

## 7.2 Infrastructure and Services

### 7.2.1 Scope of Assessment

#### 7.2.1.1 Regulatory and Policy Setting

A number of regulatory, policy, and guidance documents were used in the assessment of social effects, as they relate to federal, provincial, regional, municipal and Aboriginal Groups' community infrastructure and service delivery. These include:

- *Transportation Act (2004)* – Administered by the BC Ministry of Transportation and Infrastructure (MOTI). The Act deals with public works related to transportation including planning, design, construction, operation, and maintenance of provincial highways (TC 2011a).
- Infrastructure Planning Grant Program (2013) – A grant program (up to \$10,000) designed to support local government in projects related to the development of sustainable community infrastructure in northwestern BC (MCSCD 2013).
- *Kalum Land and Resource Management Plan (2002)* – Started in 1992 and approved in 2002, the integrated land use plan covers 2.1 million ha and includes the Kalum Forest District and the communities of Terrace, Kitimat and Kitimaat Village. The plan provides broad direction for the sustainable use of Crown land and resources, including land, forests, lakes and rivers in the planning area (MFLNRO 2002).
- *Northwest Regional Airport Master Plan (2014)* – This plan provides a long-term (20-year) growth framework for the airport including upgrades to the airfield, expansion of the terminal facility, improvements to ground access and parking, and commercial development (AirBiz 2014).
- Kitimat Municipal Code – The consolidated regulatory bylaws of the District of Kitimat. The Code outlines the policies and regulatory framework of various local government functions such as local government, traffic and vehicle, licences and permits, police and fire regulations, public utilities, public work and planning, finance, recreation, civil defense, and building (District of Kitimat 2013a)
- *District of Kitimat Official Community Plan (OCP) (2008)* – Developed in 2008, the Kitimat OCP provides the objectives, goals, and policies used to guide long-term planning and land use management decisions for 5 to 25 years. Adopted as a bylaw, the Kitimat OCP must satisfy the content provisions outlined by the BC *Local Government Act* (District of Kitimat 2013b).

- Comprehensive Housing Needs Assessment for the District of Kitimat (2012) – In response to the need for more accessible and affordable housing options, the Kitimat Housing Committee commissioned the assessment in an effort to describe current and future housing conditions, describe demand and supply, identify needs, and provide recommendations (Terra 2012).
- *The City of Terrace Official Community Plan (2009)* – Started in 2009, this OCP provides a statement of objectives and policies to guide community planning and land use management decisions in the City's municipal boundaries for 50 years (City of Terrace 2011).
- Haisla Nation - BC Strategic Land Use Planning Agreement (2006) – This agreement outlines the details regarding the strategic land use planning agreement between Haisla Nation and the Province of BC. It also outlines a set of land-use management objectives that include Haisla Nation's traditional territory (Province of BC 2006).
- *Kitselas Land Use Plan (2012)* – This plan outlines the community's vision, objectives, and priorities for managing its reserve lands for the next five to 10 years. It is meant to provide the community, Lands Management Office, and Chief and Council a terms of reference for making land-use decisions (Kitselas First Nation 2012).

#### **7.2.1.2 Consultations' Influence on the Identification of Issues and the Assessment Process**

The scope of the assessment was based on the AIR. The draft AIR was subject to a 30-day public comment period from November 13 to December 13, 2013. LNG Canada consulted with Aboriginal Groups, the public, the EAO Working Group, and other interested parties throughout the development of the AIR. Based on consultation, additional measurable parameters were selected for assessing Project effects on infrastructure and services. These additional measurable parameters include:

- demand and supply of infrastructure and services to include community centres
- access and availability of green spaces and land-based parks, and
- housing supply and demand to include government-assisted housing.

As part of the LNG Canada's assessment of potential socio-economic effects, primary research was undertaken with Haisla Nation and Kitselas First Nation. This included key one-on-one interviews with band office administration staff and other community members, small focus group discussions, a community meeting, a traditional foods survey (with Kitselas First Nation, see Section 7.5) and fisheries workshops (see Section 7.4). The result of these interviews informed the selection of measurable parameters, were used to inform baseline information in Section 7.2.3, and assisted in the assessing of residual effects noted (Section 7.2.5). Socio-economic information was also obtained from studies commissioned by the Haisla Nation (Powell 2013), Kitsumkalum First Nation (Crossroads 2014), and Gitxaala Nation (Firelight 2014). In addition, potentially affected Aboriginal Groups have identified issues and concerns related to infrastructure and services, which are assessed, as applicable, in this

assessment as well as in Part C as they relate to potential adverse effects on Aboriginal Interests (Section 14) or other matters of concern to Aboriginals (Section 16).

#### **7.2.1.3 Traditional Knowledge and Traditional Use Incorporation**

Information included in infrastructure and services does not typically include specific information related to traditional knowledge or the incorporation of traditional use studies. However, baseline information from the following reports provided by First Nations communities is included in this assessment :

- *Haisla Nation TUS and Socio-economic Profile* (Powell 2013)
- *Kitsumkalum First Nation Interim Traditional Use Study* (Crossroads 2014)
- *Gitxaala Nation Socio-economic Study* (Firelight 2014), and
- *Lax Kw'alaams First Nation Interim Land and Marine Resources Plan of the Allied Tsimshian Tribes of Lax Kw'alaams* (Lax Kw'alaams First Nation 2004)

#### **7.2.1.4 Selection of Effects**

The following potential Project effects on infrastructure and services were identified from a description of Project activities and physical works (see Section 2); regulatory and policy setting; issues identified through consultation with Aboriginal Groups, the public, the Working Group, other interested parties, and professional judgment and experience of the environmental assessment team. These effects include:

- effects on community infrastructure and services. An increase in the demand for community infrastructure and services from Project-related population increase has the potential to affect the viability of infrastructure capability and services.
- effects on traffic and pressure on transportation infrastructure. Demands associated with the movement of workers, materials, and equipment to and from the Project, and Project-related population increase, could create congestion on roads and at airports, resulting in a decreased level of service for all users. This could also result in increased traffic incidents.
- change in housing availability. An increase in population could lead to increased demands for housing and reduced housing availability, increased rental and housing costs, and increased demand for government-assisted housing.

#### **7.2.1.5 Selection of Measurable Parameters**

Measureable parameters were selected to facilitate quantitative or qualitative measurement of potential effects, based on standards or guidelines, inputs from consultation, and the professional judgment of the assessment team (Table 7.2-1).

**Table 7.2-1: Potential Effects on Infrastructure and Services and Measurable Parameters**

Potential Adverse Project Effects	Measurable Parameters
Effects on community infrastructure and services	<ul style="list-style-type: none"> <li>▪ Population/demographic composition</li> <li>▪ Demand and supply of community, social, and government infrastructure and services (e.g., education facilities, community centres, first responder services, domestic water supply, wastewater, solid waste)</li> <li>▪ Access and availability of green spaces, and land-based parks and places of recreation</li> <li>▪ Parameters based on affected infrastructure and services (i.e., students/educator, police officers/1,000 people)</li> <li>▪ Local government cost measurements</li> </ul>
Effects on traffic and pressure on transportation infrastructure	<ul style="list-style-type: none"> <li>▪ Daily road traffic volume (vehicles/day)</li> <li>▪ Traffic collisions (collisions/year)</li> <li>▪ Air and rail traffic volumes</li> </ul>
Change in housing availability	<ul style="list-style-type: none"> <li>▪ Housing supply and demand, including government-assisted housing</li> <li>▪ Indicators of housing affordability</li> </ul>

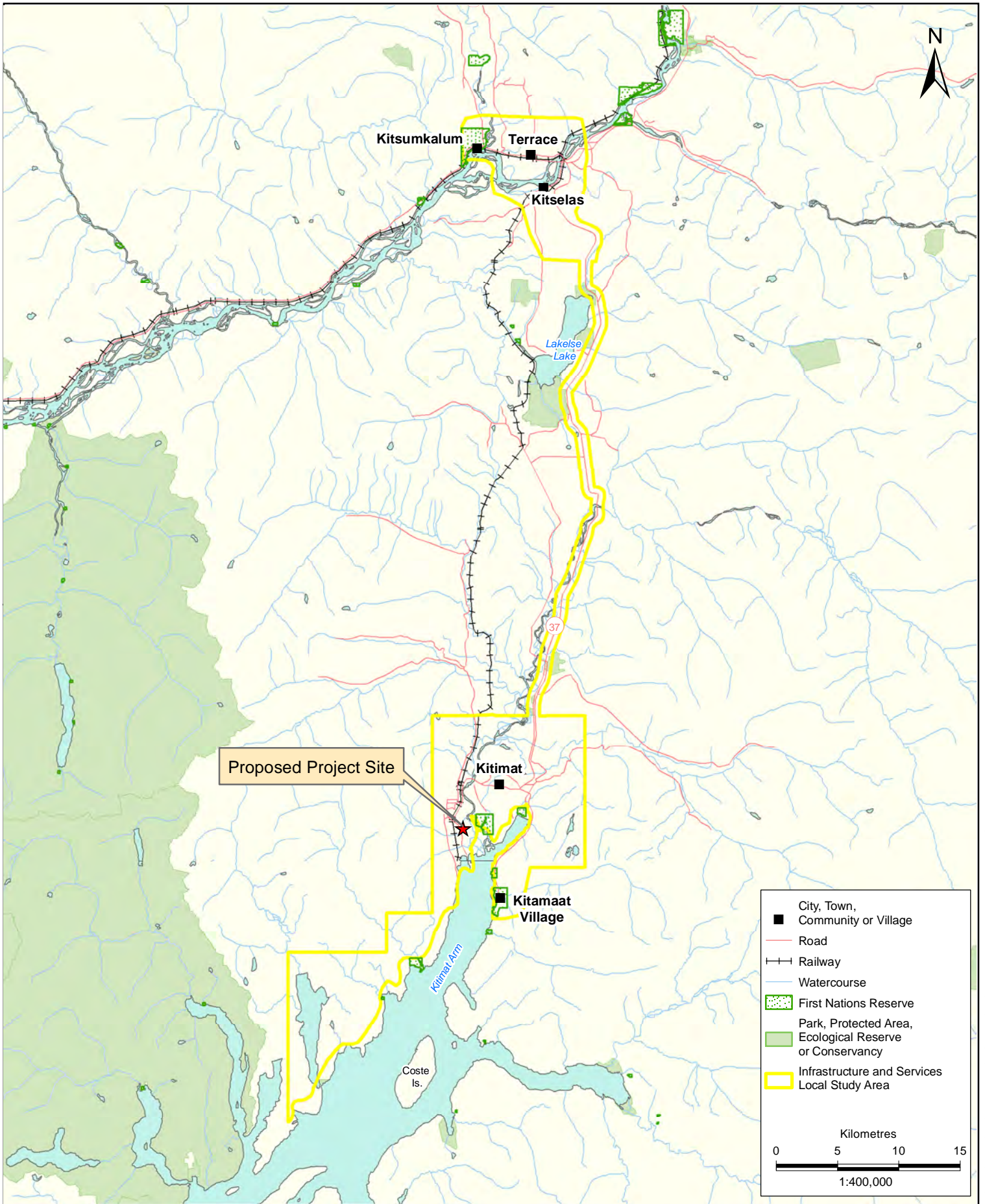
### 7.2.1.6 Boundaries

#### 7.2.1.6.1 Spatial Boundaries

The Project footprint refers to the structures required for operation of the Project and includes natural gas treatment, LNG production, storage and loading, the LNG loading line, marine terminal, and supporting infrastructure.

The LSA for assessing Project effects on infrastructure and services is shown in Figure 7.2-1. The area includes the following communities and rural areas: Kitamaat Village (Kitamaat 2 Indian Reserve [IR]), Kitsumkalum, Kitselas, Kitimat District Municipality, and the Terrace Census Agglomeration area (which includes the City of Terrace, Kitimat-Stikine E [Thornhill], and the Kulpai Indian Reserve 6). This area encompasses the potential effects of the LNG facility and associated activities, as well as demands on transportation and utility infrastructure between the City of Terrace and District of Kitimat, and the Northwest Regional Airport (Figure 7.2-1). The following Aboriginal Groups are in the LSA: Kitselas First Nations (the communities of Gitaus and Kulpai); Haisla Nation (the community of Kitamaat Village), and Kitsumkalum First Nation (the community of Kalum).

The RSA for infrastructure and services includes the RDKS, Regional District Electoral Areas [RDEA] C (Part 1 and 2) and E, and the Skeena-Queen Charlotte Regional District (SQCRD) RDEAs A and C. Because the RSA encompasses all of the LSA, it includes the transportation and utility infrastructure between the City of Terrace and District of Kitimat, as well as the Northwest Regional Airport (Figure 7.2-2). The following Aboriginal groups are in the RSA: Gitxaala Nation, Lax Kw'alaams First Nation, Gitga'at First Nation, and Metlakatla First Nation.



V:\1231\active\EM\123110458\figures\EA\section\_7.2\_infrastructure\_services\fig\_10458\_ea\_infra\_7.2-1\_infrastructure\_LSA.mxd



INFRASTRUCTURE AND SERVICES  
 ENVIRONMENTAL EFFECTS ASSESSMENT  
**INFRASTRUCTURE AND SERVICES  
 LOCAL STUDY AREA**  
 LNG CANADA EXPORT TERMINAL  
 KITIMAT, BRITISH COLUMBIA

PROJECTION	UTM9	DRAWN BY	SHS
DATUM	NAD 83	CHECKED BY	SW
DATE	08-MAY-14	FIGURE NO.	<b>7.2-1</b>

PROJECTION	UTM9	DRAWN BY	SHS
DATUM	NAD 83	CHECKED BY	SW
DATE	08-MAY-14	FIGURE NO.	<b>7.2-1</b>

5/8/2014 - 9:41:41 AM



V:\1231\active\EM\123110458\gis\figures\EA\section\_7.2\_infrastructure\_services\fig\_10458\_ea\_infra\_7.2-2\_infrastructure\_RSA.mxd



INFRASTRUCTURE AND SERVICES  
 ENVIRONMENTAL EFFECTS ASSESSMENT  
**INFRASTRUCTURE AND SERVICES  
 REGIONAL STUDY AREA**  
 LNG CANADA EXPORT TERMINAL  
 KITIMAT, BRITISH COLUMBIA

PROJECTION	UTM9	DRAWN BY	SHS
DATUM	NAD 83	CHECKED BY	SW
DATE	08-MAY-14	FIGURE NO.	<b>7.2-2</b>

5/8/2014 - 11:30:56 AM

#### **7.2.1.6.2 Temporal Boundaries**

Based on the current Project schedule, the temporal boundaries for infrastructure and services are:

- construction, Phase 1 (trains 1 and 2) to be completed approximately five to six years following issuance of permits, the subsequent phase(s) (trains 3, 4) to be determined based on market demand
- operation, minimum of 25 years after commissioning, and
- decommissioning, approximately two years at the end of the Project life.

#### **7.2.1.6.3 Administrative and Technical Boundaries**

Administrative boundaries consist of the census tracts in the RDKS Area C (Part 1 and 2) and E, and the SQCRD, Areas A and C.

Technical boundaries reflect data suppression and rounding by Statistics Canada to maintain confidentiality of smaller data sets, particularly those for Aboriginal communities. Prior to 2011, Statistics Canada used both a long- and short-form census to collect statistical information. In 2011, the short-form census remained mandatory, but the long-form census was replaced with the National Household Survey (NHS), which was made voluntary. For some census subdivisions, the resulting response rates for the NHS were so low that many of the detailed socio-economic data used for analytical and statistical analysis were not released. In addition, NHS data for small communities may be suppressed for confidentiality reasons. For the RSA, the entire area of the RDKS and SQCRD was used to assess demographic and socio-economic related data given data suppression and confidentiality issues.

Data on road traffic volume are limited temporally and spatially. MOTI provided data for provincial highways, but there have been few recent or comprehensive traffic counts on local roads in the LSA, and temporal or spatial extrapolation was necessary. Similarly, recent data on railway use are not publicly available. A short field program was undertaken to obtain information on rail movements at several road intersections in the LSA.

#### **7.2.1.7 Residual Effects Description Criteria**

The criteria used to characterize residual effects on infrastructure and services are described in Table 7.2-2.

**Table 7.2-2: Characterization of Residual Effects for Infrastructure and Services**

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
<b>Characterization of Residual Effects</b>		
Magnitude	The expected size or severity of a residual effect. Low magnitude effects may have negligible to little effect, while high magnitude effects may have a substantial effect.	<p><b>Negligible</b>—No detectable or measurable change in use of, or access to, infrastructure and services from baseline conditions.</p> <p><b>Low</b>—Measurable effect on use of, or access to, infrastructure and services, but on scale that it is within the current available capacity and will not affect the quality of service provided.</p> <p><b>Moderate</b>—A measurable effect on a scale that nears the available capacity and may affect the viability or displace public access to or use of infrastructure and services.</p> <p><b>High</b>: A measurable effect on a scale that will either affect the viability or displace public use of infrastructure and services.</p>
Geographic Extent	The spatial scale over which the residual effects of the Project are expected to occur. The geographic extent of effects can be local or regional.	<p><b>Project footprint</b> —residual effects are restricted to the LNG facility.</p> <p><b>LSA</b>—residual effects occur in LSA.</p> <p><b>RSA</b>—residual effects extend into the RSA.</p>
Duration	The length of time the residual effect persists. The duration of an effect can be short term or longer term.	<p><b>Short-term</b>—residual effect is restricted to the construction phase.</p> <p><b>Medium-term</b>—residual effect extends through the life of the Project.</p> <p><b>Long-term</b>—residual effect extends beyond Project decommissioning.</p>
Frequency	How often the effect occurs. The frequency of an effect can be frequent or infrequent. Short term and/or infrequent effects may have a lower effect than long term and/or infrequent effects.	<p><b>Single event</b>—occurs once.</p> <p><b>Multiple irregular event</b>—occurs sporadically at irregular intervals throughout construction, operation or decommissioning phases.</p> <p><b>Multiple regular event</b>—occurs on a regular basis and at regular intervals throughout construction, operation, or decommissioning phases.</p> <p><b>Continuous</b>—occurs continuously throughout the life of the Project.</p>
Reversibility	Whether or not the residual effect on the VC can be reversed once the physical work or activity causing the disturbance ceases. Effects can be reversible or permanent. Reversible effects may have lower effect than irreversible or permanent effects.	<p><b>Reversible</b>—residual effect will no longer occur after Project closure and reclamation (or sooner)</p> <p><b>Irreversible</b>—residual effect is irreversible after closure of the Project (i.e., permanent).</p>
Context	Refers primarily to the sensitivity and resilience of the VC. 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 information about the impact of natural and human-caused trends on the condition of the VC.	<p><b>Low resilience</b>—infrastructure and services have little available capacity or low quality of service, and are unable to accommodate changes.</p> <p><b>Moderate resilience</b>—infrastructure and services are able to accommodate changes, but with some impacts to available capacity</p> <p><b>High resilience</b>—high capacity for infrastructure and services are well developed and able to accommodate changes without impacts to available capacity or quality of service.</p>



Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
<b>Likelihood of Residual Effects</b>		
Likelihood	Whether or not a residual effect is likely to occur	<p><b>Low</b>—low likelihood that there will be a residual effect.</p> <p><b>Medium</b>—moderate likelihood that there will be a residual effect.</p> <p><b>High</b>—high likelihood that there will be a residual effect.</p>

### 7.2.1.8 Significance Thresholds for Residual Effects

An adverse residual effect is considered significant if, after mitigation, any of the following occur:

- a service or infrastructure capacity is unable to cope with the added demand caused by the Project or
- there is a substantial and persistent decrease in quality of service within local communities, or
- local, regional, or provincial governments need to increase taxation rates or reduce spending in other areas of responsibility to meet public infrastructure or service needs associated with the Project.

## 7.2.2 Baseline Conditions

### 7.2.2.1 Baseline Data Sources

Baseline information was obtained from published reports, statistical information sources, academic literature and other quantitative and qualitative data sources. Where applicable, key informant interviews with representatives from appropriate government departments and agencies (municipal, provincial, and federal), Aboriginal Groups and other organizations (e.g., Kitimat Valley Rod and Gun Association, Terrace Economic Development Authority, Kitimat Housing Committee) were used to confirm secondary sources and fill information gaps (Table 7.2-3).

**Table 7.2-3: Infrastructure and Services Research Methods**

Social Environment Baseline	
Component	Data and Approach
Demographics	Census and NHS data, BC Stats current and forecast population estimates Data from regional districts Aboriginal Affairs and Northern Development Canada (AANDC) Indian Register data
Social and Government Services	Regional and municipal government data sources, secondary literature, AANDC and Aboriginal Group's websites

<b>Social Environment Baseline</b>	
<b>Component</b>	<b>Data and Approach</b>
Education	The student/educator ratio and provincial classroom size standards (Statistics Canada 2011) Ministry of Education capacity utilization rate (Coast Mountains School District 2011) Interviews with local daycare service authorities and Northern Health Public Health Protection 2012-2013 surveys and reports BC enrolment and capacity standards for daycare services (Ministry of Children and Family Development 2009; Community Care and Assisted Living Act 2013).
Housing and Accommodation	Census and NHS, BC Housing, and Canada Mortgage and Housing Corporation (CHMC) data (spring 2007-2013 and fall surveys 2000-2013, Housing in Canada Online 2014) Data on building permits, local Multiple Listing Service listings and rental listings, BC Stats (housing starts, value and units) BC Northern Real Estate Board News Releases 2005-2013 Local area community and development plans Key one-on-one interviews with municipal staff and community members from Kitimat, Terrace, Thornhill, Kitselas, and Kitamaat Village
Transportation	MOTI traffic count data for provincial highways Consultant reports for local road traffic data and analysis ICBC traffic collision data Transportation service provider websites Interviews with key informants to determine current use, capacity, and to identify key issues
Community Services Infrastructure	Local community planning documents, community investment profiles, and key one-on-one interviews with service providers to confirm numbers regarding water, sewer, waste, recycling, and communication data.
Emergency and Protection Services	Local community planning documents and emergency response plans Key one-on-one interviews with service providers in the LSA (ambulance, fire protection, and emergency response) Ministry of Justice (2013), 2010-2012 crime statistics by region
Recreation and Tourism	Local community planning documents One-on-one interviews with service providers, community centres, and tourism professionals in the LSA

### 7.2.2.1.1 Primary Research

LNG Canada undertook primary research activities to determine data gaps, verify baseline information, and provide an opportunity for Aboriginal and stakeholder input. The primary research methods included: key informant interviews (in-person and by telephone), focus groups and workshops, and surveys. A field program was undertaken to obtain information about crossing frequency and delay times at road-rail intersections. LNG Canada also undertook socio-economic research collaboratively with Haisla Nation and Kitselas First Nation with the assistance of community researchers. Primary research was also

undertaken by Gitga'at First Nation, Gitxaala Nation, and Kitsumkalum First Nation, and the results are incorporated into the assessment<sup>1</sup>.

## 7.2.2.2 Baseline Overview

### 7.2.2.2.1 Population

In 2011, the total population of the RSA was approximately 56,160; of this, 24,925 people resided in the LSA (Table 7.2-4). The largest population centre in the LSA was the Terrace census agglomeration (CA), with a population of 15,545, which accounted for 41.6% of the total population. The second largest population centre in the LSA was Kitimat DM with a population of 8,335 (Statistics Canada 2012a). Among the three IRs in the LSA, Kitamaat 2 IR was the most populous, with about 510 residents (Statistics Canada 2012c).

Compared with the median age of the population of BC (41.9 years), populations in the RSA were slightly younger, with the median ages of residents of RDKS and SQCRD being 40.3 and 39.9, respectively. In the LSA, the proportion of the population aged 15 years and older was greater than 80%, with the exception of Kitselas 1 and Kitsumkalum. There were slightly more males than females in the RSA (Figure 7.2-3a-g) (Statistics Canada 2012a–2012g).

**Table 7.2-4: Gender Characteristics in the LSA and RSA**

Population Segment	Total Population	Median Age	Male		Female	
			Total	Percent	Total	Percent
Kitimat, DM	8,345	44.4	4,290	51.4	4,050	48.5
Terrace, CA	15,545	39.2	7,705	49.6	7,855	50.5
Kitamaat 2 IR	515	43.6	265	51.5	240	46.6
Kitselas 1 IR	225	26.8	100	44.4	145	64.4
Kitsumkaylum 1 IR <sup>2</sup>	295	32	150	50.8	140	47.5
Kitimat-Stikine, RD	37,370	40.3	19,045	51.0	18,325	49.0
Skeena-Queen Charlotte, RD	18,790	39.9	9,505	50.6	9,275	49.4
BC	4,400,055	41.9	2,156,600	49	2,243,455	51

**SOURCE:** Statistics Canada (2012a; 2012b; 2012c; 2012d; 2012e; 2012f; 2012g)

<sup>1</sup> At Application submission, results have yet to be received from all First Nations communities mentioned here. This statement will be amended if expected information from Gitga'at First Nation is not provided.

<sup>2</sup> “Kitsumkaylum 1 IR” refers to the primary reserve community of the Kitsumkalum First Nation. Data from Statistics Canada does not follow normal or preferred Aboriginal Group naming conventions. Therefore, where data is being referenced from the NHS or Census in the discussion of the Kitsumkalum First Nation “Kitsumkaylum 1 IR” (Indian Reserve) is used. Where other socio-economic data is being discussed or in reference to Aboriginal Groups the proper naming convention of “Kitsumkalum First Nation” (alt. “Kitsumkalum”) is used.

