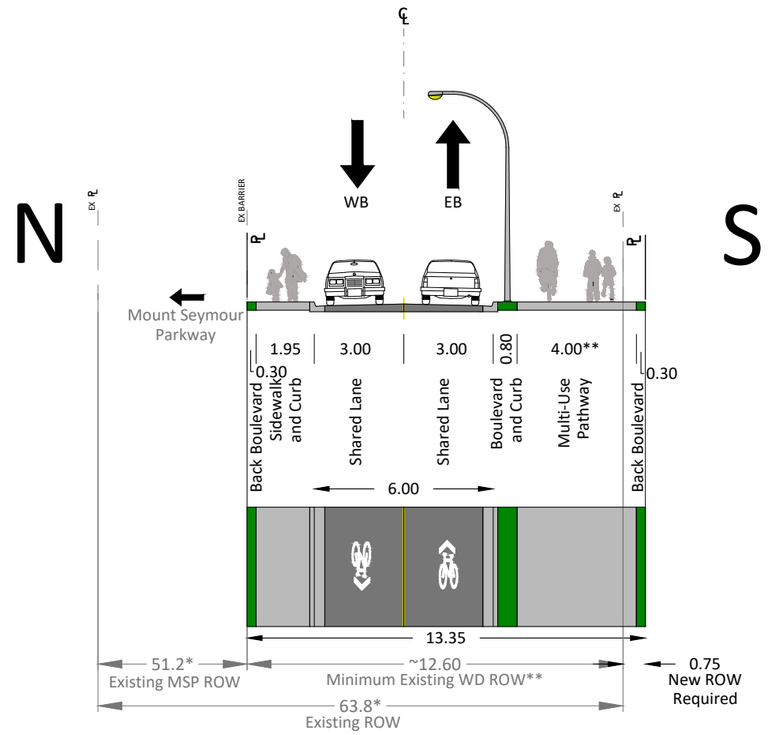
APRIL 18, 2018
URBAN systems

Client/Project	
District of North Vancouver Maplewood Phase 3	
Scale	Date / Figure
1:200	18-04-2018 / WD-T2
1333.0040.03	Title

Windridge Drive
Typical



* NOT TO SCALE
**MULTI-USE PATH TRANSITIONS TO SIDEWALK HALF WAY. CYCLISTS TO TRANSITION TO ROADWAY

WD 5

WINDRIDGE DRIVE

TRAILHEAD TO BROWNING PLACE (ROW SHARED WITH MOUNT SEYMOUR PARKWAY))

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project		
District of North Vancouver Maplewood Phase 3		
Scale	Date	Figure
1:200	18-04-2018	WD-T3
1333.0040.03		Title

Windridge Drive
Typical

Roadway Windridge Drive
Extents Seymour River Place to Riverside Drive
Right-of-Way Width 9.5/11.5
Length 180
Existing Roadway 0
Proposed Roadway 4.5/5.5

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	1890	$ 18,900
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	1890	$ 75,600
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Local - Residential)	m2	$ 75	900	$ 67,500
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	360	$ 46,800
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
Sod (1.2m Blvd)	m	$ 18	180	$ 3,300
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	18	$ 12,600
Asphalt Multiuse Path/Bike Path	m2	$ 70	657	$ 46,000
Pavement Markings	m	$ 60	180	$ 10,800
Street Light Relocation	ea	$ 12,000	0	$ -
New Street Light	ea	$ 10,000	9	$ 90,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 37,150
SUBTOTAL COST ESTIMATE				**$ 408,700**
Contingency	40%			164,000
Engineering & Project Management (w/o contingency)	15%			62,000
TOTAL ROADWAY COST ESTIMATE				**$ 635,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Roadway Windridge Drive
Extents Riverside Drive to End of Roadway
Right-of-Way Width 13.35/15.35/13.35
Length 510
Existing Roadway 0/6.8
Proposed Roadway 6/8.4/6

