

Lower Nicola Indian Band Subdivision Feasibility Study

Site Location Options

February 2023

Final Site Recommendation

Site 3 is recommended for further study and investigation based on the detailed review of existing site conditions, available data, current understanding of available infrastructure and servicing, conversations with and feedback from the LNIB community, and LNIB priorities.

1.0 Introduction

The purpose of this memo is to provide a review of potential advantages and disadvantages of three (3) sites that have been identified as options for a future residential subdivision. The summary of advantages and disadvantages is based on known information and desktop reviews of background information. The sites were also analyzed in comparison to each other to identify if a site has an advantage over another site from a technical perspective.

The following technical core areas were considered as part of this review:

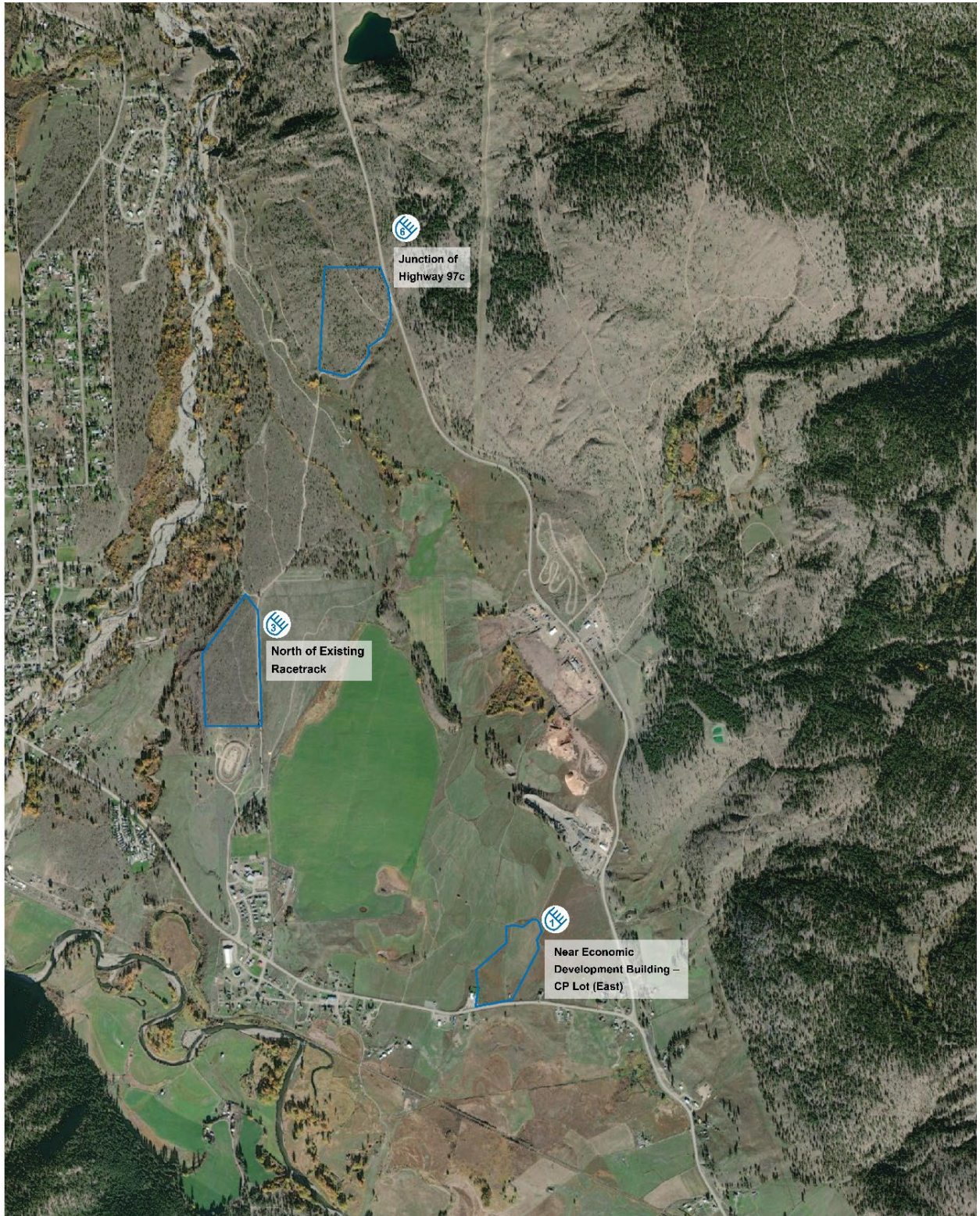
- Land Use and Ownership
- Heritage/Culture (Considerations were identified based on community input. A detailed archaeological study will be undertaken for the final recommended site)
- Transportation and Active Modes
- Flooding
- Environmental
- Hydro-Geological (A coordinated geotechnical and hydro-geological field reconnaissance will be performed for the final recommended site)
- Servicing
- Other Considerations
- Community Input

It is important to note that the technical core areas used to evaluate the advantages and disadvantages of the three (3) sites are not necessarily of equal weight. While all three (3) sites were reviewed within the context of the varying technical core areas, the recommendation is based on a holistic review of the technical core areas.

Section 2 provides an analysis of each of the three sites selected and Section 3 provides a recommendation on which site to advance, based on the desktop review of the sites.