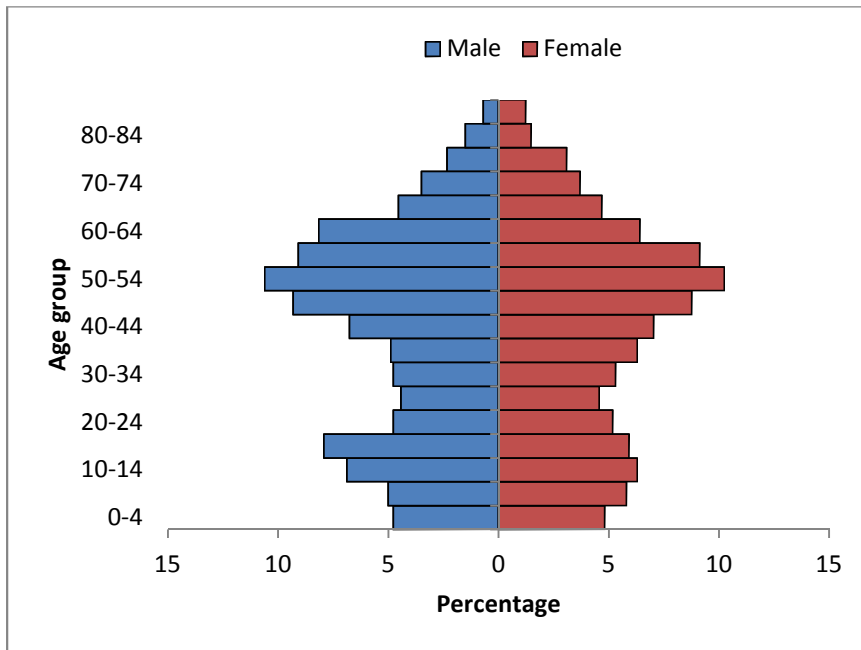


Figure 7.2-3a: Population Characteristics of Kitimat, District Municipality, 2011

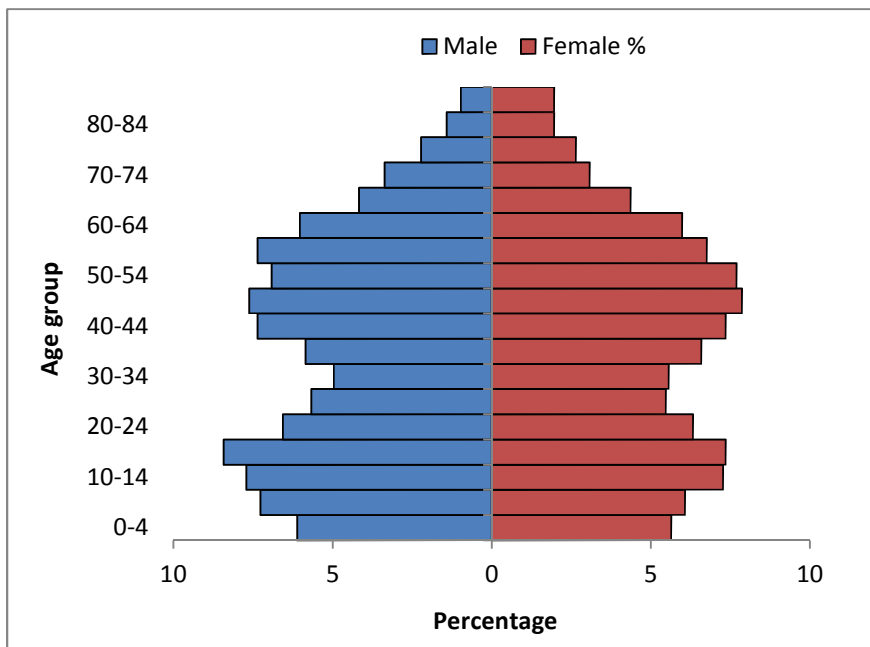


Figure 7.2-3b: Population Characteristics of Terrace, Census Agglomeration, 2011

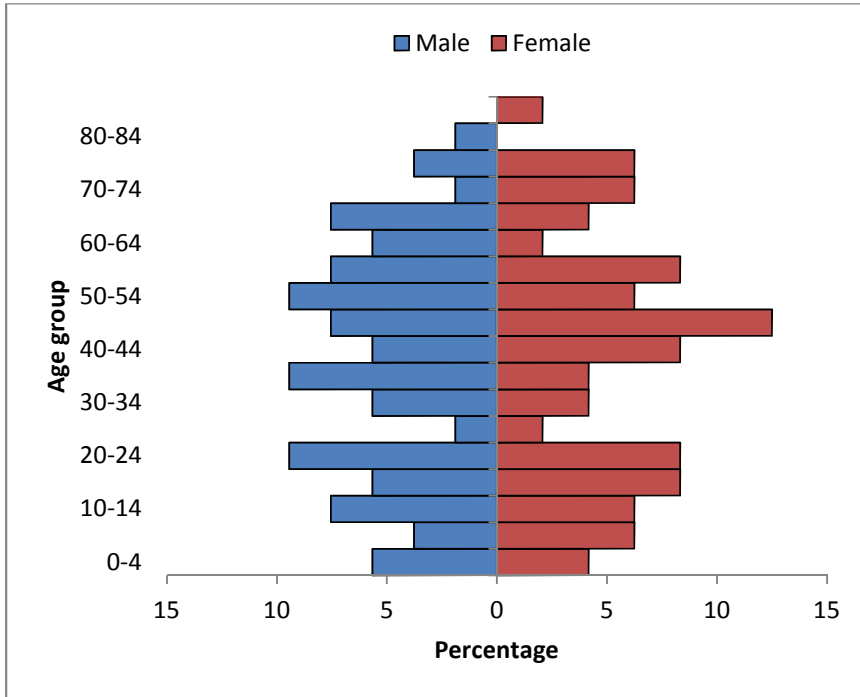


Figure 7.2-3c: Population Characteristics of Kitamaat 2 IR, 2011

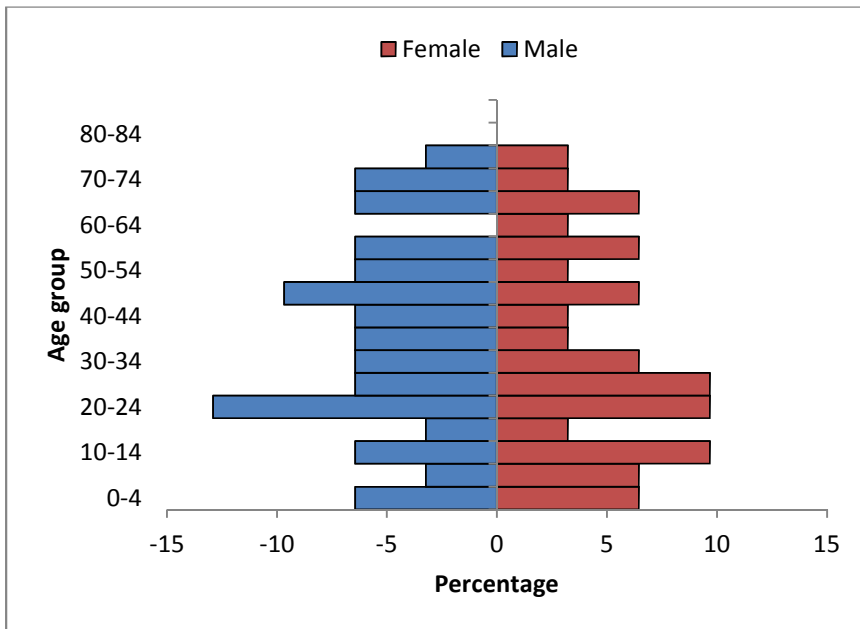


Figure 7.2-3d: Population Characteristics of Kitsumkaylum 1 IR, 2011

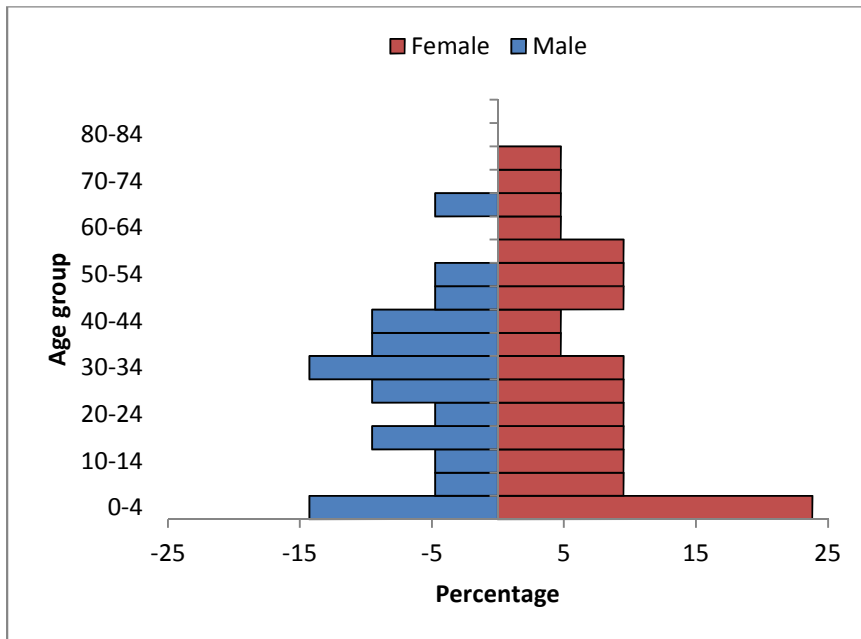


Figure 7.2-3e: Population Characteristics of Kitselas 1 IR, 2011

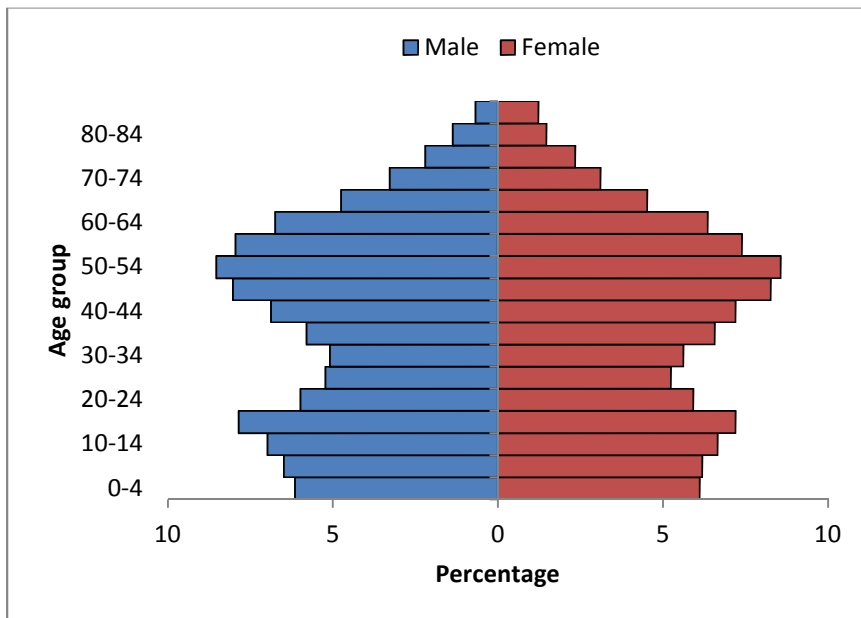


Figure 7.2-3f: Population Characteristics of Kitimat-Stikine Regional District, 2011

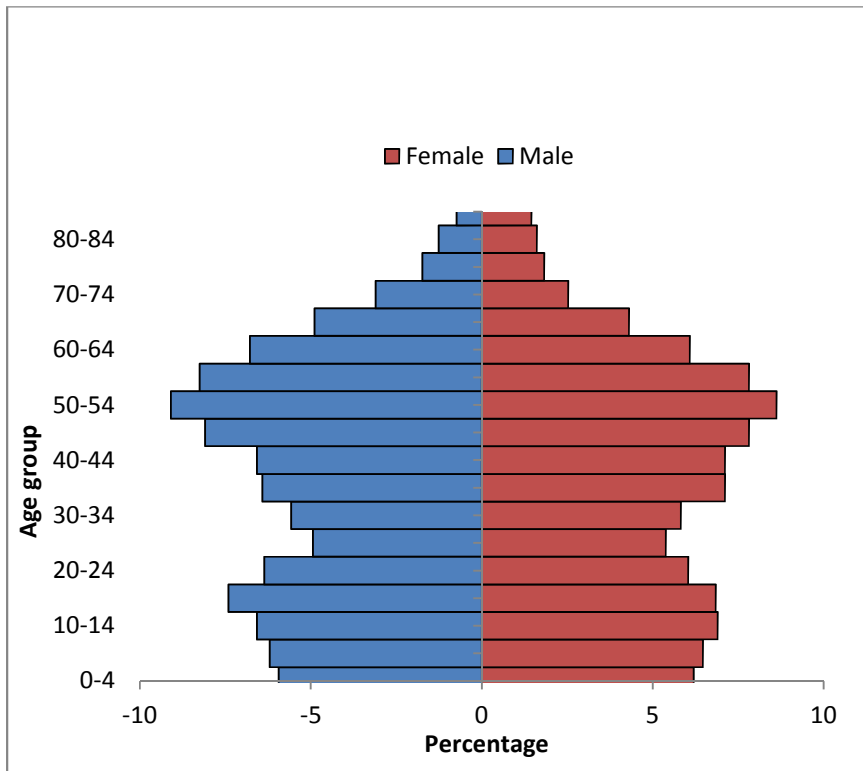


Figure 7.2-3g: Population Characteristics of Skeena-Queen Charlotte Regional District, 2011

#### 7.2.2.2.2 Historical Population Change

According to Census figures, the populations of Kitimat, Terrace, and the RDKS and SQCRD decreased between 2006 and 2011 (Table 7.2-5). In the LSA, the largest decline occurred in Terrace CA where the population fell by 16.4%. Kitimaat 2 IR experienced no change, while, contrary to regional trends, according to Census data, the populations of Kitselas 1 IR and Kitsumkaylum 1 IR increased 188.5% and 18.0%, respectively. The apparent substantial change in population in Kitselas 1 IR between 2006 to 2011 could be partly attributed to differences in response rates between the two censuses (see Table 7.2-5).

Historical population trends indicate a cyclical character to population change in the LSA community of Kitimat and the RDKS and SQCRD. Between 1986 and 2011, they experienced periods of population growth interrupted by episodes of population contraction between 1996 and 2001 and again between 2006 and 2011 (Table 7.2-5).

**Table 7.2-5: Population Information for the LSA and Regional Districts of Kitimat-Stikine and Skeena-Queen Charlotte, 2001–2011**

	Community	Population 2001	Population 2006	Population 2011	Population Change 2001 – 2011 (%)
<b>LSA</b>	Kitimat, DM	10,285	8,987	8,335	-19.0
	Terrace, CA	19,980	18,585	15,545	-22.2
	Kitamaat 2 IR	511	510	510	-0.2
	Kitselas 1 IR <sup>a</sup>	NA	78	225	NA
	Kitsumkalum 1 IR	265	250	295	11.3
<b>RSA</b>	Kitimat-Stikine, RD	40,876	38,476	37,370	-8.6
	Skeena-Queen Charlotte, RD	21,695	19,665	18,790	-13.4

**NOTES:**<sup>a</sup> In 2006 the short form census questionnaire indicates a global non response rate higher than or equal to 25% (suppressed) for Kitselas 1 IR. However, in 2011 the short form census questionnaire indicates a global non response rate higher than or equal to 5% but lower than 10%. NA - Data not available (suppressed by Statistics Canada)

**SOURCE:** Modified from Statistics Canada (2012a, 2012b, 2012c, 2012d, 2012e, 2012f, 2012g); Statistics Canada (2007a, 2007b, 2007c, 2007d, 2007e, 2007f); BC Stats (2005a, 2005b, 2005c, 2005d, 2005e); BC Stats (2001a, 2001b, 2001c, 2001d); BC Stats (no date[a], no date[b]); BC Stats (2010a, 2010b).



Census data is not available for the Terrace CA before 2001; however, the Terrace CA experienced population growth between 2001 and 2006, followed by a decline in the subsequent five years (Table 7.2-5). The three First Nation communities in the LSA do not follow the same trends in population change. The population of Kitimaat 2 declines between 1996 and 2001; it continued to decrease through 2006 before stabilizing at about 500 residents (Table 7.2-5).

#### **7.2.2.2.3 Population Mobility**

In 2006, most residents living in Kitimat, Terrace, Kitsumkaylum 1 IR, and the RDKS and SQCRD had lived at the same address the preceding year. The proportion of the population who had changed addresses within the same community ranged from 0.0% in Kitsumkaylum 1 IR to 10.1% in Terrace. Residents of the LSA communities who had moved from another municipality between 2005 and 2006 ranged from 1.5% in Kitimat to 5.2% in Kitsumkaylum 1 IR. The proportion of individuals residing in the LSA communities in 2006 who had moved from either another province or country within the preceding year was approximately 1.0% of the populations of urban communities in the LSA and the regional districts in the RSA. Of the LSA communities, Kitimat had the highest proportion of new residents who had moved from another province (1.2%) or country (0.1%). No residents of Kitsumkaylum 1 IR had moved there from outside the province over the course of the 2005-2006 year.

#### **7.2.2.2.4 Population Projections**

Regional population projections for the North Coast prepared by BC Stats forecast an average annual growth of 0.1% between 2013 and 2036, one of the lowest rates in the province and far below the average annual growth rate of 1.0% for the province as a whole (Ip and Grundlingh 2013). At the regional district level, these models forecast a growth rate of 5.8% for RDKS and 2.1% for SQCRD over the 2013 to 2036 period (BC Stats 2013b)

Although population forecasts are not available for individual communities, BC Stats has developed forecasts at the Local Health Area (LHA) level. According to these forecasts, the Terrace LHA will experience below-average growth at 2.4%, whereas the Kitimat LHA will grow 8.9% between 2013 and 2036 (BC Stats 2013a). Based on this prediction, the Kitimat LHA will surpass the estimated growth for all of the LHAs included in the LSA and RSA between 2013 and 2036 (Table 7.2-6; Figure 7.2-4).

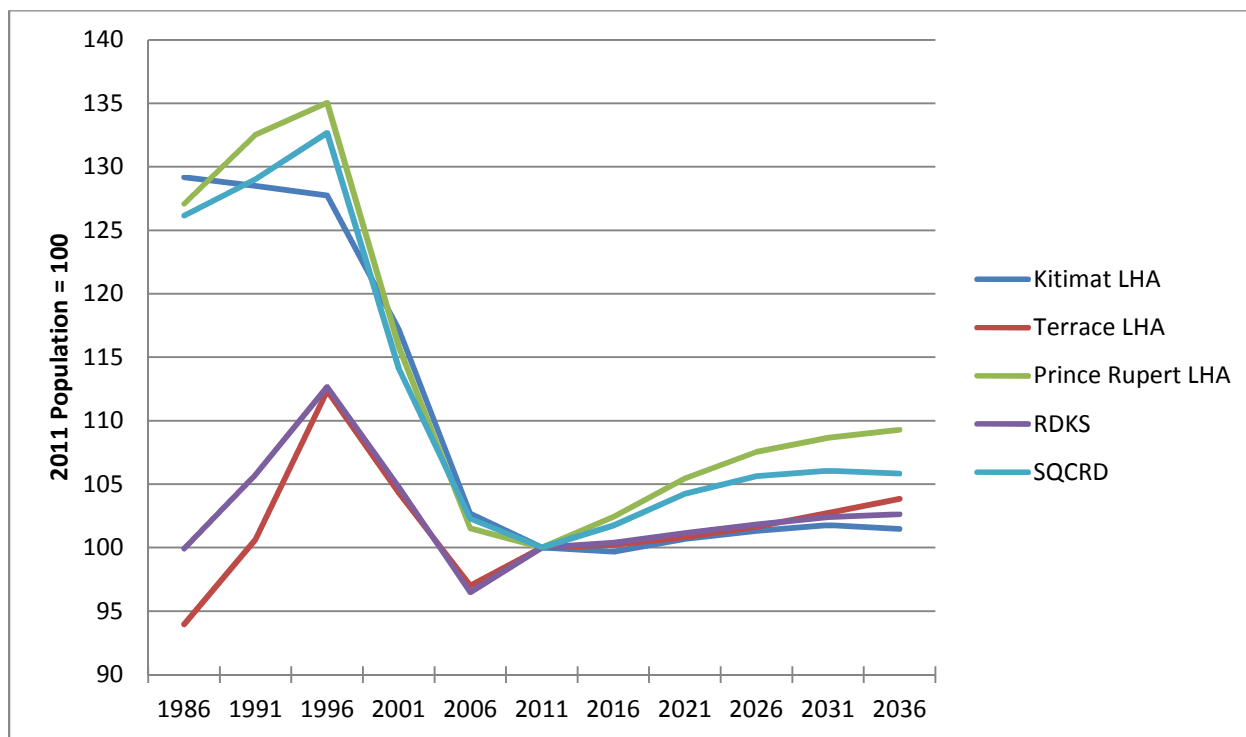
**Table 7.2-6: Population Projections for Local Health Areas in the LSA and Regional Districts, 2011 to 2036**

Year	Kitimat LHA	Terrace LHA	Prince Rupert LHA	RDSK	SQCRD
2011	10,171	20,661	14,328	40,195	19,537
2012	10,067	20,769	14,284	40,187	19,419
2013	10,081	20,935	14,384	40,419	19,539
2014	10,084	20,891	14,478	40,473	19,652
2015	10,146	20,688	14,579	40,296	19,771
2016	10,139	20,705	14,677	40,347	19,880
2017	10,161	20,723	14,769	40,421	19,990
2018	10,182	20,750	14,859	40,489	20,094
2019	10,197	20,768	14,949	40,534	20,192
2020	10,218	20,797	15,032	40,595	20,285
2021	10,241	20,831	15,109	40,660	20,368
2026	10,305	21,000	15,411	40,925	20,639
2031	10,351	21,228	15,567	41,165	20,721
2036	10,321	21,453	15,659	41,253	20,679
Percent change in population 2013-2036	8.9	2.4	2.5	5.8	2.1

**NOTES:**

Data for Kitimaat 2 and Kitselas 1 was not available.

**SOURCE:** BC Stats 2013a



SOURCE: BC Stats 2013a

Figure 7.2-4: Population Projections in the LSA and RSA

**Effects of Rio Tinto Kitimat Modernization Project on Population in Kitimat**

Historically, the population of Kitimat has been strongly correlated with the workforce employed at the RTA facility. A population forecast prepared by the District of Kitimat shows that a change in RTA workforce by one person results in a change in the Kitimat population by 3.75 persons (District of Kitimat 2014a). As of December 31, 2012, RTA employed 1,204 workers at its Kitimat operation (RTA 2013). With the completion of the RTA Kitimat Modernization Project (KMP) in 2015, RTA’s workforce requirements are estimated at 1,000 individuals (RTA 2011). The forecast reduction in workforce attributable to the KMP has been incorporated into the baseline population forecast in assessment of population change in the LSA (Section 7.2.5.2).

**In- and out-migration in Kitimat-Stikine Regional District**

Figure 7.2-5 illustrates the net migration trends in the RDKS from 1985 to 2012. Since 1998 there has been an overall net migration out of the RDKS, with approximately two-thirds of migrants moving elsewhere in the province, and most of the rest moving elsewhere in Canada.



SOURCE: BC Stats (2013c)

**Figure 7.2-5: Net Migration in Kitimat Stikine Regional District, 1985 to 2012**

### Aboriginal Population

The Aboriginal population in the RSA is composed of members of Gitga’at First Nation, Gitxaala Nation, Lax Kw’alaams First Nation, and Metlakatla First Nation (Table 7.2-7). Aboriginal populations in the LSA include Haisla Nation, Kitselas First Nation, and Kitsumkalum First Nation. In 2012, the total population for these Aboriginal Groups was 10,066 (Indian Register 2012). Of this, approximately 19% lived on reserves, primarily on their own band’s reserves. For all Aboriginal Groups considered, more than half of the registered population in 2012 lived off-reserve.

Among the Aboriginal Groups in the LSA, Haisla Nation had the largest registered population with 1,741 members, and Kitselas First Nation had the smallest registered population with 591 members (Indian Register 2012). Kitselas First Nation had the largest proportion (46.4%) of its registered population living on-reserve, and Kitsumkalum First Nation had the smallest proportion (33.7%) of its registered population living on-reserve (Indian Register 2012).

**Table 7.2-7: Population Affiliated with Aboriginal Groups in the RSA and LSA by Residency, 2012**

Aboriginal Group	Total			On-Reserve		On Crown Land		Off-Reserve	
	Total	Male	Female	Total	Percent	Total	Percent	Total	Percent
<b>RSA</b>									
Gitga'at	729	348	381	146	20.0	0	0.0	583	80.0
Gitxaala	1,863	901	962	459	24.6	0	0.0	1,404	75.4
Lax Kw'alaams	3,575	1,794	1,781	NA	NA	NA	NA	2,835	79.3
Metlakatla	855	405	450	95	11.1	0	0.0	760	88.9
<b>LSA</b>									
Haisla	1,741	860	881	668	38.4	0	0.0	1,073	61.6
Kitselas	591	270	321	274	46.4	0	0.0	317	53.6
Kitsumkalum	712	349	363	240	33.7	0	0.0	472	66.3

**NOTE:**

NA - Data not available. Data suppressed by the Indian Register.

**SOURCE:** Indian Register 2012

**7.2.2.2.5 Governance**

**Regional Governance**

Two regional districts are located in the RSA: RDKS and SQCRD (RDEAs A and C). The RDKS and SQCRD provide various local government services to northwestern BC, including rural land use planning, community water systems, fire protection, library services, transportation, and engineering.

Two municipal governments operate in the LSA: the District of Kitimat and the City of Terrace. A mayor and council are elected as representatives for each community and are accountable for filling the responsibilities outlined by the *Community Charter* (Part 5, Division 1. SBC 2003 [Queens Printer 2013]). The District of Kitimat and the City of Terrace provide various community services generally associated with: administration, community development and planning, economic development, public works and engineering, finance, emergency response, fire rescue, and leisure services.

Three Aboriginal Groups are located in the LSA: Haisla Nation (Kitamaat Village), Kitselas First Nation (Gitaus and Kulspai), and Kitsumkalum First Nation (Kalum). The chief and council of each Aboriginal Group are responsible for providing municipal services, such as social, education, and community-development programs. A full description of Haisla Nation, Kitselas First Nation and Kitsumkalum First Nation Indian Reserves (including their location and size) are further discussed in Section 13.1.

### **Official Community Plans**

Every local government in BC must adopt an OCP following the *BC Local Government Act* (Part 26). OCPs provide a statement of objectives and policies and are used to guide municipal government planning and manage land use for the future. The District of Kitimat's current OCP outlines how the community will physically and socially develop over 20 years to 2027 (District of Kitimat 2008 [amended 2013]). OCP's are typically reviewed and updated every five to ten years. Policies and objectives in the following areas are used to guide the community's development: Cultivate Diversified Economic Growth; Enhance 'Sense of Place'; Maximize Liveability; Protect the Natural Environment; Foster Effective Services; and Meet Responsibilities of Governance (District of Kitimat 2008 [amended 2013]). Like Kitimat, the City of Terrace has an OCP, which outlines policies and objectives to guide its growth, in this case over a 41-year period to 2050 (City of Terrace 2009).

#### **7.2.2.2.6 Utilities**

##### **Water**

Water and sewer distribution and treatment are provided by municipalities, regional districts, First Nations, individual water licences and wells, and single owner septic systems. In the LSA, Kitimat and Terrace both have water rated capacity above their current peak demand, and sewer capacity at or above their rated capacity (Table 7.2-8). Increase in demand for water volume by current or new users would require upgrades to the Kitimat Service Centre lift station (Sussbauer 2013, pers. comm.). In 2009, Terrace upgraded its water infrastructure to increase the system's existing capacity. No upgrades are currently scheduled because the system is considered capable of meeting the city's requirements given regular maintenance (Stantec 2014). Water is supplied to Kitimaat Village from Wathl Creek and is distributed to the community via gravity fed pipes (Powell 2014). Water is typically trucked in to Kitselas First Nation communities of Gitaus and Kulspai. Kitsumkalum First Nation receives its water from City of Terrace (Crossroads 2014).

##### **Sewer**

The District of Kitimat, City of Terrace, and RDKS have noted that they have the ability to expand their sewage infrastructure systems, but no expansions are currently planned for Kitimat or Terrace (Stantec 2014). As of 2010, the RDKS initiated an environmental assessment application to expand sewer services to residents of Lakelse Lake and Jackpine Flats (Cambria Gordon 2013). The District of Kitimat provides secondary treatment for domestic sewage, wastewater, and storm runoff, and the existing facilities have unused capacity for some future population growth, except in the case of work camps over 500 people (Stantec 2013). The City of Terrace sewage treatment system includes two cell aerated

lagoon facilities, which have been upgraded several times, most recently in 2006, and the system has sufficient capacity for a population of 20,000 (The City of Terrace 2011).

The Kitimaat Village sewer system was built in 1996 and has capacity for up to 800 people. The sewer system is gravity-fed and the wastewater treatment facility sludge is pumped out by Norco Septic at least every four to six months and disposed of at the Kitimat Municipal Dump (Powell 2013). Kitsumkalum and Kitselas First Nations also operate sewage and wastewater treatment facilities. The RDKS owns and operates three water/sewer systems in the LSA. Individual properties in this system rely on septic tanks, where the effluent is pumped into a community collection system, and it is treated at a municipal dump or sewage facility (Regional District of Kitimat-Stikine no date[a]).

**Table 7.2-8: Sewage and Wastewater Treatment**

Service Provider	Rated Capacity <sup>1</sup> (Mgd)	Average Daily Demand <sup>2</sup> (Mgd)	Peak Demand <sup>3</sup> (Mgd)
<b>Water</b>			
District of Kitimat	4	1.7	3.2
Terrace Area	5.0	2.4	4.8
<b>Sewage</b>			
District of Kitimat	10.2	2.1	10.2
Terrace Area	5.34	1.19	3.17

**SOURCES:** Terrace Economic Development Authority (2010); District of Kitimat (2012a), Sussbauer 2013, pers. comm.

**NOTES:**

Information on the rated capacity, average daily demand and peak demand of sewage and wastewater was not available for the primary reserve communities of Haisla Nation, Kitselas First Nation or Kitsumkalum First Nation.

Mgd = million gallons/day

<sup>1</sup> Rated capacity = intended technical capacity of facility

<sup>2</sup> Average daily demand = typical daily demand

<sup>3</sup> Peak demand = high demand point

**7.2.2.2.7 Garbage Collection and Disposal and Recycling Facilities**

***Waste Management Facilities***

Waste capacity varies by landfill in the RSA (Table 7.2-9). Kitimat has one landfill (the Kitimat Landfill), which has an assessed life of 30 years from 2013 based on the average amount of waste disposal for a population of 8,000 to 9,000 (Towse 2013, pers. comm.). The Terrace area has two landfills, the City of Terrace Landfill and the Thornhill Landfill. The former has an assessed capacity of approximately five years, and the latter is considered to be at or near capacity (Irwin 2013, pers. comm.). However, the RDKS has plans to open a new landfill in 2016 (Forceman Ridge Landfill), which would make the

Thornhill Landfill a transfer station and expand the overall waste capacity to 50+ years for Terrace-area residents.

The landfills in the LSA take domestic waste but do not accept industrial or hazardous waste. In the RSA, there are four licensed hazardous waste haulers. There are no known hazardous waste disposal sites other than those managed and owned on private industrial lands (Towse 2013, pers. comm.). Waste disposal at the Kitimat Landfill has increased by 30% to 40% in the past five years (2008-2013), especially between 2011 and 2013 (Towse 2013, pers. comm.). This is attributed to housing renovations and rental market speculation in Kitimat. Kitimat and Terrace both have recycling programs; however, some of them, such as KUTE (Kitimat Understanding the Environment), are under pressure to deal with increased amounts of recyclable material (Towse 2013, pers. comm.).

Haisla Nation and Kitselas First Nation provide collection services through curbside pickup of garbage (Haisla Nation no date[a]; Erickson 2013, pers. comm.). Garbage collection and disposal for Kitsumkalum First Nation has not been identified.

**Table 7.2-9: Landfill Capacity**

Facility	Owner	Landfill Capacity (at current rate – Fall 2013)	Plans for Upgrades	Population Served	Total Waste Disposed/year
Kitimat Landfill	District of Kitimat	30 years	No	8,000–9,000	NA
Terrace Landfill	City of Terrace	± 5 years	No	NA	NA
Thornhill Landfill	RDKS	Nearing capacity	To become transfer site	NA	NA
Forceman Ridge Landfill	RDKS	Minimum of 50 years	Proposed to open 2016	20,000 for 50 years	up to 955,600 tonnes

**NOTES:**

NA - Baseline data were not available

**SOURCE:** District of Kitimat (2009); Terrace Economic Development Authority (2010); District of Kitimat (2012); Regional District of Kitimat-Stikine (2012); District of Kitimat (2013c); Stantec (2013); Lakelse Landfill Concerns (no date)

**Energy and Utilities**

Communities in the LSA are served by two different power suppliers: BC Hydro (electric) and Pacific Northern Gas (natural gas) (Table 7.2-10) (Terrace Economic Development Authority 2010). With construction of the Northwest Transmission Line (2009 to 2013), utility power has been made available to areas within the RSA north of Terrace (BC Hydro 2014).



**Table 7.2-10: Energy Source and Use**

<b>Provider</b>	<b>Source</b>	<b>Area Served</b>	<b>Customer</b>
BC Hydro	Electric	94% of BC	Residential, business, commercial, industrial
Pacific Northern Gas	Natural Gas	Vanderhoof to Prince Rupert/Kitimat Area	Small Industrial (RS 5)

**SOURCE:** Terrace Economic Development Authority (2010); Trade and Invest British Columbia (no date)

#### **7.2.2.2.8 Communications Infrastructure**

There are three major telephone, internet, cable, and cellular providers in the RSA: TELUS, Rogers, and City West. Coverage includes the City of Terrace and District of Kitimat in the LSA, and the City of Prince Rupert and District of Port Edward in the RSA. Aboriginal communities in the LSA have limited reliable internet service (Erickson 2014, pers. comm.; Wilson 2014, pers. comm.).

