

7.5 Community Health and Wellbeing

7.5.1 Introduction

Community health and wellbeing is a VC because of the potential for the Project to affect key areas of health, diet, and nutrition. Health—as defined by the World Health Organization (WHO) and accepted by federal, provincial, and territorial governments—is “a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity” and is “the extent to which an individual or a group is able, on the one hand, to realize aspirations and to satisfy needs, and on the other, to change or cope with the environment” (WHO 2009; Health Canada 2004).

Other sections closely linked to the assessment of community health and wellbeing are:

- Vegetation Resources (Section 5.5)
- Wildlife Resources (Section 5.6)
- Freshwater and Estuarine Fish and Fish Habitat (Section 5.7)
- Marine Resources (Section 5.8)
- Surface Water Quality (Section 5.9)
- Economic Conditions (Section 6.2)
- Infrastructure and Services (Section 7.2)
- Visual Quality (Section 7.3)
- Marine Transportation and Use (Section 7.4), and
- Human Health (Section 9.2).

7.5.2 Scope of Assessment

7.5.2.1 Regulatory and Policy Setting

Federal and provincial government organizations that are most relevant to community health and wellbeing are listed in Table 7.5-1.

Table 7.5-1: Government Organizations with Community Health Responsibilities

Provincial/Federal Organizations	Role
Federal	
Aboriginal Affairs and Northern Development	Supports Aboriginal people and those living in northern regions of Canada in improving social wellbeing and economic prosperity and developing healthier, more self-sufficient communities; negotiates and implements comprehensive and specific claims and self-government agreements; supports services on reserve such as education, economic development, housing, community infrastructure and social support.
Health Canada	Manages and communicates to Canadians health risks and benefits associated with food, products, substances, and environmental factors. Supports delivery of, and access to, health programs and services for First Nations and Inuit peoples.
Public Health Agency of Canada (ministry responsible for health)	Promotes health; prevents and controls chronic diseases and injuries; prevents and controls infectious diseases; prepares for and responds to public health emergencies; strengthens intergovernmental collaboration on public health and facilitates national approaches to public health policy and planning.
Provincial	
Ministry of Education	K-12 standards and accountability, K-12 funding, independent schools, literacy, libraries, Strong Start BC Early Learning Centres
Ministry of Environment	Parks, wilderness and protected areas; air, land and water quality standards; pollution prevention and waste management; oceans protection and sustainability; water protection and water sustainability policy; water and air monitoring and reporting.
Ministry of Health	Leadership and support for the health service delivery system; health promotion, protection, and preventative health; Aboriginal health promotion; public health planning; Provincial Health Officer; performance management of the health authorities; health human resource planning; health regulation and licensing; health information systems and e-health; women and seniors; end-of-life and palliative care; community and home support services; assisted living and residential care; community care licensing; mental health and addictions services; communicable diseases prevention and addictions services promotion; healthy living <i>and</i> chronic disease prevention. Under the Ministry of Health, Northern Health functions as the regional health authority that governs, plans and delivers health care services to local health areas (LHAs) 28, 50-57, 59, 60, 80, 81, 87, 88, 92, 94. Other agencies such as the First Nations Health Authority (FNHA) also deliver health care services.
Ministry of Social Development and Social Innovation	Income assistance, disability assistance, delivery of employment programs, Provincial Disability Strategy, adult community living services, mental health and additional services such as coordination, volunteer and non-profit support.

Source: Government of British Columbia (2014)

7.5.2.2 Consultations' Influence on the Identification of Issues and the Assessment Process

Outcomes of public consultation informed identification of potential effects, the assessment, and the development of mitigation measures. General themes identified during consultation with service providers, community planners and officials in Kitimat, Terrace, and Prince Rupert, as well as key informants in community health-related roles, are as follows:

- Changes in local population or demographics could contribute to increased demand on health care and emergency services, a decrease in community cohesion and poor health outcomes.
- Changes in population and in employment and income could contribute to increased crime rates, increased homelessness and at-risk homelessness, and an increased number of at-risk children and youth.
- The perception exists in the LSA communities (e.g., Kitimat, Terrace) that the recent increase in resource development activity has increased the presence of drug dealers and sex workers in the area.

Topic-specific outcomes of public consultation are presented in Section 18. Public consultation also provided supporting information to that obtained through literature review, government databases, industry published literature and online sources. This information is used to focus the assessment. In particular, baseline data were collected through interviews with key informants, community members, and concerned stakeholders. Issues of importance to Aboriginal Groups were identified through consultation activities as presented in Section 13.2, in addition to the provision of traditional knowledge and use studies as discussed in Section 7.5.2.3

7.5.2.3 Traditional Knowledge and Traditional Use Incorporation

In addition to information in Section 13 (Background Information), Section 14 (Aboriginal Interests), Section 15 (Statutory Requirements under CEAA 2012 (section 5(1)(c)), and Section 16 (Other Matters of Concern to Aboriginal Groups), traditional knowledge and use studies and other plans provided to LNG Canada through consultation were used to inform LNG Canada's understanding of, to the extent possible, Aboriginal country food use and use of health services in greater Kitimat and greater Terrace area. Studies and documents reviewed were:

- The LNG Canada Proposed Terminal Site and Tanker Route within Haisla Traditional Territory: Haisla TLUS and Socio-economic Profile (Powell 2013)
- Interim Letter Report for LNG Canada's Environmental Assessment Application Submission–Kitsumkalum First Nation TUS and SIA Preliminary Information (Crossroads Cultural Resource Management Ltd. 2014)
- Gitxaala Use Study: LNG Export Terminal Project (Calliou Group 2014a)
- Gitxaala Nation Socioeconomic Study: Interim Report for the LNG Canada Project (The Firelight Group 2014)
- Gitxaala Valued Components Report: LNG Canada Development Inc. Application (Calliou Group 2014b)

- Gitga’at Economic Development Strategy (Hartley Bay Council 2011)
- Giga’at Sustainable Tourism Strategy (Gitga’at Nation 2003)
- Being Gitka’a’ata: A Baseline Report on Gitka’a’ata Way of Life, a Statement of Cultural Impacts Posed by the Northern Gateway Pipeline, and a Critique of the ENGP Assessment Regarding Cultural Impacts (Satterfield et al. 2011)
- Report to the Kitselas First Nation Regarding Kitselas Traditional Use/Occupancy of the Coastal Territories Between the Mouths of the Kitimat and Skeena Rivers (Smith 2008)
- Report on the Kitselas Traditional Histories and Territories Project August 1998 to 1999 (Smith 1999)
- Interim Land and Marine Resources Plan of the Allied Tsimshian Tribes of Lax Kw’alaams (Lax Kw’alaams 2004)
- Draft Marine Use Plan Executive Summary (Metlakatla First Nation 2014)
- Metlakatla First Nations Multi-species Calendar Logbook (Metlakatla Fisheries 2013)

7.5.2.4 Selection of Effects

Through a review of existing data, primary research and consultation records, as well as professional judgment, the following Project effects are assessed:

- change in community health and wellbeing, and
- change in diet and nutrition.

7.5.2.5 Selection of Measurable Parameters

The measurable parameters used to evaluate potential changes in community health and wellbeing are listed in Table 7.5-2.

Table 7.5-2: Potential Effects on Community Health and Wellbeing and Measurable Parameters

Potential Adverse Effects	Measurable Parameters
Change in community health and wellbeing	<ul style="list-style-type: none"> ▪ demand and supply of health care infrastructure and services (includes counselling services) ▪ changes in health outcome indicators (e.g., mental health issues, substance abuse, sexually transmitted infection rates (STIs), life expectancy) ▪ indicators of community cohesion and resilience (e.g., rapid population change, crime rates) ▪ indicators of factors affecting families (e.g., violence against women, divorce rates, children and youth at risk)
Change in diet and nutrition	<ul style="list-style-type: none"> ▪ proportion of diets from country foods ▪ composition of country foods in diet

Potential effects on community health and wellbeing due to the operation and construction of the LNG facility are addressed in Section 7.5.5, while potential effects due to Project-associated marine shipping are addressed in Section 7.5.6.

7.5.2.6 Boundaries

7.5.2.6.1 Spatial Boundaries

The following are the spatial boundaries for community health and wellbeing (see Figure 7.5-1).

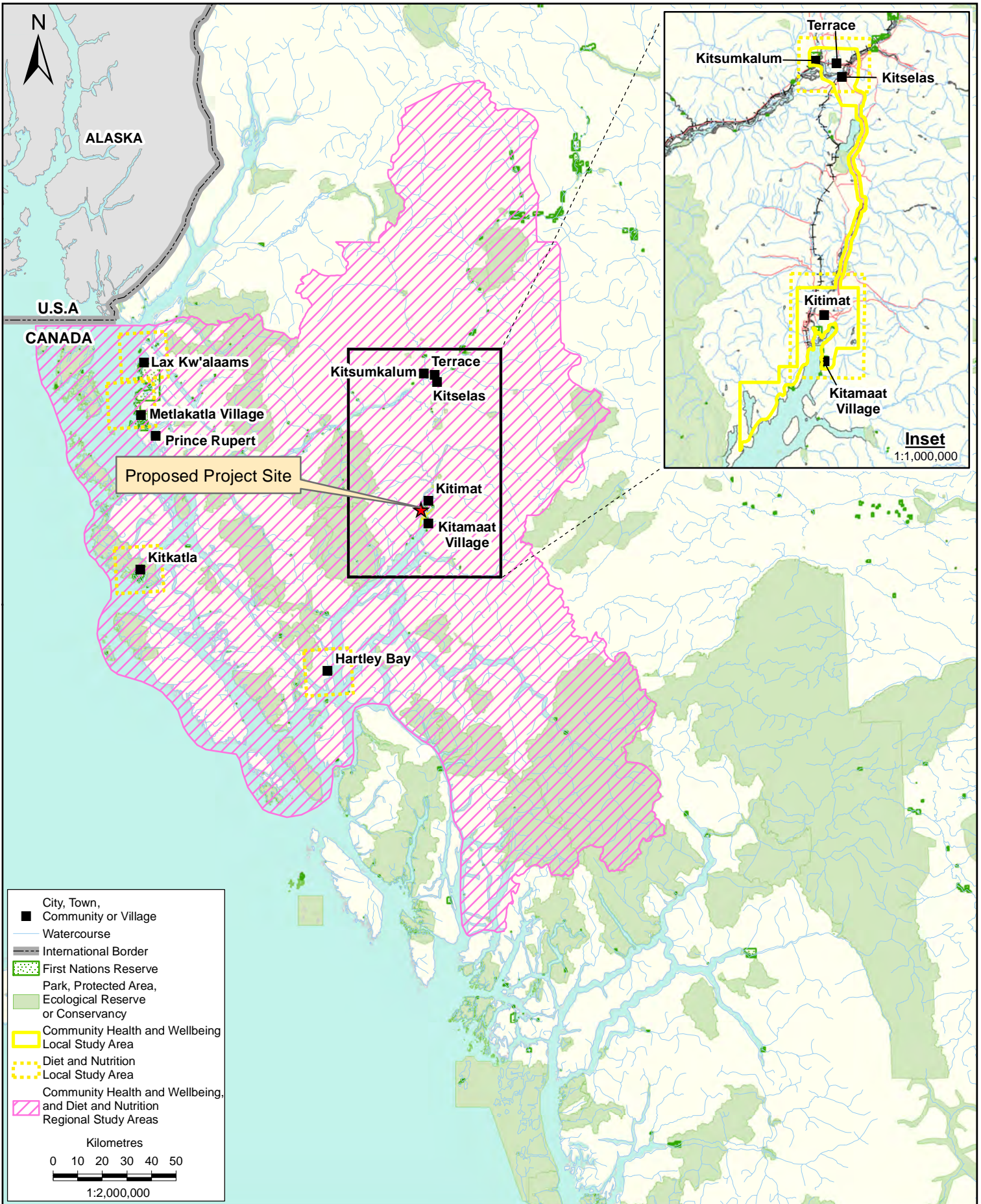
- The Project footprint refers to the physical area cleared.
- The LSA for community health and wellbeing encompasses the communities in the Northwest Health Service Delivery Area (NWHSDA) of Northern Health with the greatest potential to experience direct community health effects as a result of the Project. This consists of the communities in the Greater Kitimat and Greater Terrace areas, Haisla Nation, Kitselas First Nation and Kitsumkalum First Nation.
- The LSA for diet and nutrition encompasses the Kitimat District Municipality, the Terrace Census Agglomeration (the City of Terrace, Kitimat-Stikine E, Thornhill, and Kulpai Indian Reserve 6), Kitamaat Village, Kitselas First Nation, Kitsumkalum First Nation, Gitga'at First Nation, Gitxaala Nation, Lax Kw'alaams First Nation, and Metlakatla First Nation. The City of Prince Rupert and the District of Port Edward are excluded from the LSA for diet and nutrition because the potential for these communities to experience adverse effects on diet and nutrition from the Project is negligible.
- The RSA encompasses the communities in the Kitimat Local Health Area (LHA), the Terrace LHA and the Prince Rupert LHA of the NWHSDA.

The LSA and RSA boundaries were identified through consultation with potentially affected Aboriginal Groups, local and regional stakeholders, health service providers, and representatives of local and regional health authority jurisdictions, as well as through professional judgment.

7.5.2.6.2 Temporal Boundaries

Based on the 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.



COMMUNITY HEALTH AND WELLBEING ENVIRONMENTAL EFFECTS ASSESSMENT

RSA/LSA COMMUNITY HEALTH AND WELLBEING

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

PROJECTION	UTM9	DRAWN BY	SHS
DATUM	NAD 83	CHECKED BY	SW
DATE	07-MAY-14	FIGURE NO.	7.5-1

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7.5.2.6.3 Administrative and Technical Boundaries

Northern Health is divided into three Health Service Delivery Areas (HSDAs): the Northeast HSDA, the Northern Interior HSDA, and the NWHSDA (Northern Health 2014a). Northern Health provides health services to over 300,000 people within a 600,000 km² area (Northern Health 2014a). The NWHSDA services 25 First Nations Communities and 11 towns or cities (Northern Health 2014b), including those in the RSA.

The District of Kitimat’s OCP and the City of Terrace’s OCP highlight socio-economic determinants of health and identify areas where increased investment in health care infrastructure and services could result in improved individual and population health. Both OCPs identify issues affecting health (such as quality access to social services and meaningful recreational opportunities) that require administrative involvement and oversight from district and city officials. Through their OCPs, Kitimat and Terrace have administrative discretion over decisions that have the potential to affect various aspects of living that are related to community health and wellbeing.

Technical boundaries are associated with limited availability and interpretation of information and data. The assessment of community health and wellbeing is based on primary information obtained through consultation with Aboriginal Groups and key stakeholders, a review of academic literature, and publicly available secondary information from federal, provincial and municipal government databases. Primary information, where available, was used to validate information obtained through secondary sources.

7.5.2.7 Residual Effects Description Criteria

Residual effects on community health and wellbeing are those that remain after the application of mitigation measures. These effects are characterized using the criteria defined in Table 7.5-3.

Table 7.5-3: Characterization of Residual Effects for Community Health and Wellbeing

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Characterization of Residual Effects		
Magnitude	The expected size or severity of effect. Low magnitude effects may have negligible to little effect, while high magnitude effects may have a substantial effect.	<p>Negligible: No measurable change from baseline conditions</p> <p>Low: Above baseline conditions, but within normal variation of human health conditions or within current capabilities of infrastructure or service management systems</p> <p>OR*</p> <p>has the potential to cause acute, short-term effects with limited and reversible effects on function, health, or wellbeing</p> <p>Moderate: Above baseline conditions and predicted to result in decline in human health and or a deterioration of the capabilities of infrastructure</p> <p>OR*</p> <p>Has the potential to cause acute or chronic effects that substantially affect function, health, or wellbeing</p> <p>High: Above baseline conditions, and predicted to result in a change in human health and/or exceeds the capabilities of infrastructure</p> <p>OR*</p> <p>Has the potential to cause acute or chronic effects that are potentially disabling</p>

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
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. Local effects may have a lower effect than regional effects.	LSA: effect is restricted to the LSA RSA: effect extends beyond LSA
Duration	The length of time the residual effect persists. The duration of an effect can be short term or longer term.	Short term: residual effect is restricted to the duration of the construction period or less. Medium term: residual effect extends past the construction period but less than the life of the Project. Long term: residual effect extends through the life of the Project. Permanent: residual effect is permanent.
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.	Single event: residual effect occurs once. Multiple irregular event: residual effect occurs sporadically at irregular intervals throughout construction, operation or decommissioning phases. Multiple regular event: occurs on a regular basis and at regular intervals throughout construction, operation, or decommissioning phases. Continuous: residual occurs continuously throughout the life of the Project.
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.	Reversible: will recover after Project closure and reclamation. Irreversible: permanent.
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. Project effects may have a higher effect if they occur in areas or regions that have already been adversely affected by human activities (i.e., disturbed or undisturbed) or are ecologically fragile and have little resilience to imposed stresses (i.e., fragile)	Low resilience: vulnerable to small adverse changes from baseline conditions. Moderate resilience: vulnerable to moderate adverse changes from baseline conditions. High resilience: vulnerable to large adverse changes from baseline conditions.
Likelihood of Residual Effects		
Likelihood	Whether or not a residual effect is likely to occur	Low: low likelihood that there will be a residual effect. Medium: moderate likelihood that there will be a residual effect. High: high likelihood that there will be a residual effect.

