

16 INFRASTRUCTURE AND SERVICES

16.1 Introduction

Infrastructure and Services was selected as a valued component (VC) because of potential project-related changes in demand for such services. The quality and capacity of infrastructure and services contribute to the overall standard of living and quality of life in a community. Changes in demographics can affect the availability and quality of infrastructure and services through changes in demand. This assessment considers the effects of the Project on housing, accommodation, transportation, waste management, water and sewer services, emergency services, education, and other municipal infrastructure and services (including communications).

Economic and demographic considerations (Section 14) were used in the assessment of increased demand on infrastructure and services in conjunction with baseline conditions highlighted in Section 16.3. Community health and well-being (Section 18) are also affected by population and demographic changes and related demand on services. Concerns of Aboriginal related to access to traditional use areas and effects on reserve infrastructure and services are discussed in Section 27.

16.2 Scope of Assessment

16.2.1 Regulatory and Policy Setting

Skeena-Queen Charlotte Regional District (SQCRD) does not currently have a regional growth strategy; however District Council recognizes the need for localized development plans created through increased regional leadership and advocacy among municipalities and First Nations. District Council has identified a regional need for integrated emergency planning and preparedness, improved recycling programs, and improved water quality. These requirements guide regional investment, development, and future growth plans in the SQCRD. Funding to improve these services is limited; however, the need to improve most of these services is considered important if not urgent (SQCRD 2013).

The *Port Edward Official Community Plan 2013 (OCP)* (District of Port Edward 2013) guides investment and development to protect social, environmental, and economic values in Port Edward. The Project is consistent with Port Edward's OCP.

Prince Rupert's *Quality of Life Official Community Plan (QLOCP)* (City of Prince Rupert [COPR] 2008a) guides investment and development in the municipality to protect social, environmental, and economic values. Prince Rupert's *2012 Strategic Plan (COPR 2012)* focuses on improving municipal infrastructure and attracting development. The Project is consistent with Prince Rupert's QLOCP and *2012 Strategic Plan*. A 2011 report to Prince Rupert City Council from the General Manager of Engineering and Public Works also supported the need for investment in new and current infrastructure (COPR 2012).

Recommendations presented to Town Council call for increased taxation and local development to increase municipal revenue for investment in infrastructure maintenance and renewal. Surveys conducted by the Port Edward and Prince Rupert Economic Development Corporation and by the Community Futures Development Corporation of the Pacific Northwest identified the need for investment and support of local business to improve regional economies. The Port Edward and Prince Rupert Economic Development Corporation work to attract and retain investment in the region.

The *Port of Prince Rupert 2020 Land Use Management Plan* (Prince Rupert Port Authority [PRPA] 2013) guides investment and development of lands under the jurisdiction of the Prince Rupert Port Authority.

16.2.2 Influence of Consultation on the Assessment

Consultation with service providers, community planners, and officials in Port Edward and Prince Rupert identified the following concerns:

- Congestion along Highway 16 and Skeena Drive (Highway 599R)
- Limited passing opportunities along Highway 16 and Skeena Drive (Highway 599R), which could increase motor vehicle collisions when impatient motorists attempt to pass slower-moving vehicles
- Skeena Drive (Highway 599R) is engineered for non-industrial road use; roadway infrastructure is inadequate for use by large vehicles and the continuous transportation of large or heavy loads
- Increased drug trafficking and organized crime related to housing workers in construction camps
- The need for an integrated emergency response plan or partnership between Prince Rupert Port Authority, Prince Rupert Fire Rescue, Port Edward Fire Department, the RCMP and PNW LNG
- Inadequate firefighter training with respect to chemical and industry-specific fires
- Cautioned use and comparison of 2006 Census (Statistics Canada 2013) and National Household Survey (Statistics Canada 2013) data for baseline and effects assessments; census data do not represent current conditions, and data collection methods and outcomes of the National Household Survey differ from previously conducted surveys
- Concerns and recommendations raised during consultations informed baseline and effects assessments, and outcomes of consultations influenced proposed mitigation.

16.2.3 Selection of Potential Effects

Results of baseline research and consultations were used to divide infrastructure and services into three categories (housing, transportation and community services) which reflect areas of concern related to potential effects on quality, access, and use of infrastructure and services. Health infrastructure and services are discussed in Section 18 (Community Health and Well-Being). Specific infrastructure and services identified in each category are noted below:

- Transportation: air, rail, and road corridors
- Housing: occupancy rates, values, dwelling type, condition, age, and municipal capacity to increase residentially zoned areas
- Community Services: waste management, water and sewer services, emergency services (police and fire), education, communications and recreation.

Selected potential effects on infrastructure and services associated with project-related activities and changes in demographics include:

- Change in traffic and pressure on transportation infrastructure
- Change in housing availability and affordability
- Change in capacity of infrastructure and community services.

16.2.4 Selection of Measurable Parameters

Table 16-1 lists the measurable parameters used to assess each potential effect and the rationale for selection of the parameters.

Table 16-1: Measurable Parameters for Infrastructure and Services

Effect	Measurable Parameter(s) and Units of Measurement	Notes or Rationale for Selection of the Measurable Parameter
Change in traffic and pressure on transportation infrastructure	<ul style="list-style-type: none"> ▪ Daily traffic volume (vehicles/day) ▪ Air traffic ▪ Traffic incidents in Port Edward and Prince Rupert 	<ul style="list-style-type: none"> ▪ Potential for in-migration of permanent and visiting temporary workers leading to increased demand for municipal infrastructure and services ▪ Increased demand for local and regional infrastructure and services as a result of project-related activities
Change in housing availability and affordability	<ul style="list-style-type: none"> ▪ Housing supply and demand (units) ▪ Housing cost 	
Effects on infrastructure and community services	<ul style="list-style-type: none"> ▪ Number of workers and their dependents for each phase ▪ Change in demographic composition ▪ Demand and supply of infrastructure and community services (e.g., education, social services) ▪ Parameters based on infrastructure and services affected (e.g., police officers/1,000 people) 	

16.2.5 Boundaries

16.2.5.1 Temporal Boundaries

Based on the current project schedule, the temporal boundaries for each project phase are:

- **Construction:** Q1 2015 – Q4 2018
- **Operations:** Q1 2019 – 2048+
- **Decommissioning:** 2048+

16.2.5.2 Spatial Boundaries

The local assessment area (LAA) includes the District of Port Edward and the City of Prince Rupert and Highway 16 up to and including the Northwest Regional Airport Terrace-Kitimat (YXT).

The regional assessment area (RAA) includes the mainland portion of the SQCRD and Highway 16 up to and including the Northwest Regional Airport Terrace-Kitimat (YXT).

Figure 16-1 illustrates the spatial boundaries for this VC.

16.2.5.3 Administrative and Technical Boundaries

Administrative boundaries for the assessment of Infrastructure and Services are those used in land use plans that apply to the RAA. These include the Central and North Coast EBM implementation plans (BC Ministry of Agriculture and Lands [BC MAL] 2013); *Port Edward's Official Community Plan 2013* (District

of Port Edward 2013); Prince Rupert’s *Quality of Life Official Community Plan* (COPR 2008b); and the *Port of Prince Rupert 2020 Land Use Management Plan* (PRPA 2013).

This assessment uses information available from federal, provincial, and municipal government databases and information provided by industries and communities through interviews with representatives. Limited qualitative information was used to validate publically available information through interviews with community representatives and related stakeholders. In addition, traffic count data from the Ministry of Transportation and Infrastructure (MOTI) regarding Highway 16 is limited to 2001 (BC MOTI 2013).

16.2.6 Residual Effects Description Criteria

The criteria used to describe residual effects are listed in Table 16-2.

Table 16-2: Characterization of Residual Effects for Infrastructure and Services

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Characterization of Residual Effects		
Context	Refers primarily to the current and future sensitivity and resilience of the VC to change caused by the Project. Consideration of context draws heavily on the description of existing conditions of the VC, which reflect cumulative effects of other projects and activities that have been carried out, and especially information about the impact of natural and human-caused trends in the condition of the VC.	<p>Low resilience: infrastructure and services are unable to accommodate changes.</p> <p>Moderate resilience: infrastructure and services are able to accommodate changes with minor impacts to viability.</p> <p>High resilience: infrastructure and services are well developed and able to accommodate changes.</p>
Magnitude	Refers to the expected size or severity of the residual effect. When evaluating magnitude of residual effects, consider the proportion of the VC affected within the spatial boundaries and the relative effect.	<p>Negligible: no measurable change from baseline conditions</p> <p>Low: a measurable change but effect cannot be distinguished from baseline conditions</p> <p>Moderate: a measurable change in use of, or access to, infrastructure and services, but which will not affect viability or displace public use in ways that cannot be accommodated elsewhere in the RAA</p> <p>High: measurable change in the use of, or access to, infrastructure and services that will affect viability or will displace public use in ways that cannot be accommodated elsewhere in the RAA</p>
Extent	Refers to the spatial scale over which the residual effect is expected to occur.	<p>PDA: effects restricted to the PDA</p> <p>LAA: effects extend into the LAA</p> <p>RAA: effects extend into the RAA</p>

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	Refers to the length of time the residual effect persists—which may be longer than the duration of the physical work or activity that gave rise to the residual effect.	<p>Short term: effect restricted to the duration of the construction period or less.</p> <p>Medium term: effect extends past the construction period but less than the life of the Project.</p> <p>Long term: effect extends through the life of the Project.</p> <p>Permanent: effect is permanently measurable.</p>
Reversibility	Pertains to whether or not the residual effect on the VC can be reversed once the physical work or activity causing the disturbance ceases.	<p>Reversible: effects will cease after project closure and reclamation.</p> <p>Irreversible: effects will persist after the life of the Project.</p>
Frequency	Refers to how often the residual effect occurs and is usually closely related to the frequency of the physical work or activity causing the residual effect.	<p>Single event: effect occurs once.</p> <p>Multiple irregular event: effect reoccurs with no set schedule.</p> <p>Multiple regular event: effect reoccurs on a set schedule.</p> <p>Continuous: effect occurs continuously.</p>
Likelihood of Residual Effects		
Likelihood	Refers to whether or not a residual effect is likely to occur.	<p>Low: well understood and there is a low likelihood of effects on infrastructure and services, as predicted.</p> <p>Medium: well understood and there is a moderate likelihood of effects on infrastructure and services, as predicted.</p> <p>High: well understood and there is a high likelihood of effects on infrastructure and services, as predicted.</p>

16.2.7 Significance Thresholds for Residual Effects

A significant adverse residual effect on Infrastructure and Services is one that results in demands on infrastructure or services above and beyond capacity, such that standards of service are routinely and persistently reduced below current levels for an extended period of time.