2.0 Identified Sites Review Summary

Three (3) sites, as shown below, were selected to be reviewed in more detail to better understand the advantages and disadvantages of each site for future residential development and to identify one site best suited for residential development at this time.



Site 1 (Lot 91, 58927 CLSR BC, Nicola Mameet IR #1)



Summary of Advantages and Disadvantages

Advantages

- Site is relatively flat and has high development potential.
- Close to community amenities and access off Highway 8.
- An existing watermain appears to bisect a small area of the site (southwest).
- No known risks of flooding from major storm events

Disadvantages

- Designated as Agricultural.
- Community members are generally not supportive of using this site for residential development as it is close to the Highway. It is currently being used for agricultural purposes and members would like it to remain in agricultural operation.
- Would need to coordinate approvals with MOTI. A Transportation Impact Assessment and traffic counts will be required with the review/approval by MOTI which would be time consuming.
- Currently no safe way for members to walk/cycle to nearby community facilities.
- No existing storm sewer infrastructure near site.
- Potentially costly existing wastewater system improvements to accommodate additional and future development.

Land Use

Advantages

- Close to community amenities (e.g., Johnny’s on the Rez, LNIB Economic Development Building, Shulus Hall, Shulus Village).
- Good location for multifamily residential development (i.e., apartments) and affordable housing (**Community Feedback**).
- Site is relatively flat and large which provides opportunity for a sizeable development (approximately 180m wide x 380m deep parcel).

Disadvantages

- Currently under Agricultural Designation and in agricultural operation.
- Community feedback indicated to leave this area as agricultural and not develop.
- Noise/traffic from being close to highway.

Heritage/Culture

Advantages

- *Nothing identified as part of desktop review. Archaeological study to be completed for final site.*

Disadvantages

- *Nothing identified as part of desktop review. Archaeological study to be completed for final site.*

Transportation/Active Modes	
<p>Advantages</p> <ul style="list-style-type: none"> • Highway 8 access is immediately adjacent to the southern property boundary and is likely the only available access point for the subject Lot. • Several key amenities with a short walk/cycle (~1km) of the site if safe infrastructure could be provided off the highway. • Consideration of both sidewalks and multi-use pathways to promote healthy lifestyles by means of walking, running, biking, and scooting. Multi-use pathways may be sufficient given the rural nature of the community and lower volumes and could potentially be incorporated outside of Highway 8 right-of-way. • On-street bike facilities are considered on the long term improvements to Highway 8. 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Ministry of Transportation coordination, cooperation, and approvals will be required. • Transportation Impact Assessment will be required with the review/approval by the Ministry of Transportation which would be time consuming. • Traffic counts on Highway 8 will be required. • Intersection safety to be considered for access to Highway 8 while the geometric modifications should be fulfilled the Ministry's and TAC's requirements, such as left-turn bay and/or acceleration/deceleration lanes. • No observed active modes of transportation (i.e., sidewalks, pathways, dedicated pedestrian corridors, etc.) to/from subject Lot, only existing paved/gravel shoulders and one crosswalk is provided at Mamit Lake Branch Road. Access to amenities on foot or by bicycle would be unsafe in the current condition, increase reliance on the automobile.
Flooding	
<p>Advantages</p> <ul style="list-style-type: none"> • No known flooding issues from storm/flood events. 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Dedicated overland flood route will need to be investigated and established and a stormwater analysis of existing overland drainage routes and culvert capacities would be required. • The Ministry of Transportation does not usually support major overland flood routes from private developments to their highway corridor but could be investigated to confirm their position/appetite. • Need to review and investigate historical flood records and develop hydrologic stormwater model based on available information to understand and identify the flood levels derived from a variety of rainfall events or storms.
Environmental	
<p>Advantages</p> <ul style="list-style-type: none"> • Site 1 is a flat, open field with no visible trees or watercourses. • Close to Highway 8 and subsequent access to Merritt will have reduced greenhouse gas emissions compared to Sites 3 and 6. • No known Areas of Potential Environmental Concern (APEC) for soil or groundwater contamination. 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Critical Habitat for Species at Risk: American Badger (<i>Taxidea taxus jeffersoni</i>) overlaps the entire site. This species is listed as Endangered on Schedule 1 of the federal <i>Species at Risk Act</i> (SARA).