#### **7.2.2.2.9 Education and Daycare Services**

##### ***Education***

The Coast Mountains School District (CMSD) # 82 is responsible for providing educational services to the Kitimat and Terrace area. The BC First Nations Schools Association, in association with Aboriginal Group's offices, provides education services to Haisla Nation, Kitselas First Nation, and Kitsumkalum First Nation (Haisla Nation 2013; FNSA 2013).

The LSA has 19 schools (private and public) of which nine are K-7, two are K-12, four are Grades 7-12, and two each are K-3 and Grades 3-6. Kitamaat Village has one school, the Haisla Community School, which provides K-7 education. Kitamaat Village high school students commute to Kitimat. Students from Kitselas and Kitsumkalum First Nations commute to schools in Terrace. Kitselas and Kitsumkalum First Nations also operate adult education programs; the Na aksa Gila Kyew Learning Centre (Kitsumkalum First Nation) and the Wabsuwilaks'm Gitselasu Adult School (Kitselas First Nation).

The average student to educator ratio for the LSA is 14.7 compared with a provincial average of 16.2 (Stantec 2014). In 2012, Kitimat had an average student to educator ratio of 11.4, whereas Terrace ranked similar to the provincial average (Stantec 2014). School infrastructure needs are assessed using the Ministry of Education's capacity utilization rate, which compares the percentage of occupancy to building capacity (Coast Mountains School District 2011). In 2010, the Ministry of Education reported the

total capacity utilization rate of Coast Mountains School District #82 as 61.8%, lower than the Ministry's target of 95%<sup>3</sup>.

### ***Daycare***

In the LSA, there are 10 licensed childcare facilities, and six pre-kindergarten facilities, of which one each is located in the three Aboriginal communities (Stantec 2014). Surveys completed in 2012 and 2013 show all licensed preschool and childcare facilities in Kitimat and Terrace to be at or over capacity (NHPHP 2012-2013a; 2012-2013b; 2012-2013c). Capacity rates are determined by the Ministry of Health's Child Care Licensing Regulations, which consider the number and education of staff needed, the age of child being cared for, and the size of a group of children (Community Care and Assisted Living Act 2013). Childcare challenges in the LSA include a need for additional early childhood education practitioners, staff turnover because of non-competitive wages, and the need for more facilities for children at the age mothers return to work and before and after school care (Mentiero 2013, pers. comm.).

#### **7.2.2.2.10 Emergency and Protective Services**

##### ***Ambulance Services***

Ambulance services are provided by the British Columbia Ambulance Service (BCAS) for Terrace, Kitimat and other communities in the Skeena District BCAS region. Between 2007 and 2012, the District of Kitimat Fire and Rescue Services Department (which provides pre-hospital emergency care for Kitimat through contract with the BCAS) had an increase in the annual average number of calls; except for 2011 which experienced a minor decrease (District of Kitimat 2012b). In 2012, the Department responded to 846 ambulance calls (70.5 calls per month), which was consistent with the rate for the previous five years (except 2011) (District of Kitimat 2012b). Between 2012 and 2013, the total call volume for the region was estimated at 3,400 calls, but this is expected to increase to more than 5,000 for 2014–2015 (Parks 2013, pers. comm.).

Between 2012 and 2013, the region faced a variety of challenges, including increased call volumes, pressure on service resources, competition with industry for staff, and an overall change in call types (e.g., more motor vehicle accidents and drug- and alcohol-related incidents) (Parks 2013, pers. comm.). Compared with Terrace, Kitimat is somewhat better able to accommodate increased demand because employees are employed full time, allowing for more stability and less competition from resource industry sector jobs (Bossence 2013, pers. comm.; Parks 2013, pers. comm.). The LSA is under increasing

---

<sup>3</sup> Gitxaala Nation (included in the RSA) has identified that from September 2012 to June 2013 there were 74 students enrolled in the Lach Klan School and that in the past five years (from 2013) the enrollment of students has dropped. It was also noted that the school is currently meeting the spatial capacity needs of students.

pressure to provide ambulance services and has overall limited capacity to counter increased demands without considering staff resources and service quality.

### ***Fire Protection***

Most fire departments in the LSA depend on part-time staff and volunteers (Stantec 2014). However, the Kitimat Fire Department is staffed only by full-time members (Bossence 2013, pers. comm.). In 2012, the Terrace Fire Department logged approximately 40,600 hours for 25 volunteer firefighters and eight career firefighters (City of Terrace 2012). As of fall 2013, the Terrace and Thornhill fire departments had enough volunteer hours to meet community needs (Boehm 2013, pers. comm.; Klie 2013, pers. comm.). Smaller communities such as Kitamaat Village have between 15 to 20 volunteer firefighters but often only seven to 10 are available because of work schedules (Grant 2013, pers. comm.). Kitsumkalum and Kitselas First Nations both have volunteer fire departments and or mutual aid agreements for additional service with the RDKS Thornhill Fire Department and its two other secondary fire departments: Kleanza Creek and Lakelse Lake.

In 2013, fire departments in the LSA noted an increase in call volume and a change in call types, with more drug- and alcohol-related incidents (Boehm 2013, pers. comm.; Bossence 2013, pers. comm.; Klie 2013, pers. comm.). The Kitimat Fire Department is facing increased demands on resources for fire prevention services.

### ***Police***

Police services are delivered in the LSA by two RCMP integrated detachments: the Kitimat Municipal/Provincial Detachment, and the Terrace Municipal/Provincial Detachment. Kitamaat Village, Kitselas and Kitsumkalum each have a First Nations community police officer (Ministry of Justice 2013a).

Changes in crime rates and caseloads indicate that police services in the LSA are experiencing increased pressure, especially for the Terrace area. Overall crime rates (the number of Criminal Code offences or crimes, excluding drugs and traffic, reported for every 1,000 permanent residents) in municipal-policed areas increased (between 2010 and 2012) by 2.8% in Kitimat, by 6.3% in Terrace, and by 19% in the Terrace Provincial Area (Ministry of Justice 2013a, 2013b). However, the overall crime rate decreased in the Kitimat Provincial Area by 49% between 2010 and 2011, but increased by 3% between 2011 and 2012 (Ministry of Justice 2013a, 2013b). Aboriginal communities in the LSA are reported to have lower reported call or crime rates volumes compared to Kitimat and Terrace (Harrison 2013, pers. comm.; Robinson 2013, pers. comm.).

In 2012, municipal crime rates in Kitimat and Terrace were both above the RCMP municipal forces total crime rate of 69 for municipalities with population between 5,000 and 14,999 (Ministry of Justice 2013a, 2013b). The Kitimat and Terrace Provincial Area crime rates were also above the crime rate for the

RCMP provincial detachment total in 2012 (Ministry of Justice 2013a, 2013b). In 2012, the case load (i.e., the number of Criminal Code offences per authorized police strength) in Kitimat (Municipal) was 8.6% (63) lower than the RCMP municipal forces total case load of 70, and higher in Terrace (Municipal) by 25.6% (93). In 2012, the Kitimat Provincial Area case load was lower compared with the RCMP provincial detachment total case load. However, temporal and reliable case load data were not available for the Terrace Provincial Area for 2012 (Stantec 2014).

#### **7.2.2.2.11 Land-based Recreational Resources**

##### ***Outdoor Recreation Areas***

Outdoor recreation opportunities in the LSA are abundant and diverse. The area draws recreationalists and tourists from all over the world to engage in a variety of outdoor activities, including hiking, wildlife and nature viewing, front- and back-country camping, hunting, and recreational fishing (British Columbia 2013a; Hittel 2013, pers. comm.; Parsons 2013, pers. comm.; Pont 2013, pers. comm.)

Outdoor recreation opportunities in and near the LSA are typically easily accessible within the boundaries of Kitimat and Terrace, and from Highway 37 outside these communities (Kitimat 2014b; Terrace 2011). However, Kitimat is an oceanfront community, and presently has limited to no public waterfront access (except Hospital Beach which is owned by Rio Tinto Alcan).

Retaining access to backcountry and outdoor recreation areas is important to local residents (Hummel and Langagger 2013, pers. comm.; McCleod 2013, pers. comm.; Pont 2013, pers. comm.; Wakita 2013, pers. comm.), and is identified as a key planning initiative in multiple land use and management documentation for the LSA (MFLNRO 2002; City of Terrace 2011; District of Kitimat 2013b). Because access has been identified as an important aspect of the ability to participate in recreation activities, land-based access points and routes that overlap with the LSA are included in the relevant sections that follow.

##### ***Municipal Outdoor Recreation Areas***

The District of Kitimat and the City of Terrace offer local residents and visitors a number of recreation sites and multi-use trails. District of Kitimat Leisure Services operates and maintains a number of outdoor recreation facilities for use by the public, including parks and open spaces; these account for 25% of the land base (District of Kitimat 2014b). The City of Terrace manages and maintains over 220 ha of parks and open space, providing easily accessible natural outdoor recreation opportunities for residents and visitors (City of Terrace 2011).

There are six outdoor recreation areas in Kitimat, including two parks, Radley Park and Hirsch Creek Park, that provide camping, day use, and opportunities for outdoor recreation activities such as hiking and kayaking (District of Kitimat 2014b; Tourism Kitimat 2014). Ferry Island Campground provides other outdoor recreation facilities less than 5 km from downtown Terrace (Visit Terrace BC 2014). There are also seven trails in or near Kitimat's City Centre.

There are five trails in or near Terrace: Ferry Island Trail, Grand Trunk Pathway, Terrace Mountain Hiking and Mountain Biking trails, and Howe Creek Trails (District of Kitimat 2014b; MFLNRO 2014a, 2014b; City of Terrace 2014a; Tourism Kitimat 2014). The District of Kitimat and City of Terrace have identified goals to enhance and expand existing capacity of outdoor recreation areas and develop new outdoor recreation sites (City of Terrace 2011; District of Kitimat 2013b; District of Kitimat 2014b).

#### ***Public and Private Recreational Sites***

The LSA overlaps with a number of outdoor recreation areas in provincial parks, on Crown land and outside of parks, municipalities or settlements, and protected areas.

There are six Class A Provincial Parks that overlap with or are near the LSA: Kitimat River Provincial Park, Nalbeelah Creek Wetlands Provincial Park, Lakelse Lake Wetlands Provincial Park, Lakelse Lake Provincial Park, and Hai Lake–Mount Herman Provincial Park (BC Parks 2014; 2014b; 2014c; 2014d; 2014e; 2014f). Kitimat River Provincial Park and Nalbeelah Creek Wetlands Provincial Park are located closest to the Project site and are within 10 km of the District of Kitimat, and are easily accessible from Highway 37. Lakelse Lake Provincial Park, located approximately 20 km south of Terrace, is the largest full-facility park (BC Parks. 2014d. BC Parks has identified initiatives to improve visitor facilities, including recent enhancements to Lakelse Lake Provincial Park (BC Parks 2013a). A number of public recreation trails that overlap with the LSA are maintained by the Province or other outdoor recreation organizations in the Kitimat and Terrace areas.

Table 7.2-11 provides a description of various public and private or commercial outdoor recreation sites that overlap in the LSA.

Hiking, day use or picnicking, camping, and fishing are the most popular activities in outdoor recreation areas in the LSA.

**Table 7.2-11: Outdoor Recreation Sites in the Terrace and Kitimat Areas**

Site	Location	Facilities and amenities		Activities	
<b>Public Sites</b>					
Upper Kitimat River Recreation Site	Approximately 38 km north of Kitimat, east side of Highway 37	Small, user maintained site		Camping Hunting Picnicking	Kayaking: Kitimat River
		Campsites: 5	Pit toilets		
Chist Creek Recreation Site	Approximately 29 km north of Kitimat, east side of Highway 37	Small, user maintained site		Day use Hunting	Rock climbing Bouldering
		Campsites: 3	Pit toilets		
Onion Lake Recreation Site	Approximately 28 km south of terrace, west side of Highway 37	Small day use site		Day use Picnicking	Fishing
Hospital Beach	South of Kitimat and the RTA site	Picnic area Sandy beach	Boat launch Washrooms	Tourist attraction and local gathering spot	
<b>Private/ Commercial Sites</b>					
Waterlily Bay resort	Approximately 20 km south of Terrace	Commercial recreation site Campsites: 28 (22 un-serviced sites) Full service marina RV and boat storage		Camping Canoeing, kayaking, boating: Lakelse Lake	
		Showers Flush toilets	Boat launch		
Wild Duck RV Park	Terrace	Campsites: 20 serviced		Day use Camping	
		Showers Laundry facility Tap water Gazebo	Sani-station Flush toilets Internet Cable		
Kitsumkalum RV and Boat Launch	Terrace	Campsites: 6 Pit toilets	Boat launch	Day use Camping	Boating
Copper River RV Park	Terrace	Full or partial service trailers Tent sites		Day use Camping	
		RV sites: 11	Showers		

**SOURCE:** British Columbia (2014b); MFLNRO (2014b, 2014c)

Multiple trails along the Kitimat River provide easy access to outdoor recreation opportunities, such as off-road vehicle use and camping (Hittel 2013, pers. comm.; MacCleod 2013, pers. comm.). Snowmobiling is a common activity along the rail line in Kitimat and in established recreation areas such as Hirsch Creek Park and Kitimat River Provincial Park (Hitell 2013, pers. comm.). Freshwater fishing is a popular recreational activity in the Kitimat area (Parsons 2013, pers. comm.); the Kitimat River experiences high volumes of anglers in the evenings and on Sundays (Hummel 2013, pers. comm.; Langagger 2013, pers. comm.; Pont 2013, pers. comm.). Emsley Creek is also a popular fishing destination, but access to this

area is currently restricted, which is a public concern (Hummel 2013, pers. comm.; Langagger 2013, pers. comm.).

Municipal and public recreation trails in the LSA are popular and heavily used, with many trails providing easy access to alpine and remote wilderness areas (MFLNRO 2002; District of Kitimat 2014b; Tourism Kitimat 2014; British Columbia 2014b).

There was an increase in overall park attendance from 2011/2012 to the 2012/2013 seasons, with the Northern Region contributing to the province's highest rise in camping attendance (BC Parks 2013a). Lakelse Lake Provincial Park experienced an increase in camping visitation and day use attendance between the 2011/2012 and 2012/2013 seasons. However, Kitimat River Provincial Park experienced a decrease in attendance in 2012/2013 from the previous season (BC Parks 2013a).

Participation rates for outdoor recreation activities in Northern BC were used to estimate the current potential demand on outdoor recreation sites in the LSA. It has been estimated that 93% of BC residents participated in at least one outdoor recreation activity, with 91% of them having participated in at least one outdoor recreation activity between October 2008 and September 2009 (British Columbia 2013b). Thus, it is estimated that approximately 7,000 Kitimat residents and 13,100 Terrace residents participate in at least one outdoor recreation activity per year (i.e., within a 12-month period).

Visitation to the Kitimat and Terrace areas peaks during the summer and early fall (from June through September) (Tourism BC 2014). In 2013, Kitimat experienced an increase in visitors to the area. Foreign tourists travel to Kitimat to fish the Kitimat and Skeena rivers (Parsons 2013, pers. comm.). For at least one commercial fishing guide, international clientele accounts for close to 60% of total business, and these individuals tend to stay in the area for longer durations (Hittel 2013, pers. comm.) (See Section 7.4 for additional information on recreation along the marine access route).

### **Community Centres**

Within the LSA, the residents of the District of Kitimat, City of Terrace, and each First Nations community have access to and use of community centres, which provide venues for various recreational, community, and social activities. Most sport and recreational activities in Kitimat are provided through the Riverlodge Recreation Centre, the Tamitik Centre, and the Seniors Centre. In Terrace, most community recreation services are offered through the Sportsplex and Aquatic Centre. These community centres are not at capacity and thus are considered to be able to accommodate additional use (Sewell 2013, pers. comm.). Community members at Kitamaat Village have identified a need for additional community centre space (Powell 2013).

Capacity to offer social programs, which community centres are used for, is closely tied to the degree of volunteering and participation in community-led organizations (Neysmith and Reitsma-Street 2000). A

recent study on social and economic transformation in Kitimat found that industry-related firms provided support in developing capacity for community centre-led organizations (Ryser and Halseth 2013). At the same time, the study found that community-led organizations have declined in membership and volunteers needed to support programs and services, which was attributed to the community's reliance on an aging cohort of senior citizen volunteers.

#### **7.2.2.2.12 Municipal Government Finances**

##### ***Revenue***

Table 7.2-12 shows the sources of revenue and total revenues for Kitimat, Terrace, and the RDKS in 2012. In that year, Kitimat derived approximately 78% of its \$26.3 million revenues from property taxes, 64.5% of which came from major industry, and the rest from light industry, commercial, and residential sources (District of Kitimat 2013b). The sale of services, including fees or charges for licences, permits, refuse collection, recreation, water and sewer, accounted for much of the balance of Kitimat's revenue in 2012. Taxation accounted for 58% of Terrace's 2012 revenue of \$21.5 million. In that year, Terrace obtained 19% of its revenues from the sale of services and 21% from transfers from provincial and regional governments.

Unlike municipalities, regional districts do not collect taxes directly from residents, but rather requisition their annual budgets based on approved five-year financial plans. Requisitions are based on the cost of services to be provided by the regional district, including costs shared with municipalities in the region. In 2012, the RDKS had revenues of nearly \$11 million, of which requisitions accounted for 46%. The sale of services and transfers from other governments' accounted for much of the RDKS's other revenue in 2012.

##### ***Expenditures***

Municipal expenditures data show that the District of Kitimat and City of Terrace have similar spending priorities (Table 7.2-12). For both communities, the top three non-financial expenditure areas in 2012 were: protective services (primarily fire protection and policing); transportation and transit; and parks, recreation, and culture (BC Ministry of Community, Sport and Cultural Development 2014). As a proportion of its total expenditures, Terrace spent comparatively more on municipal utilities, whereas Kitimat spent more on general government. Terrace's expenditures on debt amortization were substantially greater than Kitimat's (16.8% versus 7.9%).



**Table 7.2-12: Municipal Government Expenditures in the LSA and Kitimat-Stikine Regional District**

	Kitimat	Terrace	RDKS
General government	13.3%	8.5%	11.0%
Protective services	20.8%	24.5%	15.5%
Solid waste management and recycling	5.1%	1.4%	20.7%
Health, social services, and housing	0.4%	0.0%	0.0%
Development services	5.1%	8.8%	7.0%
Transportation and transit	21.6%	13.7%	5.3%
Parks, recreation and culture	20.4%	19.4%	23.2%
Water services	3.3%	4.0%	6.9%
Sewer services	1.6%	2.7%	1.2%
Other services	0.5%	0.3%	0.0%
Amortization	7.9%	16.8%	3.7%
Other adjustments	NA	NA	0.0%
Debt payments for member municipality	NA	NA	5.6%
Total expenditure	\$24,090,393	\$19,272,298	\$11,891,433
Fiscal surplus (deficit)			
2012 population	9,009	12,182	37,814
Per-capita expenditure	\$2,674	\$1,582	\$314

**SOURCE:** BC Ministry of Community, Sport and Cultural Development (2014)

Owing to its far larger industrial tax base and smaller population, Kitimat's revenues and expenditures on a per capita basis are substantially larger than Terrace's. In 2012, Kitimat spent approximately \$2,674 per capita, compared to \$1,584 per capita expenditure for Terrace. Both communities experienced operational fiscal surpluses of approximately \$2 million in 2012.

On a per-capita basis, the expenditures of the RDKS are far lower than for either Kitimat or Terrace. In 2012, the RDKS spent the largest portions of its budget on parks, recreation, and culture (23.2%), solid waste management and recycling (20.7%), protective services (15.5%), and general government (11%).

***Budget Forecast and Capital Spending***

Kitimat's 2014 budget's five-year outlook predicts revenue and expenditures averaging approximately \$32 million per year, with no fiscal deficits or surpluses. Kitimat forecasts annual capital spending over the 2014 to 2018 period will be in the range of \$3.0 million to \$7.9 million per year (Table 7.2-13).

**Table 7.2-13: District of Kitimat and City of Terrace Forecast Capital Expenditures, 2013 to 2017**

	2014	2015	2016	2017	2018
Kitimat	4,950,487	2,988,500	7,907,353	3,887,083	6,493,782
Terrace	4,068,500	2,081,500	1,941,000	2,713,599	3,283,000

**SOURCE:** City of Terrace (2014b), District of Kitimat (2014c)

Terrace's 2014 to 2018 financial plan calls for revenues and expenses in the \$20.5 million to \$20.8 million range, with operating deficits of about \$183,000 beginning in 2015. Terrace forecasts capital expenditures in the range of \$1.9 million to \$4.1 million per year over the 2013 to 2017 period.

#### 7.2.2.2.13 Transportation

##### **Roads**

The LSA includes roads in the District of Kitimat and the Terrace CA, and Highway 37 between the City of Terrace and the District of Kitimat. Although there are few recent publicly available traffic studies, a 1991 study in Kitimat (InterCAD 1991) and a 2009 study in Terrace (Boulevard Transportation Group 2009) indicated that major roads and intersections in both communities generally operate at a high level of service (LOS<sup>4</sup>), even at busy intersections during peak hours. The exception is the Haisla Bridge, an aging two-lane truss bridge in Kitimat, which is currently the only road crossing of the Kitimat River within the town of Kitimat. It has been identified as a concern because it operates at a low LOS during the peak hours, and it is a key link to much of the industry-related land use on the west side of Kitimat. Municipal permits are required for oversized (larger than 2.4 m wide or larger than 4.0 m high) or overweight (greater than 65,000 kg) loads across the bridge, and there are restrictions on crossing times and requirements for signage, lights, and flagpersons.

MOTI traffic count data for Highway 37 between Kitimat and Terrace indicate that this segment of highway operates at a high LOS. Table 7.2-14 provides an overview of the traffic data for select roads and intersections in the LSA.

---

<sup>4</sup> LOS ratings describe how well a road segment or intersection is operating under the current volumes. The ratings are from A to F, with A being the best and F the worst. LOS E describes conditions when demand equals capacity.

**Table 7.2-14: Traffic Counts for Roads and Intersections in the LSA**

Road or Intersection Name	Type	AADT <sup>a</sup>	Year	Average LOS <sup>b</sup>	Peak LOS <sup>c</sup>
Haisla Bridge	Arterial / Bridge	8,700	1991	A	D-E
Haisla Boulevard x Lahakas Boulevard	Urban intersection	19,150	1991	A-B	B
Haisla Boulevard x Kuldo Boulevard	Urban intersection	12,650	1991	A-B	B
Haisla Boulevard x Tsimshian Boulevard	Urban intersection	11,340	1991	A-B	B
Haisla Boulevard x Nalabila Boulevard	Urban intersection	4,810	1991	A-B	A-B
Haisla Boulevard x Kingfisher Avenue	Urban intersection	7,880	1991	A-B	A-B / D <sup>d</sup>
Highway 37	Highway	1,930	2005	B or better <sup>e</sup>	B or better <sup>e</sup>

**NOTES:**

<sup>a</sup> AADT – annual average daily traffic

<sup>b</sup> Average LOS is the average level of service provided by the road or intersection throughout the day

<sup>c</sup> Peak LOS is the level of service provided by the road or intersection during the peak hour of the day, normally between 3:45 p.m. and 4:45 p.m. in Kitimat

<sup>d</sup> Only the left-turning movement from Kingfisher Avenue onto Haisla Boulevard operates at LOS D during the peak hour

<sup>e</sup> A full LOS analysis was out of scope for this assessment. Estimated based on generalized daily service volumes as described in the *Highway Capacity Manual 2010* (Transportation Research Board 2010)

**SOURCES:** InterCAD (1991); MOTI (2001, 2011, 2012)

Road transportation in the RSA includes roads connecting to the LSA in the broader scope of the RDKS and the SQCRD. Highways 16 and 37 and Kalum Lake Drive (Nisga’a Highway) are the main highways in the RSA and are most likely to be used by the Project. MOTI traffic count data indicate that these highways currently operate well below capacity and at a high LOS (Table 7.2-15). In most cases, winter weather conditions, terrain, and speed limits are the main limiting factors for traffic flow.

**Table 7.2-15: Traffic Counts for Highways in the RSA**

Road Name	Type	AADT <sup>a</sup>	Year	Average LOS
Highway 16	Highway	1,232	2001	B or better <sup>b</sup>
Highway 16/37	Highway	2,301	2011	B or better <sup>b</sup>
Kalum Lake Drive	Arterial	810	2012	B or better <sup>b</sup>

**NOTES:**

<sup>a</sup> AADT – annual average daily traffic

<sup>b</sup> A full LOS analysis was out of scope for this assessment. Estimated based on generalized daily service volumes as described in the *Highway Capacity Manual 2010*.

**SOURCE:** MOTI (2001, 2011, 2012).

Between 2008 and 2012, 605 collisions were reported in the LSA, of which 400 (66%) were property damage only and 205 (34%) involved an injury or fatality (ICBC 2013a, 2013b). In Terrace, the highest number of collisions occurred at the major intersections along Kalum Street and Kenney Street. In Kitimat, the highest occurrences were at major intersections along Haisla Boulevard, at Lahakas Boulevard, and at Kuldo Boulevard. Table 7.2-16 provides an overview of collisions at key roads and intersections in the LSA.

**Table 7.2-16: Traffic Collisions for Roads and Intersections in the LSA, 2008 to 2012)**

Road or Intersection Name	Property Damage Only	Injury/Fatality	Total Collisions/Year
Haisla Bridge	NA	NA	NA
Haisla Boulevard x Lahakas Boulevard	7	6	13
Haisla Boulevard x Kuldo Boulevard	6	1	7
Haisla Boulevard x Tsimshian Boulevard	4	3	7
Haisla Boulevard x Nalabila Boulevard	2	1	3
Haisla Boulevard x Kingfisher Avenue	3	0	3
Highway 37	30	17	47
Kitimat (total)	74	25	99
Terrace (total)	296	163	459

**NOTES:**

NA – Baseline data were not available

<sup>a</sup> Collisions that occur on segments between intersections are counted under the nearest intersection.

In the RSA, 64% of collisions were property damage only and 36% involved an injury or fatality. Road condition was the most common contributing factor to these collisions (ICBC 2013a). Section 7.5 discusses how traffic collisions contribute to demands on health and emergency services.

**Airports**

The Northwest Regional Airport is the only airport in the RSA. Located approximately 10 km south of Terrace, it has two runways, one of which is able to accommodate instrument approach. Aircraft up to the size of a Boeing 737 can land and take off without limitations. Aircraft up to the size of a Boeing 757 can land without issue but can only take off if not fully loaded. Anything larger would require special procedures (e.g., tire pressures) (Hendry 2014, pers. comm.). The Air Terminal Building can support Boeing 737 sized passenger aircraft. Parking is available for three at a time; however, the terminal would need to be expanded or modified to accommodate larger aircraft (Hendry 2014, pers. comm.).

The airport provides service to four commercial airlines; several charters, couriers, and helicopter companies; and private aircraft. In 2013, an estimated 177,000 air passengers used the airport, a 28%

increase over 2012. The airport's 20-year plan focuses on accommodating at least 250,000 air passengers per year through the terminal facility (Northwest Regional Airport 2012; Hendry 2013, pers. comm.; AirBiz 2014). Upgrades in the plan include improvements to airport infrastructure to allow for a Boeing 737 or an Airbus A320 (AirBiz 2014).

### ***Railways***

CN Rail is the primary heavy rail service provider for goods movement in the RSA. Three routes service this area: the Bulkley route between Smithers and Terrace; the Kitimat route between Terrace and Kitimat; and the Skeena route between Terrace and Prince Rupert (CN Rail 2013). Road-rail crossings are an area of potential concern from both safety and traffic efficiency standpoints (Jephsen 2013, pers. comm.). When trains cross at grade, traffic flow can be impeded and access can be cut off to certain areas, including access for emergency vehicles. In the LSA, key potential conflict points include vehicle crossings at Kenney Street and Frank Street in Terrace; Substation Avenue and Queensway Drive near Thornhill; and Alcan Way and Eurocan Way in Kitimat. Rail use data were not available, but field observations indicate that a few trains per day cross at these locations. Vehicle crossing times vary greatly from approximately 30 seconds (counted 10 rail cars) during the 5:00 p.m. peak period to approximately 21 minutes (counted 126 rail cars) late at night. Vehicle queue lengths on adjacent roads were not observed to exceed eight cars.

### ***Aboriginal Communities***

In the LSA, Highway 37 intersects with Kitamaat Village Road, which leads to Kitamaat Village. Highway 37 also intersects with Substation Avenue, which leads to Queensway Drive and the Kitselas First Nation community of Kulspai. Highway 16 passes by the Kitselas First Nation reserve community of Gitaus, located just north of Kleanza Creek Provincial Park. Highway 16 also intersects with Spokeshute Road, which leads to Kalum (Kitsumkalum First Nation). Train crossings intersecting with roads leading to First Nations reserve communities include the Front Street crossing, which intersects with Highway 16 West near Kalum and Queens Drive located off the intersection of Lakelse Avenue.

#### **7.2.2.2.14 Housing and Accommodations**

Communities in the LSA are experiencing changes in the demand for and availability of housing and temporary accommodations (Martin 2013, pers. comm.; Sewell 2013, pers. comm.). These changes have occurred within a relatively short period and are likely associated with large infrastructure and construction projects that are either complete or underway (i.e., Northwest Transmission Line, RTA Modernization Project) or anticipated (e.g., Kitimat LNG, LNG Canada, Coastal Gas Link). The influx of temporary workers associated with these projects has increased demand for rental accommodations, while both increased demand and speculative activity have increased housing prices.