16.3 Baseline Conditions

16.3.1 Baseline Methods and Data Sources

The description of baseline conditions is based on information contained in publically available literature such as: environmental assessment reports and peer-reviewed literature; consultations with concerned stakeholders; and information obtained from Statistics Canada (Statistics Canada 2009). Information obtained from Statistics Canada for Port Edward and Prince Rupert is limited to 2006 census information with estimates to 2012 (Statistics Canada 2009). Section 16.3.2 provides an overview of baseline conditions and lists common themes and concerns raised during consultation.

16.3.2 Overview of Baseline Conditions

Existing infrastructure and services in the RAA meet or exceed current levels of demand. Recent infrastructure improvements to Highway 16 between Prince Rupert and Terrace have increased capacity to meet current levels of demand. Additional scheduled improvements to Highway 16 are anticipated to increase capacity. Roadway infrastructure in Port Edward and Prince Rupert has the capacity to meet current levels of demand, but increased traffic could increase maintenance requirements.

Current Capacity – Traffic and Transportation Infrastructure

Based on average annual daily traffic (AADT) and seasonal average daily traffic (SADT), municipal road traffic has increased in Prince Rupert and has decreased in Port Edward since 2003. Traffic on Skeena Drive (Highway 599R) has decreased since 1994. Traffic west of Terrace on Highway 16 has decreased since 1994, but has increased in and near Terrace. Recent upgrades to Highway 16 and Skeena Drive (Highway 599R) have improved road surface quality.

Capacity of municipal roads in Port Edward and Prince Rupert meet current levels of demand and are capable of accommodating increased levels of non-industrial traffic (COPR 2007; District of Port Edward 2010). Increased industrial traffic on municipal roads in Prince Rupert (40% of which are at least 30 years old and require asphalt resurfacing) could lead to road surface and base failures (COPR 2007).

Skeena Drive (Highway 599R) is a two-lane rural highway that traverses rolling land, has limited lines of sight and is classified as a rural arterial undivided road (RAU). The highway has been identified through consultation with city planners and emergency responders as potentially inappropriate for use by oversize trucks as sufficient lines of sight and passing lanes do not exist; there exists the risk that passing vehicles could be involved in a motor vehicle collision. Drawing on AADT for Skeena Drive (Highway 599R) traffic has declined from 3,305 in 1995 to 1,498 in 2012. Consequently, additional commuter traffic from Port Edward and Prince Rupert should not negatively affect traffic patterns or quality of this highway. Based on the analysis of existing and forecasted worse-case-scenario traffic and resulting expected levels of service (LOS) conducted by PNW LNG, increased commuter and industrial traffic on Skeena Drive (Highway 599R) is not expected to negatively affect levels of service (LOS was estimated to be between an A-B rating; the lowest acceptable LOS for rural areas is C and urban D). To maintain sufficient LOS and lines of sight at the proposed intersection of the proposed Lelu Island Access Road and Skeena Drive (Highway 599R) minor upgrades to existing grades will be required (as required by road construction standards concerning line of sight). Skeena Drive (Highway 599R) has capacity to meet current and increased levels of non-industrial demand.

Highway 16 is classified as a primary highway that is both urban and rural, has expressway sections but is mostly arterial, is mostly three lanes wide (has sections of at least four lanes), and traverses level, rolling, and mountainous terrain (Government of British Columbia 2012). Primary highways are designed to carry substantial heavy truck volumes over long distances, provide high travel speeds, and have minimal interference of through traffic (Government of British Columbia 2010). Because of its design, recent and planned upgrades, and recent decreased levels of recorded traffic, Highway 16 has the capacity to meet current and increased demand.

Excess capacity exists at the Prince Rupert Airport (YPR) to meet increased aircraft and passenger demand. The Northwest Regional Airport Terrace-Kitimat (YXT) has limited capacity to meet additional aircraft and passenger demand. Both airports have undergone recent infrastructure improvements to terminal buildings and runways. Ferry service supporting YPR from Digby Island to Kaien Island has the

ability to accommodate additional demand, however waiting times to board the ferry will increase. Development of a fixed link is outlined in Prince Rupert's Official Community Plan (CORP 2010) to replace the ferry service between Digby and Kaien Islands.

Current Capacity – Housing

Little capacity currently exists to accommodate increased demand for rental housing, hotels, and motels in the LAA. Baseline conditions indicate that rental housing is limited in Port Edward and Prince Rupert, with only 0.5% of the total market not occupied. Similarly, consultation has identified that hotels and motels have virtually no vacancy because of the construction of several projects in the LAA and increased tourism. Baseline conditions indicate that the number of existing owner-occupied private dwellings in both Port Edward and Prince Rupert has decreased since 2006 with sufficient capacity to meet increased demand through the construction of houses on preexisting undeveloped residentially zoned land.

Current Capacity – Infrastructure and Community Services

The capacity of community services in Port Edward and Prince Rupert is sufficient to accommodate increased demand. Sewer and wastewater treatment systems in Prince Rupert require investment in maintenance and infrastructure but are capable of meeting increased demand. Water and sewer systems in Port Edward were constructed with a greater capacity than is currently required and can accommodate increased use. PNW LNG will work with the District of Port Edward to expand this infrastructure and to mitigate projected future demand resulting from the Project. Baseline conditions indicate that recreational infrastructure and services and community social services have sufficient capacity to meet increased demand.

In Prince Rupert, educational programs in business, trades, and continuing education, and those for university credit are offered through North West Community College (NWCC). These programs are in high demand, with a 20% increase in full-time student enrollment over the past five years. NWCC is expected to be resilient to fluctuations in demand and is not expected to be negatively affected by changes in population and demand related to potential project effects. Primary schools in the RAA having undergone a 15% decrease in full-time enrollment from 2009 to 2013, and consequently have a nationally competitive educator to student ratio of 1 to 8 (BC MOED 2013d). The capacity of secondary schools in the LAA is considered responsive to market demand. Services will adjust relative to changes in demand. Increases in population and demand are not expected to negatively affect educational services as excess capacity currently exists with respect to these services.

Table 16-3 provides a descriptive summary of baseline conditions.

Table 16-3: Summary of Baseline Conditions

Current Capacity		
Housing		
	Prince Rupert	Port Edward
	<ul style="list-style-type: none"> ▪ Residentially zoned land available for development; average house price \$246,462 ▪ Rental unit vacancy: 0.5% ▪ Hotel and motel vacancy: limited 	<ul style="list-style-type: none"> ▪ Residentially zoned land available for development (60 ha): average house price \$110,877 ▪ Rental unit vacancy: limited ▪ Hotel and motel vacancy: limited
Transportation		
Ports	Prince Rupert	Port Edward
	<ul style="list-style-type: none"> ▪ Increased large marine vessel traffic from 2009 to 2011 from 311 to 406 vessels ▪ Total of 780 commercial and recreational fishing vessels based out of the Port of Prince Rupert ▪ Average cruise ship traffic exceeds 49 vessels a year ▪ Undergoing improvements to increase capacity per the <i>Port of Prince Rupert 2020 Land Management Plan</i> 	<ul style="list-style-type: none"> ▪ Small craft harbour on Bayview Drive ▪ Port Edward Harbour Authority works collaboratively with PRPA to manage and attract commercial marine traffic
Air	Prince Rupert	Port Edward
	<ul style="list-style-type: none"> ▪ Prince Rupert Airport (located on Digby Island) <ul style="list-style-type: none"> • Shuttle and ferry service offered to and from Kaien Island to Digby Island. City of Prince Rupert is actively considering the development of a fixed link from Kaien Island to Digby Island • Aircraft movements decreased 31.2% from 2008 to 2012. Down 51.2% from 1997 • Passenger traffic increased 2% from 2011 to 2012. Down 7.6% from 1997 • Major renovation plans to runway and terminal building infrastructure announced in 2011 • Capacity exists to accommodate additional passenger traffic ▪ Seal Cove Seaplane Base (located on the northeastern tip of Kaien Island) 	<ul style="list-style-type: none"> ▪ No airport/served by Prince Rupert
	Terrace	
	<ul style="list-style-type: none"> ▪ Northwest Regional Airport Terrace-Kitimat <ul style="list-style-type: none"> • Located 10 km south of the City of Terrace • Passenger traffic in 2012 totaled 139,193; up 41.5% from 2005 • New commercial passenger service from Vancouver to be offered in November 2013 by WestJet • Infrastructure upgrades completed in 2005 and 2007 • Limited capacity exists to accommodate increased passenger traffic and aircraft movements 	

Current Capacity		
Rail ¹	Prince Rupert	Port Edward
	<ul style="list-style-type: none"> ▪ Rail connection to Port of Prince Rupert (currently undergoing upgrades) ▪ Capacity to handle increased cargo traffic ▪ Passenger service offered by VIA (The Skeena Line). Connections offered in Jasper (The Canadian Line) to Eastern Canada 	<ul style="list-style-type: none"> ▪ CN right-of-way bisects the town site and waterfront. District council in discussion with CN to reduce impacts on quality of life as a result of increased industrial demand.
Road	<ul style="list-style-type: none"> ▪ Connected east to Terrace and Prince George via Highway 16 – Yellowhead Highway <ul style="list-style-type: none"> • Maintained by the BC Ministry of Transportation • Annual daily traffic east of Port Edward and Prince Rupert increased from 2004 to 2012. Traffic is highly seasonal: twice as much traffic in the summer compared to winter. Weekend traffic is generally greater than weekday traffic. • Receives regular maintenance with major improvements announced in 2013 • Skeena Drive (Highway 599R) generally running north-south connects Port Edward and Prince Rupert ▪ Maintained by the BC Ministry of Transportation <ul style="list-style-type: none"> • Annual daily traffic has decreased from 1994 to 2012. ▪ Consultation has identified that road width may not be suitable for regular truck traffic ▪ 148 vehicle collisions (54 injuries and 2 fatalities) in the LAA in 2007 	
Infrastructure and Community Services		
Waste Management	<ul style="list-style-type: none"> ▪ Prince Rupert Landfill is the only solid waste disposal facility in the LAA. ▪ Recycling is coordinated through the Mainland Solid Waste Advisory Committee. 	
Water and Sewer	Prince Rupert	Port Edward
	<ul style="list-style-type: none"> ▪ Infrastructure requires investment in maintenance and upgrades. Capacity meets current demand. ▪ Water is supplied from Woodworth Lake (primary source; gravity feed) and Shawatlans Lake (backup source; pumped). The dam at Woodworth Lake is 92 years old with supporting distribution pipes 80 years old. Current capacity is 5.3 million gallons/day (mgd) with peak demand of 1.32 mgd. ▪ Investment in sewer infrastructure is required. 	<ul style="list-style-type: none"> ▪ Infrastructure was developed to accommodate a larger population than currently exists. Excess capacity exists. ▪ Water is supplied from Alwyn Lake. In 2004 a new water treatment facility was constructed. Aging distribution infrastructure is currently being replaced. Current capacity is 2,400 m³/day with peak demand of 1,470 m³/day. ▪ Sewer lines were updated in the 1970. In 1997 a second sewage treatment facility was constructed. Current facilities can serve 1,500 people.
Power	<ul style="list-style-type: none"> ▪ Power supplied by BC Hydro via a 287 KV hydroelectric transmission line to a substation east of Port Edward ▪ Separate lines from the substation service the townships of Port Edward and Prince Rupert, Watson Island and Ridley Island. Excess capacity currently exists. 	