Hydro-Geological	
<p>Advantages</p> <ul style="list-style-type: none"> Soil in the area is mapped in the Canadian Soil Information Service (CanSIS) as being predominantly dry sand overlying glaciofluvial (mostly sand and gravel) material (CANSIS 2023¹). This type of material is conducive to sanitary sewer system disposal. Only one registered water source well exists in the provincial database (GWELLS) in the area, and existing land use suggests other water source wells are unlikely, reducing the risk of contamination of an in-use well (GWELLS 2023²). Stumbles Creek Aquifer is mapped to exist under this site and is noted to have moderate productivity (median well yield of 1.1 L/s) with shallow (12m depth or less) water wells (GWELLS 2023). 	<p>Disadvantages</p> <ul style="list-style-type: none"> Sandy soils quickly infiltrate sanitary sewer system water, further site-specific studies would be required to ensure this water does not contaminate the water table or aquifers below. The Stumbles Creek Aquifer is noted to be highly vulnerable to contamination and is the largest source of recharge to the Nicola River. Any groundwater production from this aquifer will require detailed studies to ensure the source wells are protected from contamination and that the Nicola River is not negatively impacted (Golder 2016³).
Servicing	
<p>Advantages</p> <ul style="list-style-type: none"> Close proximity to two (2) existing 150mm dia. PVC potable watermains present on the south boundary of the site and also on the south boundary of Highway 8. Potential to extend the existing Shulus Springs potable water system following an assessment of existing water system infrastructure, resources, and demand requirements related to existing capacity and availability. Consideration for water system infrastructure capacity to support future development(s). Shulus Village has a community tank and field wastewater system that could be investigated as an option for servicing this site. An on-site sanitary sewer collection and ground disposal system could be considered. Opportunity to utilize the existing Highway 8 roadside ditch and LNIB's existing main irrigation channel to support overland stormwater conveyance. Consideration of stormwater detention pond to mitigate negative effects of major storm events and incorporate sub-surface infiltration to recharge underlying aquifer. 	<p>Disadvantages</p> <ul style="list-style-type: none"> An existing 150mm dia. PVC watermain appears to bisect a small area of the site (southwest). The Ministry of Transportation will need to be involved to support approval(s) for any modification or alteration (i.e., water system tie-in) to the existing watermain within Highway 8 right-of-way. An assessment is required to confirm and verify that both demand and fire flow requirements can be achieved without negative impacts to the existing system. No existing sanitary conveyance infrastructure near the site. An investigation is required to identify an appropriate sanitary sewer alignment from the site to Shulus Village (located ~1,250m west). An investigation is required to determine if on-site sanitary collection and ground disposal can be implemented for the site. Requires analysis of site applicability for use of on-site sanitary sewer disposal area. Potentially costly existing wastewater system improvements to accommodate additional and future development. Developable land will be reduced to allow for and accommodate on-site sanitary sewer disposal area including provision for backup field. No existing storm sewer infrastructure near the site.

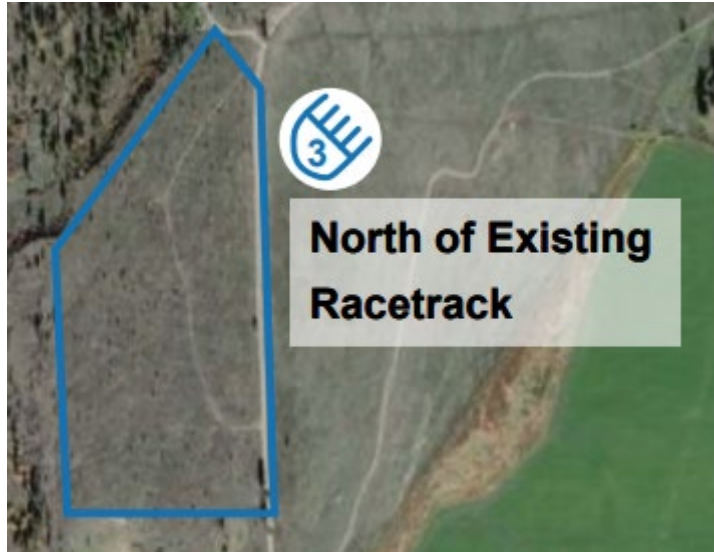
¹ <https://sis.agr.gc.ca/cansis/soils/bc/GDY/~~~~~N/description.html>

² <https://apps.nrs.gov.bc.ca/gwells/>

³ https://a100.gov.bc.ca/pub/acat/documents/r50382/1533225-001-R-Rev1-GroundwaterBudget-07MAR_16_1463159536446_3159151540.pdf

	<ul style="list-style-type: none"> • Requires the development of a stormwater management plan that addresses and accommodates the collection, conveyance, and safe discharge of surface water, south, towards the existing Highway 8 roadside ditch and LNIB's existing main irrigation channel. • Dedicated area will need to be considered for detention ponds, which can be extensive in size depending on the required criteria. • Ministry of Transportation approval will be required for surface water discharge directed towards their highway right-of-way.
Other Considerations	
<p>Advantages</p> <ul style="list-style-type: none"> • Existing 3-phase power (above ground) is observed on the south side of Highway 8 and includes communication/tel on the same pole alignment • On the north side of Highway 8 is an existing communication/tel utility mounted to utility poles 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Environmental implications/permitting effort: <ul style="list-style-type: none"> • The project is on Band lands and will therefore require an Impact Assessment per the federal <i>Impact Assessment Act</i> (IAA) process. • LNIB will require an Environmental Assessment (EA) under LNIB law to obtain project approval. The LNIB EA must meet or exceed IAA or provincial/regulatory frameworks. • Further field assessment will be needed to evaluate the habitat attributes for badger at the site. SARA Section 73 permits are required for engaging in activities affecting listed species and their Critical Habitat.

Site 3 (BC215 CLSR BC, Nicola Mameet IR #1)



Summary of Advantages and Disadvantages

Advantages

- Designated Residential.
- Site is supported by the community for residential development.
- Access point from Mamit Lake Branch Road.
- Several key amenities with a short walk/cycle (~1km) of the site via Mamit Lake Branch Road. School can be accessed from the site without students having to walk on the Highway.
- Less requirement for BC MOTI approvals if site is located sufficiently far from Highway 8.
- An existing sanitary forcemain immediately east of the site.
- A sanitary sewer disposal field northeast of the site.