### Housing Stock

In 2011, most LSA residents lived in their own homes. However, there was an overall decrease in the percentage of owned homes compared with rented homes in the LSA and RSA from 2006 to 2011. Most houses in the LSA are single-detached homes, with a very limited supply of bachelor apartments, larger apartments, and town houses (Table 7.2-17).

**Table 7.2-17: LSA Housing Characteristics**

	Census Year	Total Private Dwellings Occupied by Usual Residents	Single-detached Houses (%)	Owned (%) <sup>b</sup>	Rented (%)	Band Housing (%) <sup>a</sup>	Homes in Need of Major Repair (%)
Kitsumkalum 1 IR	2006	85	100	87.5	12.5	0	35.3
	2011	90	100	NA	NA	NA	NA
Kitselas 1 IR	2006	7	NA	NA	NA	NA	NA
	2011	70	100	73.3	26.7	0	14.3
Kitamaat 2 IR	2006	173	NA	NA	NA	NA	NA
	2011	180	94.4	83.3	8.3	8.3	48.6
Kitimat DM	2006	3,625	62.3	81	19	0	9.0
	2011	3,630	63.4	77.1	22.9	0	7.7
Terrace CA	2006	7,190	70.9	75.2	24.7	0	14.6
	2011	6,240	67	71.2	28.7	0.2	11.1
Kitimat-Stikine RD	2006	14,370	72.9	74	23	2	17.5
	2011	14,765	73.2	72.5	24.3	3.1	16.4
Skeena-Queen Charlotte RD	2006	7,805	68.6	67	33	0	17
	2011	7,560	67.3	67.4	31.3	1.2	19.8
BC	2006	1,643,150	49.2	70	30	0	7.4
	2011	1,764,635	47.7	70	29.8	0.3	7.2

**NOTES:**

<sup>a</sup> Kitsumkalum 1 IR, Kitselas 1 IR, and Kitamaat 2 IR are the First Nations (Indian Reserves) identified in the LSA and do not reflect the total Aboriginal population of each First Nations.

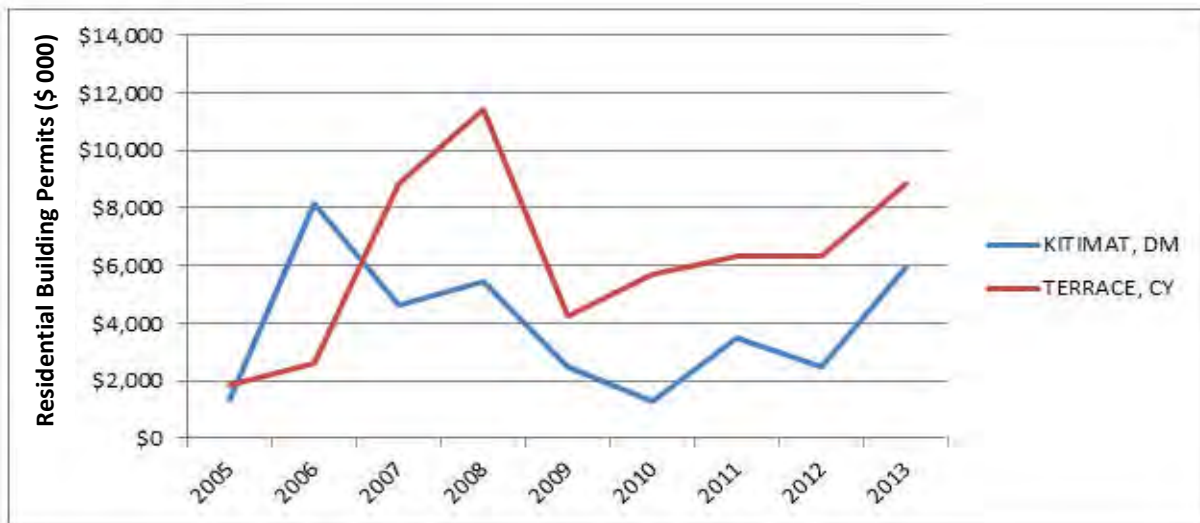
<sup>b</sup> Percentages of owned, rented, and band housing is divided by the total tenure of housing indicated for each census year  
 NA – data not available

**SOURCES:** Statistics Canada (2012a, 2013b, 2013c, 2013d, 2013e, 2013f)  
 Statistics Canada (2007a, 2007b, 2007c, 2007d, 2007e, 2007f, 2007g)

**Home Construction, Sales, and Prices**

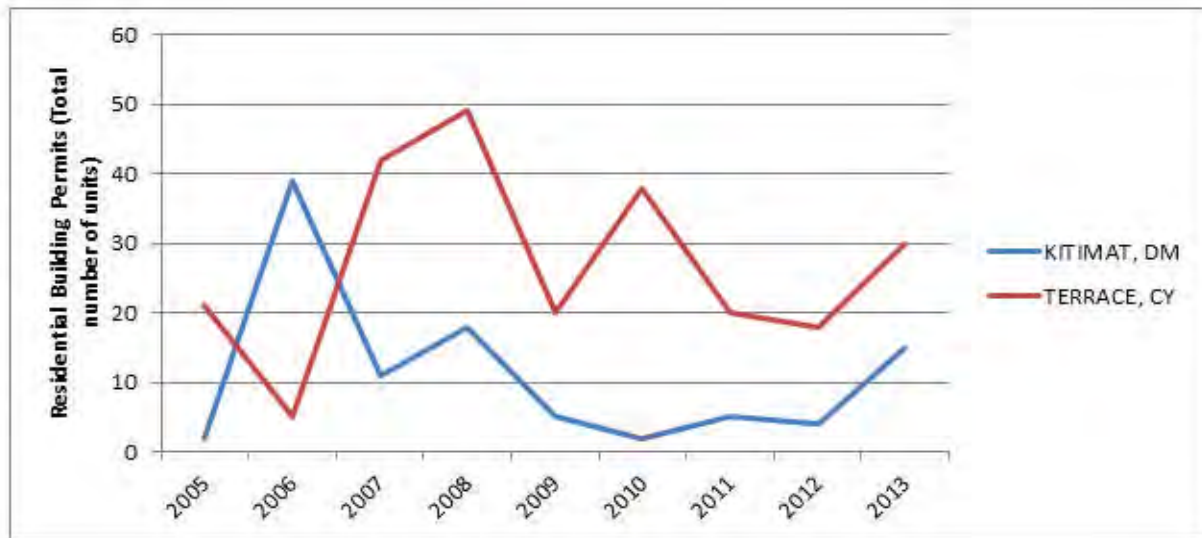
Kitimat and Terrace have both experienced increases in residential and commercial development (BC Stats 2012; District of Kitimat 2014d; Thomson Consulting 2014). Kitimat experienced a substantial increase in the total number of dwellings under construction in 2013 as a result of the phased development of two subdivisions: Strawberry Meadows and Forest Hills (District of Kitimat 2014d). In both Terrace and Kitimat, the number and value of building permits has increased since 2011, but are still below peaks experienced during the 2006 to 2008 period (Figure 7.2-6, Figure 7.2-7). New home construction for Terrace and Kitimat (data only available until 2011) follows trends in building permit issuances (Figure 7.2-8). Kitimat currently has a total of 114 residential building lots available and another five lots could provide approximately 169 units (District of Kitimat 2014d). Information on residential building lots for Terrace was not available.

The volume and price of homes sold in Terrace and Kitimat has risen steadily since 2009/2010 (Figure 7.2-9). Between 2010 and the first quarter of 2014, the average selling price of a single family home increased by \$47,430 (33%) in Kitimat and by \$91,678 (45%) in Terrace (Northern Real Estate Board 2008 to 2013). In early 2014, the average value of a single family dwelling in Kitimat is at an all-time high of \$228,000 (District of Kitimat 2014d).



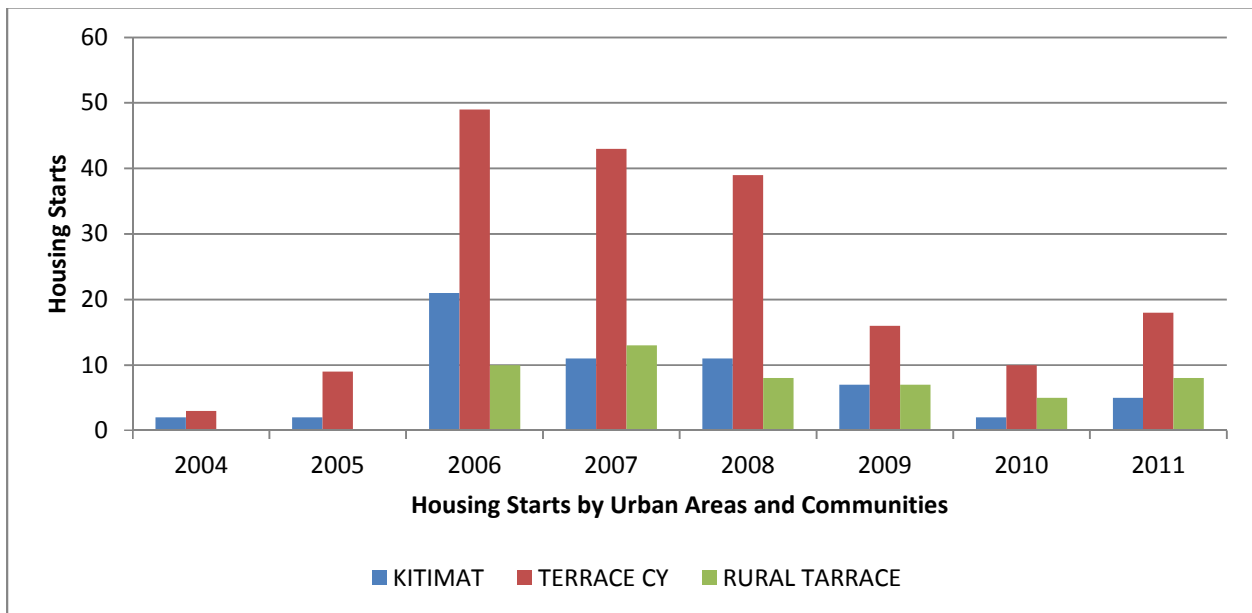
SOURCE: BC Stats (2014a)

**Figure 7.2-6: Value of Residential Building Permits in the LSA, 2005 to 2013**



SOURCE: BC Stats (2014a)

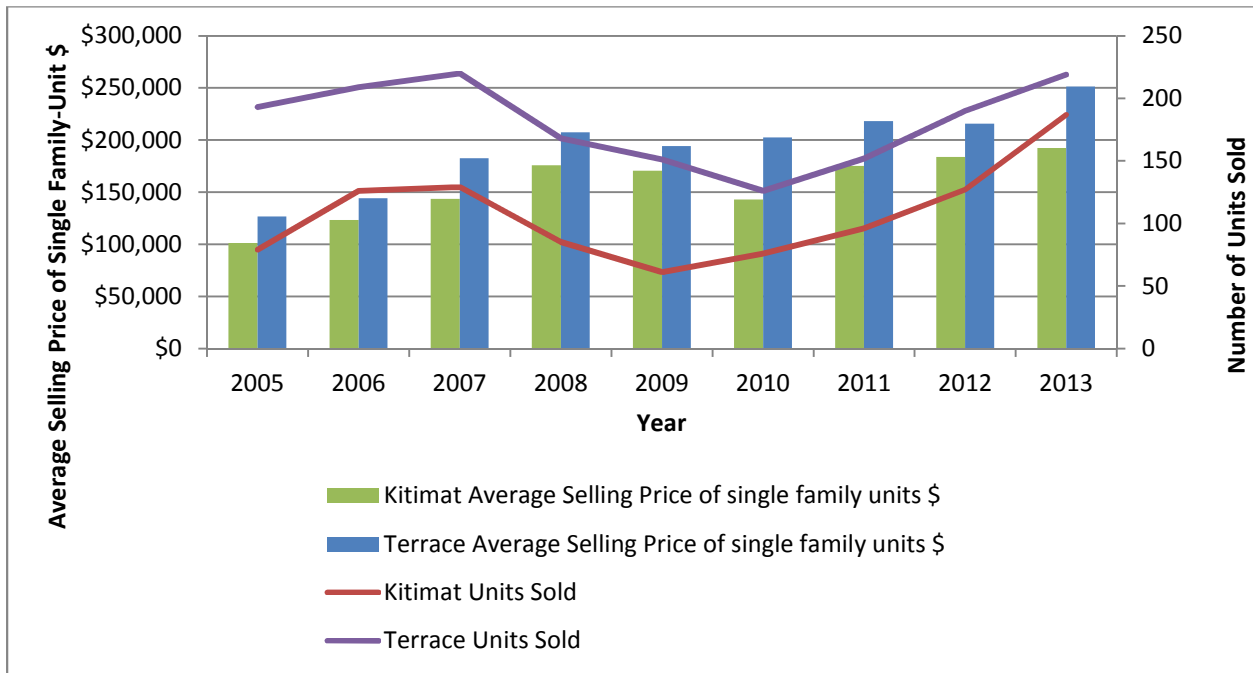
Figure 7.2-7: Number Residential Building Permits Issued in the LSA, 2005 to 2013



SOURCE: BC Stats (2012h)

Figure 7.2-8: New Home Construction in the LSA, 2004 to 2011





SOURCE: BC Northern Real Estate Board News Releases 2005–2013.

**Figure 7.2-9: Volume and Average Selling Price of Single-Family Homes Sold in Kitimat and Terrace, 2005 to 2013<sup>ab</sup>**

### **Rental Availability and Prices**

Between 2012 and 2013, the average rental vacancy rate of Kitimat decreased from 21.9% to 5.5%, while the rate in Terrace increased from 3.6% to 4.1% (in rental apartment structures of three units and over) (CHMC 2013a). However, as of late 2013, Kitimat and Terrace had vacancy rates of 1.0% and 0.0%, respectively (Martin 2014, pers. comm.; CMHC 2013b). Between 2000 and 2013, the average cost to rent a one- or two-bedroom unit in Kitimat and Terrace increased by about 20% and 46%, respectively. As of early 2014, rental prices in Kitimat and Terrace ranged from \$1,250 per month for a two-bedroom home to \$3,300 per month for a three-bedroom home (March–April 2014 Listings) (Craigslist, Skeena-Bulkley April 15, 2014; Kijiji, Skeena–Bulkley Area, April 15, 2014).

### **Temporary and Short-term Accommodations**

In total, the LSA has 48 year-round short-term rental accommodations of which 16 are hotels or motels, 21 are lodges or cabins, and 11 are bed and breakfasts. There are also 35 recreational vehicle (RV) and camp sites located in the LSA. It has been estimated that most hotels, motels, and camp sites are at 90% to 100% capacity on most days, especially in the summer months (Clark 2013, pers. comm.). The limited

availability of short-term accommodations has been partially attributed to “block-booking” for temporary workers (Martin 2013, pers. comm.; Sewell 2013, pers. comm.). There are recent proposals for new hotel or motel developments in Kitimat and Terrace: a 60-bed hotel, a 149-bed Master Built-branded hotel, and a 600-bed hotel have been proposed and or are undergoing rezoning or development permit agreements (Martin 2014, pers. comm.).

Worker accommodations that have been developed or planned for the LSA are listed in Table 7.2-18. To help alleviate pressure on the rental market, the District of Kitimat approved the zoning and construction of a 2,160-bed temporary worker accommodation facility adjacent to the downtown core (District of Kitimat 2014e). A 500-bed cruise ship located in the port of Kitimat is currently being used for the RTA Modernization Project to house temporary workers (Globe and Mail 2014).

**Table 7.2-18: Temporary Worker Accommodations in LSA**

<b>Owner/Operator</b>	<b>Location/Name</b>	<b>Current Capacity</b>	<b>Maximum Capacity</b>	<b>Status</b>	<b>Work Camp Type</b>
Bechtel	Kitimat facility modernization project village	1,760	2,160	Operating	Project work camp
Bechtel	Delta Spirit (Cruise Ship)	400–500	NA	Operating	Project work camp
Kitimat LNG	Eurocan Way	260–600	NA	Operating	Project work camp
PTI Group	Loganberry Avenue/Kitimat lodge	0	2,154	Approved development permit	Open lodge
Bryton Group	28 Highway 37/Crossroads Project	0	1,000	Proposed	Open lodge

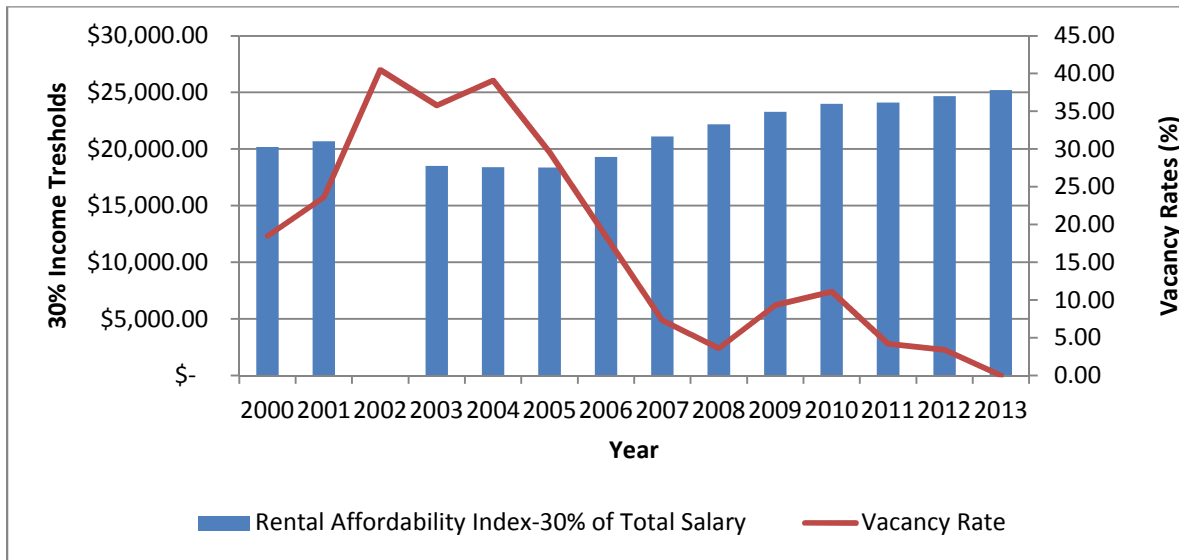
**NOTES**

NA – data not available

**SOURCE:** District of Kitimat (2014e)

***Housing Affordability***

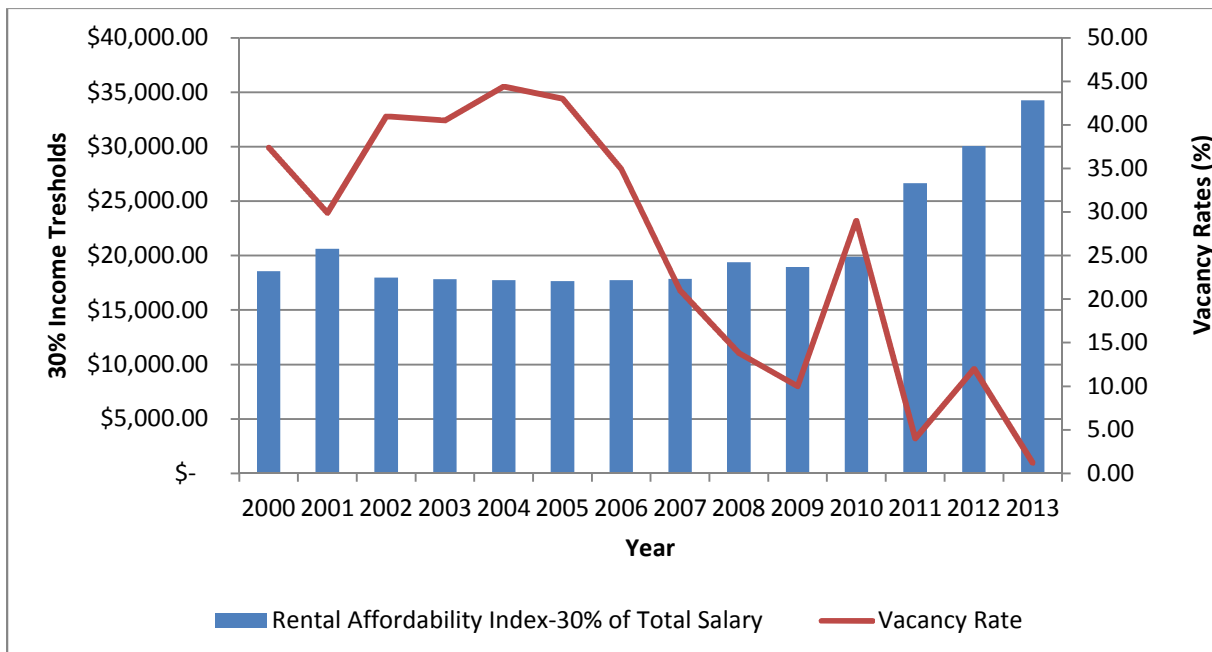
If a household spends more than 30% of its gross total income on shelter (including utilities for renters and related taxes and fees for owners), it is considered susceptible to housing unaffordability (CMHC 2014 and Statistics Canada 2010). In 2006 and 2011, Terrace and Kitimat had a lower proportion of households with a shelter to income ratio (STIR) of more than 30% compared with the BC average (Table 7.2-19). However, recent industrial development has increased demand and, thus, house prices and rents, resulting in a high proportion of households with a STIR of more than 30% (Figure 7.2-10, Figure 7.2-11).



**NOTES:** <sup>a</sup> In 2002 data was suppressed by CMHC for confidentiality reasons. <sup>b</sup> Salaries are derived from one- and two-bedroom average rents from CMHC's Fall Rental Market Survey

**SOURCE:** CMHC Fall Survey 2000 -2013

**Figure 7.2-10: Rental Vacancy Rate and Affordability in Terrace, 2000 to 2013**



**NOTES:** Salaries are derived from one- and two-bedroom average rents from CMHC's Fall Rental Market Survey

**SOURCE:** CMHC Fall Survey 2000–2013

**Figure 7.2-11: Rental Vacancy Rate and Affordability in Kitimat, 2000 to 2013**

**Table 7.2-19: Home Owners and Renters Spending 30% or More of Their Total Household Income on Shelter Costs**

	Census Year	Total Number of Non-farm, Non-reserve Private Dwellings Occupied by Usual Residents	Number of Owner Households in Non-farm, Non-reserve Private Dwellings	Percent of Owner Households Spending 30% or More of Household Total Income on Shelter Costs	Number of Tenant Households in Non-farm, Non-reserve Private Dwellings	Percent of Tenant Households Spending 30% or More of Household Total Income on Shelter Costs
Kitimat DM	2006	3,630	2,925	5.0	700	32.9
	2011	3,630	2,805	10.9	835	33.5
Terrace CA	2006	7,035	5,285	13.5	1,745	40.7
	2011	6,195	4,410	10.7	1,790	45.3
Kitimat-Stikine RD	2006	12,025	9,200	11.5	2,825	37.7
	2011	12,355	9,190	11	3,190	38.9
Skeena-Queen Charlotte RD	2006	6,815	4,350	17	2,465	31
	2011	6,610	4,325	16.1	2,295	34.8
BC	2006	1,606,875	1,118,160	22.7	488,720	43.4
	2011	1,717,195	1,202,000	23.8	519,855	45.3

**SOURCE:** Statistics Canada (2007d, 2007e, 2007, 2007g, 2007h, 2013c, 2013d, 2013e, 2013f)

Renters are typically more vulnerable to changes in the housing market because they may be susceptible to short-term fluctuations in rental prices. Based on census figures, the average family would have been able to afford a one- or two-bedroom apartment in either Kitimat or Terrace in 2011, while female lone-parent families were at severe risk of being unable to afford housing in both communities. In 2014, lone-parent households with median earnings might face difficulty in renting a two-bedroom unit in Terrace, owing to the gap between affordable housing (\$772 per month) and average rents (\$1,210 per month) (Thomson M. Consulting 2014). Single persons not in census families and earning a median income would also face challenges renting a one-bedroom apartment in Terrace.

Because of high demand for rental units, and in a bid to increase rents, some property owners have given notice to their tenants to vacate the premise so that it can be renovated, a phenomenon known as “renoviction” (CBC News 2014). This has led to overcrowding and increased the potential for homelessness (Grant 2013, pers. comm.). Other instances of renoviction and displacement of low-income tenants have been reported in Kitimat (Monaghan 2013, pers. comm.; Poole 2013, pers. comm.).

### ***Non-market Housing***

Kitimat has two non-market housing projects, Delta King Place and Kiwanis Village (Terra 2012). They each provide affordable housing primarily to seniors and may also be used to support people with physical disabilities. Both are operating at capacity (Terra 2012). Kitimat has one emergency shelter, operated by the Tamitik Status of Women Association, which was nearing maximum capacity with rates of 95% occupancy in 2012 (Terra 2012). In 2010, the City of Terrace partnered with BC Housing to provide 24 affordable housing units for seniors, while in 2013 BC Housing maintained 11 units of affordable housing in Terrace (CMHC 2012; BC Housing 2013a).

In a study on Terrace's housing needs, Thomson (2014) found that, since 2009, vulnerable populations, such as low-income and fixed-income households, individuals with mental illness or addiction issues, individuals with physical or cognitive disabilities, new arrivals, and youth in transition from foster care, have experienced increasing difficulty in accessing affordable housing.

Government-assisted housing includes any units receiving provincial or Crown corporation funding targeted at those in need of shelter. Low-income families receiving rental assistance subsidies fall into a number of categories: families with children and dependents, rent assistance seniors, rent assistance families, and women and children fleeing violence. In Kitimat and Terrace, demand on government-assisted housing is allocated through different subsidized service programs, including emergency shelter and housing for the homeless, transitional supported and assisted living, independent social housing, and rent assistance in the private market.

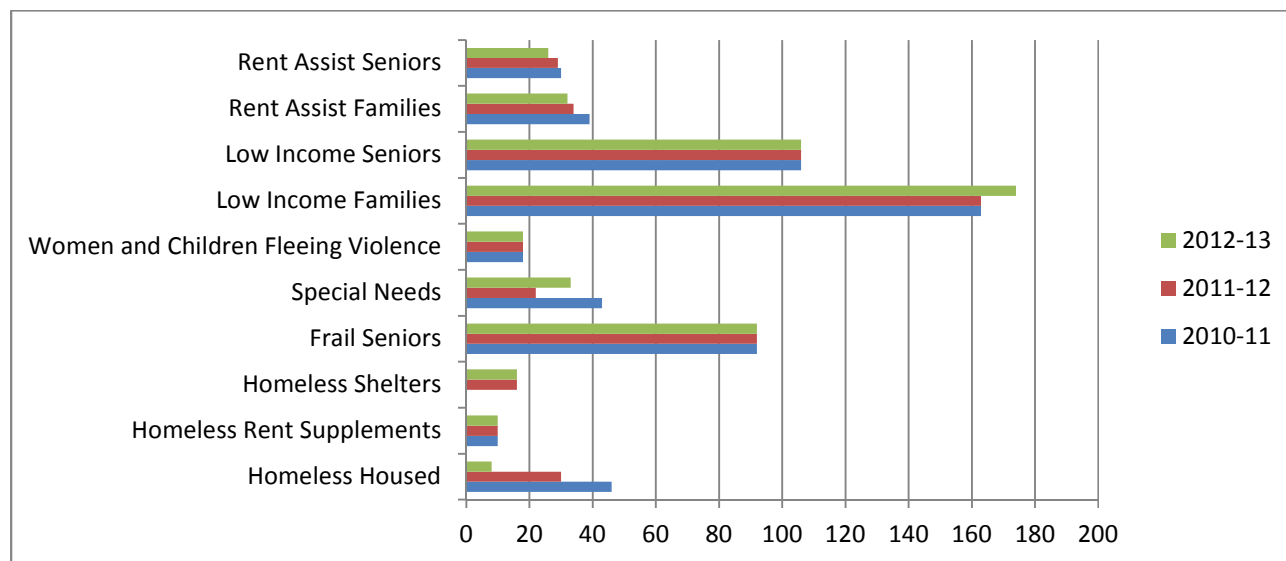
Potential demand on government-assisted housing is assessed using BC Housing's housing income limits (HILS). To be eligible for government-assisted housing, an applicant's gross household income must be below certain income limits as established by the HILS (BC Housing 2010). HILS represent the income required to pay the average market rent for an appropriately sized unit in the private market (BC Housing 2010). For example, in 2012, households in Kitimat and Terrace needed maximum incomes of \$17,500 and \$21,500, respectively, to qualify for government-assisted housing related to a bachelor-sized unit (BC Housing 2012) (Table 7.2-20). In 2013, BC Housing increased its housing income limits for a bachelor-sized unit by \$2,000 in Kitimat and by \$500 in Terrace (BC Housing 2013b) (Table 7.2-20).

Between 2010 and 2013, the demand for subsidized housing decreased in the LSA and RSA, except in Terrace where the number of families requiring housing support increased by 7.1% to 163 families from 2012 to 2013 (Figure 7.2-12) (Stantec 2014).

