27154 Sea to Sky Highway, Britannia Beach

Application for Temporary Use Permit Approval

Temporary Workforce Accommodation

Proponent: LandSea Camp Services

Applicant: Cameron Chalmers Consulting

CAMERON CHALMERS CONSULTING INC.

January 28, 2019

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1 Vision Statement

Accommodating an influx of out of town workers employed by major projects, the South Britannia lands will offer a temporary housing solution in a purpose-built facility. The housing solution will deflect the influx of workers from the local and regional housing rental market, providing safe, convenient accommodation for the life of the projects.

Workers will enjoy a purpose-built facility providing comfortable accommodation in an emerging commercial neighbourhood, serving as a catalyst for imminent commercial development. Providing an environment dedicated to safe and comfortable recuperation, the facility will enable workers to recreate, dine, and rest before being shuttled back to their jobsites.

Workers will integrate into the local and regional community and feed the local economy through direct spending resulting from their employment.

2 Introduction

Squamish and the surrounding area will be inundated by out-of-town workers required to construct major projects in the next several years. Though these workers and the projects will have a direct benefit to the local economy, housing the workers will place a significant burden on housing in Squamish and the region. This document proposes a purpose built temporary worker accommodation facility to provide suitable housing for the workers and to deflect the foreseeable impacts on the saturated housing market in Squamish and the region.

This document has been prepared in support of an application by LandSea for a Temporary Use Permit (TUP) to facilitate the construction of a temporary workforce accommodation solution at Britannia Beach. The TUP application is for a period of three years, and the applicant intends to apply for permit extension in accordance with Part 14, Division 8 of the Local Government Act.

This document outlines the application, provides a summary of the development proposal, establishes the need for the proposed temporary use, and illustrates a land use rationale respecting the TUP provisions of the Local Government Act and Squamish Lillooet Regional District (SLRD) Temporary Use Policy. This document is based on several studies and other reference materials attached as appendices to provide additional detailed information on the matters contained herein.

The Applicant looks forward to advancing the process quickly and effectively through the application process.

2.1 Background

In 2017 Landsea made an application to the SLRD for a Temporary Use Permit for workforce accommodation on the same site in anticipation of an influx of workers as a result of several major projects and developments occurring in the area.

At that time, the SLRD Board reviewed the TUP application and decided that temporary workforce accommodation for a variety of different projects was not the preferred accommodation type at that time. The board suggested that project specific temporary workforce accommodation would be more suitable, and that further discussion internally surrounding workforce accommodation would be required due to other major projects occurring on other areas within the SLRD. As a result, the Board chose not to issue the TUP.

The Board subsequently developed additional Temporary Use Permit policy requiring workforce accommodation uses link directly to a specific infrastructure or other project.

Since the previous application, the Woodfibre LNG Project and the FortisBC Eagle Mountain Pipeline Project have both passed the Federal and Provincial EA Process. The Woodfibre LNG Project has also passed the Squamish Nation EA Process and has signed a Mutual Benefit Agreement with the Nation. The start of construction is anticipated in the next 12 months and both these project proponents have expressed concern regarding the availability of suitable housing for workers.

Housing affordability and rental availability has changed in Squamish, now it is even more apparent that the influx of temporary workers will oversaturate an already saturated housing market. This oversaturation will drive rental prices higher and absorb limited available stock, making it increasingly difficult for residents and migrants to Squamish and the region to find suitable housing.

As outlined in more detail further in this report and the accompanying SNC Lavalin and Swift Creek reports, there are potential consequences on the Squamish rental market, which would lead to the displacement of Squamish residents and a further contraction of rental availability as more resourced workers enter the Squamish housing and rental market.

In the face of these dynamics, LandSea has continued to pursue the solution of temporary workforce accommodation for specific projects in the region leading to the submission of this TUP.

2.2 Proponent Profile

Landsea (the "Proponent") is a Squamish-based company specializing in the design, installation, and operation of workforce accommodation solutions throughout British Columbia. Established in 2010, the company has most recently implemented successful workforce accommodations in the Community of Port Edward, BC (Prince Rupert) as well as locations in the Skeena-Queen Charlotte Regional District, the Sunshine Coast Regional District, and the Fraser Valley Regional District.

As a locally founded and Squamish based company, with 15 local full-time employees and over 100 employees throughout BC, this specific endeavor is viewed as an opportunity to accommodate the anticipated influx of out-of-town workers while reducing the impact on the housing market and encouraging economic growth for local businesses and First Nations.

LandSea is planning on building and operating this temporary workforce accommodation solution with its Squamish Nation member owned joint-venture

partner – Stalkaya Construction Group Ltd. and in participation with the Squamish and Tsleil-Waututh Nations.

3 Site Description

3.1 Location

The subject lands are located in Britannia Beach on lands owned by Taicheng Investments and managed by Tiger Bay Developments Ltd. The lands are known as the "South Britannia" lands and referenced as such in the SLRD Official Community Plan and Howe Sound East Sub Area Plan.