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	7075	$ 70,800
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	7075	$ 283,000
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Local - Residential)	m2	$ 75	3372	$ 252,900
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	1020	$ 132,600
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	510	$ 76,500
Sod (1.2m Blvd)	m	$ 18	510	$ 9,200
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	2040	$ 142,800
Pavement Markings	m	$ 60	510	$ 30,600
Street Light Relocation	ea	$ 12,000	16	$ 192,000
New Street Light	ea	$ 10,000	10	$ 95,000
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 128,540
SUBTOTAL COST ESTIMATE				**$ 1,413,900**
Contingency	40%			566,000
Engineering & Project Management (w/o contingency)	15%			213,000
TOTAL ROADWAY COST ESTIMATE				**$ 2,193,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX Q - TRAILS

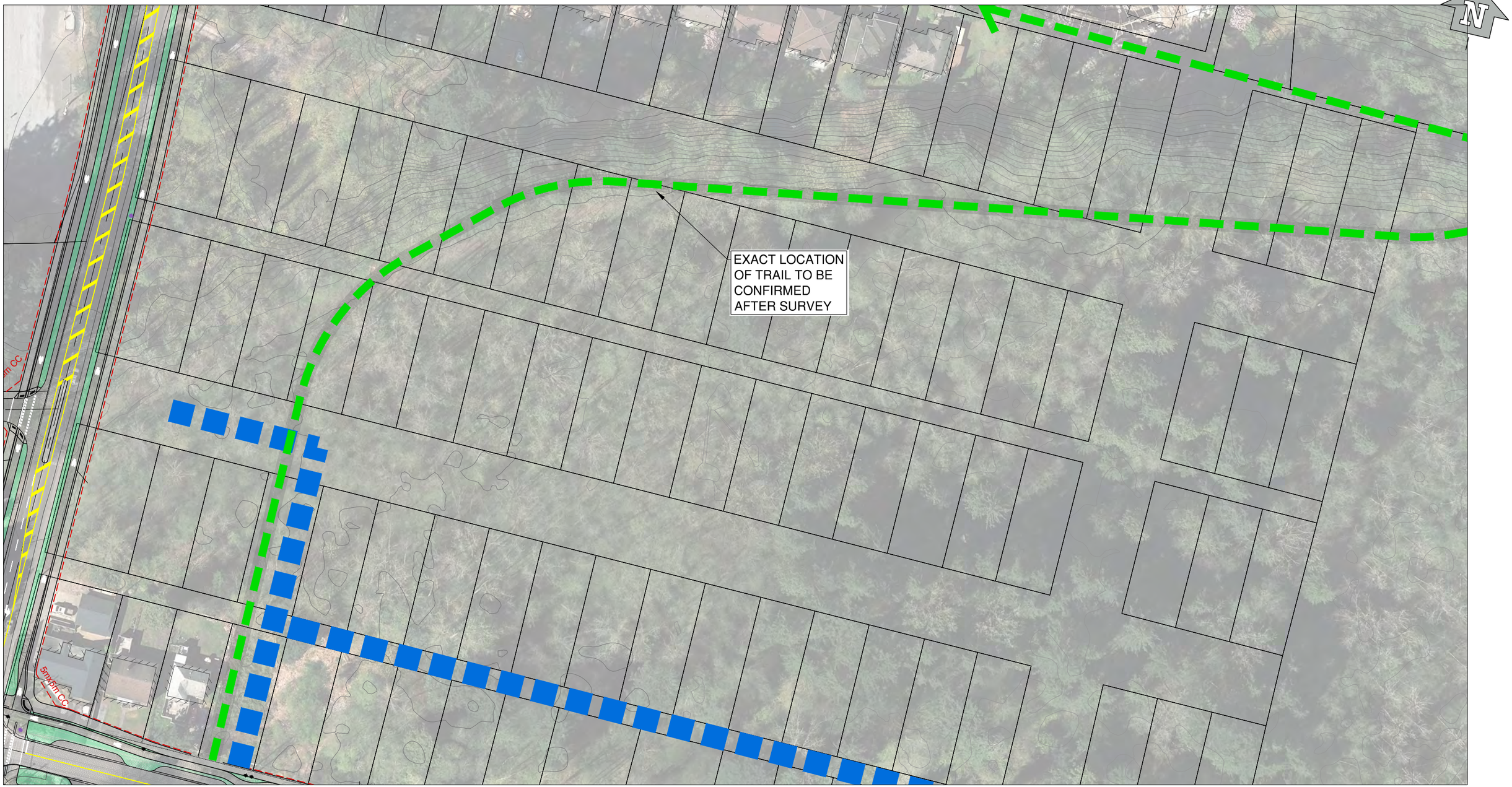