NOTE:

*Varying sets of criteria for magnitude are provided because significance thresholds are specific to social determinants of health, supply and demand of health infrastructure and services and physical and mental health conditions.

7.5.2.8 Significance Thresholds for Residual Effects

7.5.2.8.1 Change in Community Health and Wellbeing

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

- The capacity of health care infrastructure or services is unable to cope with added demand caused by the Project.
- The Project causes a substantial and persistent decrease in the quality of health service within local communities.
- The Project causes acute or chronic physical or mental health outcomes that are highly distinguishable and beyond the normal range of variability in baseline conditions.
- The Project adversely affects one or more social determinants of health that are highly distinguishable and beyond the normal range of variability in baseline conditions.

7.5.2.8.2 Change in Diet and Nutrition

An adverse residual effect is considered significant if, after mitigation, the following occurs:

- The Project causes a decrease in consumption of country foods that is highly distinguishable and beyond the normal range of variability in baseline conditions as a result of changes in the availability, accessibility or quality of country foods.

7.5.3 Baseline Conditions

7.5.3.1 Baseline Data Sources

Baseline data were collected from the following sources:

- federal census data from Statistics Canada
- Canadian Community Health Survey (CCHS)
- reports submitted by Aboriginal Groups as identified in Section 7.5.2.3
- Canadian Institute for Health Information Discharge Abstracts Database
- regional health and administrative information from the BC Ministry of Health, the BC Centre for Disease Control, Vital Statistics, WorkSafeBC, and local health authorities in BC
- data from the First Nations Food, Nutrition and Environment Study (University of Northern British Columbia, Université de Montréal and Assembly of First Nations 2011), and
- issue-specific studies and reports produced by governments, industry groups, and non-governmental organizations.

In addition to baseline information submitted by Aboriginal Groups, information was also collected through interviews with Aboriginal Groups, key informants, community members, and concerned stakeholders. Issues of importance to Aboriginal Groups were identified through consultation activities and through a review of traditional knowledge and traditional land use studies and secondary data sources, where

available. Traditional knowledge and traditional land use data have been integrated into the overview of baseline information, where appropriate. Where possible, information pertaining to Aboriginal Groups was disaggregated.

7.5.3.2 Baseline Overview

Baseline conditions are categorized into five topics: health care infrastructure and services; physical and mental health outcomes; community cohesion and resilience; factors affecting families; and diet and nutrition. More detailed baseline information is provided in the Socio-Economic Baseline Report (Stantec 2014). Additional information on health care infrastructure and services is also available in the assessment of infrastructure and services (Section 7.2).

7.5.3.2.1 Health Care Infrastructure and Services

Health care infrastructure and services are administered through hospital-based, community-based, and private-sector facilities and services with the goal of maintaining, improving, and promoting physical and mental health. Health care infrastructure and services consist of hospitals, health care clinics, and allied health services, such as pharmacies, public health, mental health and addictions services, laboratory services, emergency medical, health promotion services and programs, and other specialty areas.

In BC, the delivery of provincial health care is geographically segmented into operational units. From the largest operational unit, the Ministry of Health delivers services through five regional Health Authorities, one Provincial Health Authority and the newly formed First Nation Health Authority. The Health Authorities are divided into 16 HSDAs. Together the 16 HSDAs encompass 202 LHAs. The Project falls within areas administered by the regional health authority Northern Health in the NWHSDA. The Project also falls under areas administered by the First Nation Health Authority. The NWHSDA is comprised of 10 LHAs: 050-Queen Charlotte, 051-Snow Country, 052-Prince Rupert, 053-Upper Skeena, 054-Smithers, 080-Kitimat, 087-Stikine, 088-Terrace, 092-Nisga'a, 094-Telegraph Creek. The LSA includes the LHAs 080-Kitimat and 088-Terrace. The RSA includes the LHAs 052-Prince Rupert, 080-Kitimat, 088-Terrace.

There are three hospitals in the RSA: the Kitimat General Hospital and Health Centre, the Mills Memorial Hospital in Terrace, and the Prince Rupert Regional Hospital. There are also 12 medical clinics: two in Kitimat, five in Terrace (two associated with local Aboriginal Groups in Kitselas and Kitsumkalum), and one each in Kitimaat Village, Kitkatla, Hartley Bay, Lax Kw'alaams, and Prince Rupert (for Metlakatla) (First Nation Health Authority [FNHA] 2012; Northern Health 2012a,b,c; Rural Coordination Centre of BC [RCCBC] 2012a,b,c).

Mental health and addictions services are offered in the RSA through hospitals and community facilities, including through a Mental Health and Addiction Community Program at the Prince Rupert Regional Hospital, which offers assessment, treatment (short- and long-term counselling), and referrals. Because of the stigma associated with mental health and addictions issues, key informants in Terrace and Kitimat have stated that some individuals may seek treatment in a more distant community, such as Prince Rupert, to protect their privacy, rather than accessing services in Kitimat or Terrace (Viveiros 2013, pers. comm.; Warcup 2013, pers. comm.).

Emergency medical services (EMS) in BC consist primarily of ground and air ambulance, which provide onsite care and stabilization of patients and transportation to appropriate care facilities. In BC, air and ground EMS are organized by the province and operated by the BC Ambulance Service (BCAS), under the authority of the Emergency and Health Services Commission (BC Ambulance Service 2011).

In the LSA and RSA, there are ambulance stations in Kitimat (run by the Kitimat District Fire and Rescue Services Department) and Terrace (operated by BCAS). Ambulance calls for the region are coordinated in Kamloops (Bossence 2013, pers. comm.). Air ambulance service is also provided by BCAS (BC Ambulance Service 2011). There is an air ambulance base in Prince Rupert; however, air ambulance has also been called out of Vancouver on occasion (Bossence 2013, pers. comm.).

There are 18 full-time firefighters in Kitimat who are also trained as pre-hospital, emergency medical assistants (first responders) and have additional training for specialized emergency response, such as confined spaces, high-angle response, and decon-hazmat (decontamination-hazardous materials) training (see Section 7.2 and the Socio-Economic Baseline Report for additional information).

Table 7.5-4 summarizes data on the use or demand of services at the Kitimat General Hospital and Health Centre and the Mills Memorial Hospital in Terrace.

Table 7.5-4: Facility and Patient Activity, 2010/11

Selected Measures	Kitimat General Hospital and Health Centre	Mills Memorial Hospital (Terrace)	Prince Rupert Regional Hospital
Acute in-patient admissions total	1,056	2,540	2,125
Acute in-patient days	5,571	13,995	7,551
Ambulatory visits (excluding ER)	2,969	10,398	10,583
Emergency visits (excluding ambulances)	10,406	24,704	23,606
In-patient surgical cases total	344	548	543
Surgical day care cases total	1,255	2,821	1,880
Medical imaging tests	12,848	28,611	17,836
Lab tests	231,887	404,039	395,332

NOTE:

Data from 2010/2011

ER – emergency room

Source: Northern Health (2012a, 2012b, 2012c)

Table 7.5-5 summarizes capacity information pertaining to health care infrastructure and services in the NWHSDA. The NWHSDA, relative to BC, has a higher ratio of general or family physicians per 100,000 populations; however, relative to BC, specialists and specialty services are in short supply. Hospital inflow and outflow rates measure the number of people leaving the NWHSDA to receive treatment; a ratio less than 1 means people had to leave the NWHSDA to receive treatment. The closer the ratio is to 0, the greater the number of people leaving the NWHSDA. The ratio of 0.84 is consistent with many rural and remote areas of BC where specialist services are limited.

Table 7.5-5: Health Care Services: Accessibility, Effectiveness, and Resources, 2011

	Northwest Health Service Delivery Area (NWHSDA)			BC		
	Total	Male	Female	Total	Male	Female
General or family physicians (per 100,000 population)	152	NA	NA	119	NA	NA
Specialist physicians (per 100,000 population)	26	NA	NA	96	NA	NA
Contact with a medical doctor in the past 12 months (%)	78.4	72.9	84.4	81.4	75.9	86.8
Percent of population with a regular medical doctor	88.4	85.2	91.7	86.3	83.0	89.5
Inflow/outflow ratio – Overall (ratio)	0.84	NA	NA	NA	NA	NA
Hospitalizations for ambulatory care sensitive conditions (per 100,000 population)	520	602	432	263	291	235
Potentially avoidable mortality (per 100,000 population)	266.5	346.7	178.4	169.0	213.1	126.0
Avoidable mortality from preventable causes (per 100,000 population)	190.6	262.8	112.1	113.0	151.7	75.1
Avoidable mortality from treatable causes (per 100,000 population)	75.9	84.0	66.3	56.1	61.4	50.9

NOTES:

Data from 2011

NA – data not available

Source: Statistics Canada (2013a)

The number of hospitalizations for ambulatory care sensitive conditions¹ provides an indication of the frequency with which people are hospitalized for conditions that normally could be treated in the community; it is used as an indicator of whether there is sufficient access to appropriate primary health care. The rate of 520 hospitalizations per 100,000, compared to the BC average of 263 per 100,000, indicates that primary care services are relatively restricted in the LSA. The higher-than-average rate of avoidable mortality is consistent with patterns seen among many rural and remote areas across Canada (Mitura and Bollman 2003). Recent population changes associated with increased resource development activity has resulted in increased demand on emergency outpatient and specific allied health services and infrastructure. Increased demand for medical services predominately affects the Kitimat General Hospital and Health Centre and Mills Memorial Hospital, and has resulted in increased demand on mental health and addictions services. Through key-informant interviews, medical personnel and local residents have reported that many health care services are at or over capacity.

Resource development is associated with increased demand on health care infrastructure and services. Case studies conducted on oil and gas projects in northeastern BC show that peak employment periods, often correlated with construction activities lead to an increase in unscheduled emergency room visits (emergency room visits not including scheduled testing and procedures) (Medd 2007). An assessment of

¹ Ambulatory care sensitive conditions are medical conditions in which timely and effective out-patient care can reduce the rate of hospitalization. Examples are asthma, angina, gastroenteritis, congestive heart failure, epilepsy, bacterial pneumonia, tuberculosis, and dental conditions.

health care infrastructure and service use between 2000 and 2005 for Dawson Creek, Chetwynd, Fort Nelson, Fort St. John, and Hudson's Hope found that there was an increase in unscheduled emergency room visits in each of the communities, particularly during the October to March period, which corresponds with highest oil and gas activities in the region (Medd 2007). A more recent study in Chetwynd and Tumbler Ridge identified a 12% increase (Medd 2007).

Workers associated with fly-in fly-out operations tend to increase demand on hospital emergency departments for several reasons:

- Emergency departments are generally open 24 hours per day and can be accessed following shift work.
- Mobile workers are in the region only temporarily, and may prefer to use emergency departments rather than establishing a relationship with primary caregivers in the work area.
- Workers may also not want to access Project onsite medical services for personal reasons (e.g., mental health issues).
- Health effects described in other measurable parameters, such as changes in health outcome indicators, specifically those of traffic-related injury and health effects related to alcohol and drug misuse, often present first in the emergency department.

Since the costs associated with emergency room visits are nearly 15 times higher than visits to a general practitioner, any increase in demand for emergency services poses a large burden on the public health care system (Sinclair 2013, pers. comm.).

A shortage of specialists in Kitimat, combined with increased demand in emergency room use, has led to increased wait times to see doctors and adverse effects on levels of service (Cooper 2013, pers. comm.; Kitimat Health Advocacy Group 2013, pers. comm.). Existing staff are experiencing increased workloads, and higher call volumes for EMS (from 3,400 in 2012 to 5,000 calls in 2013) have also been noted (Cooper 2013, pers. comm.; Parke 2013, pers. comm.). The capacity of EMS in the LSA is limited, and there have been reports of paramedics and other ambulance personnel moving to other jobs (because of better hours and higher pay). The difficulty in recruitment and retention directly affects the capacity of Northern Health and the BCAS to deliver services; this trend is similar across communities in northern BC. Similar increases in demand and physician shortages have also been reported in Terrace (Anguish 2013, pers. comm.; Carey 2013, pers. comm.; Pellegrino 2013, pers. comm.; Rumley 2013, pers. comm.; Sabo 2013, pers. comm.; Viveiros 2013, pers. comm.; Warcup 2013, pers. comm.).

Most hospitals, long-term care facilities and publicly funded mental, public health and rehabilitation facilities in Canada are funded under global budgets (Sutherland et al. 2013). Funding amounts are typically based on factors such as historical budgets and inflation and are provided irrespective of the number of patients or levels of demand on resources (Sutherland and Repin 2012). In BC, funding is distributed to health authorities following ministry staff identification of government commitments to health authorities, determination of the amount of funding that remains after making allocations to core-program commitments, and use of the population-based funding model tool to help allocate remaining funding (Auditor General of British Columbia 2013). Because of the process of allocating funding to health

authorities, short-term response to increased demand for health care infrastructure and services can be delayed.

7.5.3.2.2 Physical and Mental Health Outcomes

Physical Health

In general, perceived health and functional health levels in the NWHSDA are lower than the provincial average (Statistics Canada 2013a). In addition, there is a lower overall life expectancy and a higher infant mortality rate compared to province-wide data. However, the NWHSDA appeared to fare better than the BC average for low birth weight babies (Statistics Canada 2013a).

Terrace ranks second-to-last of 78 communities across BC for shorter life expectancies at birth and higher than average potential years of life lost due to natural causes (BC Stats 2012c, 2012d). The rates of several health conditions (arthritis, high blood pressure, cancer and acute myocardial infarction [heart attack]) may be higher in the NWHSDA than the rest of the province, but rates of diabetes, asthma, and mood disorders are similar (BC Stats 2012c, 2012d; Statistics Canada 2013a).

The mortality measures listed in Table 7.5-6 describe the number of deaths from specific causes per 100,000 populations. In 2009/2010, circulatory diseases were the most common primary cause of death, followed by cancers, respiratory diseases, and unintentional injuries (Statistics Canada 2013a). Premature mortality describes the rate of death among people younger than age 75. The NWHSDA had higher rates than the BC average for all mortality measures.

Table 7.5-6: Age-Standardized Mortality Measures, 2009/2010

	NWHSDA			BC		
	Total	Male	Female	Total	Male	Female
Total, all causes of death (per 100,000 population)	659.9	778.5	537.9	523.1	637.1	427.9
All cancers, deaths (per 100,000 population)	171.4	203.4	143.4	152.5	180.6	131.2
Circulatory diseases, deaths (per 100,000 population)	196.5	237.8	154.0	153.9	189.5	124.1
Respiratory diseases, deaths (per 100,000 population)	62.5	66.1	56.3	45.3	56.5	37.4
Unintentional injuries, deaths (per 100,000 population)	39.5	54.3	23.8	25.6	36.5	15.4
Premature mortality (per 100,000 population)	357.8	441.7	266.2	236.8	293.9	181.2

NOTE:

Data for year 2009/2010; standardized by age.

Source: Statistics Canada (2013a)

An influx of people into an area can cause an increase in infectious diseases, such as STIs, infectious respiratory diseases, and gastrointestinal illnesses. STIs include gonorrhoea, chlamydia, syphilis, hepatitis C, HIV/AIDS, and human papilloma virus. These diseases are transmitted through unprotected sexual contact and are an important public health concern. The most prevalent STI in the Northern Health region is chlamydia, followed by hepatitis C and gonorrhoea. In 2011, the rate of chlamydia was almost 75%

higher in the NWHSDA than in BC as a whole. STI rates in BC tend to be highest among young adults aged 20 to 24.

Public safety issues are strongly linked to the potential for injury and fatality. In the Northern Health region, an average of 365 people are injured and require medical attention every month, with 3.6% dying from preventable injuries (BC Injury Research and Prevention Unit 2011). In 2011, rates of injuries that resulted in limitations of activities or required hospitalization were higher in the NWHSDA than across BC, which is consistent with higher rates of injuries in rural areas across Canada (Statistics Canada 2013a).

Traffic-related injuries and fatalities contribute to public safety indicators; traffic data pertaining to collisions was last collected in BC in 2007. In 2007, 33% of injury deaths in the Northern Health region were attributed to motor vehicle crashes (Northern Health 2012b, d). Increased economic activity in the LSA has resulted in more vehicle traffic, particularly heavy trucks (Hurst 2013, pers. comm.; Warcup 2013, pers. comm.), including a 5% to 10% increase in traffic between Terrace and Kitimat (Kile 2013, pers. comm.). Despite increased traffic, demand for emergency services in the LSA in response to motor vehicle collisions has not increased (Hurst 2013, pers. comm.). Additional information regarding traffic is presented in Section 7.2 and in the Socio-Economic Baseline Report (Stantec 2014).