The subject lands are located at 27154 Sea to Sky Highway. The uses proposed TUP would occupy a 4.22 ha (10.43 acre) portion of the 15.4 ha (38.05 acre) parent parcel legally described as Lot A, Except Portion Dedicated Road on Plan BCP28651, District Lots 1583, 2001 & 7034, Plan 21576.

Figure 1: Site Location

3.2 Legal Information

Legal Description:	Lot A, Except Portion Dedicated Road on Plan BCP28651, District Lots 1583, 2001 & 7034, Plan 21576.
Property ID:	010077227
Roll Number:	4810900100
Proposed TUP Area:	4.22 Hectares (10.43 acres)
Lot Area (Hectares):	15.4 ha
Lot Area (Acres):	38.05

3.3 Site Characteristics

Located adjacent to Highway 99, the lands proposed for the uses outlined in the TUP application are generally flat and graveled. There are several temporary and aged structures on the property, none of which are affected by the proposed TUP. The highway frontage is visually screened and physically separated by an earthen berm of between 3-5 metres and a band of existing trees and vegetation. The majority of the site is not visible from Highway 99.

The proposed development area is effectively flat, devoid of vegetation and is prepared to accommodate the proposed TUP and future development with minimal site preparation. A preliminary screening did not identify any environmental constraints within the proposed project area.

Access to the site is presently controlled by a manually operated gate at a location approved by the Ministry of Transportation and Infrastructure (MOTI). A full movement intersection to the proposed lands was created in the Highway 99 upgrades in preparation for the 2010 Olympic Games.

3.4 Current Land Uses

3.4.1 Current Zoning

The lands are presently zoned RR3 in the Squamish Lillooet Regional District Electoral Area C Zoning Bylaw. This zone does not permit industrial oriented workforce accommodation. Given the temporary nature of the project-driven workforce

accommodation, the application for TUP has been put forward as an alternative to a more permanent rezoning application.

3.4.2 Current Uses

The lands are undeveloped. Currently a modular office trailer occupies the site for a temporary office for the landowner. The lands are frequently used for filming, which is a secondary sporadic use for the subject lands.

When not in use for filming, the subject lands remain gated and unoccupied/unused.

3.5 Site Context

The site is located approximately 12 kilometers from the District of Squamish, which provides a complete residential and service center of nearly 20,000 people. The District of Squamish will be a primary source of goods and services for residents and employees of the proposed temporary workforce accommodation facility.

The lands are located south of the Britannia Beach Townsite and Britannia Mining Museum. A small café is located between the subject lands and the Britannia Townsite.

The Britannia Beach Townsite is in a phase of transformation. Historic commercial operations have recently closed while the Townsite undergoes a phase of commercial growth. Historic buildings are being repositioned and repurposed to create a new commercial node at the former Townsite. This represents the first commercial expansion in Britannia Beach in many decades.

The subject property is surrounded primarily by undeveloped lands, most of which are held by the same owner as the subject lands. With the exception of a café located on the north-west portion of the lands, there are no immediate neighbours, and no existing uses that are affected by the proposed development.

4 Temporary Use Permit Proposal

4.1 Overview

The development contemplated in the TUP application consists of modular housing units containing approximately 500 private rooms. Additional units for recreation facilities, cooking/dining facilities, administration, security and first aid will be placed on the site generally in the configuration shown below and in Appendix 1.

The plan will include on-site parking for 104 vehicles and include specific facilities to accommodate buses as the primary mode of transportation for workers to and from worksites in the Sea to Sky corridor. On-site parking will require permits for residents only. Additional details are provided in the transportation section below.