**Table 7.2-20: BC Housing Income Limits for Kitimat and Terrace, 2012 to 2013**

Planning Area	Bachelor	1 bedroom	2 bedroom	3 bedroom	4+ bedroom
<b>2012 Housing Income Limits</b>					
Kitimat	\$17,500	\$20,500	\$24,500	\$29,500	\$32,000
Terrace	\$21,500	\$26,000	\$30,000	\$35,000	\$38,000
<b>2013 Housing Income Limits</b>					
Kitimat	\$19,500	\$23,000	\$27,000	\$31,000	\$33,500
Terrace	\$22,000	\$26,000	\$30,500	\$36,000	\$39,000
<b>Change In 2012 – 2013 Housing Income Limits</b>					
Kitimat	\$2,000	\$2,500	\$2,500	\$1,500	\$1,500
Terrace	\$500	0	\$500	\$1,000	\$1,000

**SOURCES:** BC Housing (2012; 2013b)



**SOURCE:** BC Housing (2014)

**Figure 7.2-12: Number of BC Housing Subsidized Housing Units in the LSA, 2010 to 2013**

### ***Aboriginal Communities***

The federal government and First Nations located in the LSA (Haisla Nation, Kitsumkalum First Nation, and Kitselas First Nation) share responsibility in managing housing for each respective First Nation reserve. Each First Nation has a housing department or a housing coordinator responsible for accessing funding for new housing, funding repairs for renovation, managing construction, and reporting on funding use (Kitselas 2013b; Kitsumkalum First Nation 2013).

Table 7.2-17 summarizes housing characteristics of First Nations communities in the LSA. In 2011, Kitsumkalum and Kitimaat Village each had a higher proportion of homes needing major repair compared to other communities in the LSA. The housing stock at Kitselas First Nations was in comparatively good repair, with 14.3% of dwellings being in need of major repair, likely reflecting that much of Kitselas First Nation have a higher proportion of people living in newer homes than other LSA communities.

Housing challenges associated with increased rents and eviction notices in Kitimat and Terrace have led to a number of housing issues for First Nations communities in the LSA. Increases in homelessness were reported to have started several years ago in Kitimaat Village (Light 2013, pers. comm.). Multiple families from Haisla Nation are living under one roof in Kitimaat Village (Terra 2013; Light 2013, pers. comm.). Kitselas First Nation has a waiting list of 80 individuals for on-reserve housing (Venegas 2013, pers. comm.). Squeezed between high market rents and limited band-owned housing, people are finding shelter by “couch surfing” and staying with friends and family (Venegas 2013, pers. comm.). Other housing challenges associated with First Nations reserve communities include limited developable land, and overcrowding (Terra 2013).

### **7.2.3 Project Interactions**

Table 4.4–1 (Section 4) identifies potential interactions of concern between Project activities and each of the selected VCs. The potential effects identified in Section 7.2.2.4 that may result in an adverse effect as a result of interactions with Project activities are assessed. The extent to which the interactions are considered is ranked in Table 7.2-21 using categories defined in the footnote to the table.

**Table 7.2-21: Potential Project Effects on Infrastructure and Services**

Project Activities and Physical Works	Potential Effects		
	Effects on community infrastructure and services	Effects on traffic and pressure on transportation infrastructure	Change in housing availability
<b>Facility Activities and Works</b>			
<b>Construction</b>			
Site preparation (clearing, grubbing, grading, levelling, and set-up of temporary facilities)	2	0	2
Onshore construction (installation of LNG facility, utilities, ancillary support facilities, access roads, and includes hydrotesting)	2	0	2
Dredging (includes disposal)	2	0	1
Marine terminal construction (modifications to existing wharf, installation of sheet piling, material offloading and laydown areas, transfer piping and electrical installations)	2	0	2
Waste management (waste collection and treatment)	2	1	0
Vehicle and rail traffic (haul road upgrades, road use, vehicle traffic)	0	2	1
Commissioning and start-up	1	1	1
<b>Operation</b>			
LNG production (including natural gas treatment, condensate extraction, storage, and transfer), storage, and loading	1	1	1
Waste management (solid and liquid waste collection and disposal, wastewater effluent collection and treatment, site stormwater management)	2	2	0
Vehicle and rail traffic (road use, vehicle traffic)	0	2	0
<b>Decommissioning</b>			
Dismantling of land-based and marine infrastructure	1	1	1
Remediation and reclamation of the site	1	1	1
Waste management	2	1	1
Post-closure monitoring and follow-up	1	1	1

**KEY:**

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 BMPs.

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

**NOTE:** Only activities with an interaction of 1 or 2 for at least one effect are shown.



### **7.2.3.1 Justification of Interaction Rankings**

#### **7.2.3.1.1 Justification of Rank 0**

Project activities and works that have no potential to cause a measurable interaction with infrastructure and services are ranked as 0 and not considered further in the assessment.

Industrial wastes generated in the process of LNG production will be removed by either rail or specialized waste haulers. However, it is not anticipated that waste management activities during operation will require the in-migration of a permanent workforce and, therefore, will not adversely affect housing availability.

Social effects related to Project marine shipping activities are considered in the marine transportation and use assessment (Section 7.4) and are ranked 0 to avoid duplication.

Effects of vehicle and rail traffic on community infrastructure and services are assessed under the effects on traffic and pressure on transportation infrastructure, and are therefore ranked 0 in the construction and operation phases to avoid duplication.

#### **7.2.3.1.2 Justification of Rank 1**

Interactions are ranked 1 where a Project activity or work has the potential to cause an adverse effect on infrastructure and services but is not expected to cause a measurable residual effect with the application of codified practices, standard operating procedures or best management practices. Although not assessed in Section 7.2.5, these interactions are considered in the cumulative effects assessment (Section 7.2.6).

Commissioning and start-up, and decommissioning are anticipated to require a smaller workforce, relative to Project construction, and will therefore not directly or indirectly result in population change that will exceed the capacity or decrease the quality of service of community services and infrastructure, transportation, or housing availability, even without the use of mitigation measures.

#### **7.2.3.1.3 Justification of Rank 2**

The potential effects of the Project on community infrastructure and services and change in housing availability will occur mainly as a result of Project employment for construction and, to a lesser extent, operation phase. This will create an increase in the local population either through the in-migration of workers and their dependents for employment on the Project or Project-related economic growth, leading to additional demands on infrastructure, services and housing. As such, Project activities and works that involve a larger workforce require more detailed analysis and consideration in the environmental assessment to manage and evaluate the potential effects and are, accordingly, ranked as 2.

Increased population during construction and operation, as well as Project activities during construction, will increase traffic in the LSA and RSA and place incremental pressure on the transportation infrastructure. These effects may be substantial and are of public and regulatory concern. As such, these interactions require more detailed analysis and consideration in the environmental assessment in order to understand, manage, and evaluate the potential effects and are, accordingly, ranked as 2.

## **7.2.4 Assessment of Residual Effects from the LNG Facility**

### **7.2.4.1 Analytical Methods**

#### **7.2.4.1.1 Analytical Assessment Techniques**

##### ***Population Forecast***

Potential effects on infrastructure and services were quantified, where possible. A population forecast was prepared, based on baseline forecasts for Kitimat and Terrace available from BC Stats, to which the potential population increase in the LSA associated with the Project was added. The quantitative analysis was supplemented, as appropriate, with information obtained from primary research, as well as from a literature review.

##### ***Community Infrastructure and Services***

Potential effects on community infrastructure and services were estimated by calculating the additional demand associated with population change and or direct Project requirements based on appropriate ratios for each measurable parameter (e.g., students per educator, police officers per 1,000 residents, sewer and wastewater capacity). This additional demand was then compared to available capacity, in consideration of local or provincial standards. It was assumed that Project-related population change would not affect Terrace during the construction phase because the temporary construction workforce will be housed in a workforce accommodation centre(s) to be located in Kitimat. To derive the anticipated project-related demand for community services in Kitimat (e.g., police and fire fighters) it was assumed that because temporary workers would reside in a self-contained workforce accommodation centre(s), they would consume only 25% of the services as permanent residents.

##### ***Traffic and Transportation Infrastructure***

Potential effects on daily road traffic volume were assessed by estimating the change in volume associated with the Project (i.e., traffic related to Project activity and that resulting from Project-related population increase) at peak periods during Project construction and operation, then comparing this change with the baseline traffic volume and the capability of the existing road network to absorb the additional demand. The potential increase in collisions attributable to the projected traffic volume was estimated by De Leur and Sayed (2008) for key roads and intersections in the LSA. The Project-related

airport passenger volume was estimated based on the estimated size of the construction workforce operating on a FIFO commute basis, assuming monthly shift rotations, plus additional air traffic resulting from Project-related population increase. Additional rail traffic volume was estimated using information provided by LNG Canada. Estimated additional wait times at road-rail crossings in the LSA were calculated based on field observations of train speeds. Where Project values were not certain, potential ranges are provided to illustrate "expected" volumes and high volumes.

### ***Housing Availability***

Potential change in housing availability is based on a comparison of the total available housing in the LSA to the forecasted demand resulting from the in-migration of temporary and permanent workforce (plus dependents) employed on the Project, and other Project-related population increase. The assessment of housing units and type that will be required from the in-migrating population is based on the average family size and number of children per family reported in the 2011 Census for the LSA. The assessment of housing availability and affordability is based on current rental and real estate market indicator trends and qualitative data. This information is then compared with other case study literature to determine who will most be affected and what types of outcomes are likely to occur. A conservative approach was taken by assuming the operational workforce will either be local hires with existing housing or will in-migrate and require housing.

### ***Municipal Government Costs***

Potential effects on municipal government costs was estimated by subtracting the additional expenditures anticipated for local and regional governments because of the Project from the additional revenues that could be anticipated from new sources of tax and fee revenue.

#### **7.2.4.1.2 Assumptions and the Conservative Approach**

The following assumptions were used in the assessment of Project effects on infrastructure and services.

### ***Project Construction and Operation Timing***

LNG Canada plans to build the Project used a phased approach. Based on the current Project schedule, the temporal boundaries are:

- construction, Phase 1 (trains 1 and 2) to be completed approximately five to six years following issuance of permits, the subsequent phase(s) (trains 3, 4) to be determined based on market demand
- operation, minimum of 25 years after commissioning, and
- decommissioning, approximately two years at the end of the Project life.

### Maintenance Turnarounds

During operation, turnarounds of the facility will occur approximately every three years to allow for maintenance and upgrading. Each train is expected to undergo a small turnaround requiring an estimated 14 days of effort, approximately three years after commissioning, and a large turnaround requiring an estimated 24 to 28 days, approximately six years after commissioning. Turnarounds are expected to continue on this schedule resulting in an alternating cycle of small and large turnarounds every three years. Turnarounds will bring 500 to 1,000 contractors to the LSA, depending on the size of the turnaround. It is conservatively estimated (overstating duration) that contractors will be in LSA communities for approximately 54 days to 58 days for large turnarounds and approximately 44 days for small turnarounds to complete ramp-up tasks, complete physical activities related to the turnaround and to ramp-down following the completion of physical work.

### Population Forecast Assumptions

It is anticipated that the Project will employ 4,500 to 7,500 people during construction and 400 to 700 during operation. Because the population forecast is conducted on an annual basis, the average workforce size during the peak construction period is used (6,170).

Table 7.2-22 summarizes assumptions used in the workforce estimates for construction and operation phases. Due to a limited supply of skilled trades and heavy equipment operators, it is assumed that 5% of the Project's construction workforce will be hired from in the LSA. This represents approximately 5.7% of the number of LSA residents in 2011 that have occupations related to trades, transport, and equipment operation. It is assumed that a further additional 5% of the construction workforce will in-migrate to the LSA, with the remainder on a FIFO rotation. While this is below the rate of in-migration that Nichols Applied Management (2007) found in a survey of the mobile workforce in northern Alberta, it is assumed that a combination of attractive worker accommodations and shift rotations offered by LNG Canada, and the high cost and scarcity of off-camp accommodation, will limit the number of workers who in-migrate into the LSA during construction.

**Table 7.2-22: Workforce Forecast Assumptions**

	Construction	Operation
Workforce (peak annual average)	6170	625
Target Percent LSA residents	5	14
Target Percent in-migrating	5	Up to 86
Target Percent FIFO	90	0–10
Non-basic jobs created per Project job held by local resident or in-migrant	0.70 (Kitimat), 1.13 (Terrace)	0.70 (Kitimat), 1.13 (Terrace)

LNG Canada will purchase a proportion of its goods and services used during construction and operation from within the LSA. The economic spin-offs of these purchases will include indirect employment, plus additional induced employment.

Estimates of the potential population effects that might result from indirect and induced employment are developed based on data related to the number of service jobs (non-basic employment) associated with each basic job (i.e., manufacturing, resource, construction, or public sector)<sup>5</sup>. As of 2011, Kitimat had 0.65 non-basic jobs for every basic job (i.e., a non-basic/basic employment ratio of 0.65:1) (Statistics Canada 2011). The non-basic/basic employment ratio was 1.1:1 in Terrace, and 0.9:1 in the LSA. Kitimat's non-basic:basic-employment ratio was lower than other mid-sized BC communities, such as Smithers (1.0:1), Castlegar (1:1), or Trail (1.2:1). For Kitimat, the low ratio suggests that the services sector has not evolved to provide the full range of all the goods and services that would be expected for a community of its size, partly because of the changing number of jobs in basic employment over the last decade and partly because Kitimat residents rely on Terrace as a regional trading centre. This means that Project-related population growth in Kitimat will likely result in increases in service sector employment in both Kitimat and Terrace. It is assumed that every 10 basic jobs in Kitimat will result in 7.0 non-basic jobs in Kitimat plus 2.3 non-basic jobs in Terrace.

Table 7.2-23 summarizes the assumptions underlying the forecasted demographic change during the construction and operation phases. The household composition, average family size, and number of children per family are based on 2011 Census information for the LSA. It was assumed that 70% of workers and their families who move to the LSA to seek Project employment will settle in Kitimat, with the balance choosing to live in Terrace.

**Table 7.2-23: Demographic Forecast Assumptions**

	Assumption
Percent single-person households <sup>a</sup>	28
Percent multi-person households <sup>a</sup>	72
Average family size of multi-person households <sup>a</sup>	2.85
Average number of children per family <sup>a</sup>	1.04
Percent of workforce residing in Kitimat <sup>b</sup>	70
Percent of workforce residing in Terrace <sup>c</sup>	30

**NOTES**

<sup>a</sup> Based on Census 2011 for LSA

<sup>b</sup> Including the District of Kitimat and Kitimaat Village

<sup>c</sup> Including the City of Terrace, and surrounding communities, including Kitselas and Kitsumkalum communities

<sup>5</sup> Based on definition of basic and non-basic sectors from Horne (2009)

The forecast conservatively assumes that individuals who obtain non-basic employment will in-migrate at the same rate, and have the same household characteristics, as those who are hired for direct Project employment. This can lead to an over-estimate in the population forecast for a number of reasons. First, the workforce in the LSA likely will be able to absorb a higher proportion of induced labour demand because such demand will be spread over multiple sectors (i.e., not requiring a concentration of individuals with specific industry skills). As well, some of the spouses of in-migrant Project workers will seek employment in the non-basic sector, thus reducing the total population increase associated with induced labour. For these reasons, the population forecast included in this analysis is considered conservative, erring towards over-estimating population effects.

### ***Municipal Government Cost Assumptions***

It is assumed that, as a result of population growth associated with Project employment, local and regional governments will incur expenditures equivalent to the 2012 per-capita rates. As well, it is assumed that the District of Kitimat will experience an 25% increase in annual expenditures (based on its operating budget) associated with the Project during the construction phase due to, for example, increased roadway maintenance, additional emergency services personnel, and additional protective services personnel. Upon completion of construction it is assumed that such additional expenditures would not be required due to the lower level of Project-associated demands on infrastructure and services. However, additional expenditures associated with increases in population would be expected during the operation phase.

## **7.2.4.2 Assessment of Effects on Community Infrastructure and Services**

### **7.2.4.2.1 Description of Project Effect Mechanisms for Effects on Community Infrastructure and Services**

Construction and operation of the Project could affect community infrastructure and services because of increased use by the Project directly and increased population associated with the temporary and permanent Project workforce. Potential effects on community infrastructure and services will depend on:

- the size of the temporary and permanent population change associated with the Project
- temporary worker work schedule (e.g., structure of time off)
- existing capacity of infrastructure and services, and
- ease of accessibility (e.g., distance from Kitimat).

Project effects on the population are based on direct, indirect, and induced labour requirements during the various Project phases and assumptions about how this labour demand will be satisfied. Section 6.2 describes anticipated labour demand associated with the Project. The extent of population change associated with the Project depends on the:

- proportion of Project workers that are hired locally
- proportion of workforce that in-migrates
- extent of Project-associated indirect and induced labour occurring in the LSA
- size and demographic characteristics of in-migrant workforce families, and
- length of time for construction and operation.

Project-related population changes are expected to increase demands on utilities (water and sewer, and waste management facilities), education (daycare), and access to and use of public recreation sites during construction and operation, and emergency response (police, fire protection, and ambulance) primarily during construction. Without the implementation of mitigation measures, this demand may exceed the available capacity or decrease the quality of service provided. The Project is anticipated to increase local government costs because of additional demand placed on community infrastructure and services, including transportation infrastructure, both directly by the Project and as a result of a Project-related increase in population.

#### **7.2.4.2.2 Mitigation for Effects on Community Services and Infrastructure**

To manage potential demands on community infrastructure and services, LNG Canada will implement the following mitigation measures.

- Construct and operate workforce accommodation centre(s) for non-resident workforce during the pre-construction and construction phase to manage effects of temporary workforce on communities (Mitigation 6.2-5).
- Prohibit unauthorized public access to the worksite or construction workforce accommodation centre(s) (Mitigation 7.2-1).
- Develop a Worker Code of Conduct to communicate expectations for the behaviour of all workers when they are in Kitimat, Terrace, or any other local community. LNG Canada will ensure that all workers are familiar with the Worker Code of Conduct and expected standards of behaviour. Workers will sign a copy of the Code of Conduct at orientation acknowledging their commitment to comply with the Code (Mitigation 7.2-2).
- Require all Project workers to undertake worker orientation, including cross-cultural awareness, to help build awareness and respect of local issues of importance, including local facilities, recreational opportunities, and other community considerations, with expectation of reducing adverse interactions with the community (Mitigation 7.2-3).

- Undertake ongoing and meaningful community engagement, and log, monitor, and work to address community complaints to reduce community concerns associated with perceived and actual changes resulting from the Project (Mitigation 7.2-4).
- Make the workforce accommodation centre(s) and LNG facility self-sufficient (to extent practicable) with respect to potable water and wastewater treatment services so that additional service demands will not be placed on municipal water and sewer services (Mitigation 7.2-5).
- Provide local and regional governments with information on anticipated changes in resident populations attributable to the Project to facilitate their planning for incremental demands for solid waste management, potable water supply, sewage system needs, and recreation facilities (Mitigation 7.2-6).
- Provide onsite first aid equipment, supplies, and trained first aid personnel to deal with minor injuries. In the case of major injuries, patients will be evacuated via land or air ambulance to medical facilities (Mitigation 7.2-7).
- Provide on-site health services and medical emergency response for primary care including health promotion, injury/illness prevention, and injury/illness management, in order to manage impact on the local public health care system (Mitigation 7.5-3).
- Establish and implement a Spill Response Plan as part of a broader Emergency Response Plan with input from relevant agencies (Mitigation 7.2-8).
- Work with emergency service providers to plan for anticipated changes in service requirements associated with the temporary and permanent workforce by providing information related to workforce projections, temporary workforce accommodation, and housing plans, and onsite emergency services (Mitigation 7.2-9).
- Include recreational venues, and entertainment and communications amenities in the construction workforce accommodation centre(s) to reduce Project-related demands on community infrastructure and services (Mitigation 7.2-10).
- Provide security services to monitor and enforce compliance of workforce accommodation and construction policies (Mitigation 7.2-11).
- As part of the Emergency Response Plan, make employees aware of fire suppression systems installed onsite, and train key employees in fire suppression, where appropriate (Mitigation 7.2-12).
- Work with local parks and recreation planning entities to provide input into the development and improvement of outdoor recreation areas (including parks and trails) (Mitigation 7.2-13).
- As part of the Emergency Response Plan, work with District of Kitimat fire department to forecast additional demands on fire and rescue services, and with RCMP to forecast additional demands on policing (Mitigation 7.2-14).



- Local residents will be informed of job and procurement opportunities during the Project phases. LNG Canada will encourage a hire-local first approach for all phases (Mitigation 6.2-1).
- Potential shortages of workers with specific skill requirements will be identified and training and educational facilities will be engaged so that regional residents have the opportunity to upgrade their skills (Mitigation 6.2-3).
- LNG Canada will develop and implement a Social Management Plan to manage potential social effects of the Project and optimize potential benefits (Mitigation 6.2-8).

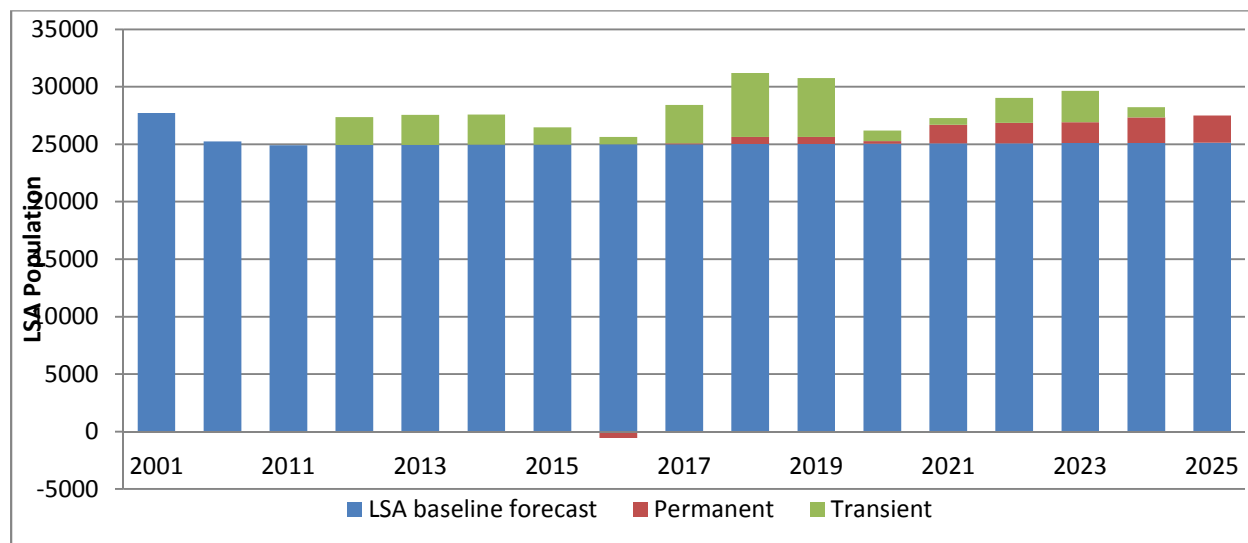
Mitigation measures will commence at the beginning of Project construction, earlier where applicable to develop plans or consult with First Nations or local stakeholders, and will continue throughout the life of the Project; mitigation measures specific to a Project phase or physical work (e.g., construction, commissioning, operation, or decommissioning) will cease following the completion of that phase or physical work. Because it is not possible to estimate the extent of known effects related to community services and infrastructure, it is unknown how successful the measures will be at reducing such effects. Based on these considerations, a low to moderate level of confidence exists with respect to the effectiveness of the mitigation measures.

#### **7.2.4.2.3 Characterization of Residual Effects on Community Services and Infrastructure**

##### ***Population Change in LSA***

During the peak of Phase 1 construction, the population of the LSA is forecast to increase by approximately 6,170 people because of the Project, which is a 25% increase relative to the resident population estimated by BC Stats. However, most of this increase will be from construction workers who will maintain their residence outside the LSA and work on a FIFO basis. Because these workers will be housed in a self-contained workforce accommodation centre(s), their demands on community infrastructure and services will be less than those of individuals who relocate to the LSA. While details of Project shift rotations have not been finalized, up to 5% of the onsite workforce may be off-shift on any given day. These workers, along with the in-migrating workers and their families, may be consumers of services and infrastructure in the LSA communities.

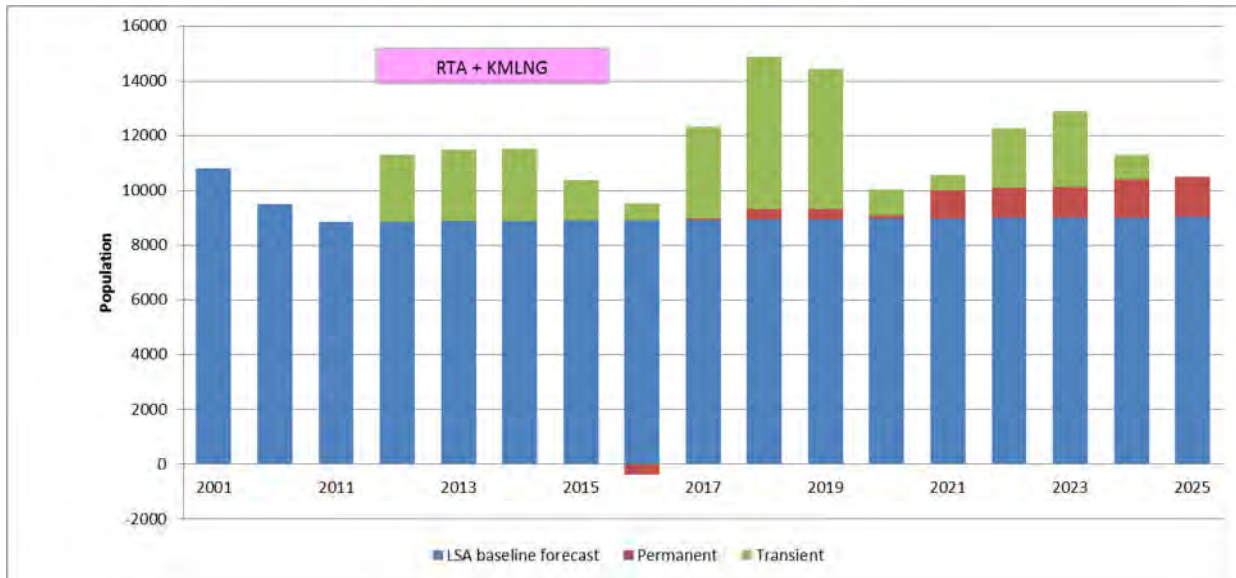
The permanent population of the LSA is forecast to increase by approximately 7% (1,765 people) during the operation phase, which is projected to increase the LSA population up to 26,888. This is higher than the LSA's 2006 population but is below the 2001 population, which was 27,720 people (Figure 7.2-13). At the end of the Project's operational life, the LSA could be expected to experience a reduction in population to the extent that individuals (and their families) no longer working at the Project choose to move elsewhere for employment or lifestyle reasons.



**Figure 7.2-13: LSA Population Forecast Associated with the Project**

Because the workforce accommodation centre(s) will be located in Kitimat, the population change in that community during construction will be more pronounced than for the LSA overall (Figure 7.2-14). At the peak of Phase 1 construction, the Project is expected to increase Kitimat’s population by up to 5,930 people, or approximately 66% of the current resident population estimated by BC Stats. During operation, Kitimat’s permanent population is expected to increase by up to 12%, reaching approximately 10,100 people by 2023, a population level similar to that of 2001.

In-migrating workers and their families will increase Terrace’s population during Project construction and operation. It is estimated that a large percentage of these in-migrants will work in non-basic sectors, induced by Project development. At the peak of construction, Terrace’s population is estimated to increase by up to 230 people. During the operation phase, the Project is expected to increase Terrace’s population by up to 630 people.



**Figure 7.2-14: Kitimat Population Forecast Associated with the Project**

***Population Change in Aboriginal Communities***

The Project is anticipated to affect the population of Aboriginal communities in the LSA because there is likely to be some migration within the area. Some First Nations members who moved elsewhere in recent years might move back to their home reserves or communities to participate in Project-related economic opportunities. Off-reserve community members might also move on-reserve to seek lower-cost housing (see Section 7.2.5.4).

***Potable Water and Wastewater Treatment***

The workforce accommodation centre(s) are expected to place little or no demand on municipal infrastructure in Kitimat because it will have its own water treatment facility and wastewater treatment facility. Construction workers and their dependents who choose to relocate permanently to Kitimat are expected to increase average daily demand for potable water and wastewater (sewage) treatment services in Kitimat to 2.1 Mgd and 2.6 Mgd, respectively (Table 7.2-24). With the projected increases, average daily demand is expected to be within Kitimat’s rated capacity for both potable water and sewage treatment. However, projected peak demand for potable water is nearly 90% of rated capacity, while peak demand for wastewater treatment would exceed rated capacity. This indicates that the current infrastructure may need to be upgraded to handle demand due to Project-associated population growth (Table 7.2-23). Current potable and wastewater treatment facilities in Terrace will be able to absorb the additional average demand but may need to be upgraded to meet peak demands (Table 7.2-24).

**Table 7.2-24: Estimated Demand for Potable Water and Wastewater Treatment in 2025**

Service Provider	Rated Capacity (Mgd)	Average Daily Demand (Mgd)	Peak Demand (Mgd)	Project-related Demand (Mgd)	Daily Demand with Project (Mgd)	Peak Demand with Project (Mgd)
<b>WATER</b>						
District of Kitimat (DM)	4	1.7	3.2	0.4	2.1	3.6
Terrace Area	5	2.4	4.8	0.2	2.6	5.0
<b>SEWAGE</b>						
District of Kitimat (DM)	10.2	2.1	10.2	0.7	2.8	10.9
Terrace Area	5.34	1.19	3.17	0.4	1.6	3.6

**NOTES:**

Mgd = million gallons/day

Domestic water usage is based on an average daily use of 329 L of water per day, per person in Canada,

Residential wastewater usage is based on an average of 668 L of wastewater per person served by sanitary sewers in Canada.