¹ Project effects on rail infrastructure and services have not been conducted as these services are not anticipated to have an interaction with the Project.

Current Capacity					
Communications	<ul style="list-style-type: none"> ▪ Pay-per-use telephone, cellular, satellite, cable and internet services are available throughout the LAA; cellular coverage is limited in interior forested/mountainous areas of the RAA ▪ Local radio stations provide service to the RAA; CBC Radio One is available throughout the RAA. ▪ 92% of British Columbians have access to high speed internet; the 8% without access are primarily located in rural areas. 				
Police	<ul style="list-style-type: none"> ▪ Serviced by the RCMP with a detachment in Prince Rupert consisting of 42 members divided between a municipal and provincial force ▪ In 2011 the municipal force had an officer to resident ratio of 1:359 with a crime rate of 276 per 1,000 residents. In 2011 the municipal force had an officer case load of 99. ▪ In 2011 the provincial force had an officer to resident ratio of 1:328 with a crime rate of 165 per 1,000 residents. In 2011 the provincial force had an officer case load of 54. 				
Fire	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: left; background-color: #f2f2f2;">Prince Rupert</th> <th style="width: 50%; text-align: left; background-color: #f2f2f2;">Port Edward</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ▪ Prince Rupert Fire Rescue (PRFR) consists of 2 chief officers, 18 career firefighters and 4 career and 4 casual emergency response personal. ▪ Attends to over 1,100 service calls and 1,000 safety inspections per year ▪ Trained in: hazmat, auto-extrication, angle and confined space rescue, and provide ambulance assistance ▪ Fire hall is currently being considered for replacement under Prince Rupert's 2012 <i>Strategic Plan</i>. Current capacity affects response time. </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ▪ The Port Edward Fire Department fluctuates between 5 and 13 volunteer firefighters ▪ Equipment includes one fire truck and 1 rescue van ▪ Mutual aid agreement in place with PRFR </td> </tr> </tbody> </table>	Prince Rupert	Port Edward	<ul style="list-style-type: none"> ▪ Prince Rupert Fire Rescue (PRFR) consists of 2 chief officers, 18 career firefighters and 4 career and 4 casual emergency response personal. ▪ Attends to over 1,100 service calls and 1,000 safety inspections per year ▪ Trained in: hazmat, auto-extrication, angle and confined space rescue, and provide ambulance assistance ▪ Fire hall is currently being considered for replacement under Prince Rupert's 2012 <i>Strategic Plan</i>. Current capacity affects response time. 	<ul style="list-style-type: none"> ▪ The Port Edward Fire Department fluctuates between 5 and 13 volunteer firefighters ▪ Equipment includes one fire truck and 1 rescue van ▪ Mutual aid agreement in place with PRFR
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Education	<ul style="list-style-type: none"> ▪ Eight public schools (District 52) ▪ In 2012 there were 2,125 full –time students and 166 full-time educators ▪ One school in Port Edward (opened January 2013) ▪ One independent primary school in the LAA with 227 students ▪ North West Community Collage operates a campus in Prince Rupert 				
Recreation	<ul style="list-style-type: none"> ▪ Recreational facilities and general infrastructure are in good condition with capacity to meet current demand. ▪ There are two Provincial Parks in the LAA: Dianna Lake and Prudhomme Lake. ▪ Historic Sites in the LAA include: North Pacific Cannery National Historic Site of Canada, The Canadian National Railway Station (Prince Rupert) and Prince Rupert Meat Company Building. ▪ Historic Sites in the RAA include: Triple Island Light House National Historic Site of Canada and Metlakatla Pass National Historic Site of Canada. ▪ Kitson Island is also a popular recreational area. ▪ Several eco-tourism based businesses operate within the RAA. 				
Community Social Resources	<ul style="list-style-type: none"> ▪ A wide range of community social services are offered throughout the LAA and meet current levels of demand. ▪ Capacity exists to meet increased demand. 				

16.4 Project Interactions with Infrastructure and Services

Project interactions with the Infrastructure and Services VC were assessed to determine whether potential adverse effects could result from each project activity (Table 16-4). Activities identified as having no interaction with infrastructure and services are ranked as 0 and are not assessed further. Project activities that may have some effect on infrastructure and services, but can be managed to acceptable levels through application of best management practices are ranked as 1. Project activities that could cause changes of concern are ranked as 2. Interactions ranked as 2 are assessed in detail in Section 16.5.

Table 16-4 provides rankings of potential effects resulting from interactions between infrastructure or services and project activities.

Table 16-4: Potential Effects on Infrastructure and Services

Project Activities and Physical Works	Potential Effects		
	Change in Traffic and Pressure on Transportation Infrastructure	Change in Housing Availability and Affordability	Change in Infrastructure and Community Services
Construction			
Site preparation (land-based)	2	1	1
Onshore construction	2	2	2
Vehicle traffic	2	0	1
Dredging	1	0	0
Marine construction	1	1	1
Waste management and disposal (liquid, solid, and hazardous)	2	0	2
Disposal at sea	0	0	0
Operational testing and commissioning	0	0	0
Site clean-up and reclamation	1	1	1
Operations			
LNG facility and supporting infrastructure on Lelu Island	1	1	1
Marine terminal use	1	0	0
Shipping	1	0	0
Waste management and disposal	1	0	1
Fish habitat offsetting	0	0	0
Wetland habitat compensation	0	0	0

Project Activities and Physical Works	Potential Effects		
	Change in Traffic and Pressure on Transportation Infrastructure	Change in Housing Availability and Affordability	Change in Infrastructure and Community Services
Decommissioning			
Dismantling facility and supporting infrastructure	1	1	1
Dismantling of marine terminal	1	1	1
Waste disposal	1	1	1
Site clean-up and reclamation	1	1	1

NOTES:

0 = No interaction.

1 = Potential adverse effect requiring mitigation, but further consideration determines that any residual adverse effects will be eliminated or reduced to negligible levels by existing codified practices, proven effective mitigation measures, or best management practices (BMPs).

2 = Interaction may occur and the resulting effect may exceed acceptable levels without implementation of project-specific mitigation. Further assessment is warranted.

16.4.1 Justification of Interaction Rankings

Construction activities related to disposal at sea and operational testing and commissioning, and operational activities related to fish habitat offsetting and wetland habitat compensation, are not expected to affect infrastructure and services; they have therefore been ranked as 0. These activities will not be considered further.

16.4.1.1 Construction

Site Preparation

Site preparation is expected to affect traffic and transportation infrastructure. This effect may exceed acceptable levels without mitigation and has been ranked as 2. Site preparation involves the movement of heavy equipment, construction materials, waste, and workers along Skeena Drive (Highway 599R), potentially causing deterioration of road surfaces and traffic congestion. A marine off-loading facility (MOF) will be used where practical to lower demand on roads in the LAA. A more detailed discussion of potential effects on traffic and transportation infrastructure resulting from interactions ranked as 2 is provided in Section 16.5.

Interactions between site preparation activities and housing availability and between site preparation activities and infrastructure and community services with potential adverse effects have been ranked as 1, therefore requiring some mitigation. These interactions are considered here. The number of workers temporarily housed in Prince Rupert or Port Edward during site preparation activities (50-100) prior to the establishment of the construction camp on Lelu Island is not expected to limit access to, the quality of, or use of community services or infrastructure or housing. Once the construction camp on Lelu Island is established site preparation workers will be relocated to Lelu Island decreasing demand on infrastructure and community services and housing in the LAA. Increased demand for community infrastructure, including water and sewer, waste management, recreational facilities, communication or emergency services during initial site preparation is not expected to exceed current levels of variation associated with

tourism and seasonality. Because of the temporary nature of their employment, workers engaged in site preparation activities are not anticipated to permanently relocate to the RAA, thus increased demand of educational services is not expected.

Onshore Construction

Onshore construction involves the movement of heavy equipment, construction materials, waste materials, and workers and will require the accommodation of workers in Port Edward or Prince Rupert. Interactions between onshore construction and traffic and transportation infrastructure (road and air), housing availability, and infrastructure and community services were ranked as 2. Increased demand on infrastructure and services as a result of these interactions may exceed acceptable levels. Effects are discussed in detail in Section 16.5.

Vehicle Traffic

Vehicle traffic on Highway 16 and Skeena Drive (Highway 599R) is expected to have an interaction exceeding acceptable levels and has been ranked as 2. This effect is discussed in detail in Section 16.5. Vehicle traffic is not expected to affect housing availability and was ranked as 0; this effect will not be considered further.

Interactions between vehicle traffic and infrastructure and community services with potential adverse effects have been ranked as 1, therefore requiring some mitigation. This interaction is considered here. Increased vehicle collisions associated with construction traffic could place increased demand on police and fire services. Consultation has identified concerns that increased road traffic could lead to increased policing requirements and demand for emergency response. Increased demand of emergency services is not expected to exceed the current capacity of Prince Rupert's regional RCMP police force, as well, best management practices related to the transportation of goods in addition to regulated driver responsibilities the potential for collisions will be managed to acceptable levels.

