

OCTOBER 2019

NORTH EAST **ALBION**

LAND USE AND SERVICING CONCEPT PLAN



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Prepared by:



Technical Team:



PART 1 -

LAND-USE CONCEPT PLAN

01 | INTRODUCTION

1.1 ORIGINS

The North East Albion Land Use and Servicing Concept planning process was initiated by City of Maple Ridge Council in January 2019.

It was triggered by a rezoning application submitted by Aplin & Martin Consultants Ltd. (Aplin Martin) on behalf of Epic Homes for the properties located at 11070 Lockwood Street and 24984, 25024, and 25038 112 Avenue.

For the purpose of proceeding with this application, a Land Use and Servicing Concept planning process for North East Albion was advanced to help guide future growth and development in the community. As anticipated in the Albion Area Plan adopted in the Maple Ridge Official Community Plan (OCP), a review and update to the land uses and servicing for North East Albion has been conducted to ensure that development in the area responds to the community's changing needs.

Aplin Martin was retained to conduct the planning process, cost recovered through Epic Homes, and working collaboratively with the City of Maple Ridge. The North East Albion Land Use and Servicing Concept Plan is the result of technical rigor, research, and robust consultation.

1.2 PURPOSE

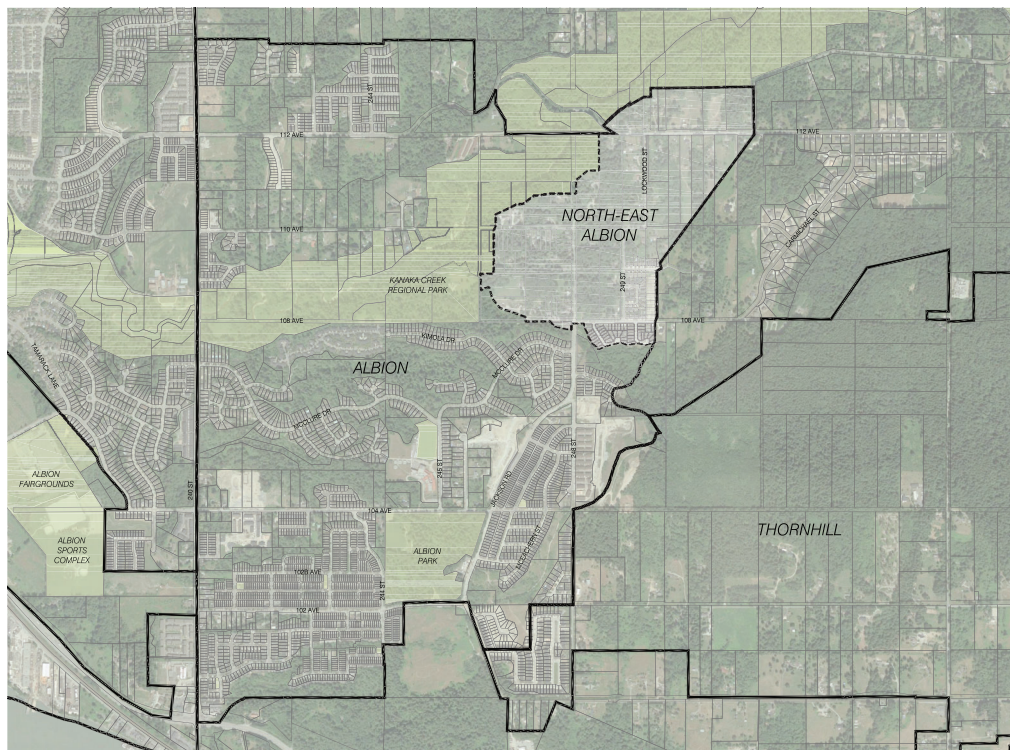
The purpose of this report is to summarize the planning process and to present the proposed North East Albion Land Use and Servicing Concept Plan. It provides an overview of the technical analyses and key land-use decisions that shaped the North East Albion Concept Plan. This report may be used as a tool to interpret the Concept Plan and Servicing Strategy but does not replace site specific analysis. Future development applications will be subject to comprehensive site analysis per standard development procedures.

1.3 CONCEPT PLAN AREA

North East Albion is in the Albion Plan Area in eastern Maple Ridge. The total area consists of 70.4ha (174.1ac), discounting lands recently acquired by Metro Vancouver.

The area is bound by:

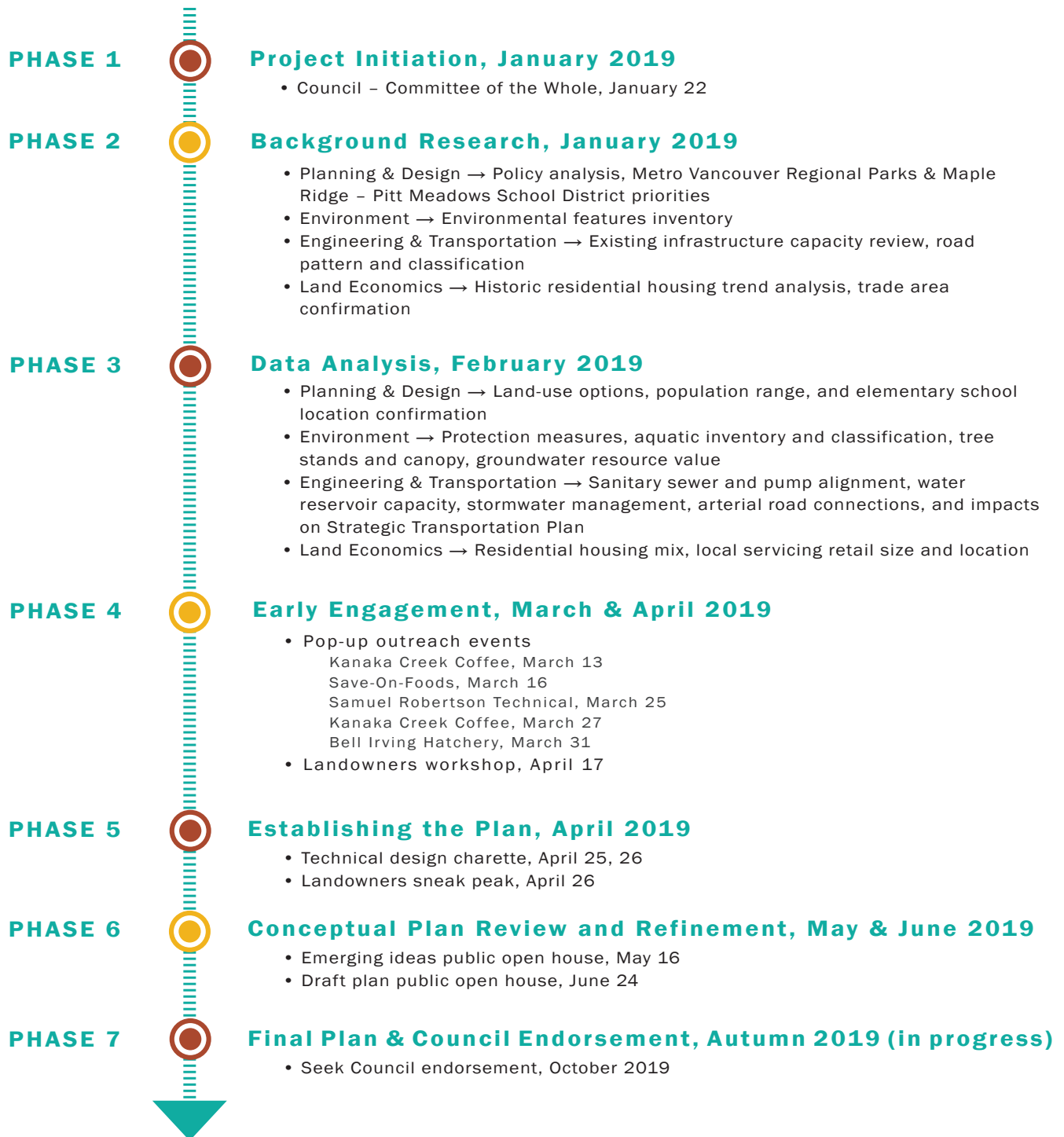
- North - Kanaka Creek Regional Park and Agricultural Land Reserve
- South - Existing Residential (Albion Area Plan)
- West - Kanaka Creek Regional Park
- East - Rural Residential, Grant Hill



02 | PLANNING PROCESS

2.1 TIMELINE

The North East Albion Land Use and Servicing Concept planning process has been iterative and responsive to information provided by the consultant team, City staff, external stakeholders, and the community.



03 | EXISTING CONDITIONS

3.1 POLICY CONTEXT

The existing Albion Area Plan currently designates the North East Albion neighbourhood as “Low Density Residential”, “Low/Medium Density Residential”, “Medium Density Residential”, “Conservation”, and “Institutional”.

The OCP identifies that future growth in the area may create a need for commercial spaces in proximity to the neighbourhood. However, the OCP does not specify the thresholds of residential densities that would trigger the need for the creation of a neighbourhood commercial node in Albion (section 6.3.7).

Furthermore, the OCP and the Maple Ridge - Pitt Meadows School District 42 Strategic Facilities Plan outline the location for a future school in North East Albion.

The North East Albion concept planning process examined different forms of residential land uses for this area of Maple Ridge in order to create a more complete community. It will also ensure that the City has the population density, services, and amenities necessary to support such a neighbourhood in the long term.

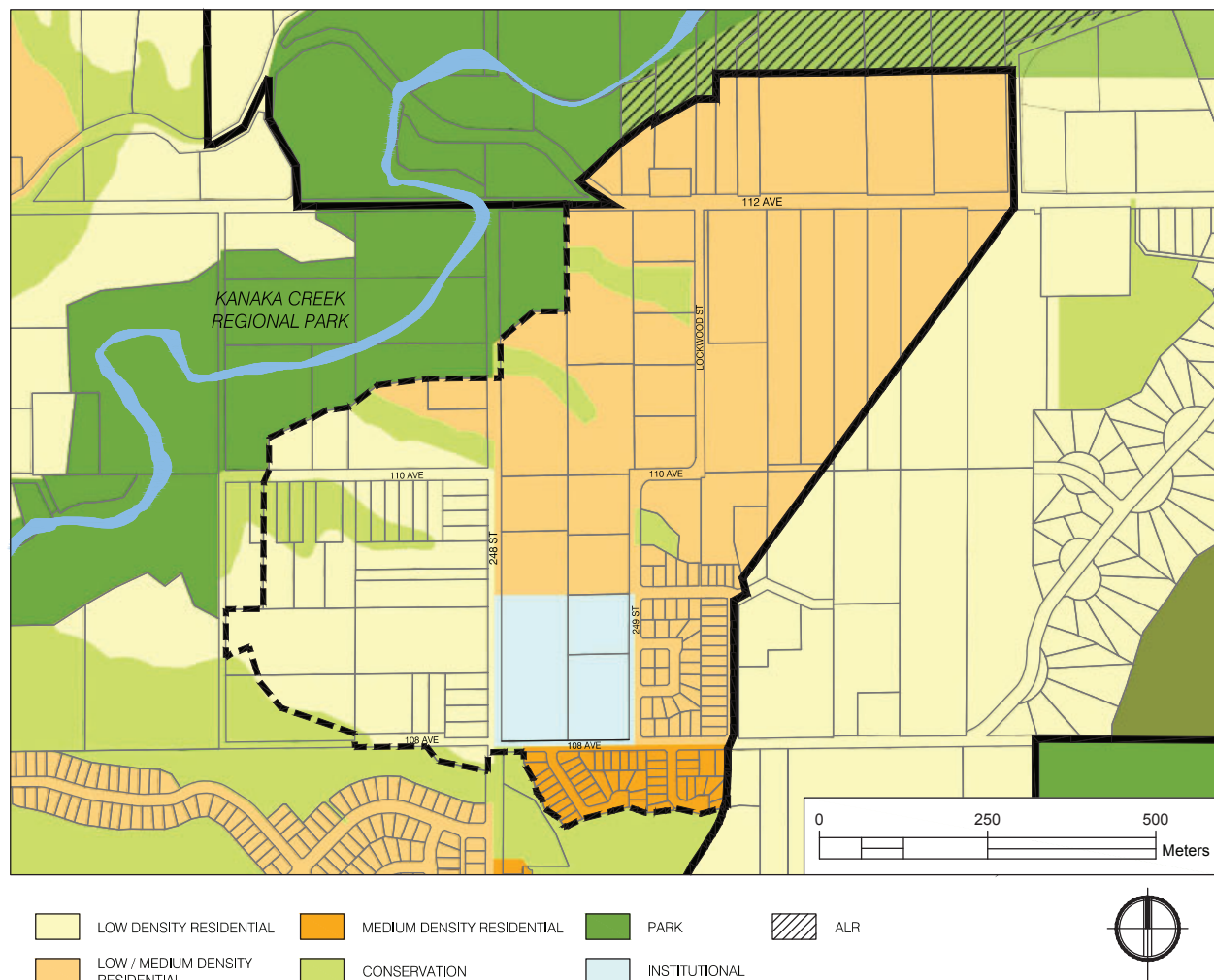


Figure 2 - Existing Land Use Designations (Official Community Plan, 2014)

3.2 EXISTING LAND USES

The current land use in North East Albion is residential, comprised of 157 properties, most of which are large rural acreages. The landscape is a mix of residential yards and lawns to mature mixed evergreen and deciduous forest stands. A small number of serviced lots exist on Morrisette Place and south of 108 Avenue, in the south-east of North East Albion. These lots have been developed as low-medium density single-family dwellings. North East Albion has remained relatively undeveloped and rural in nature.



Existing Housing on Jackson Road

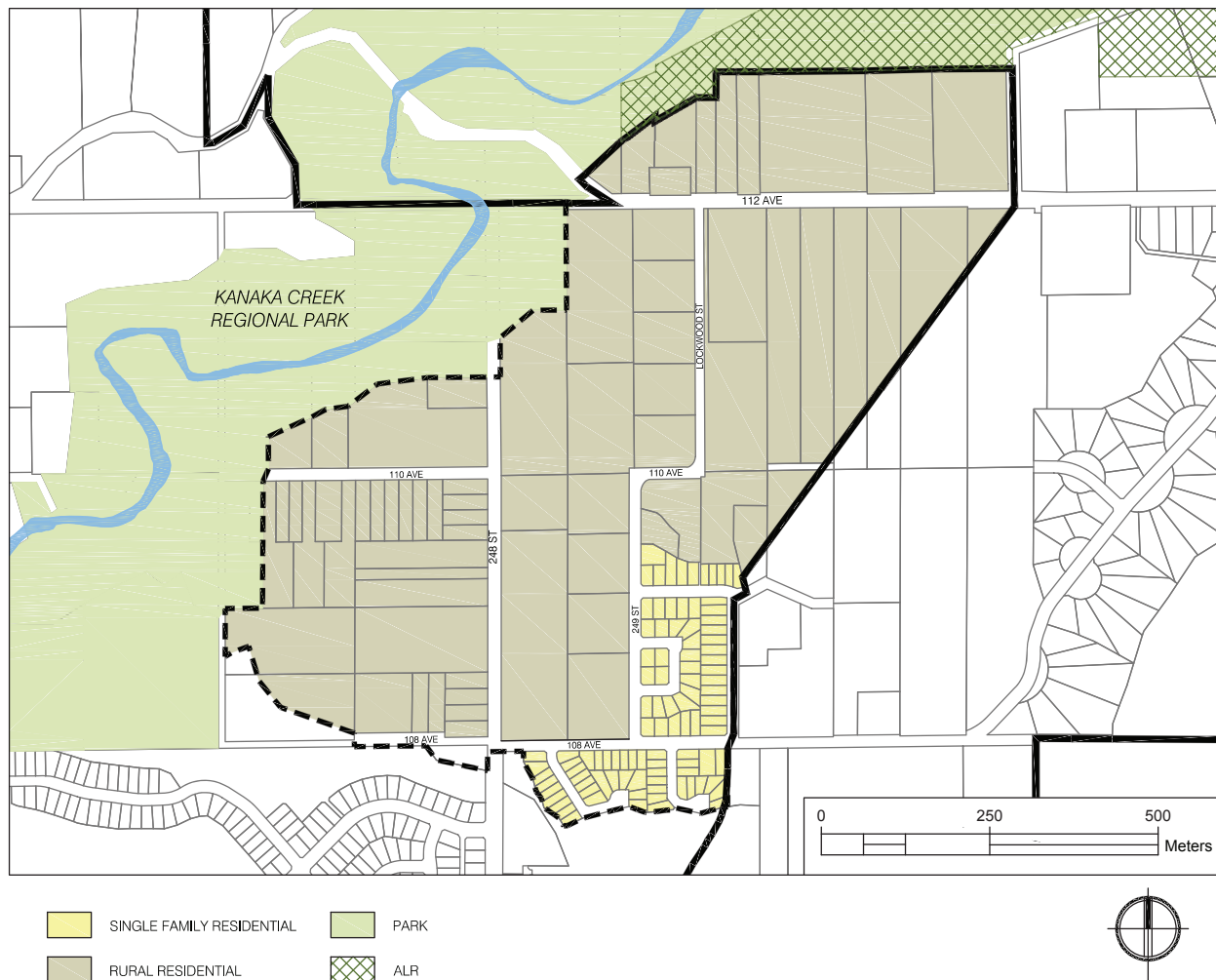


Figure 3 - Existing Land Uses in North East Albion

3.3 ENVIRONMENTAL CONTEXT

Topography

North East Albion is located between Grant Hill to the southeast and the Kanaka Creek ravine to the north/northwest. The southern boundary runs along the ravine top-of-bank of Thornvale Creek. The land generally slopes down to the west/northwest towards the Kanaka Creek ravine. Analysis shows contours ranging from approximately 110m in the east to 20m in the west (west end of 100 Avenue) which is a substantial grade difference of 90m across the Concept Plan area. Overall, North East Albion is characterized primarily by a mix of moderate to significant northwestward slopes (10% to greater than 25% grade) with smaller patches of relatively flat lands along the northern and western extent of the North East Albion boundary adjacent to Kanaka Creek Regional Park.

There are a number of streams within North East Albion, several of which are within ravine settings. Streams generally flow to the west or north, toward the Kanaka Creek ravine.

The slopes in North East Albion will be an important consideration for the design and form of future development and services in this area in order to preserve natural grade, where possible. Preserving the natural character of the land has been identified as an important consideration by local residents.

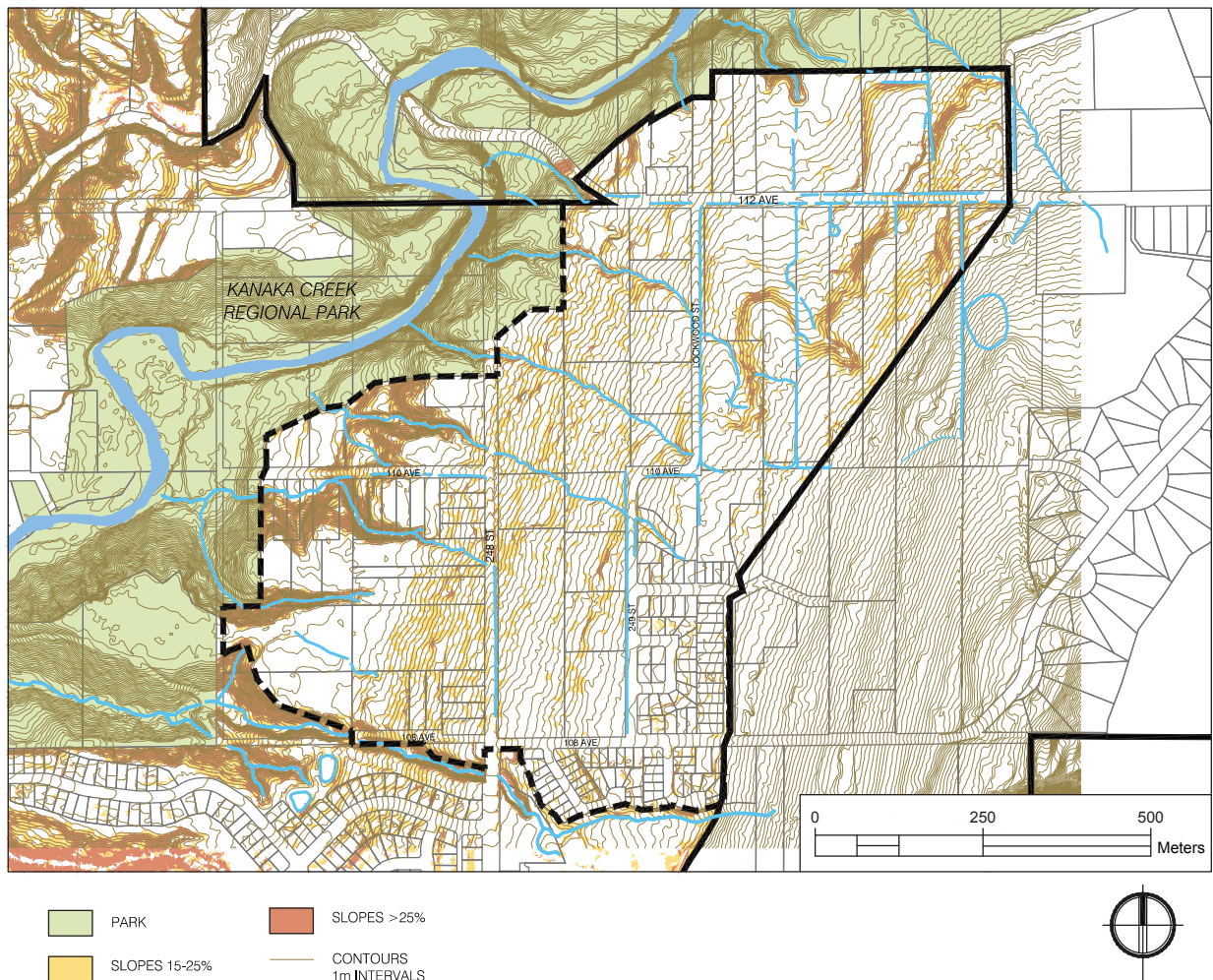


Figure 4 - Slope Analysis Showing 1m Contour Lines

Soil and Geology

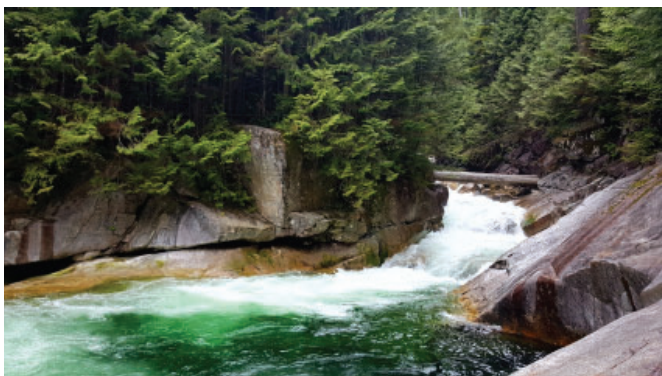
Surficial geology mapping shows that native soils (beneath topsoil) across most of North East Albion are comprised of three different types: Fort Langley Formation (FL – primarily subtype FLc with some FLb and FLd), Undivided pre-Vashon Deposits (UPV), and Tertiary bedrock.

FL soils are mapped in the northwest portion of North East Albion. FL soils are described as glacial and deltaic sediments. Subtype FLc (the primary mapped FL soil subtype within North East Albion) described as glaciomarine stony clayey silt to silty sand 8 to 90m thick, commonly thinly bedded and containing marine shells. FLb is described as outwash and ice-contact gravel and sand containing clasts of FLa (till with sandy loam). FLd is described as marine silty clay to fine sand commonly containing marine shells.

UPV soils extend into the eastern portion of North East Albion and consist of till, glaciofluvial, glaciolacustrine, fluvial, marine, and organic sediments.

A significant portion of southeast North East Albion is mapped as Tertiary which appears to be associated with Grant Hill. Tertiary type is described as tertiary bedrock including sandstone, siltstone, shale, conglomerate, and minor volcanic rocks. Where bedrock is not at the surface, it is overlain by glacial deposits and colluviums.

The soil makeup of the area determines ground permeability and affects infiltration rates. The types of soil found in North East Albion have helped to determine stormwater management improvement requirements outlined in Section 10.5.



Kanaka Creek

Groundwater

Areas of groundwater recharge are present within North East Albion, but the area is primarily characterized by groundwater discharge. A large, moderately vulnerable, bedrock aquifer is present within North East Albion, referred to as the 'Grant Hill Aquifer'. The main recharge area for this aquifer is on Grant Hill, to the southeast of North East Albion. Potential recharge areas also exist in the south and east of North East Albion, where soils are classified as Tertiary. Additionally, a moderately vulnerable, shallow aquifer, referred to as the 'South of Grant Hill Aquifer', protrudes into North East Albion from the south. The shallow depth of this aquifer and its proximity to Thornvale Creek suggest that it may provide valuable moderated water flows to this important salmonid-spawning stream. Groundwater flow is expected to be generally northwestward, consistent with local surface topography. There is potential for groundwater to produce springs and streams along the toe of sloped areas in the eastern portion of North East Albion. This would occur during winter and early spring periods while the shallow aquifer remains saturated and where geological layers that are otherwise subsurface become exposed.

The management of groundwater is a key consideration for development in order to preserve the existing drainage patterns, maintain watercourse quality and water quantity, and protect shallow wells.



Deer In The Forest

Watercourses

North East Albion contains numerous tributaries and watercourses that feed into Kanaka Creek. These watercourses are primarily groundwater fed from the Grant Hill aquifer, which provides flows year-round. The watercourses flow toward Kanaka Creek, starting at shallow gradients. On occasion, they are culverted under roads or diverted along property lines and receive additional flows from roadside streams or ditches. Nearing Kanaka Creek Regional Park, the watercourses located within the Concept Plan enter steep ravines until they reach the benches above Kanaka Creek channel. The watercourses in the northern portion of the Concept Plan then drop over a canyon into the Kanaka Creek channel.

The reaches of the watercourses within North East Albion (KA1 to KA7 and unnamed watercourses) do not appear to be fish-bearing with the exception of KA1 (downstream) and Thornvale Creek. Most of the creeks contain permanent barriers to fish migration, for example due to waterfalls, steep ravine reaches, and/or very shallow, braided channels.

The importance of these watercourses, and the role of groundwater inputs to these watercourses, is in providing fish habitat, maintaining habitable temperatures, steady flows, and considerable nutrient content to the habitat of Kanaka Creek. Future development in North East Albion must be designed to buffer and protect watercourses in order to preserve and improve the water quality and quantity within the watercourses and subsequently in Kanaka Creek and its tributaries.

Not all watercourses have been identified or classified as part of the conceptual planning process. Further ground-truthing will be required on a site-by-site basis at the time of development.

Vegetation and Forest Cover

Trees and forest stands provide cultural and aesthetic values as well as synergetic value to aquatic and terrestrial habitat. The existing vegetation communities in North East Albion range from residential landscaped yards and lawns to mature mixed evergreen and deciduous forest stands. There are distinct vegetation communities in the area; they include grassed and landscaped residential areas, riparian areas that are young to moderate in age, mature forest communities, and young to moderate in age forest communities. Forest stands are primarily found within aquatic riparian areas. Significant mature conifers are frequently present between riparian areas in the west of North East Albion or they stand alone on landscaped lawns. The stands located outside of protected riparian setbacks offer important and valuable wildlife linkages. For further details on forested areas, please refer to Figures 5, 9, and 12

As identified by area residents, preservation of high-value tree stands is desirable. Per standard development processes, development applications will be required to retain a Certified Arborist to evaluate tree health and retention suitability.

Wildlife Inventory and Habitat

North East Albion offers a high degree of biodiversity as exemplified by the richness of the plant and animal species that occupy it. Valuable habitat is located throughout North East Albion, including Kanaka Creek, the forest stands, and the streamside riparian areas. Regular visitors in the area include bears, deer, mink, otters, muskrats, coyotes, foxes, moles, shrews, voles, mice, squirrels, and chipmunks. Cougars are occasionally seen within Kanaka Creek Regional Park. Maintaining the movement corridors of these animals along Kanaka Creek and between Kanaka Creek and Grant Hill is important for facilitating wildlife conservation and resident safety as it reduces the risk of dangerous wildlife encounters.

Key ecological corridors currently utilized by native habitat include Thornvale along the south boundary, which provides a link to Grant Hill, and Kanaka Creek Regional Park to the west and north.