Disadvantages

- Potential risk of exposure to storm/flood events due to proximity to Guichon Creek (flood protection and or engineered fill solution may be required).
- Previous existing groundwater test samples indicate manganese levels exceed Health Canada aesthetic objective.
- No existing watermain near the site.
- No existing storm sewer near the site.
- Sewer disposal field may need expansion to facilitate development.

Land Use

Advantages

- Site is already designated as residential.
- Near community amenities (Merritt Speedway, LNIB school).
- Site is supported by the community for residential development.
- Development would border intact natural areas and may also encourage potential economic development initiatives such as passive agriculture and tourism.

Disadvantages

- Noise from the Speedway may be intrusive.

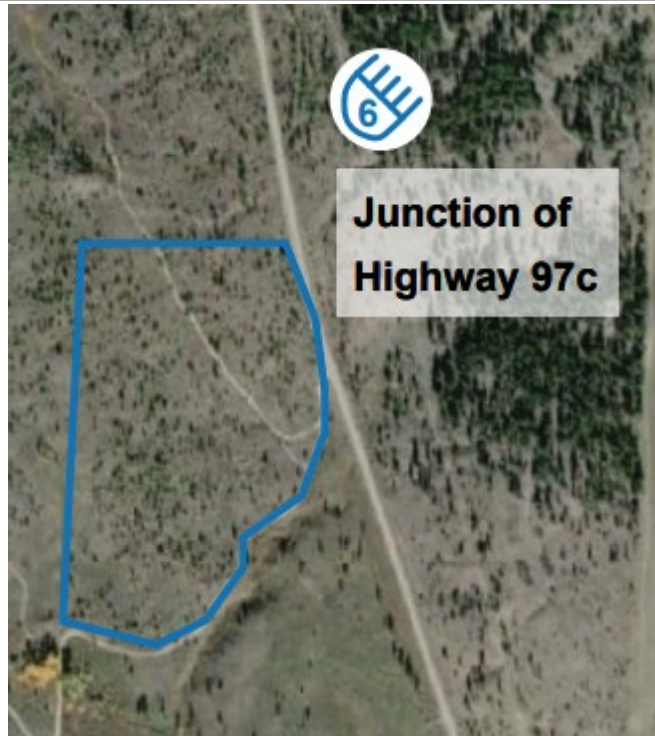
Heritage/Culture	
Advantages	Disadvantages
<ul style="list-style-type: none"> • <i>Nothing identified as part of desktop review. Archaeological study to be completed for final site.</i> 	<ul style="list-style-type: none"> • <i>Nothing identified as part of desktop review. Archaeological study to be completed for final site.</i>
Transportation/Active Modes	
Advantages	Disadvantages
<ul style="list-style-type: none"> • Mamit Lake Branch Road access is immediately adjacent to the eastern property boundary and could serve as the primary access point to the subject Lot. • Several key amenities with a short walk/cycle (~1km) of the site via Mamit Lake Branch Road. • Mamit Lake Branch Road connects to key amenities via a marked crosswalk. This may benefit from upgrades such as flashing beacons. • Consideration of both sidewalks and multi-use pathways to promote healthy lifestyles by means of walking, running, biking, and scooting. Multi-use pathways may be sufficient given the rural nature of the community and lower volumes. • Several prospects exist to promote non-invasive active modes and recreation activities within the surrounding natural area. • Highway is not close to this site (Community Feedback), i.e., less intrusion from traffic noise and emissions. • School can be accessed from site without students having to walk on the Highway. • Less requirement for BC MOTI approvals if site is located sufficiently far from the Highway. 	<ul style="list-style-type: none"> • Limited to one (1) existing road access near the subject Lot. • Traffic counts at the existing road access should be conducted. • Level of service applicable to the existing Mamit Lake Branch Road may require lane widening and surface drainage improvements to accommodate development population as well provision for future community growth. • Vehicle speeding could be hard to monitor/enforce for long straight access road connecting to Highway. • An overall LNIB community trail network plan has not been developed to inform future connectivity to existing active transportation corridors.
Flooding	
Advantages	Disadvantages
<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • The site may be exposed to recurring storm and/or flood events. • Potential flood protection berms may be required to protect the development from major storm and/or flood events. • Potentially extensive engineered fill requirements to create habitable spaces above flood elevation; use of dyke protection infrastructure along westerly limits of the site may be potentially more economical to mitigate flood risk. • Need to review and investigate historical flood records and develop hydrologic stormwater model based on available information to understand and identify the flood levels derived from a variety of rainfall events or storms.
Environmental	