Mental Wellbeing and Stress

Rates of self-injury hospitalization, suicides, and self-inflicted injuries in the NWHSDA are approximately twice the provincial level. In 2009/2010, 63.4% of residents in the NWHSDA perceived their mental health to be very good or excellent, versus 71.0% of residents in the province (Statistics Canada 2013a).

In 2009/2010, heavy alcohol consumption was higher among women in the NWHSDA than the general BC population; rates for men were similar between the NWHSDA and the province as a whole (Statistics Canada 2013a).

The Kitimat and Terrace LHAs both have a higher prevalence of alcohol consumption and heavy drinking than the province as a whole, with Terrace higher than Kitimat for most indicators. Non-cannabis drug offences among adults appear lower for Kitimat and Terrace than the provincial average; however, drug offence rates reflect not just underlying drug use but also the policing capacity and approach. Additionally, drug offence rates have high year-to-year variability for these LHAs with a relatively small population (BC Stats 2012a, 2012b; Statistics Canada 2013a).

From 2002 to 2011, alcohol-related hospitalizations increased in the Kitimat LHA and remained relatively stable in the Terrace LHA. Illicit drug-related hospitalizations increased in both the Kitimat LHA and Terrace LHA peaking in 2006/2007, as they did that year throughout BC. It is difficult to determine whether this trend reflects underlying substance misuse or a change in coding protocols across the province; illicit drug-related hospitalizations do not appear to correspond with overdose or drug-related mortality across the province, which are much more definitive in terms of how they are coded (Vallance et al. 2012). While not definitive, changes in economic activity are often correlated to these health behaviours (Vallance et al. 2012).

Interviews with key informants suggest that alcohol and drug usage rates have recently been on the rise with the increase in development in the area:

- It is perceived that new drug dealers are moving into the LSA and are establishing their territory (Harrison 2013, pers. comm.; Robinson 2013, pers. comm.).
- In the LSA and RSA, there has been an apparent increase in mental health issues and people self-medicating with alcohol and drugs (Brown 2013, pers. comm.; Pellegrino 2013, pers. comm.).
- In Kitimat, there has been an apparent increase in bar fights and assaults involving alcohol and drugs (Harrison 2013, pers. comm.).
- In the RSA, there has been an increase in ambulance calls on Fridays and Saturdays involving drugs and alcohol (Parke 2013, pers. comm.).
- Mental health and addictions services in Terrace and Kitimat are experiencing increased demand, longer wait lists, and the need for additional mental health counsellors for children, youth, and adults (Warcup 2013, pers. comm.).
- Issues of addiction and selling drugs and sex have been seen not only in adults but also in at-risk youth in Terrace (Carey 2013, pers. comm.).

7.5.3.2.3 Community Cohesion and Resilience

Community cohesion, measured through indices based on social determinants of health, is used to illustrate the susceptibility of communities and disadvantaged individuals and groups to social change. Measures of community cohesion and resilience include income, education, crime rates, and children and youth at risk. These measures were identified through consultation and highlighted through baseline studies applicable to the LSA and RSA. Measures of community cohesion and resilience are affected by population change. Information on baseline population, historical population change, population mobility and population projections including project-residual effects on population change is provided in Section 7.2.

Economic Hardship

BC Stats has published a Socio-Economic Composite Index from which 78 LHAs and 26 RDs across BC are ranked on a worst-off to best-off scale from 1 to 78 (LHAs) and 1 to 26 (RDs). In terms of ranking, 1 is the worst possible ranking and 78 (or 26) the best. Table 7.5-7 lists rankings for the index of human economic hardship (BC Stats 2012a, 2012b). High percentages of the total population on income assistance primarily contribute to low rankings of human economic hardship in the LSA. In the RSA, in addition to high percentages of the total population on income assistance, the percentage of seniors receiving maximum guaranteed income supplement, and high percentages of persons on employment insurance and low per capita income levels, result in low human economic hardship rankings.

Table 7.5-7: Indicators of Human Economic Hardship (as per Socio-Economic Composite Index)

Community	Index of Human Economic Hardship									
	Overall Ranking*	Percent of Population (All Ages) on Income Assistance (Sept. 2012)			Percent of Seniors Receiving Maximum GIS (2012)	Percent of Persons Aged 15+ on EI (4Q Avg. to Sept. 2012)	2009 Per Capita Income	2005 Average Household Income (Census 2006)	2005 Income Inequality Measure	Per Capita Net Taxes Paid (2009-Taxes Minus Transfers)
		Total	For 1 Yr. or More	For Less Than 1 Yr.						
Kitimat LHA	10	12	10	9	26	20	NA	10	2	NA
Terrace LHA	5	3	4	2	28	19	NA	41	33	NA
Vancouver LHA	29	45	38	54	3	77	NA	16	77	NA
Kitimat-Stikine RD	2	2	2	3	3	2	2	NA	21	17
Skeena-Queen Charlotte RD	1	1	1	1	7	1	1	NA	25	11

NOTES:

* The lower the number the better

1) Acronyms used: Local Health Area (LHA); Regional District (RD); guaranteed income supplement (GIS); employment insurance (EI).

2) Vancouver LHA is included for comparison purposes.

3) Kitimat-Stikine RD and Skeena-Queen Charlotte RD include communities not part of the RSA for community health and wellbeing but are considered representative of overall baseline conditions in the RSA.

4) NA – data not available

Source: BC Stats (2012a, 2012b)

Education

Table 7.5-8 lists rankings for indicators of education concerns (BC Stats 2012c, 2012d). High percentages of the population not completing a Grade 12 provincial exam, having below-standard writing and math comprehension, and having low completion rates for Grade 10 English and science provincial exams primarily influence the index of education concerns. In the RSA, low rankings of every education indicator included in the index result in a ranking of one and two for the Skeena-Queen Charlotte RD and Kitimat-Stikine RD, respectively.

Table 7.5-8: Indicators of Education Concerns

Community	Index: Education Concerns					
	Overall Ranking*	Percent of Population Aged 25–54 (2006)		Percent of 18 Year Olds Who Did Not Graduate (average of 2009/10–2011/12)	Gr. 12 Provincial Exam Non Completion Rate (Average of 2009/10–2011/12)	Percent Below Standard Gr. 4 Reading, Writing, and Math (2009/10–2011/12)
		Without High School Completion	Without Post-Secondary Credentials			
Kitimat LHA	25	17	15	33	48	18
Terrace LHA	16	30	36	18	7	9
Vancouver LHA	66	70	76	25	60	59
Kitimat-Stikine RD	2	4	6	3	1	1
Skeena-Queen Charlotte RD	1	2	4	1	4	3

NOTES:

* The lower the number the better

- 1) Acronyms used: Local Health Area (LHA); Regional District (RD).
- 2) Vancouver LHA is included for comparison purposes.
- 3) Kitimat-Stikine RD and Skeena-Queen Charlotte RD include communities are not part of the RSA for community health and wellbeing but are considered representative of overall baseline conditions in the RSA.

Source: (BC Stats 2012c, 2012d)

Additional information regarding education and educational infrastructure and service capacity for the LSA and RSA is presented in Section 7.2.

Homelessness and At-Risk Homelessness

Homelessness is linked to higher rates of physical and mental health problems, with the likelihood of early death among homeless people being eight to 10 times greater than for the general population (Mikkonen and Raphael 2010). In the RSA, low-cost rental housing is available; however, many units have fallen into disrepair because of low rents and little incentive for renovations by landlords. There has also been a resettlement of low-income people from Vancouver to Kitimat by a local community church group. This has created a fluid culture of low-income renters accustomed to moving frequently between rental units. With ongoing in-migration of resource development project workers, LSA populations are facing escalating rents and shrinking vacancy rates (Hummel 2013, pers. comm.; Phelps 2013, pers. comm.; Rumley 2013, pers. comm.). See Section 7.2 for a more detailed description of housing in the LSA and RSA.

Crime Rates

The Kitimat LHA is in the top 38% of communities in BC in terms of high crime index rankings; the Terrace LHA is in the top 64% (BC Stats 2012e, 2012f). Primary indicators affecting LSA crime rankings are related to high crime rates associated with serious violent crime and serious property crime, high

rates of offences related to illicit drug deaths, and high rates of juvenile non-cannabis drug charges. In the RSA, high offence rates and increasing rates of serious violent crime and serious property crime, as well as high offence rates associated with serious drug crime and juvenile crime, affected overall index rankings. Section 7.2 and the Socio Economic Baseline TDR present additional baseline information on crime rates.

7.5.3.2.4 Factors Affecting Families

Violence against Women

Violence against women can have short- and long-term adverse consequences on health and wellbeing that extend beyond the immediate physical and mental effects of violence, whereby quality of life can be adversely affected for the lifetime of the victimized individual (Statistics Canada 2013b). Adverse effects on quality of life can affect overall community cohesion and societal function, and can place increased demand on health care infrastructure and services (WHO 2003, 2009; Statistics Canada 2013b).

In 2000, through a joint territorial, provincial and federal working group, Statistics Canada was commissioned to develop a set of statistical indicators on violence against women (Statistics Canada 2013b). Since 2002, statistical information regarding violence against women has been published. Data availability is limited to those for Canada, the provinces and territories, and census metropolitan areas (CMs). Statistical information is largely limited to those violent acts that reach a criminal threshold and that of self-reported emotional and financial abuse (spousal violence) and therefore mostly defined by *Criminal Code* definitions; it is recognized that violence against women extends beyond the criminal threshold to encompass a continuum from name-calling to homicide.

“Police-reported and self-reported data show women are more likely than men to be victims of specific forms of violence, such as intimate partner violence, severe forms of spousal violence, sexual violence and stalking” (GNL and FMRSW 2013). In Canada, police-reported data show that, while violent crime against men is similar to that of women, women are 11 times more likely to be sexually victimized and three times more likely to be stalked than men (FMRSW 2013 and Statistics Canada 2013b). Overall, 83% of violent acts in Canada against women were committed by men (FMRSW 2013 and Statistics Canada 2013b). Nationally, 98% of those accused of violence against women from 2002 to 2011 (police-reported) were male (FMRSW 2013 and Statistics Canada 2013b). From 2002 to 2011, males are most of those accused of violence against women committed by strangers (74%), non-spousal family members (68%), and friends or acquaintances (60%) (FMRSW 2013 and Statistics Canada 2013b). As of 2009, self-reported violent victimization against Aboriginal women was about 2.5 times higher across Canadian provinces. Aboriginal women are also twice as likely to be victims of homicide than non-Aboriginal women (“between 2001 and 2011, at least 8% of all murdered women aged 15 years and older were Aboriginal, double their representation in the Canadian population”) (FMRSW 2013 and Statistics Canada 2013b). Missing and murdered Aboriginal women in Canada has been identified nationally and internationally as an issue of key concern related to violence against women (Statistics Canada 2013b).

The actual incidence of violence against women is estimated to be greater than official police-reported statistics show because a large percentage of violence goes unreported (Statistics Canada 2013b). Self- and police-reported victimization statistics are unavailable for LHA communities; however, trends in self-reported and police-reported victimization are useful for understanding pathways to violence against women that is applicable to LHA communities. Trends for self-reported violence against women from 2002 to 2011 show that (Statistics Canada 2013b):

- Single and young women are most at risk.
- The prevalence of spousal victimization among lesbian and bisexual women is increasing.
- Women who participate in evening activities are at higher risk of spousal and non-spousal violence.
- Educational attainment and income are not linked to women's risk.
- Non-spousal victimization is higher among women who use alcohol or drugs.
- Women with an activity limitation (such as a physical, mental, or health condition that restricts a person's activities) are more likely to experience spousal violence.
- Spousal violence is less prevalent among immigrant women than Canadian-born women.
- Aboriginal women are at higher risk of victimization than non-Aboriginal women.

Overall trends for police-reported violence against women from 2002 to 2011 show that (Statistics Canada 2013b):

- Women are most at risk from an intimate partner.
- Rates of violence against women are higher in non-CMAs than CMAs.
- Homicide rates among Aboriginal women are disproportionate to their percentage in the overall population. Aboriginal women are 4% of the population in 2006 but accounted for 11% of dating homicide victims and 10% of non-intimate partner homicide victims between 2001 and 2011 (Statistics Canada 2013b).

Divorce Rates

Divorce can be a stressful event in the lives of family members; it can have an adverse effect on the financial, social, psychological, and physical wellbeing of the couple divorcing and their children (Employment and Social Development Canada 2014). Marital status information for LSA and RSA communities is presented in the Socio-Economic Baseline Report.

Children and Youth at Risk

Table 7.5-9 presents socio-economic composite index rankings for indicators of children at risk (BC Stats 2012g, 2012h). High percentages of children on income assistance and high rates of child hospitalizations attributable to respiratory disease influence index rankings for the Kitimat LHA. In the Terrace LHA, high percentages of children on income assistance and high rates of children in care, infant mortality, and juvenile crime related to non-cannabis drug charges, and high rates of child hospitalizations attributable to respiratory disease affect index rankings. Overall, low rankings for each indicator of children at risk place the Skeena-Queen Charlotte RD at one and the Kitimat-Stikine RD at three in terms of worst-off of the 26 regional districts of the province with respect to the composite index for children at risk.

Table 7.5-9: Indicators of Children at Risk

Community	Index of Children at Risk						
	Overall Ranking*	Percent of Children (aged 0–14) on Income Assistance (Sept. 2012)		Children in Care (Dec 2012; per 1,000 Population Aged 0–18)	Infant Mortality Rate (2008–2012; rate/1,000 live births)	Reading Gr. 4 and 7 (Average of 2009/10–2011/12; Percent Below Standard)	Total Serious Juvenile Crime (Average of 2009–2011; Charges per 1,000 Population Aged 12–17)
		For 1 Year or More	For Less than 1 Year				
Kitimat LHA	23	14	8	34	30	34	62
Terrace LHA	6	4	5	12	15	23	20
Vancouver LHA	63	54	59	69	40	68	50
Kitimat-Stikine RD	3	2	3	7	6	3	7
Skeena-Queen Charlotte RD	1	1	1	3	2	2	1

NOTES:

* The lower the number the better

- 1) Acronyms used: Local Health Area (LHA); Regional District (RD).
- 2) Vancouver LHA is included for comparison purposes.
- 3) Kitimat-Stikine RD and Skeena-Queen Charlotte RD include communities are not part of the RSA for community health and wellbeing but are considered representative of overall baseline conditions within the RSA.

Source: BC Stats (2012g, 2012h)

Table 7.5-10 presents rankings for the index of youth at risk (BC Stats 2012i, 2012j). High percentages of youth on income assistance and youth on employment insurance influence overall rankings of the index. Low rankings in each indicator of youth at risk place the Skeena-Queen Charlotte RD at one and the Kitimat-Stikine RD at three in terms of worst-off of the 26 RDs in the province in terms of the composite index for children at risk.

Table 7.5-10: Indicators of Youth at Risk

Community	Index: Youth at Risk					Total Serious Crime (Offences per 1,000 Population, Average 2009–2011)
	Overall Ranking*	Overall Percent of Youth (aged 15–24) on Income Assistance (Sept. 2012)			Percent of 18 Year Olds Who Did Not Graduate (2009/10–2011/12)	
		Total	For 1 Year or More	For Less than 1 Year		
Kitimat LHA	13	12	12	12	33	47
Terrace LHA	8	4	6	3	18	26
Vancouver LHA	43	56	51	58	25	18
Kitimat-Stikine RD	3	3	3	3	3	7
Skeena- Queen Charlotte RD	1	1	1	2	1	4

NOTES:

* The lower the number the better

1) Acronyms used: Local Health Area (LHA); Regional District (RD).

2) Vancouver LHA is included for comparison purposes.

3) Kitimat-Stikine RD and Skeena-Queen Charlotte RD include communities are not part of the RSA for community health and wellbeing but are considered representative of overall baseline conditions in the RSA.

Source: BC Stats (2012i, 2012j)

7.5.3.2.5 Diet and Nutrition

Diet and nutrition play a vital role in the physical, social, and cultural health of individuals, families, and communities. Not only do healthful diets help prevent disease and promote better health, but the harvesting, preparing and consuming of food can be an important source of enjoyment and pride and can encourage social bonding and foster cultural diversity (McKee et al. 2009).

Food Insecurity

Food insecurity results from a combination of social conditions and policies that limit the resources available to a household to acquire and purchase adequate nutritious food (Loopstra and Tarasuk 2013). Low-income women, and in particular single mothers, are especially susceptible to experiencing food insecurity with health effects, potentially extending to both themselves and their children (McIntyre and Rondeau 2008). Food insecurity is also associated with poor mental health outcomes and complicates coping abilities of individuals with chronic diseases (Statistics Canada 2013c). In BC, food security is viewed as a key determinant of health and a core public health function (Foster et al. 2011).