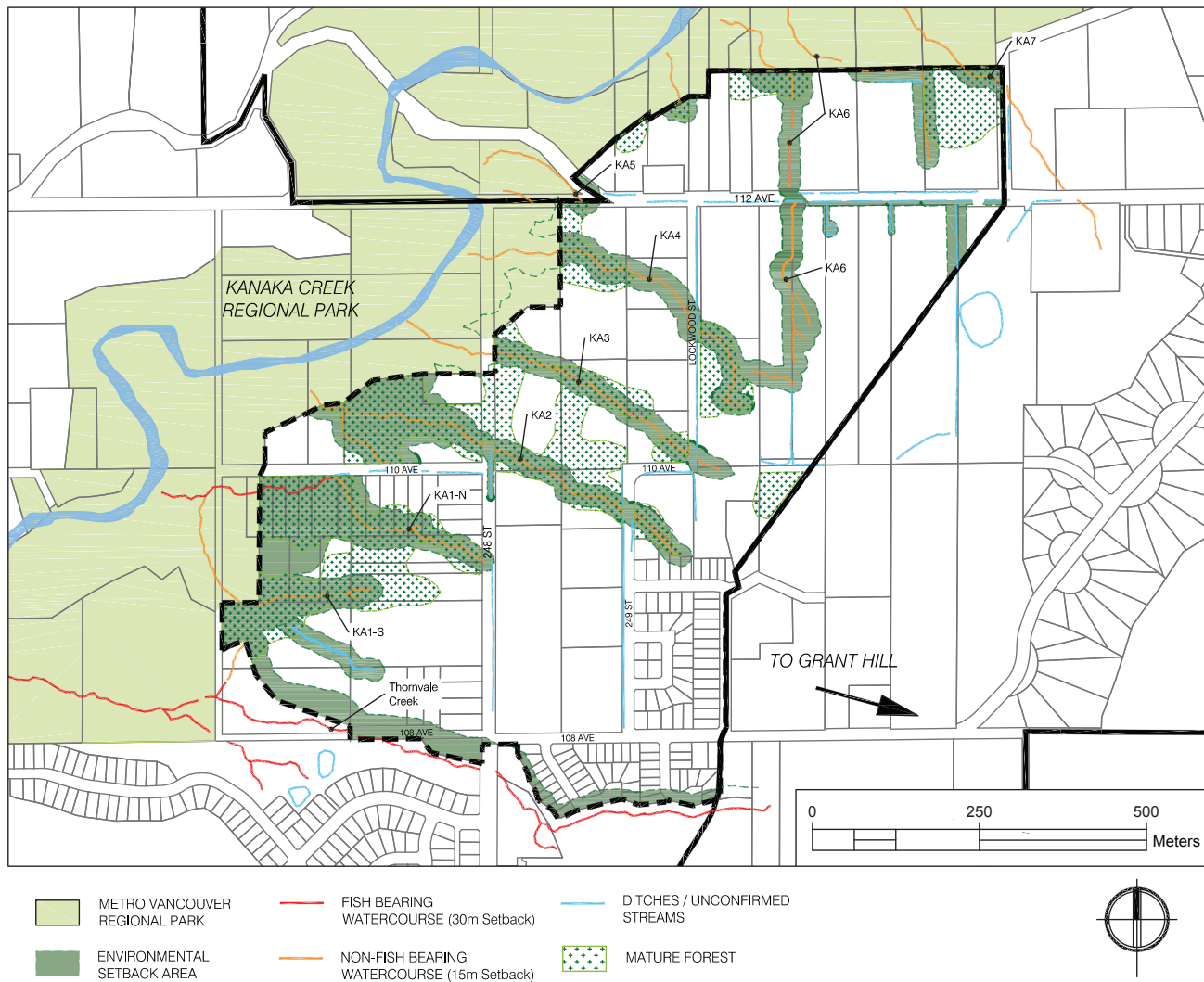


Figure 5 - Watercourses and Mature Forests

3.4 MOBILITY CONTEXT

The North East Albion area is currently serviced by 112 Avenue to the north and 108 Avenue to the south. At present, active transportation options are limited for Albion residents. There are currently no sidewalks on 112 Avenue through North East Albion and there is no dedicated cycling infrastructure available, despite community interest in the provision of cycling paths within North East Albion.

North East Albion is served by a TransLink operated community shuttle (#748 Haney Place/Thornhill) and is roughly a 30-minute ride to Downtown Maple Ridge. Port Haney Station is served by nearby bus #746 Haney Place/Albion or roughly a 15-minute drive by car.

The Maple Ridge Strategic Transportation Plan (STP) has identified several key considerations for the future of mobility and transportation in North East Albion. One key concept is a 108 Avenue/112 Avenue connector, which has been identified as necessary to provide east-west connectivity between Lougheed Highway at the Haney Bypass (via Kanaka Way) and 272 Street for existing and future development. Additionally, the STP identifies long-term transit service in the North East Albion area will continue to be provided via Community Shuttle transit service. The STP identifies North East Albion as an area to improve walkability for residents by providing sidewalks as growth occurs, constructing temporary sidewalks where needed, and striving towards a full sidewalk standard in the long-term. Future sidewalk construction will be provided through the land development application process.

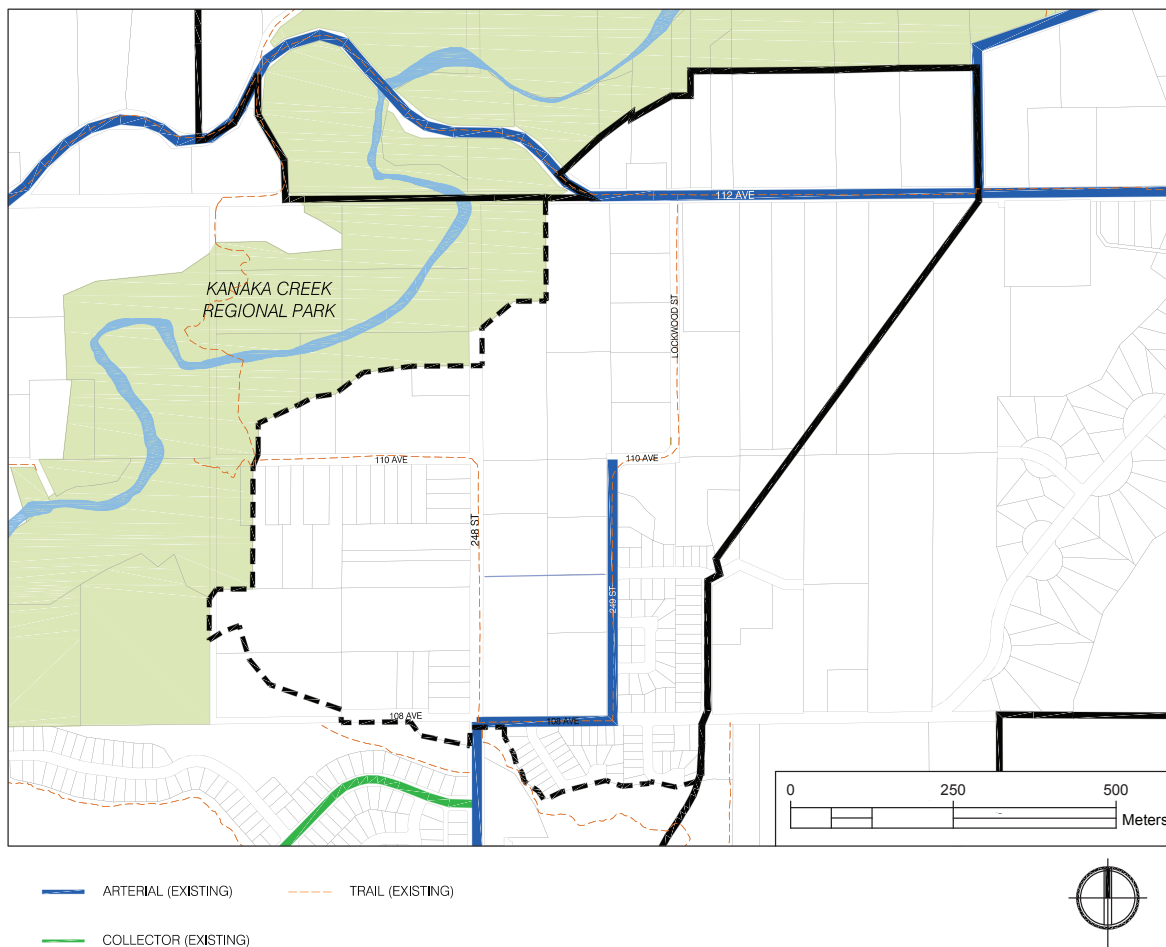


Figure 6 - Existing Major Roads - Arterials and Collectors

3.5 COMMERCIAL CONTEXT

Nearby commercial uses are located primarily along 248 Street. These existing commercial nodes offer retail and commercial services for residents including a grocery store, restaurants, childcare centers, pharmacies, and salons.

The potential for retail to be located and succeed in North East Albion will be influenced by the location of existing and planned retail nearby, the existing and future transportation network, and the proposed population density in North East Albion. A retail economic analysis concluded that North East Albion has the potential to support a convenience retail node that may include tenants such as take-out restaurants, cafes, hair salons, childcare centre, convenience stores, and florists, for example



Kanaka Creek Coffee, 102 Avenue at 241 Street.

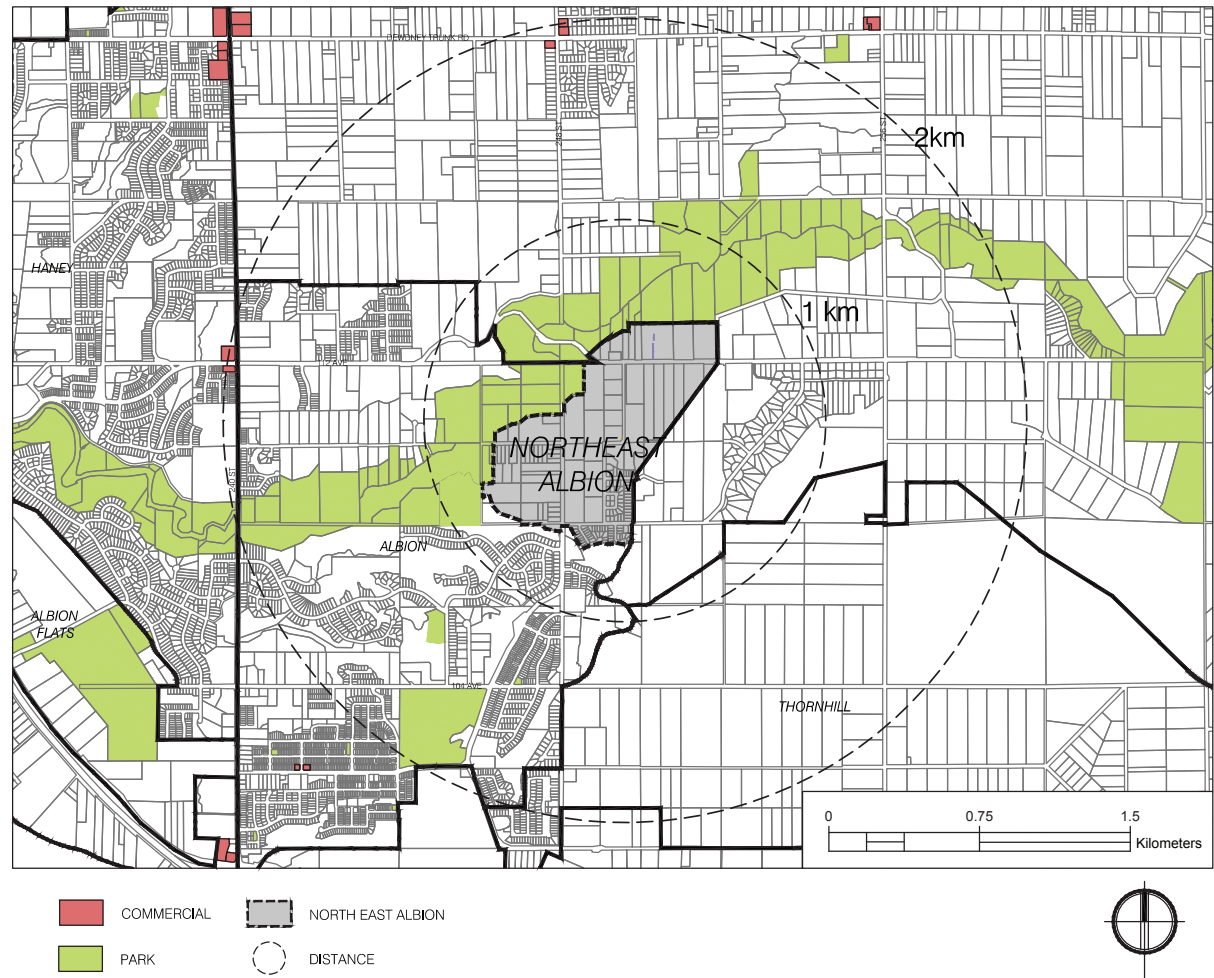


Figure 7 - Existing Commercial Nodes

3.6 EXISTING INFRASTRUCTURE

There are currently limited sanitary services in North East Albion. North East Albion is primarily serviced by well water and septic sewer, except for a small portion of land in the south, which is serviced with sanitary and water that drains south into the Albion area system.

For North East Albion to accommodate future development, substantial investment into sanitary infrastructure is required. New development in the area will be responsible for financing all proposed infrastructure.

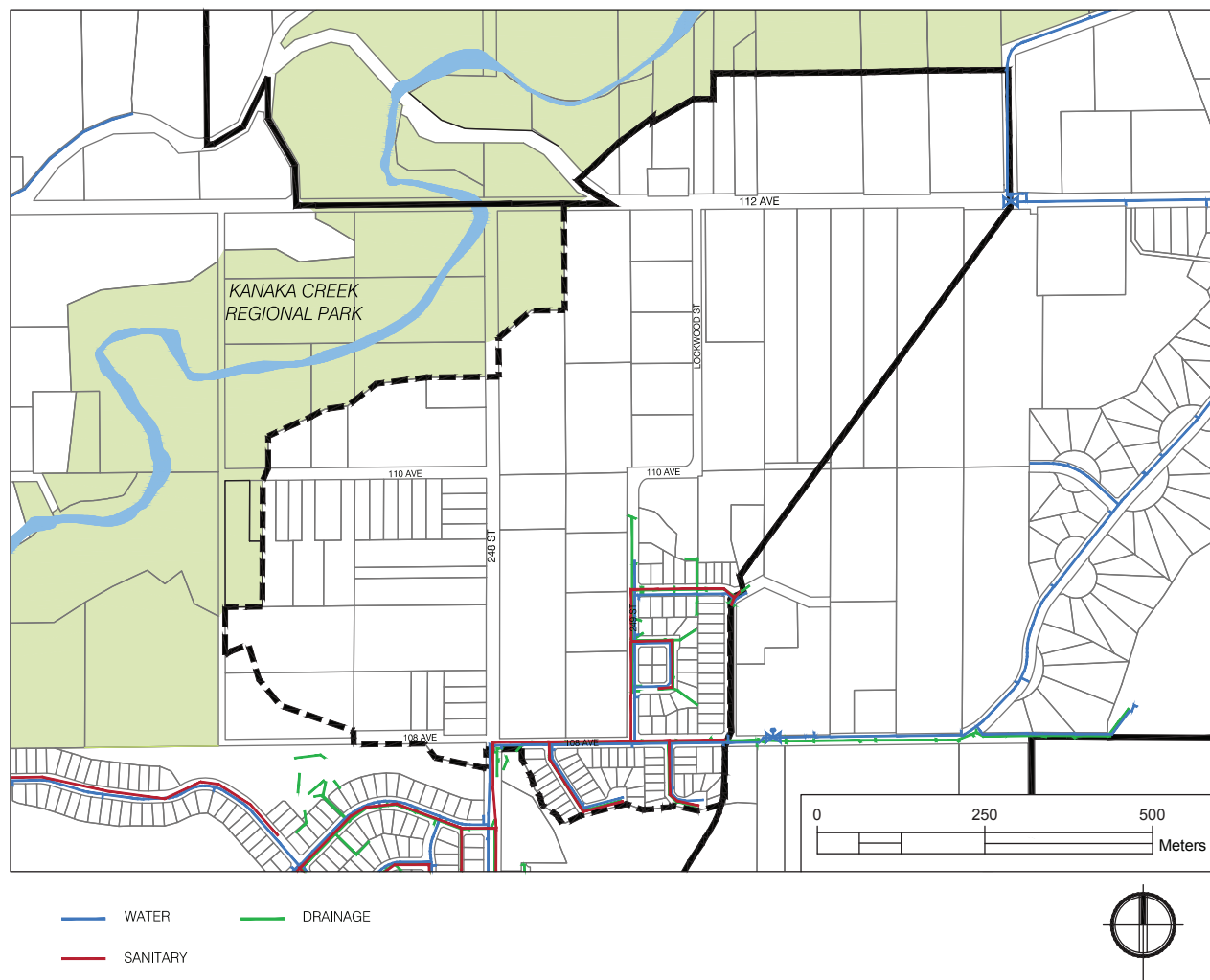


Figure 8 - Existing Services

04 | COMMUNITY CONSULTATION

4.1 CONSULTATION PROCESS

The planning process has been iterative and responsive to information provided by the consultant team, City staff, external stakeholders, and the community. From January to July 2019, Aplin Martin and the City of Maple Ridge conducted an extensive consultation program with key stakeholder groups and the community at large.



4.2 CONSULTATION HIGHLIGHTS

A number of public consultation events for both local landowners and the greater community were held throughout the planning process. At one of the initial visioning events, community members were asked to help the Consultant team understand what makes North East Albion truly special.

WHAT MAKES A GREAT NEIGHBOURHOOD?

- Knowing your neighbours
- Shops within walking distance
- Diversity and affordability of housing
- Options for homeownership and rental housing
- Private, quiet, and unique homes
- Sidewalk, streetlights, sewer, and water infrastructure
- Sufficient parking, limited traffic
- Transit options
- Playgrounds and parks for all ages
- Greenery and shaded recreation areas for families
- Trails, linkages, and pathways
- Fire station
- Daycares, schools, and libraries
- The secret duck pond (Shhh!)

WHAT CHALLENGES DO WE HAVE FOR NEW DEVELOPMENT?

- Financing new community amenities and services
- Traffic flow on Lougheed Highway during peak hours
- Limited local parking
- Limited emergency routes for evacuation
- Limited lighting and visibility through Kanaka Creek Regional Park
- Threats to pollution of groundwater and dewatering of wells
- Steep grades and erosion
- Potential for disruption to existing residents during construction
- Potential for the loss of green space, natural assets, and rural character

WHAT ARE THE OPPORTUNITIES IN NORTH EAST ALBION?

- New, modern homes
- Increased product choice for prospective homeowners
- Improved streetscapes, street lighting, and greenery
- Improved transit to the West Coast Express and the Town Centre
- Creation of a Park-and-Ride nearby
- Protection of groundwater and wells
- Protection of wildlife corridors
- Preservation of nature and access to nature
- Create sightlines to Kanaka Creek Regional Park
- Improved safety and privacy
- Townhouses with backyards
- Secondary suites as a mortgage helper
- Interconnected trail network
- Improvement of long-standing equestrian trails
- Introduction of bicycling lanes
- Improved access to Kanaka Creek Regional Park
- Local commercial options
- Affordable housing options located near services
- A diversity of housing types
- Sports fields and playgrounds
- Spaces for dogs
- Viewpoints



Community Consultation

05 | LAND-USE CONCEPT PLAN

5.1 PLAN SYNOPSIS

The natural environment forms the foundation upon which the land use planning process evolved. This framework is reflective of consultation with area residents and other stakeholders and embodies the planning themes and principles developed throughout the process. The Concept Plan represents a strategy to integrate land use and sustainable ecosystem management, while addressing concerns around housing affordability and diversity, transportation, parks, school capacity, and improving local neighbourhood amenities. The Concept Plan envisions residential pockets nestled between watercourses linked by a network of pathways and trails. A multi-modal network links neighbourhood amenities, such as parks, an elementary school, and shopping nodes within the community and to the larger Albion area and Kanaka Creek Regional Park.

North East Albion is typified by a tapestry of watercourses draped over a sloping landscape. These watercourses lead to one of Maple Ridge's greatest environmental treasures, Kanaka Creek. Mapping this rich and diverse landscape was the first step in establishing the Concept Plan and connecting these natural areas with green links, the second. Interconnected loops of pathways and trails are identified throughout the Concept Plan. A "Spine Trail" was established in the eastern portion of the plan area along a contour line in order to create a gentle-grade connection from the elementary school to 112 Avenue and the Cliff Falls trailhead. The Spine Trail will connect the community to future open spaces and amenity spaces. This trail, along with the "Northern Greenway" trail identified along the north boundary of the Concept Plan (from 112 Avenue to KA6) are designed to serve operational and aesthetic purposes by incorporating stormwater features into their design. These features will help provide for the management of sensitive ecosystems as well as the long-term protection of groundwater and natural aquifers. This celebration of water is illustrated through visible stormwater management features that will serve to capture surface water, create habitat, and protect our water resources.

The future for North East Albion is seen as an inclusive and sustainable community with equal opportunities for people of all ages, cultures, lifestyles, and abilities. An affordable and varied housing stock is an important foundation for achieving this vision and ensuring a diverse and vibrant city. The North East Albion Concept Plan introduces density through a range of housing forms that support a resilient local economy, respect the area's existing rural character at the Plan's boundaries, and ensure a greener future.

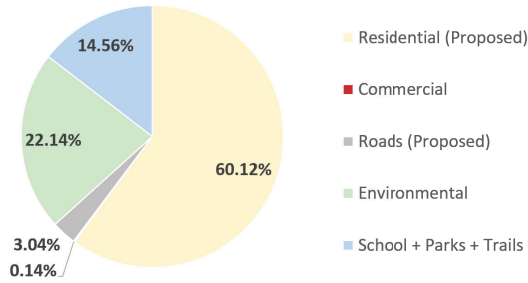
The proposed housing forms in North East Albion include the following:

- Townhouses are proposed in the centre of the Concept Plan, adjacent to 112 Avenue. By including higher density housing forms in North East Albion, the high cost of land is defrayed among more units, increasing housing affordability.
- Townhouse and attached-building forms stretch along arterial and collector roads towards the proposed elementary school site, providing affordable homeownership opportunities for families near services and amenities.
- Lower density, single-family detached homes and duplex, triplex, and fourplex dwellings that resemble single-family homes are proposed adjacent to existing small lot residents, plan boundaries, and sensitive habitat areas west of 248 Street. Single-family forms permit secondary suites or detached garden suites, creating an opportunity for more affordable homeownership and the potential for rental options for neighbourhood residents.

The Concept Plan reimagines North East Albion as a comprehensive, modern neighbourhood that incorporates housing choice, improved community amenities, and affordable housing, all while respecting the natural environment. In order to achieve a complete community that supports the daily needs of residents, new commercial nodes are being proposed within North East Albion near 112 Avenue and 248 Street. A neighbourhood that includes commercial nodes reduces vehicle trips taken and encourages active forms of transportation, leading to a healthier lifestyle and environment. The initial commercial node and nearby neighbourhood park are envisioned to proceed alongside initial development. The full network of amenities will be achieved overtime as the area continues to grow and mature. Guided by the Concept Plan, growth in North East Albion will be sustainable, resilient, and well-integrated to contribute to the overall quality of life for residents in Maple Ridge.

Plan Summary By the Numbers

**NORTH EAST ALBION CONCEPT PLAN
PROPOSED LAND USE (%)**



**NORTH EAST ALBION CONCEPT PLAN
PROPOSED RESIDENTIAL MIX (%)**

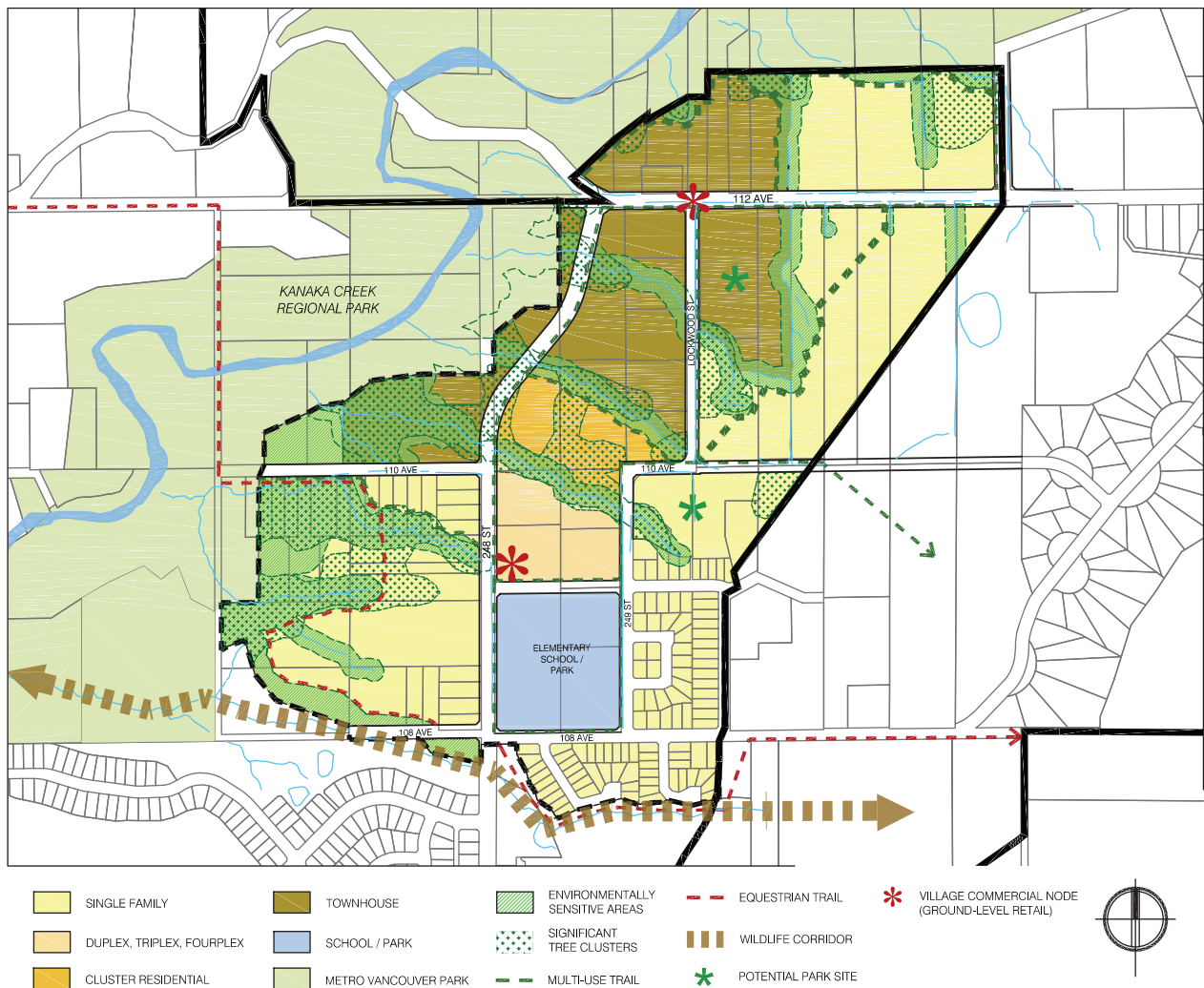
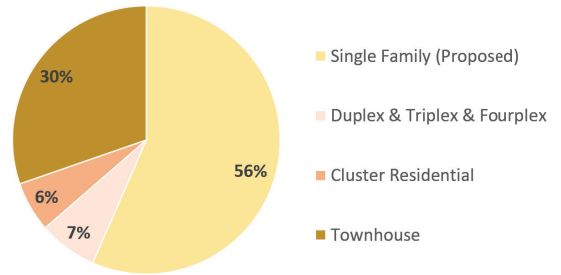