<p>Advantages</p> <ul style="list-style-type: none"> • No mapped Critical Habitat for aquatic Species at Risk is present in the unnamed watercourse at the northwest edge of the site. • Groundwater is not suspected to be contaminated at APEC-7 (i.e., APEC-43 of Report 15 from Lightship). • Except for manganese, (exceeds Health Canada aesthetic objective), all other laboratory test results completed at APEC-6 (i.e., APEC-60 in Lightship) indicate that groundwater concentrations are below the applicable guidelines. • All soil samples at APEC-7, had concentrations of hydrocarbons, volatile substances, and glycols less than the applicable guidelines or standards (Legacy Clean Up Report, 2021). 	<p>Disadvantages</p> <ul style="list-style-type: none"> • An unnamed watercourse is present along the northwestern property boundary and appears to be a tributary to Guichon Creek (Watershed Code 120-246600-29600). No fish data available on provincial databases for this watercourse, but salmonids and coarse fish are present in Guichon Creek. • Critical Habitat for Species at Risk: American Badger (<i>Taxidea taxus jeffersoni</i>) overlaps the entire site. This species is listed as Endangered on Schedule 1 of SARA. • Critical Habitat for Lewis's Woodpecker (<i>Melanerpes lewis</i>) overlaps the northern tip of the site. This species is listed as Threatened on Schedule 1 of SARA. The riparian zone surrounding the unnamed watercourse and trees on the site could be potential nesting sites. • APECs are observed at the northern limits (APEC-7) and beyond the southern limits (APEC-6) of the conceptual property boundary. • Copper, zinc, and lead concentrations in soils at APEC 6 were above regional background level and applicable guidelines. One sample of polycyclic aromatic hydrocarbons (PAH) exceedances above federal guidelines. Indicative of deep (> 1m) anthropogenic contamination at APEC-6 site (Legacy Clean Up Report, 2021). • Elevated vanadium concentrations were found in one deep (> 1 meter below ground surface) soil sample at APEC 6; however, this was considered to be anomalous and not indicative of anthropogenic contamination (Legacy Clean Up Report, 2021). • There is no indication of post-remedial test samples being completed further to the soil remediation work and reporting does not offer an insight as to the degree of contaminant exposure for potential receptors at this APEC.
Hydro-Geological	
<p>Advantages</p> <ul style="list-style-type: none"> • Only one registered water source well exists in GWELLS in the area, and existing land use suggests other water source wells are unlikely, reducing the risk of contamination of an in-use well (GWELLS 2023). • Stumbles Creek Aquifer is mapped to exist under this site and is noted to have moderate productivity (median well yield of 1.1 L/s) with shallow (12 m depth or less) water wells (GWELLS 2023). 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Previous existing groundwater test samples indicate manganese exceeds Health Canada aesthetic objective • Soil in the area is mapped in CanSIS as being siltier than Sites 1 and 6, overlying glaciofluvial (mostly sand and gravel) material (CANSIS 2023). This type of material is conducive to sanitary sewer system disposal, but infiltration would be lower. • Sandy silt soils still infiltrate sanitary sewer system water, further site-specific studies would be required to ensure this water does not contaminate the water table or aquifers below.

	<ul style="list-style-type: none"> • The Stumbles Creek Aquifer is noted to be highly vulnerable to contamination and is the largest source of recharge to the Nicola River. Any groundwater production from this aquifer will require detailed studies to ensure the source wells are protected from contamination and that the Nicola River is not negatively impacted (Golder 2016).
Servicing	
<p>Advantages</p> <ul style="list-style-type: none"> • Potential to interconnect and extend the existing Rocky Pines water system and create a proposed water system loop. • Potential to extend and expand upon the existing Shulus Springs water system to accommodate development of this site, but also consider other future developments that may require servicing. • An existing 150mm dia. PVC sanitary sewer forcemain is located within Mamit Lake Branch Road immediately east of the site. • An existing sanitary disposal field (i.e., absorption beds) is located northeast of the site. • Need to develop a gravity sanitary sewer collection system, internal of the site, to allow for gravity sanitary sewer service connections for future homes, which could then be conveyed to a common confluence point (i.e., low point) that would necessitate the installation of a new sanitary lift station that could be either tied into the existing forcemain on Mamit Lake Branch Road or other means. • Potential to utilize the existing lift station and associated forcemain. • Site 3 is the only site that has an existing adjacent sanitary sewer system for potential connection. The other two Sites (1 and 6) do not have a convenient and immediately local sewer infrastructure without significant off-site improvements. • Consideration of stormwater detention pond to mitigate negative effects from major storm events and incorporate sub-surface infiltration to recharge underlying aquifer. 	<p>Disadvantages</p> <ul style="list-style-type: none"> • No existing watermains near the site. • Lengthy watermain extensions from the existing Shulus Springs water system (approx. 800m south) to service the site. • May require the need for investigation of a new water system comprising of a reservoir, supply line, and distribution watermains, fire hydrants, service connections (for existing and future), etc. depending on the capacity of the existing system. • Requires the confirmation of available capacity in the existing 150mm dia. PVC sanitary forcemain and the existing disposal field (located approx. 185m northeast) to consider connection to the existing system. • Additional land area may be required to supplement and expand the existing sanitary disposal facility. • A new sanitary lift station may be required for this development, which is costly to construct as well as to operate and maintain. • The existing lift station/forcemain may need to be upgraded to tie-in the site. • No existing storm sewer infrastructure near the site. • Requires the development of a stormwater management plan that addresses and accommodates the collection, conveyance, and safe discharge of surface water, west, towards existing Guichon Creek or the existing surrounding irrigation channels. • Dedicated area will need to be considered for detention ponds, which can be extensive in size depending on the required criteria.
Other Considerations	
<p>Advantages</p> <ul style="list-style-type: none"> • Existing 3-phase power (above ground) is observed on the east side of Mamit Lake Branch Road and includes communication/tel on the same pole alignment 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Site may require additional soil/groundwater sampling to determine degree of contamination at this site. • LNIB requires permits for movement of soil in, out, or across lands (EMP, 2021). • Environmental implications/permitting effort:

	<ul style="list-style-type: none"> • The project is on Band lands and will therefore require an Impact Assessment per the federal IAA process. • LNIB will require an Environmental Assessment (EA) under LNIB law to obtain project approval. The LNIB EA must meet or exceed IAA or provincial/regulatory frameworks. • Further field assessment will be needed to evaluate the habitat attributes for American Badger at the site. SARA Section 73 permits are required for engaging in activities affecting listed species and their Critical Habitat. • Further field assessment would be required to evaluate habitat attributes for Lewis's Woodpecker at the site. SARA Section 73 permits will be required for project activities affecting Lewis's Woodpecker. Lewis's Woodpecker is also protected under the federal <i>Migratory Birds Convention Act</i> (MBCA) and Regulations. • Due to lack of available data, further field assessment will be needed to evaluate the potential project impacts to the unnamed watercourse. Due to the site proximity to the watercourse, the project will require a <i>Fisheries Act</i> Request for Project Review at the minimum.
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Site 6 (BC215 CLSR BC, Nicola Mameet IR #1)



Summary of Advantages and Disadvantages

Advantages

- Community feedback indicates support for the site.
- Mamit Lake Branch Road could provide a primary access and Highway 97C a secondary access.

Disadvantages

- Designated Natural Area.
- Would require coordination with MOTI.
- Safety review of intersection access and traffic counts should be undertaken.
- Site is more remote compared to the other two and community facilities are not easily accessible by walking and cycling.
- Potential improvements to the existing roadway crossing at the existing LNIB main irrigation channel that crosses Mamit Lake Branch Road.
- LNIB's main irrigation channel is situated near the southwest boundary of the site providing an option for surface water discharge.
- No immediately available water system near the site. The industrial subdivision's water system is non-potable and would require water treatment infrastructure/improvements.
- No existing sanitary system for potential connection near the site.
- No existing storm sewer infrastructure near the site.

Land Use

Advantages

- No existing easements or rights-of-way occupy the site.

Disadvantages

- Not currently designated for residential uses.
- Not close to existing community amenities.

<ul style="list-style-type: none"> Development of the site for residential uses is supported by the community and it is an accessible location. 	
Heritage/Culture	
<p>Disadvantages</p> <ul style="list-style-type: none"> Nothing identified as part of desktop review. Archaeological study to be completed for final site. 	<p>Disadvantages</p> <ul style="list-style-type: none"> Nothing identified as part of desktop review. Archaeological study to be completed for final site.
Transportation/Active Modes	
<p>Advantages</p> <ul style="list-style-type: none"> Highway 97C and/or Mamit Lake Branch Road access is immediately adjacent to the east and south property boundary, respectively and could serve to provide a primary access (Mamit Lake Branch Road) and secondary access (Highway 97C) for emergency purposes. Investigate and seek the Ministry of Transportation's support to consider subdivision access road from Highway 97C, suggesting that minimal improvements would be required. Consideration of both sidewalks and multi-use pathways to promote healthy lifestyles by means of walking, running, biking, and scooting. Multi-use pathways may be sufficient given the rural nature of the community and lower volumes. Several prospects exist to promote non-invasive active modes and recreation activities within the surrounding natural area. 	<p>Disadvantages</p> <ul style="list-style-type: none"> Potential improvements to the existing roadway crossing the existing LNIB main irrigation channel that crosses Mamit Lake Branch Road. Clear signage (including advance) to show the access to the proposed development. Safety review to access road close by the Highway 97C/Mamit Lake Branch Road should be considered – reasonable sightline and adequate signage. Traffic counts along Highway 97C or at Mamit Lake Branch Road should be undertaken. Intersection safety to be considered for access to Ministry's highway while the geometric modifications should accommodate the Ministry and TAC requirements, such as left-turn bay and/or acceleration/deceleration lanes. Level of service applicable to the existing Mamit Lake Branch Road may require lane widening and surface condition/drainage improvements to accommodate development population as well provision for future community growth. For active modes, this site is far more remote from key amenities along Highway 8 with the site being approximately ~3km away the Shulus Community Arena compared with ~1km for the other two sites.
Flooding	
<p>Advantages</p> <ul style="list-style-type: none"> N/A (need more information on potential risk for flood events). 	<p>Disadvantages</p> <ul style="list-style-type: none"> Need to review and investigate historical flood records and develop hydrologic stormwater model based on available information to understand and identify the flood levels derived from a variety of rainfall events or storms. Maintain existing LNIB main irrigation channel and consider erosion protection measures to reinforce and safeguard. Consider irrigation sluice gate/dam infrastructure upstream to manage irrigation flows.
Environmental	