**SOURCE:** Government of Canada (2013); Statistics Canada (2014), Sussbauer 2013, pers. comm.

***Solid Waste Disposal and Recycling***

Construction of the workforce accommodation centre(s) and LNG facility, presence of workers in the accommodation centre(s), and Project-related population growth will result in increased demand on waste management facilities. Construction—including site preparation and onshore construction—will generate non-hazardous construction material debris, such as lumber, plastic, glass, metal, and other related building-material byproducts. Solid waste generated during LNG processing will be transported to an approved third-party disposal site. Solid, compostable, and recyclable waste will be generated by temporary and permanent workers living at the workforce accommodation centre(s) and in communities in the LSA. Waste will also be generated from the dismantling of land-based and marine infrastructure in the decommissioning phase. Where possible, construction and related recyclable materials will be recycled locally or transported to the nearest recycling processing facility. No landfills in the LSA process industrial-related waste.

The capacity for solid waste disposal and recycling infrastructure and services varies by community in the LSA. The District of Kitimat landfill has capacity to support waste disposal for another 30 years; however, it is under increased pressure, as are recycling programs in Kitimat and Terrace. Other landfills in the LSA are facing imminent closure or consolidation with plans for major expansion within the next couple of years. Depending on the construction timelines and opening of the RDKS's Forceman Ridge Landfill, additional pressure and challenges may be directed to the District of Kitimat Landfill or other landfills

located in the LSA. As a result of Project-related population increase, the lifespan of the Kitimat landfill will decrease from its assessed capacity of 30 more years from 2013.

### ***Education and Daycare Services***

Project-related demands for daycare services, as well as elementary, middle, and high school teachers, will occur as a result of Project-related population growth in the LSA. Because the total capacity utilization rate of schools in the LSA is lower than the Ministry's target of 95%, there will be sufficient schoolroom space to accommodate the expected increase in elementary, middle, and high school students associated with the Project. The average student to educator ratio is lower than the provincial average in Kitimat but is similar to the provincial average in Terrace. Some additional hiring will likely be necessary so that student to teacher ratios fall within provincial standards. Daycare service providers in the LSA are currently at full capacity and, unless existing providers expand their capacity or new service providers emerge, there will be insufficient capacity to handle demand associated with the Project.

### ***Emergency and Protection Services***

Demands on emergency and protection services will be managed through the mitigation measures described, including the implementation of an emergency response plan and the provision of security personnel, health facilities, and fire suppression systems. During construction, minor incidents or injuries will be addressed by an onsite occupational first-aid health practitioner. Additionally, workers at the accommodations centre will have access to a full suite of health related services (e.g., on-site health services and medical emergency response for primary care including health promotion, injury/illness prevention, and injury/illness management). However, for more severe incidents, ambulance services will be required for patient transfers to appropriate health facilities. During operation, minor incidents or injuries will likely be addressed by certified first aid attendants, for more severe incidences ambulance services will be required.

Additional demand on emergency and protection services will occur as a result of a rapid increase in population in the LSA during the construction phase. The presence of a large temporary construction workforce could result in increased disruptive social interactions such as disorderly conduct, nuisances, crime, and harassment that may require police intervention. Additional demands will result from a potential increase in traffic incidents, increased drug- and alcohol-related instances associated with increased expendable incomes and temporary worker populations. Community consultation undertaken for the Project identified increased safety concerns, crime rates involving non-local residents, and confirmation from local RCMP of more organized crime activity, greater reports in assault and violent crimes, and the need for additional police services or onsite security measures.

Potential adverse interactions between the temporary construction workforce and LSA residents that may result in increased demands for emergency or protective services will be managed by limiting available free time while on rotation, limiting mobility options available to Project workers, implementing the Worker Code of Conduct, and providing recreational and entertainment facilities to encourage Project workers to remain at the workforce accommodation centre(s). Increased demands are expected for:

- fire code compliance and site inspections as a result of construction activities
- first responder service as a result of severe workplace incidents and injuries
- fire safety response for onsite fires, for search and rescue services for employees injured or lost during recreational opportunities, and
- medical aid for socially disruptive interactions, which can be associated with temporary worker populations.

An increase in population, particularly during the operation phase, could place additional pressure on fire services and infrastructure. Based on the current firefighter:population ratio, Terrace will need three additional volunteer firefighters, and Kitimat will need three additional firefighters to handle increased service demand associated with projected permanent population change related to the Project. Kitimat could need three to four additional firefighters because of service demands associated with the temporary workforce during construction.

Based on the current officer to population ratios and anticipated Project-related increases in population, it is estimated that Terrace and Kitimat will each need two additional full-time police officers to address increased call volume associated with permanent population change associated with the Project. One or two additional full-time police officers may also be needed in Kitimat to address call volumes associated with the temporary workforce and Project-related population increase during construction.

### ***Outdoor Recreation***

The construction workforce accommodation centre(s) will provide a variety of localized indoor and outdoor recreation opportunities for the Project temporary workforce, which will alleviate demand on outdoor recreation resources in the LSA.

Participation in outdoor recreation by Project workers will depend on Project shifts, availability of time for outdoor recreation activities, and preference for onsite outdoor recreation facilities or activities. Demand on outdoor recreation areas in the LSA is estimated by combining the number of participants assumed to engage in outdoor recreation from the communities of Kitimat and Terrace with the assumed number of Project workers and other in-migrants who might participate in outdoor recreation. Participation for Project workers and other in-migrants in outdoor recreation is based on a BC resident outdoor recreation participation study, using information for the Northern BC demographic (British Columbia 2013b).

Approximately 93% of northern BC residents participated in outdoor recreation activities, with 91% of those engaging in at least one outdoor recreation activity within a 12-month period (British Columbia 2013b). A variety of highly accessible outdoor recreation areas occur in and near the LSA, which provide ample recreation opportunities and alternatives close to the Project site. In addition, municipal and provincial agencies have identified plans to manage capacity and improve or expand outdoor recreation areas and facilities in the LSA (Terrace 2011; BC Parks 2013b; Kitimat 2013, 2014a). Therefore, capacity of outdoor recreation areas are expected to meet increased demand associated with the Project.

### ***Government Finances***

With the application of mitigation measures, residual effects on municipal government finances in the LSA during construction are anticipated to be low. While LSA communities can anticipate increased expenditures during construction, these will be offset by increased revenues from taxation, fees, charges, and levies during operation. However, owing to the lag between the incurrence of expenditures and realization of additional tax revenue, there is potential for short-term deficits during the first couple years of Project construction, which is the period when local and regional governments are expected to face higher costs. This will be followed by a period of surpluses when construction activity winds down. During operation, incremental expenditures and revenues of LSA communities are expected to be in balance.

In Kitimat, additional annual expenditures associated directly with the Project, including those associated with the temporary workforce, are forecast to reach \$6.7 million per year by 2024, before declining when the Project transitions to the operation phase (Table 7.2-25). Additional annual expenditures associated with the in-migrating population are forecast to reach \$4 million by 2025 and remain at that level throughout the operation phase.

It is anticipated that revenues generated by the District of Kitimat will offset the increased expenditures. Residential taxes will be payable by individuals who in-migrate into the community (either directly if they own property, or by their landlords if they rent). The Project is anticipated to induce growth of local businesses, which will pay business taxes and fees to the District. LNG Canada will also pay property taxes on applicable components of the Project, as they become assessable. It is anticipated that the workforce accommodation centre(s) will be assessed at the residential property tax rate while the LNG facility and marine infrastructure will be assessable at the heavy industry rate. The increased taxes and fees paid by LNG Canada are anticipated to offset the increase in Project-associated expenditures.

Terrace will incur additional expenditures associated with an increase in temporary and permanent population growth. There is also likely to be an increase in expenditures for protection services associated with the increase in vehicle traffic within city limits. While Terrace can reasonably expect an increase in some service demand from the temporary construction workforce, this demand is expected to be low because only a small proportion of the workforce will be able to visit Terrace on any given day. The movement of workers transiting between shifts will avoid Terrace because they will be transported directly between the airport and the workforce accommodation centre(s) in Kitimat.

Before the start of operation, Terrace is forecast to experience low additional revenue requirements because the expected population change during construction is modest, and the Project's direct demand for infrastructure and services in Terrace is low. Considering the reduction in the permanent workforce at RTA, it is possible that Terrace's permanent population will decline during the first few years of construction, resulting in a slight decline in required expenditures. As the Project becomes operational, more households are expected to settle in Terrace, resulting in an increase in expenditures by approximately \$1.4 million by 2026 (Table 7.2-26). The increase in population will broaden Terrace's residential tax base, while Project-induced increases in business investment (both commercial and light industrial revenue from direct and indirect Project suppliers and business activity induced by local spending by Project-associated workers) will also increase taxes and fees paid to the city. In summary, it is anticipated that the increase in revenue will offset the Terraces' increased expenditures over both construction and operation periods.

### ***Aboriginal Communities***

It is expected that Aboriginal communities in the LSA will experience in-migration because individuals and households will seek economic opportunities associated with industrial development or seek lower-cost accommodations. It is anticipated that if the population exceeds 800 in Kitimaat Village, potable water and wastewater treatment upgrades and additional community centre space will be needed. Additional potable water supply will also be required at Kitselas First Nation communities of Gitau and Kulspai if the on-reserve population continues to grow. Demand for protection services, education, and daycare is expected to increase in tandem with population growth. Should populations increase, Aboriginal communities can be expected to incur some additional costs to provide services to community members. Through its various funding mechanisms, AANDC may be able to cover some of the additional cost, but Aboriginal communities may require additional own-source funding to cover additional expenditures.



**Table 7.2-25: Estimated Change in Expenditures for the District of Kitimat, 2015 to 2026**

Estimated Change	Years											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Additional expenditures – population change (\$ thousands)	-\$37	-\$1,039	\$85	\$994	\$962	\$355	\$2,747	\$2,967	\$3,051	\$3,747	\$4,017	\$3,990
Additional expenditures – LNG Canada direct (\$ thousands)	\$0	\$1,200	\$3,600	\$6,000	\$6,120	\$6,242	\$6,367	\$6,495	\$6,624	\$6,757	\$6,419	\$5,777
Additional expenditures – total (\$ thousands)	-\$37	\$161	\$3,685	\$6,994	\$7,082	\$6,598	\$9,115	\$9,462	\$9,676	\$10,504	\$10,436	\$9,768

**SOURCE:** Stantec estimate

**Table 7.2-26: Estimated Change in Expenditures for the City of Terrace, 2015 to 2026**

Estimated Change	Years											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Additional expenditures – population change (\$ thousands)	\$0	-\$14	-\$317	\$31	\$363	\$351	\$130	\$1,003	\$1,084	\$1,114	\$1,368	\$1,467
Additional expenditures – LNG Canada direct (\$ thousands)	\$29	\$13	\$66	\$110	\$101	\$19	\$12	\$43	\$54	\$18	\$1	\$0
Additional expenditures – total (\$ thousands)	\$29	-\$1	-\$251	\$141	\$464	\$370	\$141	\$1,046	\$1,138	\$1,132	\$1,370	\$1,467

**SOURCE:** Stantec estimate

### ***Summary of Residual Effects on Community Infrastructure and Services***

In summary, residual effects on community infrastructure and services are expected to be moderate in magnitude, short to medium term in duration, and continuous. They will occur in a moderate resilience context because communities are anticipated to be able to accommodate additional demand with minor effects on available capacity or level of service. Most effects are expected to be concentrated in communities in the LSA, although there could be some spill over to other communities in the RSA. Reversibility will depend on whether in-migrant workers stay after the end of the Project lifetime, although the magnitude of effects is expected to be reduced to low or negligible levels after the decommissioning phase.

#### **7.2.4.2.4 Determination of Significance for Residual Demand on Community Infrastructure and Services**

Population growth associated with the Project will place additional demand on community infrastructure and services, particularly on emergency services, which have experienced increased demand in recent years. These effects will be more pronounced during the construction phase, as the LSA communities adjust to a rapid increase in population. During the operation phase, the Project can be expected to have beneficial effects on community services in the LSA because of the stabilizing effect of a larger population and a more diversified tax base. With the implementation of mitigation measures, as well as communication of Project requirements by LNG Canada to the municipal authorities and local agencies responsible for infrastructure and services, adverse residual effects are assessed as not significant. This conclusion is made with a moderate level of confidence.

#### **7.2.4.3 Assessment of Effects on Traffic and Pressure on Transportation Infrastructure**

##### **7.2.4.3.1 Description of Project Effect Mechanisms for Effects on Traffic and Pressure on Transportation Infrastructure**

###### ***Road Traffic Volumes***

The Project will generate additional road traffic through the movement of workers, goods, materials, and equipment to and from the Project site. The construction phase is anticipated to have the highest associated volumes of heavy or oversized loads, in addition to traffic generated by the large construction workforce. Traffic during the operation phase will be generated primarily by the movement of locally based workers to and from the Project site, and the incremental increased local traffic as a result of Project-related population growth. Congestion on roads because of increased traffic volumes may result in a decreased level of service for all users. Additional road traffic volumes may increase the risk of collisions at intersections and along road segments in the LSA, or may accelerate the wear and tear on road infrastructure.

### ***Air Traffic Volumes***

The FIFO workforce, particularly during the peak construction period, together with Project-related population increase, will increase the demand at the Northwest Regional Airport. The movement of Project supplies and equipment, and the Project-related population growth during both the construction and operation phases will also increase demand. If demand nears or exceeds capacity, it may result in a decreased LOS for all users.

### ***Rail Traffic Volumes***

Heavy rail will be used to import items that can fit onto standard-sized rail cars during construction and to export stabilized condensate during operation. Longer trains or additional train trips may result in longer or more frequent waits at road-rail crossings, resulting in a decreased LOS for road users, and may pose additional risk in delaying the response of emergency vehicles. Given the uncertainty on transportation methods at this early stage of the engineering design, a range is provided with the expected volume plus potentially higher volumes.

#### **7.2.4.3.2 Mitigation for Effects on Traffic and Pressure on Transportation Infrastructure**

LNG Canada will implement the following mitigation measures to eliminate or manage effects on traffic and pressure on transportation infrastructure.

- Develop and implement a Traffic Management Plan (Mitigation 5.4-6).
- Provide relevant information on Project transportation planning to MOTI and District of Kitimat to facilitate their planning for road improvements and traffic movement (Mitigation 7.2-15).
- Monitor all travel-related incidents involving LNG Canada workers, and review these data regularly to identify how travel can be improved to reduce risks to safety and further incidents (Mitigation 7.2-16).
- Worker rotations and charter flights, where practical, will be scheduled to alleviate peak pressures on the airport terminal facilities (Mitigation 7.2-17).
- Peak-hour traffic volumes, particularly across the Haisla Bridge, will be managed by scheduling worker rotations, and equipment, material, and goods deliveries to the off-peak hours whenever practicable (Mitigation 7.2-18).
- Commuter support will be provided between Terrace and the Project site (e.g., scheduled crew transportation) to facilitate residents of the Greater Terrace area and nearby Aboriginal communities to participate in the Project while maintaining residence in home communities (Mitigation 7.2-19).
- The “vehicle factor” of collisions will be managed by requiring winterization and snow tires (when appropriate) for Project vehicles, walk-around vehicle inspections, and regular vehicle maintenance (Mitigation 7.2-20).

- The “driver factor” of collisions will be managed by implementing stringent policies such as fit-for-duty rules (e.g., drugs, alcohol, fatigue) and driver training for adverse weather (Mitigation 7.2-21).
- LNG Canada will develop and implement a Social Management Plan to manage potential social effects of the Project and optimize potential benefits (Mitigation 6.2-8).

It is anticipated that the majority of the mitigation measures will be implemented upon the commencement of construction or as early as possible to support the measures, including preplanning and logistics regarding the movement of goods and people. Confidence in each of the mitigation measures is high because they have proven useful in managing similar affects and consider Project related concerns and issues.

#### **7.2.4.3.3 Characterization of Residual Effects on Traffic and Pressure on Transportation Infrastructure**

With the implementation of the mitigation measures, traffic volumes at key intersections and road segments in the LSA are predicted to increase by approximately 11% to 36% in the construction phase (Table 7.2-27), and 16% to 21% in the operation phase (Table 7.2-28).

**Table 7.2-27: Estimated Increase in Traffic Volumes at the Peak Construction Period**

Road or Intersection Name	Baseline	Direct		Other		Total	
	Veh/Day	Veh/Day	% Increase	Veh/Day	% Increase	Veh/Day	% Increase
Haisla Bridge	8,700	1,351	15.5	274	3.2	1,625	18.7
Haisla Boulevard x Lahakas Boulevard	19,150	1,462	7.6	604	3.2	2,066	10.8
Haisla Boulevard x Kuldo Boulevard	12,650	1,393	11.0	399	3.2	1,792	14.2
Haisla Boulevard x Tsimshian Boulevard	11,340	1,379	12.2	358	3.2	1,737	15.3
Haisla Boulevard x Nalabila Boulevard	4,810	1,310	27.2	152	3.2	1,461	30.4
Haisla Boulevard x Kingfisher Avenue	7,880	1,342	17.0	249	3.2	1,591	20.2
Highway 37	1,930	659	34.1	27	1.4	686	35.5

**NOTES:**

**SOURCES:** InterCAD (1991); MOTI (2001, 2011, 2012); Stantec estimate

**Table 7.2-28: Estimated Increase in Traffic Volumes at the Peak Operation Period**

Road or Intersection Name	Baseline	Direct		Other		Total	
	Veh/Day	Veh/Day	% Increase	Veh/Day	% Increase	Veh/Day	% Increase
Haisla Bridge	8,700	585	6.7	1,060	12.2	1,645	18.9
Haisla Boulevard x Lahakas Boulevard	19,150	1,013	5.3	2,334	12.2	3,347	17.5
Haisla Boulevard x Kuldo Boulevard	12,650	747	5.9	1,542	12.2	2,289	18.1
Haisla Boulevard x Tsimshian Boulevard	11,340	693	6.1	1,382	12.2	2,075	18.3
Haisla Boulevard x Nalabila Boulevard	4,810	426	8.8	586	12.2	1,012	21.0
Haisla Boulevard x Kingfisher Avenue	7,880	551	7.0	960	12.2	1,512	19.2
Highway 37	1,930	208	10.8	104	5.4	313	16.2

**NOTES:**

**Sources:** InterCAD (1991); MOTI (2001, 2011, 2012), Stantec estimate.

Managing peak-hour traffic volumes at key congestion points such as the Haisla Bridge will help alleviate peak pressures on roads. There is available capacity during the off-peak hours, and the road network will be able to accommodate the additional Project demands during these times.

Vehicle traffic using Highway 37 and driving from Terrace towards Kitimat will not affect the reserve communities of Kalum and Gituas. However, vehicle traffic during peak periods may be slowed turning onto Kitamaat Village Road or Substation Avenue towards Kulspai. Vehicle traffic using Highway 16 West driving towards Prince Rupert will pass by the reserve communities of Gituas and Kalum but will not directly impede traffic flow within either reserve community.

This increase in traffic volumes could lead to an increase in traffic collisions. Results of collision modelling indicate that additional traffic at key roads and intersections in the LSA may cause between 0.05 and 1.5 additional collisions per year during the construction phase and 0.08 and 1.3 during the operation phase (Table 7.2-29). With implementation of mitigation measures, in particular the Traffic Management Plan, traffic volumes and potential collisions are expected to be managed.

**Table 7.2-29: Estimated Increase in Collisions throughout the Project Lifetime**

Road or Intersection Name	Construction			Operation		
	Increase (col/year)	% increase	Total (col/year)	Increase (col/year)	% increase	Total (col/year)
Haisla Bridge	0.05	4.3	1.12	0.08	7.4	1.15
Haisla Boulevard x Lahakas Boulevard	0.14	5.7	2.64	0.46	18.3	2.96
Haisla Boulevard x Kuldo Boulevard	0.08	5.0	1.65	0.22	13.8	1.78
Haisla Boulevard x Tsimshian Boulevard	0.04	3.8	1.20	0.10	8.7	1.26
Haisla Boulevard x Nalabila Boulevard	0.19	19.4	1.15	0.11	11.9	1.07
Haisla Boulevard x Kingfisher Avenue	0.13	21.6	0.74	0.12	20.1	0.73
Highway 37	1.51	14.6	11.9	1.34	12.9	11.7

**SOURCE:** Stantec estimate.

It is estimated that up to 10 additional trains (30 to 60 cars each) per week (or the equivalent number of additional cars on existing trains if feasible) may be required during the peak construction phase. Up to 50 additional rail cars per week may be required during the operation phase. Based on observed train speeds at road-rail crossings in Terrace, this could result in crossing delay increases of approximately up to 15 minutes per train during the construction and operation phases. Scheduling train trips to the off-peak hours will manage potential conflicts with road traffic and keep queue lengths to a minimum.

The increase in air traffic volume will be highest during the construction phase because of the movement of Project construction workers, supplies, and goods by plane. Air traffic volumes will remain elevated, to a lesser degree, during the operation phase as a result of Project visitors, and a smaller continuing FIFO worker population, plus the Project-related increase in local population. At the peak of construction, the Northwest Regional Airport may see an increase of up to 133,000 air passengers per year because of the Project, a 76% increase over the baseline of 177,000 air passengers per year (inclusive of commercial flights and charter flights). Given the baseline conditions and the implementation of the 20-year plan for the airport, this volume of air passengers is expected to exceed the capacity of the airport for up to three years during construction. A Socio-economic Management Plan will be developed. The plan will include measures to address Project related demands on infrastructure and services including airport terminal facilities.

**Summary of Effects on Traffic and Pressure on Transportation Infrastructure**

Residual effects on transportation infrastructure are expected to be of low to medium magnitude, short to medium term in duration, and continuous. They occur in a moderate resilience context because the transportation infrastructure as designed is expected to be able to accommodate the changes with some effects on the available capacity or LOS. Residual effects are expected to be concentrated in the LSA,

although it is recognized that transportation infrastructure connecting to the LSA will also be used by the Project. Reversibility will depend on whether or not in-migrant workers stay after the end of the Project lifetime, although the magnitude of effects is expected to be reduced to low after the decommissioning phase.

#### **7.2.4.3.4 Determination of Significance for Residual Effects on Traffic and Pressure on Transportation Infrastructure**

Given the existing capacity of transportation infrastructure in the LSA and the implementation of mitigation measures by LNG Canada, it is anticipated that the projected traffic volumes caused by Project activities and Project-related population growth will not exceed design capacity at any location. Therefore, these residual effects are assessed as not significant. Rail traffic volumes and the anticipated increase in traffic collisions are not expected to result in a substantial increase over the current conditions and are also assessed as not significant. While the increase in air traffic would exceed planned volumes for the terminal, direct effects will be managed through the use of chartered flights; therefore, these effects are also assessed as not significant. This conclusion is made with moderate level confidence because of uncertainty in estimating the total increase of in-migrating residence and the potential for upgrades regarding some municipal and provincial infrastructure such as highways and the airport terminal.

#### **7.2.4.4 Assessment of Change in Housing Availability**

##### **7.2.4.4.1 Description of Project Effect Mechanisms for Change in Housing Availability**

Project-related demographic changes have the potential to affect the demand for accommodation throughout the life of the Project. The temporary workforce is not likely to place demands on housing supply because they will be accommodated at the workforce accommodation centre(s). During the operation phase, the permanent workforce will require accommodation in the LSA. This operation workforce will, in most cases, be accompanied by spouses and children, and they and other Project-related in-migrant individuals and households may require housing for the duration of the minimum 25-year operation phase.

##### **7.2.4.4.2 Mitigation for Change in Housing Availability**

LNG Canada will implement the following measures to mitigate effects of the Project on housing availability and affordability:

- Construct and operate workforce accommodation centre(s) for non-resident workforce during the pre-construction and construction phase to manage effect of temporary workforce on communities (Mitigation 6.2-5).

- Local residents will be informed of job and procurement opportunities during the Project phases. LNG Canada will encourage a hire-local first approach for all phases (Mitigation 6.2-1).
- LNG Canada will work to manage demands on local housing (e.g., apartments and single-family houses) due to the anticipated requirements of the construction management and operational workforce, and will also include, in periodic reassessments of the housing market, the consideration of the risk posed by oversupply of accommodations (Mitigation 7.2-22).
- Develop a worker accommodation plan that addresses worker accommodations throughout the project lifecycle, including pre-construction, construction, operation, decommissioning, and turnarounds (Mitigation 7.2-23).
- Communicate with local and provincial housing authorities as early as possible regarding anticipated changes in the demand for worker accommodations between each project phase (Mitigation 7.2-24).
- Participate in initiatives and recommended measures identified in the Northwest Communities Housing Action Plan to address the availability of affordable housing within northwest communities (Mitigation 7.2-25).
- Work with communities in the local study area, including Aboriginal Groups, to help identify and address Project-related effects on housing (Mitigation 7.2-26).
- LNG Canada will develop and implement a Social Management Plan to manage potential social effects of the Project and optimize potential benefits (Mitigation 6.2-8).

It is anticipated that the majority of the mitigation measures will be implemented prior to commencement of construction because two of the measures identified will require preplanning to support the accommodation of workers during construction (i.e., the Worker Accommodation Plan and the workforce accommodation centre(s) and will require LNG Canada's involvement in the Northwest Housing Action Plan, which has a terms of reference date for the summer of 2014.

Confidence in the mitigation for workforce accommodations and housing for operation staff and their families is high as LNG Canada will be able to plan for and adjust housing requirements in accordance with their workforce needs. However, confidence in mitigation that address other housing related affects (e.g., housing affordability and the need for housing on Aboriginal reserve communities) is low both because of the difficulty in estimating with precision changes in affordable housing demand, and because specific measures (i.e., as identified by the Northwest Communities Housing Action Plan) addressing changes in such demand have yet to be identified and agreed upon.



#### **7.2.4.4.3 Characterization of Residual Change in Housing Availability**

The Project will increase demand for housing in the LSA, beginning with construction and lasting throughout the life of the Project. During construction most of the temporary workforce will be housed in the workforce accommodation centre(s). LNG Canada will work to add permanent housing and apartment units in Kitimat to help accommodate Project staff and their families who will relocate to Kitimat. Periodic reassessments of the housing market will also take into consideration the risk of oversupply of housing and that effect on the market. Because of these reasons the Project will not directly affect the supply and demand balance of housing in the LSA

The Project will generate additional indirect and induced demand for temporary accommodations, such as hotels and motels, particularly before completion of the workforce accommodation centre, during turnarounds and decommissioning. Demand for temporary accommodations will peak during the construction period and then taper down as the Project transitions to the operation phase. Some of this demand may be accommodated by new hotels and motels proposed for development in the LSA, as well as “open lodge” worker accommodations.

During operation, turnarounds will bring 500 to 1,000 contractors to the LSA depending on the size of the turnaround. It is conservatively estimated that these contract workers will be in LSA communities for approximately 54 days to 58 days for large turnarounds and approximately 44 days for small turnarounds. During these periods, the demand on temporary accommodations will peak, especially in the summer months when tourist-related activities peak. The workforce accommodation centre will be available to house workers during turnarounds until the completion of the construction phase; at the request of District of Kitimat. The workforce accommodation centre(s) will then be decommissioned. Following completion of construction, the turnaround workforce will be accommodated in LSA communities.

Individuals and their families who choose to permanently relocate to the LSA to take a job directly with the Project or to participate in indirect and induced economic opportunities will add to the housing demand in the region.

Based on estimated population change associated with the Project (Section 7.2.5.2) and assumed demographic characteristics of in-migrants, it is forecast that up to 490 housing units may be needed in the LSA by 2025 to accommodate in-migrating households (Table 7.2-30). Demand will increase gradually over the construction period and then increase sharply with the commencement of operation. LNG Canada will help local and provincial housing authorities to plan for increased demands in housing by communicating its plans as early as possible when the demand and reduction for worker accommodations changes between the Project phases.

**Table 7.2-30: Estimated Housing Demand Associated with the Project, 2015 to 2025**

Household Type		Estimated Total Demand by Year										
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Single person households	Change in demand	-2	-34	40	32	-1	-22	83	8	3	24	8
	Cumulative additional demand	-2	-36	4	36	35	13	95	103	106	130	138
Multi-person households	Change in demand	-2	-89	101	82	-3	-56	211	20	8	60	21
	Cumulative additional demand	-2	-91	10	91	88	32	243	263	271	331	352
Total	Change in demand	-5	-123	140	114	-4	-78	294	28	11	84	29
	Cumulative additional demand	-5	-127	13	127	123	44	338	367	377	461	490

The effects that Project in-migration will have on the housing market will depend on a number of factors, including other forces affecting population change, the stock of available housing, and the rate of new home construction. For example, with the completion of the RTA Kitimat Modernization Project in 2015, RTA's Kitimat workforce is expected to decrease by about 200 workers. A proportion of these individuals and their families may choose to relocate to other communities, thus adding to the LSA's stock of available housing. The reduction of basic jobs at RTA will also influence the number of non-basic jobs in the LSA, and thus affect the net housing demands of the LSA's service sector. The effect of the reduced demand for housing associated with the RTA workforce is incorporated into Table 7.2-31. Other factors affecting cumulative change in the housing market are discussed in Section 7.2.7.1.

**Table 7.2-31: Effects of Industrial Developments on Average Housing Prices**

Community	Industrial Developments	Period	Median housing price increase (%)
Gladstone (Australia)	Aluminum, LNG	2005–2011	80
Fort St. John <sup>a</sup>	Oil and gas, hydroelectric, mining	2007–2013	53
Dawson Creek <sup>b</sup>	Oil and gas, mining	2007–2014	45
Fort Nelson <sup>c</sup>	Oil and gas	2006–2012	38
Fort McMurray <sup>d</sup>	Oil and gas	2003–2013	194

**SOURCES:** <sup>a</sup>Aasen (2013); <sup>b</sup>BC Northern Real Estate Board News Releases 2006 -2012; <sup>d</sup>Urbanation (2013).

The effect that the Project will have on pricing and affordability of housing in the LSA is difficult to estimate. The increased demand caused by the Project could reasonably be expected to contribute to increases in both rental and owner-occupied housing costs in the LSA over the construction period, and first few years of operation, until Project-associated population change has stabilized and the real estate market reaches a new equilibrium. This pattern would be consistent with other communities that have experienced rapid industrial development (Table 7.2-31).