Trail

The District of North Vancouver plans to have a network of trails between the western and eastern portions of the Maplewood area. These trails would connect to a spine trail that connects Old Dollarton Road at Riverside Drive with Berkley Road. This trail will be incorporated as part of the north shore Spirit Trail and shall be a minimum 4.0m wide with a max grade of 5%. The alignment shown is schematic and can be adjusted as needed to suit the District's requirements.

This appendix includes the following materials:

- Functional Plan Drawings
- Profile
  - For Typical Section refer to DNV's Spirit Trail Standards
- Cost Estimate Details

Maplewood Phase 3



URBAN systems

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APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	TR-01
1333.0040.03		Title

Trail Plan

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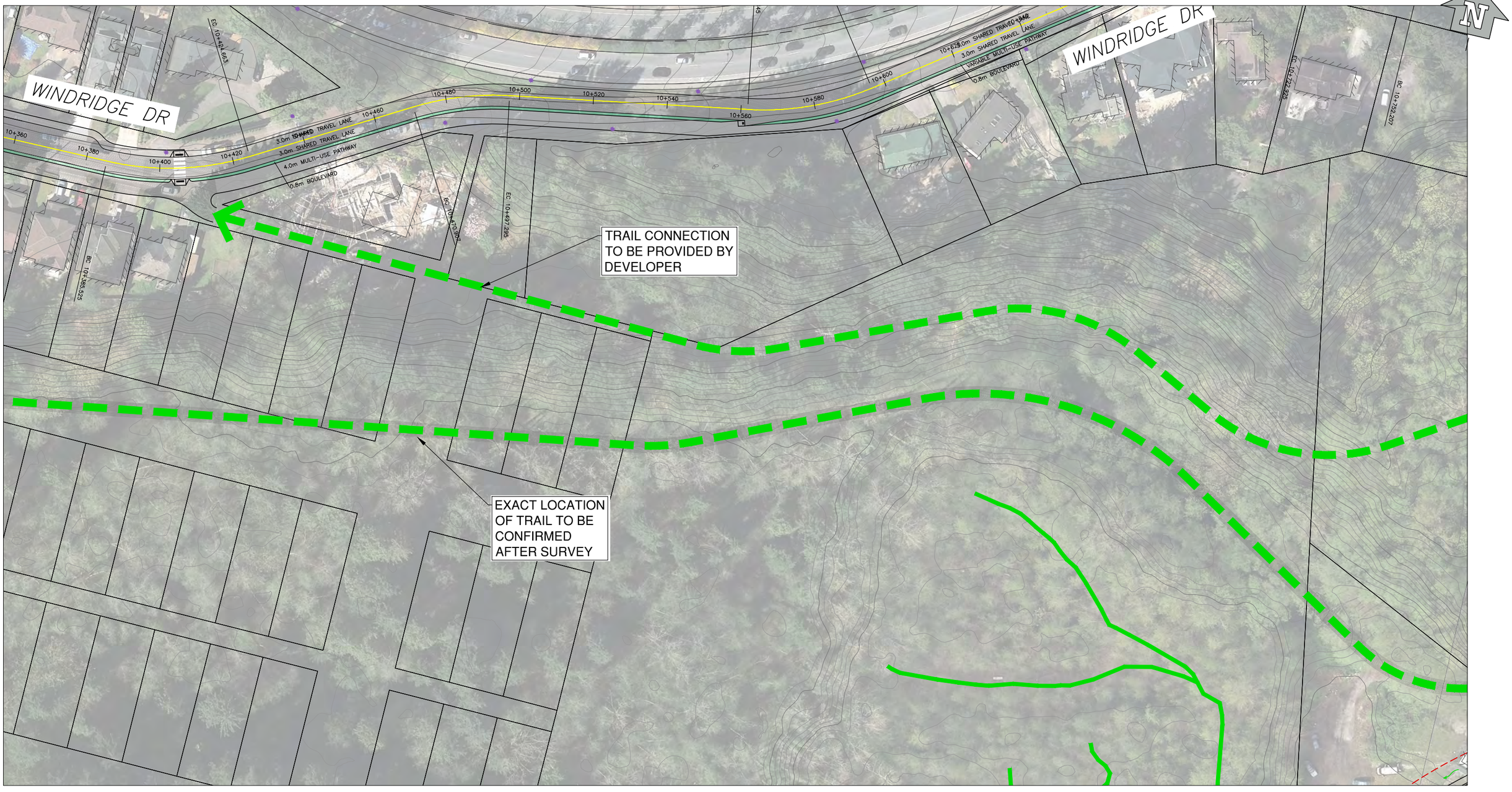