Figure 9 - Proposed Land-Use Concept Plan

5.2 NEIGHBOURHOOD QUADRANTS

Quadrant East of Lockwood Street

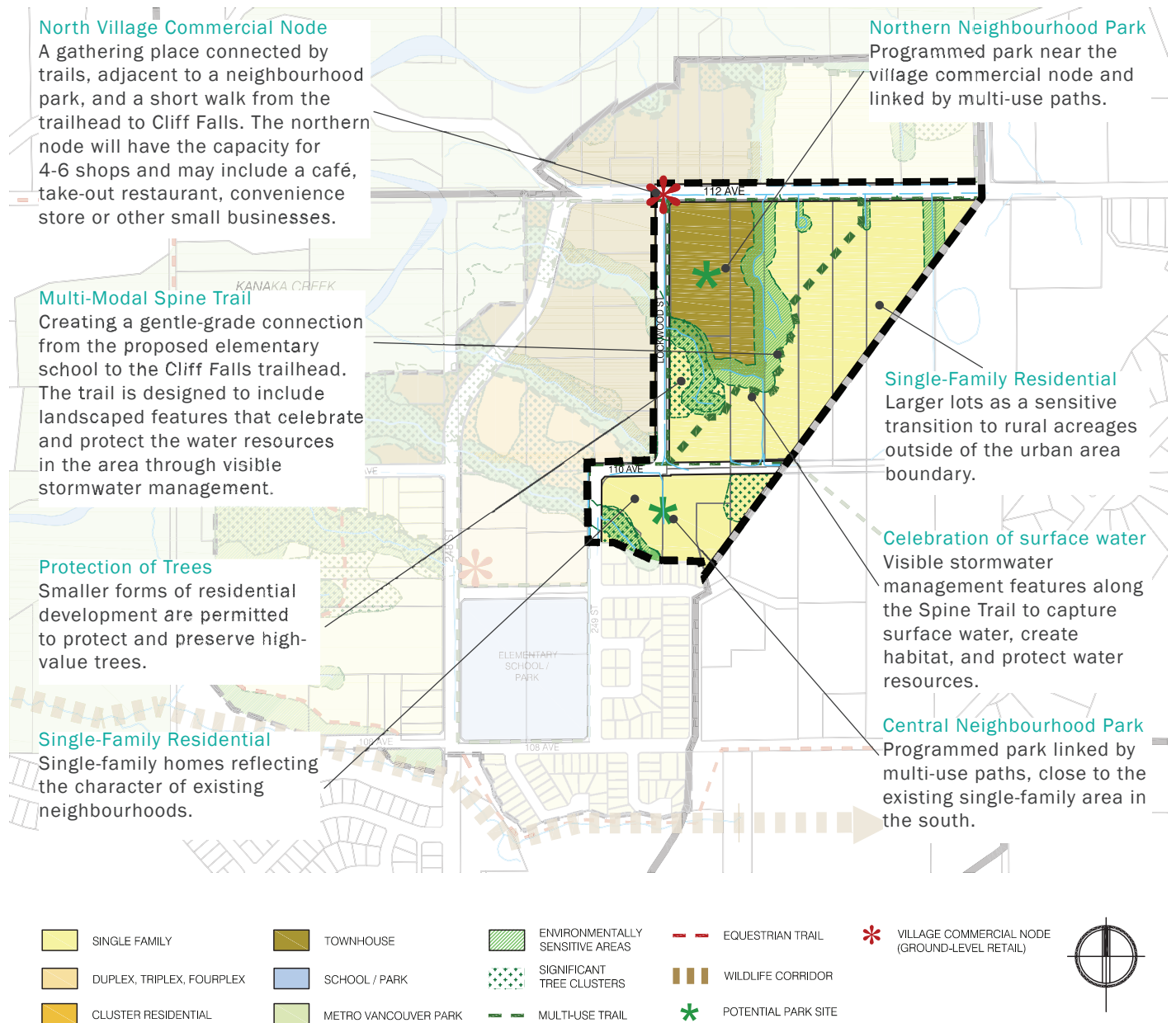


Figure 10 - Proposed Quadrant Land-Use Plan, East of Lockwood Street

Quadrant Between 248 Street and Lockwood Street

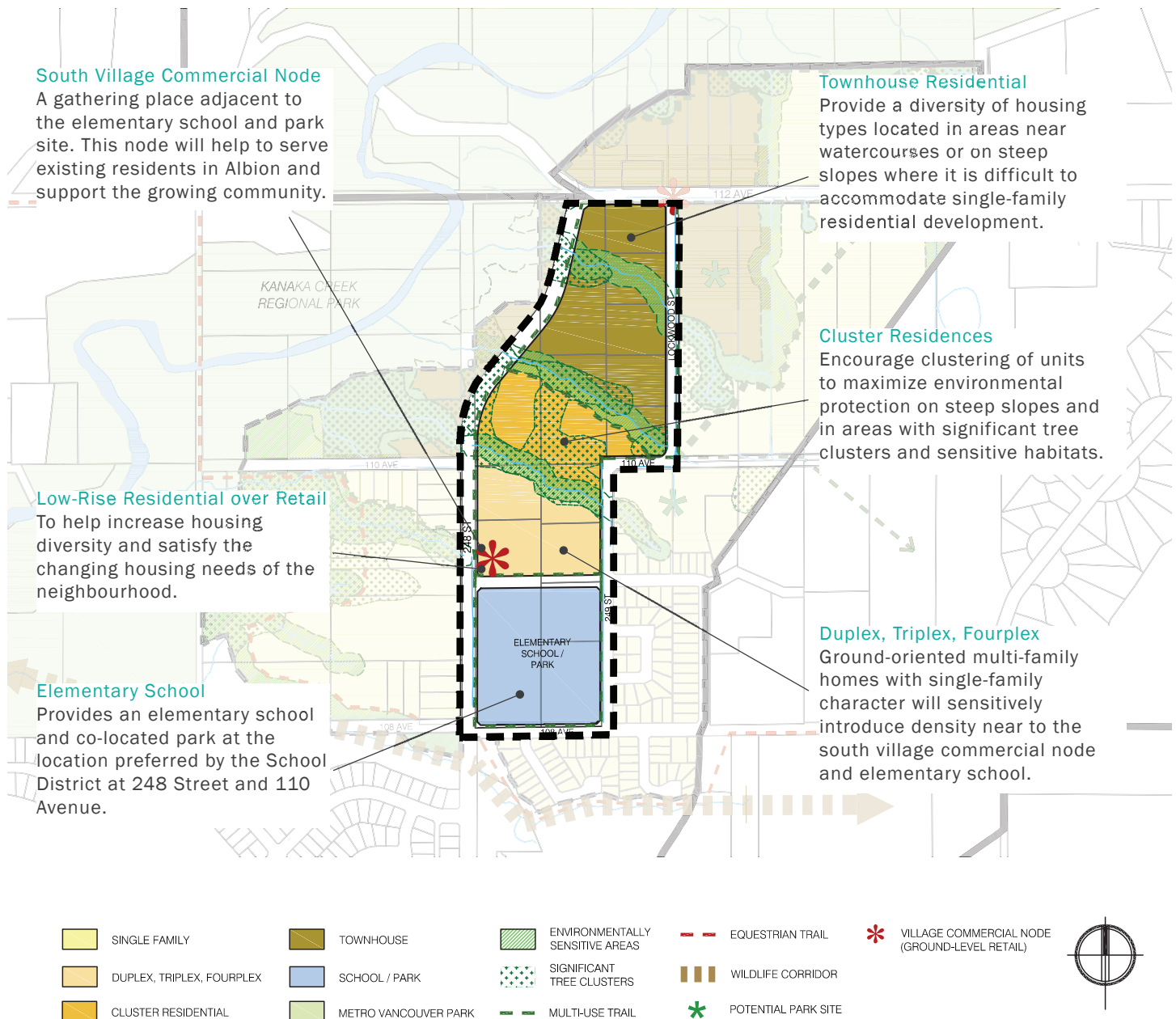


Figure 11 - Proposed Quadrant Land-Use Plan, Between 248 Street and Lockwood Street

Quadrant West of 248 Street

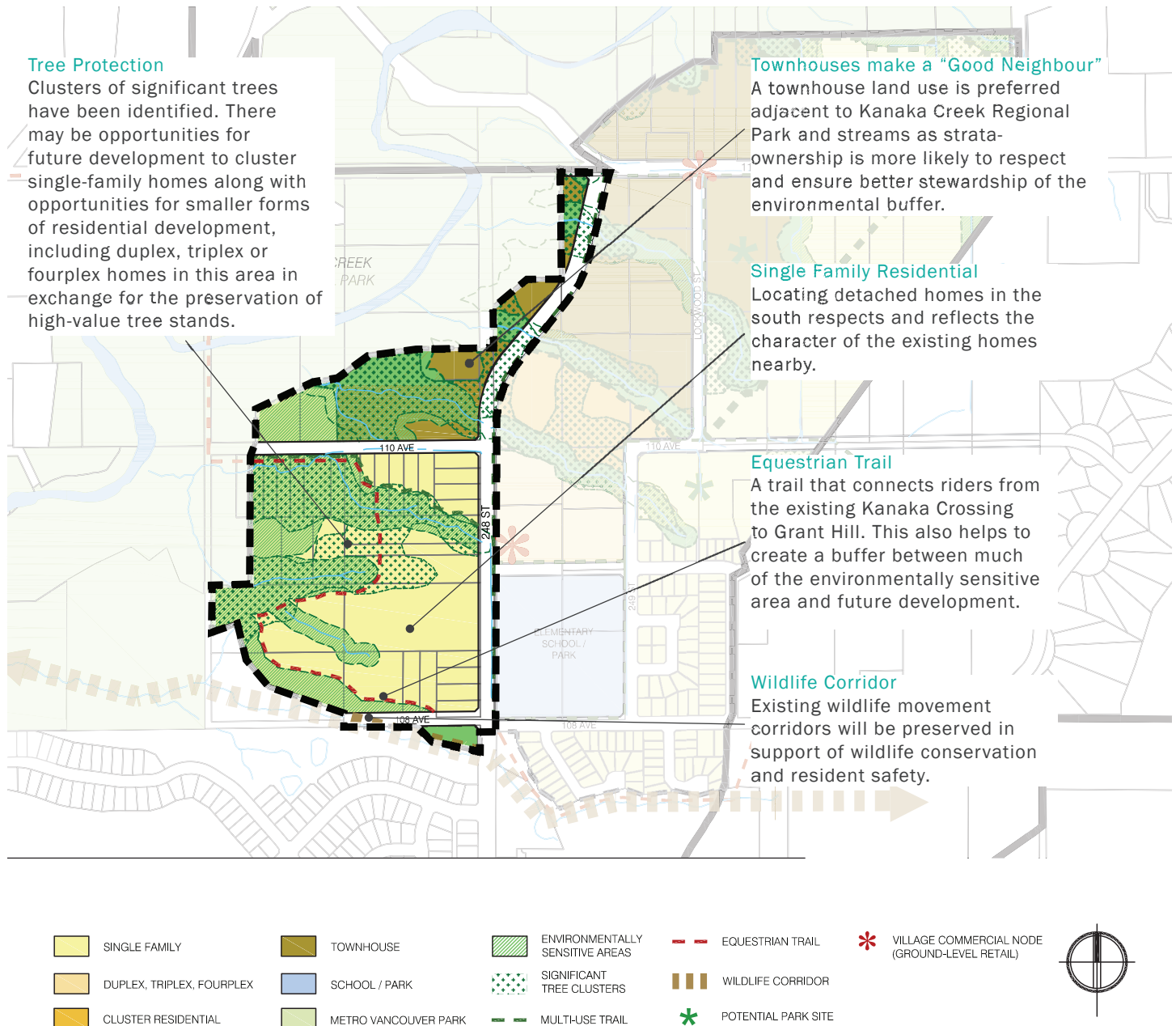


Figure 12 - Proposed Quadrant Land-Use Plan, West of 248 Street

Quadrant North of 112 Avenue

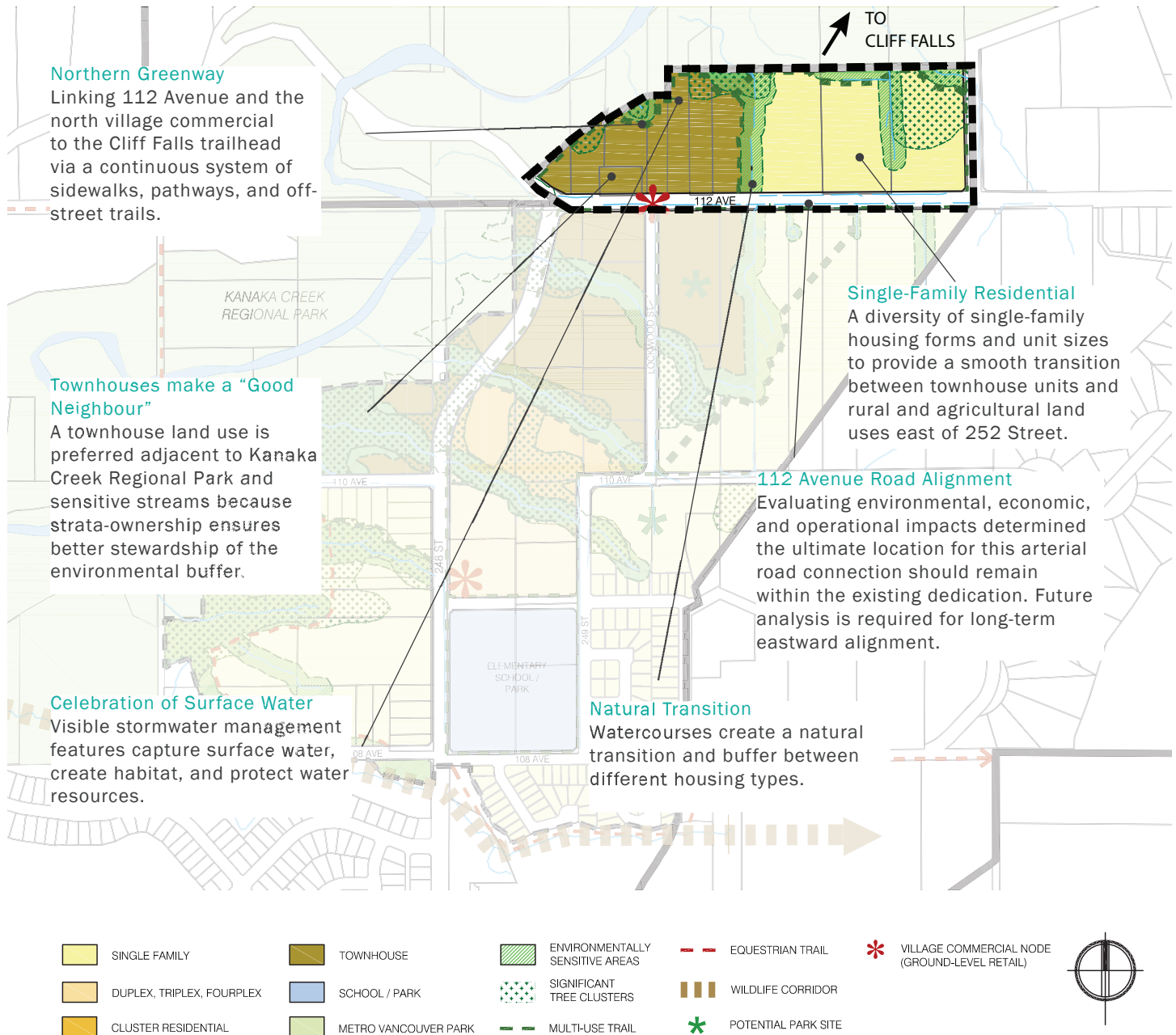


Figure 13 - Proposed Quadrant Land-Use Plan, North of 112 Avenue

5.3 ENVIRONMENTAL INTEGRATION

A healthy community depends on a healthy environment. The Concept Plan emphasizes environmental objectives at its forefront to promote environmental stewardship, protect natural resources, and preserve ecosystems while balancing social and economic objectives for the community.

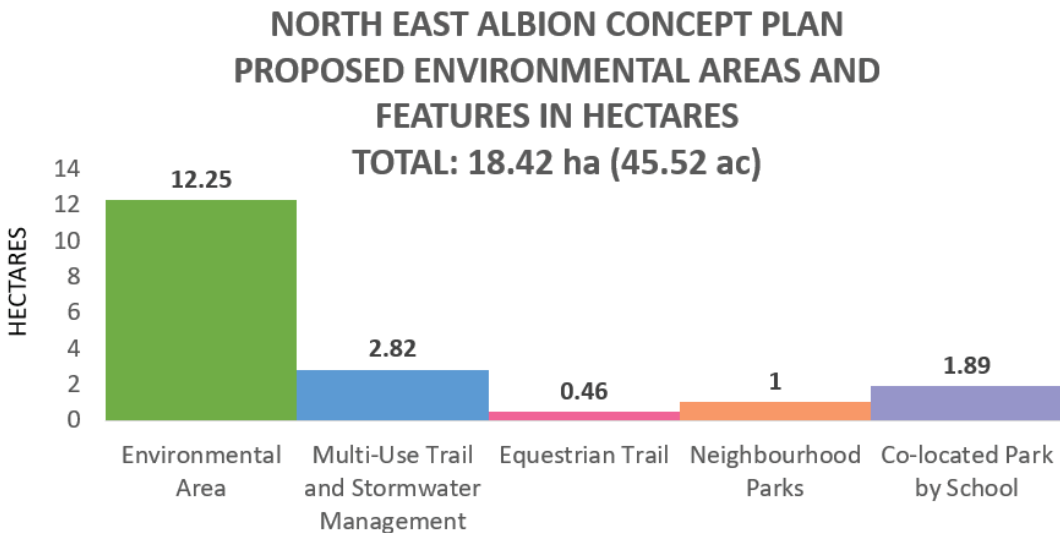
The existing environmental context guides the strategies and tools proposed in this Concept Plan to balance the impacts of development and increase human connection to nature. North East Albion will be developed to protect fish and fish habitat, minimize potential for stream erosion, prevent surface flooding, and ensure major storm conveyance systems are capable of safely conveying significant flows and minimize damage to life and properties under extreme storm conditions.

Water Conservation

The Concept Plan provides a vision for sustainable water stewardship practices that will adapt to climate change impacts and the pressures placed on water resources from a growing population. Water conservation is a key component to ensuring the health of humans, plants, and animals by protecting

groundwater, fisheries, and potable water. Water conservation measures in the context of a changing climate in the Concept Plan will protect fish and fish habitat by maintaining baseflows and water quality to Kanaka Creek and its tributaries. By effectively managing water, North East Albion will have reliable, safe, and clean water, maintain property values, and ensure the environmental stewardship of wildlife hubs and corridors in the area.

To maximize groundwater protection and water conservation, stormwater management best practices, including the introduction of visible stormwater management features, are proposed throughout the Concept Plan. At the time of development, Geotechnical investigations will be required to include a groundwater impact assessment that is focused on groundwater characterization regarding aquifer presence at a site (e.g. groundwater-bearing soil formation, depth, flow direction) and impact mitigation measures (e.g. intercept and direct to nearby stream, supplement with stormwater infiltration) to protect stream base flows and local use of drinking water resources.



Watercourses and Setbacks

Watercourses will be protected by environmental setbacks to preserve their health and integrity throughout the Concept Plan. The riparian setback areas illustrated in the Concept Plan provide a high-level overview of the many watercourses in the Concept Plan. These watercourses feed into the Regional Park and support the health and integrity of the Kanaka Creek ecosystem. Additional unclassified watercourses may be discovered with individual site investigation at the time of development.

There are ditches and unclassified roadside streams located throughout the Concept Plan that have not been assessed. These ditches and streams may have habitat and aquatic value that will require compensation if relocated or will require some level of recognition, interpretation, or integration in the development design.

Sensitive design is encouraged to ensure that pre-development water quality and quantity are maintained in post-development conditions. This will be determined based on ground-truthing at the time of development on a site-by-site basis.

Tree Retention and Forest Stands

Significant tree stands that are not already protected through existing legislation, bylaws or policies may be preserved through thoughtful site design. There is the potential for density bonuses for the purpose of managing the development footprint while maximizing environmental preservation. Evaluation by a certified Arborist is required to determine tree health and retention potential. High-value trees should be incorporated into site design, where possible. Significant trees are primarily located within existing riparian areas and are critical to watercourse health.

Mature Forest

The Concept Plan also acknowledges the importance of mature forest stands and potential co-dependence with riparian areas to create a windfirm boundary. Tree retention in North East Albion enhances the natural beauty of the area and provides significant environmental benefits such as air purification and carbon sequestration. Tree retention is also imperative to minimizing local climate impacts, creating habitat for wildlife, and water management objectives.

Wildlife Movement

Kanaka Creek Regional Park provides valuable habitat for wildlife. Existing wildlife movement corridors along Kanaka Creek and between Kanaka Creek and Grant Hill along Thornhill will be preserved in support of wildlife conservation and resident safety. The Concept Plan proposes to further buffer Kanaka Creek Regional Park where wildlife primarily travels currently. This buffer will couple landscaping and stormwater management features to improve passage for wildlife by further setting back from steep ravine barriers within the Regional Park. The proposed buffer will also act as a deterrent to encroachment, as they will be maintained by the City and/or strata.

5.4 COMMUNITY SERVICES AND AMENITIES

Parks

New parks and open spaces are important components of a green, liveable, and connected neighbourhood. The Concept Plan proposes a co-located neighbourhood park and elementary school with a sports field, as well as playgrounds, pathways, and neighbourhood park(s) to meet the needs of the growing community.

- Neighbourhood parks form the visual, physical, and social focus of a neighbourhood and are typically a minimum of 0.49ha (1.2ac) in size.
- A co-located school-park site with the proposed elementary school could include an active use sports field, looping trails, sports courts, and playgrounds.
- All residents will have a park within a 5-minute walk.

Park Programming

Park amenities are typically determined through the design process, which includes neighbourhood consultation several months prior to park development. Typical neighbourhood park amenities include:

- Playgrounds
- Sports courts
- Splash pad
- Looping pathways
- Open grass
- Picnicking and seating areas

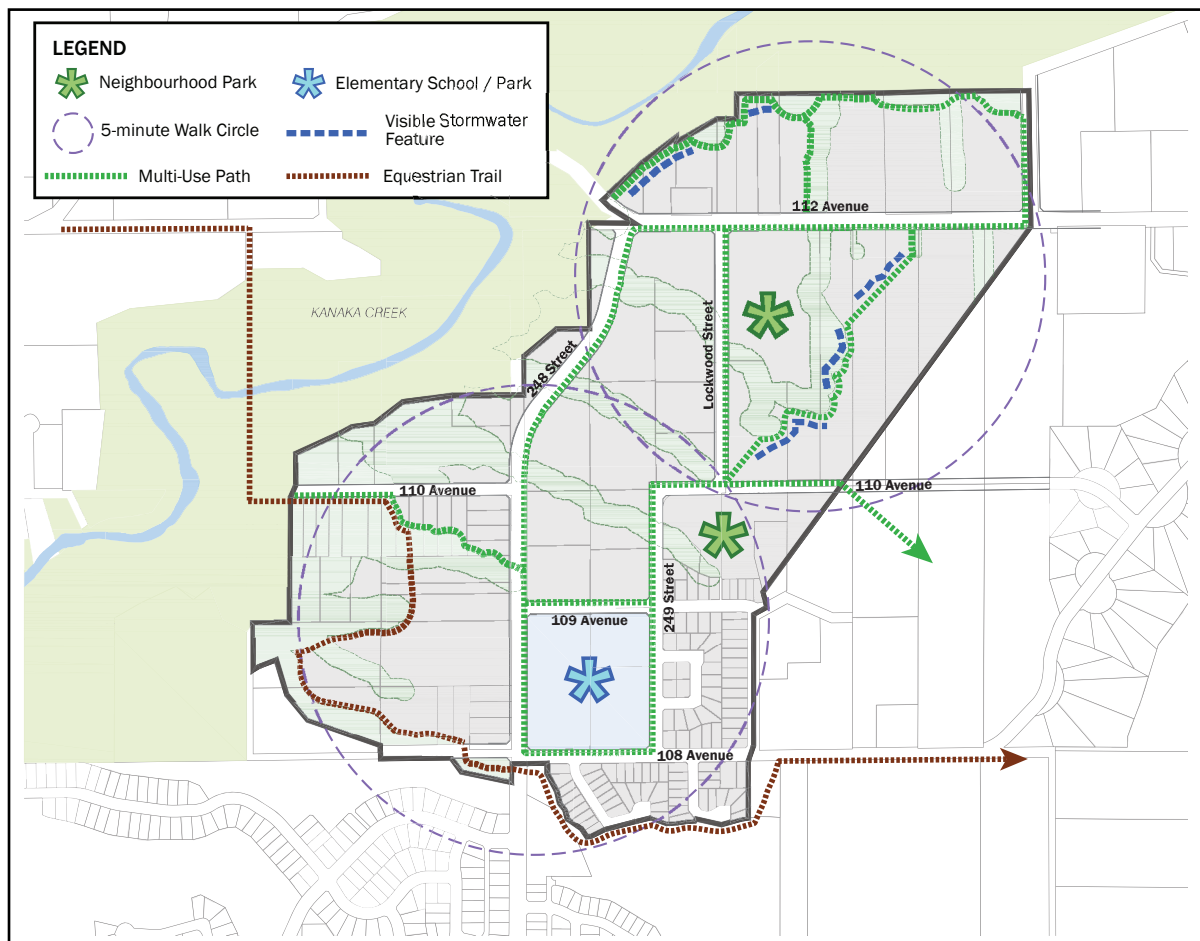


Figure 14 - Proposed Neighbourhood Parks and Trails

Trails and Pathways

North East Albion will provide active and passive recreational opportunities woven into the neighbourhood through a network of off-street trails and multi-use pathways. These trails and pathways act as a greenway and buffer to sensitive environmental areas and create a more attractive public realm for pedestrians and bicyclists. They are connected by walking loops throughout the community, linking residents to neighbourhood amenities and green spaces. These will encourage reduced driving in North East Albion as short trips are made by walking rather than driving.

Spine Trail & Northern Greenway

The Spine Trail creates a gentle-grade connection from the proposed elementary school to the Cliff Falls trailhead on-street following 249 Street and 110 Avenue and off-street from 110 Avenue to 112 Avenue. The Northern Greenway links the 112 Avenue Parkway over Kanaka Creek to Cliff Falls via a continuous pathway lining the Kanaka Creek Regional Park boundary at the northern edge of the Concept Plan.

A townhouse land use is proposed adjacent to the Northern Greenway to ensure better stewardship of the environmental buffer and provide additional surveillance as well as “eyes-on-the-trail”.

These trails will be designed to include landscaped features that celebrate and protect the water resources in the area through visible stormwater management. A series of connected

ponds are proposed to be woven into the trail system. The design and location of these features along the trails is flexible to ensure that they meet stormwater management targets and can be sensitively and seamlessly knit into the natural slope of the site. Site specific analysis at the time of development will refine the design and location of these features.

Equestrian Trail

A trail that connects riders from the existing Kanaka Crossing to Grant Hill. This trail helps to create a buffer between the environmentally sensitive areas and future development.

Elementary School

North East Albion has been identified as a high priority for an additional elementary school site by the Maple Ridge – Pitt Meadows School District No. 42 (SD 42) in their Strategic Facilities Plan. SD 42 has identified the parcels located at 248 Street and 108 Avenue as the preferred location for a new elementary school, per the Albion Area Plan, and has asked the Ministry of Education for funding to acquire the parcels.

While more detailed design and analysis is anticipated, at this time the new elementary school is expected to be 5,100 m². and is to accommodate approximately 660 additional students from the community in 27 classrooms. The site identified will also accommodate a sports field to be owned and operated in partnership with the City of Maple Ridge.

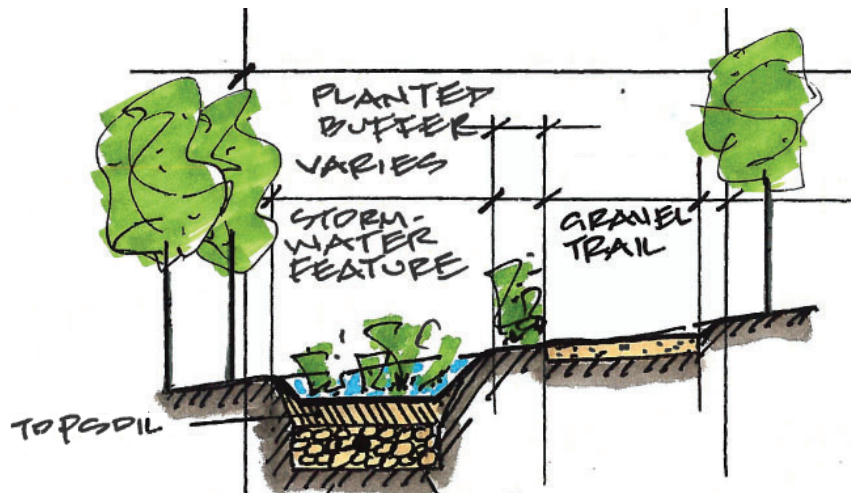


Figure 15 - Trail and Stormwater Feature Typical Section

5.5 VILLAGE COMMERCIAL

Mixed-Use Development

Mixed-use development is a fundamental component to achieving a complete neighbourhood where residents can live, work, and play. Two commercial nodes are proposed in North East Albion, one at the intersection of 112 Avenue and Lockwood Street, and one adjacent to the proposed elementary school at 248 Street. The nodes are envisioned as anchors for community activity: connected by trails, adjacent to new neighbourhood park(s), and a short walk away from trailheads into Kanaka Creek Regional Park. The northern commercial node is envisioned to be achieved at the early stages of build-out. The secondary commercial node, adjacent to the elementary school site, allows for additional commercial space should there be sufficient demand as the neighbourhood grows.

Each node will have the capacity for 4-6 shops (555–840 m²). Retail uses at this scale may include a café, take-out restaurant, hair salon, childcare center, florist, convenience store or other small businesses.

The nodes will be designed as 2-3 storey multi-family apartments or townhouses stacked above ground-level commercial, allowing for both affordable home ownership and the possibility of rental housing to be introduced in North East Albion. The inclusion of mixed-use development may stimulate more variety in the design of, and options for, more affordable multi-family housing.

The benefits of mixed-use development include a reduction in reliance on vehicles and promote more of a pedestrian-friendly environment due to the short distances between living, work, commercial, and recreational destinations. This results in lowered commuting costs and decreased road congestion. Mixed-use developments also contribute to livelier urban spaces with public gathering places and a variety of shops, restaurants, and entertainment.



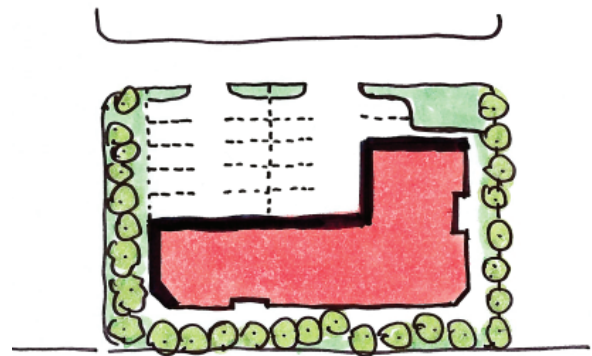
Mavis Street, Fort Langley



Reid Block, Fort Langley

Design Intentions

- Blends commercial, residential, and institutional uses to create an activated and animated street presence.
- Sized appropriately to meet the needs of the growing community with additional room to expand, should demand be present.
- Locating commercial nodes near future multi-family units to help support the commercial interests.
- Co-locating commercial uses adjacent to homes, parks, trails, and areas of activity and gathering.
- Within a 5-to-10-minute walk of the future school; easy access from an arterial road to respect future car travel routes.
- Market or rental apartment or townhouse units above ground-floor commercial, providing residents with easy access to a wide range of amenities.
- Ground-oriented and street-facing units along 112 Avenue and Lockwood Street.
- Building heights tapering to adjacent lower density land-uses.






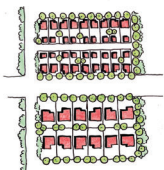
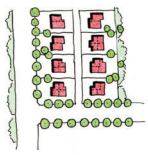


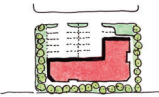


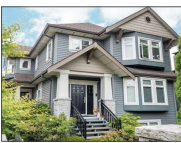


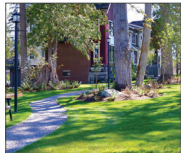






Typology Sketch

5.6 HOUSING TYPOLOGY

Maple Ridge is a growing and diverse community that requires a range of housing options to support the social and economic health of the city. Allowing for, and encouraging, a mix of different housing types provides homes that are affordable within different ages and stages of one's life. A variety of residential designations are included in the North East Albion

Concept Plan to support a diversity of housing options, ranging from townhouses adjacent to the northern commercial node to single-family dwellings. The Concept Plan features a gradual decrease in density away from major roads and towards the urban area boundary and the existing single-family homes.