Dredging

Interactions between dredging and traffic and transportation infrastructure with potential adverse effects have been ranked as 1, therefore requiring some mitigation. This interaction is considered here. Dredging was ranked as 1; this ranking is conservative because it is expected that dredged materials will be disposed at sea with minimal amounts potentially used for construction activities on Lelu Island. If dredged materials need to be transported offsite, intermittent and non-reoccurring effects on traffic and transportation infrastructure could occur, but these could be managed to acceptable levels through standard operating procedures and best management practices related to construction operations.

Dredging is not expected to affect housing availability or infrastructure and community services, have been ranked as 0 and will not be considered further.

Marine Construction

Interactions between marine construction and traffic and pressure on transportation infrastructure, housing availability and infrastructure and community services with potential adverse effects have been ranked as 1, therefore requiring some mitigation. This interaction is considered here. Marine construction activities will occur primarily after the construction camp on Lelu Island is constructed, lowering demand for housing and community services in Port Edward and Prince Rupert. Prior to the establishment of the construction camp, workers will be shuttled to Lelu Island via bus, lowering potential traffic and the possibility of

increased road surface deterioration. Increased demand for emergency services may result from the housing of marine construction workers on Lelu Island and from marine construction activities. Through project design and best management practices related to construction activities potential adverse effects will be eliminated or reduced to negligible levels.

Waste Management and Disposal

Waste management and disposal is not expected to affect the availability of housing and was ranked as 0. Interactions with traffic and pressure on transportation infrastructure, as well as interactions with infrastructure and community services, were ranked as 2 because waste generated through construction activities and the operation of the construction camp will increase demand for garbage disposal and wastewater collection and treatment facilities and services in Port Edward. Transportation of waste will affect traffic, roadways, and the rate of fill of the Prince Rupert Landfill. These effects are discussed in greater detail in Section 16.5.

Disposal at Sea

Construction activities related to disposal at sea are not expected to affect infrastructure and services as no interaction is expected between marine disposal activities and transportation infrastructure, housing availability and affordability or infrastructure and community services. The interaction has been ranked as 0. These activities will not be considered further.

Operational Testing

Construction activities related to operational testing are not expected to affect infrastructure and services. No interaction is expected to occur between transportation infrastructure, housing availability and affordability or infrastructure and community services as a result of testing facilities. The interaction has been ranked as 0. These activities will not be considered further.

Site Cleanup and Reclamation

Interactions between site cleanup and reclamation and traffic and pressure on transportation infrastructure, housing availability and infrastructure and community services with potential adverse effects have been ranked as 1, therefore requiring some mitigation. The transportation of materials along Skeena Drive (Highway 599R) could affect the quality of road services and traffic patterns; workers staying in Port Edward and Prince Rupert will affect housing availability because accommodations will be required; increased demand for off-site disposal of materials at the Prince Rupert Landfill will affect the rate of fill of the facility. These effects were ranked as 1 because increased demand is expected to be intermittent and last for a short time. The magnitude of interactions associated with site cleanup and reclamation are expected to be manageable to acceptable levels through use of BMPs and standard operating procedures.

16.4.1.2 Operations

The current capacity of transportation infrastructure, housing, and infrastructure and community services is sufficient to meet the combined increased demand from operation activities (see Table 16-3 for an overview of existing baseline conditions and available capacity). Increased demand is not expected to affect access to, use of, or quality of infrastructure and services in the RAA.

Operation of the LNG Facility and Supporting Infrastructure on Lelu Island

Interactions between operation of the LNG facility and supporting infrastructure on Lelu Island and traffic and pressure on transportation infrastructure, housing availability, and infrastructure and community services with potential adverse effects have been ranked as 1, therefore requiring some mitigation.

Operation of the LNG facility and supporting infrastructure will affect traffic and transportation infrastructure through routine service and supply requirements. Service and supply operations will involve the movement of materials, vehicles, and equipment along Skeena Drive (Highway 599R). Increased traffic during operation is expected to be comparable to that of other industries operating in the RAA, with interactions manageable to acceptable levels through standard procedures.

Operation of the LNG facility and supporting infrastructure is expected to affect housing availability and affordability. Increased demand for housing in Port Edward and Prince Rupert during operation can be met through current and projected capacity levels. During operation it is anticipated that 680 positions (200 direct, 100 indirect, 40 induced) will be created for existing residents of the RAA and another 120 positions for new residents (see Section 14 Economic Environment). It is anticipated that a majority of permanent workers and their families will build or buy owner-occupied housing. Increased demand for the construction of new owner-occupied housing can be met through existing excess capacity of residentially zoned land in both Port Edward and Prince Rupert. Potential increased demand for house and apartment rentals and hotels and motels is expected to be corrected through supply-and-demand market pressure in the LAA because of the multiyear construction of the Project.

Operation of the LNG facility and supporting infrastructure is expected to affect infrastructure and community services. Workers and their families living in Port Edward and Prince Rupert (see Section 14 Economic Environment of estimated numbers of in-migrating workers) will increase demand on infrastructure and services; however, increased demand is not expected to negatively affect quality of, access to, or use of these services. Similar to the housing market, because of the multiyear construction of the Project, increased demand for infrastructure and community services during operation is expected to be corrected through supply-and-demand market pressure.

Marine Terminal Use and Shipping

Marine terminal use and shipping are not expected to affect the availability or affordability of housing or the delivery and use of infrastructure and community services as at the time of operation increased demand for hotels, motels and infrastructure and community services from ship personnel is expected to be corrected through supply-and-demand market pressures. Effects have been ranked as 0 and will not be considered further.

Interactions between marine terminal use and shipping and traffic and pressure on transportation infrastructure with potential adverse effects have been ranked as 1, therefore requiring some mitigation. Road based transportation of both ship crews and product is expected to result from project activities related to marine terminal use and shipping. Increased traffic on Highway 599R (Skeena Drive) and Highway 16 could occur; however, demand for road-based transportation is not expected to exceed acceptable levels or available capacity.

Waste Management and Disposal

Interactions between waste management and disposal during operation and traffic and pressure on transportation infrastructure and infrastructure and community services with potential adverse effects have been ranked as 1, therefore requiring some mitigation. Interactions will occur through increased demand

for waste disposal and use of the Prince Rupert Landfill and wastewater collection and treatment facilities in Port Edward. Increased demand of these services is not expected to affect the use of, access to, or quality of infrastructure and services in the LAA. Solid waste collection and disposal at the Prince Rupert Landfill will not exceed available capacity of services or infrastructure at the facility and increased demand can be managed through standard operating and BMPs. Wastewater collection and treatment are not expected to exceed available capacity at Port Edward's wastewater treatment facility. Currently there are no sewer lines connecting Lelu Island to Port Edward's wastewater treatment facility. Connecting lines will need to be constructed.

Increased demand for hazardous waste transportation and disposal is not expected to affect infrastructure and services. There are no hazardous waste disposal facilities within the LAA. Hazardous waste is transported for offsite disposal by eight commercial hazardous waste haulers. These haulers offer competitive services and are able to expand services to meet increased demand.

No interaction is expected to occur between waste management and disposal and housing availability and has been ranked as 0.

Fish Habitat Offsetting and Wetland Habitat Compensation

Operation activities related to fish habitat offsetting and wetland habitat compensation are not expected to affect infrastructure and services as no interactions anticipated with transportation infrastructure, housing availability and affordability and infrastructure and community services. The interaction has been ranked as 0. These activities will not be considered further.

16.4.1.3 Decommissioning

It is anticipated that the Project will operate for at least 30 years, pending the demand for LNG. Maintenance and refurbishment of facilities will extend the Project's potential operating life. Physical work related to dismantling of the facility and infrastructure and dismantling of the marine terminal, waste disposal, and site cleanup and reclamation could affect traffic and transportation infrastructure, the availability of housing, and the delivery and use of infrastructure and community services. Interactions are not expected to exceed acceptable levels and were ranked as 1. For this assessment, effects of project activities associated with decommissioning of infrastructure and services are conceptual in nature and will not be assessed further.

16.5 Effects Assessment

16.5.1 Analytical Methods

16.5.1.1 Analytical Assessment Techniques

Assessment of project effects on Infrastructure and Services considers potential changes in demand and provision of community, social, education, and emergency services and potential displacement of infrastructure, including roadways, housing, and water and waste systems. Interactions ranked as 2 in Table 16-4 are assessed in the sections below.

Potential effects are assessed using the rationale that the in-migration of permanent workers and increased numbers of visiting temporary workers, as well as physical work related to the Project, could increase demand for infrastructure and services. Through the assessment of (1) changes in population

demographics and, (2) interactions between physical work and infrastructure and services potential effects are discussed and mitigation proposed.

16.5.1.2 Assumptions and the Conservative Approach

The ability to understand baseline conditions and to predict potential effects is limited because of inherent uncertainties associated with incomplete information and changing socio-economic environmental conditions. Consequently, assumptions are made with a degree of uncertainty. Using a conservative approach (i.e., likely overstates effects), reduces the potential to mistake the significance of an effect. Proposed mitigation measures are considered to be more than adequate to reduce expected effects.

16.5.2 Change in Traffic and Pressure on Transportation Infrastructure

16.5.2.1 Potential Effects

Interactions between traffic and pressure on transportation infrastructure and the following construction activities were ranked as 2 (see Table 16-4): site preparation (land-based), onshore construction, vehicle traffic, waste management and disposal. Activities are grouped into three categories, transportation of workers, equipment movement and waste management and assessed using measurable parameters identified in Table 16-1.

Construction activities could increase ground traffic in the LAA. Increased congestion, collisions, and rates of road surface degradation could result from additional demand on public roadways. Roadways potentially affected by construction include:

- Port Edward municipal roads
- Prince Rupert municipal roads
- Skeena Drive (Highway 599R) from Highway 16 through Port Edward
- TransCanada Highway 16 – Yellowhead Highway from Prince Rupert to Terrace.

The transportation of construction works could also result in increased demand for air transportation services in the LAA. Increased demand could affect the quality of infrastructure and services at the Prince Rupert Airport, Seal Cove Seaplane Base and Northwest Regional Airport Terrace-Kitimat. Demand for ferry and shuttle services from the Prince Rupert Airport connecting Kaien Island to Digby Island could also increase.