URBAN systems

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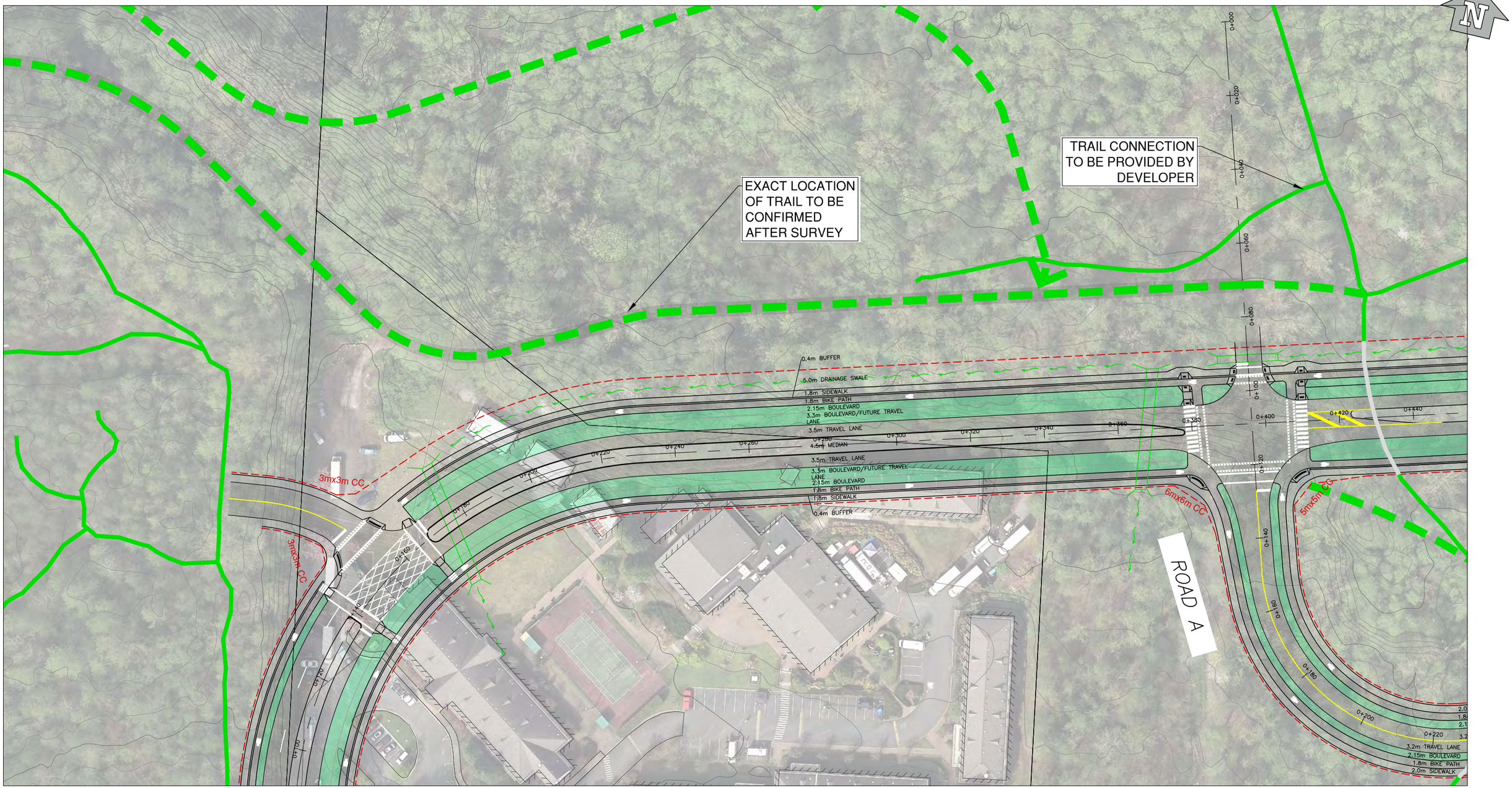
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	TR-02
1333.0040.03		Title