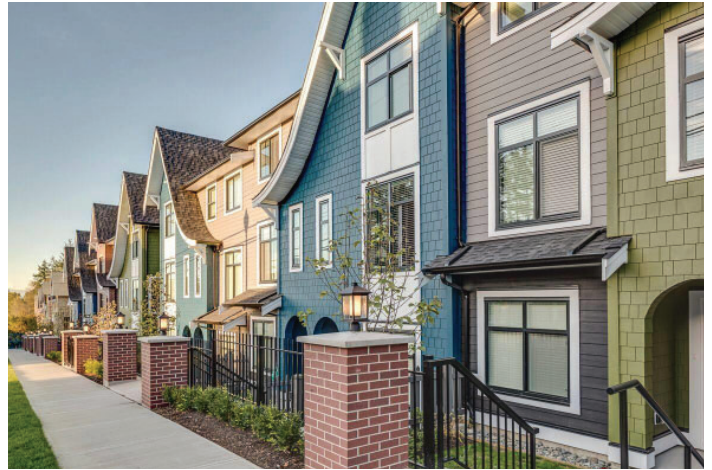
Land Use Designation	Single Family	Duplex, Triplex, Fourplex	Cluster Residential	Townhouse	Mixed Use Commercial
Design Principle	Single-family homes that serve as a continuation of the existing character in the area. May also include duplex, triplex, and fourplex in select locations.	Ground-oriented, multi-family homes that appear as a single-family house; increases housing diversity and maintains existing character.	Multi-family residential units clustered to minimize development footprint and maximize environmental protection in sensitive areas.	Multi-family homes at densities that support new commercial and park amenities.	Community node that mix retail options and residential units with an opportunity for rental options.
Building Form Options	<p>2-3 storey attached or detached dwellings.</p> <p>Large lots with front garages.</p> <p>Small urban lots with rear or front garages.</p> <p>Option for detached garden suite or secondary suite.</p>	<p>2-3 storey attached dwellings.</p> <p>Smaller units within larger dwellings that have the appearance of a single-family dwelling.</p> <p>Smaller units within larger dwellings surrounding a central courtyard or strata road.</p>	<p>2-3 storey townhouse units with private strata parking.</p> <p>Option for detached garden suite or secondary suite in single family forms.</p>	<p>2-3 storey townhouse units with private strata parking.</p> <p>3 storey townhouse or stacked townhouse with surface or underground parking.</p>	<p>2 storey with apartment above ground floor commercial.</p> <p>3 storey stacked townhouse units above ground floor commercial.</p>
Illustrative Example					
Concept Design Illustration					
Photo Example	 	 	 	 	 

Townhouse

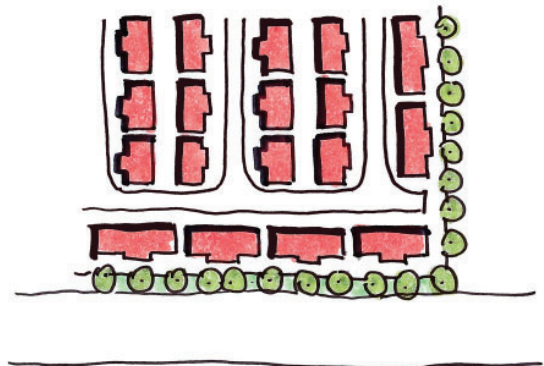
The Townhouse designation is intended to accommodate urban townhouses in areas with access to major circulation routes, commercial areas, and public amenities. The proposed townhouse developments are in close proximity to amenities and services, where residents can walk or bike rather than drive their cars. Typical townhouse developments may consist of primarily 2 to 3 storey buildings that house multiple dwelling units and provide some form of indoor and outdoor amenity spaces. These developments will feature private strata parking. Stacked townhouses up to 3 storeys are permitted along arterial roads adjacent to commercial nodes, with surface or underground parking.

Design Intentions

- Townhouse units adjacent to roads, trails, and/or public spaces for increased surveillance.
- Townhouse or stacked townhouses adjacent to commercial nodes and green spaces along 112 Avenue.
- Townhouse units are preferred adjacent to Kanaka Creek Regional Park and sensitive streams to ensure buffering and stewardship of the Park.
- Oriented to and directly accessed from the fronting street.
- Front and rear yards as private outdoor living spaces for residents.



Built Form Example



Typology Sketch

Cluster Residential

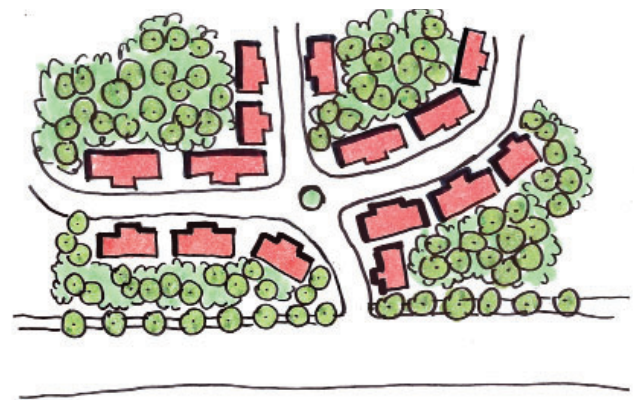
The Cluster Residential designation is intended for multi-family units that are clustered together to minimize the development footprint and maximize environmental protection in sensitive areas. Clustered residences promote integrated site design that is considerate to the natural features and topography of the site. They protect environmentally sensitive areas and permanently preserve important natural features and open space to create larger areas for recreation and social interaction. The designation is intended for ground-oriented multi-unit strata residential townhouse buildings and related amenity and open space.

Design Intentions

- Integrated site design that is considerate to the natural features and topography.
- Protection of environmentally sensitive areas.
- Create more areas for open space, recreation, and social interaction.
- Units can be a variety of forms, including freehold or strata, attached or detached product.
- Townhouse units with front doors facing 248 Street and 110 Street and other major streets.



Built Form Example



Typology Sketch

Duplex, Triplex, Fourplex

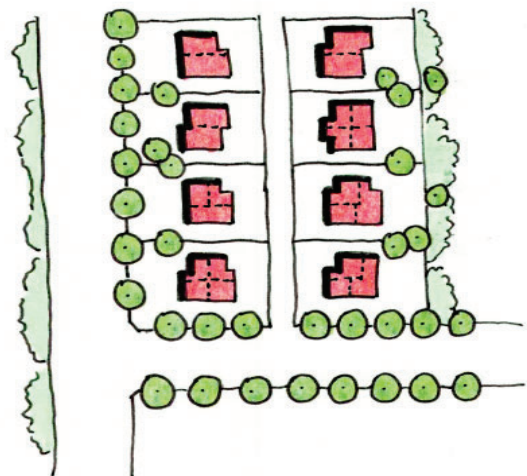
The Duplex, Triplex, Fourplex residential designation is intended for buildings joined by a common party wall or strata buildings. They provide greater housing diversity options to meet the needs of potential homeowners. This designation may include a mix of semi-detached or attached courtyard dwellings. They are to be designed to resemble single-family homes and are ground-oriented.

Design Intentions

- Duplex, triplex, and fourplexes designed with the outward appearance of a single-family home yet feature multiple distinct entries.
- Units in a variety of designs to break up the massing of the building, provide for individuality in the design, and are visually interesting.
- Rowhouses are also permitted, maximizing opportunity for hidden density and interesting streetscapes.



Built Form Example



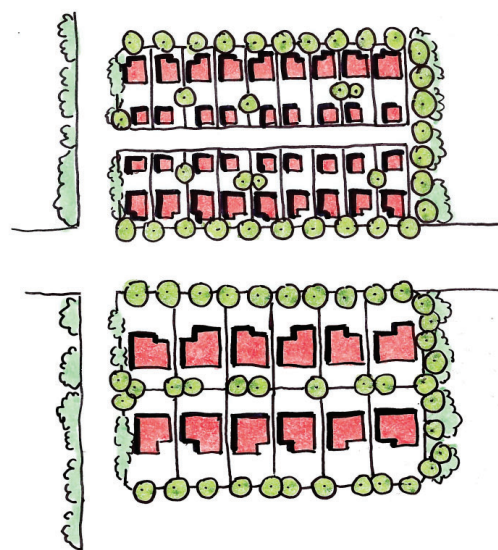
Typology Sketch

Single-Family

The Single-Family residential designation is intended for detached dwellings on rural to smaller urban lots. The inclusion of smaller single-family lots will allow for more affordable homeownership opportunities for single-family homes. The opportunity to include secondary suites or detached garden suites on larger residential lots will also enhance affordability and the potential for rental opportunities in North East Albion. Intensive residential areas may also permit attached buildings forms along collector and arterial roads or when clustering away from environmentally sensitive areas.

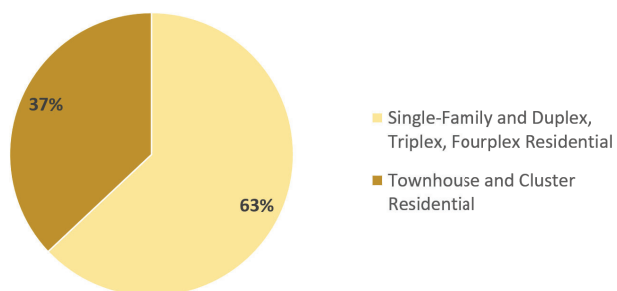
Design Intentions

- Larger residential dwellings adjacent to the east Concept Plan boundary, adjacent to rural properties to protect the edge.
- Lots of varying size west of 248 Street clustered to encourage the protection of sensitive habitat and high-value tree clusters.
- Homes of a variety of sizes to increase housing diversity and affordability
- Smaller urban lots near the existing single-family dwellings.
- Attached or detached dwellings with rear garages adjacent to collector and arterial roads.
- Potential for the inclusion of secondary suites or detached garden suites on properties.



Typology Sketch

NORTH EAST ALBION CONCEPT PLAN PROPOSED HOUSING MIX (%)



Built Form Example

PART 2 - SERVICING STRATEGY

06 | INTRODUCTION

The North East Albion Land Use and Servicing Concept planning process involves a review of the existing infrastructure in the area and an evaluation of the existing systems to withstand buildout of North East Albion.

07 | TRANSPORTATION

The proposed transportation network is designed to foster interconnection between streets, trails, and greenways to promote cycling, walking, and horse-back riding. New roads essential to a functional street grid are identified, such as the 248 Street connection. Any new local roads required for proposed housing will be determined at the time of development. A network of high-quality trail loops will link neighbourhood parks, open spaces, commercial nodes, and other key destinations.

Please refer to Section 12, **Drawing 18-1022A-101 (Roadworks Master Plan)** for the proposed major road network and road classifications.

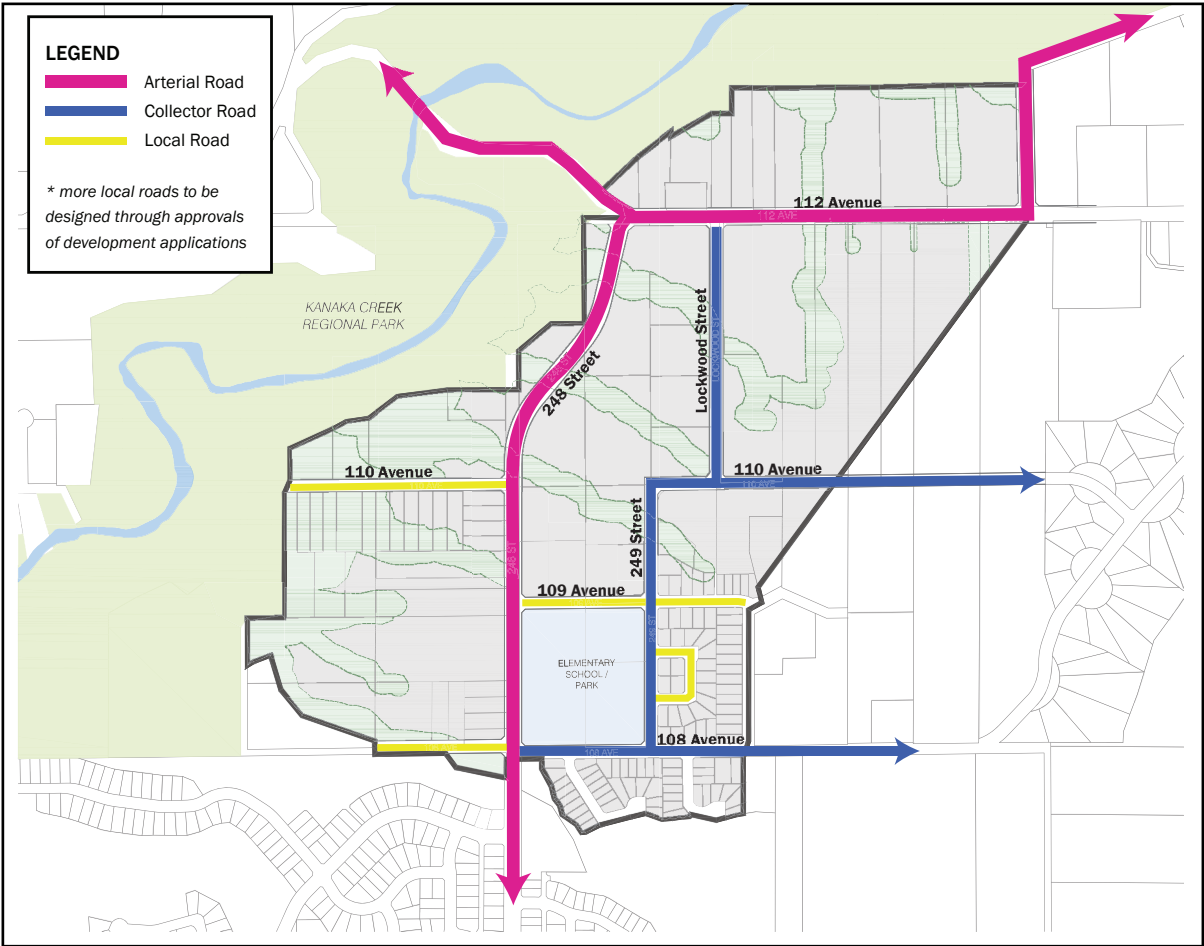


Figure 16 - Proposed Road Network

7.1 ROAD NETWORK

The North East Albion Concept Plan is currently serviced by 112 Avenue to the north and 108 Avenue to the south. New roadways shall be constructed generally in accordance with the City of Maple Ridge standards to service the proposed development of the area. A traffic signal is proposed to help traffic control and safe crossing at the 112 Avenue and 248 Street intersection, and a roundabout is proposed at the 112 Avenue and 252 Street intersection to facilitate movement as the arterial roadway turns north at 252 Street.

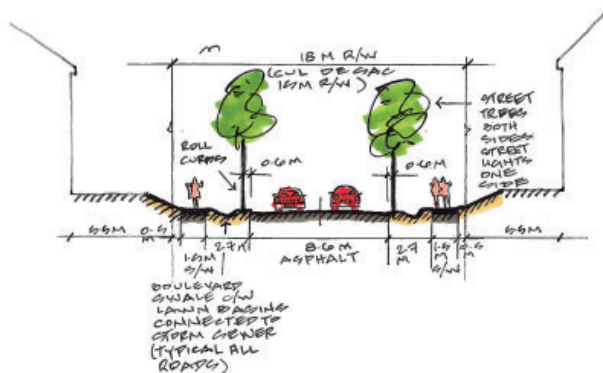
7.2 FUTURE ROAD ALIGNMENTS

As part of the Strategic Transportation Plan (STP), the City of Maple Ridge identified the 108/112 Connector as a long-term east-west link. The specific alignment was not detailed in the STP but rather a notional connection is illustrated, establishing

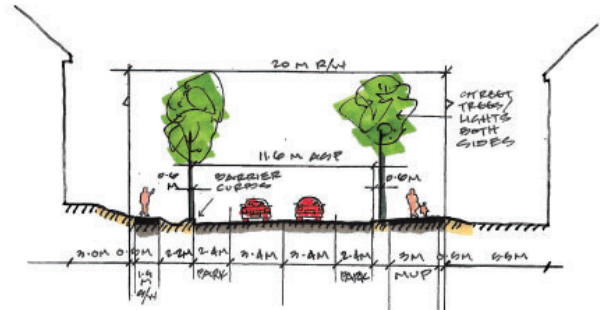
an east/west arterial grid network. As part of the North East Albion planning process, the Engineering Department at the City of Maple Ridge requested that the consultant team look at alignment options for the connector between 248 Street and 260 Street to ensure that the preferred option is not precluded by implementation of the North East Albion Plan.

It was determined that there is the possibility for future arterial road alignments, but these would be outside the Concept Plan area and would require further studies to be conducted under a separate process.

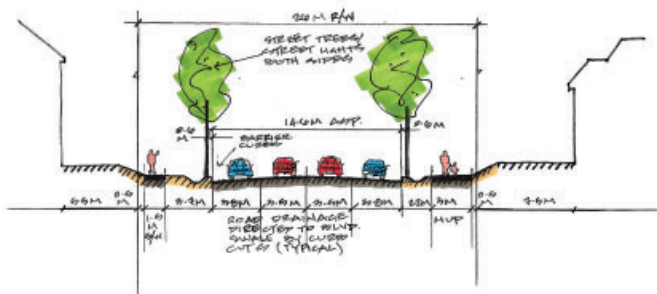
A major east-west arterial route analysis was also completed as a part of this project. As a result of that analysis, the ultimate alignment for the 112 Avenue connection from 248 Street to Grant Avenue was confirmed.



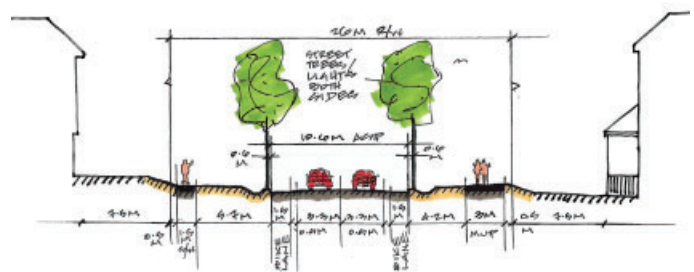
Typical Section, Local Road



Typical Section, Collector Road



Typical Section, 248 Street



Typical Section, 112 Avenue

7.3 ACTIVE TRANSPORTATION

The Concept Plan includes sidewalk or pathway access to the school site and to Cliff Falls in Kanaka Creek Regional Park. All roads include sidewalks or trails on both sides to encourage walkability through the area and to connect to the school and park.

The Maple Ridge STP identifies two corridors for a long-term bicycle network within the Concept Plan: 112 Avenue and 248 Street. The North East Albion Concept Plan provides on or off-street bicycle access to the school site and to the existing and planned municipal bike route network. 248 Street will have a multi-use path on the east side to facilitate access to the school and 112 Avenue will have on-street bike lanes consistent with the STP.

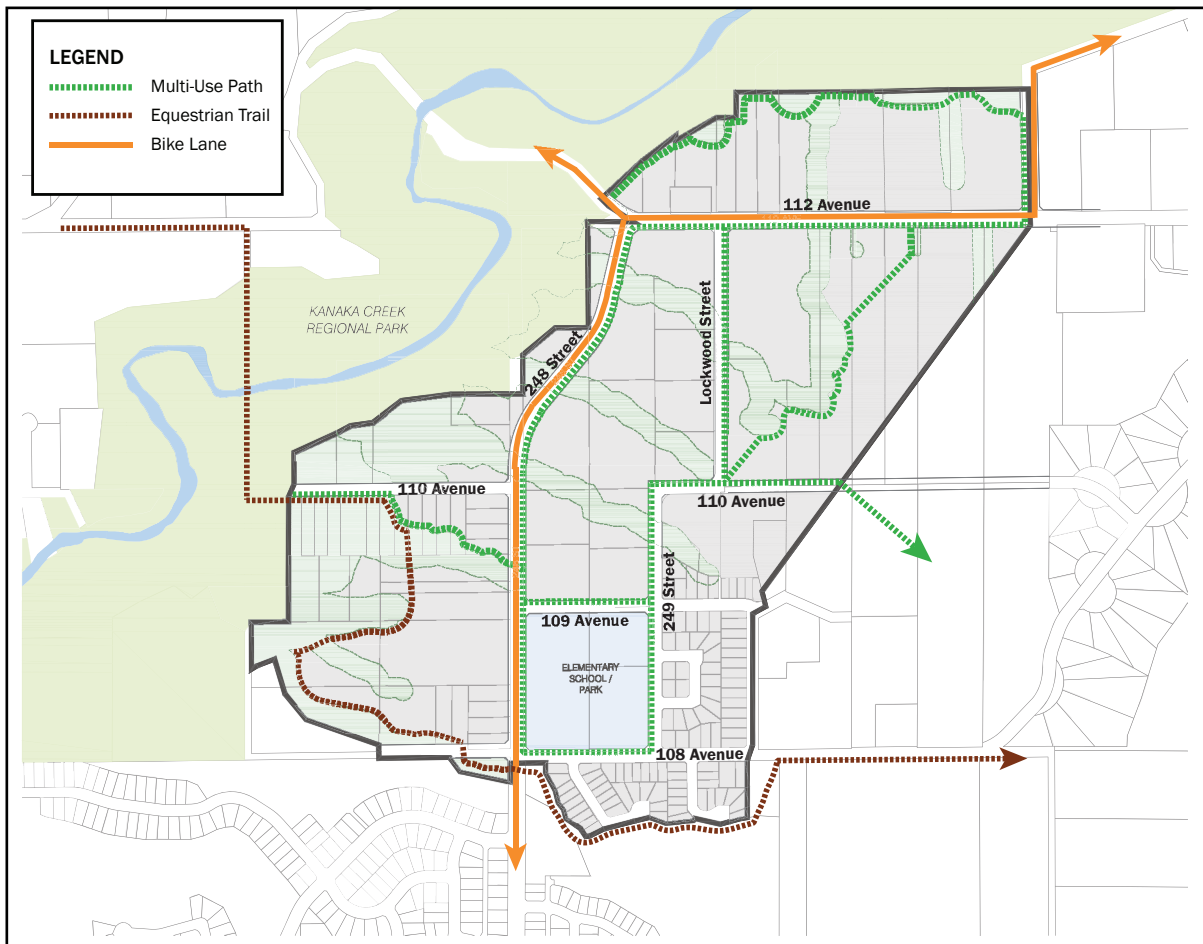


Figure 17 - Proposed Bike Lanes, Multi-Use Paths and Trails

08 | SANITARY

North East Albion is not currently serviced with sanitary sewer, except for a small portion of land near 108 Avenue that is currently serviced to the south by the existing Albion Area system. The City recently had a *Master Sanitary Plan* (MSP) completed by AECOM (November 7, 2016) that considered the existing (2016) system, anticipated 2018 loading, anticipated 2023 loading, and anticipated 2041 loading. The MSP forms the framework for integrating the localized North East Albion analysis in this Concept Plan into the overall master plan for the City.

The intent of this servicing analysis is to review the capacity of the existing system downstream of North East Albion based on the projected ultimate population proposed within the North East Albion Concept Plan.

8.1 DESIGN CRITERIA

The criteria for the evaluation of existing downstream systems used in this analysis is the same as that set forth in Section 4.1 of the Maple Ridge MSP, namely:

- Local sewers (PWWF < 40 L/s) were permitted to run at a maximum of 70% full ($Q_{peak}/Q_{full} > 0.7$); and
- Trunk sewers (PWWF > 40 L/s) were permitted to run at a maximum of 83.5% full ($Q_{peak}/Q_{full} > 0.835$). This is equivalent to approximately 70% of the full pipe depth.

8.2 SERVICING PLAN

North East Albion is proposed to be serviced primarily by a municipal pump station (PS-1) located on 112 Avenue just east of the Kanaka Creek bridge. This pump station will service the 65ha catchment within North East Albion not already being serviced to the south. Please see Section 12, **Drawing 18-1022A-201 (Sanitary Master Plan)** for the overall servicing plan and the downstream capacity calculations.

A pipe network along 112 Avenue, Lockwood Street and 110 Avenue will convey the northeast portion of the catchment to PS-1 by gravity. A gravity main along the north portion of 248 Street will convey the northwest portion of the catchment to PS-1 by gravity. Please see Section 12, **Drawing 18-1022A-202 (NE Albion Sanitary Catchment Plan)** for the local servicing plan and **Drawing 18-1022A-203 (NE Albion Sanitary Catchment Plan - Calculations)** for the local capacity calculations.

North East Albion lands south of this zone will be conveyed by gravity to PS-2 located at the west end of 110 Avenue. Flows will be pumped from PS-2 east on 110 Avenue and north on 248 Street until discharging into the gravity system on 248 Street (at MH S55). Lands at the southwest corner of North East Albion will be conveyed to PS-3 which will pump flows to 248 Street and convey them to PS-2. There is also a provision for an interim pump station to be located near the intersection of 110 Avenue and 248 Street, to permit some development within the ultimate PS-2 catchment to proceed ahead of lands for PS-2 being secured. This would also permit the school site to develop ahead of PS-2 being available, if desired.

The currently anticipated design flow and approximate total dynamic head values for the three ultimate pump stations are as below:

Pump Station	Design Flow (L/s)	Dynamic Head (m)
PS-1	40.3	16
PS-2	14.6	48
PS-3	4.4	20

8.3 FINANCIAL BUDGET REVIEW

North East Albion flows are proposed to be pumped west along 112 Avenue from PS-1 discharging to the existing 300mm diameter sanitary sewer on 112 Avenue just west of 244 Street (EX S1). The offsite analysis consisted of reviewing the existing 300mm diameter system from EX S1 east to EX S11 at the intersection of 112 Avenue and 240 Street, and the existing 375mm diameter system south from EX S11 to EX S17. Flows generated by this area were independently reviewed considering the latest state of development and developable areas for these catchment lands. Results were verified against the MSP and agreed very closely with the MSP predicted downstream flows for the 2041 scenario, providing a level of validation of the analysis.

With the proposed ultimate flows from North East Albion included, the downstream system meets the trunk main criteria for its entirety.

It should be noted that the MSP identifies one short section of downstream pipe for upgrade from an existing 200mm pipe size to a 375mm. However, the as-builts for this main provided by the City note that the 200mm size shown on the plan is incorrect, and that the pipe constructed is in fact a 375mm pipe.

Downstream of EX S19 (240 Street & Kanaka Creek Road) the system heads west into a major trunk line with significant excess capacity based on the MSP.

It is proposed to include all sanitary works located outside of the North East Albion boundary (gravity trunk main from boundary edge to PS-1, PS-1 including any road adjustments required to service PS-1, water service to PS-1, and forcemain from PS-1 to MH EXS1 including creek crossing) in an area latecomer applied over the entirety of the undeveloped North East Albion area.

It is expected that PS-2 and PS-3 may also require area latecomers in the future depending on how lands ultimately consolidate and develop. However, it should be noted that all undeveloped lands (including those catchment to PS-2 and/or PS-3) would be included in the PS-1 area latecomer, as all flows from these lands will eventually be serviced by PS-1 and the associated infrastructure west of 248 Street.

Preliminary budgets (not including land acquisition) for works associated with each pump station that would likely be eligible for an area latecomer are as below:

Pump Station	Budgetary Construction Values	Total Construction Value
PS-1	Pump Station: \$3,800,000 Gravity main & Forcemain: \$1,300,000	\$5,100,000
PS-2	Pump Station: \$1,000,000 Forcemain: \$185,000	\$1,185,000
PS-3	Pump Station: \$950,000	\$1,045,000

09 | WATER

North East Albion is not currently serviced with water, with the exception of a small portion of land at the south end that is currently serviced from the 108 Avenue system. The City recently had a *Master Water Plan (MWP)* completed by Kerr Wood Leidal (November 2016) that considered future upgrades on the City system at large. The MWP shows North East Albion being serviced by the 158m Albion pressure zone and being primarily fed by the Albion Reservoirs (158m TWL) with redundancy and some fire flow support provided from the Grant Mountain Reservoir (224m TWL).

PRV stations in three locations will ultimately allow for fire flow and emergency support from the Grant Mountain Zone to the Albion Zone. The stations are all existing, and are as follows:

- PRV 1: 112 Avenue at 252 Street;
- PRV 2: 108 Avenue just east of Morrisette Place; and,
- PRV 3: 112 Avenue and 256 Street (within the Grant Mountain Booster Pump Station).

The buildout of the North East Albion Concept Plan will allow for integration of the existing 158m Grant Mountain sub-zone into the 158m Albion Zone. This sub-zone services lots along 112 Avenue between 252 Street and 256 Street and was created as part of the Grant Mountain development.

Water Street Engineering Ltd. (WSE) was retained to assist in sizing the trunk infrastructure to service the area and to evaluate pressures throughout the system.

9.1 DESIGN CRITERIA

The City's Design Criteria states the following pressure requirements:

- Maximum allowable pressure: 900kPa (130 psi)
- Minimum pressure at Peak Hour Demand: 30 kPa (44 psi)
- Minimum pressure during Max Day Demand and Fire Flow: 150kPa (22 psi)
- Fire flow requirements:
 - Single family residential: 60L/s
 - Apartments / Townhouses: 120L/s
 - Commercial / Institutional: 150L/s

It is noted that the lowest elevation areas of the existing 158m Albion Zone (53m el. west of 248 Street) have pressures up to 1035 kPa (105m WC).