Transportation of Workers

During construction most workers will be housed in accommodations on Lelu Island and will not contribute to increased commuter traffic. However, site preparation activities will take place prior to the construction of the 3,500-person construction camp on Lelu Island requiring workers to commute from Prince Rupert or Port Edward to the project site on a daily basis. These workers will increase traffic on municipal roads and Skeena Drive (Highway 599R). It is expected that hundreds of workers will be involved with site preparation activities over 12-18 month. The in-migration of permanent workers and increased numbers of visiting workers to Port Edward and Prince Rupert could also increase vehicle traffic in the RAA because of increased numbers of vehicles in the area. Crew-cab trucks and vans will be used to transport workers to the project site, lowering potential traffic. Where possible, local residents will be hired for site preparation activities. The current capacity of Skeena Drive (Highway 599R) and roads in Port Edward and Prince Rupert (see Section 16.5.2.1 Overview-current capacity) will accommodate increased demand from site preparation activities.

Once the construction camp is operational, construction workers will be relocated to Lelu Island. Workers living at the construction camp will have a limited effect on traffic because the need for daily commuting will be removed. A small number of administrative personnel (100-150) will remain in Port Edward and Prince Rupert and will commute to the site for the duration of construction activities. Some increase in traffic associated with the transportation of workers to and from the Prince Rupert Airport and the construction camp is expected to occur. The use of vans and crew-cab trucks to transport workers will decrease potential traffic along Skeena Drive (Highway 599R) and local roads in Port Edward and Prince Rupert. Increased demand for roadways during construction activities related to crew transportation is not expected to exceed current capacity.

It is anticipated that workers will be flown into Prince Rupert Airport (YPR) and into the Northwest Regional Airport Terrace-Kitimat (YXT). Use of Seal Cove Seaplane base is not anticipated. Increased demand for air transportation infrastructure and services can be accommodated through existing capacity at YPR but is limited at YXT. Assuming rotational work shifts an increase of up to four chartered flights per week or 32 aircraft movements per month (384 per year) is expected to occur between YPR and YXT. Assuming all aircraft movements were to occur at either YPR or YXT increased demand would represent a 12.5% increase in aircraft movements from 2011 at YPR and a 0.3% increase at YXT. Considering total aircraft movements at YPR decreased 31.2% from 2008 to 2012 (51.2% from 1997 to 2012) increased demand is not expected to affect quality, access or use of air transportation at YPR. From 2008 to 2012 total aircraft movements at YXT increased 16.6%. Consultation has confirmed that limited capacity exists to accommodate increased demand at YXT. New commercial airline services scheduled for YXT will further limit the capacity of the airport to accommodate increased demand for charter flights.

The use of chartered aircraft to YPR will remove the need to use commercial passenger aircraft thereby reducing potential effects on flight availability. Despite a 2% increase in passenger traffic from 2011 to 2012, passenger traffic has decreased 7.6% from 1997 (4,824 passengers). Investment in terminal infrastructure at YPR has increased capacity from 1997. Increased demand on terminal infrastructure is not expected to exceed current capacity nor affect the quality of service, access or use.

The capacity of YPR airport shuttle services and those offered by Digby Island Ferry are anticipated to be capable of accommodating increased demand during construction and operation activities. During construction wait times for shuttle service to Digby Island Ferries could be increased. Passenger levels on Digby Island Ferries could also be increased but are not expected to exceed capacity. The use of West Coast Launch Water Taxi could lower demand on Digby Island Ferries and would be required if workers required transportation from Digby Island to Kaien Island outside standard operating hours of Digby Island Ferry. Effects are expected to occur intermittently and to last for the duration of construction.

Increased demand from workers flying into YPR during operation is expected to be minimal as operations will not be fly-in/fly-out (as such charters will not be provided). Increased demand on YPR and supporting shuttle and ferry services and infrastructure is expected to be manageable to acceptable levels using BMPs and standard operating practices during operation.

Equipment Movement

Site preparation and onshore construction activities will require the transportation and movement of heavy machinery, construction equipment, and building materials. It is expected that equipment required for construction activities will be transported west from Terrace on Highway 16 onto Skeena Drive (Highway 599R) to construction sites near Lelu Island.

Large components, equipment, and construction materials will be primarily transported by barge; however, demand for ground transportation is expected to increase as a result of construction activities. In certain cases, materials may be transported by truck. Detailed information regarding equipment and associated transportation requirements is not currently available. It is estimated that during construction activities approximately hundreds of round trips will be required to move equipment to the site and for logging trucks to move merchantable timber from the site. These trips do not include those taken by commuting workers from Port Edward and Prince Rupert. The transportation of construction equipment on Highway 16 is not anticipated to exceed available capacity (see Section 16.5.2.1 Overview-current capacity). Use of Skeena Drive (Highway 599R) by industrial traffic has been identified through consultation as a concern as sufficient lines of sight and passing lanes do not exist to pass slow-moving oversized vehicles. Based on an analysis of expected levels of service (see Section 16.5.2.1 Overview-current capacity) and supported by Skeena Drives (Highway 599R) RAU classification increased industrial traffic is not expected to result in increased traffic congestion that exceeds acceptable levels. During consultation it was also noted that the quality of road surfaces on Skeena Drive (Highway 599R) could be affected through increased industrial use. Following construction activities PNW LNG has committed to repairing/reconstructing affected roadways.

Waste Management

During construction, waste management and disposal activities are expected to affect traffic and transportation infrastructure along Skeena Drive (Highway 599R). Hundreds of round trips will be required to move waste from the project site to offsite disposal facilities. These trips do not include those required to move domestic waste from the construction camp or incidental movements of hazardous waste. While the use of barge for offsite waste disposal may be used, the potential use of infrastructure and services in the LAA must be considered. Potential congestion along Skeena Drive (Highway 599R), especially through Port Edward caused by increased waste transportation could occur if not mitigated; however based on LOS studies conducted by PNW LNG (see Section 16.5.2.1 Overview-current capacity) increased traffic is expected to be within acceptable levels. Concerns regarding potential deterioration of road surfaces also apply to the transportation of waste; however PNW LNG has committed to repairing/reconstructing affected roadways.

16.5.2.2 Mitigation

Mitigation measures to limit effects on traffic and pressure on transportation infrastructure include:

- **A transportation management plan** that will:
 - Outline preferred ground transportation corridors.
 - Provide policies for the movement of dangerous goods, heavy, oversized and regular loads; convoys will be prohibited.
 - Outline policies and procedures for the use of the Prince Rupert Airport the Northwest Regional Airport Terrace-Kitimat for project-related activities.
 - Provide policies for the movement of workers to and from construction sites and airports; where possible workers will be transported by bus or crew-cab truck.
 - Require PNW LNG to engage in frequent communication between MOTI, RCMP, PRPA and the council members of Port Edward and Prince Rupert to address potential concerns and changes in demand of infrastructure and services.

16.5.2.3 Characterization of Residual Effects

Implementation of the mitigation measures described will limit residual effects on traffic and transportation infrastructure. Residual effects from increased traffic through Port Edward with respect to the movement of oversized loads will cause periodic congestion along Skeena Drive (Highway 599R) however is expected to be within acceptable LOS. Residual effects causing congestion on Highway 16 will be low in magnitude and limited to the RAA. Residual effects related to traffic and transportation infrastructure will occur continuously through the duration of the Project and will be reversible after the Project is decommissioned. Effects on the quality of road surfaces are expected to be limited to Skeena Drive (Highway 599R). Residual effects from construction activities on road surface quality are expected to occur for the duration of construction activities. Skeena Drive will be repaired or rebuilt following the completion of construction activities.

16.5.2.4 Likelihood

There is a medium probability that effects on infrastructure and services will occur as predicted. Mitigation measures lower the probability of occurrence, however, it is expected that deviation from established mitigation measures as a result of unforeseen circumstances will occur. Deviation from established mitigation measures is expected to result in a greater probability of occurrence of effects on traffic and transportation infrastructure.

16.5.2.5 Determination of Significance of Residual Effects

Traffic along Skeena Drive (Highway 599R) will increase during construction activities but is expected to be within acceptable LOS. Peak increased demand will occur during initial stages of site preparation due to the movement of heavy equipment and during onshore construction caused by ground transportation of building materials. While daily traffic will increase along Skeena Drive (Highway 599R) peak increases are not expected to exceed median traffic volumes of recorded roadway use between 1994 and 1997 (2,970 vehicles per day; a 98% increase from current volumes). Project effects on traffic and transportation infrastructure are considered not significant.

16.5.2.6 Confidence and Risk

Predictions regarding project-specific residual effects were made using publically available information, trade and industry publications, information obtained through consultation initiatives, and professional judgment. Technical boundaries identified in Section 16.2.5.3 highlight potential gaps in traffic count data. Considering existing limitations and potential gaps in information, predictions were made using a conservative approach (Section 16.4.1.2).

Overall prediction confidence is considered moderate with respect to project-specific residual effects on traffic and transportation infrastructure. There is a risk that unforeseen circumstances could result in that demand for ground transportation increasing beyond expected levels. Mitigation measures will lower the risk of increased demand affecting use and quality of transportation infrastructure; however, mitigation measures were developed to address limited demand from ground transportation.

16.5.3 Change in Housing Availability and Affordability

16.5.3.1 Potential Effects

Interactions between housing availability and onshore construction were ranked as 2 (see Table 16-4). Available housing options are considered to be: rental housing – apartments, house rentals, vacation

rentals, hotels and motels – includes bed and breakfasts, and owner-occupied housing. Effects are assessed on housing of workers using measurable parameters identified in Table 16-1.

Housing of Workers

Project construction has the potential to affect housing availability through increased demand from permanent and temporary workers not housed in the construction camp on Lelu Island and of whom are not local residents of the LAA (approximately 50-100 workers during site preparation and 100-150 workers during the balance of construction activities). During site preparation it is expected that workers not housed on Lelu Island will predominately increase demand for rental housing; little demand for owner-occupied housing is anticipated.

Following site preparation activities, workers housed in Port Edward and Prince Rupert (approximately 100-150) will mostly be those filling administrative roles. Workers completing construction tasks that are less than a day in duration and certain specialized professionals may choose to stay in Prince Rupert or Port Edward. Administrative employees will stay in Port Edward and Prince Rupert on an as-needed basis. It is expected that these workers will predominately increase demand for rental housing in the form of hotels and motels. It is expected that few administrative personnel will be required to permanently relocate to the LAA.