Trail Plan



URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

PROPERTY REQUIREMENTS REPRESENT MINIMUMS BASED ON AVAILABLE INFORMATION. FINAL REQUIREMENTS TO BE CONFIRMED AT LATER STAGES OF DESIGN.

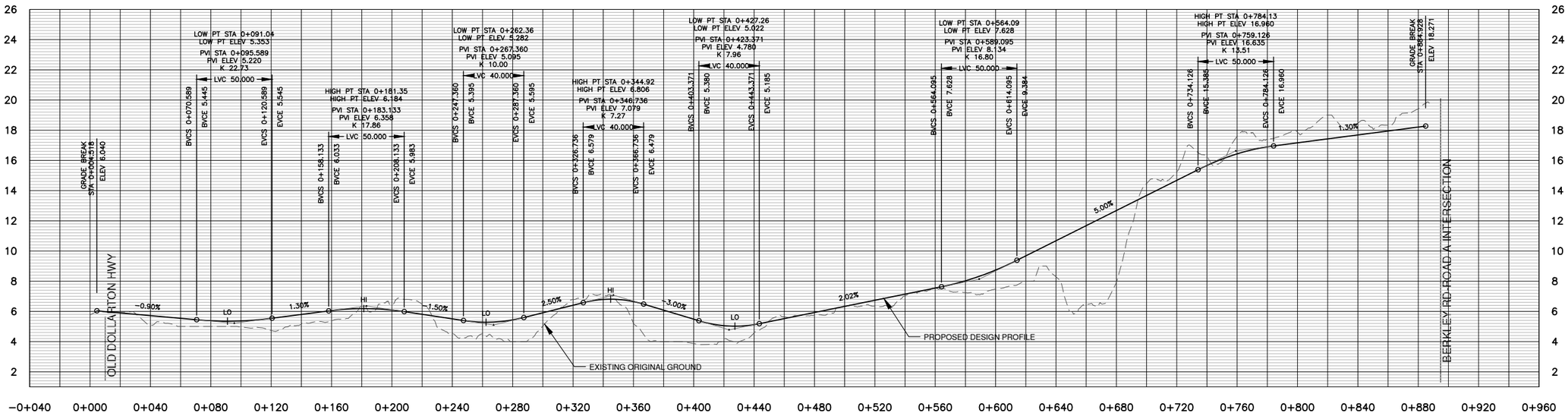
Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:1000	18-04-2018	TR-03
1333.0040.03		Title

Trail Plan

Appendix p-126

TRAIL 1 -0+040 to 0+960



URBAN systems

ISSUED FOR FUNCTIONAL DESIGN
APRIL 18, 2018
URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
H:1:3000	18-04-2018	TR-04
1333.0040.03		Title