<p>Advantages</p> <ul style="list-style-type: none"> • No watercourses or fish habitat are present on the site. • No APECs have been identified within this site. 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Site 6 is furthest away from access to services in Merritt, will have larger amounts of greenhouse gas emissions compared to Sites 1 and 3. • Critical Habitat for Species at Risk: American Badger (<i>Taxidea taxus jeffersoni</i>) overlaps the entire site. This species is listed as Endangered on Schedule 1 of SARA. • Critical Habitat for Lewis’s Woodpecker (<i>Melanerpes lewis</i>) overlaps the southwest edge of the site. This species is listed as Threatened on Schedule 1 of SARA. Trees present on the site could be potential nest trees. • A riparian buffer is present immediately west and south of the property lines (TNRD GIS, 2023).
Hydro-Geological	
<p>Advantages</p> <ul style="list-style-type: none"> • Soil in the area is mapped in the Canadian Soil Information Service (CanSIS) as being predominantly sand overlying glaciofluvial (mostly sand and gravel) material (CANSIS 2023). This type of material is conducive to sanitary sewer system disposal. • There are no registered water source wells in the provincial database (GWELLS) in the area, and existing land use suggests other water source wells are unlikely, reducing the risk of contamination of an in-use well (GWELLS 2023). 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Sandy soils quickly infiltrate sanitary sewer system water, further site-specific studies would be required to ensure this water does not contaminate the water table or aquifers below. • There is no information available on mapped aquifers in the area, so groundwater sourcing studies would require additional effort to map and identify potential aquifers in the area.
Servicing	
<p>Advantages</p> <ul style="list-style-type: none"> • Opportunity to extend the existing industrial subdivision water system by approx. 1,200m. Transitioning and extending existing non-potable watermain is less costly and time consuming compared to installing new watermain. • Potential to extend a water supply main via Highway 97C boulevard in accordance with the MOTI Utility Policy Manual. • Potential to only provide water system treatment applicable to an extension of the existing industrial subdivision’s water system. • Potential for gravity sanitary sewer extension from the site to the existing absorption bed (i.e., same as Site 3) located approx. 1,000m south on Mamit Lake Branch Road and east. • An on-site sanitary sewer collection and ground disposal system could be considered. • LNIB’s main irrigation channel is situated in close proximity to the southwest boundary of the site affording an option for surface water discharge. 	<p>Disadvantages</p> <ul style="list-style-type: none"> • No immediately available potable water system near the site. • The industrial subdivision’s water system (approx. 1,200m) is non-potable and therefore would require water treatment infrastructure. • Potentially requires an analysis of treatment infrastructure requirements. • Implementation of a new water treatment system is costly to construct as well as to operate and maintain. • Requires confirmation that the existing water system can support the development and/or increase in population/use. • No existing sanitary system for potential connection near the site. • Requires analysis of site applicability for use of on-site sanitary sewer disposal area. • Developable land will be reduced to allow for and accommodate on-site sanitary sewer disposal area including provision for backup field.

<ul style="list-style-type: none"> • Consideration of stormwater detention pond to mitigate negative effects of major storm events and incorporate sub-surface infiltration to recharge underlying aquifer. 	<ul style="list-style-type: none"> • Requires the confirmation of capacity in the existing absorption field and verification that the disposal field can be expanded to accommodate additional development as needed. Absorption field is located approximately 1,300m from site. • No existing storm sewer infrastructure near the site. • Requires the development of a stormwater management plan that addresses and accommodates the collection, conveyance, and safe discharge of surface water, southwest, towards existing LNIB's main irrigation ditch. • Dedicated area will need to be considered for detention ponds, which can be extensive in size depending on the required criteria. • Feasibility of servicing may be challenging (Community Feedback).
Other Considerations	
<p>Advantages</p> <ul style="list-style-type: none"> • <i>Nothing identified at this time.</i> 	<p>Disadvantages</p> <ul style="list-style-type: none"> • No existing power or communications is observed on along Highway 97C. • Environmental implications/permitting effort: <ul style="list-style-type: none"> • The project is on federal lands and will therefore require an Impact Assessment per the federal IAA process. • LNIB will require an Environmental Assessment (EA) under LNIB law to obtain project approval. The LNIB EA must meet or exceed IAA or provincial/regulatory frameworks. • Further field assessment will be needed to evaluate the habitat attributes for badger at the site. SARA Section 73 permits are required for engaging in activities affecting listed species and their Critical Habitat. • Further field assessment would be required to evaluate habitat attributes for Lewis's Woodpecker at the site. SARA Section 73 permits will be required for project activities affecting Lewis's Woodpecker. Lewis's Woodpecker is also protected under the federal <i>Migratory Birds Convention Act</i> (MBCA) and Regulations.

3.0 Preliminary Sites Recommendations

Site 3 is recommended for further study and investigation based on the detailed review of existing site conditions, available data, current understanding of available infrastructure and servicing, conversations with and feedback from the LNIB community, and LNIB priorities. This recommendation is not based on a detailed on-site investigation nor utility record documentation, and therefore field studies (i.e., geotechnical and hydrogeological) will be performed to further assess the selected site.

The following table provides an overview of the high-level findings of the technical review organized by the core areas. In reviewing the core areas, the magnitude of order costs, effort, external agency involvement, and time required were considered in a general sense.