In addition to workers already employed by the Project, workers seeking employment may visit or immigrate from surrounding communities in the RAA to Prince Rupert or Port Edward. It is expected that these workers will primarily increase demand for rental housing. Increased demand for owner-occupied housing from these workers is expected to be limited.

Considering current capacity and the availability of rental housing in the LAA there is insufficient supply to satisfy increased demand during construction. With limited vacancy of rental housing increased demand from workers not housed on Lelu Island could result in negative effects on tourism and local business. Unable to secure rental housing (hotels and motels) tourists may be less inclined or unable to stay in the LAA; limited vacancy could have lasting effects on tourism dissuading future visits to the LAA. Local businesses that cater to the tourism industry could realize decreased revenue as a result of decreased tourism. Alternatively, low vacancy rates could result in increased revenue for hotels and motels and lower effects on revenue associated decreased demand during non-peak-season operation. Increased revenue among hotels and motels could positively affect employment of hospitality workers (hotel and motel staff).

Effects on the availability of housing during operation of the LNG facility and supporting infrastructure are expected to be minimal because current owner-occupied housing markets are able to accommodate increased demand. Increased demand for rental housing during project operation is expected to be minimal. Reduced numbers of transient employees and the multi-year construction of the Project will further allow housing markets to adjust by the time the Project is operational in 2018.

The greatest potential for inflation and cost-of living increases relates to housing, which accounts for 24% of living costs (Welcome BC, 2013). With an estimated 120 workers and their families moving into the RAA, there would be major demands for new housing (see Section 14 Economic Environment). However, because only 2% of occupied private dwellings in the Prince Rupert CA have been constructed since 2000 (see Section 14), it is more likely that the incoming labour force will choose to live in newly constructed housing than compete for existing housing. Increased cost-of-living as it relates to housing is detailed in Section 14.

16.5.3.2 Mitigation

Visiting temporary workers to the LAA during construction activities will have an effect on the availability of housing. The following mitigation measures will be implemented to address these concerns:

- A camp will be used to house workers during construction
- An accommodation plan will be implemented to:
 - Require PNW LNG to engage in frequent communication with city and district planners in Port Edward and Prince Rupert as a means of responding to potential community grievances and changes in demand for housing infrastructure.
 - Provide housing policies for non-local temporary workers of whom are not housed in the construction camp on Lelu Island; policies will outline preferred accommodations and require workers be housed in both Port Edward and Prince Rupert when not in housed in the construction camp to lower the demand in a single community.
 - Outline camp management policies and practices.

16.5.3.3 Characterization of Residual Effects

The Project will increase demand for rental housing and owner-occupied housing in the RAA. Project residual effects will limit the availability of rental housing in Port Edward and Prince Rupert during construction activities. Residual effects are expected to be highest in magnitude during site preparation and prior to the establishment of accommodations on Lelu Island. Project residual effects with respect to housing availability are expected to be low in magnitude, to occur predominately during site preparation activities, and to be followed by intermittent effects during construction. Project residual effects are considered to be reversible after the Project ceases operation.

16.5.3.4 Likelihood

There is a high probability that effects on housing availability and affordability will occur as predicted. Mitigation measures lower the magnitude of potential effects; however, as there is limited supply of rental housing in the LAA any increase in demand is expected to affect availability and affordability. It is expected that the Project will increase demand for housing in the LAA through both visiting and in-migrating workers employed and seeking employment with the Project either directly, indirectly or through induced opportunities.

16.5.3.5 Determination of Significance of Residual Effects

As noted in Section 16.2.6, a significant adverse effect is one that results in demand beyond current capacity such that standards of service are routinely and persistently reduced below current levels for an extended period of time. Residual effects are expected to increase demand of rental housing; however, with mitigation demand is expected to be manageable as the duration of effects is limited to activities occurring prior to the establishment of the construction camp on Lelu Island. From this, residual effects on housing availability are predicted to be not significant.

16.5.3.6 Confidence and Risk

Predictions regarding project-specific residual effects were made using publically available information, trade and industry publications, information obtained through consultation initiatives, and professional judgment. Consultation initiatives identified cautionary restrictions to the use of 2011 census data for

baseline studies in Prince Rupert (Section 16.3.2). Considering existing limitations and potential gaps in information, predictions were made using a conservative approach (Section 16.4.1.2).

Overall prediction confidence is considered moderate with respect to project-specific residual effects on housing availability and affordability as the characterization of effects was based on limited consultation and imperfect information. There is a risk that housing demand from workers employed indirectly or though induced employment opportunities associated with the Project could exceed foreseeable levels accounted for through mitigation measures. While the housing of indirect and induced workers is not the responsibility of PNW LNG mitigation measures have been designed to mitigate for the increased demand from workers employed through indirect and induced work.

16.5.4 Change in Infrastructure and Community Services

16.5.4.1 Potential Effects

Interactions between infrastructure and community services and activities related to onshore construction, waste management and disposal were ranked as 2 (see Table 16-4). Activities are grouped into 2 categories, non-camp related demand and camp-related demand using the measurable parameters identified in Table 16-1.

Non-Camp Housing-Related Demand

During construction in-migrating permanent and visiting temporary non-local workers not housed on Lelu Island (estimated to be 50-100 site preparation workers and 100-150 administrative workers following site preparation) could affect the quality of, access to, and use of infrastructure and community services. Workers visiting Port Edward and Prince Rupert on a temporary basis are not expected to increase demand for educational infrastructure and services or other social services. It is expected that a majority of workers temporarily housed in Port Edward and Prince Rupert will be present for short durations of time and will commute to communities outside the LAA where they maintain residency once their work is completed. Workers in this category will use community services in their home communities, foregoing the need to use services in Prince Rupert or Port Edward. Similarly, workers temporarily housed in Port Edward and Prince Rupert are not expected to increase demand for community infrastructure, including water and sewer, waste management, recreational facilities, or emergency services beyond current levels of variation associated with tourism, seasonality, and already occurring in- and out-migration.

Workers permanently relocating to the LAA during construction (it is estimated that few construction workers will permanently relocate to the LAA based on temporary work contracts) and during operation (estimated to be 120 workers and their families) will increase demand for infrastructure and community services. While demand is expected to increase, sufficient capacity exists to accommodate increased use of infrastructure and community services. Through consultation, city officials in Prince Rupert have expressed that Prince Rupert is supportive of the Project drawing on infrastructure and community services and that excess capacity exists to meet limited increased demand. Existing excess capacity and collaborative planning and communication between PNW LNG and municipal officials will ensure that the quality of, access to, and use of infrastructure and community services is not affected.

Camp Housing and Project Construction and Operation-Related Demand

Non-local workers housed in the construction camp are not expected to affect delivery of infrastructure and community services. While the camp and LNG facilities will draw on Port Edward's drinking water and

waste water treatment facilities, considering existing capacity, commitments to invest in municipal water infrastructure and findings highlighted in studies conducted by PNW LNG access to, use and quality of these infrastructure and community services are not expected to be affected. The Project will similarly draw on Port Edward's wastewater system. Current wastewater systems have the capacity to meet increased demand, however, PNW LNG has committed to working with the District to upgrade existing infrastructure.

The camp will be constructed with its own recreational facilities decreasing demand on recreational infrastructure and services in Port Edward and Prince Rupert. Considering that workers housed in the construction camp will be employed as rotational shift workers increased demand for recreational infrastructure and services in the LAA is expected to be minimal. At the beginning and end of shifts, workers will be transported to and from the construction camp and the Prince Rupert Airport. This rotational movement of workers will limit demand on recreational facilities and services because employees will recreate in their home communities during days off.

Workers housed at the construction camp could increase demand for emergency services. During consultation, community members and service providers noted that increased demand for policing and fire rescue services was a key concern regarding a remote work camp on Lelu Island. Possible measures to reduce demand on policing services include the use of on-site security staff, and the reserved right to undertake background and drug tests on perspective employees. Consultation identified potential concerns about increased opportunities for organized crime, particularly trafficking of drugs. Local RCMP officers noted that transient populations housed in remote work camps increase the risk of drug trafficking as workers are continually commuting to and from the camp, generally have disposable income, and are relatively isolated. These conditions are desirable among organized crime and those engaged in drug trafficking. The RCMP also revealed that policing requirements with respect to construction camps is primarily intelligence driven. The RCMP highlighted that Intelligence gathering where large work camps are present is an important feature for policing small communities like Kitimat and is an efficient way to monitor on- and off-site criminal activities.

Increased demand of the Port Edward Fire Department (PEFD) and Prince Rupert Fire Rescue (PRFR) is expected as a result of the work camp and onshore construction activities. The Project will be within PEFD's fire control area and will subsequently involve PRFR through a mutual aid agreement. Required fire code compliance site inspections of newly constructed facilities and the potential for increased fire, medical, and rescue responses will increase the demand for fire rescue services. Increased responses are expected as a result of workplace injuries, motor vehicle collisions along Highway 16 and Skeena Drive, and on-site fires. Consultation has identified pre-existing challenges with respect to the delivery of services provided by PEFD, as well as potential gaps in specialized hazmat training and response abilities of both fire departments. Fire suppression equipment and trained first responders will be onsite, lowering potential demand, but industry practice in the RAA involves PRFD and PEFD with fire, rescue, and medical responses.

Construction activities are expected to increase demand for infrastructure and community services associated with waste management and disposal. Waste generated from construction activities and camp operations could increase the demand placed on waste removal services and on the Prince Rupert Landfill. While the use of barges for offsite solid waste disposal could be used, an assessment of effects on local solid waste facilities and services is required. It is estimated that with current rates of fill, 75 years of capacity remain at the Prince Rupert Landfill. However, increased demand from construction activities could lead to decreased capacity. Likewise, increased demand for waste disposal could escalate the

need for maintenance or replacement of physical infrastructure, as well as infrastructure at the landfill not limited to scales, roadways, and machinery.

While efforts are taken to reduce dependency on infrastructure and community services in the LAA a degree of interaction is anticipated. City officials in Prince Rupert have expressed support for the use of infrastructure and community services by the Project and that capacity exists to meet limited increase in demand.