Although the Project will create indirect and induced employment for LSA residents and will help foster economic development in the region, there are many individuals and households in the LSA who will likely remain on low or fixed incomes, or otherwise be unable to increase their incomes. Rising housing costs will affect such vulnerable populations, resulting in an increase in the proportion of households exceeding the STIR of 30% (Figure 7.2-10, Figure 7.2-11). Considering the potential for increased housing costs, and the limited stock of affordable housing in the LSA, the total number of households in the core housing need category is anticipated to increase, as is the potential that individuals and households will be unable to find affordable housing altogether.

The magnitude and duration of effects related to housing affordability are difficult to estimate. However, based on experience of other communities that experienced rapid industrial growth, it is anticipated that such effects will persist over the construction period. As the Project moves into operation, supply and demand of housing are expected to balance. However, the cost of housing may remain higher throughout the operation phase, relative to baseline conditions in the LSA, because of increased economic activity and elevated overall levels of demand. Through LNG Canada's support and participation in addressing findings identified by the Northwest Communities Housing Action Plan, residual effects on housing availability and affordability will be managed.

The Project may indirectly affect the housing situation in Aboriginal communities in the LSA. Increased costs for rental housing outside the reserves may compel more individuals and households to seek band-owned housing. Because Aboriginal communities have limited ability to expand their stock of band-owned housing, crowding and homelessness might increase in these communities. These considerations are included LNG Canada's commitment to address Project-related housing effects on communities located in the LSA, including Aboriginal communities.

### ***Summary of Change in Housing Availability***

In summary, the short-term and long-term accommodation requirements of the Project workforce during all phases will be addressed through implementation of mitigation measures identified in Section 7.2.5.4.2 and therefore should not contribute directly to the housing shortage and increased cost of accommodations now occurring in the LSA. Mitigation measures to increase the number of affordable and emergency shelter housing or apartment units in the LSA will help manage effects on housing availability as a result of Project-related population growth.

Indirect and induced housing demands associated with the Project will be expected to contribute to higher housing costs, increasing the number of individuals and households unable to afford adequate housing. With the implementation of mitigation that address housing affordability and availability, residual effects on housing availability are anticipated to be moderate to high in magnitude and occur in the LSA over the medium term. Residual effects will occur sporadically as the supply and demand of housing changes with market conditions and will be reversible after closure of the Project. Because of current limited availability of housing in the LSA and demands on affordable housing, the context is considered low resilience.

#### **7.2.4.4.4 Determination of Significance for Residual Change in Housing Availability**

With the construction and use of a workforce accommodation centre(s) and a commitment by LNG Canada to provide housing for its operation workforce, limited direct Project effects on housing availability are anticipated. Given LNG Canada's commitments to address residual effects on housing availability from the indirect and induced workforce, as identified in Section 7.2.3.5, residual effects of the Project on housing availability are assessed as not significant. This conclusion is made with low confidence because of uncertainty in estimating population change in the LSA associated with the Project, changes in supply, demand, and pricing of accommodations, and the effectiveness of mitigation at addressing potential future changes in affordable housing.

### **7.2.5 Summary of Project Residual Effects**

Project residual effects on infrastructure and services are summarized in Table 7.2-32.

**Table 7.2-32: Summary of Project Residual Effects: Infrastructure and Services**

Project Phase	Mitigation Measures	Residual Effects Rating Criteria						Likelihood of Residual Effects	Significance	Prediction Confidence	Follow-up and Monitoring
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context				
<b>Facility Works and Activities</b>											
<b>Effects on Community Infrastructure and Services</b>											
Construction	Mitigation 6.2-1 mitigation 6.2-3 Mitigation 6.2-5 Mitigation 6.2-8 Mitigation 7.2-2 Mitigation 7.2-3 Mitigation 7.2-4 Mitigation 7.2-5 Mitigation 7.2-8 Mitigation 7.5-3 Mitigation 7.2-10 Mitigation 7.2-11 Mitigation 7.2-12 Mitigation 7.2-13 Mitigation 7.2-14 Mitigation 7.2-20	M	RSA	ST	C	R	M	H	N	M	No follow-up programs are proposed for infrastructure and services.

Project Phase	Mitigation Measures	Residual Effects Rating Criteria						Likelihood of Residual Effects	Significance	Prediction Confidence	Follow-up and Monitoring
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context				
Operation	Mitigation 6.2-1 mitigation 6.2-3 Mitigation 6.2-5 Mitigation 6.2-8 Mitigation 7.2-2 Mitigation 7.2-4 Mitigation 7.2-5 Mitigation 7.2-6 mitigation 7.2-7 Mitigation 7.2-8 Mitigation 7.5-3 Mitigation 7.2-11 Mitigation 7.2-12 Mitigation 7.2-13 Mitigation 7.2-20	M	RSA	MT	C	R	M	H	N	M	
Decommissioning	Mitigation 6.2-5 Mitigation 6.2-8 Mitigation 7.2-2 Mitigation 7.2-3 Mitigation 7.2-4 Mitigation 7.2-8 Mitigation 7.2-9 Mitigation 7.2-11 Mitigation 7.2-13 Mitigation 7.2-20	M	RSA	MT	C	R	M	H	N	M	

Project Phase	Mitigation Measures	Residual Effects Rating Criteria						Likelihood of Residual Effects	Significance	Prediction Confidence	Follow-up and Monitoring
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context				
Residual effects for all phases	N	M	RSA	MT	C	R	M	H	N	M	
<b>Effects on Traffic and Pressure on Transportation Infrastructure</b>											
Construction	Mitigation 5.4-6 Mitigation 6.2-8 Mitigation 7.2-15 Mitigation 7.2-16 Mitigation 7.2-17 Mitigation 7.2-18 Mitigation 7.2-19 Mitigation 7.2-20	M	LSA	ST	C	R	M	H	N	M	No follow-up programs are proposed for infrastructure and services.
Operation	Mitigation 5.4-6 Mitigation 6.2-8 Mitigation 7.2-15 Mitigation 7.2-16 Mitigation 7.2-17	M	LSA	MT	C	R	M	H	N	M	
Decommissioning	N/A	L	LSA	MT	C	R	M	H	N	M	
Residual effects for all phases	N	M	LSA	MT	C	R	M	H	N	M	

Project Phase	Mitigation Measures	Residual Effects Rating Criteria						Likelihood of Residual Effects	Significance	Prediction Confidence	Follow-up and Monitoring
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context				
<b>Change in Housing Availability</b>											
Construction	Mitigation 6.2-1 Mitigation 6.2-5 Mitigation 6.2-8 Mitigation 7.2-20 Mitigation 7.2-22 Mitigation 7.2-23 Mitigation 7.2-24	H	LSA	ST	MI	R	M	H	N	L	No follow-up programs are proposed for infrastructure and services.
Operation	Mitigation 7.2-20 Mitigation 7.2-25 Mitigation 7.2-26 Mitigation 6.2-8	M	LSA	MT	MI	R	M	H	N	L	
Decommissioning	Mitigation 7.2-20 Mitigation 7.2-23 Mitigation 7.2-24 Mitigation 6.2-8	M	LSA	MT	MI	R	M	H	N	L	
Residual effects for all phases	N	H	LSA	MT	MI	R	M	L	N	L/M	



**KEY**

**MAGNITUDE:**

**N** = Negligible—no detectable or measurable change in use of, or access to, infrastructure and services from baseline conditions

**L** = Low—measurable effect on use of, or access to infrastructure and services, but on scale that it is within the current available capacity and will not affect the quality of service provided

**M** = Moderate—a measurable effect on a scale that nears the available capacity and may affect the viability or displace public access to or use of infrastructure and services.

**H** = High—effect will result in a measurable change on a scale that will either affect the viability or displace public use of infrastructure and services

**GEOGRAPHIC EXTENT:**

**PF** = Project footprint—effects are restricted to the LNG facility

**LSA**—effects occur within the LSA

**RSA**—effects extend into the RSA

**DURATION:**

**ST** = Short-term effect restricted to the duration of construction phase or less

**MT** = Medium-term—effect extends through the construction and operation phases of the Project

**LT** = Long-term—effect extends beyond Project decommissioning

**FREQUENCY:**

**S** = Single event—effect occurs once

**MI** = Multiple irregular event—effect occurs sporadically with no set schedule

**MR** = Multiple regular event—effect occurs on a set schedule

**C** = Continuous—effect occurs continuously

**REVERSIBILITY:**

**R** = Reversible—residual effect will no longer occur after Project closure and reclamation (or sooner)

**I** = Irreversible—residual effect is irreversible after closure of the Project

**CONTEXT:**

**L** = Low resilience—infrastructure and services have little available capacity or low quality of service, and are unable to accommodate changes

**M** = Moderate resilience—infrastructure and services are able to accommodate changes with minor impacts to available capacity or change in quality of service

**H** = High resilience—infrastructure and services are well developed and able to accommodate changes without impacts to available capacity or quality of service

**SIGNIFICANCE:**

**S** = Significant

**N** = Not Significant

**PREDICTION CONFIDENCE:**

Based on scientific information and statistical analysis, professional judgment, effectiveness of mitigation, and assumptions made.

**L** = Low level of confidence

**M** = Moderate level of confidence

**H** = High level of confidence

**LIKELIHOOD OF RESIDUAL EFFECT:**

**L** = Low likelihood that there will be a residual effect

**M** = Moderate likelihood that there will be a residual effect

**H** = High likelihood that there will be a residual effect

**OTHER:**

**N/A:** not applicable

**N:** residual effects do not occur during all phases of the Project

## 7.2.6 Assessment of Cumulative Effects

Cumulative effects are considered for each Project residual effect. Three stages are involved: Stage 1) establishes context by providing an overview of the cumulative effects of other projects and activities on Infrastructure and Services; Stage 2) determines the potential for Project residual effects to interact with the effects of other projects and activities; and Stage 3), if the Project does interact cumulatively with other projects and activities, assesses the significance of the resulting overall cumulative effect and characterizes the Project's contribution to the change in cumulative effects.

### 7.2.6.1 Stage 1: Cumulative Effects Context

After a decade of economic decline that saw many large employers in the RSA, including pulp mills, sawmills, and fish processing facilities, close their doors, economic conditions are improving, with several large projects bringing jobs and economic development into the region. Projects related to oil and gas exports, shipping, terminal expansion, and renewable energy, coupled with associated demographic changes, have placed, and are expected to continue to place, demands on infrastructure and services for communities located in the RSA.

Community infrastructure and services are typically affected by a combination of direct demands placed on them by projects (e.g., the use of roads for transporting materials, equipment, and personnel), as well as the demands associated with the workforce and dependents.

Of the 30 past, present, and reasonably foreseeable projects and activities that have been identified for inclusion in the cumulative effects assessment for the Project as a whole, 23 are projected to temporally overlap with the Project (Table 7.2-33). Figure 7.2-15 illustrates temporal overlap between the Project and other reasonably foreseeable projects in the RSA.

Projects recently completed, or currently underway, have affected nearby communities to varying degrees. RTA's Kitimat Modernization Project has contributed to the housing shortage in Kitimat and Terrace, owing to the demands of that project's workforce. Terrace also serves as a staging area for projects occurring further north along Highway 37, such as Northwest Transmission Line and the Forest Kerr Hydroelectric facility, as well as mining developments further north. Port development projects, such as Fairview Terminal Phase 2, have brought jobs and economic stimulus to Prince Rupert and have likely contributed to the decline in vacancy rates for rental accommodations in the community.



\\cd1183-104\workgroup\1231\active\EM\1231\10458\gifs\figures\EA\section\_7.2\_infrastructure\_services\fig\_10458\_ea\_infra\_7.2-15\_temporal\_overlap\_between\_current\_and\_foreseeable\_projects.mxd



INFRASTRUCTURE AND SERVICES  
ENVIRONMENTAL EFFECTS ASSESSMENT  
**TEMPORAL OVERLAP BETWEEN CURRENT  
AND FORESEEABLE PROJECTS IN THE RSA**  
LNG CANADA EXPORT TERMINAL  
KITIMAT, BRITISH COLUMBIA

PROJECTION	BC Albers	DRAWN BY	SS
DATUM	NAD 83	CHECKED BY	SW
DATE	18-JUN-14	FIGURE NO.	7.2-15

6/18/2014 - 1:59:22 PM

**Table 7.2-33: Past, Present, and Reasonably Foreseeable Project Summary**

Project	Location	Project Type	Status <sup>c</sup>	Approximate Peak Worker Size and Project Life	
				Construction	Operation
<b>Kitimat Area Project Facility</b>					
Coastal GasLink Pipeline Project	Dawson Creek to Kitimat	Natural Gas Pipeline	Proposed	2015–2018 2,500 workers	2018–2048 20 workers
Douglas Channel LNG Terminal (also known as BC LNG)	Moon Bay (near Kitimat)	LNG Facility and Terminal	Proposed	NA	NA
Enbridge Northern Gateway Project	Edmonton to Kitimat	Oil Pipeline	Proposed	2015–2018 600 workers	2018–2048 100 workers
Kitimat Clean Oil Refinery and Pipeline	Kitimat (25 km north)	Oil Refinery and Pipeline	Proposed	2014–2020 6,000	2020 3,000
Kitimat LNG Terminal Project	Kitimat (18 km south)	LNG Facility and Terminal	Proposed	2013–2016 3,000 (400 current) workers	2016–2036
Pacific Northern Gas Pipeline (includes proposed looping)	Summit Lake to Kitimat	Natural Gas Pipeline	Proposed	2015–2016 2,400	2016
Pacific Trail Pipelines Project	Summit Lake to Kitimat	Natural Gas Pipeline	Proposed	2013–2018	2018
Rio Tinto Alcan Facility and Modernization Project	Kitimat	Aluminum Facility	Ongoing	2011–2015 2,500 workers	2015–2055 1,000 workers
Sandhill Materials – Aggregate Processing	Kitimat)	Aggregate Processing	Ongoing	NA	NA
<b>Prince Rupert Areas Project/Facility</b>					
BG Group – Prince Rupert LNG Project	Ridley Island	LNG Facility and Terminal	Proposed	Construction: 2016–2021 3,500 workers	Operations: 2021–2051 (+/-30 years) 600 workers
Canpotex – Potash Export Terminal	Ridley Island	Potash Terminal	Proposed	2012–2016	2016–2067
Maher Terminals – Fairview Terminal Phase 2 Expansion Project	Prince Rupert	Container Terminal	Ongoing	Phase 1: 2012 1,030 workers Phase 2: 2015	Phase 1: 2012–2015 Phase 2: 2019–2070
Pinnacle Renewable Resources – Pellet Export Terminal	Prince Rupert	Pellet Export Terminal	Ongoing	2012–2015 15 Workers	2015 10 Workers
Prince Rupert Grain Terminal	Prince Rupert	Grain Terminal	Completed	NA	NA
Prince Rupert Port Authority –Ridley Island Road, Rail Utility Corridor	Prince Rupert	Container Terminal	Ongoing	2013–2014	2014

Project	Location	Project Type	Status <sup>c</sup>	Approximate Peak Worker Size and Project Life	
				Construction	Operation
Progress Energy – Pacific Northwest LNG Project	Lelu Island (south of Prince Rupert)	LNG Facility and Terminal	Proposed	2015–2018 3,500 workers	2018–2048 200–300 workers
Ridley Terminal Inc.	Ridley Island	Coal Terminal	Ongoing	2012–2015	2015
Spectra Energy – Natural Gas Pipeline	Northeast BC – Prince Rupert	Natural Gas Pipeline	Proposed	2016–2020 900 workers <sup>a1</sup>	2020 50–60 Workers
TransCanada Corporation – Prince Rupert Gas Transmission Project	Hudson Hope – Prince Rupert	Natural Gas Pipeline	Proposed	2012–2017 1,100 workers <sup>a1</sup>	2017 30–40 workers
Watco – Watson Island Re-Development	Watco Island	Industrial Port	Proposed	2013–2015	NA
<b>Terrace Area Project/Facility</b>					
Galore Creek Copper-Gold-Silver Project	Wrangell, Alaska (transported through Stewart, BC)	Mine	On Hold	2018-	NA
KSM (Kerr-Sulphurets-Mitchell) Project	Steward (65 km north)	Mine	Proposed	NA	NA
Brucejack Gold Mine Project	Steward (65 km north)	Mine	Proposed	2013–2016 500 workers	2016–2038
Kitsault Mine Project	Prince Rupert (145 km northeast)	Mine	Proposed	2013–2015 700 workers	2013 300 workers
Altagas Hydro Projects (Forest Kerr, McLymont Creek, Volcano Creek)	Northeastern BC	Hydroelectric Projects	Proposed /Ongoing	Forest Kerr: 2011–2014 400 workers	NA
Kinskuch Hydro Project	Connects along Highway 37	Transmission Line	Proposed	NA	NA
Northwest Transmission Line	Skeena Substation (near Terrace) to Bob Quinn Lake	Transmission Line	Ongoing	2012–2014 840 workers	2014–2024
<b>Activity</b>					
Forestry Activities	N/A	N/A	Ongoing	N/A	N/A

**NOTES:**

NA - data not available; N/A -not applicable.a1Peak person years of employment/construction years

Projects/activities listed here only reflect that that are likely to interact temporally or spatially with those identified in Table 7.2-34.

**SOURCE:** Coastal Gaslink 2012; Province of BC 2013 ; DCEP 2014a; Enbridge Northern Gateway Pipeline 2010; District of Kitimat 2014f; District of Kitimat 2014g; Chevron 2014; PNW 2012; District of Kitimat 2014h ; RTA 2014; Prince Rupert LNG 2014a; Prince Rupert LNG 2014b; Stantec 2011; BCEAO 2012; Golder Associates 2012 ;PNW 2013; NDIT 2014a; PRGT 2013; NDIT 2014b;NDIT 2014c ;NDIT 2014d; NDIT 2014e.

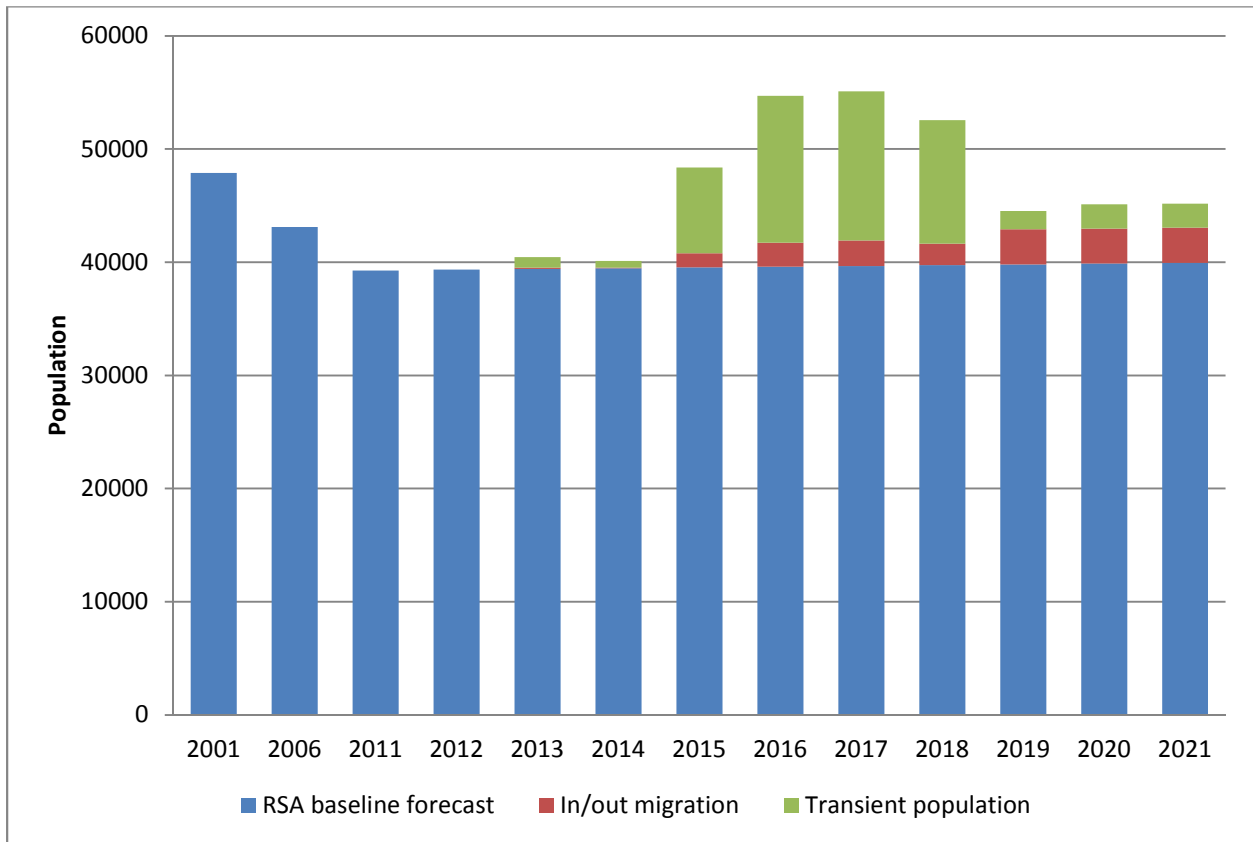
In addition to LNG Canada, there are four LNG projects in the RSA at various stages of regulatory review or development: Kitimat LNG, Douglas Channel LNG, Pacific NorthWest LNG, and Prince Rupert LNG. Other LNG projects have also been proposed, but have not yet commenced a regulatory review process. Because the proposed LNG projects are located near population centres (Prince Rupert, Port Edward, Terrace, and Kitimat) and require relatively large amounts of labour for both construction and operation (including the associated natural gas pipelines), if built, they could substantially reshape nearby communities.

Population changes will have the greatest effects on demand for infrastructure and services for communities in the RSA. Assuming that the projects identified in Table 7.2-33 proceed to construction and operation, as well as LNG Canada, and applying the same population assumptions as in Table 7.2-22, the permanent population in the RSA is forecast to increase by approximately 7,600 persons by 2025 (19% increase over baseline). However, there is considerable uncertainty in this forecast, primarily because none of the LNG projects, which would have the largest effect on population change, have made final investment decisions.

Recent population forecasts prepared for the District of Kitimat and the City of Terrace illustrate this uncertainty. Kitimat's forecast ranges from a low-growth case, where no oil and gas-related projects are built, and the population continues to decline, to a high-growth case where all proposed and tentative projects are built, and the population grows to 17,000 people by 2031 (District of Kitimat 2013). A study of Terrace's housing needs forecast that the population of Terrace would grow only slightly to 19,766 persons by 2021 under the status quo scenario (Thomson M. Consulting 2014). However, in the high-growth scenario, Terrace's population is forecast to reach 28,500 persons by 2021, an increase of nearly 52%.

#### **7.2.6.1.1 Effects on Community Infrastructure and Services**

In a scenario in which multiple LNG projects, pipelines, and other industrial developments are constructed in the RSA over the 2015 to 2025 period, there will be a rapid increase in in-migrating and temporary populations (Figure 7.2-16). Depending on the extent of mitigation measures implemented by project proponents, RSA communities may not have time to adjust to this rapid increase in demand, potentially affecting their ability to provide infrastructure and services at current service levels. In this scenario, it is possible that significant adverse effects on infrastructure and services could occur over the short term.



**Figure 7.2-16: RSA In-Migration for the Cumulative Effects Case, without the Project**

Over the longer term, the effect of economic development on community infrastructure and services in the RSA is expected to be beneficial. The more diversified economies and larger populations would be able to support larger tax bases in RSA communities and the increased revenues would be needed to fund the expansions in community services and infrastructure. To accommodate the demands of larger populations, RSA communities would likely require upgrades and expansion of municipal utilities, such as potable water and wastewater treatment, as well schools, hospitals, and other critical pieces of municipal infrastructure. Additional landfills would need to be planned because the current landfills would be expected to reach the end of their operating lives sooner than forecast. Additional staff and professionals, including teachers, health care workers, protective services personnel, and municipal staff, would be required to service the larger populations.

#### **7.2.6.1.2 Effects on Traffic and Pressure on Transportation Infrastructure**

Generally, transportation infrastructure in the RSA currently has available capacity and operates at a high or acceptable LOS. Traffic volumes on many of the provincial highways in the RSA have declined over the last decade because of population decreases and changes in industry and economic conditions in the area. However, these conditions are beginning to change with recent projects and activities, such as the RTA Kitimat Modernization Project, the Northwest Transmission Line near Terrace, and various export terminal projects in Prince Rupert. The Northwest Regional Airport, for example, has already seen substantial increases in air passenger traffic in the past few years, primarily attributable to new projects in the area. In the high-growth scenario described above, it is anticipated that substantial additional demands on roads, airports, and railways could result.

The Northwest Regional Airport and the Prince Rupert Airport are expected to be heavily used by the projects and activities in the RSA. Airports may also have a spillover effect to one another; that is, if flights are not available at one airport because of weather or other factors, workers may use the other. Smaller airports outside the RSA may also be used for charter flights. These airports may have to upgrade their facilities, extend their hours of operation, or optimize their operations to accommodate these additional demands.

Highways 16 and 37 between Smithers and Terrace are likely to be used for road access to almost all the proposed projects in the RSA. Although future traffic volumes on each highway are not yet known, it can be reasonably expected that traffic volumes will change in pattern and magnitude in accordance with the population estimates presented in Figure 7.2-13. Highway 16 between Terrace and Prince Rupert would also be used heavily for projects in the Prince Rupert area, and Highway 37 between Terrace and Kitimat would be heavily used for projects in the Kitimat area. Traffic volumes in the local communities would also increase.

Assuming that project proponents will implement measures such as traffic and logistics management, it is anticipated that major highways should be able to accommodate the increase in traffic associated with the cumulative effects of other projects. However, the Haisla Bridge would not likely be able to accommodate the additional demand caused by several large projects simultaneously being developed, particularly those west of the Kitimat River. Given the level of economic development associated with major projects in Northwestern BC the Province is undertaking a study to determine the potential need for infrastructure upgrades (such as the Haisla Bridge) to manage associated cumulative effects on traffic pressure on transportation infrastructure. For this reason, cumulative effects on traffic and pressure on transportation infrastructure are assessed as not significant.



### **7.2.6.1.3 Change in Housing Availability**

Cumulative effects on housing affordability in the RSA will result from demand for accommodations by the temporary construction workforce and in-migrant population associated with industrial and infrastructure developments. The magnitude of such effects will depend partially on the ability of project proponents to provide accommodations for their respective workforces and the ability of the local development community, as well as government organizations, to respond to the increased demand for temporary and permanent accommodations, including affordable housing.

Housing availability and affordability in Terrace and Kitimat is being substantially affected by a rapid change in demand because of recent and ongoing resource and industrial development in the LSA, and likely speculative activities in anticipation of additional large-scale industrial development occurring in the near future. Adverse effects from this rapid change have included a decline in the availability of rental accommodation, rising rents, and a deterioration in rental affordability.

Current and planned worker accommodations in the LSA are anticipated to be sufficient for the direct workforce associated with the construction of identified projects in the area. However, these projects will also create indirect and induced employment in the LSA, and the housing needs of these workers and their dependents will also contribute to the overall demand for housing. These adverse effects will be partially offset by the reduced workforce of RTA once the modernization project is completed.

At present, there is sufficient owner-occupied housing stock in the Prince Rupert area to satisfy current demand. However, should multiple projects proceed in the Prince Rupert area, local shortages of housing could be expected, leading to price increases, and consequently affordability issues with vulnerable population groups. There could be some spillover effects on housing availability between Prince Rupert and Terrace; however, the distance between the communities manages the extent to which individuals would be willing to commute for project work (rather than relocating or working on a FIFO basis).

In summary, while project proponents will likely address the housing requirements of their direct workforce, in the absence of additional measures, the indirect project-related population increase in the RSA will have a significant adverse effect on housing availability and affordability over the short term. Over the longer term, the housing market will likely return to a supply/demand balance, but because of the increased population and level of economic activity, accommodation costs will likely be higher than at present.

### **7.2.6.1.4 Context Summary**

Considering the information presented above, cumulative effects on infrastructure and services from other past, present, and reasonably foreseeable projects are considered significant over the short term (i.e., 2015 to 2020) and not significant over the longer term.

### 7.2.6.2 Stage 2: Determination of Potential Cumulative Interactions

Twenty-three projects and activities have the potential to interact with the Project residual effects and cause cumulative effects on infrastructure and services in the RSA (Table 7.2-34). Any projects or activities that did not have a predicted or known effect on infrastructure and services within the RSA are not considered.