Colour coding is used below to identify which sites would have an advantage in comparison to the other sites. While some sites may have an advantage in certain areas, it does not exclude the potential costs and efforts required to support future development. Additionally, the core areas need to be considered as a whole picture for each site. Green is used to identify where a site has an advantage compared to the other sites. Yellow indicates that the finding would be required for multiple sites, and/or is not considered to be a significant disadvantage at this time compared to other sites. Red shows where a site has a disadvantage compared to other sites.

Core Area	Site 1	Site 3	Site 6
Ownership Type	Certificate of Possession – would require LNIB to purchase land increasing length of time for development and costs associated with land purchase.	LNIB lands.	LNIB lands.
Community Feedback	Not Supportive	Supportive	Supportive
Heritage/Culture	Nothing site-specific identified at this time.	Nothing site-specific identified at this time.	Nothing site-specific identified at this time.
Transportation	Good access off Highway 8. Requires coordination and approvals with MOTI.	Good access off Mamit Lake Branch Road. MOTI coordination and approvals likely not required.	Good access off Mamit Lake Branch Road and Highway 97C. Requires coordination and approvals with MOTI.
Active Modes	~1km walking/cycling distance from community facilities, but no current safe connection available separated from Highway 8.	~1km walking/cycling distance from community facilities (e.g., school) that can be accessed without needing to walk/cycle on the Highway.	Far from community facilities. Not easily accessible by walking/cycling.
Flooding	No immediate flood risk identified, but historic flood records would need to be reviewed and models developed to better understand risk from rainfall events or storms.	Potential risk of exposure to storm/flood events due to proximity to Guichon Creek (flood protection and or engineered fill solution may be required).	Maintain existing LNIB main irrigation channel and consider erosion protection measures to reinforce and safeguard.

Core Area	Site 1	Site 3	Site 6
Environmental	<p>Critical Habitat for Species at Risk identified for one species (American Badger) and further field assessment required.</p> <p>No known Areas of Potential Environmental Concern (APEC) for soil or groundwater contamination.</p>	<p>Critical Habitat for Species at Risk identified for two species (American Badger, Lewis's Woodpecker) and further field assessment required.</p> <p>Areas of Potential Environmental Concern (APEC) are observed at northern limits and beyond southern limits of site boundary. Site may require additional soil/groundwater sampling to determine degree of contamination at this site.</p> <p>Further field assessment required to evaluate potential impacts to Guichon Creek tributary.</p>	<p>Critical Habitat for Species at Risk identified for two species (American Badger, Lewis's 'Woodpecker) and further field assessment required.</p> <p>An existing riparian buffer is identified immediately west and south of site boundary.</p>
Hydro-Geological	<p>Mostly dry sand soil which is conducive to sanitary sewer systems disposal.</p> <p>Stumbles Creek Aquifer is mapped to exist under this site and is noted to have moderate productivity.</p>	<p>Site is siltier than 1 and 6. Soil is conducive to sanitary sewer system disposal, but infiltration would be lower.</p> <p>Stumbles Creek Aquifer is mapped to exist under this site and is noted to have moderate productivity.</p>	<p>Mostly sand soil which is conducive to sanitary sewer systems disposal.</p> <p>There is no information available on mapped aquifers in the area, so groundwater sourcing studies would be needed to map and identify potential aquifers in the area.</p>
Water Servicing	<p>Existing watermains in close proximity to the south limits of site.</p> <p>Capacity of existing water system is unknown.</p>	<p>No existing watermain near the site. Potential for watermain extension from the existing Shulus Springs water system (approx. 800m south) to service the site. Capacity of existing system is unknown.</p>	<p>No immediately available water system near the site. The industrial subdivision's water system is non-potable and would require water treatment infrastructure/improvements and extension to site (~1,200m).</p>
Wastewater Servicing	<p>Need to investigate an appropriate sanitary sewer alignment from the site to Shulus Village (located ~1,250m west). Potential costly upgrades to existing system needed to meet capacity. On-site system could also be considered.</p>	<p>An existing sanitary forcemain located immediately east of the site. Sanitary sewer disposal field exists northeast of the site; however, this may need expansion to accommodate development as well as a new lift station or upgrades to the existing lift station.</p>	<p>No existing sanitary system for potential connection near the site. Existing absorption field location ~1,300m from site and expansion may be needed to accommodate development. On-site system could also be considered.</p>
Stormwater Management	<p>No existing storm sewer near site.</p> <p>Consideration of stormwater detention pond and incorporate sub-surface infiltration.</p>	<p>No existing storm sewer near site.</p> <p>Consideration of stormwater detention pond and incorporate sub-surface infiltration.</p>	<p>No existing storm sewer near site.</p> <p>Consideration of stormwater detention pond and incorporate sub-surface infiltration.</p>

Core Area	Site 1	Site 3	Site 6
Other Considerations	Further assessment needed to evaluate habitat attributes for American Badger. Existing overhead power and telecommunication utilities adjacent to site along Highway 8.	Further assessments needed to evaluate habitat attributes for American Badger; Lewis's Woodpecker; and project impacts to unnamed water course. Existing overhead power and telecommunication utilities adjacent to site along Highway 97C.	Further assessments needed to evaluate habitat attributes for American Badger and Lewis's Woodpecker. No existing power or telecommunication utilities in proximity to site.