16.5.4.2 Mitigation

Mitigation measures to reduce the effect of increased demand on infrastructure and community services include:

- A **First Nations and community training and employment strategy** will be implemented that will ensure that local communities, including First Nations, have access to training and employment opportunities provided by the Project. The long-term objective of the strategy is to maximize access to long-term career opportunities during the operational phase of the Project by local populations through enhanced skills training programs and outreach efforts (used to identify local labour talent).
- A **community crime prevention initiative** between RCMP and PNW LNG will be implemented through the Transportation Management Plan and Accommodation Plan. The initiative will encourage PNW LNG and RCMP to collaborate and communicate project updates and activities that could influence community safety. The initiative will additionally help facilitate an understanding of project-related traffic concerns.
- A PNW LNG **Project community engagement plan** that will assist communities in planning for an influx of workers. The plan will include initiatives to address potential effects and will facilitate communication with the community and provide a framework from which to respond to community grievances. The plan will also provide details on how best to maximize economic opportunities related to the Project.
- An **emergency response plan** will be established and implemented with BC OGC, PRFR, PEFD, PRPA, and the RCMP including mandatory LNG specific emergency response training (EMS and firefighting).
- Mandatory awareness programs for employees will be implemented regarding fire suppression systems installed onsite, with key employees trained in fire suppression according to legislation requirements.
- Recreational facilities will be provided on site at the construction camp to reduce potential demand on infrastructure and municipal services.
- Waste management, disposal, and recycling programs of construction and domestic waste targeted at reducing demand on municipal landfill facilities and operations will be implemented.

16.5.4.3 Characterization of Residual Effects

Implementation of identified mitigation measures will result in minimal increased demand of infrastructure and community services. Community services including education, recreation, waste management, and water services have the capacity to handle increased demand. Project residual effects are expected to be

low in magnitude, to occur in Port Edward and Prince Rupert, and to have a continual impact throughout the life of the Project, decreasing after construction activities.

Emergency services will be highly demanded during construction and operation activities however through the emergency response plan demand is expected to be mitigated to acceptable levels. During construction, increased demand will be associated with increased traffic along Skeena Drive (Highway 599R), operation of the construction camp, and initial fire code compliance site inspections. During operation, activities related to emergency preparedness, including on-site training, emergency drills, and site inspections, are expected to mitigate increased demand. Project residual effects are predicted to be low in magnitude, to last for the duration of construction and operation activities, and to be reversible after the Project is decommissioned.

Port Edward and Prince Rupert have identified several key areas of potential investment in community services and, in particular, infrastructure. Property tax paid to Port Edward could be used to invest in these services and to improve infrastructure. Prince Rupert is not expected to benefit from property tax payments related to the operation of the Project.

16.5.4.4 Likelihood

There is a high probability that effects on infrastructure and community services will occur as predicted. It is expected that the Project will increase demand for infrastructure and services related to emergency response, waste management and water and sewer treatment, however, mitigation plans will lower the magnitude of potential effects. During operation the in-migration of permanent workers is expected to increase demand for infrastructure and community services.

16.5.4.5 Determination of Significance of Residual Effects

The implementation of mitigation by PNW LNG will reduce effects from increased demand for infrastructure and community services. Emergency services will be more highly demanded during site preparation and construction activities. However, demand for emergency services will be managed through collaborative initiatives in crime prevention and emergency response, and by having security staff, fire suppression supplies, and medical supplies on site. Using this approach, project-related effects on infrastructure and community services are predicted to be not significant.

16.5.4.6 Confidence and Risk

Predictions regarding project-specific residual effects were made using publically available information, trade and industry publications, information obtained through consultation initiatives, and professional judgment. Considering existing limitations and potential gaps in information, predictions were made using a conservative approach (Section 16.4.1.2).

Overall prediction confidence is considered moderate with respect to project-specific residual effects as the characterization of effects on infrastructure and community services was based on limited consultation and imperfect information. There is a risk that estimates regarding available capacity are incorrect. Mitigation measures were developed using a conservative approach limiting the potential magnitude of potential effects if underestimated.

16.5.5 Summary of Residual Effects

Table 16-5 provides an overview of project residual effects.

Table 16-5: Summary of Residual Effects on Infrastructure and Services

Project Phase	Mitigation/Compensation Measures	Residual Effects Characterization						Likelihood	Significance	Confidence	Follow-up and Monitoring
		Context	Magnitude	Extent	Duration	Reversibility	Frequency				
Change in Traffic and Pressure on Transportation Infrastructure											
Construction	<ul style="list-style-type: none"> Transportation management plan 	M	M	L	S	R	C	M	N	M	None
Operation		H	L	L	L	R	C				
Decommissioning		No effects anticipated									
Residual effects for all phases		M	L	L	L	R	C				
Change in Housing Availability and Affordability											
Construction	<ul style="list-style-type: none"> A camp will be used to house workers during construction. Accommodation plan 	L	M	L	S	R	MI	H	N	M	None
Operation		H	L	L	L	R	C				
Decommissioning		No effects anticipated									
Residual effects for all phases		M	L	L	L	R	C				
Change in Infrastructure and Community Services											
Construction	<ul style="list-style-type: none"> First Nations and community training and employment strategy Community crime prevention initiative Project engagement plan Emergency response plan Mandatory awareness programs - fire suppression systems Recreational facilities will be provided on site at the camp Waste management, disposal, and recycling programs of construction and domestic waste 	M	M	L	S	R	MI	H	N	M	None
Operation		H	L	L	L	R	C				
² Decommissioning		No effects anticipated									
Residual effects for all phases		H	M	L	L	R	C				

<p>NOTES</p> <p>CONTEXT:</p> <p>L (Low resilience) – infrastructure and services are unable to accommodate changes.</p> <p>M (Moderate resilience) – infrastructure and services are able to accommodate changes with minor impacts to viability.</p> <p>H (High resilience) – infrastructure and services are well developed and able to accommodate changes.</p> <p>MAGNITUDE:</p> <p>N (Negligible) – no measurable change from base case conditions.</p> <p>L (Low) – a measurable change but effect cannot be distinguished from baseline conditions.</p> <p>M (Moderate) – a measurable change in use of, or access to, infrastructure and services, but of which will not affect the viability or displace public use such that cannot be accommodated elsewhere in the RAA.</p> <p>H (High) – measurable change in use of, or access to, infrastructure and services that will affect the viability or displace public use such that cannot be accommodated elsewhere in the RAA.</p>	<p>EXTENT:</p> <p>P – Effects are restricted to the PDA.</p> <p>L – Effects extend into the LAA.</p> <p>R – Effects extend into the RAA.</p> <p>DURATION:</p> <p>S (Short term) – effect restricted to the duration of the construction period or less.</p> <p>M (Medium term) – effect extends through more than the duration of the construction period but less than the life of the Project.</p> <p>L (Long term) – effect extends through the life of the Project.</p> <p>P (Permanent) – effect is permanently measurable.</p>	<p>REVERSIBILITY:</p> <p>(R) Reversible – effects will cease or recover after project closure and reclamation.</p> <p>(I) IRREVERSIBLE – effects will persist after the life of the Project.</p> <p>FREQUENCY:</p> <p>SE (Single event) – effect occurs once.</p> <p>MI (Multiple irregular event) – effect reoccurs with no set schedule.</p> <p>MR (Multiple regular event) – effect reoccurs on a set schedule.</p> <p>Continuous – effect occurs continuously.</p>	<p>LIKELIHOOD:</p> <p>Based on professional judgment</p> <p>L (Low) – well understood and there is a low likelihood of effect on infrastructure and services as predicted.</p> <p>M (Medium) – well understood and there is a medium likelihood of effect on infrastructure and services as predicted.</p> <p>H (High) – well understood and there is a high likelihood of effect on infrastructure and services as predicted.</p> <p>SIGNIFICANCE:</p> <p>S – Significant</p> <p>N – Not significant</p> <p>CONFIDENCE:</p> <p>Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation, and assumptions made.</p> <p>L – Low level of confidence</p> <p>M – Moderate level of confidence</p> <p>H – High level of confidence</p>
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16.6 Cumulative Effects

16.6.1 Context for Cumulative Effects

Industrial development ranging from terminal and shipping developments to oil and gas and renewable energy developments, along with associated changes in population, are expected to exert continual pressure on infrastructure and services in Port Edward and Prince Rupert. Cumulative increased demand for housing availability and infrastructure and community-based services, and increased traffic and pressure on transportation infrastructure is expected.

Pursuant to the *Canadian Environmental Assessment Act, 2012*, an environmental assessment must address cumulative effects that are likely to result from a designated project in combination with other physical activities that have been or will be carried out. According to CEAA 2012, 24 past, present, and reasonably foreseeable projects spatially and temporally overlap with the Project. Of the 24 projects, 3 are currently under construction in the LAA: the Prince Rupert Ferry Terminal Project (2006-2014), Westview Terminal Project (2012-2013) and Ridley Terminal Project (2012-2015) (see Table 16-6). The construction and operation of these projects will affect infrastructure and services in the RAA. These projects will directly affect infrastructure and services in Prince Rupert because they are being constructed in or very near city boundaries. The latest construction completion data of these projects is estimated to be 2015; thus, major construction activities should be completed prior to the start of construction for the Project.

Project site-preparation and the initial stages of project construction could overlap with the final phases of the Ridley Terminal Project (construction ending in 2015), however, the magnitude of effects on infrastructure and services are expected to be low. The final stages of construction for the Ridley Terminal Project and the initial site-preparation and construction phase of the Project will require minimal workers (in the case of the Project, 50-100 site preparation workers) lowering potential cumulative effects on housing availability and affordability and increased demand on infrastructure and community services. Potential cumulative short-term effects caused by increased demand for rental housing, motels, and hotels in Port Edward and Prince Rupert will be reduced.

In addition to the three projects currently under consideration, two projects, NaiKun Wind Energy Project and Mount Hays Wind Farm have been approved for construction but have not proceeded into the permitting phase. These projects have a combined cost of \$950 million and will affect infrastructure and services in Port Edward and Prince Rupert if construction and operation activities begin. Nine additional projects spatially and temporally overlap with the Project. These projects are noted in Table 16-6. Residual effects of past and current projects listed in Table 16-6 are expected to interact with project residual effects. Potential residual effects of future projects listed in Table 16-6, if approved and constructed could act cumulatively with project-related residual effects on infrastructure and services in Port Edward and Prince Rupert.