The BC Atlas of Wellness depicts levels of food security based on information derived from 18 separate measures in the 2009/10 CCHS (Foster et al. 2011). Across BC, 5.7% of CCHS respondents were food insecure; in the NWHSDA, 6.9% of CCHS respondents were food insecure. Overall, the NWHSDA ranked

12th lowest among BC's 16 HSDAs for food security. As in the province, women in the NWHSDA were more likely to be food insecure: 9.3% of females aged 12 and older versus 4.8% of males. In the NWHSDA, youth were more likely to be food insecure (10.2%) than adults aged 20 to 64 (7.2%); adults aged 65+ were least likely to be food insecure (1.3%). Overall, food security trends in the NWHSDA mirror provincial averages.

Food banks provide a valuable service to individuals suffering from food insecurity. In the LSA, Kitimat and Terrace both have a number of food bank agencies: Terrace Churches Food Bank; Salvation Army; Kitimat Food Bank; and the Food Share program. The use of food banks in the LSA has decreased recently and this can be associated with increased economic activity and employment, as well as potential increased housing costs resulting in an out-migration of lower income individuals and families (Phelps 2013, pers. comm.; Rizoni 2013, pers. comm.; Wiebenga 2013, pers. comm.). The Kitimat Food Bank has seen a decrease of clients (i.e., individuals or families/groups) (Phelps 2013, pers. comm.; Rizoni 2013, pers. comm.). Despite an overall drop in use, a number of in-migrated families sought support from the Kitimat Food Bank while seeking employment (Phelps 2013, pers. comm.; Rizoni 2013, pers. comm.). A similar trend was reported for the Terrace Churches Food Bank (Wiebenga 2013, pers. comm.).

Increased economic activity has also affected food banks in the LSA at an organizational level; increased demand for groceries has resulted in decreased donations from grocery stores in Kitimat. However, new industries and companies in the LSA actively support community food banks through regular donations (Phelps 2013, pers. comm.; Rizoni 2013, pers. comm.). In Kitimat, increased demand for commercial real estate has resulted in the Kitimat Food Bank being given notice to vacate their premises (Wiebenga 2013, pers. comm.).

Country Foods

Country foods are an important part of both Aboriginal and non-Aboriginal cultures (Earle 2011; Caspi et al. 2012; Health Canada 2012). In Aboriginal cultures, harvesting of country "traditional" foods and being out on the land are not only associated with nutritional health benefits (e.g., subsistence food sources have been linked with lower rates of conditions such as obesity, diabetes, heart disease, and stroke), but also involve health benefits from physical activity, spiritual connection with the land, and the feelings of pride and self-sufficiency (Earle 2011; FNHA 2012). In addition, country food harvesting in Aboriginal communities maintains social and cultural health, providing the basis for sharing, cooperation, non-cash economies, and cultural transmission (Earle 2011). Non-Aboriginal persons who engage in the harvesting of country foods realize similar nutritional and health benefits and also engage in culturally important practices.

Table 7.5-11 presents a consolidated list of commonly harvested country foods by Aboriginal Groups in the RSA. Section 7.4 presents information on marine traffic and use, including information applicable to Aboriginal and non-Aboriginal country food harvesting.

Table 7.5-11: Overview of Commonly Harvested Country Foods by Aboriginal Groups in the RSA

Use Category	Specific Food
Hunting	Black bear, goose, ungulate (deer, elk, moose, mountain goat), duck quail, swan, marine mammal (seal, sea lion),
Marine Fishing	Eulachon; greenling, rockfish and other species; halibut and cod; herring (including roe); octopus and other invertebrates; salmon-all species; shellfish; shrimps and prawns
Trapping	Small fur-bearing animals (beaver, fisher, land otter, mink, weasel, muskrat, raccoon)
Freshwater Fishing	Salmon, trout
Vegetation Gathering	Food harvesting – terrestrial (berries, crab-apples, wild rice, various tubers and roots) Food harvesting – marine (seaweed and kelp)

NOTE:

See Sections 13 and 14 (Section 14.3.2.2 and Tables 14.3-1,-2,-3,-4,-5,-6,-7) for Aboriginal Group specific information and current use.

Source: Allied Tsimshian Tribes Association and Lax Kw'alaams Band Council (2004); Gill and Ritchie 2011; Gregory et al. (2011); Satterfield et al. (2012); Powell (2013); Metlakatla Fisheries 2013; Metlakatla First Nation 2014; The Firelight Group (2014a, 2014b)

Haisla Nation

Commonly harvested country foods by members of Haisla Nation are identified in Table 7.5-13. See Section 14.3.2.2, Table 14.3-1 for additional information. Haisla Nation members fish, hunt, and harvest country foods throughout their traditional territory; fishing and processing of marine and aquatic resources is an important cultural practice and increases food security (Powell 2013). Food fish are vital to the diet, wellbeing, and health of Haisla Nation members. The Haisla Nation Community Food Fishery is seen as integral to the health and wellbeing of the entire community (Powell 2013). Traditionally harvested vegetation is available throughout Haisla Nation traditional territory (Powell 2013). Pressure from industrial and commercial activity in Haisla Nation traditional territory on the marine and aquatic environments and country foods has increased over the past years (Powell 2013).

Distribution of country foods among Haisla members is an essential cultural practice and helps manage food insecurity among elderly populations (Powell 2013).

Gitga'at First Nation

An overview of commonly harvested country foods by Gitga'at First Nation is provided in Table 7.5-11 (see Section 14.3.2.2, Table 14.3-2 for additional information). For Gitga'at First Nation, country foods are not only essential in satisfying material needs as consumables (increasing food security) but are used as trade items for store-bought goods, fuel, and transportation, and are central to cultural identity. Sharing of country foods is an important cultural value of care and support for the elderly and vulnerable, and is a contributing factor to the socio-economic health of the nation (Gill and Ritchie 2011; Gregory et al. 2011; Satterfield et al. 2012). Country foods often traded for other goods include clams, halibut, and cod (Gill and Ritchie 2011; Gregory et al. 2011; Satterfield et al. 2012). Value added or prepared country foods traded for other goods often include smoked cockles, dried or smoked halibut, dried seaweed, and dried and smoked salmon (Gill and Ritchie 2011; Gregory et al. 2011; Satterfield et al. 2012).

Food security is of cultural significance to Gitga'at First Nation. The ability to provide and share country foods with family members is a valued cultural attribute (Gill and Ritchie 2011; Gregory et al. 2011; Satterfield et al. 2012). In a 2010 survey of Gitga'at First Nation members, 95% of respondents noted they received country foods from others, and 89.9% noted they provided country foods for others (Gregory et al. 2011). Food security was commonly noted as highly important: 99.2% responded that having food fish is important, 95.9% responded that knowing the ocean was their fridge was important, and 89.3% responded that being able to share country foods is important (Gill and Ritchie 2011).

Gitxaala Nation

An overview of commonly harvested country foods by members of Gitxaala Nation is provided in Table 7.5-13 (see Section 14.3.2.2, Table 14.3-5 for additional information). Gitxaala Nation members rely on country foods to meet their physical and cultural needs (Calliou Group 2014; The Firelight Group 2014a, 2014b). Many Gitxaala Nation members credit their positive health to the consumption of high-quality country foods (Calliou Group 2014). Surveys conducted for the Project on behalf of Gitxaala Nation found the following information related to country food consumption and food security (The Firelight Group 2014a, 2014b):

- 75% of respondents harvested country foods to meet their consumption needs in the past year.
- 51% of respondents purchased country foods in the last year.
- 44% of respondents reported that they know of people who have run out of key food supplies before receiving their next paycheque.
- 75% of respondents reported that they would harvest country foods to solve hunger in their household; only 13% reported they would rely on a food bank or other programs to solve hunger and 37% would rely on gifts or money from family or friends.
- 40% of Gitxaala respondents indicated that the country foods they consume were given to them by other Gitxaala community members.
- 92% of off-reserve respondents indicated that they received gifts of traditional foods; jarred salmon is often shipped as far as Edmonton and Toronto to off-reserve members.

Many country foods and resources are fundamental to Gitxaala Nation members and are harvested throughout Gitxaala Nation traditional territory (The Firelight Group 2014a, 2014b); marine and foreshore resources are especially critical (Calliou Group 2014; The Firelight Group 2014a, 2014b). Halibut, abalone, shellfish and other fish products, and seaweed are important to feast and are commonly traded with Aboriginal Groups up the Nass River for oolichan grease for consumption and cultural purposes (Calliou Group 2014; The Firelight Group 2014a, 2014b). Aboriginal harvesting in and around the marine access route is described further in Section 7.4 and Section 14.

Lax Kw'alaams First Nation

Commonly harvested country foods by Lax Kw'alaams First Nation are identified in Table 7.5-11 (see Section 14.3.2.2, Table 14.3–6 for additional information). The Allied Tsimshian Tribes of Lax Kw'alaams place a high value on country foods and their ability to live off these resources (Allied Tsimshian Tribes Association and Lax Kw'alaams Band Council 2004). Hunting, fishing, and gathering of marine and terrestrial country foods continue to be important to Lax Kw'alaams First Nation members. Country foods are critical for winter food supply, feasts, trade, and healthy diets (Allied Tsimshian Tribes Association and Lax Kw'alaams Band Council 2004). The ability to fill one's freezer with country foods for the coming winter is a key indicator of food security for members of Lax Kw'alaams First Nation (Allied Tsimshian Tribes Association and Lax Kw'alaams Band Council 2004).

Although the current generations of children have been less involved in country food harvesting, education programs are underway to teach the skills necessary to harvest and preserve foods for winter months, increasing food security (Allied Tsimshian Tribes Association and Lax Kw'alaams Band Council 2004). Current pressures from industrial development, commercial fisheries, and changing government regulations have been reported by Lax Kw'alaams First Nation as having affected their food security. Lax Kw'alaams First Nation members have stated that industrial operations should be limited, if not restricted, where such activities could interfere with fishing, hunting, or other forms of food harvesting (Allied Tsimshian Tribes Association and Lax Kw'alaams Band Council 2004). While fishing, hunting, and harvesting of country foods occurs throughout Lax Kw'alaams First Nation territory, extensive harvesting occurs on Ksgaxl (Stephens Island) (Allied Tsimshian Tribes Association and Lax Kw'alaams Band Council 2004).

Metlakatla First Nation

An overview of commonly harvested country foods by Metlakatla First Nation is presented in Table 7.5-11 (see Section 14.3.2.2, Table 14.3–7 for additional information). In particular, “the relationship between salmon and the Metlakatla people cannot be overstated” (Metlakatla First Nation 2014, p. 15). Eulachon as rendered oil (or grease) and as smoked or fresh fish as well as northern abalone are important species to Metlakatla First Nation in terms of diet (Metlakatla First Nation 2014; Metlakatla Fisheries 2013). Continued access to country foods for food, social and ceremonial (FSC) purposes is vital to the Metlakatla First Nation for the continued practice and vitality of their culture (Metlakatla First Nation 2014; Metlakatla Fisheries 2103).

Metlakatla First Nation understands food security as “the state when all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance and social justice” (Hamm and Bellows in Metlakatla 2014). This value was specifically highlighted through a Community Needs Study conducted by Metlakatla First Nation with respect to marine resources. As is detailed in Metlakatla's Draft Marine Use Plan Executive Summary, crab FSC harvest requirements are not being achieved by members within Metlakatla First Nation traditional territory, in particular those areas nearest their community (Metlakatla First Nation 2014). It is also noted that marine transportation is a particular concern because it occurs in the core areas of

Metlakatla Pass and the Tree Knob group; these areas provide food and livelihood for members (Metlakatla First Nation 2014).

With respect to anticipated future use of marine resources, Metlakatla First Nation seeks to increase the amount of harvested staple foods such as crab and salmon and seeks to implement a Metlakatla Use Zone encompassing marine territories closest to Metlakatla Village (Metlakatla First Nation 2014). Continuation of Metlakatla's shellfish pilot project and expansion into marine plant, geoduck and abalone aquaculture is also being considered (Metlakatla First Nation 2014). "Metlakatla First Nation currently support the moratorium on offshore oil and gas exploration and development[;] this includes opposition to exploration and seismic testing, offshore oil and gas operation, as well as pipeline development or tanker and condensate shipping through our territory" (Metlakatla First Nation 2014, p. 18).

Kitsumkalum First Nation

An overview of commonly harvested country foods by Kitsumkalum First Nation is provided in Table 7.5-11 (see Section 14.3.2.2, Table 14.3-4 for additional information). Members of Kitsumkalum First Nation primarily hunt within Kitsumkalum, Skeena and Ecstall valleys and certain coastal islands; different house groups own territories and hunting and trapping resources (Crossroads 2014). Food security and the desire to recover hunting traditions and skills is a focus for Kitsumkalum First Nation as it is a critical aspect of their cultural heritage (Crossroads 2014).

Kitsumkalum First Nation fishers utilize over 80 coastal areas for a variety of food harvesting and fishing purposes (Crossroads 2014). In particular, eulachon is fished on the Skeena River near tidal limits below Kwinitza and in Skeena tributaries such as the Khyex, Ecstall, Kasiks and Scotia Rivers as well as on the Nass River and at Red Bluff (Crossroads 2014). Regulations limiting the harvest of some country foods to short-time frames make it difficult for some members involved in wage-based economies to engage in harvesting activities (Crossroads 2014).

Kitselas First Nation

Commonly harvested country foods by Kitselas First Nation are identified in Table 7.5-11 (see Section 14.3.2.2, Table 14.3-3 for additional information). Fish is the mainstay of food harvesting for Kitselas First Nation members (Smith 1999). Harvesting of plants and berries as well as hunting, agriculture and trapping among other methods are used to promote food security among band members (Smith 1999, 2008). The most desired seafood items include eulachon, salmon, herring eggs, crab, seaweed, abalone, mussels, black cod, shrimp, prawns, halibut, clams and cockles (Gregory et al. 2011; Kitselas Community Engagement 2014). Cockles and seaweed are generally not available from commercial markets and must be sourced locally (Kitselas Community Engagement 2014).

Information obtained from a Kitselas First Nation Country Food Survey conducted through the LNG Canada First Nation Community Research Program (see Section 7.2 for more information) show that a majority of respondents consume country foods between two to three times a week in the form of plants (e.g., berries, roots), meat (e.g., moose, deer, bear) and fish (e.g., salmon, halibut, shellfish); seasonality affects the type and rate of consumption (Stantec 2014). Country foods can be obtained through a number of sources: 87.5% of respondents indicated that one method of obtaining country foods was to

either to obtain it themselves or from a member of their household, 45.8% obtain a portion of their country foods through trade or purchase from other First Nations in the region, and 47.7% from other households in the community (Stantec 2014). For country food harvesting, 50% of respondents indicated that they or someone in their household engage in country food harvesting between one to two times a week (pending seasonality and weather), 20.8% one to two times a month, 8.3% once every four to six months, 16.7% once a year and the remainder rarely to never (Stantec 2014).

On average, of those households engaged in country food harvesting 50% to 75% of household members engage in hunting, fishing and gathering (Stantec 2014). Leading barriers to obtaining country foods include costs of obtaining country foods, perception of limited resources compared to the past, loss of transmission of knowledge between generations, time limitations, and perceived changes in the environment (Stantec 2014). Concerns regarding the quality of country food and access and ease of commercial foodstuffs were also identified as contributing barriers to obtaining and eating country foods (Stantec 2014). From the country food survey, 89.5% of respondents noted that they participate in harvesting, fishing or hunting activities near Terrace, 73.7% near the Kitimat area, 73.7% near the marine access route for the Project and 38.9% in other areas (primarily that of the Nass area) (Stantec 2014).

7.5.4 Project Interactions

Table 4.4-1 (Section 4) identifies potential interactions of concern between Project activities and each of the selected VCs that are carried forward in the assessment. The potential effects identified in Section 7.5.2.4 that may result in an adverse effect as a result of interactions with Project activities are assessed. The extent to which the interactions will be considered are ranked in Table 7.5-12.

A conservative approach is taken in assigning a Rank of 1, whereby interactions with a meaningful degree of uncertainty are assigned Rank 2 so that a detailed effects assessment is conducted.

Table 7.5-12: Potential Effects on Community Health and Wellbeing

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

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 best management practices (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.

7.5.4.1 Justification of Interaction Rankings

7.5.4.1.1 Change in Community Health and Wellbeing

Rank 0

During construction, operation, and decommissioning, activities and physical works associated with waste management are not anticipated to affect changes in community health and wellbeing. No interaction is expected to occur; therefore, these physical activities and works are not considered further. Because a ship's crew will remain onboard during LNG loading, no interaction is anticipated and there this physical activity and work is not considered further.

During decommissioning remediation and reclamation of the site and post-closure monitoring and follow-up are not expected to have an interaction with diet and nutrition. These physical activities and works are not considered further.

Rank 1

Project activities and physical works ranked as 1 (see Table 7.5-12) will require a moderate-sized workforce, most of which will be housed in the workforce accommodation centre(s) or on ships while berthed (ship's crew). Because of the relatively small workforce associated with these activities, potential adverse effects are anticipated to be manageable to acceptable levels through implementation of BMPs, such as those identified in *International Finance Corporation Workers' Accommodation Processes and Standards* (IFC and EDRD 2009). Activities ranked as 1 are not considered further in the assessment of Project effects, but they are considered in the assessment of cumulative effects.

Rank 2

Project activities and physical works ranked as 2 in Table 7.5-12 may affect community health and wellbeing because they are associated with population change and change in employment and income (further discussed in Section 7.5.5.2).

Interactions ranked as 2 may result in adverse effects that may exceed acceptable levels without implementation of Project-specific mitigation and are further assessed in Section 7.5.5; mitigation measures are discussed in Section 7.5.5.2. Interactions ranked as 2 could increase demand for health care infrastructure and services; affect indicators of health outcomes, community cohesion or resilience, and influence factors affecting families, as well as adversely affect food security through changes in market food prices and demand. This could adversely affect community health and wellbeing. These potential effects may be substantial and are of public and regulatory concern. As such, these interactions require more detailed analysis and consideration in the assessment to predict, manage, and evaluate their potential effects; accordingly, they are ranked as 2.

7.5.4.1.2 Change in Diet and Nutrition

Rank 0

During decommissioning, activities and physical works associated with remediation and reclamation of the site, waste management and post closure monitoring and follow-up are not anticipated to affect changes in diet and nutrition. No interaction is expected to occur; therefore, these physical activities and works are not considered further in the assessment.

Rank 1

Mechanisms affecting change in diet and nutrition related to Project activities and physical works ranked as 1 in Table 7.5-12 are associated with ecological change and access (accessibility and availability) to food sources, employment and income, and local economic change.

Commissioning and start-up, natural gas treatment and natural gas liquids extraction, LNG production, LNG loading, waste management, and dismantling of land based and marine infrastructure have the potential to adversely affect environmental quality, potentially affecting the quality of country foods. Adherence to federal and provincial legislation and regulations listed in Sections 5.5.2.1, 5.6.2.1, 5.7.2.1 and 5.8.1.1 are expected to mitigate to acceptable levels potential adverse effects affecting the quality and availability of country foods.

Changes in employment and income, and local economic change are anticipated to be both positive and adverse. Individuals who secure employment and realize increased individual or household income may be able to allocate a greater percentage of their income to purchase better quality food or equipment required to harvest, hunt, or gather country foods. At the same time, those who have less recreational time to engage in harvesting, hunting, or gathering activities may potentially affect their diet and nutrition. Adherence to the BC *Employment Standards Act* will provide workers time off that could be used to harvest, hunt, or gather country foods.

Rank 2

Mechanisms affecting change in community health and wellbeing related to Project activities and physical works ranked as 2 in Table 7.5-12 are associated with ecological change and access (accessibility and availability) to food sources, employment and income, and local economic change and are further discussed in Section 7.5.5.3 and Section 7.5.6.2.

Interactions ranked as 2 may result in adverse effects on diet and nutrition that may exceed acceptable levels without implementation of Project-specific mitigation and are further assessed in Sections 7.5.5 and 7.5.6; mitigation measures are discussed in Section 7.5.5.3 and 7.5.6.2. Interactions ranked as 2 could result in adverse changes in the proportion of diets from country foods and the composition of country foods in diets. Effects may be substantial and could adversely affect diet and nutrition and are of public and regulatory concern. These interactions require more detailed analysis and consideration in the assessment to predict, manage, and evaluate their potential effects; accordingly, they are ranked as 2.

7.5.5 Assessment of Residual Effects from the LNG Facility

7.5.5.1 Analytical Methods

7.5.5.1.1 Analytical Assessment Techniques

The assessment examines the effects of the Project workforce on community health and wellbeing in the context of the existing capacity of regional and local health care infrastructure and services, and current social and health conditions of local communities. It also examines the effects of the Project on the diet and nutrition of local residents based on potential changes in the availability, accessibility, and quality of country foods. The assessment of community health and wellbeing draws on related VCs identified in Section 7.5.1.

7.5.5.1.2 Assumptions and the Conservative Approach

Inherent uncertainties associated with the availability of information, data analyses, and interpretation of data and information are addressed by taking a conservative approach that manages the potential to underestimate the significance of an effect. Through the application of a conservative approach, assumptions err on the side of overstating an effect. Similarly, mitigation measures address worse-case scenarios and are considered more than adequate for reducing an effect to acceptable levels. Assumptions regarding Project construction and operation timing, population forecast, and municipal government cost are the same as those presented in Section 7.2.5.1. With respect to harvesting, hunting, and gathering, a conservative approach has been taken that assumes these activities occur in terrestrial lands included in the Project footprint but does not include the portion that is an existing industrial site.

7.5.5.2 Assessment of Change in Community Health and Wellbeing

7.5.5.2.1 Description of Project Effect Mechanisms for Change in Community Health and Wellbeing

The Project has the potential to cause changes in community health and wellbeing through changes in population, employment and income during both the construction and operation phases.

Phased Project construction may employ at its peak approximately 4,500 to 7,500 workers. Efforts will be taken to hire local residents; however, because of requirements for skilled or specialized labour, workers from outside the RSA are expected to also be hired. The Project will operate for a minimum of 25 years and will employ at its peak between 400 to 700 people during operation. The decommissioning workforce is expected to be similar with respect to required skillset to that required for construction but smaller in number. The incoming construction and operation workforce will affect the demographic composition of the District of Kitimat. However, it is expected that a proportion of these workers may choose to live in Terrace because of its more diversified commercial base and greater housing options.

Population change could result from an:

- in-migrating workforce (including their spouses and dependents) to the LSA for direct and indirect employment with the Project
- in-migrating workforce (including their spouses and dependents) to fill positions vacated by area residents employed by the Project or resulting from Project-related economic growth, and
- out-migrating workforce (including their spouses and dependents) from the LSA post-Project construction, operation and decommissioning.

Given the size and rate of population change with respect to the construction workforce relative to the population of the LSA, population stability and demographic composition could be affected. The effects of Project-related demographic change on community health and wellbeing could include increased demands on health care infrastructure and services.

Employment and income generated by the Project could cause:

- changes in housing availability and affordability (assessed in Section 7.2)
- changes in employment and disposable income, or the inability to secure employment and or job loss resulting in adverse changes to income, and
- changes in work-life balance, including changes in the allocation of time spent working versus time spent at home and with families, and in pre-established and valued working and living conditions.

Sections 6.2 and 7.2, and the Socio-Economic Baseline Report (Stantec 2014), provide baseline conditions, mechanisms, and mitigation measures, and assess residual effects on infrastructure and services and the economic environment, many of which are applicable to community health and wellbeing.

Population Change

The Project could lead to positive and adverse population-related changes:

- increased tax revenue (see Section 2.5 and the effects assessment in Section 6 Economic Environment)
- increased numbers of potential volunteers
- expanded recreational and other interests, and
- potential user-pay to support recreational and other infrastructure and services.

Each of these could ultimately foster positive physical health and mental wellbeing (see Section 2.5 for more information on benefits to Canadians from the Project). Potential adverse effects include:

- increased demand on health care infrastructure and services by workers and dependents attracted to LSA communities and by workers residing in the workforce accommodation centre(s)

- potential spread of infectious diseases because of proximity of workers to one another at the workforce accommodation centre(s) facilities
- decreased housing availability and affordability because in-migrant workers and dependents choose to live in LSA communities
- increased rates of injury and mortality associated with additional highway traffic resulting from Project-related increases in population and economic activity
- interactions between mobile resource workers and established community members, with the potential for either beneficial or adverse changes in social and physical interactions, and decreased environmental quality affecting perceptions of place; thereby, with potential feelings of loss and increased rates of stress and anxiety (Donaldson et al. 2010)
- increased drug- and alcohol-related violence, and crime related to drug and sex trade, increasing demands on health care infrastructure and services, and
- stress related to the Project, which could increase violence against women, children, and youth, and increase divorce rates.

Change in Employment and Income

Changes in employment and income as a result of the Project could lead to:

- the further inability of health service providers to attract and retain qualified workers given new employment opportunities as already seen from recent resource development activity in the LSA (Parke 2013, pers. comm.). Shortages of qualified staff may be associated with staff burnout, affecting the provision of health services. Based on high demand with little relief, staff experiencing burnout may be unable to perform work duties or may seek alternative employment.
- drug and alcohol misuse. Increased disposable income could increase use of drugs and alcohol, which may affect demand for health care infrastructure and services.
- increases in at-risk homelessness and homelessness related to housing shortages and increased housing prices. Access to affordable and adequate housing could affect community cohesion by lowering the percentage of income spent on housing and lowering rates of at-risk homelessness and homelessness. At-risk homelessness and homelessness could lead to overcrowding, potentially resulting in increased rates of infectious disease transmission.
- changes in housing availability and affordability, which could increase rates of housing unsuitability resulting from overcrowding and occurrences of “couch surfing” (Carey 2013, pers. comm.). A lack of affordable housing could result in overcrowding, contributing to stress, conflict, and violence, and infectious disease transmission. It could also contribute to a shortage of qualified health staff because they may be unable to secure an affordable place to live (Anguish 2013, pers. comm.; Cooper 2013, pers. comm.; Mills 2013, pers. comm.).
- changes in disposable income and purchasing power

- changes in costs and availability of goods and services in the LSA, and
- change in accessibility to market foods based on increased costs; manage food security related to increased costs of market foods. Changes in other costs, such as housing, or other basic needs could also affect diet and nutrition through changes in food security.

7.5.5.2.2 Mitigation for Change in Community Health and Wellbeing

LNG Canada will implement mitigation measures to manage demand on health care infrastructure and services and manage adverse effects on community health, community cohesion or resilience, and conditions affecting families.

LNG Canada will implement the following mitigation measures to address potential effects on community health and wellbeing:

- 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).
- Primarily house the initial workforce in several well managed open lodge facilities that are currently under construction in the LSA. Occupancy of the preferred lodges in the industrial areas of the LSA will be limited to the period prior to commissioning of the workforce accommodation centre(s) in the industrial areas of the LSA (Mitigation 7.5-1).
- Implement worker wellbeing and accommodation program to promote holistic worker health from a physical, mental, cultural and social perspective (Mitigation 7.5-2).
- 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).
- In the case of injury requiring evacuation of workers via ambulance, coordinate with local and provincial health providers for evacuation to appropriate medical facilities (Mitigation 7.5-4).
- Implement an employee Alcohol and Drug Policy, which will focus on pre-placement testing, awareness, prevention, and control, and will contain a strictly enforced prohibition on driving under the influence. Additional testing (with cause) may occur if required and in accordance with labour legislation (Mitigation 7.5-5).
- Develop a community engagement plan to assist communities in planning for an influx of workers. The plan will include initiatives to address potential community concerns, will facilitate communication with LSA communities, and will provide a framework for ongoing communication with municipal and provincial service providers; this plan will be developed through consultation with Aboriginal Groups and local communities (Mitigation 7.5-6).

- Develop and implement a Traffic Management Plan (Mitigation 5.4-6).
- Require contractors and subcontractors to adhere to health and safety programs that emphasize workplace health and welfare and adhere to traffic management policies (Mitigation 7.5-7).

Mitigation measures presented in other sections of the assessment are applicable to managing changes to community health and wellbeing. Specifically, mitigation and other management measures presented in Sections 6.2, 7.2, 7.3, and 7.4 enhance positive effects on community health and wellbeing while reducing the magnitude of adverse effects to acceptable and manageable levels.

Mitigation measures will commence at the beginning of Project construction, earlier where applicable, and will continue throughout the life of the Project if required; mitigation measures specific to a Project phase or physical work (e.g., construction and commissioning, operation, shipping or decommissioning) will cease following the completion of that phase or physical work. Based on these considerations, a high level of confidence exists with respect to the effectiveness of mitigation measures.

7.5.5.2.3 Characterization of Change in Community Health and Wellbeing

Construction

Project construction will require, at its peak, approximately 4,500 to 7,500 workers, most of who will reside at the workforce accommodation centre(s). During Project construction, it is estimated that 90% of the workforce will consist of rotational mobile workers residing at the workforce accommodation centre(s). Of the remaining 450 to 750 workers, 50% are estimated to in-migrate to the LSA, and 50% to be local hires (see Section 6.2). Potential population changes in the LSA during Project construction are discussed in Section 7.2.5.2.

Early Works

During early works (e.g., site preparation, temporary construction facilities installation, materials offloading facility construction, dredging, workforce accommodation centre(s) installation), it is anticipated that approximately 1,000 workers will be required. The initial workforce, those required during early works, will be housed in several well managed open lodge facilities that are currently under construction in the LSA. Occupancy of the preferred lodges in the industrial areas of the LSA will be limited to the period prior to commissioning of the workforce accommodation centre(s). Because these early works will commence before the workforce accommodation centre(s) (including the health facility) is fully constructed, LNG Canada will initially provide health services in temporary facilities; where possible, local residents (who already use local services and infrastructure) will be hired for early work activities, lowering incremental demand.

Construction – Post Commissioning of the Workforce Accommodation Centre(s)

Once commissioned, the workforce accommodation centre(s) will include an onsite health facility that is expected to lower Project-related incremental demand on local health care infrastructure and services. However, some medical issues may require the use of hospitals and health care services in the RSA.

While the NWHSDA has sufficient capacity, measured by the number of general practitioners who can meet current and increased demand, specialists and specialty services are in short supply, and primary care services are relatively restricted in the LSA. With recent increases in population, residents have reported that many health care services seem to be at or over capacity. Difficulties in recruiting skilled health care professionals by LHAs and BCAS could also increase as a result of alternative employment opportunities and changes in housing availability and affordability. Mitigation measures 6.2-5, 7.5-1, 7.5-2, 7.5-3, 7.5-4, 7.5-5, and 7.5-6 will limit Project-related increase in use of health care infrastructure and services in the LSA and RSA during the construction phase. Additional mitigation measures presented in Section 7.2.5 (specifically mitigation number 5.4-6) will help lower potential motor vehicle collisions and associated increased demand on EMS and hospital emergency rooms.

Ongoing demand for environmental health officers as a result of legislatively required facility inspections as well as permitting and compliance associated with water systems, sewerage systems (where applicable), the operation of industrial camps, the use, sale and display of tobacco products (where applicable) and responses to enteric disease outbreaks will occur. Demand will be greatest during Project construction with the licensing of food preparation and dining facilities. Increased demand will be managed through mitigation measures that enhance early and ongoing communication with community and Northern Health officials, allowing for proactive planning and resource allocation.

Project construction employment opportunities and increased household income have the potential to alleviate stress and anxiety among the underemployed. Mental wellbeing benefits extend to families as well as the employed individual. However, individuals most likely to realize employment with the Project or indirect employment are those who have the skills, experience, and mobility to take advantage of these opportunities. Vulnerable populations (e.g., people with physical or mental health conditions and less education) are less likely to gain employment and realize associated benefits; mitigation measures are will manage the magnitude of this adverse effect. Adverse mental wellbeing stressors for vulnerable populations may increase with rising costs of living not limited to accommodation (see Section 7.2), food (potentially affecting food security), and other goods. Additional stressors that may adversely affect mental wellbeing include: increased noise from Project construction and operation (assessed in Section 5.4); changes in traffic (assessed in Section 7.2); changes in demographic and social environments resulting from the influx of workers (also noted in Sections 6 and 7.2); and potential changes in environmental quality (see Sections 5.5, 5.6, 5.7, 5.8, and 5.9).

Both positive and adverse effects on food security (market foods) will occur as a result of Project construction. Positive effects will stem from generating employment for those previously unemployed or underemployed, which will increase income levels, resulting in increased buying power for healthy food choices. Adverse effects may be associated with increased housing costs and changes in cost of living in the LSA. Changes in food security could result from a greater percentage of income being spent on accommodation and other services (see Section 6.2 for estimated cost of living increase and Section 7.2 for changes in housing affordability), adversely affecting the buying power of individuals and households. This could affect the type and quality of market foods purchased.

Household dysfunction can be associated with higher rates of juvenile and youth crime. Increased occurrences of household dysfunction may result from increased negative coping behaviours or from changes in time spent at home by income earners. Rotational construction workers and workers who are employed in the LSA but maintain a residence elsewhere may be absent from important family engagements and add strain on family relationships, which may lead to anxiety and adverse effects on mental wellbeing (ACELG 2012). Continued absence could affect family dynamics and could lead to increased divorce rates (Storey 2010).

During construction, increased disposable income and the presence of a large mobile work population might result in increased rates of STIs in the LSA. Increased rates of infection among LSA residents could increase demand on local health care infrastructure and services. Adverse effects in the area of infectious disease among residents of the LSA that could result from increased crowding due to changes in housing availability; however, these will be low in magnitude with the implementation of housing mitigation presented in Section 7.2.5. Through the implementation of a worker wellbeing program, codes of conduct and the use of on-site health services, the magnitude of this effect will be lowered. The greatest magnitude of adverse effects associated with infectious disease will occur during the construction and commissioning phase of the Project when a large mobile workforce will be employed.

Project-related traffic collisions could also increase demand for health care infrastructure and services during construction (see Section 7.2 for additional information). Traffic and transportation mitigation measures, as well as those presented in Section 7.2, will manage the exposure of the population to Project-related traffic, limiting to the extent practicable the risk of traffic collisions, injuries, and fatalities.

Residual effects on children and youth at risk associated with increased household income can be beneficial as rates are closely correlated with household income levels; however, because of hiring requirements associated with many skilled positions, these beneficial effects may not be realized by some LSA residents, perpetuating dependence on income assistance and employment insurance. With changes in population, increased disposable income and potential adverse effects on mental wellbeing, crime rates may increase, particularly during Project construction. LNG Canada will provide relevant Project information, such as workforce size, shift schedules, and the movement of the temporary workforce, to local police detachments (see mitigation measures presented in Section 7.2) so they can prepare for and limit potential effects on safety and security services.

Quantification of residual effects during construction is difficult because the magnitude and degree of outcomes vary by individual and household. However, residual effects are anticipated to be high in magnitude during Project construction because of changes in local populations and employment and income effects on demand and supply of health care infrastructure and services, changes in health outcomes indicators, indicators of community cohesion and resilience, and indicators of factors affecting families.

Operation

During Project operation, it is anticipated that approximately 86% of the workforce will be in-migrating workers and approximately 14% local hires. At its peak, Project operation will require 450 to 800 workers who will reside in the LSA, a percentage of who will likely become permanent residents of local communities, thereby increasing demands on local health care infrastructure and services. Forecast population change associated with the Project is discussed further in Section 7.2.5.2.

Although health care funding is in part determined by permanent populations, of which workers residing in the LSA will become, it is anticipated that there could be a delay in Northern Health's ability to respond to increased demand for health care infrastructure and services in the LSA; short-term response to increased demand may be delayed due to government funding structures. Because of the smaller number of workers required for operation compared to construction, a smaller residual effect on health care infrastructure will occur during the operation phase.

While demand for health care infrastructure and services during operation will have a smaller residual effect than that during construction, Project turnaround during operation may have a similar effect on health care infrastructure and services as that during construction. Turnarounds will occur approximately every three years to allow for maintenance and upgrading. Each train is expected to undergo a small turn-around requiring an estimated 14 days of effort approximately three years after commissioning and a large turn-around 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 contractor employees to the LSA, depending on the size of the turnaround. It is conservatively estimated that these contractor workers will be in LSA communities for approximately 54 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. During these periods, there may be an increase in demand on health care services similar to that during the construction phase, with potential highest demand on hospital emergency rooms, EMS, and environmental health protection services. The workforce accommodation centre(s) will be available to house workers during turnarounds until the completion of the construction phase and will offset incremental demand on health care infrastructure and services; at the request of District of Kitimat the workforce accommodation centre(s) will then be decommissioned. Following completion of construction phase the turnaround workforce will be accommodated in LSA communities. Mitigation measures targeted at maintaining healthy working environments and promoting worker health will decrease potential demand on local health care infrastructure and services, but it may be expected that both non-emergency- and emergency-related demand on health care infrastructure and services might still increase during turnarounds similar that of during construction.

Similar to Project construction, increased vehicle traffic during operation could increase the number of collisions and thus demand for EMS, hospitals, and allied health services. Unlike Project construction and commissioning, most of the operation workforce will reside in LSA communities along with their spouses and dependents, thereby increasing traffic on local highways. Commuting traffic from LSA communities to

the LNG facility will be greatest during operation (see Section 7.2). However, mitigation measures presented in Section 7.2 related to traffic and transportation infrastructure and emergency services related to early and ongoing communication with community and health officials will manage potential effects on health services and infrastructure.

Demand for environmental health officers as a result of legislatively required facility inspections as well as permitting and compliance associated with water systems, sewerage systems (where applicable), the operation of industrial camps, the use, sale and display of tobacco products (where applicable) and responses to enteric disease outbreaks will occur during Project construction. While demand will be greatest during Project construction with the licensing of food preparation and dining facilities and the permitting of water, sewerage and tobacco sale and display areas (where applicable), continued demand on environmental health officers will occur throughout the operational life of the camp dining facilities due to routine inspections and potential outbreaks of enteric disease. Similar to Project construction, demand will be managed through mitigation measures that enhance early and ongoing communication with community and Northern Health officials, allowing for proactive planning and resource allocation. Demand related to outbreaks of enteric disease will further be managed by adhering to BC's *Public Health Act* and associated regulations.

During operation, housing availability may decrease as workers and their families settle in LSA communities. Challenges associated with a shortage of housing and related price increases are discussed in Section 7.2.5. Mitigation measures presented in Section 7.2.5 targeted at increasing housing availability and affordability (mitigation numbers 6.2-5, 7.2.4, 7.2.19, 7.2.21, 7.2.23, 7.2.24, 7.2.25) will lower the likelihood that a decrease in qualified health staff in the LSA could occur due to the inability of staff to secure a place to live; a trend currently identified in Kitimat and Terrace. Similarly, an increase in at-risk homelessness and homelessness will be managed through mitigation measures presented in Section 7.2.5 (mitigation numbers 6.5, 7.2.4, 7.2.19, 7.2.21, 7.2.23, 7.2.24, 7.2.25) to increase housing availability and affordability. Potential adverse effects on physical and mental health for vulnerable populations may occur as a result of rising costs for accommodation, food (potentially affecting food security), and other goods.

During operation, both positive and adverse residual effects on food security (market foods) will occur. These residual effects could affect both Aboriginals and non-Aboriginals. Positive effects stem from the Project generating employment for those previously unemployed or underemployed. Such employment will increase income levels, resulting in increased buying power for healthy food choices. Adverse residual effects can be associated with increased housing costs and changes in cost of living in the LSA. Changes in food security could result from a greater percentage of income being spent on accommodation and other services (see Section 6.2 for estimated cost of living increase and Section 7.2 for changes in housing affordability), adversely affecting the buying power of individuals and households. This could affect the type and quality of market foods purchased. Quantification of these residual effects is difficult because the magnitude and degree of outcomes vary by individual and household; however, the magnitude will be moderate during operation because of change in local economies (see Section 6.2) and housing availability and affordability (see Section 7.2).

Similar to construction, there may be an increase in infectious diseases, STIs, and housing shortages. While this residual effect will be greatest in magnitude and duration during construction and commissioning, residual effects may also be linked to turnarounds during operation that bring mobile workers into the area.

Similar to Project construction, injury rates may increase during operation as a result of vehicle collisions because of increased Project traffic. Mitigation measures here and in Section 7.2 related to traffic and transportation will be implemented to manage Project traffic and manage the risk of vehicular incidents.

Decommissioning

The decommissioning phase will require a workforce similar in skillset but smaller in size to that required for construction. Because the Project has a minimum operational life of 25 years, it is difficult to estimate the extent to which this will affect health care infrastructure and services relative to supply and demand. However, LNG Canada will work, as much as reasonably possible, to manage demand for local health care infrastructure and services. It is assumed that mechanisms and pathways affecting change in demand and supply of health care infrastructure and services during decommissioning will be similar to those during Project construction (population change, and change in employment and income) but smaller in scale. Activities and physical works associated with dismantling of land-based and marine infrastructure and remediation and reclamation of the site may increase demand for health care infrastructure and services. Residual effects on community health and wellbeing during decommissioning will be managed through the application of mitigation measures.

Summary

The residual effects on community health and wellbeing during Project construction will be high in likelihood and magnitude and moderately resilient in context. This is because of the large number of mobile workers and potential for in-migrating workers, their spouses, and dependents to affect change in community cohesion or resilience and increase demand on health care infrastructure and services (many of which are already at least perceived to be in high demand). Health care funding regimes based on permanent populations are not necessarily responsive to mobile populations, meaning that increased demand from construction workers residing at the workforce accommodation centre(s) may not be accounted for; residual effects will occur continuously for the short-term duration of the construction phase. Because the mobile and in-migrating workers associated with construction activities are expected to be housed in the LSA, the former in the workforce accommodation centre(s), residual effects on demand and supply of health care infrastructure and services, physical and mental health outcomes, and community cohesion or resilience will occur primarily in the LSA and be reversible.

Residual effects during Project operation will be moderate in magnitude because of the smaller number of operational workers residing in the LSA, affecting change in community cohesion or resilience, physical and mental health, and demand and supply of health care infrastructure and services. Health care funding models partially based on permanent populations, while expected to be delayed in response to an increased local population, should provide for increased demand. Similar to construction, most workers associated with operational activities are expected to reside in the LSA. Residual effects on demand and

supply of health care infrastructure and services, physical and mental health outcomes, and community cohesion or resilience will occur in the LSA. Based on the minimum operational period of 25 years, residual effects will be long term in duration and occur continuously. Because of the long-term duration of operation, residual effects on community cohesion or resilience will be irreversible. Similar to the construction phase, residual effects will occur in a moderately resilient context during operation. Because of Project labour requirements, the likelihood of residual effects during operation is moderate.

Residual effects during Project decommissioning will be similar to those associated with Project construction but moderate in magnitude (still extending into the LSA), short term in duration, occur continuously, be reversible, and moderately resilient in context. The likelihood of residual effects during decommissioning is high.

7.5.5.2.4 Determination of Significance for Change in Community Health and Wellbeing

Population change and employment and income associated with the Project will adversely affect community health and wellbeing through increasing demands on health care infrastructure and services, and changing community and family health, cohesion, and resilience. These changes will be greatest during Project construction (high magnitude) and will continue, to a lesser degree, through operation and decommissioning (moderate magnitude). With the implementation of mitigation measures, the magnitude of residual effects on community health and wellbeing will be reduced. Residual effects on community health and wellbeing are assessed as not significant.

Through mitigation measures, the local health care infrastructure and services will be able to cope with the added demand associated with the Project. Similarly, Project-related demand will not result in a substantial and persistent decline in the quality or accessibility of such services. The Project will not cause acute or chronic physical or mental health outcomes that are highly distinguishable and beyond the normal range of variability of baseline conditions.

7.5.5.3 Assessment of Change in Diet and Nutrition

7.5.5.3.1 Description of Project Effect Mechanisms for Change in Diet and Nutrition

The Project has the potential to cause changes in local diet and nutrition through decreasing the consumption of country food both directly and indirectly as a result of ecological change and access (accessibility and availability) to food sources, employment and income, and local economic change.

The Project could affect the consumption of country foods through the following pathways:

- change in accessibility to marine country foods because of constructed marine facilities and required Project-related safety zones
- change in accessibility to terrestrial country foods (includes vegetation and wildlife) in the Project footprint
- change in accessibility to market foods based on increased costs

- change in the viability of aquatic country foods, based on residual effects from Project activities and physical works (assessed in Sections 5.5, 5.6, 5.7, and 5.8), thereby affecting availability
- change in the viability of terrestrial country foods (includes vegetation and wildlife), based on residual effects from Project activities and physical works (assessed in Sections 5.5, 5.6, and 5.7), thereby affecting availability
- increased reliance on workforce accommodation centre(s) food by Project workers; affecting the frequency and type of country foods consumed by workers, and
- perceived decreased quality of country foods, leading to conscious decisions by some people to forego consumption of country foods.

7.5.5.3.2 Mitigation for Change in Diet and Nutrition

Mitigation measures presented in the environment and socio-economic sections (see Sections 5.5, 5.6, 5.7, 5.8, 6.2, and 7.2 for detailed information) will manage potential effects on diet and nutrition. In addition to these measures, LNG Canada will implement public awareness and information packages to:

- Inform the local community and Aboriginal Groups of changes in access to the Project footprint and marine environment potentially affecting access to country foods (Mitigation 7.5-8).
- Provide Project information to the local community and Aboriginal Groups and hold information sessions to facilitate ongoing discussion regarding concerns (Mitigation 7.5-9).

Mitigation measures will commence at the beginning of Project construction, earlier where applicable, and will continue throughout the life of the Project, where required; mitigation measures specific to a Project phase or physical work (e.g., construction and commissioning, operation, shipping or decommissioning) will cease following the completion of that phase or physical work. Based on these considerations, there is a high level of confidence in the effectiveness of mitigation measures.

7.5.5.3.3 Characterization of Change in Diet and Nutrition

Project activities related to the LNG facility could lead to changes in access to hunting, trapping, and harvesting areas, as well as changes in the availability of country foods through changes in the abundance of wildlife and vegetation near the Project footprint. This could in turn affect nutrition and metabolic outcomes.

For residual effects on the viability of vegetation see Section 5.5, on wildlife see Section 5.6, on freshwater and estuarine fish and fish habitat see Section 5.7, and on marine resources see Section 5.8; also see Section 14 for information related to potential adverse effects on the exercise of Aboriginal Interests.

Although the potential for contamination of country foods leading to adverse human health effects will be minimal (see Section 9), the perception that the quality of food has been adversely affected by the Project could lead to changes in local diets. LNG Canada will deliver awareness and information sessions to

educate the general public and Aboriginal Groups about the Project. However, mistrust in industry-presented findings and information could perpetuate decisions by some consumers to forego consumption of country foods, which could cause changes in the composition and a decrease in the proportion of country foods in their diets.

Changes in consumption of country foods could also be caused by employment of local residents by the Project, which could manage the amount of time available for harvesting, hunting, and fishing activities. This, combined with increased earnings from Project work, could lead to an increase in the consumption of market foods. Those workers living at the workforce accommodation centre(s) could also experience changes in diet because they will consume foods offered through kitchen and dining facilities onsite. Changes will be greatest during Project construction when workers are lodged at the workforce accommodation centre(s) compared with the operation phase when workers will reside in LSA communities and have greater control over their diets.

Summary

Residual effects on diet and nutrition during Project construction, operation, and decommissioning will be moderate in magnitude because Project design (see Section 2) and mitigation measures presented in Sections 5.5, 5.6, and 5.7 will manage adverse effects on the viability of vegetation, wildlife, and fish, thereby reducing adverse effects on the availability of country foods. The largest magnitude of change in access and availability will occur in the Project footprint and, therefore, residual effects will be restricted to the LSA. Because the greatest change in environmental quality and accessibility from baseline conditions will occur during Project construction through the introduction of restricted access areas and marine safety zones, many of which will extend into the operation phase, residual effects will be long-term in duration and continuous in frequency. Restricted access to some areas in the Project footprint will cease following Project decommissioning and will, therefore be reversible. Residual effects will occur in a moderately resilient context. The likelihood of residual effects is high, given the Project design.

7.5.5.3.4 Determination of Significance for Change in Diet and Nutrition

Changes in access and availability of country foods in the LSA will occur over the life of the Project. However, with the implementation of planned mitigation, residual effects on the ongoing viability of wildlife and marine resources (see Section 5.6 and Section 5.8 for justification), as well as changes in access, are assessed as not significant. Public awareness and education about the Project will help to address concerns regarding the quality of country foods and limit the potential for consumers to forego consumption of country foods based on perceived contamination.

Changes in the consumption of country foods leading to change in diet and nutrition will not be highly distinguishable from baseline conditions. Therefore, residual effects on diet and nutrition are assessed as not significant. Prediction confidence is considered moderate because, although information was collected and reviewed, there may be additional information that was not considered on Aboriginal and non-Aboriginal fisheries, harvesting and consumption of country foods in the LSA.

7.5.5.4 Summary

Residual effects related to change in community health and wellbeing and change in diet and nutrition as they relate to the LNG facility are summarized in Table 7.5-15.

7.5.5.4.1 Community Health and Wellbeing

Residual effects on community health and wellbeing from Project works and activities associated with the LNG facility will be high in magnitude. This is because the large number of mobile workers and, to lesser degree, in-migrating workers with their spouses and dependents will cause change in community cohesion or resilience and increase demand on health care infrastructure and services. These residual effects will occur continuously for the duration of the Project. Because most mobile and in-migrating workers associated with the Project are expected to be housed in the LSA, residual effects on demand and supply of health care infrastructure and services, physical and mental health outcomes, and community cohesion or resilience will occur in the LSA. Potential effects from interactions between Project workers and local residents are expected to be within a normal range of variability and not be highly distinguishable from baseline conditions; residual effects will be reversible following decommissioning. Residual effects will occur within a moderately resilient context, with a high likelihood of residual effects during construction. Residual effects are assessed as not significant. Prediction confidence is considered moderate because of inherent uncertainties associated with human behaviour and incomplete baseline data.

7.5.5.4.2 Diet and Nutrition

Residual effects on diet and nutrition from Project works and activities associated with the LNG facility will be moderate in magnitude because Project design (see Section 2) and mitigation measures (see Sections 5.5, 5.6, and 5.7) will manage adverse effects on the viability of vegetation, wildlife, and fish, thereby reducing adverse effects on the availability of country foods. The largest magnitude of change in access and availability will occur in the Project footprint; therefore, residual effects will be restricted to the LSA. Residual effects will be long term in duration but reversible following Project decommissioning. Residual effects will occur within a moderately resilient context, and likelihood of occurrence is high. Residual effects are assessed as not significant.

7.5.6 Assessment of Residual Effects from Shipping

7.5.6.1 Analytical Methods

The assessment examines the effects of the Project on the diet and nutrition of local residents based on potential changes in the availability, accessibility, and quality of marine country foods. The assessment of community health and wellbeing draws on related VCs identified in Section 7.5.1.

7.5.6.1.1 Assumptions and the Conservative Approach

Inherent uncertainties associated with the availability of information, data analyses, and interpretation of data and information are addressed by taking a conservative (precautious) approach that manages the potential to underestimate the significance of an effect. Through the application of a conservative approach, assumptions err on the side of overstating an effect. Similarly, mitigation measures address worse-case scenarios and are considered more than adequate for reducing an effect to acceptable levels. Assumptions regarding marine harvesting and fishing draw from assumptions presented in Section 5.8 and assumptions regarding marine transportation and use from Section 7.4. The assessment takes a conservative approach that assumes fishing, harvesting, and marine use activities occur in marine areas included in Project footprint and along the marine access route.

7.5.6.2 Assessment of Change in Diet and Nutrition

7.5.6.2.1 Description of Project Effects Mechanisms for Change in Diet and Nutrition

The Project has the potential to cause changes in local diet and nutrition through decreasing the consumption of marine country food directly and indirectly as a result of ecological change and access (accessibility and availability) to food sources.

The Project could affect the consumption of marine country foods through the following pathways:

- change in accessibility to marine country foods because of marine shipping activities; residual effects on marine transportation and use are assessed in Section 7.4
- change in the viability of marine country foods, based on residual effects from marine shipping activities (assessed in Section 5.8), and
- perceived decreased quality of country foods, leading to decisions by some people to forego consumption of country foods

Sections 5.8 and 7.4 provide baseline conditions, mechanisms, and mitigation measures, and assess residual effects on the environment, many of which are applicable to community health and wellbeing.

7.5.6.2.2 Mitigation for Change in Diet and Nutrition

Mitigation measures presented in the environment and socio-economic sections (see Sections 5.8 and 7.4 for detailed information) will mitigate change in diet and nutrition. In addition to these measures, LNG Canada will implement awareness and information sessions to:

- Inform the local community and Aboriginal Groups of changes in access to the Project footprint and marine environment potentially affecting access to country foods (Mitigation 7.5-8).
- Provide the local community and Aboriginal Groups with Project information related to how LNG facilities operate and hold information sessions to facilitate ongoing discussion regarding concerns (Mitigation 7.5-9).

Mitigation measures will commence at the beginning of Project construction, earlier where applicable, and will continue throughout the life of the Project; mitigation measures specific to a Project phase or physical work (e.g., construction and commissioning, operation, shipping) will cease following the completion of that phase or physical work. Based on these considerations, there is a high level of confidence in the effectiveness of mitigation measures.

7.5.6.2.3 Characterization of Change in Diet and Nutrition

Project activities could lead to changes in access to marine harvesting areas, as well as changes in the availability of marine country foods through changes in the abundance of wildlife. This could affect nutrition and metabolic outcomes. For residual effects on the viability of marine resources, see Section 5.8, and for residual effects on marine transportation and use, see Section 7.4; see Section 14 for information on potential adverse effects on the exercise of Aboriginal Interests.

Marine shipping activities will have the greatest magnitude during Project operation. On average, two LNG carriers and associated escort tug transits will occur per day (one inbound and one outbound). With the implementation of mitigation measures (see Sections 5.8 and 7.4), Project marine shipping will not affect the ongoing viability of marine fish or marine mammal populations or result in substantial and persistent declines in fishing opportunities associated with marine fisheries and shoreline harvesting. Many fisheries are not expected to interact with shipping traffic because either fishing grounds are not located along the marine access route, or the use of fishing gear or practices precludes interactions with shipping activities (see Section 7.4).

Because the viability of marine species will not be adversely affected by marine shipping activities, a change in the availability of marine country foods is not expected. Similarly, because marine shipping activities will not affect fishing opportunities, adverse effects on access to marine country foods is expected to be limited.

Mistrust in industry-presented findings and information regarding perceived contamination may perpetuate decisions to forego consumption of marine country foods (see Section 7.5.5.3). Through active decision-making on the part of the consumer (Aboriginal and non-Aboriginal alike) to forego consumption of country foods, changes in the proportion of diets from such foods could occur, and the proportion of market foods in diets could increase to compensate. Changes in nutrition and metabolic outcomes could occur. LNG Canada will provide Project information to community residents and Aboriginal Groups and hold information sessions to facilitate ongoing discussion regarding concerns of perceived contamination.

Mechanisms, pathways, and residual effects associated with employment and income resulting from marine shipping activities affecting diet and nutrition are the same as those presented in Section 7.5.5.3.3.

Summary

Residual effects from shipping activities on diet and nutrition during Project construction, operation, and decommissioning will be low in magnitude because Project design (see Section 2) and mitigation measures (see Sections 5.8 and 7.4) will manage adverse effects on the viability of marine resources and use of marine areas. The largest magnitude of change in access and availability will occur in the Project footprint and along the marine access route; therefore residual effects will extend into the LSA. Because the greatest change in environmental quality and accessibility from baseline conditions will occur during Project construction and operation through the introduction of restricted access areas and marine safety zones, residual effects associated with shipping will be long term in duration. Restricted access to some areas in the Project footprint will cease following Project decommissioning and residual effects will be reversible. Residual effects will occur within a moderately resilient context, and the likelihood of residual effects is moderate because of Project design.

7.5.6.2.4 Determination of Significance for Change in Diet and Nutrition

Changes in access and availability of marine country foods in the LSA will occur over the life of the Project. However, with the implementation of planned mitigation, residual effects on the ongoing viability of marine resources, as well as changes in access, are assessed as not significant. Engagement with the public and Aboriginal Groups and education about the Project will help address concerns regarding the quality of country foods and limit the potential for consumers to forego consumption of country foods based on perceived contamination.

Changes in the consumption of marine country foods leading to change in diet and nutrition will not be highly distinguishable from baseline conditions. Therefore, residual effects on diet and nutrition are assessed as not significant. Prediction confidence is considered moderate because of imperfect baseline data.

7.5.6.3 Summary

Residual effects related to change in diet and nutrition as they related to shipping activities are summarized in Table 7.5-13

Residual effects on diet and nutrition associated with shipping will be low in magnitude because Project design (see Section 2) and mitigation measures (see Sections 5.8 and 7.4) will manage adverse effects on the viability of marine resources and use of marine areas. The largest magnitude of change in access and availability will occur in the Project footprint and along the marine access route; therefore residual effects will extend into the LSA, be long term in duration but reversible following Project decommissioning. Residual effects will occur within a moderately resilient context, and the likelihood of residual effects occurring is low.

7.5.7 Summary of Project Residual Effects

Table 7.5-13 summarizes the residual effects of the Project (LNG facility only) on community health and wellbeing and the residual effects of the Project (LNG facility and shipping) on changes to diet and nutrition.

7.5.8 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 the VC; 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 has the potential to interact cumulatively with other projects and activities, assesses the significance of the resulting overall cumulative effect and characterizes the Project's contribution to the cumulative effects.

7.5.8.1 Stage 1, Cumulative Effects Context

Baseline conditions of community health and wellbeing for communities located in the RSA are described in Section 7.5.3. Additional related information is also presented in the environment and socio-economic sections (the balance of Section 7 and Sections 5.5, 5.6, 5.7, and 5.8, as well as in associated TDRs).

Energy and resource development projects related to oil and gas, shipping, terminal expansion and renewable energy—coupled with associated demographic and ecological changes—have affected, and are expected to continue to affect community health and wellbeing for communities in the RSA. As described in Section 7.2, existing, planned, and foreseeable projects (excluding the Project) will have a cumulative effect on emergency and protective services; education services; access to, and use of, green spaces and places of recreation; traffic and transportation infrastructure; housing availability and affordability; and demands on government-assisted housing. There could be cumulative increased demands on health care infrastructure and services, and cumulative changes in physical health and mental wellbeing, community cohesion or resilience, and factors affecting families as a result of population changes related to these developments.

Thirty past, present, and reasonably foreseeable projects have been identified in the RSA. Of these, the Project could overlap spatially and temporally with 23 of these projects (Table 7.5-14).

Residual effects of large facility-based projects (such as Kitimat Clean, BG Group–Prince Rupert LNG and Pacific Northwest LNG) could act cumulatively with Project residual effects on community health and wellbeing, particularly from 2015 to 2020 when most of these projects are scheduled for construction and will require large temporary workforces.

Residual effects of other projects (such as Coastal GasLink Pipeline Project, Pacific Trail Pipelines Project, Spectra Energy–Natural Gas Pipeline and Prince Rupert Gas Transmission Project) could also interact cumulatively with Project residual effects on community health and wellbeing. However, these cumulative effects will be moderate to low in magnitude and short-term in duration because these projects will span long distances and interact with numerous communities, and will require smaller mobile workforces that are less concentrated in any one community.

Table 7.5-13: Summary of Residual Effects: Community Health and Wellbeing

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				
Facility Works and Activities											
Change in community health and wellbeing: adverse effects associated with population change could affect demand and supply of health care infrastructure and services, changes in health outcome indicators, indicators of community cohesion or resilience, and indicators of factors affecting families											
Construction	Mitigation 5.4-6	H	LSA	ST	C	R	M	H	N	M	No follow-up programs are proposed for community health and wellbeing.
Operation	Mitigation 6.2-5	M	LSA	LT	C	I	M	M	N	M	
Decommissioning	Mitigation 7.5-2	M	LSA	ST	C	R	M	H	N	M	
Residual effects from facility works/activities on community health and wellbeing	Mitigation 7.5-5	H	LSA	LT	C	R	M	H	N	M	
	Mitigation 7.5-9										
	Mitigation 7.5-7										
	Mitigation 7.5-6										
	Mitigation 7.5-4										
	Mitigation 7.5-3										
	Mitigation 7.5-1										
Change in diet and nutrition: ecological change and changes in availability and access to country food sources could affect the proportion of diets from country foods and the composition of country foods in diets											
Construction	Mitigation 7.5-8	M	LSA	LT	C	R	M	H	N	M	No follow-up programs are proposed for community health and wellbeing.
Operation	Mitigation 7.5-9	M	LSA	LT	C	R	M	H	N	M	
Decommissioning		M	LSA	LT	C	R	M	H	N	M	
Residual effects from facility works/activities on change in diet and nutrition		M	LSA	LT	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				
Shipping Activities											
Change in Diet and Nutrition: ecological change and changes in availability and access to country food sources could affect the proportion of diets from country foods and the composition of country foods in diets											
Construction	Mitigation 7.5-8	L	LSA	LT	MR	R	M	M	N	M	No follow-up programs are proposed for community health and wellbeing.
Operation	Mitigation 7.5-9	L	LSA	LT	MR	R	M	M	N	M	
Decommissioning		L	LSA	LT	MR	R	M	M	N	M	
Residual effects from shipping activities on change in diet and nutrition		L	LSA	LT	MR	R	M	M	N	M	

KEY

MAGNITUDE:

N = Negligible—no measurable change from baseline conditions

L = Low—above baseline conditions, but within normal variation of human health conditions or within current capabilities of infrastructure or service management systems

OR

Has the potential to cause acute, short-term effects with limited and reversible effects on function, health or wellbeing

M = Moderate—above baseline conditions and predicted to result in a change in human health and or a deterioration of the capabilities of infrastructure

OR

Has the potential to cause acute or chronic effects that substantially affect function, health or wellbeing

H = High—above baseline conditions, and predicted to result in a change in human health and or deterioration of the capabilities of infrastructure

OR

Has the potential to cause acute or chronic effects that are potentially disabling

GEOGRAPHIC EXTENT:

LSA—effect is restricted to the LSA

RSA—effect extends beyond LSA

DURATION:

ST = Short term—residual effect restricted to the duration of the construction period or less

MT = Medium term—residual effect extends past the construction period but less than the life of the Project

LT = Long term—residual effect extends through the life of the Project

P = Permanent—residual effect is permanent

FREQUENCY:

S = Single event—residual effect occurs once

MI = Multiple irregular event—residual effect occurs sporadically at irregular intervals throughout construction, operation or decommissioning phases

MR = Multiple regular event—occurs on a regular basis and at regular intervals throughout construction, operation, or decommissioning phases

C = Continuous—residual occurs continuously throughout the life of the Project

REVERSIBILITY:

R = Reversible—will recover after Project closure and reclamation

I = Irreversible—permanent

CONTEXT:

L = Low resilience—vulnerable to small adverse changes from baseline conditions

M = Moderate resilience—vulnerable to moderate adverse changes from baseline conditions

H = High resilience—vulnerable to large adverse changes from baseline conditions

LIKELIHOOD OF RESIDUAL EFFECT:

Based on professional judgment

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

SIGNIFICANCE:

S = Significant

N = Not Significant

PREDICTION CONFIDENCE:

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

L = Low level of confidence

M = Moderate level of confidence

H = High level of confidence

Table 7.5-14: Past, Present, and Reasonably Foreseeable Projects

Project	Location	Project Type	Status ^c	Approximate Peak Worker Size and Project Life	
				Construction	Operation
Kitimat Area Project Facility					
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 & Terminal	Proposed	NA	NA
Enbridge Northern Gateway Project	Edmonton to Kitimat	Oil Pipeline	Proposed	2015 to 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 & 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 Smelter	Ongoing	2011–2015 2,500 workers	2015–2055 1,000 workers
Sandhill Materials – Aggregate Processing	Kitimat)	Aggregate Processing	Completed Ongoing	NA	NA
Prince Rupert Areas Project/Facility					
BG Group – Prince Rupert LNG Project	Ridley Island	LNG Facility & 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
Progress Energy – Pacific Northwest LNG Project	Lelu Island (south of Prince Rupert)	LNG Facility & Terminal	Proposed	2015–2018 3,500 workers	2018 –2048 200–300 workers
Ridley Terminal Inc.	Ridley Island	Coal Terminal	Ongoing	2012–2015	2015

Project	Location	Project Type	Status ^c	Approximate Peak Worker Size and Project Life	
				Construction	Operation
Spectra Energy – Natural Gas Pipeline	Northeast BC – Prince Rupert	Natural Gas Pipeline	Proposed	2016–2020 900 workers ^{a1}	2020 50–60 Workers
TransCanada Corporation – Prince Rupert Gas Transmission Project	Hudson Hope – Prince Rupert	Natural Gas Pipeline	Proposed	2012–2017 1,100 workers ^{a1}	2017 30–40 workers
Watco – Watson Island Re-Development	Watco Island	Industrial Port	Proposed	2013–2015	NA
Terrace Area Project/Facility					
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
Activity					
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 7.5-15.

SOURCES: 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; BC EAO 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 other 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 community health and wellbeing, primarily that of the measurable parameters demand and supply of health care infrastructure and services and indicators of community cohesion for communities in the RSA. Assuming that the projects identified in Table 7.5-14 proceed to construction and operation, and applying the same population assumptions as presented in Section 7.2.5.1 the permanent population in the RSA is forecast to increase by approximately 5,200 persons by 2025 (13% 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. Section 7.2.7.1 provides illustrative examples as to the uncertainty of population forecasts in the RSA.

7.5.8.1.1 Effects on Community Health and Wellbeing

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 health care infrastructure and services at current levels. In this scenario, it is possible that significant adverse effects on community health and wellbeing could occur over the short term.

Over the longer term, the effect of economic development on community health and wellbeing in the RSA is expected to be beneficial. The more diversified economies and larger populations would be able to support a larger tax bases in RSA communities and increased revenues would be needed to fund expansions in community support programs and protective services (See Section 7.2). A larger population base and increased incomes could also support additional doctor clinics and substance abuse support groups. To accommodate the demands of larger populations, RSA communities will likely require capacity adjustments to publicly funded health care infrastructure and services. Because BC's publicly funded health care system is largely based on registered permanent population, adjustments are anticipated over the long term with respect to increasing capacity; however, this process is not considered to be responsive to sudden changes in demand.

7.5.8.1.2 Effects on Diet and Nutrition

Cumulative effects on diet and nutrition in the RSA could result from ecological change and changes in access (accessibility and availability) to food sources, employment and income, and local economic change. Activities could lead to changes in access to hunting, trapping, and harvesting areas, as well as changes in abundance of wildlife and vegetation within other project footprints. It is important to note that the cumulative size of other project footprints within the RSA area relatively small portion of the total land mass with the greatest magnitude of effects centred within project footprints.

Where residual effects from overlapping projects could act cumulatively, the magnitude of such effects will depend partially on the ability of project proponents to mitigate adverse effects on freshwater fish, marine mammals, vegetation and wildlife. Because a number of mitigation measures applicable to the environment VCs are required by regulation (for example see Sections 5.5, 5.6, 5.7, 5.8), these measures have a level of confidence and effectiveness with respect to mitigating adverse effects on the viability of environment VCs and ecological change. In terms of changes in access associated with exclusion zones and other project footprints, this area is a small portion of the overall RSA and will, therefore, not affect the percentage of diets from country foods or the composition of country foods in diet.

Perceptions associated with ecological change and the quality of country foods could lead to decisions by Aboriginal and non-Aboriginal persons to forego the consumption of country foods from select locations within the RSA. The greatest magnitude to effect will occur along the shipping routes used by other projects and the Project marine access route and other project footprints; these areas are a small portion of the overall RSA.

7.5.8.2 Stage 2, Determination of Potential Cumulative Interactions

Project residual effects have the potential to interact cumulatively with the effects of other regional projects and activities if the following two conditions are met:

- The Project results in a demonstrable or measurable residual effect on community health and wellbeing.
- The Project residual effect on community health and wellbeing will act in a cumulative fashion with the effects of other past, existing, or future projects and activities in the area (i.e., there is an overlap of effects).

Table 7.5-15 indicates where there is potential for the Project to contribute to cumulative effects on community health and wellbeing

Table 7.5-15: Potential for Cumulative Effects on Community Health and Wellbeing

Other Projects and Activities with Potential for Cumulative Effects	Potential Cumulative Effects	
	Change in community health and wellbeing	Change in diet and nutrition
Kitimat Area Project/Facility		
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	✓	✓
Prince Rupert Areas Project/Facility		
BG Group – Prince Rupert LNG Project	✓	✓
Canpotex – Potash Export Terminal	✓	✓
Maher Terminals – Fairview Terminal Phase 2 Expansion Project	✓	✓
Progress Energy – Pacific Northwest LNG Project	✓	✓
Ridley Terminal Inc.	✓	✓
Spectra Energy – Natural Gas Pipeline	✓	✓
TransCanada Corporation – Prince Rupert Gas Transmission Project	✓	✓
Watco – Watson Island Re-Development	✓	✓
Terrace Area Project/Facility		
Galore Creek Copper-Gold-Silver Project	✓	✓
Kitsault Mine Project	✓	✓
Altagas Hydro Projects (Forest Kerr, McLymont Creek, Volcano Creek)*	✓	✓
Kinskuch Hydro Project*		✓
Northwest Transmission Line*	✓	✓
Activity		
Cruise ships	✓	✓
Forestry activities	✓	✓
Fisheries and aquaculture activities	✓	✓

NOTES:

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

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

7.5.8.3 Stage 3, Determining Significance of Cumulative Effects

Project residual effects on community health and wellbeing will interact with the effects of other present and foreseeable future projects and activities listed in Table 7.5-15. Present and reasonably foreseeable projects are forecast to increase the permanent regional population in the RSA by approximately 7,600 people by 2025 (see Section 7.2.5.1). The Project will result in an approximately 2,400 in-migrants of the RSA population.

7.5.8.3.1 Effects on Community Health and Wellbeing

Population changes associated with the Project will result in increased demand for health care infrastructure and services. Changes in employment and income (see Section 7.5.5.2 for rational supporting effect mechanisms and pathways). Although mitigation measures, including construction of self-contained workforce accommodation centre(s) with supporting medical facilities, will address much of the demand resulting from the Project's temporary workforce, the in-migrating workforce and dependants resulting from induced economic activity will add to the demand for Northern Health's health care infrastructure and services. Predicted residual effects of the Project on community health and wellbeing are as follows:

- 9% permanent population increase by 2025
- increased demand for emergency health care infrastructure and services
- increased demand of environmental health officers associated with legislatively required inspections of accommodation centre(s) food preparation and dining facilities as well as permitting and compliance associated with water systems, sewerage systems (where applicable), the operation of industrial camps, the use, sale and display of tobacco products (where applicable), and responses to outbreaks of enteric disease
- potential for increased substance misuse – associated with changes in community cohesion and employment and income
- potential need for additional general practitioners and specialized physicians
- potential need for additional emergency medical staff needed because of anticipated higher call volumes associated with temporary workforce, and
- cumulative change in housing availability could increase difficulties is associated with housing new medical professionals in the RSA (see Section 7.2.7.3).

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 health care infrastructure and services offered by Northern Health in 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 areas from Kitimat/Terrace, the Project contribution to cumulative effects on infrastructure and services will be of greater magnitude 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 the Ministry of Health to adjust health care budgets for Northern Health. Over the 2015 to 2025 period, municipalities and Aboriginal communities can anticipate an increase in the demand for health care 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 demands associated with the Project will contribute to these adverse effects.

7.5.8.3.2 Change in Diet and Nutrition

Cumulative effects of the 23 overlapping projects will not restrict access to or affect the availability of country foods in the RSA to the extent that diets or nutrition will be adversely affected. Projects considered in the cumulative effects assessment are currently situated or planned to be developed primarily on industrially zoned land. Based on the outcomes of the cumulative effects assessment for the environment VCs (Section 5), cumulative changes in viability of vegetation and wildlife will not affect the availability of country foods. Although there is the potential for individuals (Aboriginal and non-Aboriginal) to forego consumption of country foods based on quality concerns, similar awareness and engagement programs to those identified in Sections 7.5.5.3 and 7.5.6.2 have been developed, are being developed, or are anticipated to be developed by other proponents of projects. Therefore, cumulative effects on diet and nutrition are assessed as not significant.

7.5.8.4 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 and potentially result in a permanent population increase of approximately 2,400 persons.

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 community and social services and finance capital spending.

7.5.8.4.1 Community Health and Wellbeing

Demand for health care infrastructure and services associated with the induced and indirect population of the Project are forecast to increase through 2025. Because cumulative increased demand is expected to outpace the ability of public health care funding models to increase capacity, a sustained increase in the demand is expected. Increased demand will adversely affect health care infrastructure and services delivery. Similarly, increased cumulative demand for legislatively required inspections of the food preparation and dining facilities as well as permitting and compliance associated with water systems, sewerage systems (where applicable), the operation of industrial camps, the use, sale and display of

tobacco products (where applicable) and responses to enteric disease outbreaks in the RSA will adversely affect levels of service associated with environmental health officers; also publicly funded.

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 health care service requirements, it is possible that during the period of rapid population change service demand could lead to a reduction in service quality; context is therefore moderately resilient (see Section 7.5.2.7 for characterization criteria). Cumulative effects will extend over the construction period and into operation as a multiple irregular event and into early operation because the ability of the publicly funded health care system to respond to changes in demand has an associated lag factor; funding is based off permanent population of which remains largely fluid until operation. The cumulative effect will be high magnitude, extend throughout the RSA and long term in duration; the cumulative effect is assessed as significant but expected to be reversible following public health care funding adjustments.

7.5.8.4.2 Diet and Nutrition

Cumulative effects will not restrict access to or affect the availability of country foods in the RSA to the extent that diets or nutrition will be adversely affected. Based on the outcomes of the cumulative effects assessment for the environment VCs (Section 5), cumulative changes on viability of vegetation and wildlife will not occur and, therefore, will not affect the availability of country foods. There is the potential for individuals (Aboriginal and non-Aboriginal) to forego consumption of country foods based on quality concerns; however, mitigation measures will manage the magnitude of the Project contribution. Context is therefore assumed to be moderately resilient (see Section 7.5.2.7 for characterization criteria). The cumulative effect will be continuous, low (terrestrial) to moderate (marine) magnitude, extend throughout the RSA, and long term in duration; however, the cumulative effect is assessed as not significant and as reversible following decommissioning and reclamation.

Table 7.5-16: Summary of Cumulative Effects on Community Health and Wellbeing

Effect	Other Projects, Activities and Actions	Cumulative Effects Characterization					
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context
Facility Works and Activities							
Cumulative Change in Community Health and Wellbeing							
Cumulative effect with the Project and other projects, activities and actions <ul style="list-style-type: none"> ▪ Increased demand for emergency health care infrastructure and services within the RSA ▪ Change social determinants of health affecting community cohesion and resilience and factors affecting families. 	<ul style="list-style-type: none"> ▪ 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 	H	RSA	LT	C	R	M
Contribution from the Project to the overall cumulative effect <ul style="list-style-type: none"> ▪ Increased demand for emergency health care infrastructure and services Change in social determinants of health affecting community cohesion and resilience and factors affecting families. 	<ul style="list-style-type: none"> ▪ Rio Tinto Alcan Facility and Modernization Project ▪ BG Group – Prince Rupert LNG Project ▪ Canpotex – Potash Export Terminal ▪ Maher Terminals – Fairview Terminal Phase 2 Expansion Project ▪ Progress Energy – Pacific Northwest LNG Project ▪ Ridley Terminal Inc. ▪ Spectra Energy – Natural Gas Pipeline ▪ TransCanada Corporation – Prince Rupert Gas Transmission Project ▪ Watco – Watson Island Re-Development ▪ Galore Creek Copper-Gold-Silver Project ▪ Kitsault Mine Project ▪ Altagas Hydro Projects (Forest Kerr, McLymont Creek, Volcano Creek) ▪ Northwest Transmission Line ▪ Forestry activities 	H	LSA	LT	C	R	M

Effect	Other Projects, Activities and Actions	Cumulative Effects Characterization					
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context
Cumulative Change in Diet and Nutrition							
Cumulative effect with the Project and other projects, activities and actions <ul style="list-style-type: none"> Change in access to and perceived change in ecological condition and quality of country foods near other project footprints within the RSA 	<ul style="list-style-type: none"> Coastal GasLink Pipeline Project Douglas Channel LNG Project (also known as BC LNG) Enbridge Northern Gateway Project Kitimat Clean Kitimat LNG Terminal Project 	M	RSA	LT	C	R	M
Contribution from the Project to the cumulative effect <ul style="list-style-type: none"> Change in access to and perceived change in ecological condition and quality of country foods near the Project footprint 	<ul style="list-style-type: none"> Pacific Northern Gas Pipeline (includes proposed looping) Pacific Trail Pipelines Project Rio Tinto Alcan Facility and Modernization Project BG Group – Prince Rupert LNG Project Canpotex – Potash Export Terminal Maher Terminals – Fairview Terminal Phase 2 Expansion Project Progress Energy – Pacific Northwest LNG Project Ridley Terminal Inc. Spectra Energy – Natural Gas Pipeline TransCanada Corporation – Prince Rupert Gas Transmission Project Watco – Watson Island Re-Development Galore Creek Copper-Gold-Silver Project Kitsault Mine Project Altogas Hydro Projects (Forest Kerr, McLymont Creek, Volcano Creek) Kinskuch Hydro Project Northwest Transmission Line Forestry activities 	M	LSA	LT	C	R	M

Effect	Other Projects, Activities and Actions	Cumulative Effects Characterization					
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context
Shipping Activities							
Cumulative Change in Diet and Nutrition							
Cumulative effect with the Project and other projects, activities and actions <ul style="list-style-type: none"> ▪ Change in access to and perceived change in ecological condition and quality of marine country foods in other project footprints and along the shipping routes used by other projects 	<ul style="list-style-type: none"> ▪ Douglas Channel LNG Project (also known as BC LNG) ▪ Kitimat Clean ▪ Kitimat LNG Terminal Project ▪ Rio Tinto Alcan Facility and Modernization Project ▪ BG Group – Prince Rupert LNG Project ▪ Canpotex – Potash Export Terminal 	L/M	RSA	LT	C	R	M
Contribution from the Project to the cumulative effect <ul style="list-style-type: none"> ▪ Change in access to and perceived change in ecological condition and quality of marine country foods near the Project marine footprint and along the marine access route 	<ul style="list-style-type: none"> ▪ Maher Terminals – Fairview Terminal Phase 2 Expansion Project ▪ Progress Energy – Pacific Northwest LNG Project ▪ Ridley Terminal Inc. ▪ Watco – Watson Island Re-Development ▪ Galore Creek Copper-Gold-Silver Project ▪ Kitsault Mine Project ▪ Cruise ships ▪ Fisheries and aquaculture activities 	L	LSA	LT	C	R	M

KEY

MAGNITUDE:

N = Negligible—no measurable change from baseline conditions

L = Low—above baseline conditions, but within normal variation of human health conditions or within current capabilities of infrastructure or service management systems

OR

Has the potential to cause acute, short-term effects with limited and reversible effects on function, health or wellbeing

M = Moderate—above baseline conditions and predicted to result in a change in human health and or a deterioration of the capabilities of infrastructure

OR

Has the potential to cause acute or chronic effects that substantially affect function, health or wellbeing

H = High—above baseline conditions, and predicted to result in a change in human health and or deterioration of the capabilities of infrastructure

GEOGRAPHIC EXTENT:

LSA—effect is restricted to the LSA

RSA—effect extends beyond LSA

DURATION:

ST = Short term—residual effect restricted to the duration of the construction period or less

MT = Medium term—residual effect extends past the construction period but less than the life of the Project

LT = Long term—residual effect extends through the life of the Project

P = Permanent—residual effect is permanent

FREQUENCY:

S = Single event—residual effect occurs once

MI = Multiple irregular event—residual effect occurs sporadically at irregular intervals throughout construction, operation or decommissioning phases

MR = Multiple regular event—occurs on a regular basis and at regular intervals throughout construction, operation, or decommissioning phases

C = Continuous—residual occurs continuously throughout the life of the Project

REVERSIBILITY:

R = Reversible—will recover after Project closure and reclamation

I = Irreversible—permanent

CONTEXT:

L = Low resilience—vulnerable to small adverse changes from baseline conditions

M = Moderate resilience—vulnerable to moderate adverse changes from baseline conditions

H = High resilience—vulnerable to large adverse changes from baseline conditions

LIKELIHOOD OF RESIDUAL EFFECT:

Based on professional judgment

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

SIGNIFICANCE:

S = Significant

N = Not Significant

PREDICTION CONFIDENCE:

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

L = Low level of confidence

M = Moderate level of confidence

H = High level of confidence

7.5.9 Prediction Confidence and Risk

There is a low degree of risk that the assessment inadequately measured the magnitude of change in community health and wellbeing and change in diet and nutrition because the assessment and development of mitigation measures uses a conservative approach. For cumulative effects, there is a moderate degree of risk that the assessment inadequately measured the magnitude of cumulative change in community health and wellbeing and change in diet and nutrition because of uncertainty in the assumption that other projects will implement similar mitigation measures.

7.5.10 Follow-up Program and Compliance Monitoring

Described in Section 12, 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). The monitoring plan will include social performance goals and objectives, and a description of how progress against those goals and objectives will be measured. Follow-up monitoring is an internal requirement of LNG Canada's corporate Social Responsibility Program.

7.5.11 Summary of Mitigation Measures

LNG Canada commits to the following mitigation measures related to community health and wellbeing:

- 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).
- Primarily house the initial workforce in several well-managed open lodge facilities that are currently under construction in the LSA. Occupancy of the preferred lodges will be limited to the period prior to commissioning of the workforce accommodation centre(s) in the industrial areas of the LSA (Mitigation 7.5-1).
- Implement worker wellbeing and accommodation program to promote holistic worker health from a physical, mental, cultural and social perspective (Mitigation 7.5-2).
- 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).
- In the case of injury requiring evacuation of workers via ambulance, coordinate with local and provincial health providers for evacuation to appropriate medical facilities (Mitigation 7.5-4).
- Implement an employee Alcohol and Drug Policy, which will focus on pre-placement testing, awareness, prevention, and control, and will contain a strictly enforced prohibition on driving under the influence. Additional testing (with cause) may occur if required and in accordance with labour legislation (Mitigation 7.5-5).

- Develop a community engagement plan to assist communities in planning for an influx of workers. The plan will include initiatives to address potential community concerns, will facilitate communication with LSA communities, and will provide a framework for ongoing communication with municipal and provincial service providers; this plan will be developed through consultation with Aboriginal Groups and local communities (Mitigation 7.5-6).
- Develop and implement a Traffic Management Plan (Mitigation 5.4-6)
- Require contractors and subcontractors to adhere to health and safety programs that emphasize workplace health and welfare and adhere to traffic management policies (Mitigation 7.5-7)

LNG Canada commits to the following mitigation measures related to diet and nutrition:

- Inform the local community and Aboriginal Groups of changes in access to the Project footprint and marine environment potentially affecting access to country foods (Mitigation 7.5-8).
- Provide Project information to the local community and Aboriginal Groups and hold information sessions to facilitate ongoing discussion to resolve concerns (Mitigation 7.5-9).

7.5.12 Conclusion

Project residual effects on community health and wellbeing are assessed as not significant. However, cumulative effects on community health and wellbeing are assessed as significant. Baseline conditions in Kitimat and Terrace indicate that increased demand for health infrastructure and services is already occurring. Further increases in demand, and adverse changes in social determinants of health, will be exacerbated with the addition of Project residual effects and those of other reasonably foreseeable projects. Project residual effects on community health and wellbeing will be greatest during Project construction but will be managed through mitigation measures. The cumulative effects on community health and wellbeing will be greatest in magnitude with respect to overlapping facility-based projects because of population and economic change.

Project residual and cumulative effects on diet and nutrition are assessed as not significant. Because Project residual effects and cumulative effects on the ongoing viability of wildlife and marine resources and vegetation are assessed as not significant, decreased consumption of country foods is not expected to occur. Mitigation measures targeted at increasing awareness of changes in access and quality of country foods will help to manage quality concerns regarding country food source and manage the risk that consumers will forgo the consumption of country foods.