**Table 7.2-34: Potential for Cumulative Effects on Infrastructure and Services**

Other Projects and Activities	Potential Cumulative Effects		
	Effects on Community Services and Infrastructure	Effects on Traffic and Transportation Infrastructure	Change in Housing Availability
<b>Kitimat Area Project/Facility</b>			
Coastal GasLink Pipeline Project	✓	✓	✓
Douglas Channel LNG Project (also known as BC LNG)	✓	✓	✓
Enbridge Northern Gateway Project	✓	✓	✓
Kitimat Clean	✓	✓	✓
Kitimat LNG Terminal Project	✓	✓	✓
Pacific Northern Gas Pipeline (includes proposed looping)	✓	✓	✓
Pacific Trail Pipelines Project	✓	✓	✓
Rio Tinto Alcan Facility and Modernization Project	✓	✓	✓
Sandhill Materials – Aggregate Processing	✓	✓	✓
<b>Prince Rupert Area Project/Facility</b>			
BG Group – Prince Rupert LNG Project *	✓	✓	
Canpotex – Potash Export Terminal*	✓	✓	
Maher Terminals – Fairview Terminal Phase 2 Expansion Project*	✓	✓	
Pinnacle Renewable Resources – Pellet Export Terminal*	✓	✓	
Progress Energy – Pacific Northwest LNG Project *	✓	✓	
Spectra Energy – Natural Gas Pipeline*	✓	✓	✓
TransCanada Corporation – Prince Rupert Gas Transmission Project*	✓	✓	✓
Watco – Watson Island Re-Development*	✓	✓	
<b>Terrace Area Project/Facility</b>			
Altagas Hydro projects (Forest Kerr, McLymont Creek, Volcano Creek)*	✓	✓	✓
Galore Creek Copper-Gold-Silver Project*		✓	
KSM (Kerr-Sulphurets-Mitchell) Project*		✓	
Brucejack Gold Mine Project*		✓	
Kitsault Mine Project*		✓	

Other Projects and Activities	Potential Cumulative Effects		
	Effects on Community Services and Infrastructure	Effects on Traffic and Transportation Infrastructure	Change in Housing Availability
Kinskuch Hydro Project*		✓	
<b>Activities</b>			
Forestry activities	✓	✓	✓

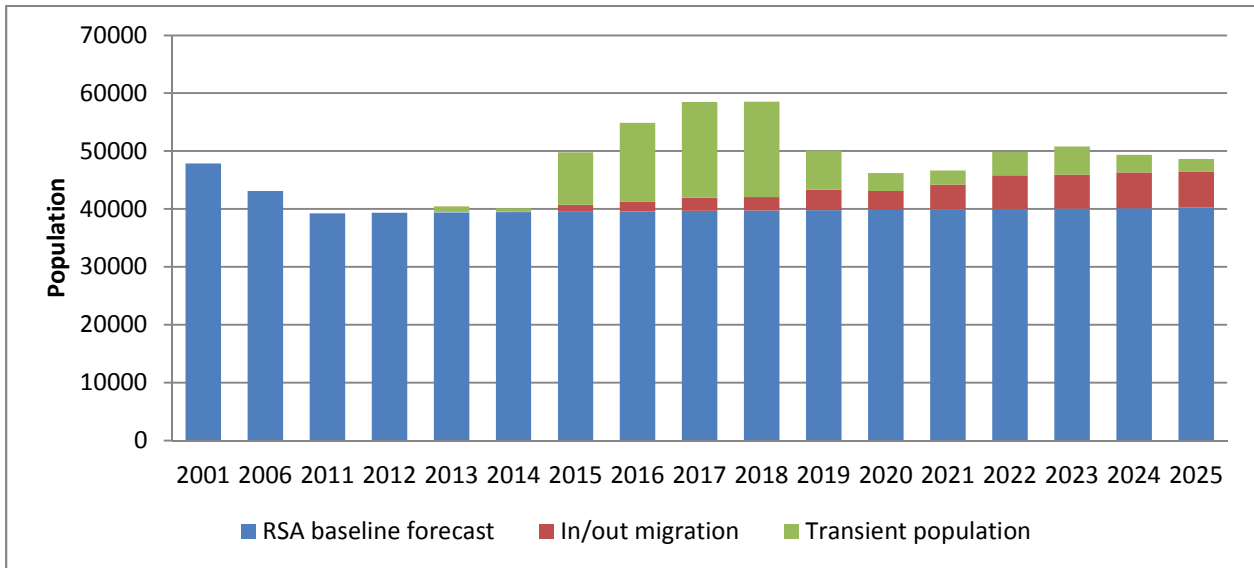
**NOTES:**

✓ = those 'other projects and activities' whose effects have potential to interact cumulatively with Project residual effects

\* These projects will be included in the cumulative assessment of social and economic VCs only.

**7.2.6.3 Stage 3: Determining Significance of Cumulative Effects**

Project residual effects on infrastructure and services are expected to interact with the effects of other present and foreseeable future projects and activities listed in Table 7.2-34. Present and reasonably foreseeable projects are forecast to increase the permanent population in the RSA by approximately 7,600 people by 2025 (Figure 7.2-17). The residual effects attributable to the Project are summarized below, along with interactions from other past, present or foreseeable projects or activities.



**Figure 7.2-17: Forecast Population Change in the RSA for the Cumulative Effects Case, with the Project**

#### 7.2.6.3.1 Effects on Community Services and Infrastructure

Population changes associated with the Project will result in increased demand for infrastructure and services. Although mitigation measures, including construction of self-contained workforce accommodation, will address much of the demand resulting from the Project's temporary workforce, the in-migrating workforce and dependents resulting from induced economic activity will add to the demand for community services and infrastructure in the LSA. Predicted residual effects of the Project on community infrastructures are as follows:

- 9% permanent population increase by 2025
- increased demand for potable water, wastewater, and solid waste disposal (upgrades to Kitimat municipal water and wastewater (sewer) infrastructure will be required from associated permanent population increased)
- no other additional municipal infrastructure anticipated, but additional staff needed (i.e., early childhood educators, teachers, municipal staff) proportionate to population increase, and
- additional protection and emergency staff will be required (police, firefighters, ambulance) because of anticipated higher call volumes associated with temporary workforce and permanent workforce.

This incremental demand will contribute to the demand resulting from the construction and operation of current and reasonably foreseeable projects in the RSA.

Current and future projects considered in this assessment primarily draw on infrastructure and services offered by the District of Kitimat, City of Terrace, City of Prince Rupert, and District of Port Edward. Because of the physical distance between the Prince Rupert/Port Edward area from Kitimat/Terrace, it is expected that the Project's contribution to cumulative effects on infrastructure and services will be felt more in the LSA than in other communities in the RSA.

Over the long term, as projects move from construction to operation, the population in Kitimat, Terrace and surrounding communities would stabilize, allowing municipalities to balance the supply and demand for community infrastructure and services. Over the 2015 to 2025 period, municipalities and Aboriginal communities can anticipate a substantial increase in the demand for infrastructure and services associated with industrial and resource development. It is anticipated that governments will need to upgrade infrastructure and hire staff as demand increases. However, tax revenues, services fees, and other sources of income will also increase, enabling governments to fund expansions in service delivery. The residual demands associated with the Project will contribute to these adverse effects, which are considered long term and not significant.

#### 7.2.6.3.2 Effects on Traffic and Pressure on Transportation Infrastructure

The movement of equipment, materials, and personnel will cause residual effects on the transportation infrastructure in the LSA. Predicted residual effects of the Project on transportation infrastructure at peak conditions are as follows:

- Traffic is expected to increase on Highway 37 and municipal streets in Terrace and Kitimat.
- Highway 37 is forecast to experience a 35.5% increase in peak traffic volumes during construction and 16.2% increase during operation, while arterial roads and intersections in Kitimat are forecast to experience increases ranging from 10.8% to 30.4%
- Peak volume over the Haisla Bridge is expected to increase by 18.7% during construction and 18.9% during operation
- Passenger traffic through Northwest Regional Airport is forecast to increase by 76% over baseline due to increase in charter aircraft, and
- There is a potential for up to 10 additional trains (up to 60 cars each) per week during peak construction, and up to one additional train (up to 50 cars) per week during operation. Delays at at-grade vehicle crossings of up to 15 minutes per train could be expected during the construction and operation phases.

The Project will contribute to cumulative effects on traffic and infrastructure primarily along the Terrace to Kitimat corridor, as well as Highway 16/37 between Terrace and Smithers. Cumulative effects would be greatest between 2015 and 2020, when multiple projects would be under construction.

It is anticipated that the major highways would be able to accommodate traffic volumes attributable to the Project and to other current and reasonably foreseeable projects, and emergency services would be able to accommodate increases in call volumes resulting from increased traffic collisions. However, the Project would add to the increased congestion on roads and at intersections in Kitimat, as well as the Haisla Bridge. Without additional mitigation measures, the levels of service at Haisla Bridge will deteriorate, resulting in increased congestion and delays to cross the bridge.

LNG Canada will develop and implement a Traffic Management Plan along with associated mitigation measures so that cumulative effects on road traffic can be managed to an acceptable level and are therefore considered not significant.

The addition of anticipated air passenger volume of the Project with that of other reasonably anticipated projects will exceed the current capacity of Northwest Regional Airport. However, it is expected that proponents will use charter services to improve the speed and efficiency of personnel movement. With the implementation of such measures, the cumulative effects on airports are anticipated to be not significant.

The total volume of rail traffic that could result from current and reasonably foreseeable projects in the RSA is not known. However, because Project-associated rail volumes are expected to be low, they result in adverse residual effects that are not significant.

#### **7.2.6.3.3 Change in Housing Availability**

The Project will have a measurable residual effect on housing availability and affordability, which is likely to act cumulatively with effects of past, present, or reasonably foreseeable future projects. Predicted residual effects on change in housing availability and affordability are:

- up to 490 additional housing units may be needed in the LSA to accommodate in-migrating workers and their families
- higher cost of rental and owner-occupied housing, as demand is forecast to outpace supply over the 2015 to 2020 period
- increase in demand for temporary accommodations over the construction period
- increase in the proportion of LSA households exceeding the STIR of 30%
- increased in the total number of households with core housing needs
- increased potential for homelessness and inadequate housing, unless government and non-profit agencies are able to increase the stock of income assisted housing, and
- increased demand for band-owned accommodations in Aboriginal communities.

With mitigation, the Project is anticipated to have residual effects on housing availability and affordability that are not significant in the LSA.

In the scenario where all of the projects identified in Table 7.2-34 are built, there will be a substantial increase in demand for temporary and permanent housing in the LSA. The resulting effects on housing availability and affordability over the Project's construction phase are anticipated to be adverse and significant. Once the population in the LSA stabilizes after the completion of construction of all projects, the cost of housing may stabilize because of an expected reduction in incremental demand, and likely an increase in the available housing stock through development activities. However, the cost of accommodation may remain above baseline conditions because of the enhanced overall level of economic activity in the LSA.

#### **7.2.6.4 Summary of Cumulative Effects**

The Project is forecast to increase the temporary construction workforce in the LSA by an average of approximately 6,200 people at the peak of construction in 2018 and potentially result in a permanent population increase of approximately 2,370 people by 2025 in the RSA.

Project-related transportation of equipment, materials, and personnel during peak construction periods is expected to increase traffic volumes on some roads by up to 13%.

Demand for housing associated with the induced and indirect population of the Project is forecast to be 490 units by 2025. Because increased demand is expected to outpace change in supply, a sustained increase in the cost of housing is expected through 2025, resulting in increased levels of unaffordability, and possibly homelessness. If this Project and all other projects are approved and proceed to construction and operation, the permanent population in the regional RSA is forecast to increase to approximately 46,000 persons by 2021.

Over the long term, cumulative effects associated with population growth are expected to be beneficial. Individuals and households that migrate to the RSA in response to economic opportunities will reverse the population decline that has occurred in most RSA communities for over a decade. The larger population and broader industrial tax base will enable local and regional governments to raise additional revenues that can be used to enhance services and finance capital spending.

Between 2015 and 2025, the RSA will benefit economically from industrial and infrastructure development, but a rapid increase in development is expected to adversely affect infrastructure and services, transportation infrastructure, and housing availability and affordability. Mitigation measures will manage most direct effects of the Project on community infrastructure, but there will be additional effects resulting from indirect and induced population change associated with the Project and other projects. Although local and regional governments will likely be able to raise sufficient funds to finance the increased service requirements, it is possible that during the period of rapid population change service demand will outstrip supply in certain areas, leading to a reduction in quality. This effect is expected to extend over the construction period only and will reverse once the population stabilizes around 2021; thus, the effect is anticipated to be adverse but not significant.

Transportation infrastructure in the RSA will similarly be affected by increased direct demands placed on it by the Project and other developments. Although transportation infrastructure overall has sufficient design capacity to handle the projected increase in demand, the Haisla Bridge is expected to be a significant pinch point in the full build-out scenario involving multiple projects located west of the Kitimat River. If no additional mitigation measures are undertaken, a significant adverse effect on transportation infrastructure (Haisla Bridge) might occur.

A rapid increase in permanent population will lead to decreased housing availability and affordability in the RSA. Communities in the LSA are already experiencing these issues, and this trend is expected to continue and increase in magnitude if additional large projects are constructed simultaneously. This effect

is anticipated to be adverse, short term and significant, particularly on vulnerable populations in the LSA and RSA.

In summary, while proposed resource and infrastructure projects, including the LNG Canada Export Terminal Project, will contribute to beneficial economic and social development in the RSA over the long term, overall cumulative effects over the short term are anticipated to be adverse and significant with respect to housing availability and affordability and transportation infrastructure in the RSA.

Cumulative effects on infrastructure and services are summarized in Table 7.2-35.

### **7.2.7 Prediction Confidence and Risk**

The confidence in the conclusions made in this assessment is a function of the quality and quantity of baseline data, level of understanding of the effect mechanisms, assumptions made, and effectiveness of mitigation measures. There is considerable uncertainty associated with population forecasts because they depend on the nature and magnitude of major projects and associated economic development that will occur in the LSA and RSA, as well as on numerous factors that will influence the extent to which individuals and households will migrate into the region in response to economic opportunities. Population forecasts developed for the District of Kitimat and the City of Terrace underscore this uncertainty. However, the population forecast used to estimate effects on infrastructure and services was made using conservative assumptions erring towards overestimating Project-related population growth (Section 7.2.5.1.2). Because the significance conclusions made in regards to Project residual effects and cumulative effects on infrastructure and services are based on uncertainty with respect to potential population changes, these conclusions are made with a low to moderate level of confidence.

### **7.2.8 Follow-up Program and Compliance Monitoring**

Although no specific follow-up and monitoring programs are currently defined for infrastructure and services, LNG Canada will develop and implement management plans for the construction and operation of the Project, which will include follow-up and communications with local and regional governments, First Nations communities, and stakeholders. Examples of such management plans are the Worker Housing and Accommodations Plan, and the Transportation Management Plan.



**Table 7.2-35: Summary of Cumulative Effects on Infrastructure and Services**

Effect	Other Projects, Activities and Actions	Cumulative Effects Characterization					
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context
<b>Facility Works and Activities</b>							
<b>Cumulative Effects on Community Infrastructure and Services</b>							
<p>Cumulative effect with the Project and other projects, activities and actions</p> <ul style="list-style-type: none"> <li>Change in population in the RSA will place additional demands on emergency services, municipal infrastructure (e.g., water and sewer), and the need to manage waste at the regional level.</li> </ul>	<ul style="list-style-type: none"> <li>Coastal Gas Link Pipeline Project</li> <li>Douglas Channel LNG Project (also known as BC LNG)</li> <li>Enbridge Northern Gateway Project</li> <li>Kitimat Clean</li> <li>Kitimat LNG Terminal Project</li> </ul>	M	RSA	MT	MI	R	M
<p>Contribution from the Project to the overall cumulative effect</p> <ul style="list-style-type: none"> <li>Population demands associated with the Project will contribute to additional demands on infrastructure and services in the LSA.</li> </ul>	<ul style="list-style-type: none"> <li>Pacific Northern Gas Pipeline (includes proposed looping)</li> <li>Pacific Trail Pipelines Project</li> <li>Rio Tinto Alcan Facility and Modernization Project</li> <li>Sandhills Materials – Aggregate Processing</li> <li>BG Group – Prince Rupert LNG Project</li> <li>Canpotex – Potash Export Terminal</li> <li>Maher Terminals – Fairview Terminal Phase 2 Expansion Project</li> <li>Pinnacle Renewable Resources – Pellet Export Terminal</li> <li>Progress Energy – Pacific Northwest LNG Project</li> <li>Spectra Energy – Natural Gas Pipeline</li> <li>TransCanada Corporation – Prince Rupert Gas Transmission Project</li> <li>Watco – Watson Island Re-Development</li> <li>Altgas Hydro projects (Forest Kerr, McLymont Creek, Volcano Creek)</li> </ul>	M	LSA	MT	C	R	M

Effect	Other Projects, Activities and Actions	Cumulative Effects Characterization					
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context
<b>Cumulative Effects on Traffic and Pressure on Transportation Infrastructure</b>							
<p>Cumulative effect with the Project and other projects, activities and actions</p> <ul style="list-style-type: none"> <li>The movement of personnel, equipment, and materials, as well as population change associated with reasonably foreseeable projects in the RSA, will result in increased road, rail, and air traffic and will affect the capacity of traffic and transportation infrastructure in the RSA.</li> <li>It is reasonably expected that government-led and proponent-led initiatives will address additional demands on traffic and transportation infrastructure, and avoid a significant adverse cumulative effect.</li> </ul>	<ul style="list-style-type: none"> <li>Coastal Gas Link Pipeline Project</li> <li>Douglas Channel LNG Project (also known as BC LNG)</li> <li>Enbridge Northern Gateway Project</li> <li>Kitimat Clean</li> <li>Kitimat LNG Terminal Project</li> <li>Pacific Northern Gas Pipeline (includes proposed looping)</li> <li>Pacific Trail Pipelines Project</li> <li>Rio Tinto Alcan Facility and Modernization Project</li> <li>Sandhill Materials – Aggregate Processing</li> <li>BG Group – Prince Rupert LNG Project</li> <li>Canpotex – Potash Export Terminal</li> </ul>	H	RSA	MT	C	R	M
<p>Contribution from the Project to the cumulative effect</p> <ul style="list-style-type: none"> <li>The Project will contribute to an increase in road traffic, air passenger traffic, and train traffic resulting from the movement of Project materials, equipment, and personnel, as well as from Project-associated population change.</li> </ul>	<ul style="list-style-type: none"> <li>Maher Terminals – Fairview Terminal Phase 2 Expansion Project</li> <li>Pinnacle Renewable Resources – Pellet Export Terminal</li> <li>Progress Energy – Pacific Northwest LNG Project</li> <li>Spectra Energy – Natural Gas Pipeline</li> <li>TransCanada Corporation – Prince Rupert Gas Transmission Project</li> <li>Watco – Watson Island Re-Development</li> <li>Altogas Hydro projects (Forest Kerr, McLymont Creek, Volcano Creek)</li> <li>Galore Creek Copper-Gold-Silver Project</li> <li>KSM (Kerr-Sulphurets-Mitchell) Project</li> <li>Brucejack Gold Mine Project</li> </ul>	M	LSA	MT	C	R	M

Effect	Other Projects, Activities and Actions	Cumulative Effects Characterization					
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context
	<ul style="list-style-type: none"> <li>▪ Kitsault Mine Project</li> <li>▪ Kinskuch Hydro Project</li> <li>▪ Forestry activities</li> </ul>						
<b>Cumulative Change in Housing Availability</b>							
Cumulative effect with the Project and other projects, activities and actions <ul style="list-style-type: none"> <li>▪ Increased demand for housing on a regional basis will affect the availability, affordability, and demand on government-assisted housing and will result in a significant cumulative effect over the short term.</li> <li>▪ Over the long term, the housing supply in the RSA is expected to be in balance with demand.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Coastal Gas Link Pipeline Project</li> <li>▪ Douglas Channel LNG Project (also known as BC LNG)</li> <li>▪ Enbridge Northern Gateway Project</li> <li>▪ Kitimat Clean</li> <li>▪ Kitimat LNG Terminal Project</li> <li>▪ Pacific Northern Gas Pipeline (includes proposed looping)</li> <li>▪ Pacific Trail Pipelines Project</li> <li>▪ Rio Tinto Alcan Aluminium Facility and Modernization Project</li> </ul>	H	RSA	MT	MI	R	M
Contribution from the Project to the overall cumulative effect <ul style="list-style-type: none"> <li>▪ Mitigation measures are expected to address direct Project effects on housing availability and affordability.</li> <li>▪ In the short term, Project associated population growth will contribute to the cumulative effect by increasing housing demand.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sandhill Materials – Aggregate Processing</li> <li>▪ Spectra Energy – Natural Gas Pipeline</li> <li>▪ TransCanada Corporation – Prince Rupert Gas Transmission Project</li> <li>▪ Altagas Hydro projects (Forest Kerr, McLymont Creek, Volcano Creek)</li> <li>▪ Forestry activities</li> </ul>	M	LSA	MT	MI	R	M

**KEY**

**MAGNITUDE:**

**N** = Negligible—no detectable or measurable change in use of, or access to, infrastructure and services from baseline conditions

**L** = Low—measurable effect on use of, or access to infrastructure and services, but on scale that it is within the current available capacity and will not affect the quality of service provided

**M** = Moderate—a measurable effect on a scale that nears the available capacity and may affect the viability or displace public access to or use of infrastructure and services.

**H** = High—effect will result in a measurable change on a scale that will either affect the viability or displace public use of infrastructure and services

**GEOGRAPHIC EXTENT:**

**PF** = Project footprint—effects are restricted to the LNG facility

**LSA**—effects occur within the LSA

**RSA**—effects extend into the RSA

**DURATION:**

**ST** = Short-term effect restricted to the duration of construction phase or less

**MT** = Medium-term—effect extends through the construction and operation phases of the Project

**LT** = Long-term—effect extends beyond Project decommissioning

**FREQUENCY:**

**S** = Single event—effect occurs once

**MI** = Multiple irregular event—effect occurs sporadically with no set schedule

**MR** = Multiple regular event—effect occurs on a set schedule

**C** = Continuous—effect occurs continuously

**REVERSIBILITY:**

**R** = Reversible—residual effect will no longer occur after Project closure and reclamation (or sooner)

**I** = Irreversible—residual effect is irreversible after closure of the Project

**CONTEXT:**

**L** = Low resilience—infrastructure and services have little available capacity or low quality of service, and are unable to accommodate changes

**M** = Moderate resilience—infrastructure and services are able to accommodate changes with minor impacts to available capacity or change in quality of service

**H** = High resilience—infrastructure and services are well developed and able to accommodate changes without impacts to available capacity or quality of service

**SIGNIFICANCE:**

**S** = Significant

**N** = Not Significant

**PREDICTION CONFIDENCE:**

Based on scientific information and statistical analysis, professional judgment, effectiveness of mitigation, and assumptions made.

**L** = Low level of confidence

**M** = Moderate level of confidence

**H** = High level of confidence

**LIKELIHOOD OF RESIDUAL EFFECT:**

**L** = Low likelihood that there will be a residual effect

**M** = Moderate likelihood that there will be a residual effect

**H** = High likelihood that there will be a residual effect

**OTHER:**

**N/A**: not applicable

**N**: residual effects do not occur during all phases of the Project

### 7.2.9 Summary of Mitigation Measures

- Construct and operate workforce accommodation centre(s) for non-resident workforce during the pre-construction and construction phase to manage effects of temporary workforce on communities (Mitigation 6.2-5).
- Prohibit unauthorized public access to the worksite or construction workforce accommodation centre(s) (Mitigation 7.2-1).
- Develop a Worker Code of Conduct to communicate expectations for the behaviour of all workers when they are in Kitimat, Terrace, or any other local community. LNG Canada will ensure that all workers are familiar with the Worker Code of Conduct and expected standards of behaviour. Workers will sign a copy of the Code of Conduct at orientation acknowledging their commitment to comply with the Code (Mitigation 7.2-2).
- Require all Project workers to undertake worker orientation, including cross-cultural awareness, to help build awareness and respect of local issues of importance, including local facilities, recreational opportunities, and other community considerations, with expectation of reducing adverse interactions with the community (Mitigation 7.2-3).
- Undertake ongoing and meaningful community engagement, and log, monitor, and work to address community complaints to reduce community concerns associated with perceived and actual changes resulting from the Project (Mitigation 7.2-4).
- Make the workforce accommodation centre(s) and LNG facility self-sufficient (to extent practicable) with respect to potable water and wastewater treatment services so that additional service demands will not be placed on municipal water and sewer services (Mitigation 7.2-5).
- Provide local and regional governments with information on anticipated changes in resident populations attributable to the Project to facilitate their planning for incremental demands for solid waste management, potable water supply, sewage system needs, and recreation facilities (Mitigation 7.2-6).
- Provide onsite first aid equipment, supplies, and trained first aid personnel to deal with minor injuries. In the case of major injuries, patients will be evacuated via land or air ambulance to medical facilities (Mitigation 7.2-7).
- Provide onsite health services and medical emergency response for primary care including health promotion, injury/illness prevention, and injury/illness management, in order to minimize impact on the local public health care system (Mitigation 7.5-3).
- Establish and implement a Spill Response Plan as part of a broader Emergency Response Plan with input from relevant agencies (Mitigation 7.2-8).

- Work with emergency service providers to plan for anticipated changes in service requirements associated with the temporary and permanent workforce by providing information related to workforce projections, temporary workforce accommodation, and housing plans, and onsite emergency services (Mitigation 7.2-9).
- Include recreational venues and entertainment and communications amenities in the construction workforce accommodation centre(s) to reduce Project-related demands on community infrastructure and services (Mitigation 7.2-10).
- Provide security services to monitor and enforce compliance of workforce accommodation and construction policies (Mitigation 7.2-11).
- As part of the Emergency Response Plan, make employees aware of fire suppression systems installed onsite, and train key employees in fire suppression, where appropriate (Mitigation 7.2-12).
- Work with local parks and recreation planning entities to provide input into the development and improvement of outdoor recreation areas (including parks and trails) (Mitigation 7.2-13).
- As part of the Emergency Response Plan, work with District of Kitimat fire department to forecast additional demands on fire and rescue services, and with RCMP to forecast additional demands on policing (Mitigation 7.2-14).
- Local residents will be informed of job and procurement opportunities during the Project phases. LNG Canada will encourage a hire-local-first approach for all phases (Mitigation 6.2-1).
- Potential shortages of workers with specific skill requirements will be identified and training and educational facilities will be engaged so that regional residents have the opportunity to upgrade their skills (Mitigation 6.2-3).
- LNG Canada will develop and implement a Social Management Plan to manage potential social effects of the Project and optimize potential benefits (Mitigation 6.2-8).
- Develop and implement a Traffic Management Plan (Mitigation 5.4-6).
- Provide relevant information on Project transportation planning to MOTI and District of Kitimat to facilitate their planning for road improvements and traffic movement (Mitigation 7.2-15).
- Monitor all travel-related incidents involving LNG Canada workers, and review these data regularly to identify how travel can be improved to reduce risks to safety and further incidents (Mitigation 7.2-16).
- Worker rotations and charter flights, where practical, will be scheduled to alleviate peak pressures on the airport terminal facilities (Mitigation 7.2-17).
- Peak-hour traffic volumes, particularly across the Haisla Bridge, will be managed by scheduling worker rotations, and equipment, material, and goods deliveries to the off-peak hours whenever practicable (Mitigation 7.2-18).

- Commuter support will be provided between Terrace and the Project site (e.g., scheduled crew transportation) to facilitate residents of the Greater Terrace area and nearby Aboriginal communities to participate in the Project while maintaining residence in home communities (Mitigation 7.2-19).
- The “vehicle factor” of collisions will be managed by requiring winterization and snow tires (when appropriate) for Project vehicles, walk-around vehicle inspections, and regular vehicle maintenance (Mitigation 7.2-20).
- The “driver factor” of collisions will be managed by implementing stringent policies such as fit-for-duty rules (e.g., drugs, alcohol, fatigue) and driver training for adverse weather (Mitigation 7.2-21).
- Local residents will be informed of job and procurement opportunities during the Project phases. LNG Canada will encourage a hire-local first approach for all phases (Mitigation 6.2-1).
- LNG Canada will work to manage demands on local housing (e.g., apartments and single-family houses) due to the anticipated requirements of the construction management and operational workforce, and will also include, in periodic reassessments of the housing market, the consideration of the risk posed by oversupply of accommodations (Mitigation 7.2-22).
- Develop a worker accommodation plan that addresses worker accommodations throughout the project lifecycle, including pre-construction, construction, operation, decommissioning, and turnarounds (Mitigation 7.2-23).
- Communicate with local and provincial housing authorities as early as possible regarding anticipated changes in the demand for worker accommodations between each Project phase (Mitigation 7.2-24).
- Participate in initiatives and recommended measures identified in the Northwest Communities Housing Action Plan to address the availability of affordable housing within northwest communities (Mitigation 7.2-25).
- Work with communities in the LSA, including Aboriginal Groups, to help identify and address Project-related effects on housing (7.2-26).

### 7.2.10 Conclusion

It is expected that the Project will affect community infrastructure and services due to direct demands, such as roadway and airport usage, and demands caused by a rapid change in population. The most substantial population change will occur during the construction phase. However, since the majority of construction workers will be employed on a fly in fly out basis, and will be housed within a self-contained workforce accommodation, it is anticipated that mitigation measures aimed at managing adverse interactions between workers and local communities, and mitigation addressing direct Project demands on community infrastructure, will manage construction related residual effects to an acceptable level.

However, should other large infrastructure projects be built at the same time, it is anticipated that a significant cumulative effect would occur, as demand for accommodations could exacerbate the current trend of rising housing costs.

Local communities in north west BC will experience an increase in their permanent populations as the Project transitions into operation, as it is expected that the workforce needed to operate the Project will only be partially fulfilled from local hiring. This in-migration will be beneficial by reversing the population decline that has occurred in northwest BC in recent years, diversifying the economy, and generating additional municipal tax revenue. Local communities will need to adapt to this change in population, and with the application of mitigation measures adverse Project residual effects will be acceptable and not significant. However, when combined with other projects there is potential for significant adverse effects related to the availability of affordable housing.

LNG Canada will be an active and responsible member of the communities within which it operates, and will seek to mitigate and manage Project effects over all phases to acceptable levels. LNG Canada also recognizes that the development and maintenance of healthy and vibrant communities will be a responsibility it shares with local and provincial governments, Aboriginal communities, community and civic organizations, stakeholders, and the general public. The Project is expected to create substantial additional revenue to all levels of government and, thus, provide a potential source of funding for infrastructure and service improvements in local communities.

LNG Canada anticipates that significant adverse Project effects on community infrastructure and services will be avoided. However, this conclusion is made with a low to moderate degree of confidence because of uncertainty associated with extent of population change that may occur in the LSA and RSA.