The extent to which present and foreseeable projects place demand on infrastructure and regional services will depend on how these projects are constructed, the extent of permanent versus temporary workforces associated with each project, and the time and ability municipalities have to respond to increased short and long-term demand. Considering current conditions and existing past and present project residual effects, a report commissioned by the City of Prince Rupert and

produced by Associated Engineering summarizes needed investment and upgrades to existing infrastructure over a ten-year period (COPR 2012) These upgrades range from investment in solid waste, water and sewer, and roadway infrastructure. Cumulative effects associated with projects listed in Table 16-6 could place higher levels of demand on current systems than expected. Cumulative effects could result in the need to invest in infrastructure and services, especially those listed as requiring investment, sooner and to a greater degree than has been originally budgeted.

16.6.2 Cumulative Effects Assessment

The cumulative effects assessment proceeds on an effect by effect basis, with a two-step process to determine the potential for cumulative effects on Infrastructure and Services. In conducting the cumulative effects assessment, the residual effects arising from interactions ranked as 1 or 2 in Table 16-4 are considered. The first step consists of a two questions:

- Is there a project residual effect?
- Does the project residual effect overlap spatially and temporally with those of other past, present or reasonably foreseeable future projects?

Where the answers to both of these two questions are affirmative, a check mark in Table 16-6 indicates that there is potential for the Project to contribute to cumulative effects on Infrastructure and Services. Potential contribution of these project effects to cumulative effects is assessed below. The second step consists of one question:

- Is there a reasonable expectation that the contribution (i.e., addition) of the Project’s residual effects would cause a change in cumulative effects that could affect the quality or sustainability of the VC?

Where the answer to this question is affirmative, additional assessment of the potential cumulative effects is described below.

Table 16-6: Potential Cumulative Effects on Infrastructure and Services

Other Projects and Activities with Potential for Cumulative Effects	Potential Cumulative Effects		
	Change in Traffic and Pressure on Transportation Infrastructure	Change in Housing Availability	Change in Capacity of Infrastructure and Community Services
Atlin Terminal	✓	✓	✓
Canpotex Potash Export Terminal	✓	✓	✓
CN Rail Line			
Douglas Channel LNG	✓		
Enbridge Northern Gateway Project	✓		
Fairview Container Terminal Phase I	✓	✓	✓
Fairview Container Terminal Phase II	✓	✓	✓
Kitimat LNG Terminal Project	✓		

Other Projects and Activities with Potential for Cumulative Effects	Potential Cumulative Effects		
	Change in Traffic and Pressure on Transportation Infrastructure	Change in Housing Availability	Change in Capacity of Infrastructure and Community Services
LNG Canada Project	✓		
Mount McDonald Wind Power Project	✓	✓	✓
NaiKun Wind Energy Project	✓	✓	✓
Northland Cruise Terminal	✓	✓	✓
Odin Seafood			
Pinnacle Pellet Inc.			
Prince Rupert LNG Facility	✓	✓	✓
Prince Rupert Gas Transmission Project	✓	✓	✓
Prince Rupert Ferry Terminal	✓	✓	✓
Prince Rupert Industrial Park			
Prince Rupert Grain Limited			
Ridley Island Log Sort	✓	✓	✓
Ridley Terminals Inc.	✓	✓	✓
Rio Tinto Alcan Aluminum Smelter and Modernization Project			
WatCo Pulp Mill	✓	✓	✓
Westcoast Connector Gas Transmission Project	✓	✓	✓

NOTES:

✓ = Those 'other projects and activities' whose effects are likely to interact cumulatively with the Project's residual effects.

Transportation

Project-related effects of traffic and pressure on transportation infrastructure are not expected to affect the sustainability of the VC. The main ground transportation corridors associated with the Project in the RAA are Highway 16 and Skeena Drive (Highway 599R). Spatially overlapping use of these roadways is limited with respect to past, current, and reasonably foreseeable future projects. Excluding demand from the Project, use of Skeena Drive (Highway 599R) is limited to increased demand from commuter traffic between Port Edward to Prince Rupert associated with past, current and reasonable foreseeable future projects. While use of Highway 16 by past, current and reasonable foreseeable future projects will overlap with that of project activities, use of BMPs and mitigation (including transportation plans) implemented by proponents of other projects mitigates effects on Highway 16. Cumulative effects on Highway 16 are therefore expected to be manageable to acceptable levels.

Air transportation in the RAA is achieved through infrastructure and services offered at Prince Rupert Airport (YPR), Seal Cove Seaplane Base and Northwest Regional Airport Terrace-Kitimat (YXT). Use of Seal Cove Seaplane Base with respect to the projects highlighted in Table 16-6 is expected to be minimal. Infrastructure and services offered at Seal Cove Seaplane Base meet current levels of demand with available capacity to satisfy increased in-kind passenger traffic and aircraft movements. Both YPR and YXT are able to meet current levels of demand; however, where YPR has available capacity to meet increased demand, the capacity of YXT is limited. Projects considered in Table 16-6 are not expected to exceed capacity at YPR, YXT or Seal Cove Seaplane Base. In particular projects in the RAA are expected to increase demand at YPR and not YXT due to their close proximity to airport.

While not expected to exceed available capacity at YPR, if approved, commuting workers involved with Prince Rupert LNG and Prince Rupert Gas Transmission Project if unmitigated could exceed the available capacity of Digby Ferry services. Mitigation strategies, such as the use of buses to transport crews to and from airports and transportation management plans to control project-related traffic, can be expected to be implemented if these overlapping projects were approved. Through the use of mitigation measures the capacity of Digby Island Ferry services as a result of increased demand from foreseeable future projects is not expected to affect access, quality or use of the service.

Housing

The Project will have a measurable residual effect on housing availability during construction activities, which is likely to act cumulatively with effects of past, present, or reasonably foreseeable future projects. Cumulative effects are not expected to affect the sustainability of the VC. Projects in the RAA are likely to increase demand for rental housing, hotels, and motels; consequently and contribute to the low vacancy rates. Increased demand from the Project and reasonably foreseeable future projects will place additional, cumulative demands on housing. Increased demand is not expected to affect the availability of housing over the long term; this demand is largely temporary and cumulative effects of overlapping projects will be limited with respect to overlapping periods of increased demand because of their construction schedules. The housing market is also recognized as being responsive and demand driven (Hincks et al. 2013). While rapid response to increased housing demand will be delayed, housing markets are expected to adjust to increased levels of demand over the long term. Correction of the housing market will mitigate potential effects to the sustainability of the VC. Joint planning and communication between PNW LNG and municipal officials will additionally mitigate potential housing shortages.

Infrastructure and Community Services

Considering the timing and rate of construction of current and reasonably foreseeable projects, effects on infrastructure and community services are not expected to affect the viability or sustainability of the VC. Current and future projects considered in this assessment primarily draw on infrastructure and services offered by the City of Prince Rupert and District of Port Edward. Although increased demand for infrastructure and community services in Port Edward can be expected, Prince Rupert's infrastructure and services will be more heavily used. Increased demand for infrastructure and community services in Prince Rupert will place added demand on the municipality but through

the use of BMPs and mitigation, the magnitude of effects on infrastructure and community services will be lowered to acceptable levels. While a 2011 infrastructure survey (COPR 2012) conducted for Prince Rupert highlighted \$90 million worth of investment needed over a 10-year period, a sizeable portion of which is related to maintenance, expansion, and improvements to infrastructure and can be funded through pay-for-use fees (fees levied for use of the service), current capacity is able to accommodate increased cumulative demand when adequately mitigated. The ability to improve infrastructure through pay-for-use will facilitate timely infrastructure improvements and expansion in-line with increasing demand over phased construction periods of current and future projects. Additional tax revenue generated from proposed projects in Prince Rupert (not including PNW LNG as it is located within the District of Port Edward) could help fund major infrastructure improvement projects. Through these measures, capacity of infrastructure and community services is expected to be responsive to increased demand and capable of accommodating increased cumulative use.

16.6.2.1 Summary of Cumulative Effects

Cumulative effects already influence access to, quality, and use of infrastructure and services in Port Edward and Prince Rupert. Baseline conditions described in Section 16.3 highlight current levels of demand, illustrate the resiliency of infrastructure and numerous services to fluctuations in demand, and note needed areas of improvement and maintenance. The degree to which past and present effects have influenced the delivery and access to infrastructure and services has not exceeded a limit whereby added demand displaces public use or access to the VC. Considering project-related residual effects and reasonably foreseeable future project effects, cumulative effects on infrastructure and services are not expected to affect the sustainability of the VC.

16.7 Follow-up and Monitoring

No follow-up and monitoring programs are proposed for Infrastructure and Services.

16.8 Conclusion

The Project's direct and cumulative effects on Infrastructure and Services were assessed considering effects on traffic and pressure on transportation infrastructure, housing availability, and infrastructure and community services. Direct effects on Infrastructure and Services are predicted to be not significant. Site preparation activities will result in increased demand for infrastructure and community services and temporary housing. Construction and operation activities will primarily place increased demand on infrastructure and community services.

Effects associated with the Project are expected to act cumulatively with past, current, and reasonably foreseeable future projects in the RAA but are not expected to affect the sustainability of the valued component. Through the implementation of mitigation measures, residual effects from the Project and cumulative effects will be limited and not significant.

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16.10 Figures



<ul style="list-style-type: none"> Local Assessment Area Regional Assessment Area ● Project Location — Potential Shipping Route — Project Component 	<ul style="list-style-type: none"> Airport ● City or Town Pilotage Station --- Electrical Power Transmission Line — Ferry Route --- International Boundary 	<ul style="list-style-type: none"> —+—+— Railway — Watercourse Indian Reserve Protected Area United States of America Waterbody 	<p style="text-align: center;">Pacific NorthWest LNG Infrastructure and Services Local Assessment Area and Regional Assessment Area</p> <p><small>Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada; Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.</small></p> <p><small>Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small></p>	<p>PREPARED BY: </p> <p>PREPARED FOR: </p> <p>FIGURE NO: 16-1</p>
<p>DATE: 06-FEB-14 FIGURE ID: 123110537-409 DRAWN BY: K. POLL</p>		<p>PROJECTION: UTM - ZONE 9 DATUM: NAD 83 CHECKED BY: S. ROBERTS</p>		

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