The design criteria proposed by WSE as a result of their previous work on this reservoir is as follows:

- Elevation range of 53m to 110m (lower elevations to be protected with PRVs or other measures as determined with City).
- Albion reservoir total storage available = 2,489m³;
- Grant Mountain fire storage available (cascading volume) = 409m³;
- Density of 2.8 people per dwelling unit;
- Net lot area to gross area ratio of 64%;
- Irrigable area to net lot area ratio of 50%;
- Balancing storage amount: 25% of MDD;
- Design fire flow of 150L/s for 2 hours;
- Emergency storage amount: 25% of balancing and fire storage combined; and,
- Areas south of 108 Avenue (outside of North East Albion) retain same build-out projections as those in the 2018 memo prepared by WSE.

9.2 SERVICING PLAN

It is proposed to comply with the overall servicing concepts outlined in the MWP. Please see Section 12 **Drawing 301 (Water Master Plan)**.

The Albion reservoir is currently undergoing storage expansion via cell #3 construction and is anticipated to be operational in 2019. Cell #3 is increasing the storage capacity by 1337m³ to a total capacity of 2,489m³ as noted above.

Within the Concept Plan, feeder mains are proposed along 248 Street and 112 Avenue, with internal looping along 249 Street, 110 Avenue, and Lockwood Street. Local mains will connect into these feeder mains as required to service build out of the lands.

A 50mm diameter water service is proposed to the sanitary pump station PS-1 from the North East Albion system. A localized PRV is expected to be required on the PS-1 service.

9.3 SYSTEM DEMANDS

The North East Albion demands in the MWP were based on a design population of 2700 capita (ca) and a serviced lot area of 43.2ha.

The unit rates used to develop demands in the MWP were:

- Residential base demands of 250L/ca/day
- Non-revenue water of approximately 12% of base demand
- Irrigable area to lot area ratio of 50%
- Seasonal demands of 0.47L/s/ha

The above unit rates were consistent with observed system-wide consumption in Maple Ridge. The resulting demands in MWP included a buildout maximum day demand of 49L/s for the 158m Albion Area, including 19L/s for the North East Albion Concept Plan.

The revised loads for the North East Albion are:

- Residential population of 3481ca
- ICI Population equivalents of 178PE
- Total population equivalents of 3659ca
- Serviced lot area of 42.12ha

Based on the above and unit-demand rates consistent with the MWP the expected buildout demands are 21.8 L/s, i.e. an increase of approximately 3L/s.

Using the City of Maple Ridge design criteria rate of 1200L/ca/day would yield flows of 51L/s for the North East Albion Concept Plan. Given the size of the proposed development and actual observed demands, use of this value for sizing of water transmission infrastructure would be overly conservative.

9.4 HYDRAULIC ANALYSIS

As per previous recommendations, the HGL setpoints for the Grant Mountain PRVs to the Albion Zone should be lower than the Albion Reservoir operating range (i.e. less than 154m HGL). This will prevent over-commitment of the Grant Mountain Reservoir and Pump Station. Hydraulic analysis was completed on this basis.

Hydraulic analyses were completed with proposed 200mm water mains added on 248 Street, Lockwood Street, 249 Street, and 112 Avenue as indicated on Section 12 Drawing

301 (Water Master Plan). The analysis was completed without other future minor mains in the area.

An analysis completed with build-out demands of 21.8L/s for the area indicated that:

- Peak hour minimum pressures were acceptable
- Fire flows were acceptable (generally > 200L/s throughout)

A second fire flow analysis was completed with design criteria demands of 51L/s for the area, PRV station links to the 224m Grant Mountain Zone closed, and 104 Ave Pump Station off (i.e. all flow supplied from Albion Reservoir). This analysis indicated that while available fire flows were reduced, they still met design criteria (>60L/s for single family, > 120L/s for multi-family, and > 150L/s for commercial and institutional areas).

As discussed above areas with elevations less than 53m will have operating pressures slightly exceeding 1035 kPa (150psi). Special considerations should be included for these areas such as a local pressure-reduced zone or pressure-reduction on services off of 248 Street (i.e. to strata developments).

10 | STORMWATER

The North East Albion Land Use and Servicing Concept Plan provides a vision and implementation measures for sustainable water stewardship and management. The Concept Plan contains numerous watercourses that flow to Kanaka Creek, a fish bearing creek. Because of the degradation of fish habitat and water flows overtime, it has been recognized as one of the 15 Sensitive Streams in BC in the *Water Sustainability Act*. The creek is very sensitive to peak flow rate increases and water quality degradation. Primary objectives for stormwater management in the North East Albion Concept Plan have been developed as follows:

- Maintain baseflows and water quality to Kanaka Creek and its tributary watercourses to protect fish and fish habitat in these streams;
- Control peak runoff flows under frequent storm events to best mimic pre-development conditions and minimize stream erosion;
- Promote onsite infiltration to protect shallow wells, maximize groundwater infiltration and recharge and ensure groundwater flows are not to be intercepted by site development and road construction;
- Design and construct a stormwater conveyance system that includes subsurface storm sewers, detention facilities, open channels and culverts to adequately convey storm runoffs to watercourses for rain events up to a 10-year return period;
- Ensure that storm runoffs under extreme storm conditions can be conveyed via major storm conveyance systems, including major road crossings, overland flow paths and stream channels and cause no damage to life and properties; and
- Preserve or maintain existing drainage patterns essential to the overall health of Kanaka Creek, wherever possible.

10.1 STORMWATER MANAGEMENT CRITERIA

Aplin Martin has identified the following design criteria to achieve the stormwater management objectives in the North East Albion Concept Plan:

Stormwater Volume Control (Achieving City's Tier A Requirements): Provide onsite infiltration and retention to capture the 6-month 24-hour event rainfall, which equals to 72% of the Mean Annual Rainfall (MAR or the 2-year return

period event rainfall) in both the development areas and the roads.

This criterion exceeds the City of Maple Ridge's Tier A design principle that requires capturing of 50% of the Mean Annual Rainfall.

Water Quality Control: Provide water quality treatment to runoff from frequent rainfall events up to a 2-year return period.

Runoff Rate Control (Achieving City's Tier B Requirements): Provide onsite or offsite storage to store runoff from design storm events up to and including the 10-year return period events and control the release rates at a forested land use condition.

This criterion exceeds the City of Maple Ridge's Tier B design principle that requires control of post-development peak flows to pre-development forested land use condition up to and including MAR (or the 2-year return period rainfall).

Groundwater Protection: Provide groundwater protection measures such as trench dams and/or groundwater flow diversions to ensure the subsurface flows in the shallow groundwater aquifer are not to be intercepted by development or new road construction.

Flood Control (Achieving City's Tier C Requirements): Design and construct minor and major stormwater conveyance systems to minimize surface flooding and flood damage to life and properties.

Minor Conveyance System: To adequately convey the 1:10-year return period post development flow within an engineered stormwater conveyance system that contains storm sewers, detention facilities, open ditches and culverts.

Major Conveyance System: To safely convey the 1:100-year return period post development flow within major flow paths, including major road crossings, overland flow paths and stream channels.

This criterion is same as the City of Maple Ridge's Tier C design principle.

Considering Climate Change Impacts: The stormwater conveyance system is to be designed to account for moderate climate change impacts that have been projected up to Year

2070 (assuming a 50-year design life for storm infrastructure).

The stormwater management criteria developed for the Concept Plan exceeds the City of Maple Ridge's three-tier stormwater design principles. This is to help maximize the environmental protection and minimize the impacts of development in North East Albion on the natural ecological system of the area and the overall Kanaka Creek watershed.

- Design requirements for onsite and offsite detention facilities; and
- Design requirements for groundwater protection measures.
- Develop stormwater management design guidelines for development applications; and
- Develop operation and maintenance, as well as monitoring programs to ensure effectiveness and sustainability of the stormwater management measures in the future.

10.2 METHODOLOGY

Based on the above objectives, the stormwater management concept plan and Best Management Practices (BMPs) have been developed for the Concept Plan based on the following scope of work:

- Develop design storms under the existing and future 2070 moderate climate change conditions;
- Delineate existing land use condition catchment boundaries to the tributaries of Kanaka Creek;
- Determine proposed catchment boundaries and creek outfall locations based on the natural topography and practical development of lands;
- Determine pre-development forested land use design flows to the creeks;
- Determine post-development (existing and future 2070 climate condition) design flows to the creeks with and without the implementation of onsite BMPs;
- Prepare design guidelines for onsite BMPs;
- Determine onsite source control retention requirements;
- Determine unit detention requirements (m^3/ha) that are in addition to the implementation of source control retention BMPs for post-development to meet the design criteria (up to 10-year peak flow control to pre-development forested land use);
- Review potential for community stormwater pond facilities in North East Albion for any of the creek catchment;
- Review overland flow paths, culvert capacities, and creek capacities to ensure safe conveyance of the 100-year event;
- Determine applicable measures for groundwater protection;
- Develop stormwater management concepts that include:
 - Proposed stormwater minor and major drainage conveyance system;
 - Design requirements for onsite source control BMPs;

10.3 EXSITING CONDITION OVERVIEW

Surface Drainage

The current state of North East Albion is generally undeveloped, with most of the land covered by natural forest and rural large parcel residential land uses. The area generally slopes west/northwest towards the Kanaka Creek ravine. Rainfall on the lands is mainly infiltrated into the ground with runoff being collected overland into ditches and tributary streams to Kanaka Creek.

Watercourses

Watercourses in North East Albion are primarily tributary to Kanaka Creek. All the tributary ravine creeks are essential sources of water and nutrients to fish population in Kanaka Creek. Most of these creeks are fed by groundwater, so they export cool temperature waters at steady rates to Kanaka Creek.

Groundwater

Based on the aquifer classification descriptions from the BC Water Resource Atlas, North East Albion is above three groundwater aquifers, the "Grant Hill" and "South of Grant Hill" aquifers, and an unnamed aquifer.

The Grant Hill Aquifer is a fractured sedimentary bedrock aquifer, underlying the entire area of North East Albion. The aquifer is approximately 6.1m to 28m below ground surface. A till layer generally covers the bedrock surface, limiting potential hydraulic connections between the shallow groundwater and fractured bedrock. However, the *Environmental Assessment*

Report – North East Albion Baseline Environmental Assessment report prepared by Phoenix Environmental Services Ltd. (April 2019), suggests that the southeast portion of North East Albion may have recharge values to this aquifer, based on background research and site investigation findings.

The South of Grant Hill Aquifer is a glacio-fluvial sand and gravel aquifer at approximately 1.2 to 1.5m below ground level. Only a small portion of the North East Albion lands on the south are underlain by this aquifer. The area near the proposed school site above this aquifer may have recharge value. In particular, the eastern side of the proposed school site consists of the well-draining soil types and this area may therefore constitute a valuable recharge area. The shallow depth of this aquifer and its proximity to Thornvale Creek suggest that it may provide valuable moderated water flows to this important salmonid-spawning stream.

The unnamed aquifer is located near the northeast portion of North East Albion. This aquifer is approximately 1.2m below ground level. Springs and streams along the toes of sloped areas in the eastern portion of North East Albion are likely fed by the aquifer.

10.4 HYDROLOGIC AND HYDRAULIC MODELLING

Modelling Scenarios

The scenarios summarized in **Table 1** were developed and assessed to define the conveyance system and detention targets.

It should be noted that the conveyance system has been reviewed and sized to meet both the minor (1:10-year return period) and major (1:100-year return period) flow conveyance requirements under the future 2070 climate conditions without source control BMPs and detention storage. This is to ensure that the proposed conveyance system will adequately convey the target flows based on the design life of the system.

For source control BMPs and detention facilities, it is assumed that they will be applied to achieve the stormwater volume and rate control targets under the existing climate condition.

The source control BMPs shall be capable of retaining a minimum of 100% of the 6-month 24-hour event (72% of 2-year 24-hour rainfall volume) rainfall onsite. They are to be implemented in all development areas, including future roadway corridors.

The additional detention volumes required for the runoff flow rate control were estimated based on modelling a unit development site for various soil and post-development land use conditions in addition to the source control BMP measure(s) proposed for the site, to control the post-development flows to the pre-development levels for design storm events up to and including the 10-year return period events.

Table 1 – Modelling Scenarios

No.	Land Use	Climate	Onsite BMPs	Purpose
1	Future	2070	No	Define future performance under future climate conditions without source controls or detention features. This scenario is to assess and size the conveyance infrastructure.
2	Pre-development	Current	No	Define base flow control targets
3	Future	Current	Yes	Define future performance under existing climate conditions with source controls. This scenario is to size onsite BMPs and additional detention requirements.

Model Coverage

The model covers the watershed encapsulating North East Albion, including the catchment draining into the neighbourhood area and via the tributary streams to Kanaka Creek. In Section 12, **Drawing 18-1022A-401** presents the existing catchment map delineated based on the air photo, topography and the available drainage plans from existing developed areas. In Section 12, **Drawing 18-1022A-402** presents the future catchment map based on the proposed Land Use Concept Plan and the planned storm sewer system for future developments.

Design Storms

Design storms were developed under both the existing and future 2070 moderate climate change conditions based on the new design storm hyetographs developed by Aplin Martin for the City of Maple Ridge.

Land Use and Percent Imperviousness

In Section 12, **Drawings 18-1022A-401** and **18-1022A-402** also summarize the existing and future land uses based on available orthophoto, zoning and the proposed Land Use Concept Plan, respectively. **Table 2** shows the percent impervious values assigned to each land use type.

For the purpose of stormwater modelling, Cluster Residential and Multiplex land-use designations have been combined to create the category of “Multiplex”.

Please note for the pre-development forested land use condition model, surface conditions of all subcatchments are assumed being the Environmentally Sensitive Areas/Metro Vancouver Regional Park (5% imperviousness).

Table 2 – Land Use Percent Imperviousness

Land Use Type	% Imperviousness
Environmentally Sensitive Areas/Metro Vancouver Regional Park	5
Single-Family Residential	55
Multiplex	60
Townhouse	65
Institutional (excluding sport field)	80
Road ROW	78

Soils and Infiltration Parameters

In Section 12, **Drawings 18-1022A-403** presents the soil map for the study catchment, showing that the study catchment area consists of three types of surficial soil textures, sandy loam, loam and silt loam soils. The soil map was developed based on soil information presented in *Soils of the Langley – Vancouver Map Area Volume 1* (Lutterding, 1981). The soil survey data has been interpreted into various soil texture categories and provided as an online open data source by the Ministry of Environment and Climate Change Strategy. This soil information has been commonly used for surficial drainage studies.

Soil infiltration parameters for the types of soils in the study area were selected based on the SWMM manual and typical textbook values.

Soil infiltration parameters used for modelling are summarized in **Table 3**.

Table 3 – Hydrological Modelling Parameters

Hydrological Model Parameters – North East Albion Neighbourhood		
Global Parameters	Depression Storage, mm	
	Impervious	2
	Pervious	7
	Manning's n	
	Impervious	0.015
	Pervious	0.25
Green-Ampt Infiltration Parameters	Sandy Loam	
	- Average Capillary Suction, mm (Wet)	110.1
	- Initial Moisture Deficit (Saturated)	0
	- Saturated Hydraulic Conductivity, mm/hr	25
	Loam	
	- Average Capillary Suction, mm (Wet)	88.9
	- Initial Moisture Deficit (Saturated)	0
	- Saturated Hydraulic Conductivity, mm/hr	13
	Silt Loam	
	- Average Capillary Suction, mm (Wet)	166.8
	- Initial Moisture Deficit (Saturated)	0
	- Saturated Hydraulic Conductivity, mm/hr	6.6

Subsurface Flow Modelling

Geotechnical investigations performed in North East Albion indicated that the groundwater table is at approximately 1.0m below the ground surface during the winter months. Likely, rainfall infiltrated to the ground would slowly drain back to the stormwater system or downstream watercourses. We have therefore included the groundwater module in our model that simulates the subsurface flows. The parameters used for the groundwater module were based on the subsurface soil characteristics and our past groundwater model calibration experience, as shown in **Table 4**.

Model Network

The stormwater network for existing developments was modeled based on the City's GIS data and available field verification data. The proposed future pipe network was modeled based on future land use and development plans, and the proposed future catchment plan. The modeled creek transects were approximated from the City's DEM data.

Downstream Boundary Conditions

The hydraulic model developed covers the tributary streams to Kanaka Creek to which North East Albion drains. Based on the topography, it does not appear that there would be backwater effects from Kanaka Creek impacting the drainage in our study catchments. Therefore, we have assumed free outfall conditions for the tributary streams to Kanaka Creek in the model.

However, it may be prudent to review the modelled Kanaka Creek peak water level profiles from the Kanaka Creek ISMP study to assess whether backwater/downstream water levels should be considered in the modelling of the boundary conditions when the ISMP becomes available.

Table 4 – Subsurface Modelling Parameters

Subsurface Model Parameters – North East Albion Neighbourhood		
Groundwater Aquifer Parameters	Porosity (/)	0.453
	Wilting Point (/)	0.085
	Field Capacity (/)	0.19
	Conductivity (mm/hr)	10.9
	Lower GW Loss Rate (mm/hr)	0.002
	Bottom Elevation (m)	0
	Initial Water Table Elevation (m)	1.0
Groundwater Parameters	Surface Elevation (m)	2
	Groundwater Flow Coefficient (A1)	0.1
	Groundwater Flow Exponent (B1)	2
	Groundwater Flow Coefficient (A2)	0
	Groundwater Flow Exponent (B2)	0
	Surface Water Depth (m)	Depth from flow routing
	Threshold Water Table Elevation (m)	1.0

10.5 STORMWATER MANAGEMENT CONCEPTS

Stormwater management concepts have been developed for North East Albion Concept Plan based on the modelling results and are as follows:

- Proposed trunk storm sewer network and major flow paths;
- Onsite source volume and Water Quality control BMPs;
- Additional detention requirements;
- Regional stormwater management features; and
- Groundwater protection measures.

Proposed Trunk Storm Sewer Network and Major Flow Paths

The proposed trunk storm mains were sized in compliance with the design criteria under Scenario 1, which simulates the peak flow in the system during future land use and future climate conditions, assuming 2070 climate condition and no source controls and detention features are functional. In Section 12, **Drawing 18-1022A-404** presents the proposed storm main sizes and upgrades to the existing system. The underground storm sewers are to be designed to convey 1:10-year return period peak design flows while the major road crossings are to convey 1:100-year return period peak design flows.

Major storm conveyance systems for safely conveying 1:100-year return period post-development flows also include overland flow paths and stream channels, in addition to major road crossings, to ensure no flood damage to life and properties. The major storm conveyance system under the post-development 2070 climate condition has been reviewed with major flow paths identified as shown in Section 12, **Drawing 18-1022A-405**. Stream channels' adequacy to convey extreme flows has been confirmed, with the exception of approximately 150m of an existing drainage ditch north of 112 Avenue that discharges to the tributary channel KA6 west (see Section 12, **Drawing 18-1022A-405**). The modelling results show that this ditch would be flooded and should be upgraded to a minimum 1m bottom width with 2:1 side slope channel to provide a suitable 100-year flow path under the assumed design condition.

Onsite Source Volume and Water Quality Control BMPs

The objectives for onsite source volume and water quality control BMPs include:

- Retain 90% of the total annual rainfall volume onsite as that typically occurs under the natural forested land use conditions; and
- Control rainfall runoff quality.

Past hydrologic analyses indicate that capturing 100% of the 6-month 24-hour rainfall volume would roughly achieve the 90% annual rainfall volume retention in the Metro Vancouver region. The 6-month 24-hour rainfall depth for the study area is estimated to be 53.6mm, that equals to 72% of the 2-year 24-hour rainfall depth.

Types of source control BMPs recommended in North East Albion for developments with different land uses are summarized in **Table 5**. These BMPs were identified based on Aplin Martin's experience with past common BMP applications within the Greater Vancouver Lower Mainland area.

Detailed design of these BMPs shall follow the design guidelines provided in the *Metro Vancouver's Stormwater Source Control Design Guidelines 2012*. A general overview of each the recommended BMPs and their application in the North East Albion Concept Plan are provided below.

ABSORBENT LANDSCAPE

Applying amended topsoil on pervious areas is the most commonly used stormwater source control BMP measure. It creates an absorbent landscape layer that acts like a sponge to soak up, store and slowly release rainfall. It also provides bio-infiltration or water quality control to the runoff draining into the absorbent landscape areas. This type of the BMP is generally suitable to use for all type of development applications. Runoff from impervious areas would need to be routed to the pervious areas.

Based on the native soil condition and percent imperviousness of the site, absorbent landscape alone or combined with other ground-infiltration measures would achieve the target volume and water quality controls in North East Albion.

Materials and application methods for absorbent landscape shall meet MMCD 2009 requirements for Topsoil and Finish Grading (Section 32-91-21), **Table 2** specifications for Growing Medium, with organic matter requirements amended to minimum of 8% for lawn areas and 15% for planting areas. The minimum amended topsoil depth is 300mm in grassed areas and 450mm in planted areas.

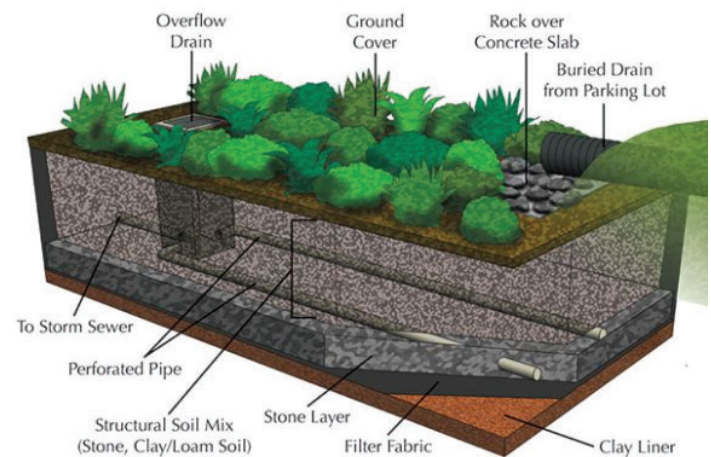


Absorbent Landscape

INFILTRATION CHAMBERS

Infiltration chambers such as rock pits are a type of BMP that can be easily implemented, and they are cost effective for onsite stormwater volume control. Infiltration chambers are commonly used for residential development areas for rainfall infiltration and capture. They can be applied in combination with the absorbent landscape BMP to achieve the target volume and water quality controls for future single-family developments in North East Albion.

Infiltration chambers are typically located below the ground surface and consist of either prefabricated storage cells or drain rock wrapped in geotextile, with a perforated underdrain pipe connected to the municipal stormwater system.

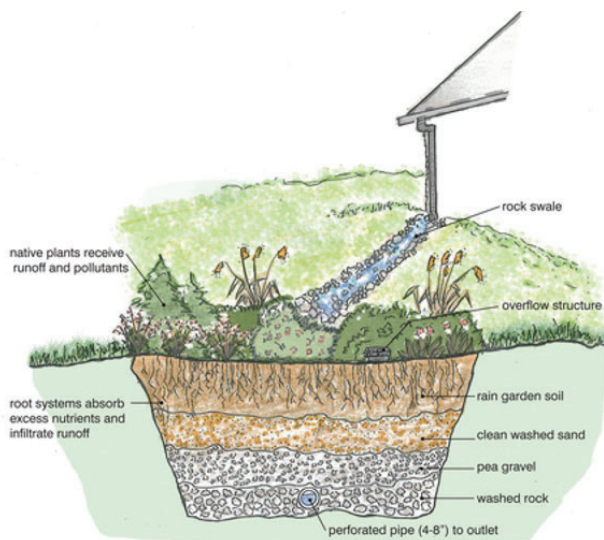


Infiltration Chambers

BIO-RETENTION

Bio-retention BMPs, such as rain gardens and infiltration swale systems, combine aspects of a green medium layer for water quality control and an infiltration trench/reservoir for runoff to store and/or infiltrate to achieve volume control. Bio-retention cells would require more maintenance than infiltration chambers and they are typically more applicable to high density residential, industrial, commercial and institutional land use development. For the North East Albion Concept Plan, it is proposed that bio-retention BMPs are to be applied for the proposed townhouse sites and institutional lands in combination with the absorbent landscape BMP measure.

Bio-retention facilities are typically designed with a minimum 450mm thick growing medium layer with amended topsoil overlaid on a rock reservoir layer. Drain rock fills the rock reservoir layer with a perforated pipe installed near the top of the rock reservoir and connected to the municipal stormwater system.

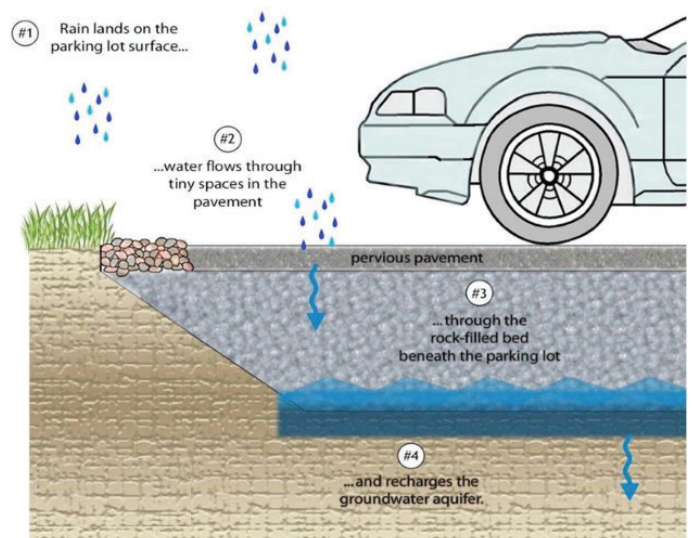


Bio-Retention

PERVIOUS PAVING

Pervious paving is a surface layer of paving systems which allow rainfall to percolate into an underlying reservoir base, where rainfall is stored and either infiltrated to underlying subgrade or discharged via a sub-drain. The surface component of pervious paving can be porous asphalt or porous concrete, concrete or plastic grid pavers, or permeable unit pavers.

Pervious paving does not have a soil layer that treats runoff and is subject to clogging from surface pollutants. It should not be used to infiltrate runoff from city roads. They may be used for driveways, walkways, patio areas, or visitor parking areas for various land use developments in North East Albion. In addition, grades are to be considered when evaluating locations to implement pervious pavings.



Pervious Paving

BIO-SWALE AND INFILTRATION TRENCH

Source control BMPs with a combined bio-swale and infiltration trench system is proposed for the roads in the North East Albion Concept Plan. Bio-swales provide water quality improvement of captured road runoff prior to discharge to infiltration trenches for infiltration and temporary storage to achieve rainfall volume control. Infiltration trenches are similar to infiltration chambers and have similar design requirements.

Amended topsoil shall also be used in the pervious areas in road rights-of-way and the surface of bio-swales. The minimum amended topsoil depth is 300mm in grassed areas and 450mm in planted areas.

Retention storage volumes for the source volume control BMPs are calculated based on the following mass balance equation:

Total 24-hour Rainfall = 24-hour Infiltration to native soil in pervious area + Water Storage in topsoil and rock reservoir

Several basic assumptions have been made to the calculation, as follows:

- Native Ground Infiltration Rate:
Sandy Loam: 25mm/hr
Loam: 13mm/hr
Silt Loam: 6.6mm/hr
- 50% effective pervious area, accounting for possible pervious area coverage to be reduced after development or during redevelopment;
- 300mm minimum depth of amended topsoil on pervious areas;
- 450mm standard soil depth in bio-retention facilities;
- 30mm water storage in amended soil layer (based on the typical 20% of the topsoil thickness as the water storage volume with 50% reduction accounting for topsoil loss over time);
- 100% impervious area will be routed via effective pervious area for all land use types except road right-of-way;
- Impervious areas in the road right-of-way will be drained to bio-swales then to infiltration trenches, assuming no retention storage in the amended topsoil.
- Assume 5% of the total development land area will be designated for source volume retention storage use for all land use types, except road rights-of-way;
- Infiltration trenches will be installed within all road rights-

of-way and cover minimum 10% of the total ROW area with minimum 200mm depth; and

- Detention storage area will be filled with drain rocks with 35% porosity.

Table 6 below provides the estimated BMP retention storage requirements (in addition to the onsite infiltration and retention storage provided in the amended topsoil) based on the mass balance calculation.

Please refer to Section 12, **Drawing 18-1022A-403** for the soil map showing areas with different soil types in North East Albion.

In addition to the above recommended BMPs, other types of source volume and water quality control BMPs, such as rainwater harvesting facilities, soak-away pits, green-roofs, tree clusters, and/or other special bio-retention facilities can also be considered in the design to achieve the stormwater retention and quality control targets, subject to approval by the City of Maple Ridge Engineering Department.



Bio-Swale and Infiltration Trench

Structural water quality treatment devices, such as oil/grit separators and stormceptors, may also be considered in the design to treat urban runoff from areas with high pollutant loadings, prior to discharge into infiltration facilities or storm

sewers. These devices are used in urban environments where space is limited. They therefore may be retrofitted into the storm systems. They are to be specified to target treatment for oils and hydrocarbons, and sand and sediment trapping.

Table 5 – Recommended Source Volume Control BMPs

Land Use Type	Applicable BMP Types				Bioswale + Infiltration Trench
	Absorbent Landscape	Infiltration Chamber	Bio-retention	Pervious Paving	
Single Family Residential	X	X		X	
Multiplex	X		X	X	
Townhouse	X		X	X	
Institutional	X		X	X	
Road ROW					X

Table 6 – Onsite Source Volume Control BMP Storage Requirements

Land Use Type	% Imp	Required Rock Reservoir Storage Depth, mm			Rock Reservoir Area
		Sandy Loam	Loam	Silt Loam	
Single Family	55%	-	-	641	5% of the Total Development Area
Multiplex	60%	-	-	910	
Townhouse	65%	-	-	1,179	
Institutional	80%	-	1,109	1,987	
Road ROW	78%	200	456	1,045	10% of Road ROW Area

Note: For land use types with soil types showing no storage depth requirement, the onsite infiltration and retention in the amended topsoil would adequately provide the 6-month 24-hour rainfall capture.