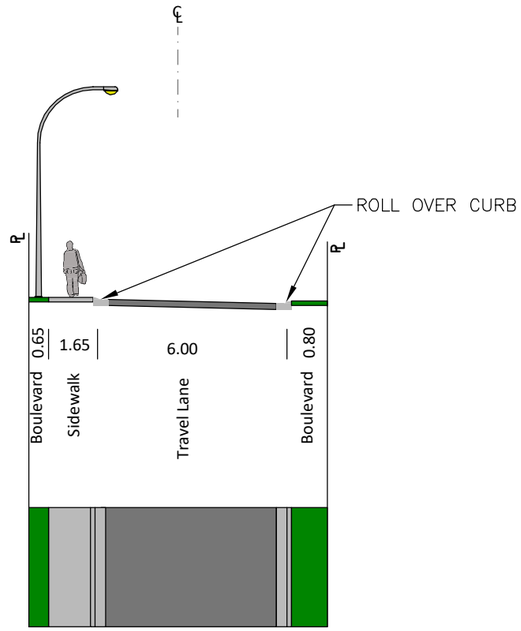
Trail Profile

Roadway Multiuse Path Trail
Extents Old Dollarton Road to Berkley Road
Right-of-Way Width 8
Length 885
Existing Roadway 0
Proposed Roadway 4

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	7080	$ 70,800
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	0	$ -
Bulk Tree Removal	m2	$ 2	7080	$ 14,200
Excavation (Cut)	m3	$ 70	1376	$ 96,400
Subgrade Fill and Compaction	m3	$ 40	5240	$ 209,600
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Local - Residential)	m2	$ 75	0	$ -
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	0	$ -
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	3540	$ 247,800
Pavement Markings	m	$ 60	443	$ 26,600
Street Light Relocation	ea	$ 12,000	0	$ -
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 66,540
SUBTOTAL COST ESTIMATE				**$ 731,900**
Contingency	40%			293,000
Engineering & Project Management (w/o contingency)	15%			110,000
TOTAL ROADWAY COST ESTIMATE				**$ 1,135,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

APPENDIX R - LANEWAYS



LN 1 TYPICAL LANE – COMMERCIAL/TOWN CENTRE

DISTRICT OF NORTH VANCOUVER SSD–R.6

URBAN systems

ISSUED FOR FUNCTIONAL DESIGN APRIL 18, 2018 URBAN systems

Client/Project
District of North Vancouver
Maplewood Phase 3

Scale	Date	Figure
1:200	18-04-2018	LN-T1
1333.0040.03		Title

Lane
Typical

Roadway Standard District Lane
Extents N/A
Right-of-Way Width 6.25
Length 100
Existing Roadway 0
Proposed Roadway 6

Description of Work	Unit of Measure	Unit Price	Quantity	Extended Amount
Site Preparation (localized compaction)	m2	$ 10	625	$ 6,300
Ex Asphalt Roadway Removal (Including Gravels)	m2	$ 40	625	$ 25,000
Excavation (Cut)	m3	$ 70	0	$ -
Subgrade Fill and Compaction	m3	$ 40	0	$ -
Sawcutting	m	$ 10	0	$ -
Pavement Structure (Local - Commercial/Industrial)	m2	$ 85	600	$ 51,000
Mill and Overlay	m2	$ 30	0	$ -
Extruded Curb	m	$ 130	0	$ -
1.5m Sidewalk (100mm)	m	$ 130	0	$ -
1.8m Sidewalk (100mm)	m	$ 150	0	$ -
Sod (1.2m Blvd)	m	$ 18	0	$ -
Sod (2.2m Blvd)	m	$ 33	0	$ -
Trees	ea	$ 700	0	$ -
Asphalt Multiuse Path/Bike Path	m2	$ 70	0	$ -
Pavement Markings	m	$ 60	100	$ 6,000
Street Light Relocation	ea	$ 12,000	0	$ -
Drainage Swale	lm	$ 250	0	$ -
Pedestrian Half Signal	ea	$ 200,000	0	$ -
Full Traffic Signal	ea	$ 350,000	0	$ -
Mobilization/Demobilization/Traffic Management	L.S.	10%		$ 8,830
SUBTOTAL COST ESTIMATE				**$ 97,100**
Contingency	40%			39,000
Engineering & Project Management (w/o contingency)	15%			15,000
TOTAL ROADWAY COST ESTIMATE				**$ 152,000**

SEE COVER PAGE FOR ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS