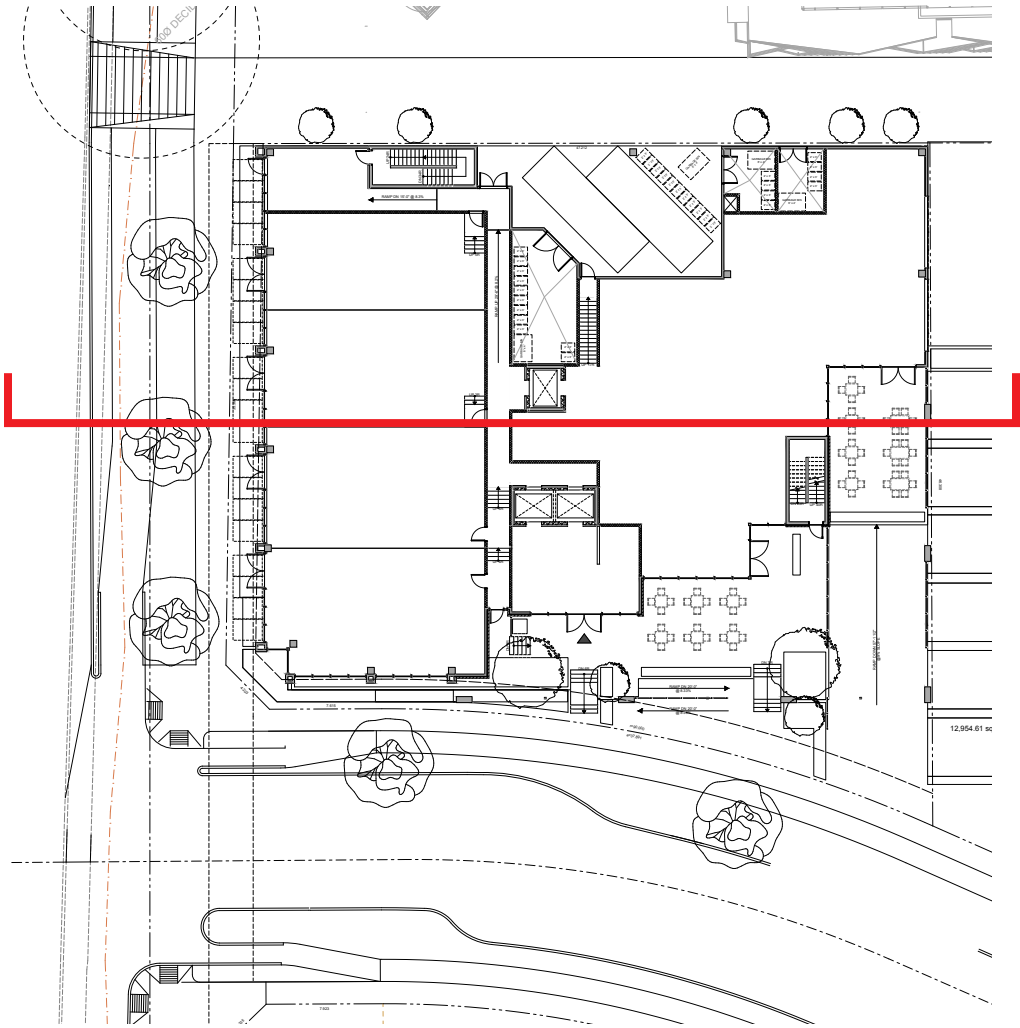
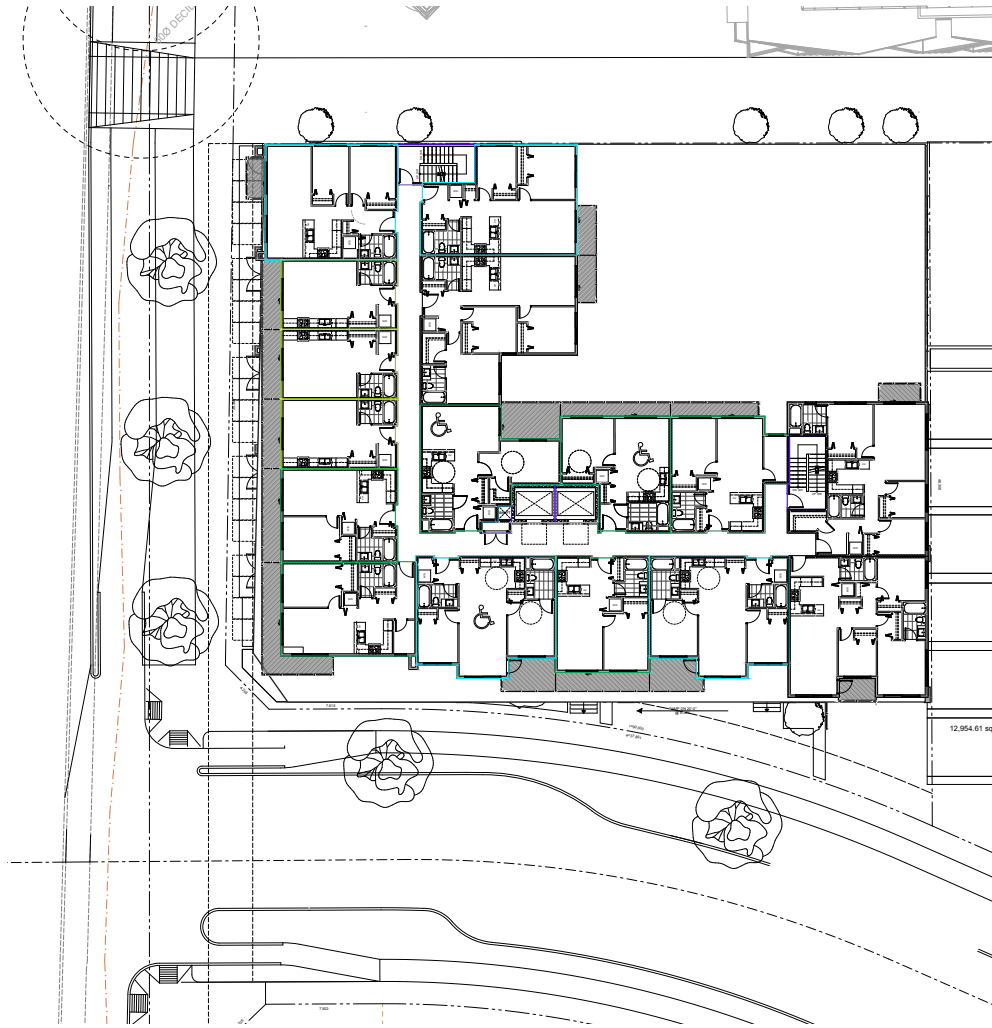


Phase 1 - Building C

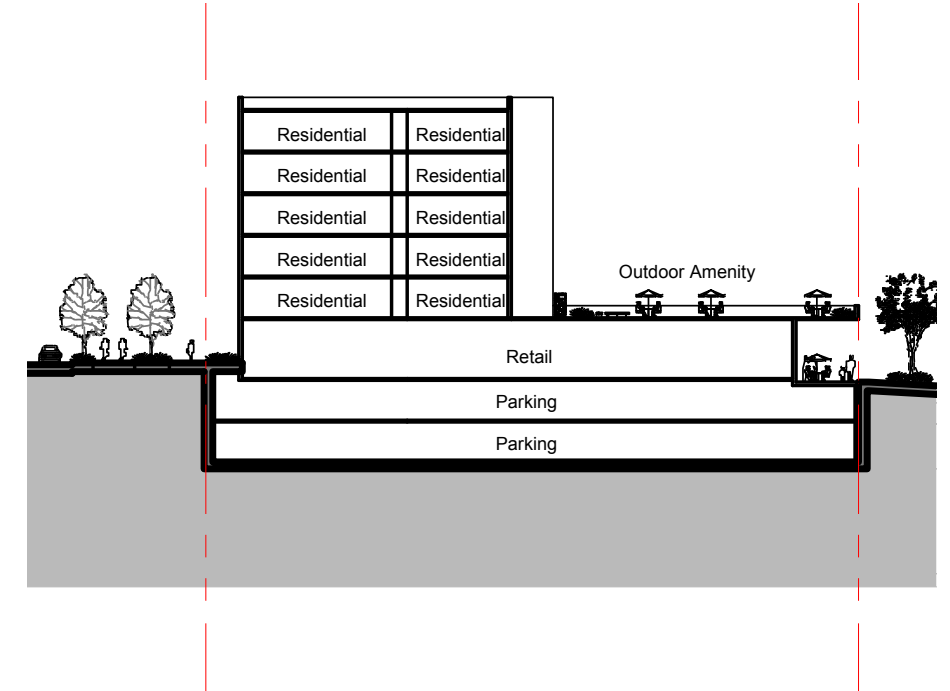
Level 1 Plan



Level 1 Plan



Typical Section



Phase 2

Phase 2 is located at the centre of the site and comprised of the Building D, the future City Park and the future Juneau Street.

Building D has a forty-six storey high-rise market residential tower connected to a five storey mid-rise rental residential podium. It will have approximately 394,890 sq ft of residential GFA and approximately 536 residential units. There is a small commercial component on the southwest corner of the parcel.

A future City Park will be located at north of Juneau Street, at the centre of the site.

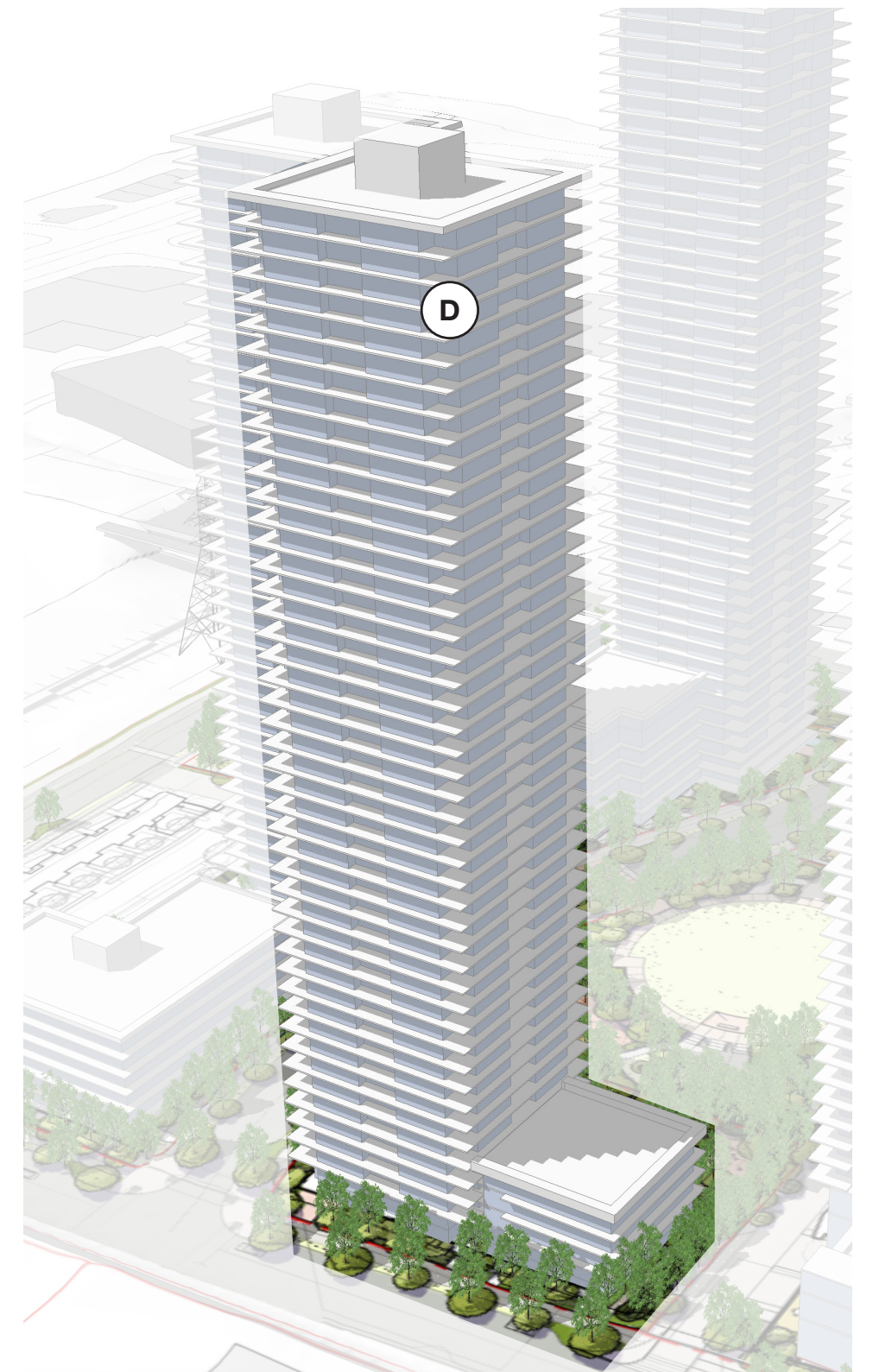
The eastern portion of Juneau Street will be constructed, providing connection to Alpha Avenue.

A portion Alpha Avenue will be reconstructed in accordance with the City of Burnaby Town Centre Standards.

Key Map



Parcel D - View from East



Phase 2 Statistics

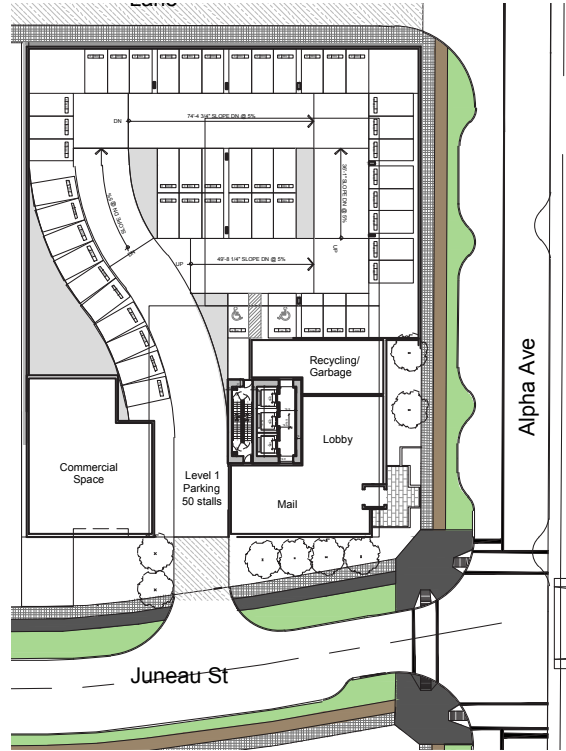
	Building	Area	Residential		Commercial GFA (sq ft.)	Building Height ²
			GFA (sq ft.)	Density ¹ (FAR)		
Phase 2	D	34,965	394,890	11.29	3,000	46
	Park	49,830	-	-	-	-
Total		84,796	394,890	4.66	-	-

¹To ensure a degree of flexibility to respond to future market influences, density may be shifted between parcels by up to 15% of the current proposed density.

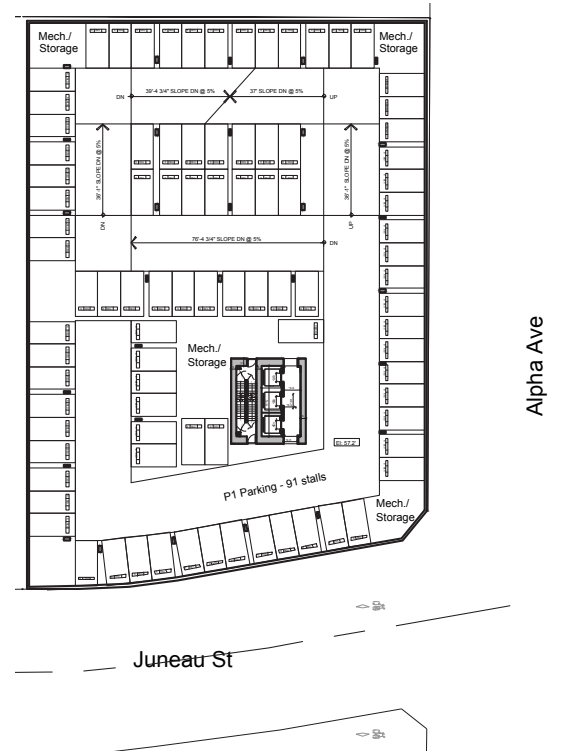
²Building heights may shift provided that the density transfer between parcels does not exceed 15% and that the guidelines for height and separation are met.

Phase 2 - Building D

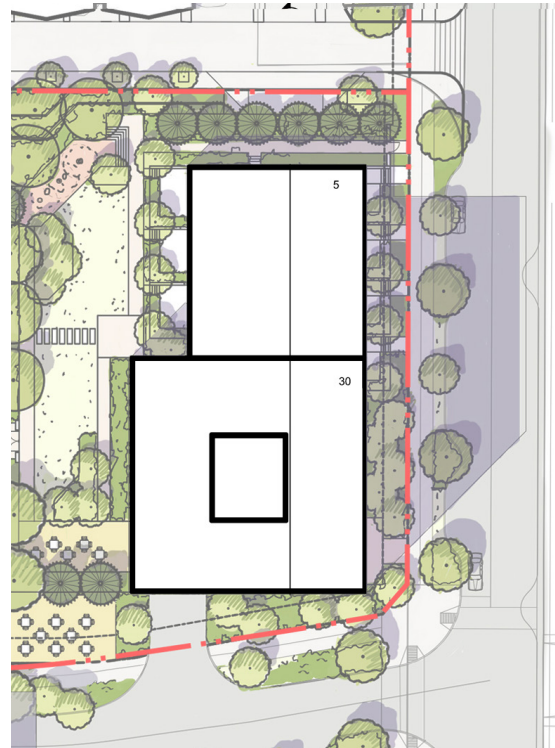
Level 1 Plan



Typical Parking Plan



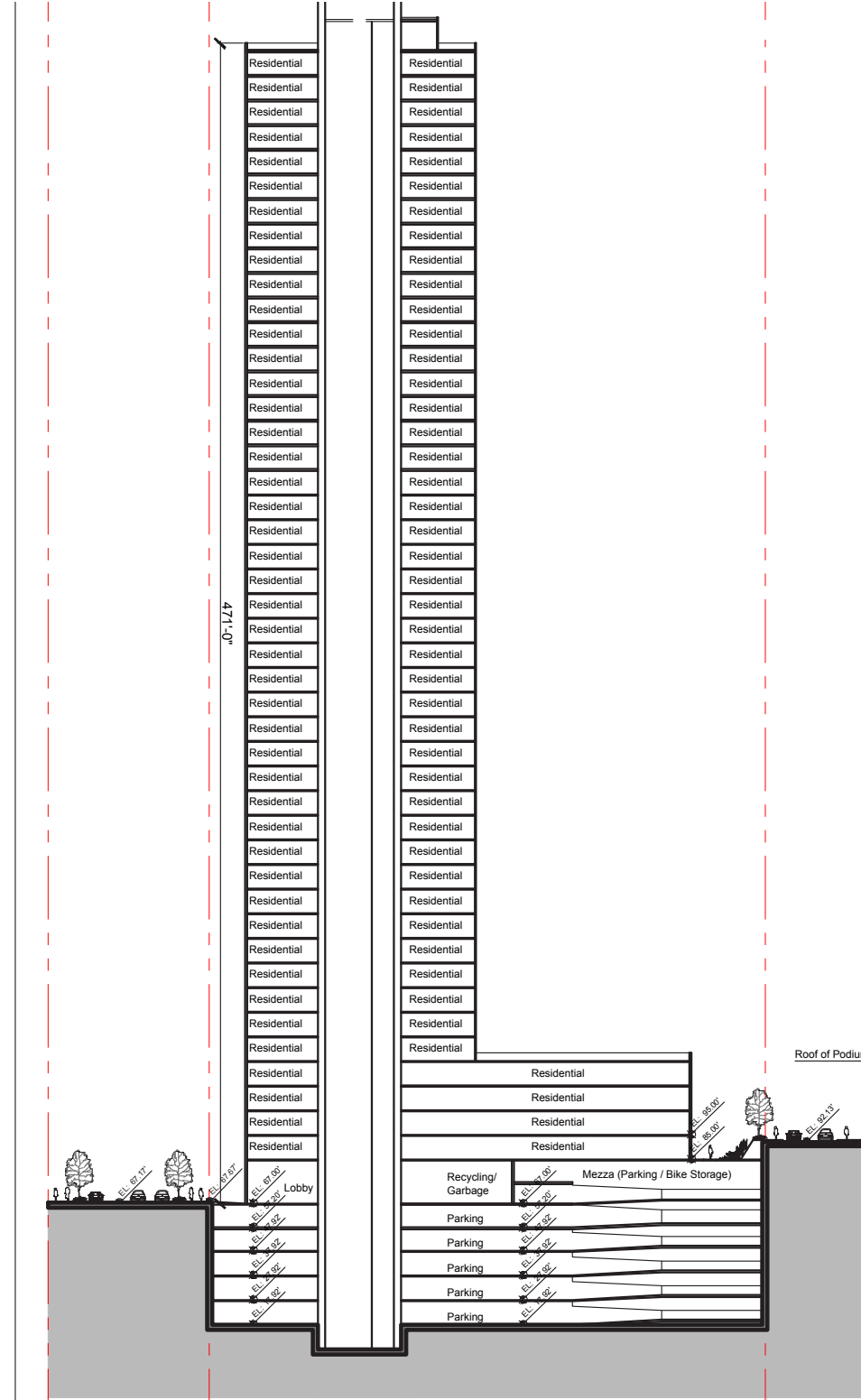
Roof Plan



Typical Upper Level Plan



Section



Phase 3

Phase 3 is located at the southwest corner of the site, bounded by Willingdon to the west, Alaska to the south, Juneau Street to the north and the 2421 Alpha Street site to the east. Two parcels, Building E, F and G will be constructed in Phase 3.

Building E has a forty-five storey residential tower at Willingdon and Juneau Street, with six storey podium fronting Juneau Street. Distinctive architecture will be chosen so that this high-rise residential tower reinforces the southern entrance in to the Brentwood Town Center. Building E has a total residential density of 414,445 sq ft, and approximately 580 residential units. A privately accessible at-grade open space will be provided on top of the parking podium roof and it will be accessible for residents of the parcel. Parking will be accommodated in five levels of underground parking and access from the lane on the east side.

Building F and G are located at the corner of Willingdon Avenue and Alaska Street, low-rise, six storey affordable rental buildings. Total rental density of the two buildings is approximately 105,600 sq ft, and approximately 157 affordable rental units. Lobbies of both buildings will be on Alaska Street and parking access from the lane on the east side.

A portion of Alaska Street will be reconstructed in accordance with the City of Burnaby Town Centre Standards.

Phase 3 Statistics

	Building	Area	Residential		Building Height ²
			GFA (sq ft.)	Density ¹ (FAR)	
Phase 3	E	39,840	414,445	10.40	45
	F & G	42,559	105,600	2.48	6
Total		82,399	520,045	6.31	-

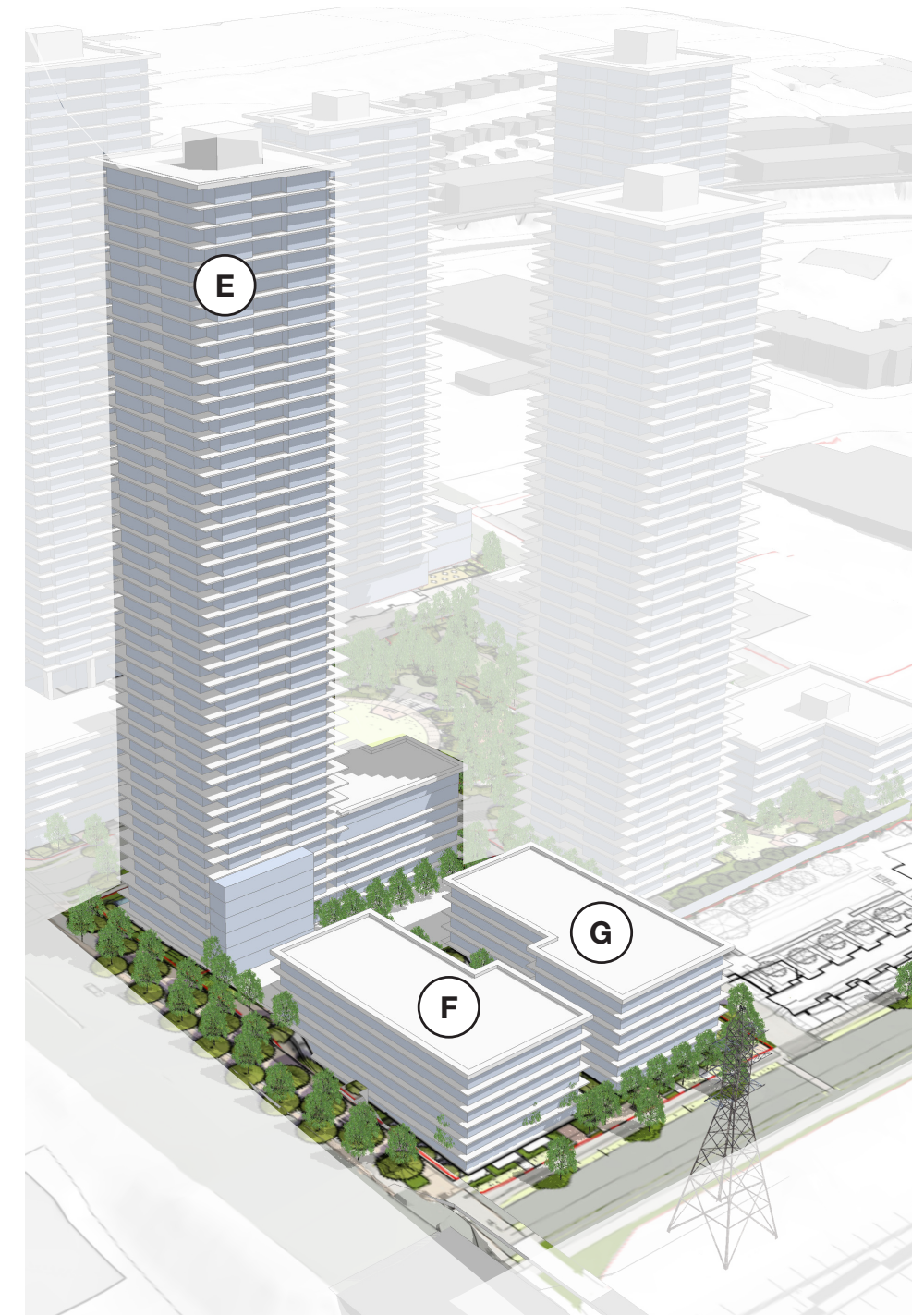
¹ To ensure a degree of flexibility to respond to future market influences, density may be shifted between parcels by up to 15% of the current proposed density.

² Building heights may shift provided that the density transfer between parcels does not exceed 15% and that the guidelines for height and separation are met.

Key Map

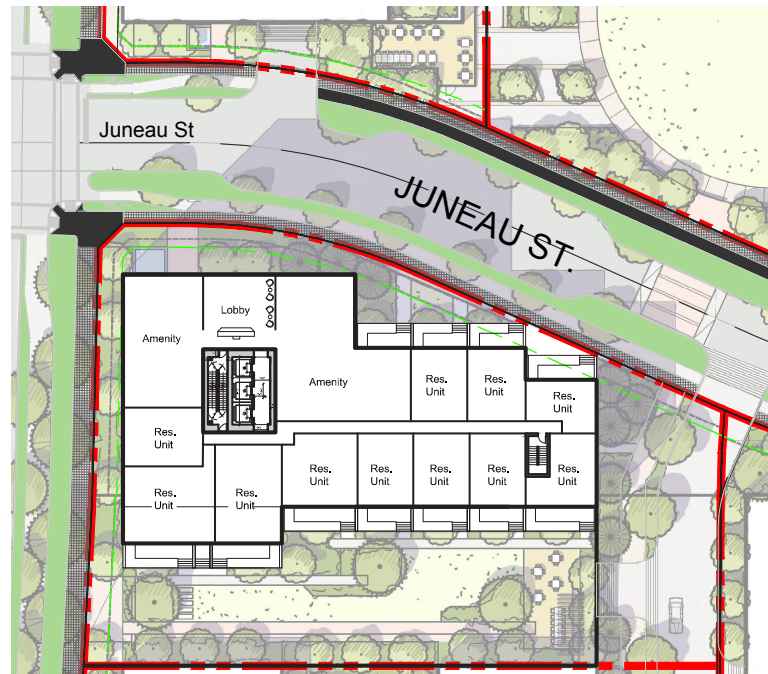


Parcel E - View from East

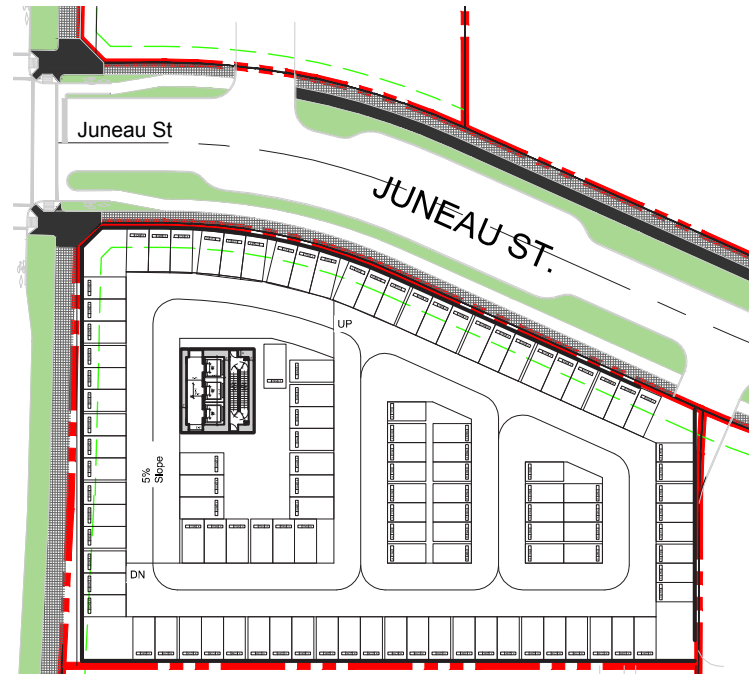


Phase 3 - Building E

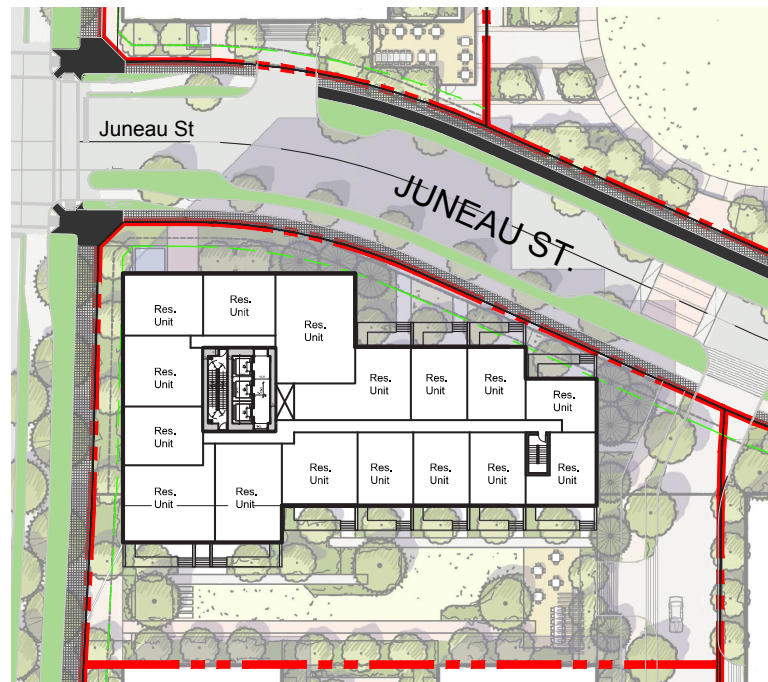
Level 1 Plan



Typical Parking Plan



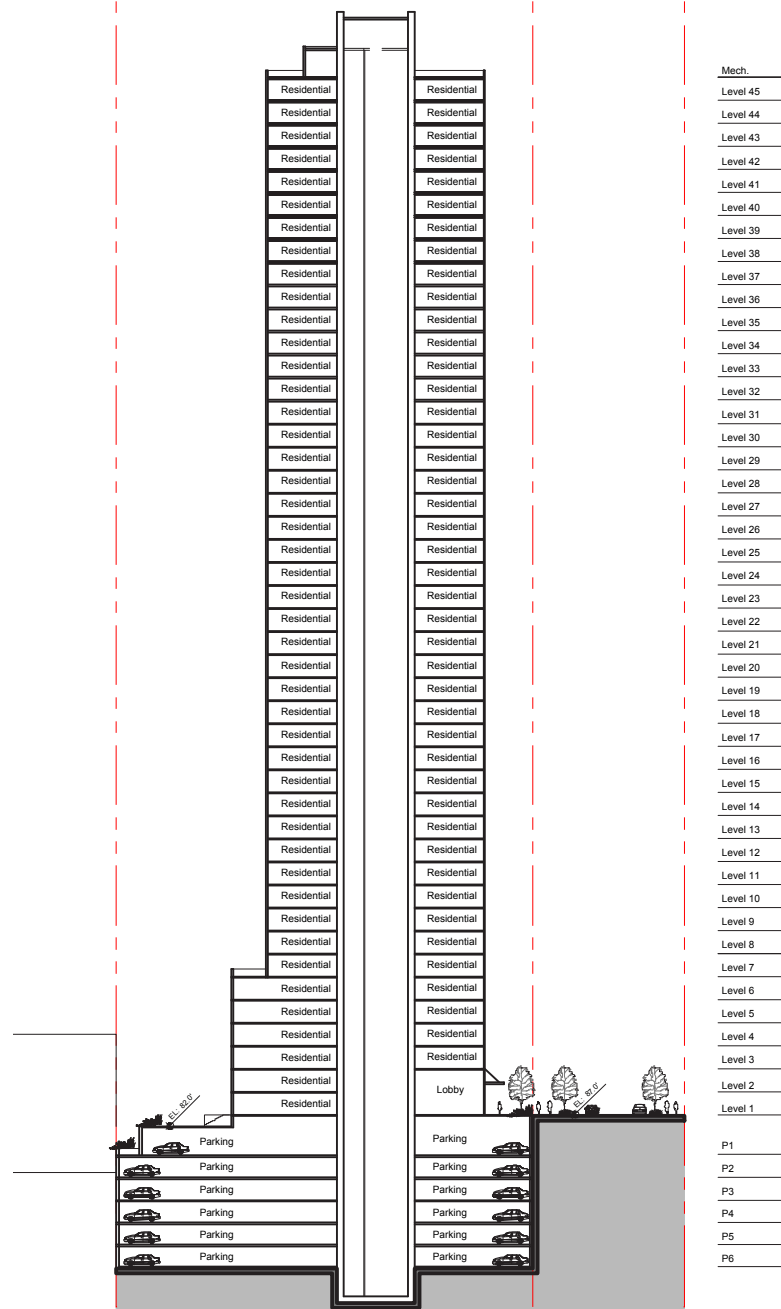
Typical Upper Level Plan



Section

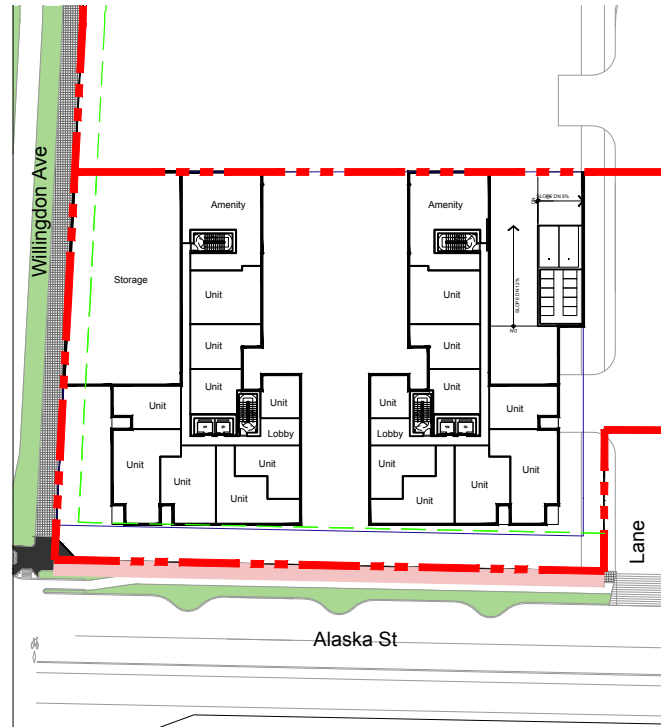
Parcel C

Juneau St



Phase 3 - Building F & G

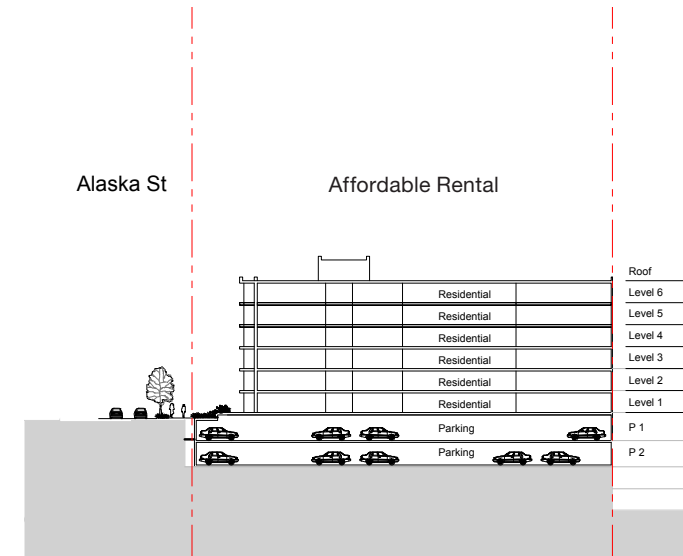
Level 1 Plan



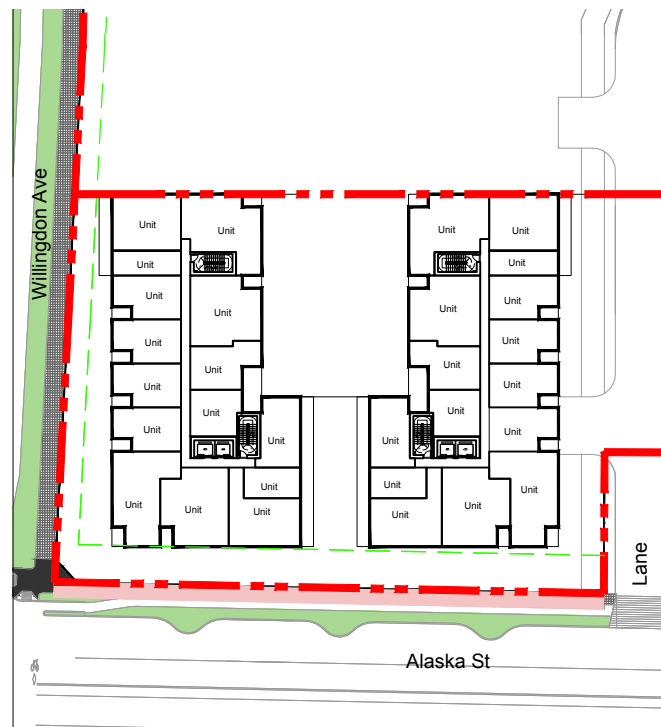
Typical Parking Level



Typical Section



Typical Upper Level Plan



Phase 4

Phase 4 is at the eastern edge of the site, bounded by Juneau Street to the north, Alpha Avenue to the east, 2421 Alpha Avenue site to the south and Building E, F and G to the west.

Phase 4 has a forty-two storey high-rise residential tower, fronting Juneau Street, which has approximately 308,911 sq ft of market strata residential GFA with 417 units and approximately 32,612 sq ft of market rental GFA with 51 units. Parking access from the lane on the west side.

Phase 4 also includes a low-rise rental building at the corner of Juneau street and Alpha Avenue, which has approximately 72,000 sq ft GFA, with approximately 113 rental units. Parking access to be from Alpha Avenue, align with the parkade entrance on the other side of the street.

A portion of Alpha Avenue will be reconstructed and the southern edge of Juneau adjacent phase 4 will be completed in accordance with the City of Burnaby Town Centre Standard for Local Roads.

Phase 4 Statistics

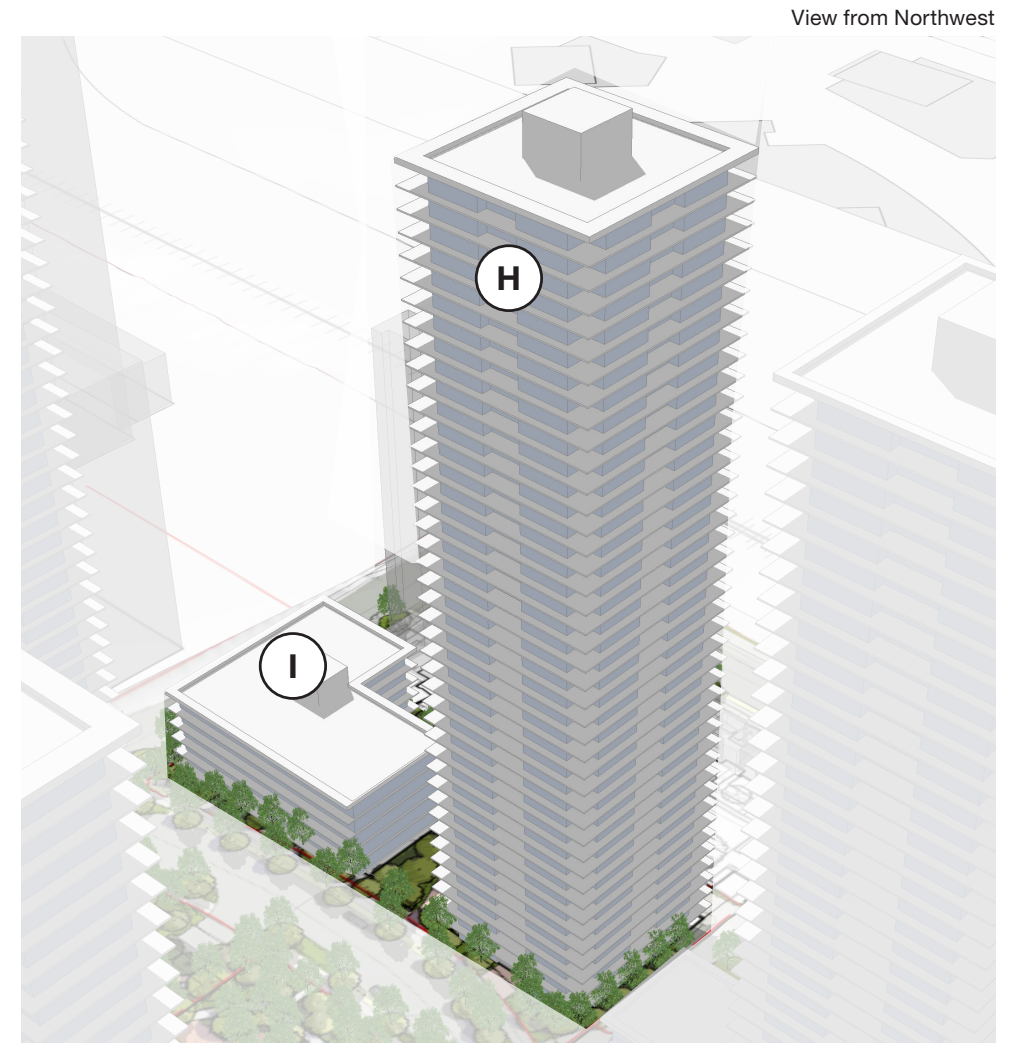
	Building	Area	Residential		Building Height ²
			GFA (sq ft.)	Density ¹ (FAR)	
Phase 4	H	42,284	341,523	9.78	42
	I		72,000		6
Total		42,284	413,523	9.78	-

¹To ensure a degree of flexibility to respond to future market influences, density may be shifted between parcels by up to 15% of the current proposed density.

²Building heights may shift provided that the density transfer between parcels does not exceed 15% and that the guidelines for height and separation are met.



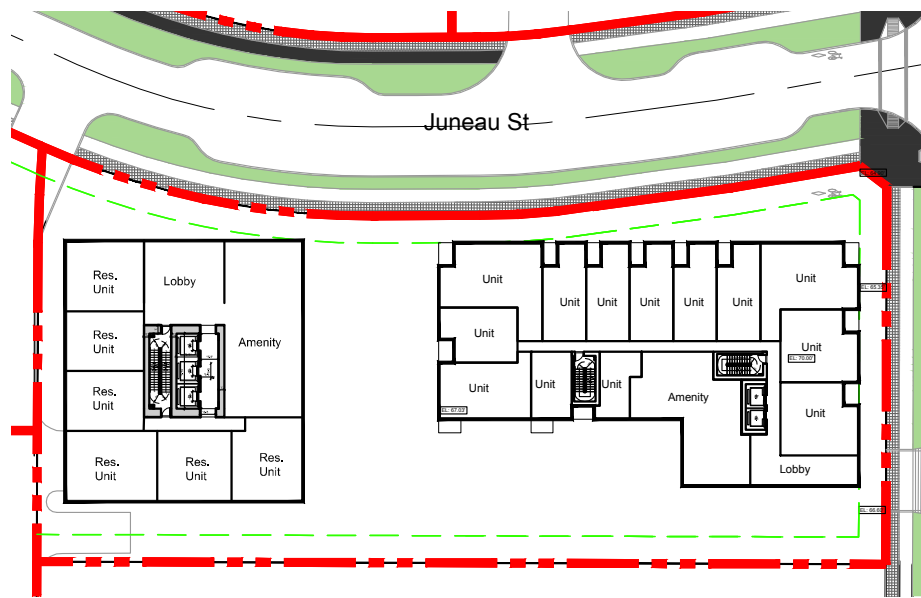
Key Map



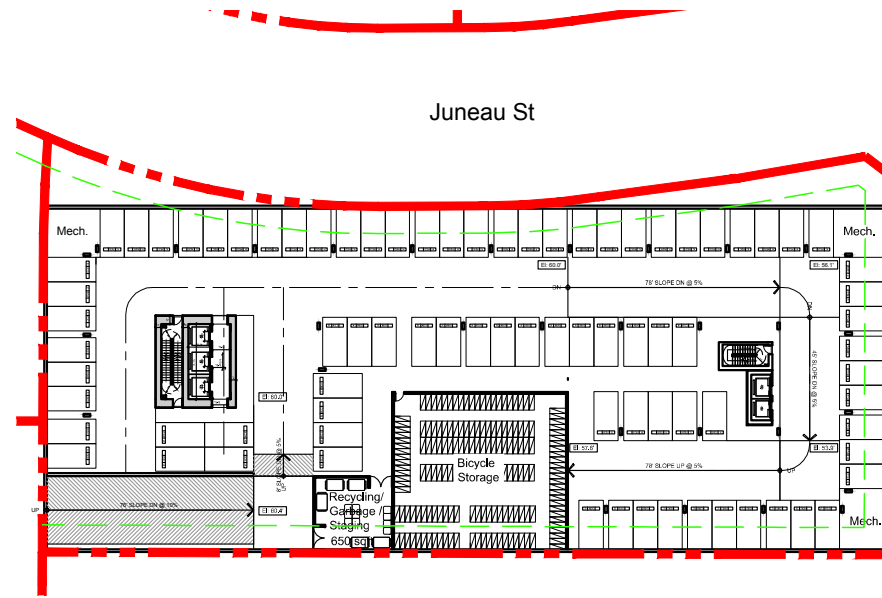
View from Northwest

Phase 4 - Building H & I

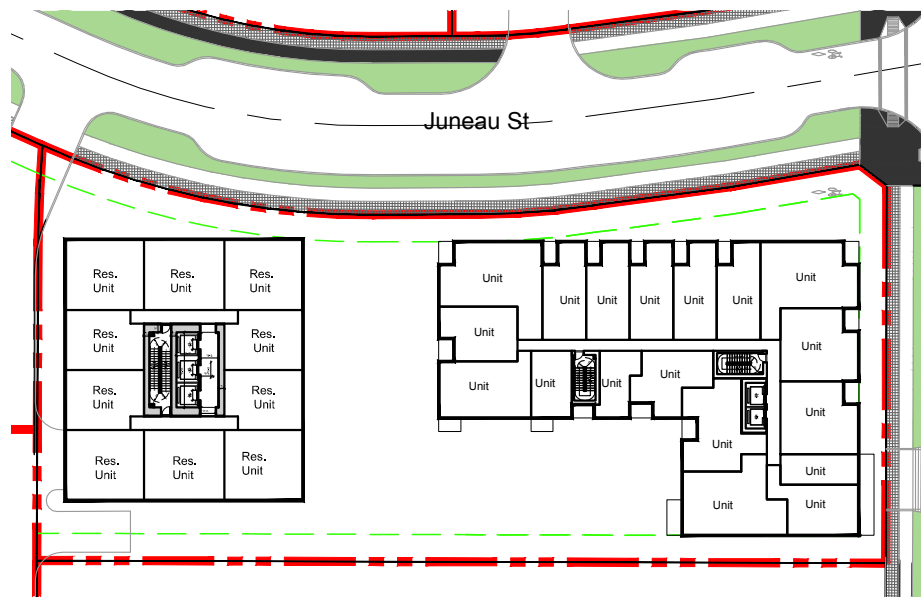
Level 1 Plan



Typical Parking Plan

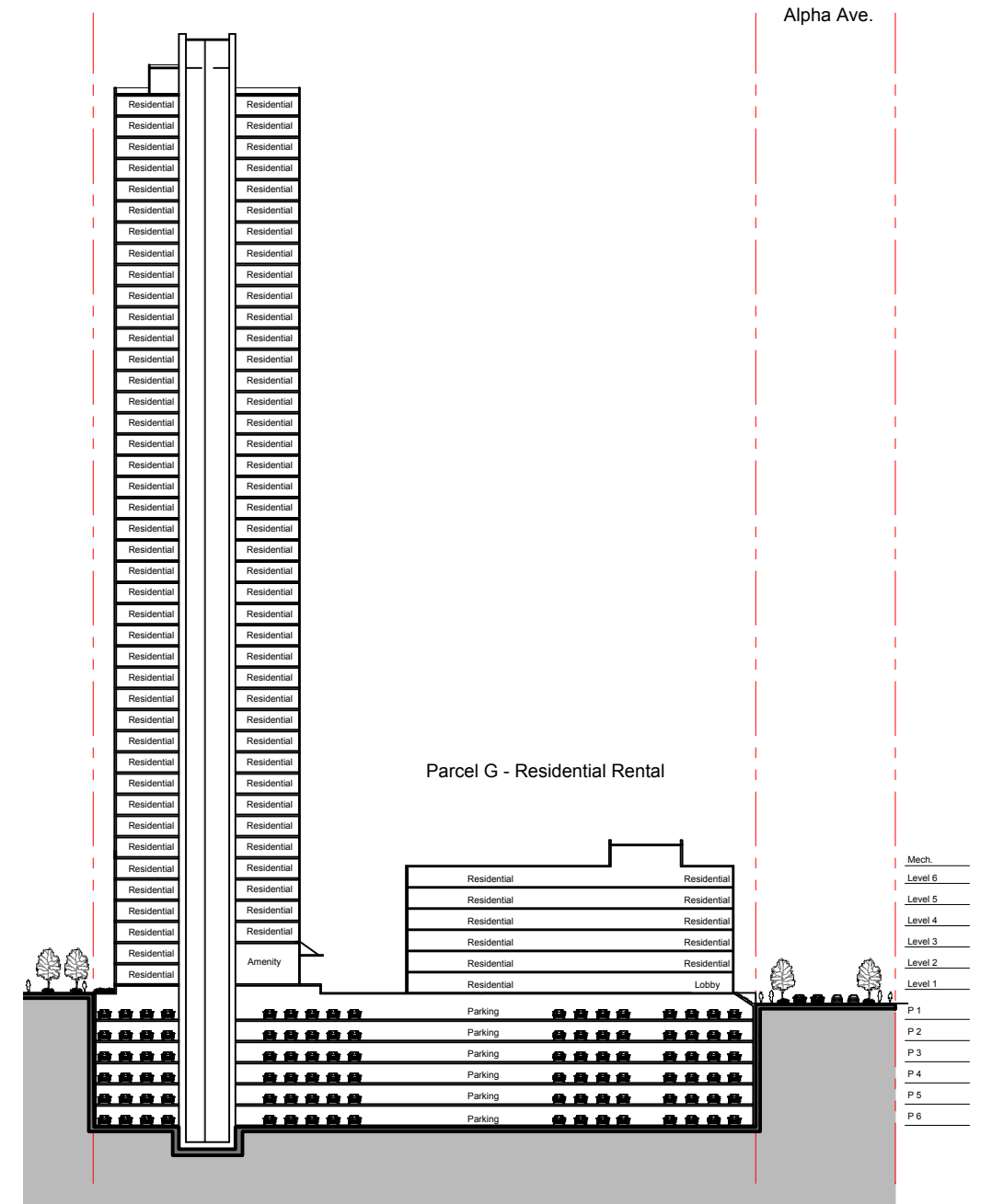


Typical Upper Level Plan



Section

Parcel G - Residential Tower



Engineering Master Plan (EMP)



The 'Grove' Masterplan Rezoning

Civil Design Brief

Brentwood Willingdon Projects Ltd.
1600-570 Granville Island
Vancouver BC Canada, V6C 3P1
#17-0413
27th September, 2019

Reviewed by:
Russell Warren, P.Eng, LEED Green Associate
Senior Project Manager, Associate

Prepared by:
Thomas Cogan, EIT
Project Engineer

R.F. BINNIE & ASSOCIATES LTD.
300 - 4940 Canada Way,
Burnaby, BC V5G 4K6
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1.0 INTRODUCTION

Brentwood Willingdon Projects Ltd. is proposing to redevelop the properties located around 2350 Willingdon Ave in the Brentwood neighbourhood of Burnaby, BC as part of the Grove Masterplan Development. The proposed project involves rezoning of the subject properties currently zoned M1 to allow for the construction of a multi-family residential development complete with four high-rise towers and ground level townhouse units above a shared underground parkade. The proposed project also includes the construction of three office buildings and commercial retail. The total project area is approximately 8.34 acres (3.376 hectares). The total density is 2,092,545 SF, and the total units are 2,807. The project will involve a major redevelopment of the site including rezoning and consolidating the six existing lots, upgrading existing water mains and sewers, and the construction of new roadworks both internally and externally to the development site.

R.F. Binnie & Associates has been engaged by the developer to review the civil infrastructure requirements for the proposed development. This design brief will provide a preliminary review of the following infrastructure:

- road systems
- water distribution systems
- sanitary systems
- storm sewers and stormwater management
- electrical and communications utilities

This report aims to identify the required upgrades to existing infrastructure external to the proposed development site and will also be discussed throughout this report. This report is considered preliminary only and is intended to provide an overall review of the road and servicing impacts of the proposed development. The findings of this report are preliminary in nature and are not intended to be relied upon without further refinement and analysis throughout the development process. It is assumed that all works will be designed and constructed in accordance with City of Burnaby standards and specifications. Required or recommended exemptions from standard requirements will be identified in this document, if necessary. Finalized copies of the appendices contained within this report are to be submitted to the City of Burnaby prior to the finalization of Rezoning.

2.0 SITE CHARACTERIZATION

The existing site located at 2350 Willingdon Avenue, consists of a mixture of vacant lots and commercial properties within close proximity to the Brentwood Skytrain Station and Town Centre. The proposed development site has a gradual slope of approximately 5.3% from the northwest to the southeast of the site. A detailed geotechnical investigation will need to be completed for the individual proposed building excavations and construction.

The proposed land is in the Brentwood area and is bound between Dawson Street and Alaska Street to the north and south respectively, and Willingdon Avenue and Alpha Avenue to the west and east respectively. The existing lots are currently zoned M1, M2r, and M5 and include vacant lots and

commercial properties. The proposed project will involve a major redevelopment of the site including consolidation of the existing lots. The proposed development encompasses the entire site and will include extensive commercial/retail space, five high-rises, office buildings with retails, three residential rental buildings.

The Grove Masterplan Development Site will be developed over time, with the pace of development reflecting market conditions. Phase 1 will begin with the development of the Parcel A, B and Parcel C adjacent to Dawson Street, Willingdon Avenue (north) and Alpha Avenue (north). This will be followed in Phase 2 by the development of Parcel D, Juneau Street R.O.W and the future City Park. Phase 3 includes Parcel E, F and G located at the south-west corner of the development site fronting Willingdon Avenue (south) and Alaska Avenue. Phase 4 will be the final stage of and will develop land Parcels H and I fronting Juneau Street and Alpha Avenue (south).

To ensure a degree of flexibility to respond to future market influences, floor area may be shifted between parcels by up to 15% of the current proposed area provided that the cumulative area at full build out does not exceed the maximum allowable residential density of 4.45 FAR, commercial retail / office density of 2.2 FAR, affordable rental density bonus of 0.75 FAR and provided the guidelines for building heights, floor plate areas and separation are met accordingly.



Figure 2-1 – Brentwood Development Phase Plan

Table 2-1 – 2-4 summarize the quantities of proposed commercial, residential and office spaces, and other site information based on building statistics from the architectural consultant, as well as the anticipated timing for the phase to achieve occupancy. Land dedications noted in the tables below relate to the construction of the park land as part of Phase 2 mentioned above and detailed in Figure 2-1. It is also noted that dedications are proposed along the Dawson, Willingdon and Alaska site frontages.

Table 2-1: Site Area Calculation

Site Area Calculation		
	Sq ft.	Sq m.
Existing Site	363,425.1	33,763.3
Dedications	61,784.9	5,740.0
Final Site Area	301,640.3	28,023.3

Table 2-2: Site Density and Timing

Stage	Building	Density			Timing	
		Total Residential GFA (sq ft.)	Total Commercial GFA (sq ft.)	Total Office GFA (sq ft.)	Assumed Rezoning Timing	Assumed Construction Timing
Phase 1	A+B+C	712,230	24,026	23,831	2019	2020
Phase 2	D	394,890	3,000	0	2020	2021
Phase 3	E+F+G	520,045	0	0	2021	2022
Phase 4	H+I	413,523	0	0	2023	2024

Table 2-3: Building Units

Building Unit Count			
Stage	Building	Market Units	Rental Units
Phase 1	A+B+C	873	80
Phase 2	D	536	0
Phase 3	E+F+G	580	157
Phase 4	H+I	468	113

Table 2-4: Site Parking and Loading

Stage	Building	Vehicle Parking		Bicycle Parking		Loading	
		Required	Proposed	Required	Proposed	Required	Proposed
Phase 1	A+B+C	2807	1,037	5912	2,001	22	12
Phase 2	D		553		1,125		3
Phase 3	E+F+G		660		1,565		4
Phase 4	H+I		557		1,221		3

The proposed redevelopment will consist of a ground level City park, five high-rise residential towers with other commercial and office spaces. The high-rise towers will be positioned above their own independent underground parkades and will also include extensive lower floor commercial/retail space, individual residential, and office towers (see **Appendix A: Site Plan**). Designated 'shared' parkades which are separate to the independent parkades are proposed as part of the masterplan, however these have not yet been detailed and will be instead be included as part of the architectural drawings at the detail design phase of the development. The ground level will be finished by integrating green space with hardscape pathways and courtyards.

3.0 ONSITE/OFFSITE CONTAMINATION

The development site is currently in use by Olympia Tile as well as other minor commercial businesses. No formal contaminated risk assessment has been carried out for the site and is therefore not included as part of this brief. The City of Burnaby's latest Engineering Master Plan submission standards requires the identification of 'Schedule 2' activities which may have been carried out over the site as defined under BC's Contaminated Site Regulations. Upon review of what constitutes a 'Schedule 2' activity under these contamination regulations, it is reasonable to conclude that these such activities have not occurred recently over the development site. Therefore, the proposed development does not require a Contaminated Sites Legal Instrument at this stage, however it is recommended that this be carried out by an appropriately licensed consultant for confirmation. A copy of this investigation is to be provided to the City under separate cover.

4.0 NOISE MANAGEMENT

The development site, located in the Brentwood area, is impacted by various potential noise sources. Mobile sources of noise, especially cars and trucks, are the most common and significant sources of noise for the proposed site. For the development site, the most significant source of noise is expected from Willingdon Avenue and Dawson Street due to the high volume of traffic, and from the nearby railway along the south of Alaska Street. The noise contamination from the train can be effectively controlled given the current buffer width from the existing railway line to the southern property boundary along Alaska Street. In order to reduce the noise from Willingdon Avenue and Dawson Street, the proposed buildings will be setback a minimum 8m from the roadway. For mitigating the noise pollution from Alpha Avenue and Alaska Street, a minimum 10m setback will be used.

Other sources of noise are the various land uses including residential and commercial activities. In general, the land use adjacent to the proposed site area is mainly established commercial and residential development. East of the proposed site, a high-rise is developing and assumed to be completed prior to this application. There is a vehicle body shop and flooring dealer shop located to the south of proposed site. Another car body shop located to the north of proposed property, which is separated by Dawson St. All of the existing industrial uses are expected to be converted in to residential / commercial uses as the Brentwood area redevelops.

The proposed development will be evaluated by an Acoustical Consultant with respect to Burnaby's Noise Policy Guidelines and CMHC's "Road and Rail Noise: Effects on Housing."

5.0 ROADS

The proposed development fronts Willingdon Avenue, Alpha Avenue, Dawson Street and Alaska Avenue. These roads are in good condition however they will need to be upgraded to conform with the City of Burnaby's latest Town Center Road Standards. Widening and new construction will be required along each of the site and a proposed extension of Juneau Street across the middle of the proposed site will connect with the Willingdon Street and Alpha Street. The proposed expansion of the

cyclist and pedestrian amenities along Willingdon Avenue, Alpha Avenue, Dawson Street and Alaska Avenue will require additional land dedication from the subject property. Proposed Juneau Avenue will be a public road and will require a road construction for the full road width. Willingdon Avenue, Alpha Avenue, Dawson Street, Alaska Avenue and new Juneau Street are owned by City of Burnaby, all other on-site lanes are private property. See **Appendix B** and **Appendix C** for Proposed Roadworks and Road Dedication details.

5.1 WILLINGDON AVENUE

Currently, the northbound of Willingdon Avenue has two travel lanes and a single HOV lane. The proposed modification to Willingdon Avenue involves creating a 1.50m-wide boulevard located between the travel lane and 3.00m-wide cycle track. Another 2.60m-wide boulevard will be used to separate the 3.00m-wide cycle track and a 2.60m-wide proposed Rainwater Management Amenity as per the City of Burnaby's requirement. The existing traffic signal at Willingdon Avenue and Dawson Street will be upgraded. A signalized intersection is proposed on Willingdon Avenue at proposed Juneau Street to improve vehicular access to the site. The left traffic lanes asphalt will be repaved. Streetlights will be installed along the east side of the Willingdon Avenue per City of Burnaby Standards. The City has advised that the Willingdon Bridge is sensitive to movement and there are plans to demolish and reconstruct sometime in the near future. The condition of the bridge will be monitored during construction.

5.2 DAWSON STREET

Dawson Street currently has one travel lane in each direction plus a travel/parking lane in each direction. Proposed upgrades to Dawson Street consist of adding one traffic lane in each direction and installing a new 1.80m-wide boulevard, 4.00m-wide cycle track, and 2.00m-wide sidewalk on the south side of street. Dawson Street will be constructed as a full depth pavement up to the existing concrete curb on the north side of Dawson Street.

5.3 ALPHA AVENUE

Alpha Avenue currently has one lane in each direction plus parking space along both sides of Alpha Avenue. According to the project development scope, proposed upgrades to Alpha Avenue consists of reducing the width of share lane on the west side of Alpha Avenue to a standard travel lane and creating a parking room along the avenue which is separated by boulevard bump out. A new 1.20m-wide boulevard, 1.5m-wide cycle track, and 1.50m-wide sidewalk will be installed along the west side of the avenue per City of Burnaby Town Centre Local Road Standards.

5.4 ALASKA STREET

Alaska Street currently has one lane in each direction plus parking space along the north side of the street. Proposed upgrades to Alaska Street includes reducing the width of share lane on the north side of Alaska Street to a standard travel lane with parking room along the street which is separated by boulevard curb bulges out. A new 1.20m-wide Boulevard, 1.5m-wide cycle track and 1.50m-wide sidewalk will be proposed along the north side of Alaska Street. The City has advised that there a

realignment of Alaska avenue is to occur and will coincide with the demolition and reconstruction of Willingdon Bridge.

5.5 PROPOSED JUNEAU STREET

The proposed Juneau Street will be aligned through the centre of the development site. This access road will consist of two lanes (one in each direction), street parking with boulevards curb bulges, 1.50m-wide boulevard, 1.50m-wide cycle track, and 1.50m-sidewalk. Along the street, several driveways will be installed to improve vehicular access to the site. Proposed Juneau Street is proposed as a public road within a 20m right-of-way for public access and use per City of Burnaby Centre Local Road Standard.

6.0 WATER

The exiting lots are serviced from by the City of Burnaby’s municipal water system. There is an existing 200mm ductile iron water main running along Dawson Street, which was built in the year 1977 and connects to a newly upgraded 250mm ductile water main located towards the western end of Dawson Street. This re-development will be responsible for upgrading the existing 41-year-old 200mm ductile iron water main along Dawson Street to a 300mm ductile iron water main (refer below). The development proposes to extend Juneau Street from Willingdon Avenue to Alpha Avenue. As a result, one 250mm ductile iron water main is proposed to be constructed along this extension of Juneau Street and will connect to the existing water mains located on Willingdon Avenue and Alpha Avenue.

Willingdon Avenue has an existing 250mm ductile iron water main which was built in 2015. Alpha Avenue has an existing 250mm ductile iron water main which was upgraded in 2011. For Alaska street, there is an existing 200mm ductile iron water main which was just upgraded in 2011.

Domestic water demand and fire flow requirement for the site will increase due to the proposed development. The preliminary water demand estimated are based on building statistics provided by the architectural consultant and a “persons per unit” (PPU) of 2.8 as specified by the City of Burnaby Design Criteria Manual. The preliminary estimate of domestic and fire flow demands are shown as in the following table.

Table 6-1: Water Demand

Water Demand			
Stage	ADD (L/s)	MDD (L/S)	PHD (L/s)
Domestic Demand			
Phase 1	11.1	16.6	22.2
Phase 2	6.3	9.4	12.5
Phase 3	8.4	12.6	16.8
Phase 4	6.6	9.9	13.2
Full Site	32.4	48.5	64.7
Fire Flow Requirement (per FUS)		F (L/s)	
Phase 1	283.3		
Phase 2	133.3		
Phase 3	266.7		
Phase 4	216.7		
Full Site	266.7		
Total Requirement (MDD+Fire)	48.5 (L/s) + 266.7 (L/s) = 315.2 L/s		

Based on the city development requirement and preliminary estimates, an upgrade from the existing 200mm water main to a 300mm water main along Dawson Street will be required. Approximately 190m of 300mm ductile iron water main is anticipated for upgrade along Dawson Street. With the extension of Juneau Street, a further 280m of 250mm ductile iron water main is expected to connect between the existing water mains on Willingdon Avenue and Alpha Avenue.

The size and location of the proposed water main upgrades are preliminary only. Sizing requirements will be refined during the detailed design of each phase in coordination with the City of Burnaby. All flow estimates are approximate and will also need to be updated during the detailed design phase. See **Appendix D** and **Appendix E** for Water Domestic Flow Estimate and Fire Flow Estimate.

Water service will be provided to the development by construction of new water service connections for each residential tower, each office tower, town homes and day care. Separation of the water services in this manner allows for simplicity in metering the water consumption of each parcel. Preliminary sizes and locations of the proposed water services are shown on **Appendix F** Proposed Waterworks.

This development is located within a water pressure zone in which the City of Burnaby has identified some deficiencies due to future water demand predictions. The developer will be required to contribute

an amenity fee established by the City of Burnaby to assist with the water network upgrade requirements.

7.0 SANITARY

The exiting properties are serviced from the City of Burnaby’s municipal sanitary system. An existing sanitary main currently runs along Willingdon Avenue and was built over 50 years. It is anticipated that only part of the proposed development will actually be serviced by this sanitary main in the future. Discussions with the City of Burnaby has identified that this existing sanitary main may be upgraded in the future with the development of the properties located on the western side of Willingdon Avenue. This is currently being reviewed by the City’s staff and as a result, no upgrade is proposed for this sanitary main as part of these development works.

An exiting 250mm PVC sanitary main runs along the southern two-thirds of Alpha Avenue and was recently upgraded in 2017. The remaining portion of the sanitary main along the northern portion of Alpha Avenue is a 200mm PVC sanitary main was built in 1967 and has not been upgraded. All the sanitary along Alpha Avenue is collected by an existing 425mm concrete downstream sanitary sewer east of Alpha Avenue.

Sanitary flow estimates are based on criteria outlined by the City of Burnaby Design Guideline Manual. According to the manual, a specified infiltration rate of 11,200 liters per hectare per day and an assumed 2.8 capita per unit population and have been adopted as part of this report. It is to be noted that some acceptable assumptions have been made during the estimating process. All flow estimates are approximate and will need to be updated during the detailed design phase. See **Appendix G** and **Appendix H** for Pre-development and Post-development Sanitary Sewer Analysis.

The following table summarize the sanitary sewage flows that proposed development would produce, as well the anticipated timing for the flows to begin contributing.

Table 7-1: Sanitary Flows Analysis

Sanitary Flows		
	Average Daily Flow (L/s)	Assumed Timing (Year)
Phase 1	31.4	2023
Phase 2	18.4	2024
Phase 3	24.6	2033
Phase 4	20.3	2037
Full Site	94.7	2037

The preliminary sanitary flow calculations show that the proportion of peak flow and existing pipe capacity for all the existing pipes are mainly below 60%. Therefore, the existing 200mm sanitary main along Willingdon Avenue is adequately sized to meet the anticipated loading requirements from the proposed development.

The preliminary sanitary flow calculations indicate that a portion of the existing 250mm sanitary main along Alpha Avenue will be undersized for the proposed development as the peak flow from the development will exceed 60% of the existing pipe capacity.

As shown in the attached spreadsheet (refer **Appendix H**), the south side of existing 250mm pipe needs to be upsized to minimum 300mm for meeting the future site development. Furthermore, according to the requirement of City of Burnaby, even though the existing 200mm sanitary pipe along the north Alpha Avenue will be oversized for the proposed site, the developer will still be required to contribute to upgrading this section to a 250mm sanitary main for further development in the area. The post-development sanitary sewer analysis indicates the proportion of peak flow and pipe capacity for the existing 425mm downstream sanitary sewer east of Alpha Avenue is 20%, which can meet the requirement for the proposed development.

The City has advised that a new sanitary main will be constructed along Alaska Avenue in 2019 and will run the full extent of the southern property frontage. It is proposed that a portion of the development site will discharge to this newly constructed main, the design for which will be included as part of the detailed design phase of the project.

One 200mm PVC sanitary main will also be constructed along the proposed extension of Juneau Street, and will link between the existing sanitary mains on the Willingdon Avenue and Alpha Avenue.

New sanitary service connections will be provided for each residential tower, each office tower and residential rental buildings. Service to each building will be dealt with onsite. The proposed locations for each service connection are shown in **Appendix I** (Proposed Sanitary Works).

8.0 STORM

The existing properties are serviced from the City of Burnaby’s municipal storm system. Currently, there is a 57-year-old 750mm concrete storm main along the centre of Willingdon Avenue. An existing storm branch consisting of sections of 250mm PVC and 300mm concrete extend from within the site and connect to this 750mm storm main. These two lines within the property are proposed to be removed to facilitate the construction of future works within the development site. An existing concrete storm main runs along Alpha Avenue and was built in 1967. The pipe sizes along Alpha Avenue range from 300mm to 525mm and are all concrete. An existing 750mm concrete storm main is located along the westernmost portion of the Dawson Street.

R. F. Binnie & Associates has conducted a preliminary review of the storm system immediately surrounding the development site. For this analysis, the site was divided into 4 catchment areas by phases as illustrated in Figure 8-1 below.

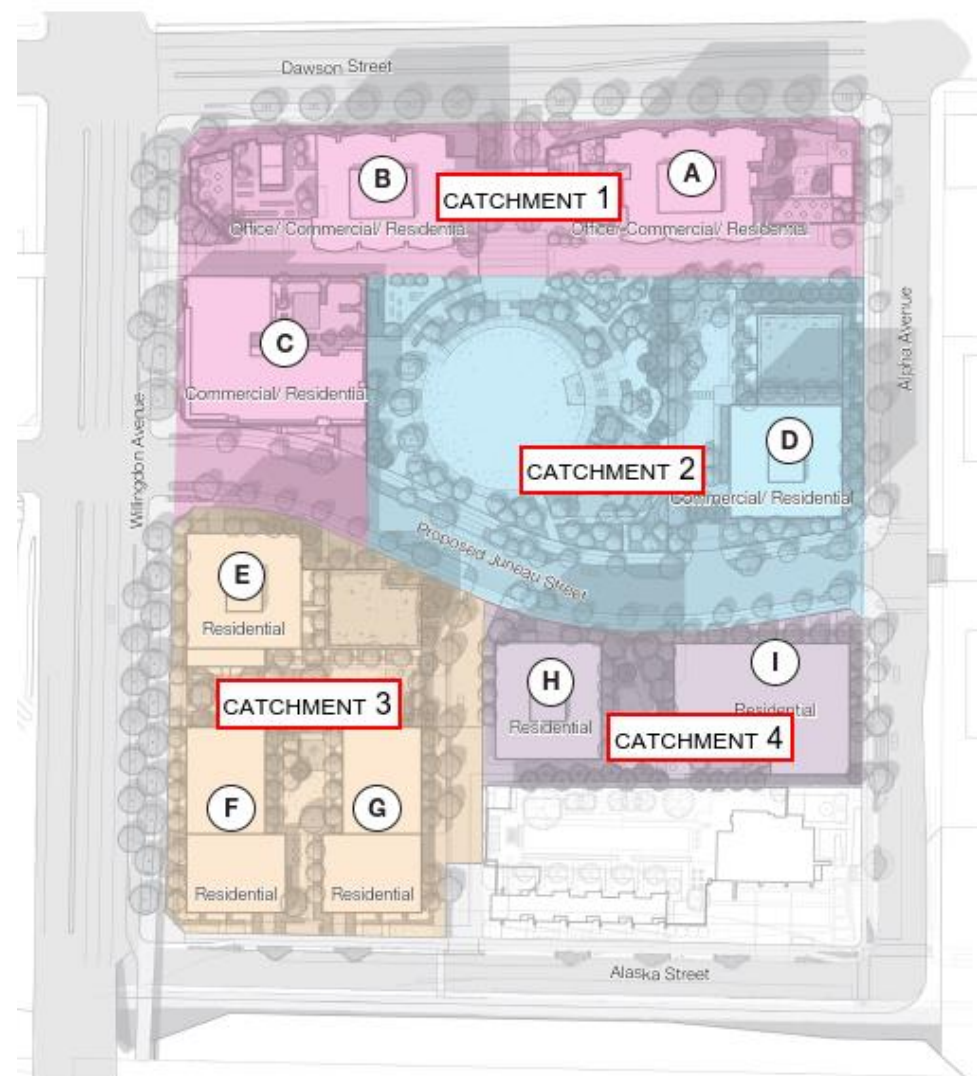


Figure 8-1 – Storm Catchment Map

Based on the preliminary storm flow calculations in **Appendix J** Phase Storm Flow, effects of the proposed development on the site’s runoff rates are summarized in 8-1. The analysis indicates that the change in stormwater runoff is minimal compared to the overall storm sewer catchment and will be mitigated by the stormwater management requirements discussed in Section 8.2.

Table 8-1: 1:10 Year Storm Flows

1:10 Year Storm Flows	
Stage	10yr Event
Existing Condition	
Phase 1	108 l/s
Phase 2	135 l/s
Phase 3	92 l/s
Phase 4	49 l/s
Full Site	384 l/s
Proposed Development	
Phase 1	91 l/s
Phase 2	127 l/s
Phase 3	87 l/s
Phase 4	44 l/s
Full Site	349 l/s

R. F. Binnie & Associates has also conducted an analysis of the storm system for the overall catchment area (see **Appendix K** and **Appendix L** for detailed calculations.). Comparing the existing condition and proposed development, the majority of the site runoff will be collected and delivered by the stormwater main on Alpha Avenue. The increase of flow in the existing pipe on the north of Alpha Avenue is slightly due to on-site development, but the fluctuation of the downstream pipes on the Alpha Avenue will change a lot. Therefore, detention storage and downstream pipe upgrades will be necessary.

To meet the onsite development requirement, one proposed 375mm PVC stormwater main will be constructed along the extension of Juneau Street, and will discharge to a newly proposed manhole on Alpha Avenue. In order to accommodate the runoff from the site, the existing portion of 375mm storm pipe will need to be upgraded to a 450mm storm pipe. This will also be required for the section of 525mm storm main towards the southern end of Alpha Avenue. It is also proposed to construct a 525mm storm main along Alaska Street in order to capture runoff from the site and from the road.

The majority of the storm water generated from the site will be collected by the stormwater main along Alpha Avenue and will discharge to the ditch south of Alaska Street. There are known capacity issue with the existing ditch and further discussion with the City of Burnaby and potentially the existing railway will be required. All flow estimates are approximate and will need to be updated during design phase.

New storm service connections will be provided for each phase of the development for a total of seven service connections (see **Appendix M** Proposed Storm Main Works for connection locations). Drainage

from each building will be dealt with onsite. Onsite drainage infrastructure will be privately owned and maintained by the property owner, while offsite drainage facilities will be owned and maintained by the City of Burnaby.

8.1 RIPARIAN CONSIDERATIONS

According to City of Burnaby Guide for Developing Near Streams, setbacks for Streamside Protection and enhancement Areas (SPEAs) apply to all types of development within the city and should be considered early in the development planning process. When the proposed development is within 30m of the top of bank of a stream, a review by the city planning department is triggered.

The nearest watercourse from the proposed development is Stickleback Creek. The proposed site is located approximately 200m away and is not directly adjacent to Stickleback Creek and therefore there is no direct impact to Stickleback Creek. The city review will not be triggered.

However, considering that the proposed project is uphill of the creek, and a ditch which connects with Stickleback Creek is part of the existing storm system for the proposed site, an appropriate storm water management plan should be incorporated into the proposed development plans.

8.2 STORMWATER MANAGEMENT PLAN

The City of Burnaby requires that a Stormwater Management Plan be prepared for each phase of the proposed development. The purpose of stormwater management is to enhance the quality of storm runoff and to protect the natural waterways that receive the storm discharge. A ditch connecting with Stickleback Creek will be part of the drainage system for the proposed site. Therefore, it is important that the development minimizes storm runoff to reduce or eliminate the potential flooding of Chub Creek.

The site as a whole is currently more than 20% impervious surfaces which classifies it as a “developed site”. According to the City of Burnaby’s *Watershed Classification: Stormwater Flow Management*, the project site is located in a “Class A” watershed (See the **Appendix N** for BBY Watershed Map). Based on the site’s location and its current development state, the City of Burnaby requires that the proposed development meets the following criteria:

$$Q_{2(post-development)} = 50\% \times Q_{2(pre-development)}$$

The site currently has a high percentage of impervious surfaces such as paved parking areas and building roofs and the opportunity for water to infiltrate into the ground is limited. The proposed redevelopment will consist of ground level park space and four high-rise residential towers all above a shared underground parkade. The ground level will be finished by integrating green space with hardscape pathways and courtyards. Each townhouse unit will have a lawn adjacent to its entrance. Landscaped planters will be found throughout the re-developed property in order to maximize rainfall capture. Runoff from impervious surfaces such as the rooftops and landscaped areas will be mitigated according to the City of Burnaby’s stormwater management criteria. A detailed stormwater

management plan will be prepared during the detailed design of each phase. Stormwater management features are expected to include;

- maximized landscaped areas on site
- extensive rooftop landscaping
- rainwater management amenities along sidewalks
- permeable pavers, where appropriate.

Stormwater detention tanks will be installed within the development to reduce peak flows to the municipal system. Preliminary calculations of the required storage volumes are summarized in Table 8-2. See **Appendix O** for detailed calculation.

Table 8-2: 1:2 Year Storm Detention Volumes

1:2 Year Storm Detention Volumes	
Stage	2yr Event
Phase 1	11.57 m ³
Phase 2	19.71 m ³
Phase 3	13.61 m ³
Phase 4	6.25 m ³
Full Site	51.14 m ³

9.0 UTILITIES

The existing properties are serviced from the existing underground BC Hydro, FortisBC, Novus, Shaw, and Telus. Given the extent of the existing underground utilities and the proximity to the existing BC Hydro substation, there should be no issues providing service for the proposed development. Details of the utility services for the proposed development will be reviewed with the separate utility companies during detailed design.

There are existing overhead BC Hydro lines along the on along the eastern side of Alpha Avenue and southern side of Dawson Street. These overhead lines will be removed and constructed underground based on the development requirement.

For Willingdon Avenue area, the City of Burnaby has requested the applicant to explore options for relocation, undergrounding, or consolidation of the existing transmission lines along Alaska Street. Based on our review and discussions to date with BC Hydro and the City, we are proposing to consolidate the existing 69kV transmission lines (double-circuit) on to a single set of poles in a new alignment which is compatible with the City of Burnaby’s road geometric for Alaska Street and can be phased to work with the timelines of the other adjacent developments.

10.0 REPORT SUBMISSION

Brentwood Willingdon Projects Ltd. is proposing to redevelop a property located in the West Central Valley area of Burnaby BC. The project consists of rezoning the currently industrial/commercial lots and constructing four high-density residential towers and a ground-level park. The project will involve a major redevelopment of the site including rezoning and consolidating the existing lots, upgrading existing water mains and sewers, and implementing new roadworks on and offsite.

R.F. Binnie consultants have reviewed the civil infrastructure requirements for the proposed development. Preliminary plans and included as part of this report, are intended to provide a conceptual overview of civil design issues related to the proposed development. The results presented within this report are limited by the scope of the report and should only be used with full understanding of those limitations.

If there are any questions or comments on any of the findings or analysis presented in this report, please contact the undersigned.

Prepared By:

R.F. BINNIE & ASSOCIATES LTD.

Reviewed by:

Russell Warren, P.Eng, LEED Green Associate
Senior Project Manager, Associate

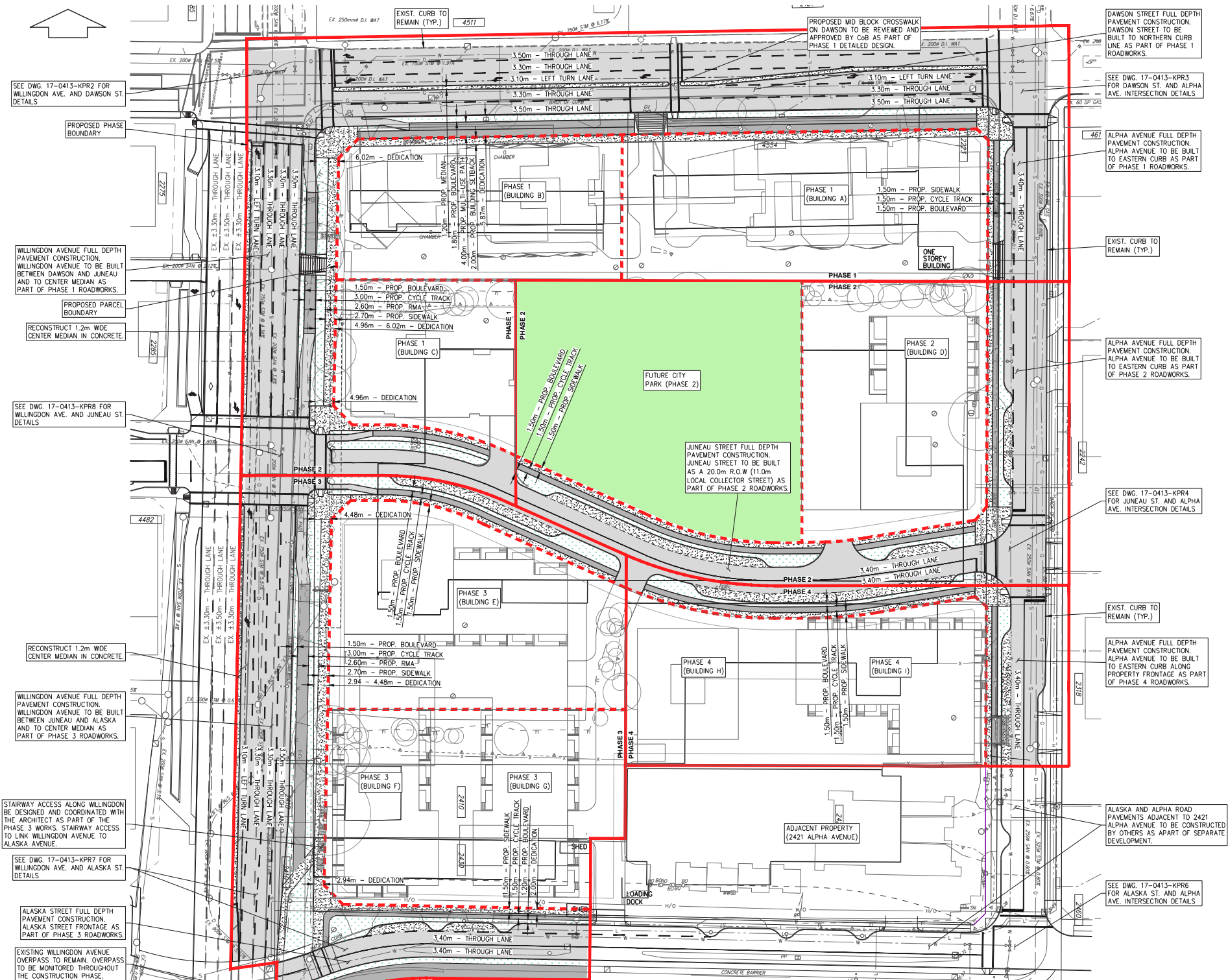
Prepared by:

Thomas Cogan, E.I.T.
Project Engineer

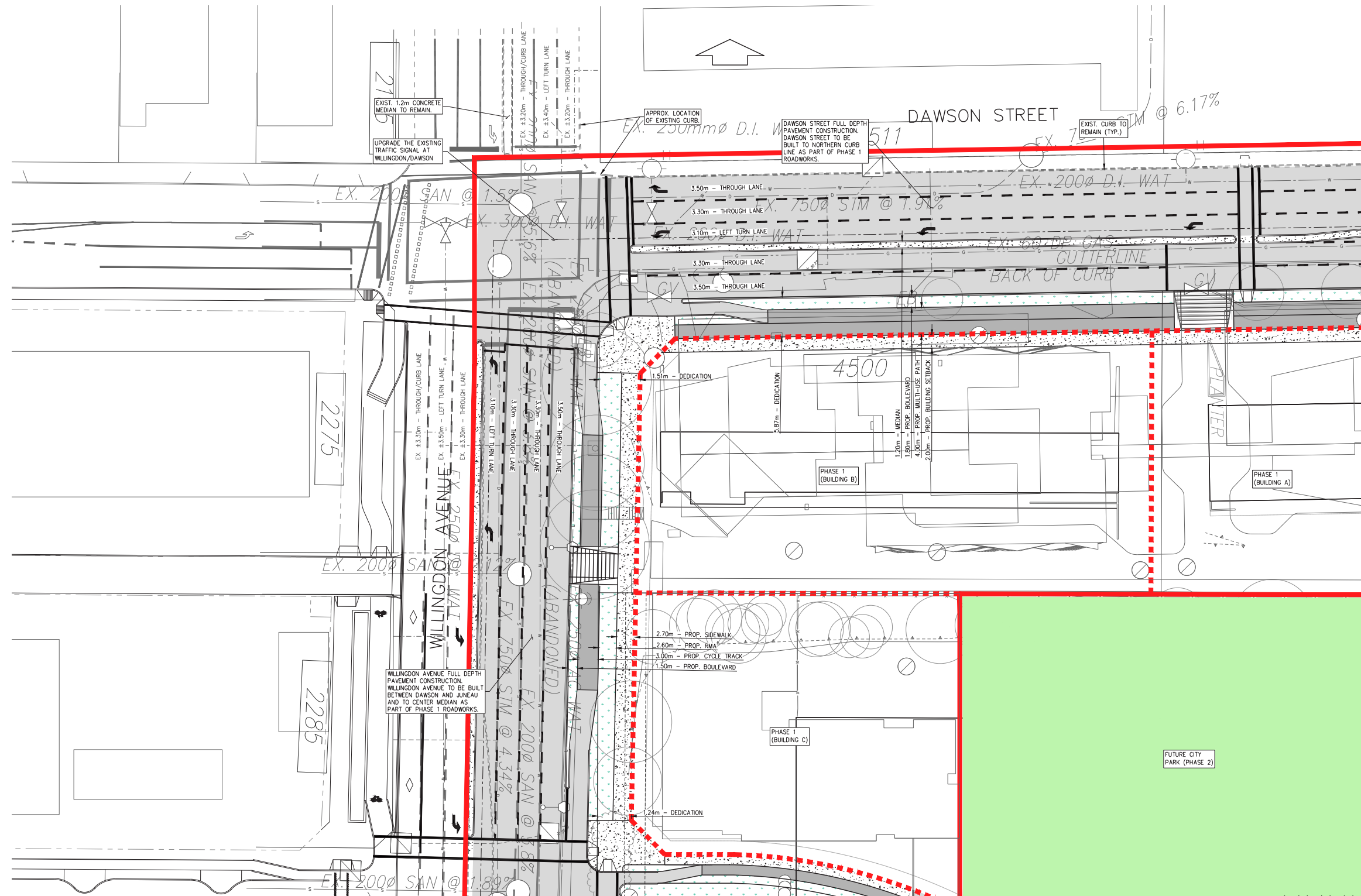
APPENDIX A: SITE PLAN



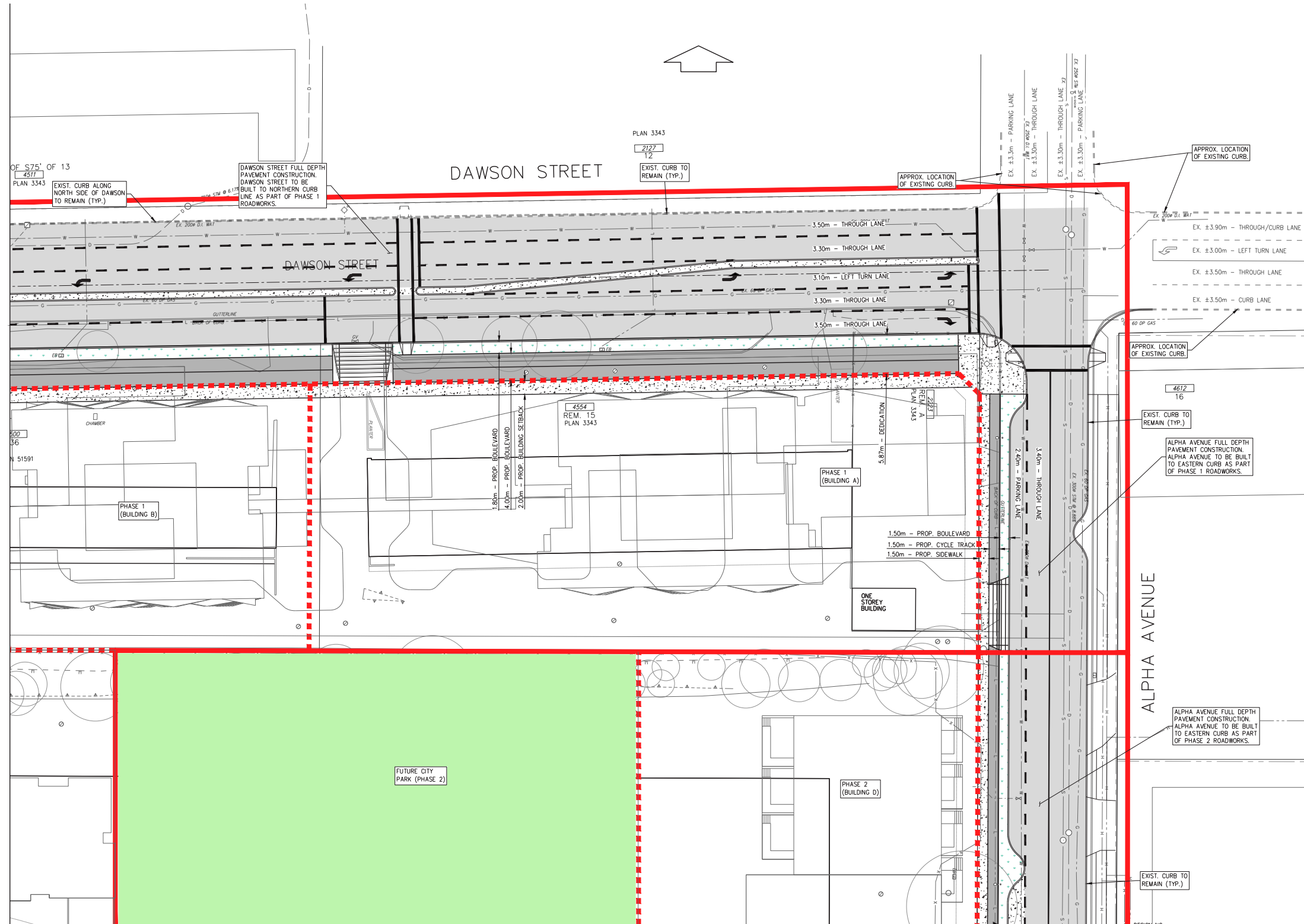
Roadworks



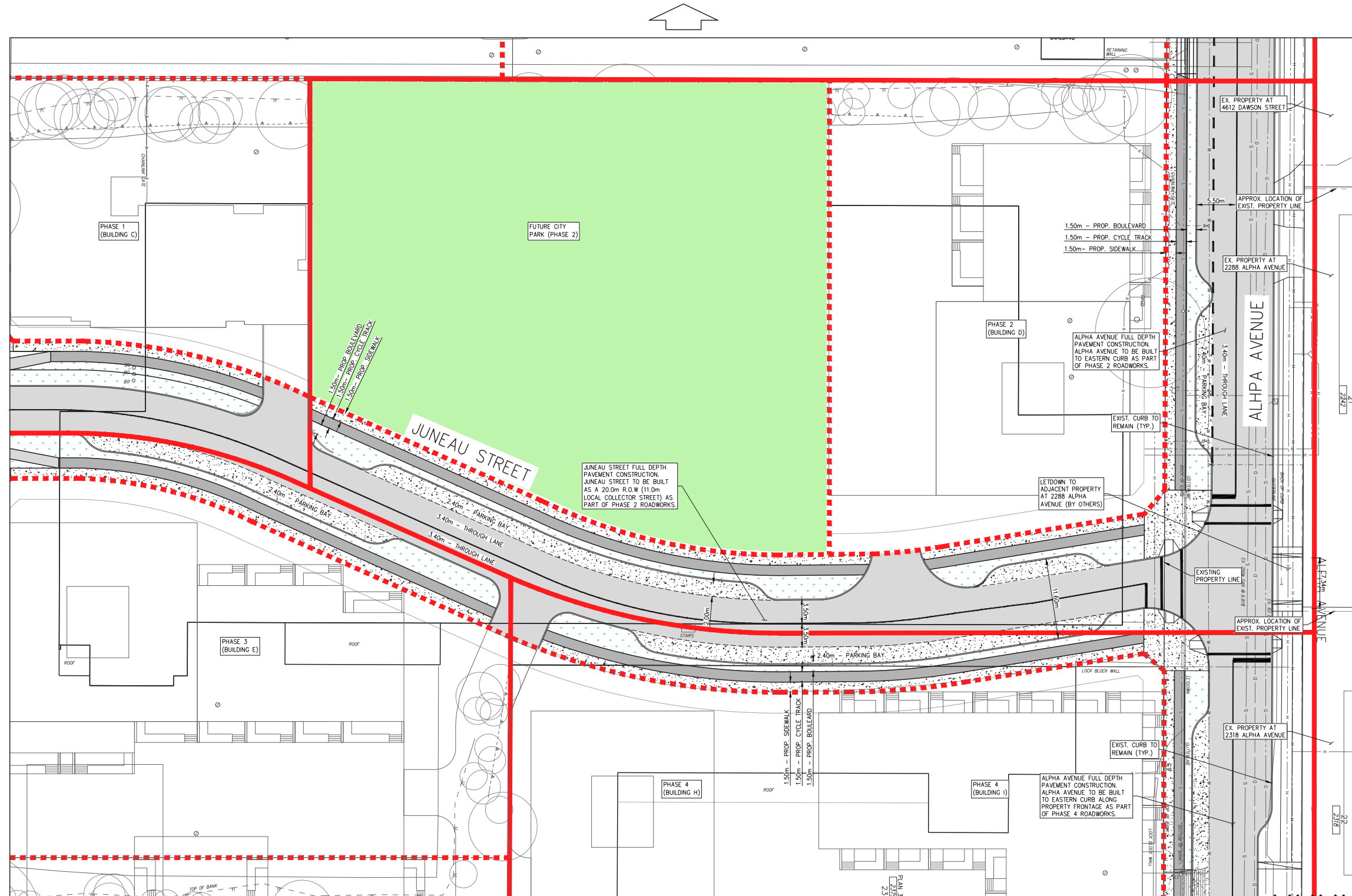
Roadworks



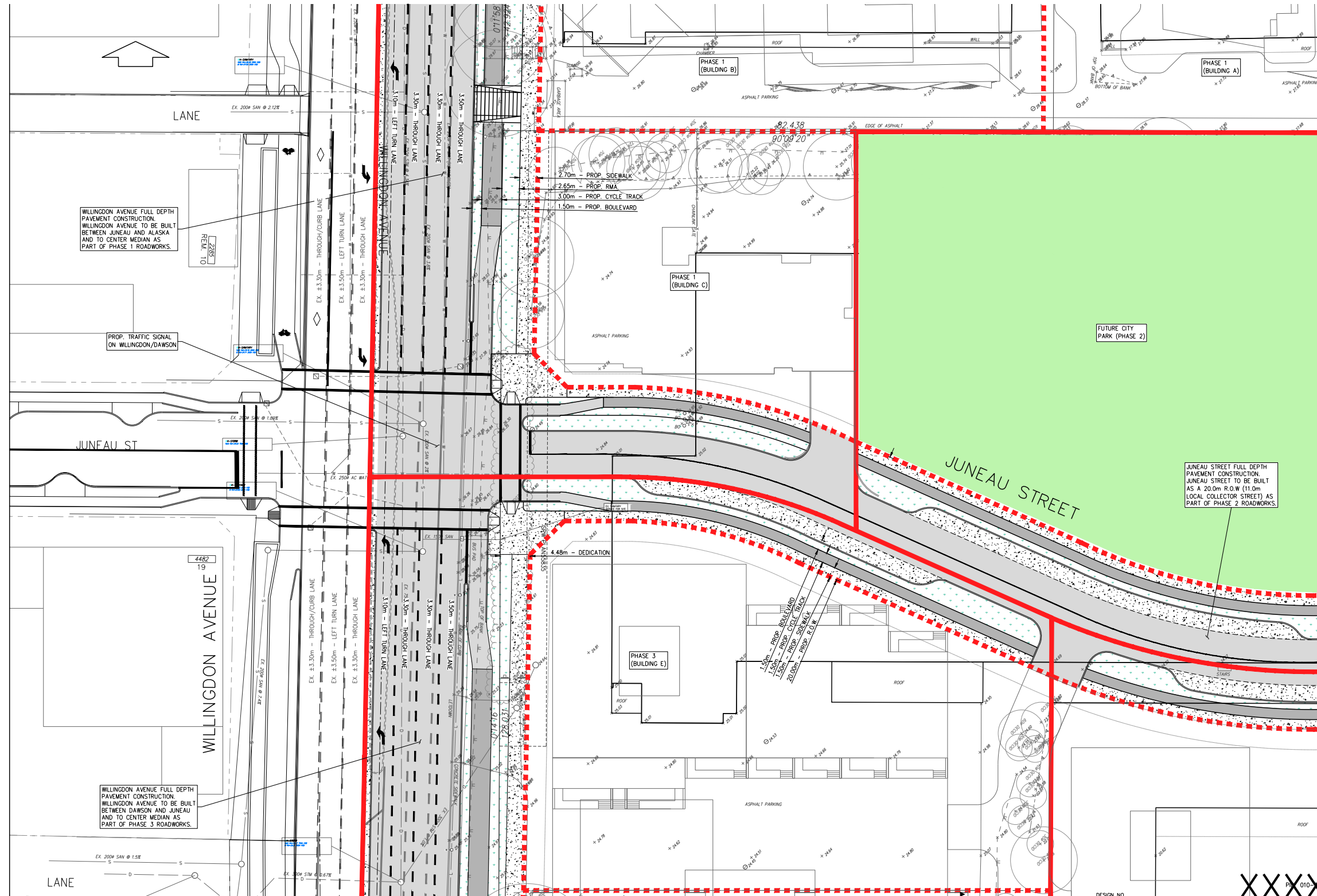
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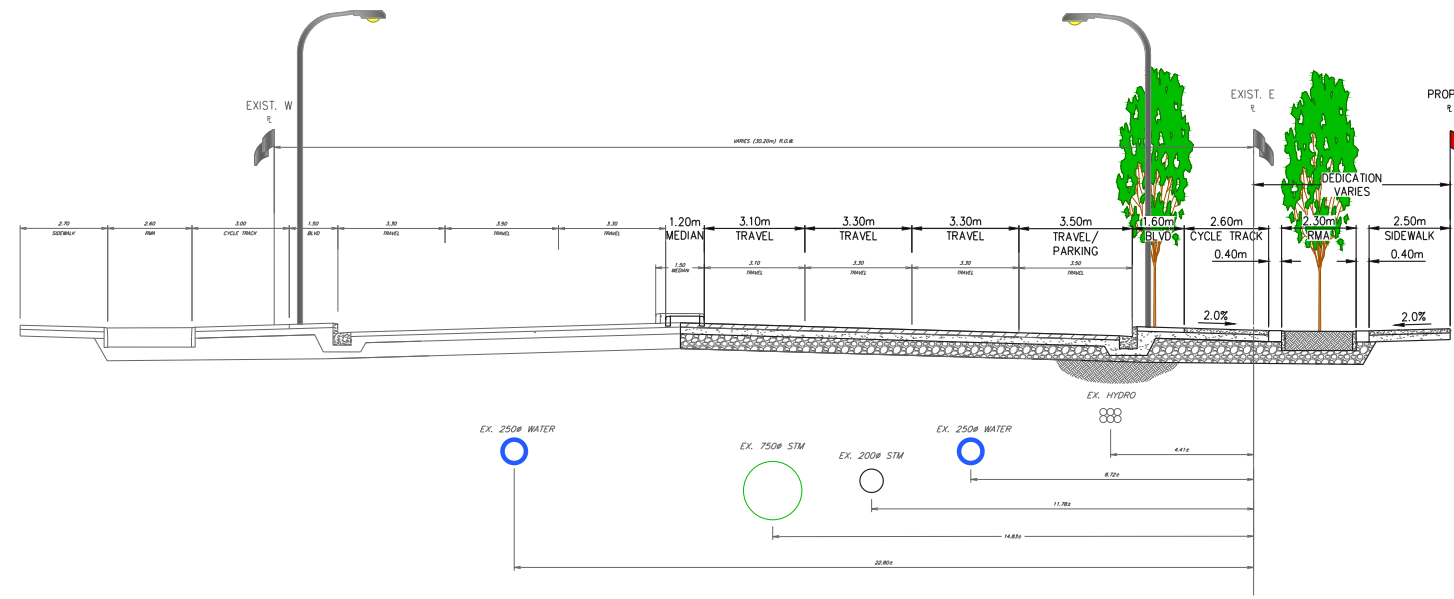
Roadworks



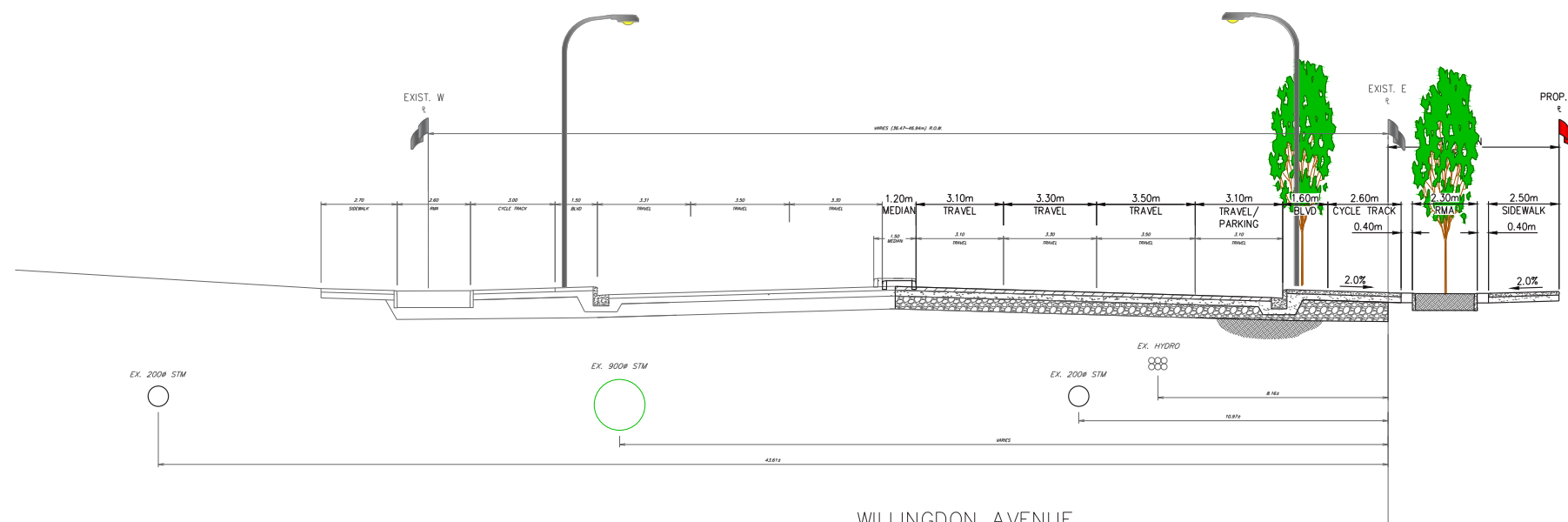
Roadworks



Typical Sections

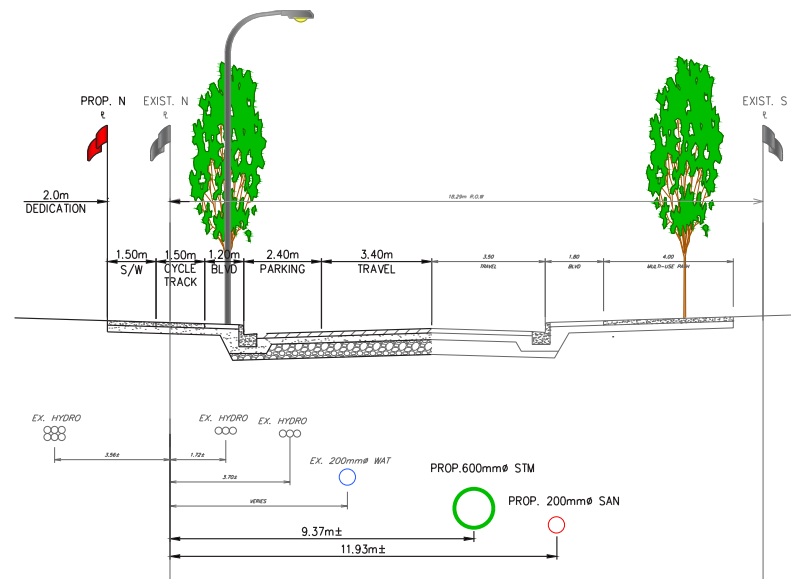


WILLINGDON AVENUE
(NORTHERN PORTION OF WILLINGDON,
NORTH OF JUNEAU STREET)

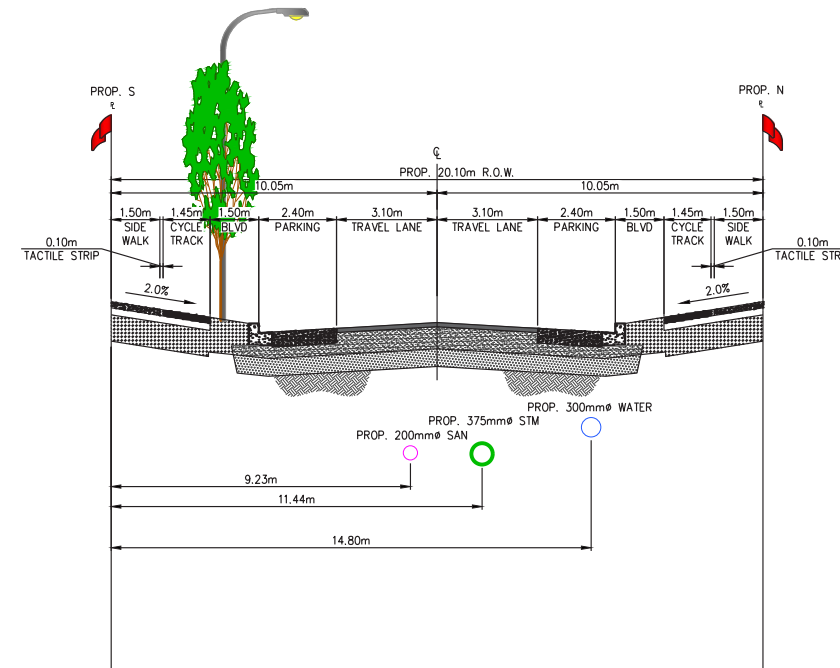


WILLINGDON AVENUE
(SOUTHERN PORTION OF WILLINGDON
LOOKING NORTH)

Typical Sections

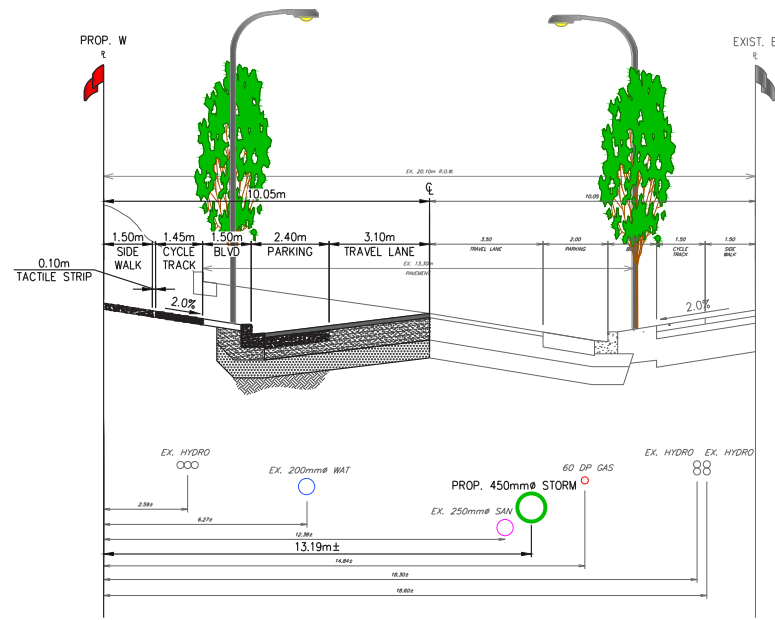


ALASKA AVENUE
(LOOKING EAST)

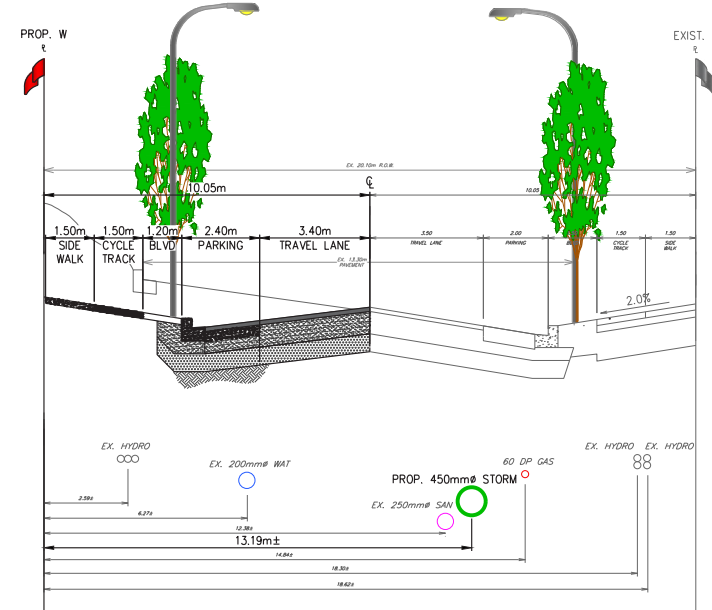


PROP. JUNEAU STREET
(LOOKING WEST)

Typical Sections

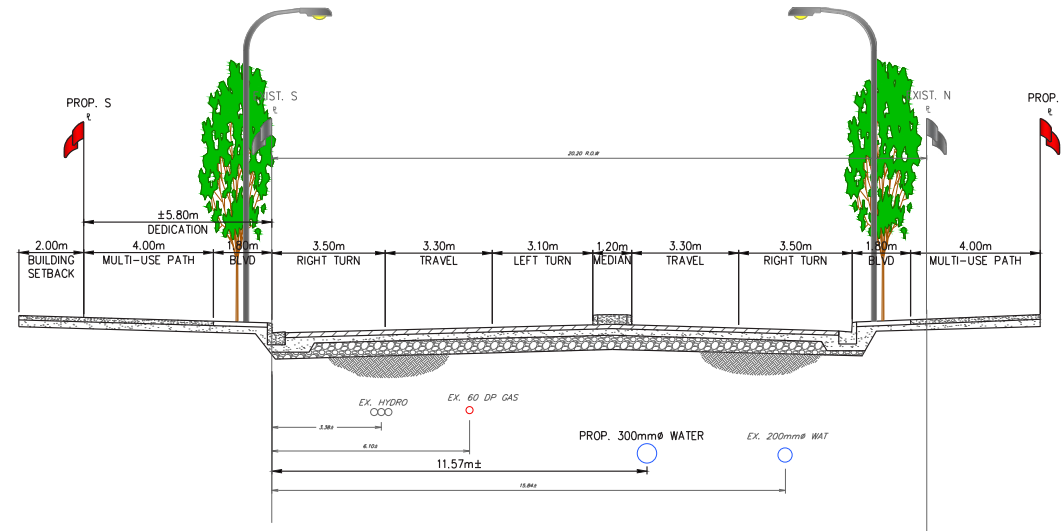


ALPHA AVENUE
(NORTH OF JUNEAU ST LOOKING NORTH)

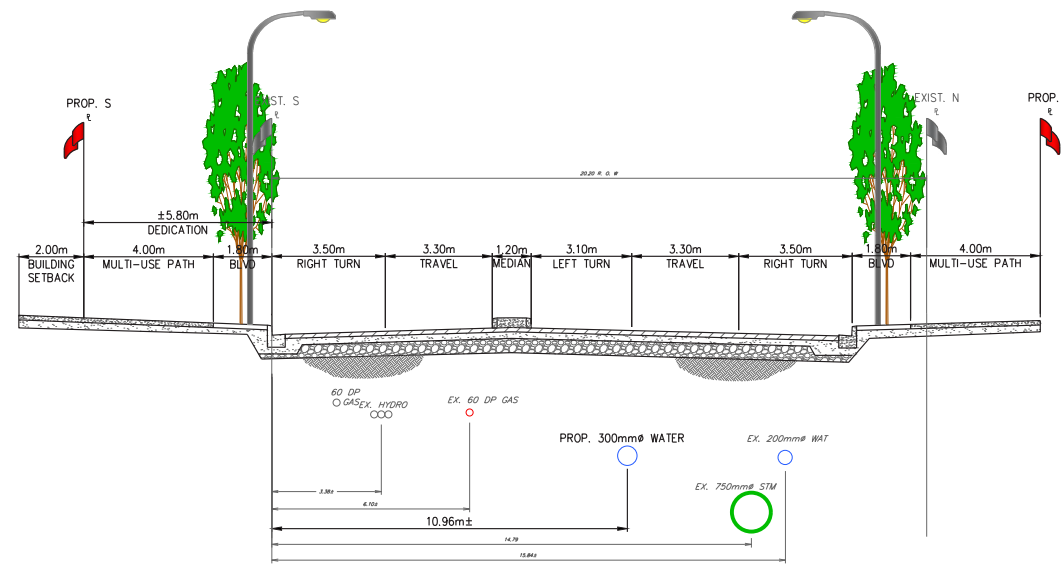


ALPHA AVENUE
(SOUTH OF JUNEAU ST LOOKING NORTH)

Typical Sections

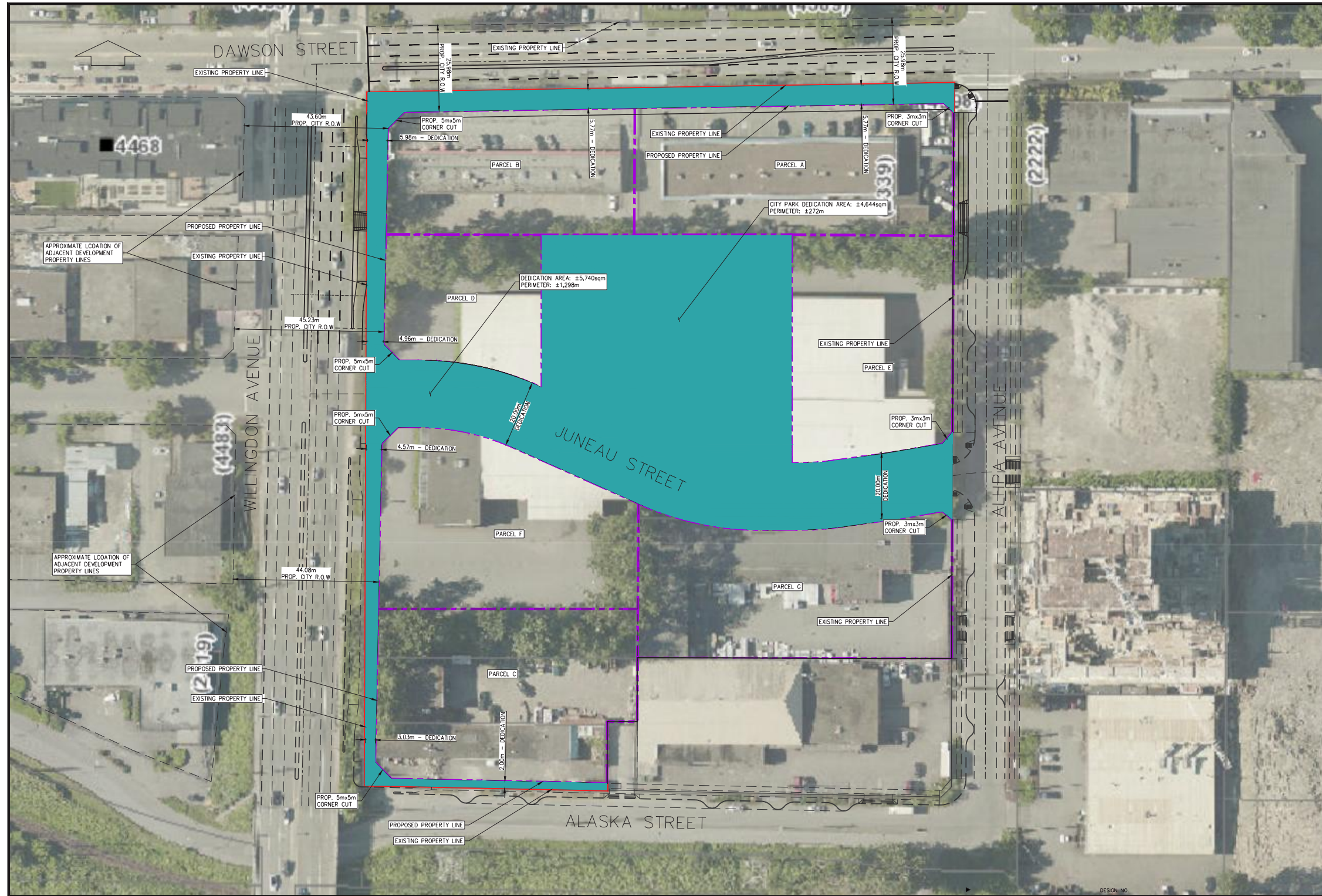


DAWSON STREET
(EAST OF DAWSON ST LOOKING WEST)

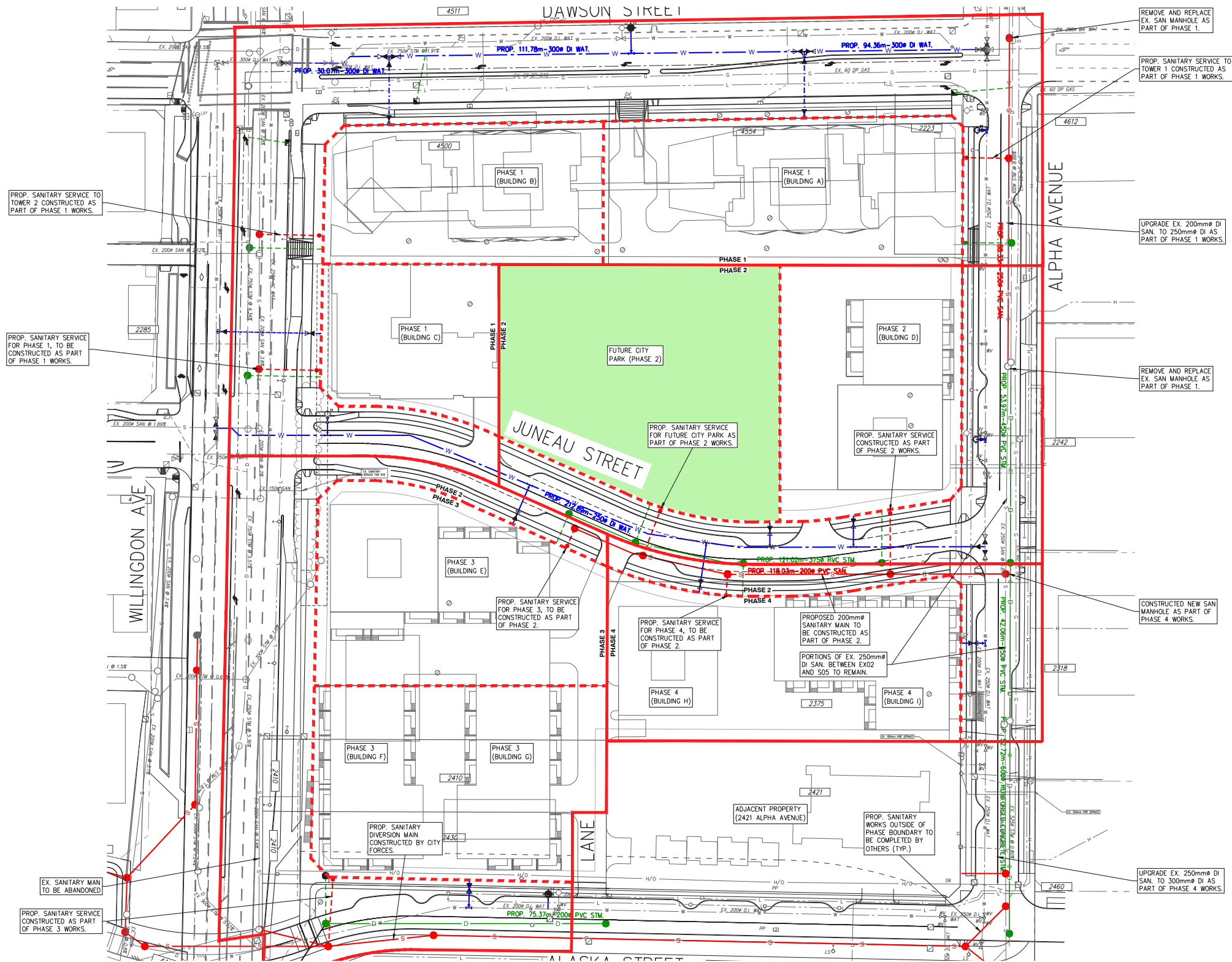


DAWSON STREET
(WEST OF DAWSON ST LOOKING WEST)

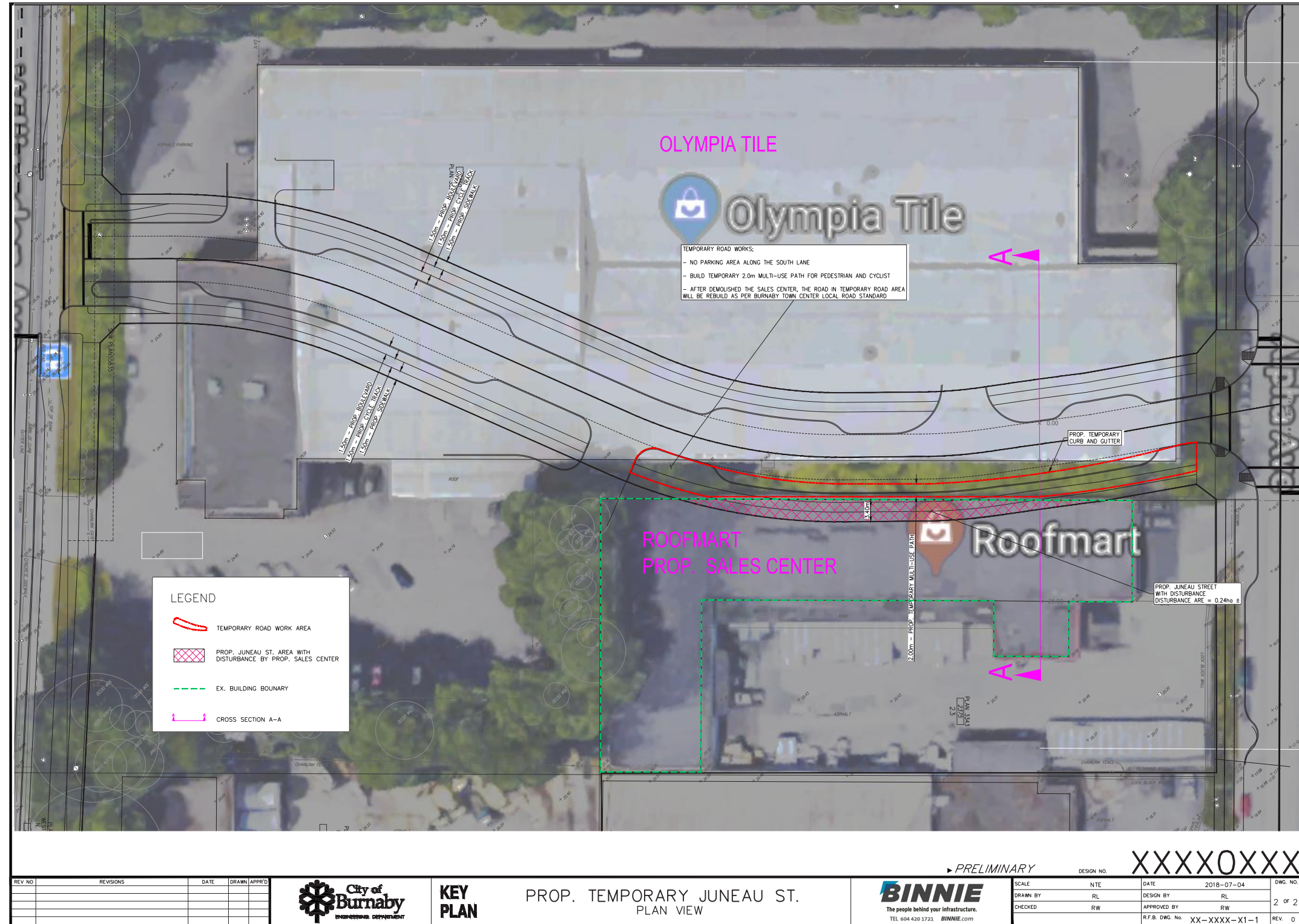
Road Dedication



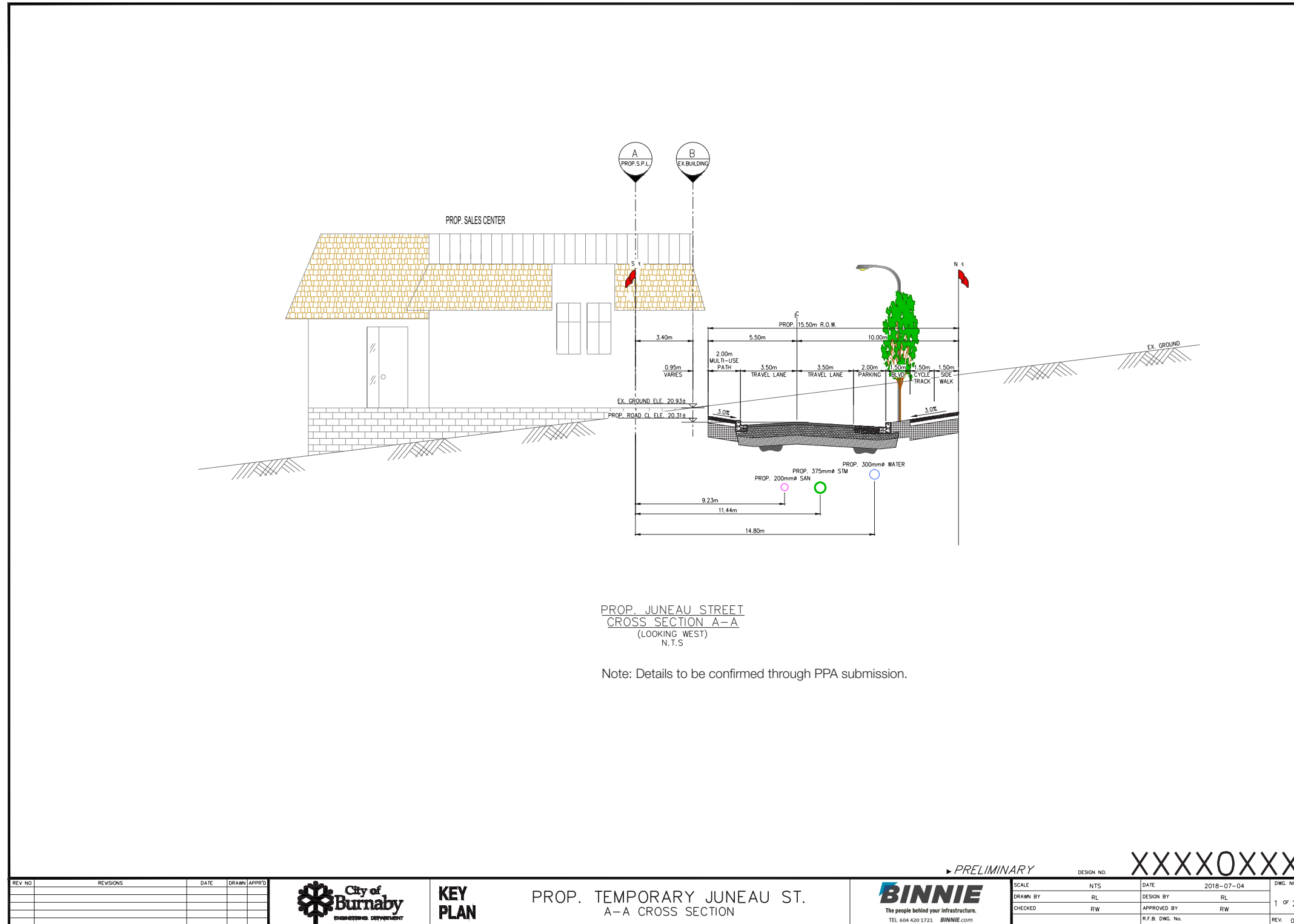
Sanitary Sewer



Proposed Temporary Juneau Street Condition - Plan View



Proposed Temporary Juneau Street Condition - Section View



REV. NO.	REVISIONS	DATE	DRAWN	APPR'D



KEY PLAN

PROP. TEMPORARY JUNEAU ST.
A-A CROSS SECTION



PRELIMINARY

XXXXOXXX

SCALE	DESIGN NO.	DATE	DWG. NO.
NTS		2018-07-04	
DRAWN BY: RL	DESIGN BY: RL		1 OF 2
CHECKED: RW	APPROVED BY: RW		REV. 0
	R.F.B. DWG. No.		

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