Detention Requirements

In addition to the BMP storages provided for 90% rainfall volume capture, additional detention may also be required to control runoff rates under the post-development condition to that of the pre-development forested condition for design storm events up to and including the 10-year return period events. This is to aim to provide erosion protection to the tributary and main channels of Kanaka Creek. To estimate the detention requirements, a unit development site of 1ha was modelled to estimate the flow hydrographs for the three soil types under pre-development forested land use and various post-development land use conditions. Onsite source volume control BMPs determined in Section 10.5 were modelled to estimate the additional detention requirements under various soil type and land use conditions. **Table 7** presents a summary of the unit detention volume required for each soil and post-development land use type according to the modelling results. Discharge rates of the detention facilities should be controlled to the pre-development forested condition rates, relative to the underlying soil stratigraphy, as shown in **Table 7**.

Detention and controlled discharge required for each development site shall be estimated based on pro-rating

storage and discharge rates required for areas with multiple land uses and/or soil types according to **Table 7**. Please refer to Section 12, **Drawing 18-1022A-403** for the soil map showing areas with different soil types in North East Albion.

Based on the topography of North East Albion, limited sites would be available for community detention facilities. The required detention volumes are therefore to be provided at individual development sites and subdivisions, roadways and/or at locations suitable for community stormwater management features. Detention storage can be provided with the following measures:

- Adding extra storage and flow controls to the onsite BMPs;
- Oversized pipes;
- Underground tanks; or
- Wet or dry open detention facilities.

Open water detention volumes integrated into the source volume and water quality control devices would be preferred in the design, instead of oversized pipes and underground tanks.

Table 7 – Summary of Detention Requirements

Soil Type	Forested Condition Peak Unit Discharge	Proposed Post-Development Land Use Type	Additional Detention, m ³ /ha
Sandy Loam	Q2-year = 3.7 L/s/ha Q5-year = 5.0 L/s/ha Q10-year = 5.9 L/s/ha	Single Family (55% Imp)	0
		Multiplex (60% Imp)	0
		Townhouse (65% Imp)	13.3
		Institutional (80% Imp)	196.0
		Road ROW (78% Imp)	167.4
Loam	Q2-year = 3.7 L/s/ha Q5-year = 5.0 L/s/ha Q10-year = 5.9 L/s/ha	Single Family (55% Imp)	18.3
		Multiplex (60% Imp)	65.7
		Townhouse (65% Imp)	119.6
		Institutional (80% Imp)	271.1
		Road ROW (78% Imp)	267.5
Silt Loam	Q2-year = 3.7 L/s/ha Q5-year = 9.0 L/s/ha Q10-year = 16.3 L/s/ha	Single Family (55% Imp)	41.3
		Multiplex (60% Imp)	64.5
		Townhouse (65% Imp)	58.6
		Institutional (80% Imp)	35.3
		Road ROW (78% Imp)	42.5

Community Stormwater Management Features

In addition to the proposed stormwater onsite source control BMP and detention measures described above, community stormwater management features may be implemented in select areas as shown on Section 12, **Drawing 18-1022A-404**. These community stormwater features have been proposed adjacent to park trails and underutilized open spaces primarily to maximize water quality control opportunities from the trails prior to discharging into the downstream watercourses. These features may also create local detention opportunities for its adjacent properties.

The proposed offsite community stormwater features utilize a series of interconnected bio-retention cells, wetted habitat channels, and ponds/wetlands which convey surface water runoff collected from the adjacent lots towards the downstream watercourses.

In addition to the areas identified above, these community stormwater management features may also be applied to areas near stream setback boundaries or other conservation area boundaries onsite or offsite.

Groundwater Protection

Groundwater is recognized as a valuable resource in North East Albion. Groundwater protection is key for stormwater management in the area. Such groundwater protection measures may include, but are not limited to:

- Promoting rainwater infiltration to recharge to groundwater. Implementing source volume control BMP measures as described in Section 10.5 would ensure capture of the 6-month 24-hour rainfall; equivalent to 90% of the annual rainfall in ground for groundwater recharge.
- Groundwater flows could be interrupted and/or redirected due to land development and road constructions. In order to ensure groundwater conservation, a groundwater impact assessment should be conducted by a qualified Hydrogeologist for each future application in North East Albion. The groundwater investigation should be focused on groundwater characterization regarding aquifer presence at a site (e.g. groundwater-bearing soil formation, depth, flow direction) and impact mitigation measures (e.g. intercept and redirect to nearby streams, supplement with stormwater infiltration) to protect stream base flows and local use as a drinking water resource.

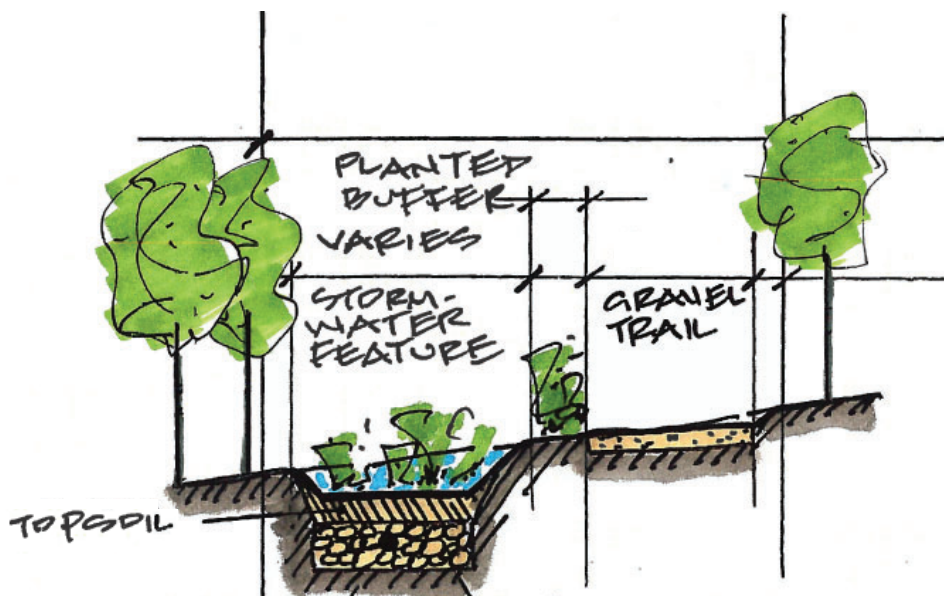


Figure 18 - Trail and Stormwater Feature Typical Section

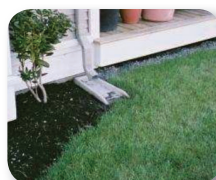
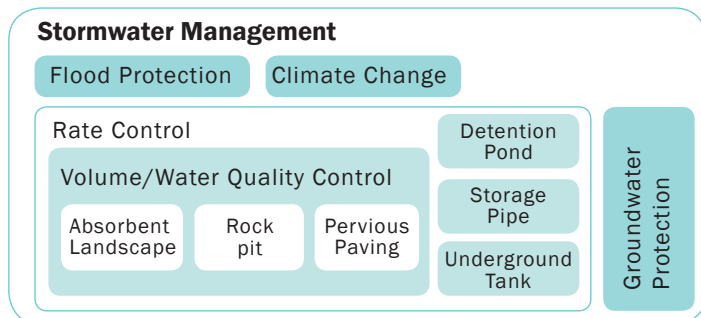
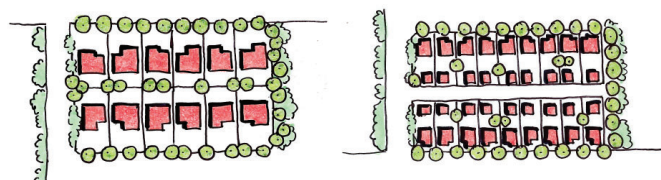
10.6 STORMWATER MANAGEMENT DESIGN GUIDELINES

Stormwater management designs for development applications in the North East Albion area are recommended to follow source control design guidelines developed for various land uses.

These design guidelines were prepared based on stormwater management concepts developed in Section 10.5

Single Family

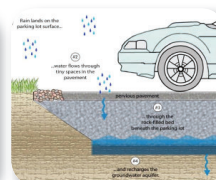
Maximum allowed imperviousness: 55%



Absorbent Landscape



Rock Pit

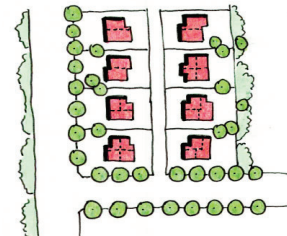


Pervious Paving

Criteria	Recommendations
Water Quality/ Volume Control (6 month 24 hour rainfall Capture)	<ul style="list-style-type: none"> Minimum 300mm amended topsoil in grassed and 450mm in planted areas Disconnected roof leaders to pervious area Pervious paving for driveways, walkways and patio areas Rock pit installation in silt loam soils, but not required in sandy loam and loam soils Rock pit area = 5% development area Rock reservoir storage depth = 641mm <p><i>Note: Required rock reservoir storage depth shall be verified based on the site specific geotechnical investigation for the subsurface soils and soil infiltration rates.</i></p>
Rate Control (Up to 10-year post-development flow to pre-development flow)	<ul style="list-style-type: none"> Additional detention storage requirements Sandy Loam Soil Area: None Loam Soil Area: 18.3 m³/ha Silt Loam Soil Area: 41.3 m³/ha
Groundwater Protection	<ul style="list-style-type: none"> Groundwater impact assessment be conducted by a Hydro-geotechnical professional to determine groundwater protection measures
Supplementary Stormwater Management Measures	<ul style="list-style-type: none"> Maintenance (or retention) of high tree cover densities Maintenance of riparian setback as per the environmental requirements if applicable. Installation of daisy-chained stormwater management features (combination of bio-retention cells, wetted habitat channels and detention ponds/wetlands) if possible along the edge of the riparian setback boundaries Other source control measures that can achieve water quality, volume and rate controls in combination with, or in replacement of replacing rock pits

Cluster Residential/Multiplex

Maximum allowed imperviousness: 60%



Stormwater Management

Flood Protection

Climate Change

Rate Control

Volume/Water Quality Control

Absorbent Landscape

Bio-Retention

Pervious Paving

Detention Pond

Storage Pipe

Underground Tank

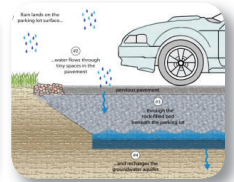
Groundwater Protection



Absorbent Landscape



Bio-Retention

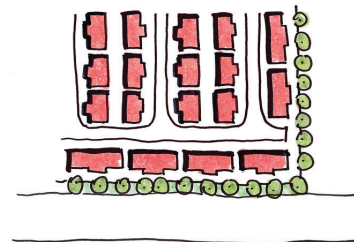


Pervious Paving

Criteria	Recommendations
Water Quality/ Volume Control (6 month 24 hour rainfall Capture)	<ul style="list-style-type: none"> Minimum 300mm amended topsoil in grassed and 450mm in planted areas Disconnected roof leaders to pervious area Pervious paving for driveways, walkways, visitor parking areas Bio-retention devices installation in silt loam soils, but not required in sandy loam and loam soils <ul style="list-style-type: none"> Bio-retention bottom area = 5% development area Rock reservoir storage depth = 910mm <p><i>Note: Required rock reservoir storage depth shall be verified based on the site specific geotechnical investigation for the subsurface soils and soil infiltration rates.</i></p>
Rate Control (Up to 10-year post-development flow to pre-development flow)	<ul style="list-style-type: none"> Additional detention storage requirements <ul style="list-style-type: none"> Sandy Loam Soil Area: None Loam Soil Area: 65.7m³/ha Silt Loam Soil Area: 64.5m³/ha
Groundwater Protection	<ul style="list-style-type: none"> Groundwater impact assessment be conducted by a Hydro-geotechnical professional to determine groundwater protection measures
Supplementary Stormwater Management Measures	<ul style="list-style-type: none"> Maintenance (or retention) of high tree cover densities Maintenance of riparian setback as per the environmental requirements if applicable Installation of daisy-chained stormwater management features (combination of bio-retention cells, wetted habitat channels and detention ponds/wetlands) if possible along the edge of the riparian setback boundaries Other source control measures that can achieve water quality, volume and rate controls in combination with, or in replacement of bio-retention devices

Townhouse

Maximum allowed imperviousness: 65%



Stormwater Management

Flood Protection

Climate Change

Rate Control

Volume/Water Quality Control

Absorbent Landscape

Bio-Retention

Pervious Paving

Detention Pond

Storage Pipe

Underground Tank

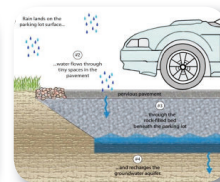
Groundwater Protection



Absorbent Landscape



Bio-Retention

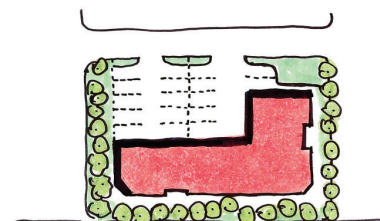


Pervious Paving

Criteria	Recommendations
Water Quality/ Volume Control (6 month 24 hour rainfall Capture)	<ul style="list-style-type: none"> Minimum 300mm amended topsoil in grassed and 450mm in planted areas Disconnected roof leaders to pervious area Pervious paving for driveways, walkways and visitor parking areas Bio-retention devices installation in silt loam soils, but not required in sandy loam and loam soils <p>Bio-retention bottom area = 5% development area Rock reservoir storage depth = 1,179mm</p> <p><i>Note: Required rock reservoir storage depth shall be verified based on the site specific geotechnical investigation for the subsurface soils and soil infiltration rates.</i></p>
Rate Control (Up to 10-year post-development flow to pre-development flow)	<ul style="list-style-type: none"> Additional detention storage requirements <p>Sandy Loam Soil Area: 13.3m³/ha Loam Soil Area: 119.6m³/ha Silt Loam Soil Area: 58.5m³/ha</p>
Groundwater Protection	<ul style="list-style-type: none"> Groundwater impact assessment be conducted by a Hydro-geotechnical professional to determine groundwater protection measures
Supplementary Stormwater Management Measures	<ul style="list-style-type: none"> Maintenance (or retention) of high tree cover densities Maintenance of riparian setback as per the environmental requirements if applicable Installation of daisy-chained stormwater management features (combination of bio-retention cells, wetted habitat channels and detention ponds/wetlands) if possible along the edge of the riparian setback boundaries Other source control measures that can achieve water quality, volume and rate controls in combination with, or in replacement of bio-retention devices

Institutional

Maximum allowed imperviousness: 80%
(excluding fields)



Stormwater Management

Flood Protection

Climate Change

Rate Control

Volume/Water Quality Control

Absorbent
Landscape

Bio-
Retention

Pervious
Paving

Detention
Pond

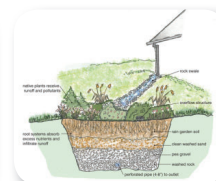
Storage
Pipe

Underground
Tank

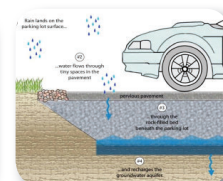
Groundwater
Protection



Absorbent
Landscape



Bio-Retention

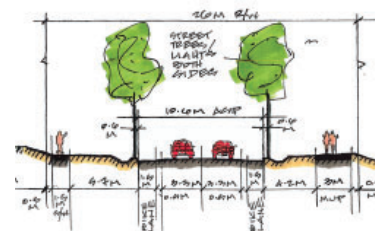
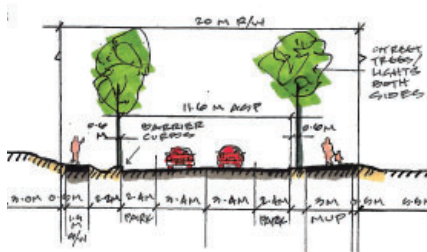


Pervious
Paving

Criteria	Recommendations
Water Quality/ Volume Control (6 month 24 hour rainfall Capture)	<ul style="list-style-type: none"> Minimum 300mm amended topsoil in grassed and 450mm in planted areas Disconnected roof leaders to pervious area Pervious paving for walkways and parking areas Bio-retention devices installation in loam and silt loam soils, but not required in sandy loam soils <p>Bio-retention bottom area = 5% development area Rock reservoir storage depth = 1,109mm (Loam)/1,987mm (Silt Loam)</p> <p><i>Note: Required rock reservoir storage depth shall be verified based on the site specific geotechnical investigation for the subsurface soils and soil infiltration rates.</i></p>
Rate Control (Up to 10-year post- development flow to pre- development flow)	<ul style="list-style-type: none"> Additional detention storage requirements <p>Sandy Loam Soil Area: 196.0m³/ha Loam Soil Area: 271.1m³/ha Silt Loam Soil Area: 35.3m³/ha</p>
Groundwater Protection	<ul style="list-style-type: none"> Groundwater impact assessment be conducted by a Hydro-geotechnical professional to determine groundwater protection measures Plan for the school sport field in the eastern portion of the school site and install perforated subsurface drainage system to allow for maximum ground infiltration and groundwater recharge in this area
Supplementary Stormwater Management Measures	<ul style="list-style-type: none"> Maintenance (or retention) of high tree cover densities Other source control measures that can achieve water quality, volume and rate controls in combination with, or in replacement of bio-retention devices

Road Right-of-Way

Maximum Design imperviousness: 78%



Stormwater Management

Flood Protection

Climate Change

Rate Control

Volume/Water Quality Control

Absorbent Landscape

Bioswale + Infiltration Trench

Storage Pipe

Underground Tank

Groundwater Protection



Absorbent Landscape



Bioswale + Infiltration Trench

Criteria	Recommendations
Water Quality/ Volume Control (6 month 24 hour rainfall Capture)	<ul style="list-style-type: none"> Minimum 300mm amended topsoil in grassed and 450mm in planted areas Bioswale in combination with infiltration trench system installation <ul style="list-style-type: none"> Infiltration trench bottom width = 10% road ROW width Rock reservoir storage depth = 200mm (Sandy Loam) = 456mm (Loam) = 1,045mm (Silt Loam) <p><i>Note: Required rock reservoir storage depth shall be verified based on the site specific geotechnical investigation for the subsurface soils and soil infiltration rates.</i></p>
Rate Control (Up to 10-year post-development flow to pre-development flow)	<ul style="list-style-type: none"> Additional detention storage requirements <ul style="list-style-type: none"> Sandy Loam Sand Area: 167.4m³/ha Loam Sand Area: 267.5m³/ha Silt Loam Sand Area: 42.5m³/ha
Groundwater Protection	<ul style="list-style-type: none"> Groundwater impact assessment be conducted by a Hydro-geotechnical professional to determine groundwater protection measures
Supplementary Stormwater Management Measures	<ul style="list-style-type: none"> Tree planting in boulevard Installation of trench dams at stream crossing locations Other source control measures that can achieve water quality, volume and rate controls in combination with, or in replacement of the proposed source control devices

In addition to the source control design guidelines provided above, onsite and offsite storm sewer systems shall be designed to convey the peak 10-year flows and the major flow paths including major road crossings, designated overland flow paths and open channels shall be designed to convey the peak 100-year flows assuming no onsite source control measures with 2070 climate condition.

10.7 STORMWATER MANAGEMENT SYSTEM OPERATION, MAINTENANCE AND PERFORMANCE MONITORING

Operation and Maintenance

Stormwater management source controls rely on appropriate operation and maintenance for performance and longevity. The lifespan of source controls will vary with the type, design and maintenance provided. **Table 8** provides the operation and maintenance requirements for various BMP devices for

use by landowners and subdivision strata management groups during and after construction and implementation of these stormwater management BMP features.

Table 8 – Stormwater BMP Operation and Maintenance Requirements

BMP Type	Required Operation and Maintenance Actions
Absorbent Landscape	<p>Construction Phase:</p> <ul style="list-style-type: none"> - Inspection to ensure required depths and areas are constructed - Ensure topsoil installation area is properly scarified and prepared <p>Operation Phase:</p> <ul style="list-style-type: none"> - Hydro-seeding in areas where topsoil is exposed and eroded (on-going) - Minimum water supply to absorbent landscape areas during dry season (on-going) - Seeding and soil maintenance (bi-annual)
Rock Pit	<p>Construction Phase:</p> <ul style="list-style-type: none"> - Ensure rock infiltration area is protected from sediment <p>Operation Phase:</p> <ul style="list-style-type: none"> - Ensure vehicles are not driven or parked on the trenches unless proper support with pavement constructed on the top of the rock pit area for vehicle access is provided (on-going) - Avoid excessive compaction from equipment, vehicles and mowers (on-going) - Remove trash, leaves and other debris collected on the surface (on-going) - Inspect cleanouts of perforated drains (quarterly) - Remove debris from surfaces (quarterly) - Catch basins and inlets to be inspected and cleaned (annually) - Check and repair damages (e.g. sink holes) (as needed) - Check for signs of failure such as standing water in the observation well for more than 48 hours after a rain event, insects and/or odour, and clean and reinstall filter fabric and rock reservoir, as needed - Redirect drainage if runoff is conveyed over and across the trench but not into the facility (as needed)

<p>Bio-Retention (e.g. rain gardens)</p>	<p>Construction Phase:</p> <ul style="list-style-type: none"> - Inspection to ensure required amended topsoil depths being constructed - Ensure topsoil installation area is properly scarified and prepared - Ensure rock infiltration area is protected from sediments <p>Operation Phase:</p> <ul style="list-style-type: none"> - Plan in place for watering until plantings established (first year) - Plant and soil maintenance and weed control (bi-annual) - Inspection of surface conditions for uneven settling, water ponding, or potholes to determine if any remedial work is needed (bi-annual)
<p>Pervious Paving</p>	<p>Construction Phase:</p> <ul style="list-style-type: none"> - Ensure rock infiltration area is protected from sediments <p>Operation Phase:</p> <ul style="list-style-type: none"> - Provide remedial work when ponding of water is visible on the surface 48 hours after a rain event (on-going) - Avoid loading or placement of landscaping materials such as mulch, sand or topsoil on pervious paving (on-going) - Surface sweeping with a commercial vacuum sweeping unit or pressure washing of clogged surface (bi-annual or when accumulated sediment is found in between pavers) - Inspection of surface conditions for uneven settling, water ponding, or potholes to determine if any remedial work is needed (bi-annual) - Restrict use of de-icing chemicals and sand on pervious paving areas (winter)
<p>Bioswale and Infiltration Trench in Road Right-of- Way</p>	<p>Construction Phase:</p> <ul style="list-style-type: none"> - Inspection to ensure required amended topsoil depths being constructed within bioswale areas - Ensure topsoil installation area is properly scarified and prepared - Ensure infiltration trench area is protected from sediments <p>Operation Phase:</p> <ul style="list-style-type: none"> - Inspect cleanouts of perforated drains (quarterly) - Remove debris from surface to maintain proper function (quarterly or as needed) - Avoid excessive compaction from equipment and mowers (on-going) - Ensure vehicles are not driven or parked on trenches unless proper support with pavement constructed on the top of the infiltration area for vehicle access (on-going) - Catch basins and inlets to be inspected and cleaned (annual) - Repair when there is visible damage to the trench, e.g. sink holes (as needed) - Redirect drainage if runoff is conveyed over and across the trench but not into the facility (as needed)

Stormwater Performance Monitoring Program

A performance monitoring program will assist the City in answering the following two questions:

- If the development is negatively impacting the ecological health of creeks; and
- If stormwater management activities are resulting in no-net-loss of the overall health of the creeks.

Aplin Martin recommends that the City of Maple Ridge consider implementing a Stormwater Performance Monitoring Program for the North East Albion Concept Plan area according to the Monitoring and Adaptive Management Framework for Stormwater (MAMF) developed by Metro Vancouver in 2014. The proposed monitoring program should follow the MAMF protocols and includes the following:

- Conduct continuous flow monitoring in the selected ravine watercourses, e.g. KA2, KA3 and KA6 west;
- Water quality grab sampling to measure dissolved oxygen, water temperature, turbidity, pH, conductivity, nitrate, e. coli, fecal coliform, total iron, total copper, total lead, total zinc and total cadmium, once every five years;
- Annual erosion monitoring for all tributary ravine areas; and
- Desktop monitoring of changes in total impervious area, effective impervious area (EIA) and riparian forest integrity (RFI) using aerial photos and GIS, every five years.

11 | BC HYDRO, TELECOMM, CABLE & GAS

The area is generally currently serviced with BC Hydro, Telus and Fortis BC natural gas services. The existing subdivisions to the south and east of North East Albion are currently serviced with underground BC Hydro and Telus distribution systems.

It is proposed to extend the existing underground systems as required to service each individual development application within North East Albion.

Three phase BC Hydro servicing appears to currently terminate at the intersection of 112 Avenue and Lockwood Street. It is anticipated that three phase BC Hydro servicing will need to be extended via overhead service along 112 Avenue to service sanitary pump station PS-1.

12 | LARGE FORMAT DRAWING

The drawings referenced in Part 2 – Servicing Strategy are provided in the following section.

Roadworks drawings include:

- Drawing 101 – Roadworks Master Plan

Sanitary drawings include:

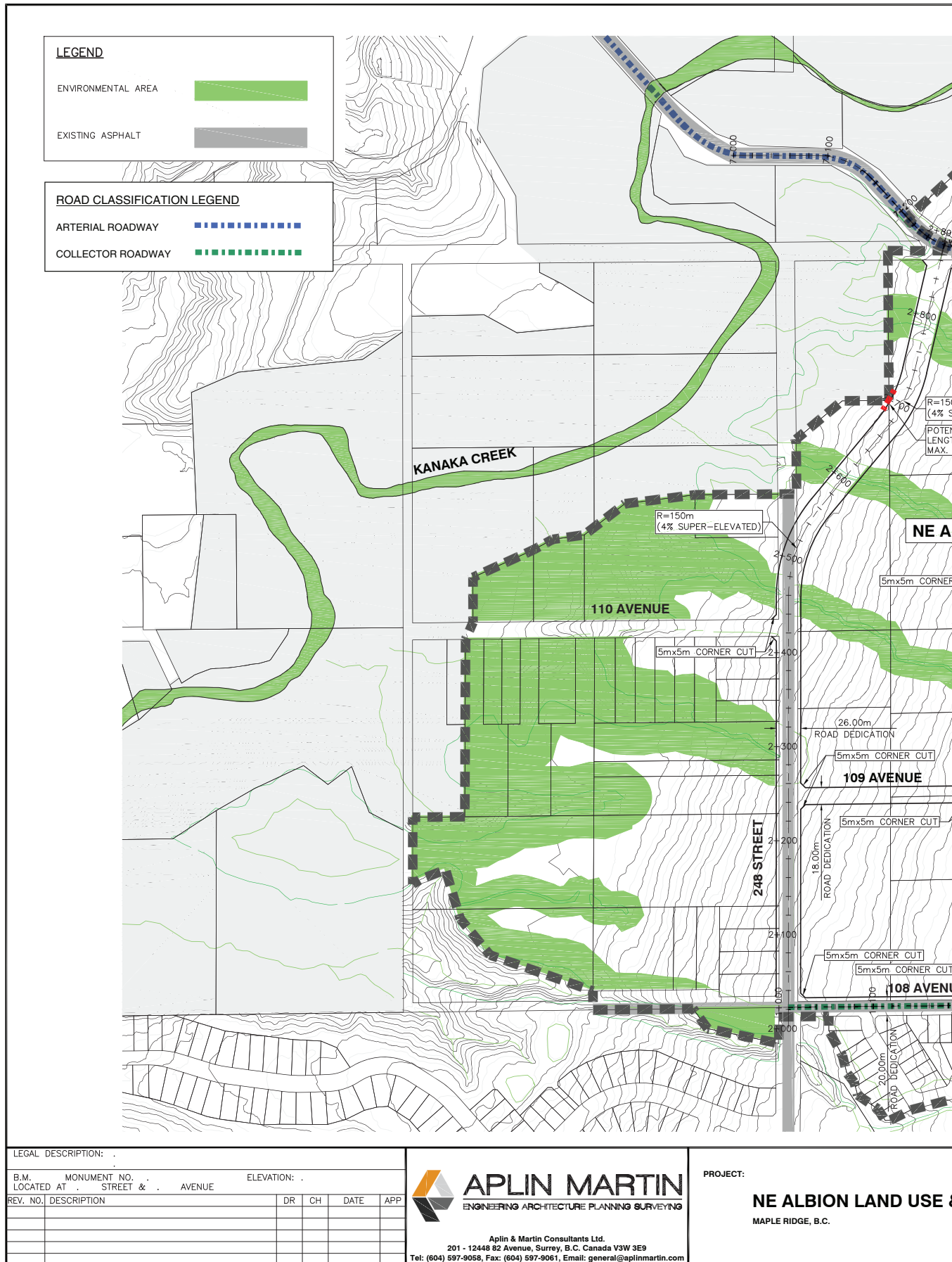
- Drawing 201 – Sanitary Master Plan
- Drawing 202 – North East Albion Sanitary Catchment Plan
- Drawing 203 – North East Albion Sanitary Catchment Plan - Calculations

Water drawings include:

- Drawing 301 – Water Master Plan

Stormwater drawings include:

- Drawing 401 – Land Use and Stormwater Catchment Plan - Existing
- Drawing 402 – Land Use and Stormwater Catchment Plan - Post Development
- Drawing 403 – Soil Map
- Drawing 404 – Stormwater Master Plan
- Drawing 405 – 100 Year Flow Paths

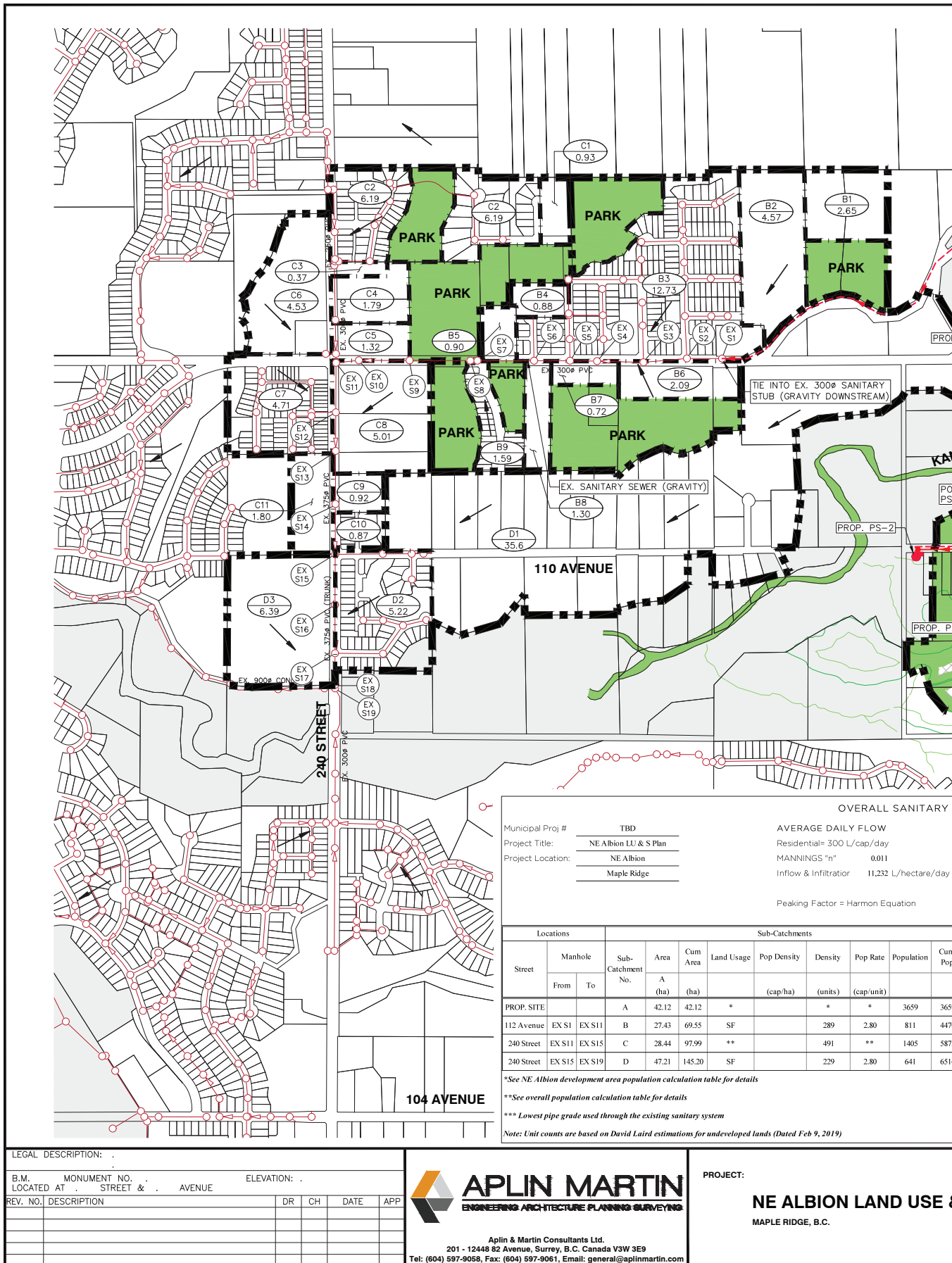


Drawing 101 – Roadworks Master Plan

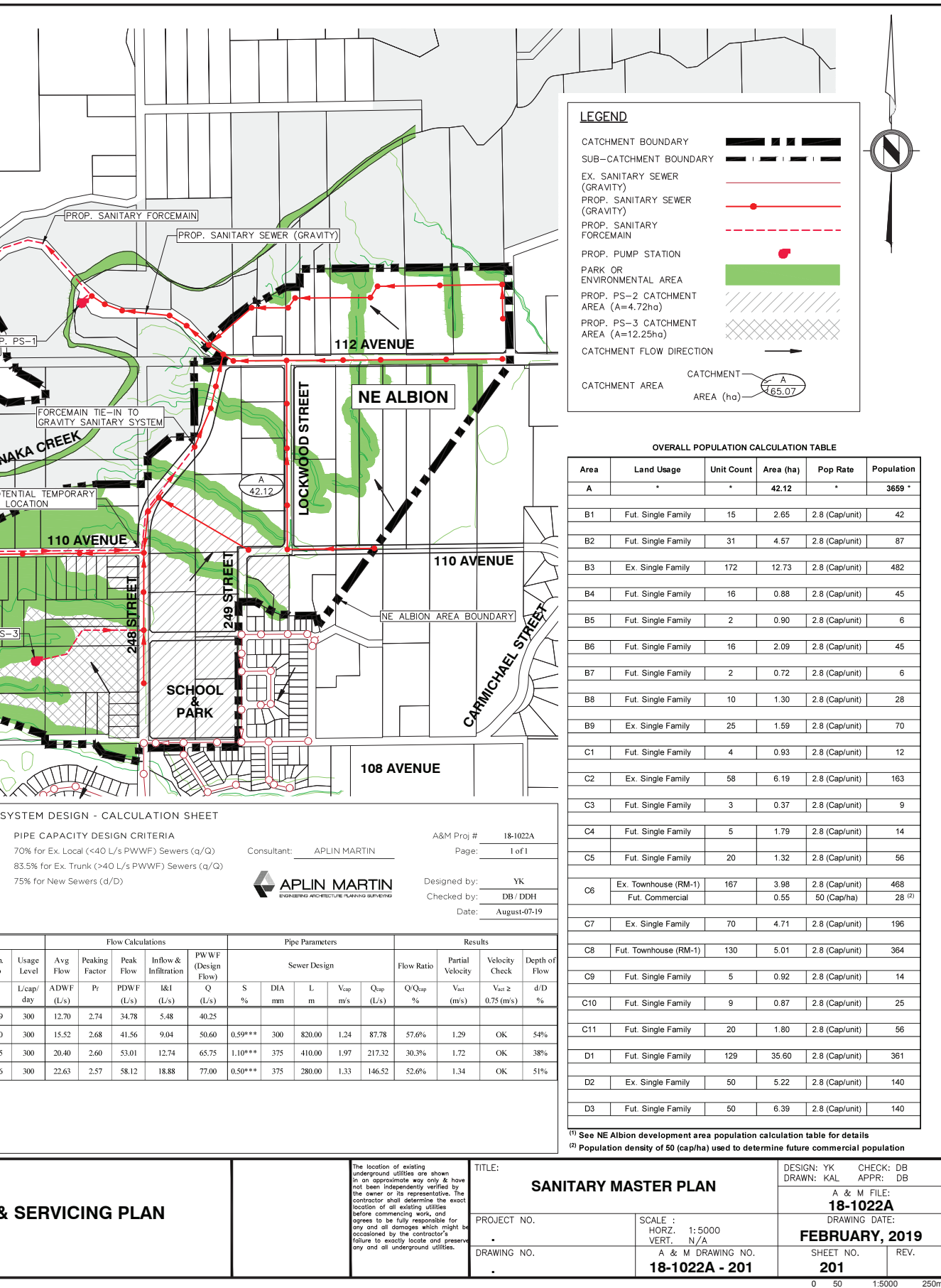


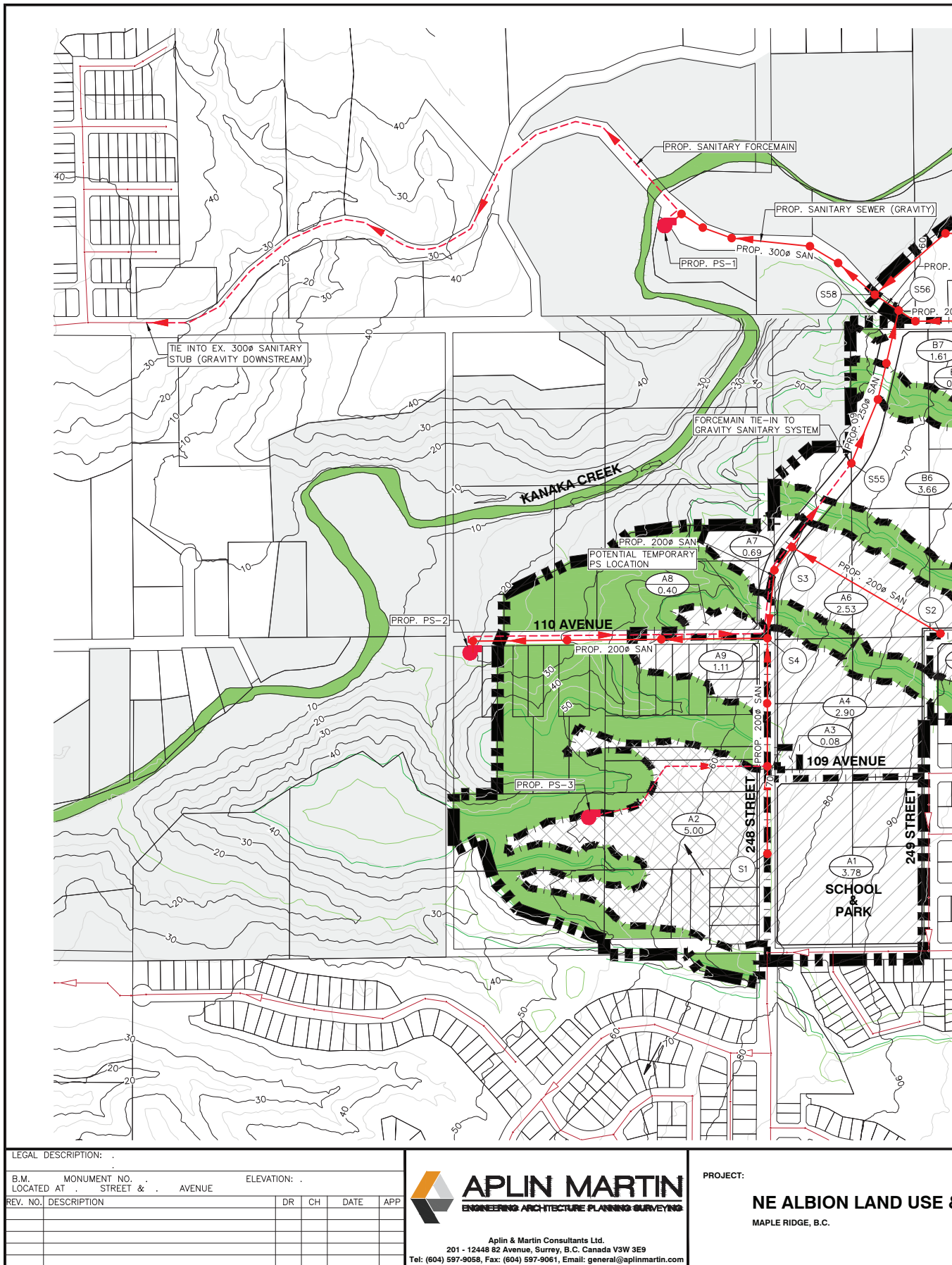
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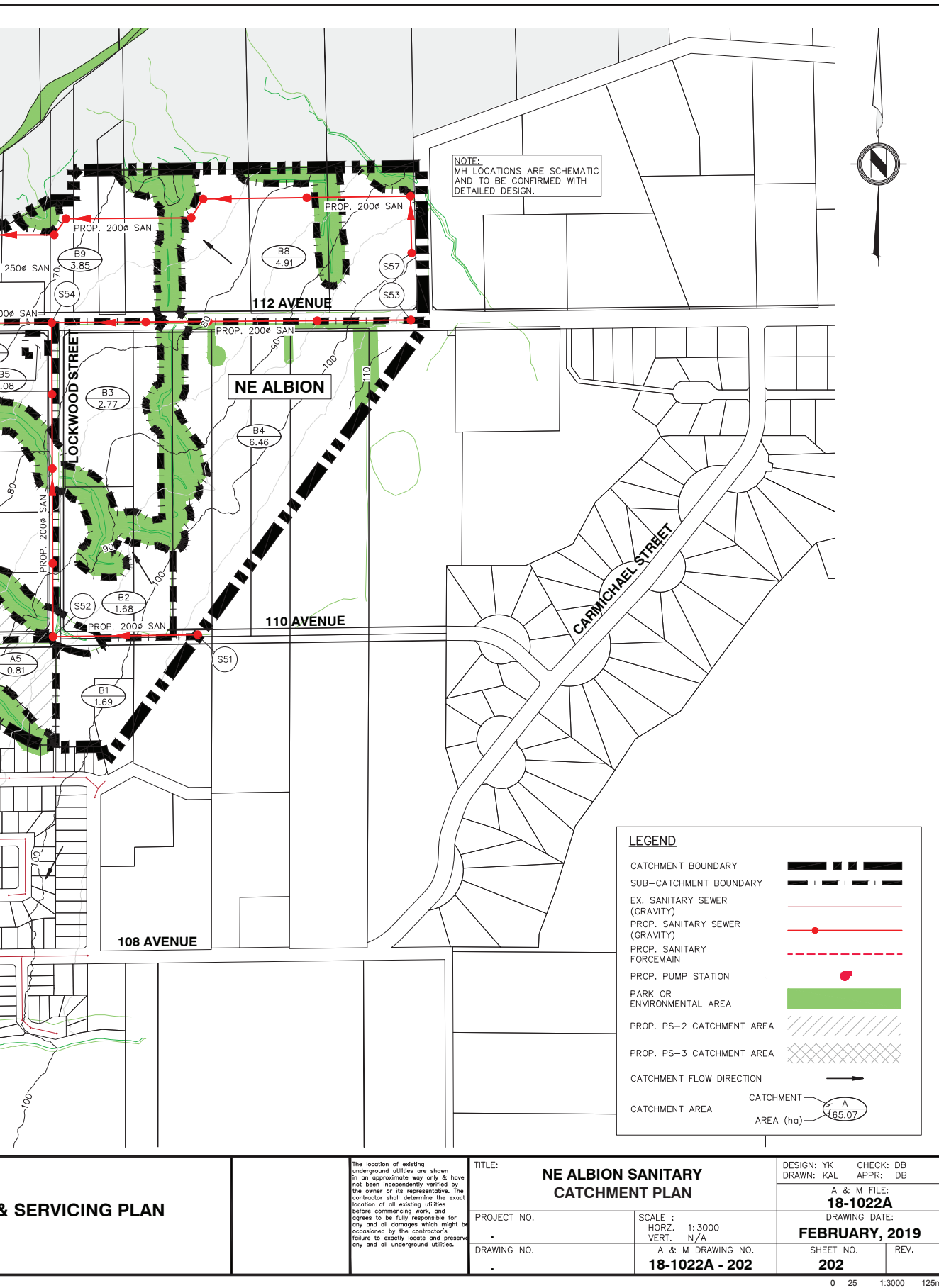


Drawing 201 – Sanitary Master Plan





Drawing 202 – North East Albion Sanitary Catchment Plan



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Municipal Proj #

TBD

Project Title:

NE Albion LU & S Plan

Project Location:

NE Albion

Maple Ridge

AVERAGE DAILY FLOW

Residential= 300 L/cap/day

MANNINGS "n" 0.011

Inflow & Infiltrator 11,232 L/hectare/day

PIPE CAPACITY DESIGN CRITERIA

70% for Ex. Local (<40 L/s PWWF) Sewers (q/Q)

83.5% for Ex. Trunk (>40 L/s PWWF) Sewers (q/Q)

75% for New Sewers (d/D)

Consultant:

A

APLI

ENGINEERS ARCHITECTS

Peaking Factor = Harmon Equation

Locations			Sub-Catchments										Flow Calculations							Pipe Parameters			
Street	Manhole		Sub-Catchment No.	Area A (ha)	Cum Area (ha)	Land Usage	Pop Density (cap/ha)	Density (units)	Pop Rate (cap/unit)	Population	Cum. Pop	Usage Level L/cap/day	Avg Flow ADWF (L/s)	Peaking Factor Pr	Peak Flow PDWF (L/s)	Inflow & Infiltration I&I (L/s)	PWWF (Design Flow) Q (L/s)	S %	DIA mm	L m	Sewer Depth		
	From	To																					
248 Street	S1	S4	A1, A2, A3 & A4	9.87	9.87	*		183	*	685	685	300	2.38	3.29	7.83	1.28	9.11	4.50	200	458.0			
	S2	S3	A5 & A6	3.34	3.34	SF/TH		95	*	265	265	300	0.92	3.65	3.36	0.43	3.80	12.00	200	370.0			
248 Street	S3	S4	A7	0.69	4.03	Townhouse		35	2.80	97	362	300	1.26	3.53	4.44	0.52	4.96	2.80	200	210.0			
110 Avenue	S4	PS-2	A8 & A9	1.51	15.41	SF/TH		70	*	118	1165	300	4.05	3.10	12.56	2.00	14.56	8.00	200	630.0			
110 Avenue	S51	S52	B1	1.69	1.69	SF		34	2.80	95	95	300	0.33	4.09	1.35	0.22	1.57	7.00	200	310.0			
Lockwood	S52	S54	B2 & B3	4.45	6.14	SF/TH		172	*	482	577	300	2.00	3.35	6.72	0.80	7.52	4.00	200	660.0			
112 Avenue	S53	S54	B4	6.46	6.46	SF		129	2.80	362	362	300	1.26	3.53	4.44	0.84	5.28	2.00	200	760.0			
112 Avenue	S54	S56	B5	0.08	12.68	Commercial				4	943	300	3.27	3.18	10.40	1.65	12.05	8.50	200	230.0			
248 Street	S55	S56	A, B6 & B7	5.27	20.68	*		264	2.50	737	1902	300	6.60	2.94	19.43	2.69	22.12	0.50	250	340.0			
112 Avenue	S56	S58			33.36						2845	300	9.88	2.81	27.80	4.34	32.14	9.40	250	650.0			
	S57	S58	B8 & B9	8.76	8.76	SF/TH		291	*	814	814	300	2.83	3.23	9.13	1.14	10.27	1.00	200	1100.0			
112 Avenue	S58	PS-1			42.12				*		3659	300	12.70	2.74	34.78	5.48	40.25	1.00	300	470.0			

* See NE Albion population calculation table for details

* See NE Albion population calculation table for details

LEGAL DESCRIPTION: .					
B.M. MONUMENT NO. .		ELEVATION: .			
LOCATED AT . STREET & . AVENUE					
REV. NO.	DESCRIPTION	DR	CH	DATE	APP



APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
201 - 12448 82 Avenue, Surrey, B.C. Canada V3W 3E9
Tel: (604) 597-9058, Fax: (604) 597-9061, Email: general@aplinmartin.com

PROJECT:

NE ALBION LAND USE & DEVELOPMENT PLAN
MAPLE RIDGE, B.C.

Drawing 203 – North East Albion Sanitary Catchment Plan - Calculations

APLIN MARTIN

N MARTIN

STRUCTURE PLANNING SERVICES

A&M Proj # 18-1022A

Designed by: YK

Checked by: DB / DDH

Date: August-07-19

Page: 1 of 1

Parameters

Results

Design

Flow Ratio

Partial Velocity

Velocity Check

Depth of Flow

V_{cap}
m/s

Q_{cap}
(L/s)

Q/Q_{cap}
%

V_{act}
(m/s)

V_{act} ≥
0.75 (m/s)

d/D
%

0

2.62

82.23

11.1%

1.72

OK

22%

0

4.27

134.28

2.8%

1.88

OK

12%

0

2.06

64.86

7.6%

1.22

OK

19%

0

3.49

109.64

13.3%

2.42

OK

25%

0

3.26

102.55

1.5%

1.19

OK

9%

0

2.47

77.52

9.7%

1.56

OK

21%

0

1.74

54.82

9.6%

1.10

OK

21%

0

3.60

113.01

10.7%

2.34

OK

22%

0

1.01

49.70

44.5%

0.98

OK

47%

0

4.39

215.47

14.9%

3.15

OK

26%

00

1.23

38.76

26.5%

1.04

OK

35%

0

1.62

114.28

35.2%

1.48

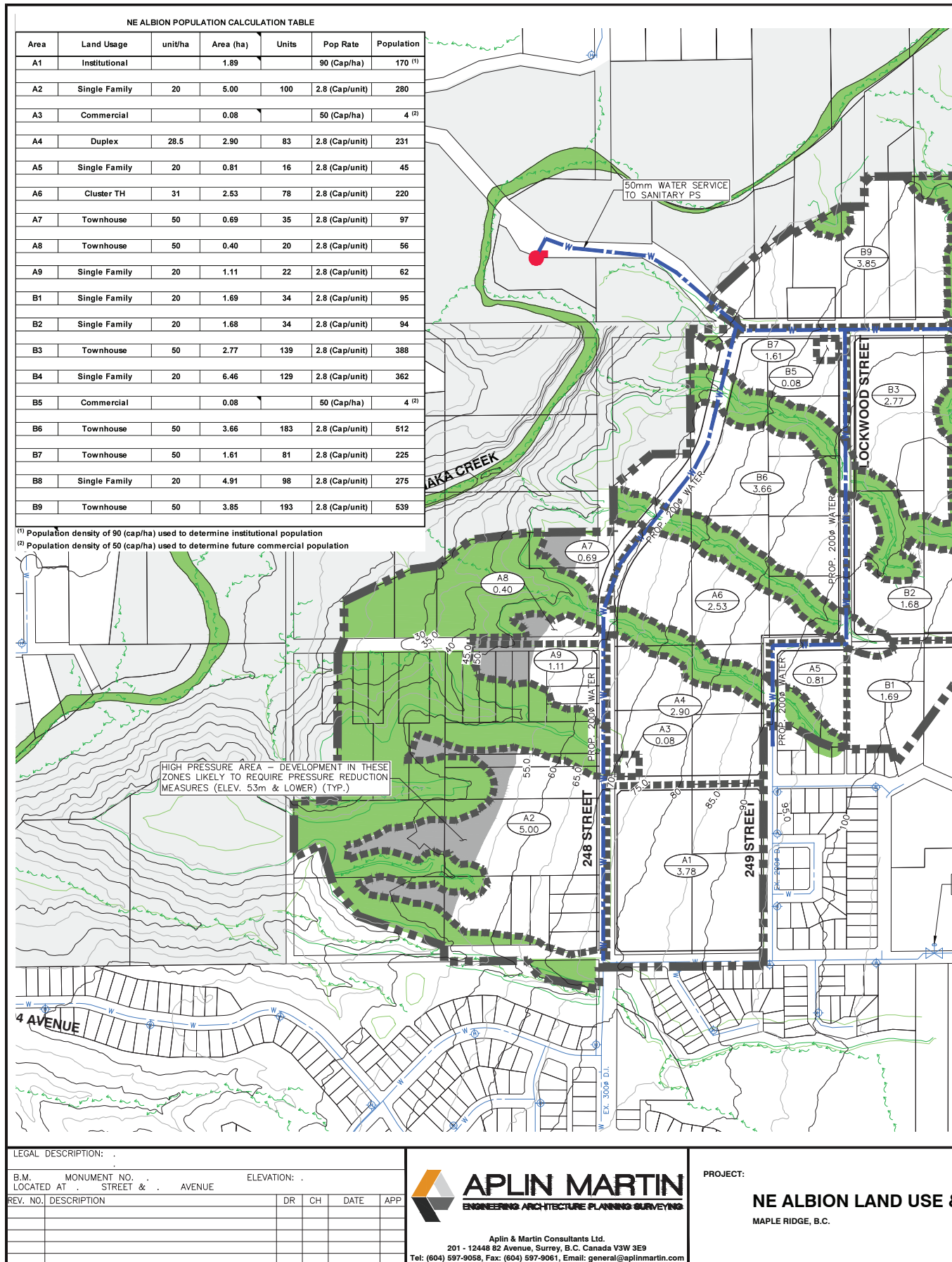
OK

41%

NE ALBION POPULATION CALCULATION TABLE						
Area	Land Usage	unit/ha	Area (ha)	Units	Pop Rate	Population
A1	Institutional		1.89		90 (Cap/ha)	170 ⁽¹⁾
A2	Single Family	20	5.00	100	2.8 (Cap/unit)	280
A3	Commercial		0.08		50 (Cap/ha)	4 ⁽²⁾
A4	Duplex	28.5	2.90	83	2.8 (Cap/unit)	231
A5	Single Family	20	0.81	16	2.8 (Cap/unit)	45
A6	Cluster TH	31	2.53	78	2.8 (Cap/unit)	220
A7	Townhouse	50	0.69	35	2.8 (Cap/unit)	97
A8	Townhouse	50	0.40	20	2.8 (Cap/unit)	56
A9	Single Family	20	1.11	22	2.8 (Cap/unit)	62
B1	Single Family	20	1.69	34	2.8 (Cap/unit)	95
B2	Single Family	20	1.68	34	2.8 (Cap/unit)	94
B3	Townhouse	50	2.77	139	2.8 (Cap/unit)	388
B4	Single Family	20	6.46	129	2.8 (Cap/unit)	362
B5	Commercial		0.08		50 (Cap/ha)	4 ⁽²⁾
B6	Townhouse	50	3.66	183	2.8 (Cap/unit)	512
B7	Townhouse	50	1.61	81	2.8 (Cap/unit)	225
B8	Single Family	20	4.91	98	2.8 (Cap/unit)	275
B9	Townhouse	50	3.85	193	2.8 (Cap/unit)	539
⁽¹⁾ Population density of 90 (cap/ha) used to determine institutional population						
⁽²⁾ Population density of 50 (cap/ha) used to determine future commercial population						

LAND USE & SERVICING PLAN	The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.	TITLE: NE ALBION SANITARY CATCHMENT PLAN - CALCULATIONS		DESIGN: YK DRAWN: KAL	CHECK: DB APPR: DB
		PROJECT NO. -	SCALE : HORZ. N/A VERT. N/A	A & M FILE: 18-1022A	
		DRAWING NO. -	A & M DRAWING NO. 18-1022A - 203	DRAWING DATE: FEBRUARY, 2019	SHEET NO. 203 REV.

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LEGAL DESCRIPTION:					
B.M.	MONUMENT NO.	ELEVATION:			
LOCATED AT	STREET &	AVENUE			
REV. NO.	DESCRIPTION	DR	CH	DATE	APP.

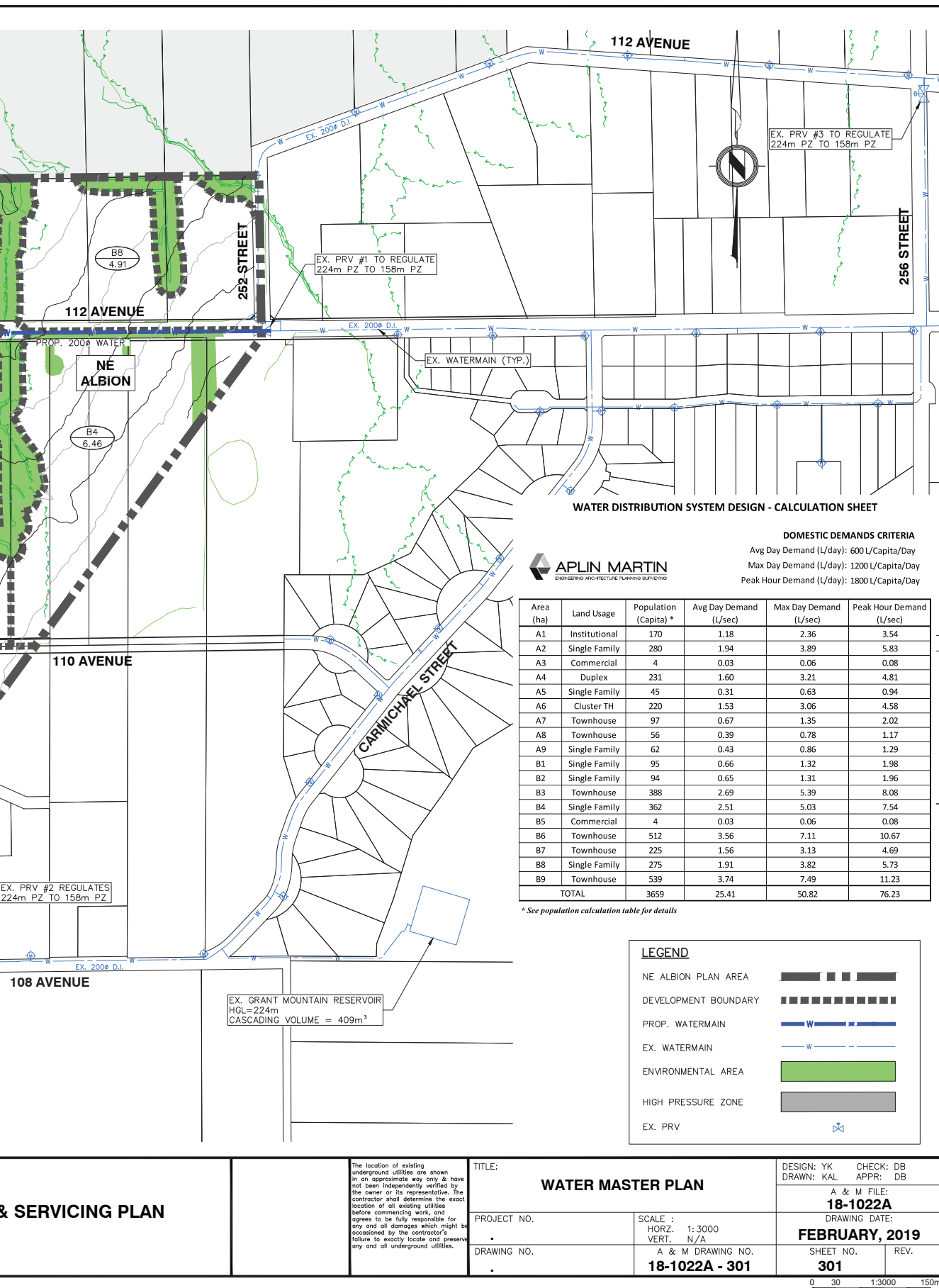
**APLIN MARTIN**
ENGINEERING ARCHITECTURE PLANNING SURVEYING

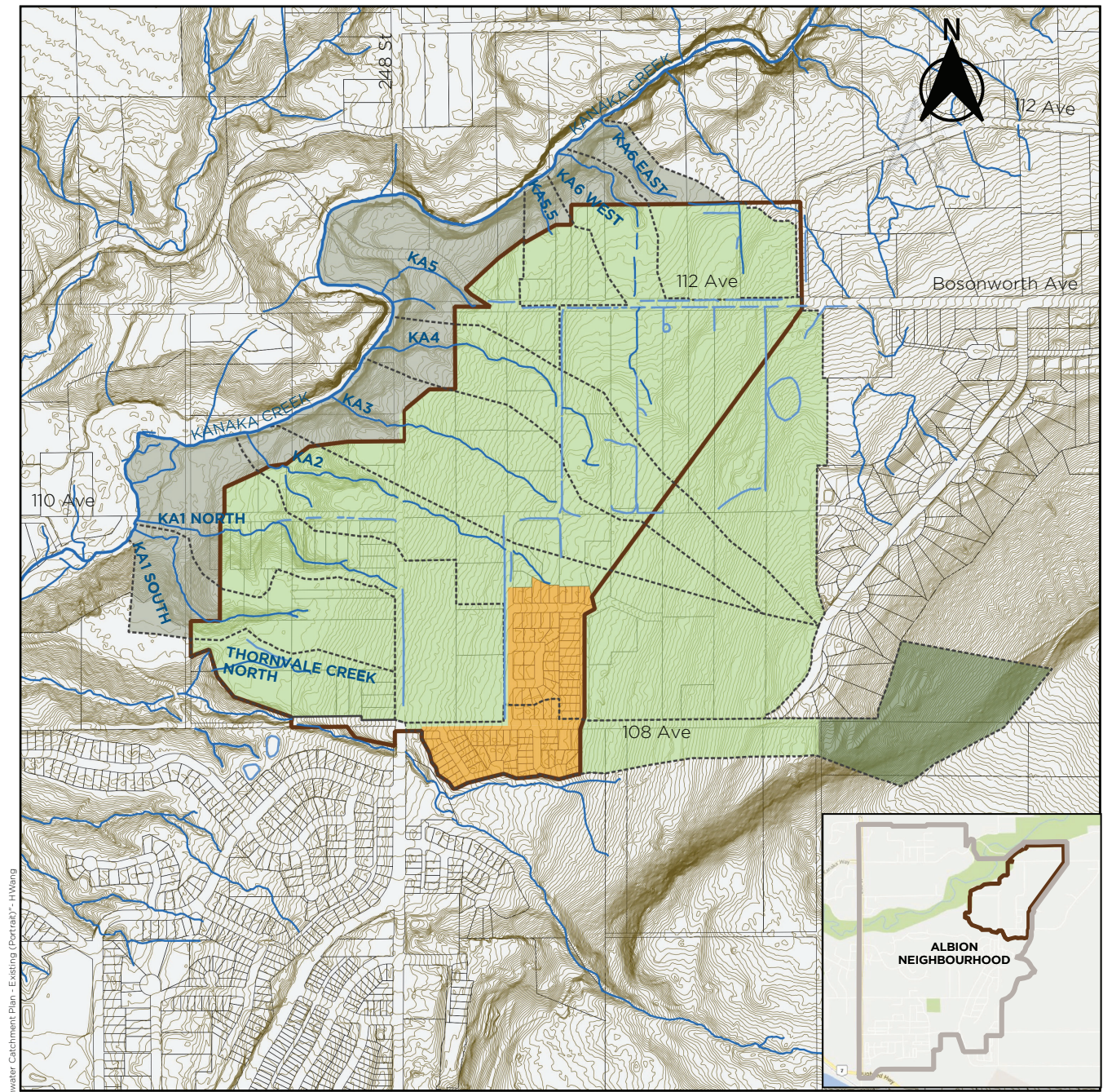
Aplin & Martin Consultants Ltd.
201 - 12448 82 Avenue, Surrey, B.C. Canada V3W 3E9
Tel: (604) 597-9058, Fax: (604) 597-9061, Email: general@aplinmartin.com

PROJECT:

NE ALBION LAND USE & DEVELOPMENT
MAPLE RIDGE, B.C.

Drawing 301 – Water Master Plan

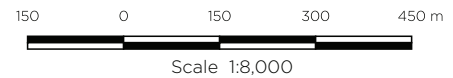




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Legend

- | | |
|---|--|
| North-East Albion | Existing Land Use |
| Existing Drainage Boundaries | Metro Vancouver Park |
| Contour (1m Interval) | Agricultural |
| — Watercourse | Rural |
| --- Ditches/Unconfirmed Streams | Low Density Residential |
| | Low/Medium Density Residential |
| | Medium Density Residential |



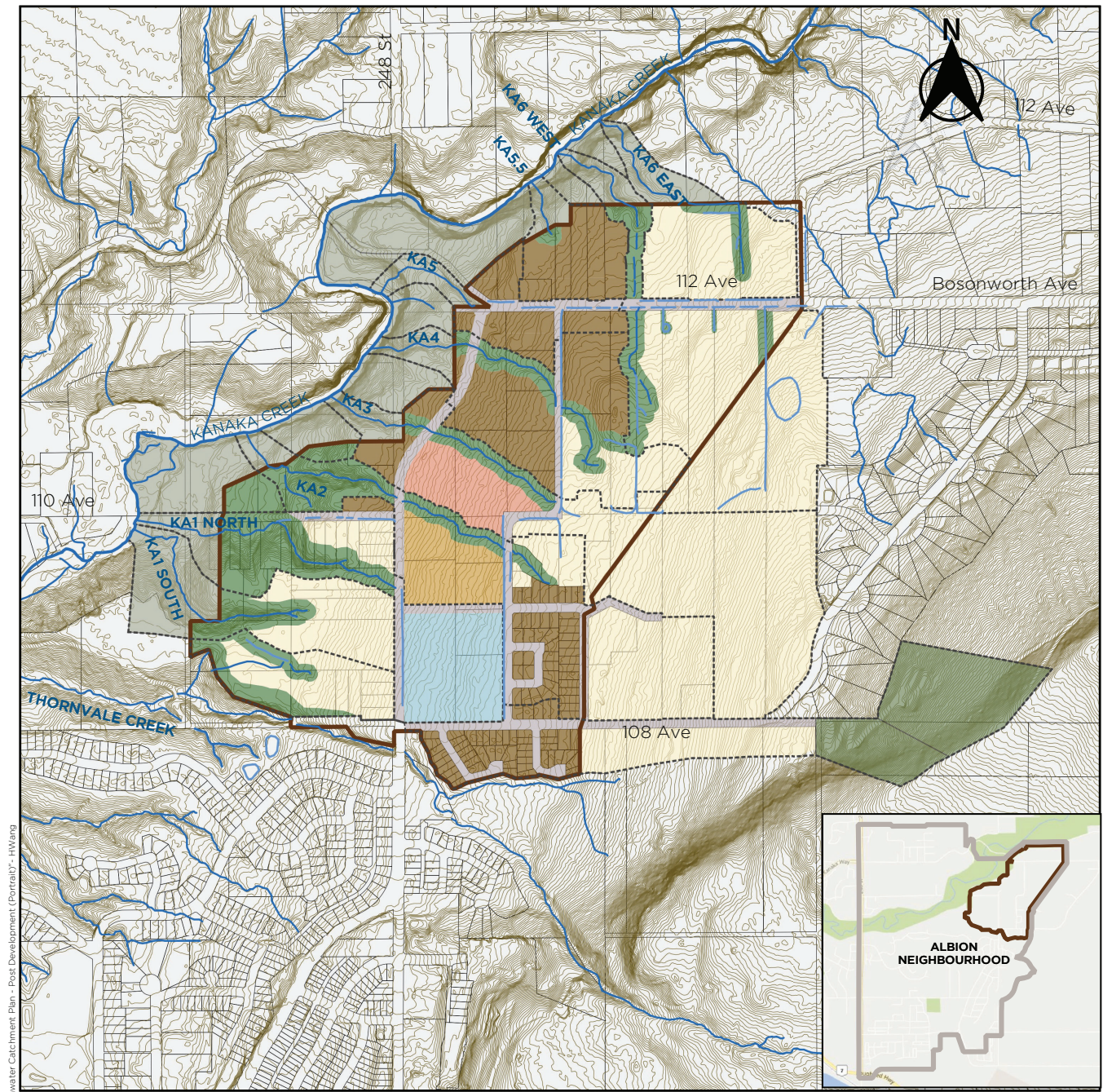
NE Albion Land Use and Stormwater Catchment Plan - Existing

Project #: 18-1022A
Author: HW
Checked: WXY
Status: Draft
Revision: A
Date: 2019/09/19



18-1022A - 401

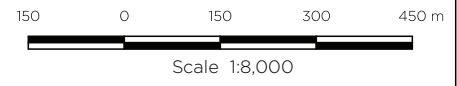
Drawing 401 – Land Use and Stormwater Catchment Plan - Existing



K:\2018\18-1022A\GIS\Map1 - Figures\CYCage - 18-1022A - 402 - Land Use and Stormwater Catchment Plan - Post Development (Portugal) - HWong

Legend

- | | |
|---|---|
| North-East Albion | Metro Vancouver Park |
| Contour (1m Interval) | Agricultural |
| Post Development Drainage Boundaries | Environmentally Sensitive Areas |
| Watercourse | Single Family |
| Ditches/ Unconfirmed Streams | Duplex, Triplex, Fourplex |
| | Cluster Townhouse |
| | Townhouse |
| | Institutional |
| | Road ROW |



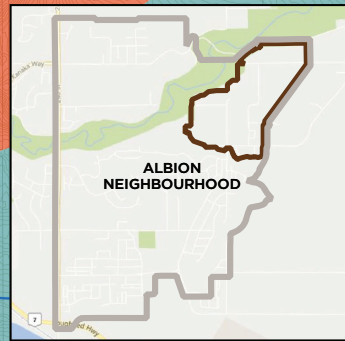
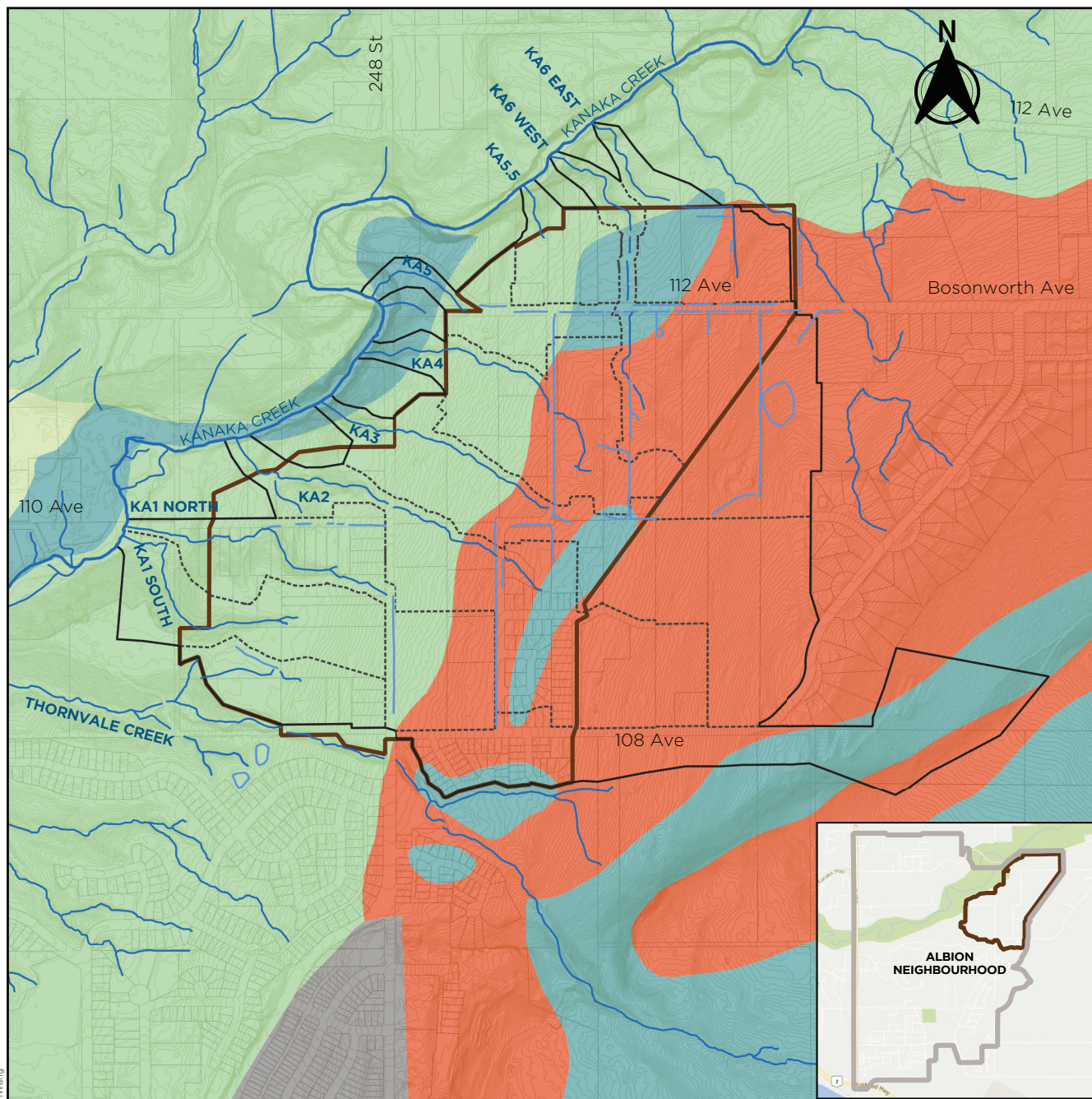
NE Albion
Land Use and Stormwater
Catchment Plan - Post
Development

Project #: 18-1022A
Author: HW
Checked: WXY
Status: Draft
Revision: A
Date: 2019/09/19



18-1022A - 402

Drawing 402 – Land Use and Stormwater Catchment Plan - Post Development

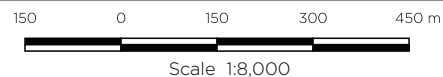


Legend

- North-East Albion
- Contour (1m Interval)
- Extent of Drainage Boundaries
- Post Development Drainage Boundaries
- Watercourse
- Ditches/ Unconfirmed Streams

Surficial Soil Types

- L - Loam
- SL - Sandy Loam
- SIL - Silt Loam
- SICL - Silty Clay Loam
- Gravel Pit



NE Albion Soil Map

Project #: 18-1022A
 Author: HW
 Checked: WXY
 Status: Draft
 Revision: A
 Date: 2019/09/13



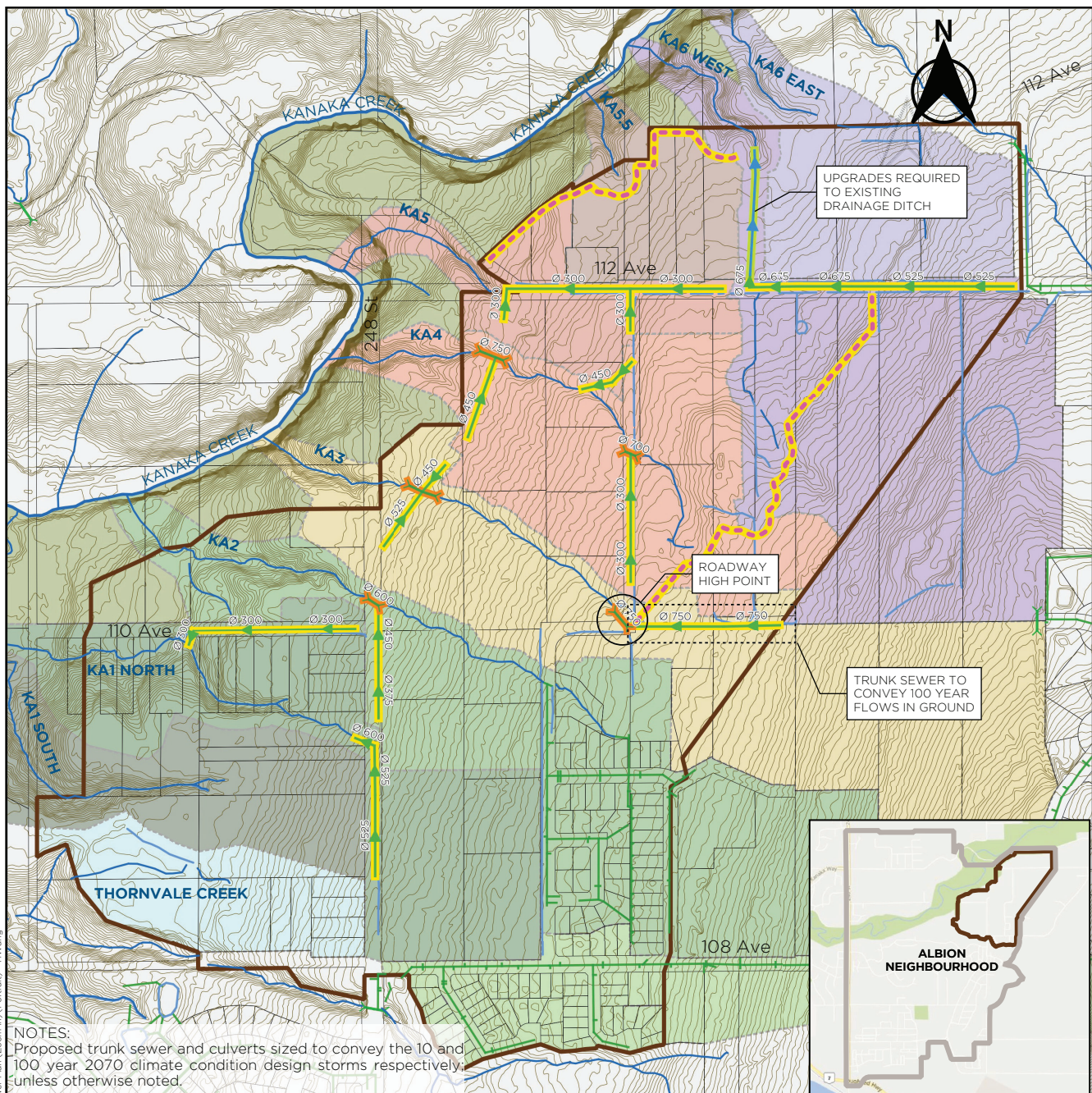
18-1022A - 403

M:\2018\18-1022A\GIS\Map1 - Figures\CYCgag-18-1022A - 403 - Soil Map (Portrait) - HWang

Surficial Geology Information Source: Soils of the Langley - Vancouver Map Area - British Columbia Soil Survey (Luttmerding, 1981); FGDB published 2016-06-23 by British Columbia - Data Catalogue

Drawing 403 - Soil Map

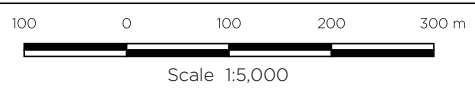
18-1022A-GIS Map 1 - Figures-CVC.qxd 18-1022A - 404 - Preliminary Trunk Sewer Plan (Zoom in Portrait) - HWang



NOTES:
Proposed trunk sewer and culverts sized to convey the 10 and 100 year 2070 climate condition design storms respectively, unless otherwise noted.

Legend

- | | | |
|-----------------------------|--|-----------------------------------|
| North-East Albion | Proposed Ditch Upgrades | KA5 Catchment |
| Contour (1m Interval) | Proposed Regional Stormwater Management Features | KA5.5 Catchment |
| Existing Storm Main | Stormwater Catchments | KA6 West Catchment |
| Existing Storm Culvert | KA1 South Catchment | Thornvale Creek North |
| Watercourse | KA1 North Catchment | KA6 East Catchment |
| Ditches/Unconfirmed Streams | KA2 Catchment | 248 St and 108 Ave Detention Pond |
| Proposed Trunk Main | KA3 Catchment | Direct Runoff to Kanaka Creek |
| Proposed Trunk Culvert | KA4 Catchment | |



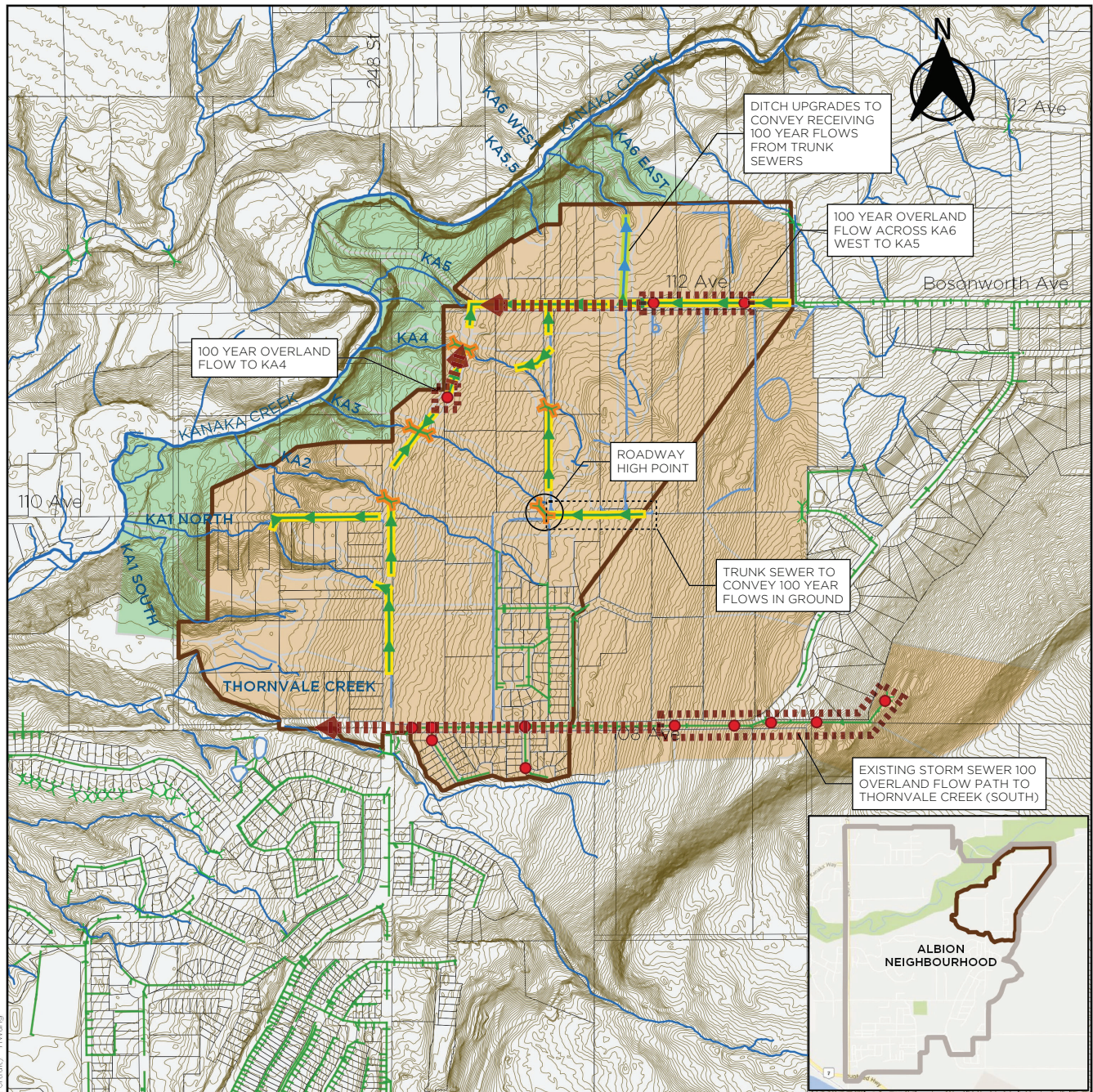
NE Albion Preliminary Stormwater Master Plan

Project #: 18-1022A
Author: HW
Checked: WXY
Status: Draft
Revision: A
Date: 2019/09/19



18-1022A - 404

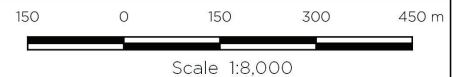
Drawing 404 – Stormwater Master Plan



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Legend

- | | |
|---------------------------------|--|
| North-East Albion | Existing Storm Culvert |
| Contour (1m Interval) | Proposed Trunk Main |
| Watercourse | Proposed Trunk Culvert |
| Ditches/
Unconfirmed Streams | Proposed Ditch Upgrades |
| Existing Storm Main | Flooded Manhole under
100-year conditions |
| | Overland Flow Path |



NE Albion 100 Year Flow Paths

Project #: 18-1022A
Author: HW
Checked: WXY
Status: Draft
Revision: A
Date: 2019/09/19



18-1022A - 405

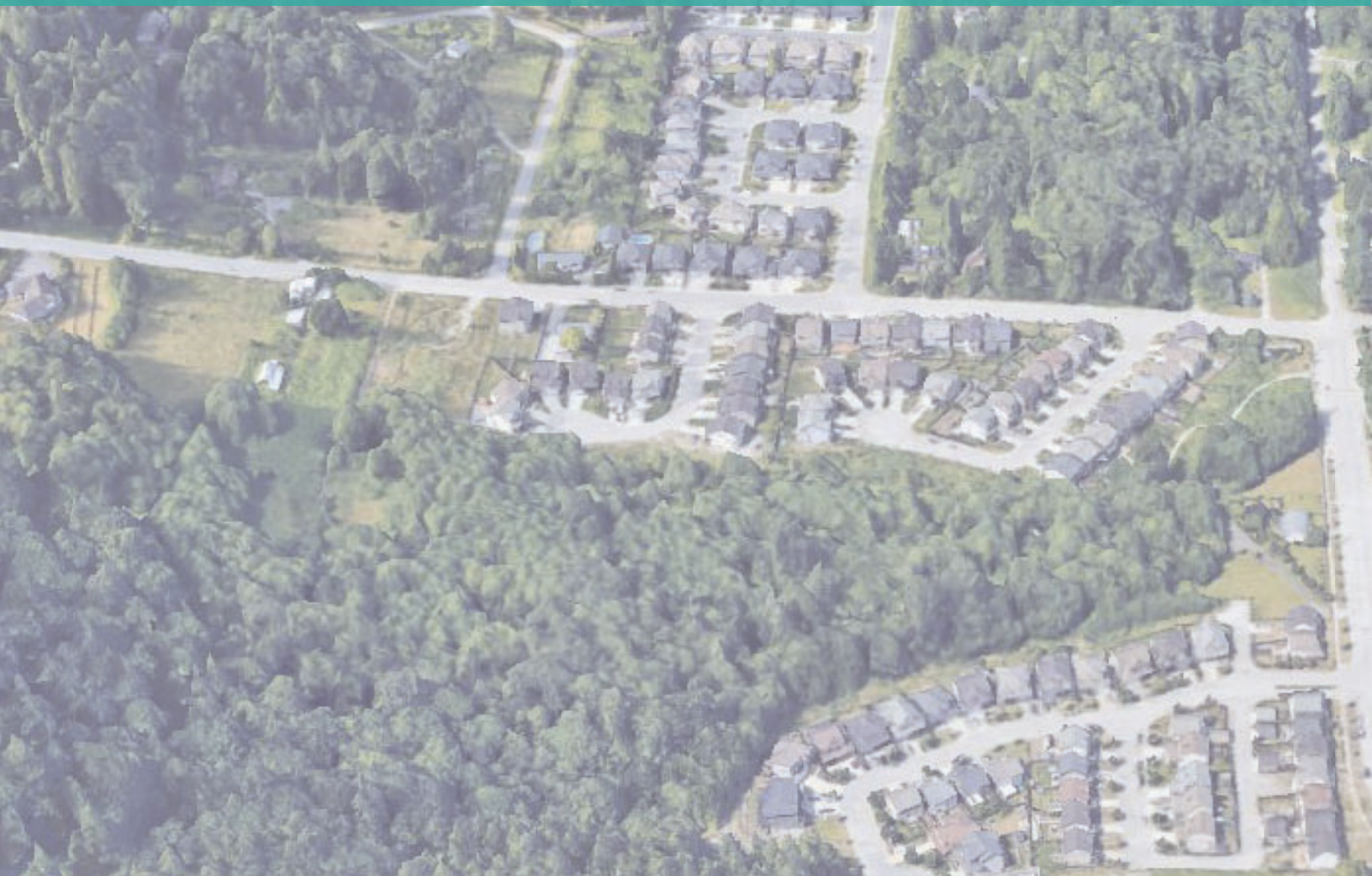
Drawing 405 – 100 Year Flow Paths

PART 3 - CONCLUSION

13 | IMPLEMENTATION

Once the finalized North East Albion Land Use and Servicing Concept Plan is endorsed, Staff will prepare supporting policies, continue the discussion with the community, and ultimately initiate a formal process to adopt the Concept Plan into the Albion Area Plan as part of the OCP. The timeline for individual development applications will vary, but development applications may be submitted following Council endorsement of the North East Albion Concept Plan.

This report is preliminary in nature. Ground-truthing and detailed site analysis will be required in the future, on an application-by-application, site-by-site basis.



Kanaka Creek