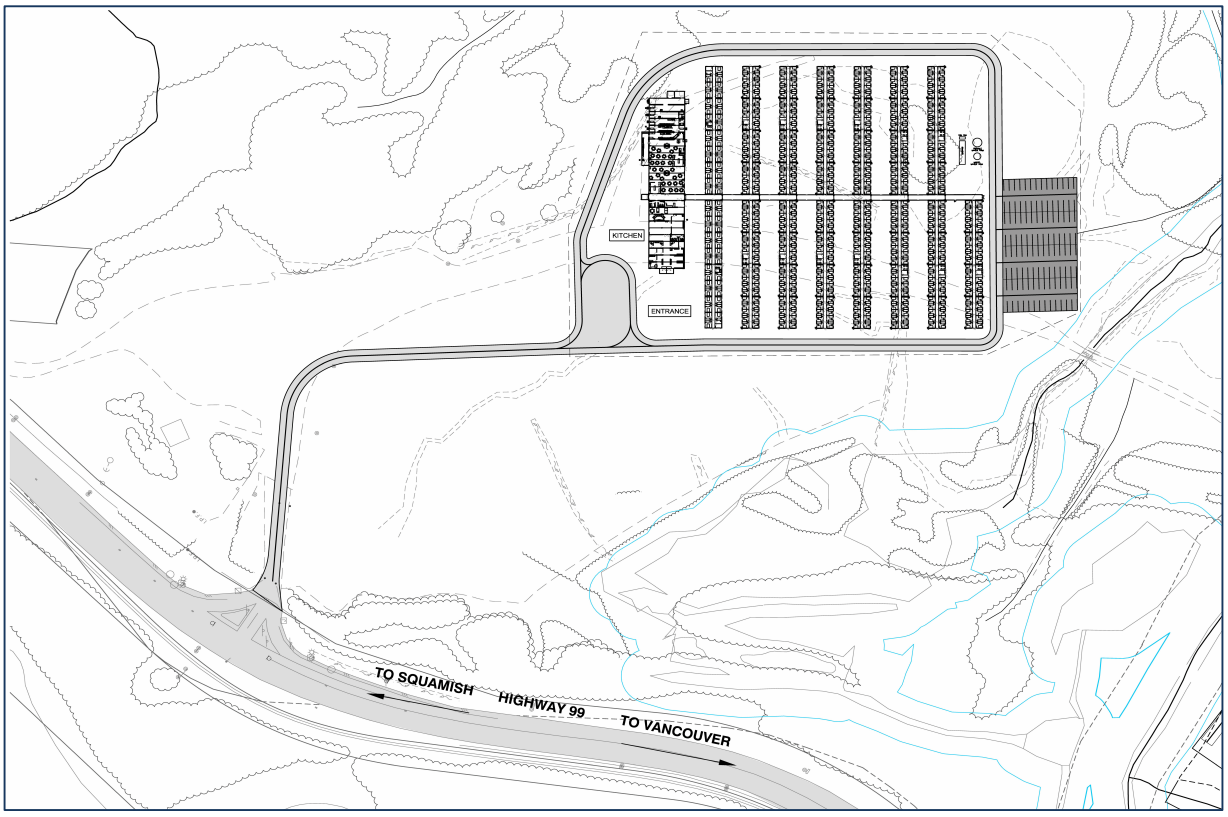


Figure 2: Site Plan

4.2 Site Development

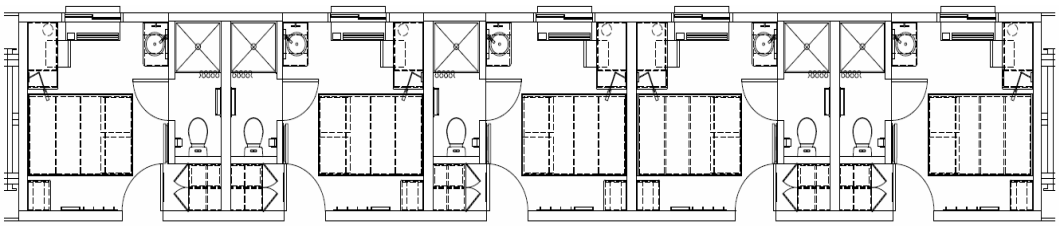
Though the proposed development site is located on a discrete portion of the site and has limited viewing or overviewing potential, attention will be paid to the visual appearance of the buildings and site.

4.2.1 Building Description

The buildings proposed are single-storey modular units that will be transported by truck and placed on the site. They will be arranged as generally outlined on the accompanying site-plan.

Each accommodation complex will provide 30 to 38 private rooms with ensuite washrooms and a shared laundry room. These complexes are connected by enclosed corridors to the kitchen, dining and recreation complexes.

Private Suites	30-38 Person	150 Sq Ft	• Private Washrooms • Double Size Bed c/w pillow-top mattress • Closet, Office desk and chair, 32" tv • Individual climate control



A common dining hall with a commercial kitchen will provide a range of on-site meals for the residents only and will be a hub for the entire facility.

Proposed recreation space includes a common media/games room with televisions, pool tables, and game consoles, and a complete exercise complex with a variety of equipment.

4.2.2 Landscaping and Buffering

The site is presently buffered by an earthen berm on the northern portion of the site and by a large vegetative buffer on the south portion of the site. In concert, these buffers result in limited visibility of the proposed development site from the highway for traffic travelling in both directions.

The proposal will include on-site landscaping to provide additional on-site screening and beautification. Fencing will demarcate the perimeter of the temporary workforce accommodation facility.

4.3 Building Form and Character

As shown on the site plan and specifications sheet accompanying the application, the buildings will be arranged in a relatively compact configuration to minimize the footprint of the proposed accommodation facility. Amenity, recreation, and dining facilities will be located in a centrally accessible location to provide convenient access to all users.

The buildings are mobile structures that are purpose built for accommodation facilities as shown on the attached drawings. As mentioned, the site will have limited visibility from public roads or other public vantage-points. However, the structures are tastefully designed and will appear generally as shown on the attached drawings.

The modular buildings are oriented around a central corridor and anchored by the multi-purpose building and dining hall located that forms the entry to the project. The individual rooms are serviced by corridors and there is separation between the buildings to permit light infiltration and suitable separation distance.

Parking will be provided within the defined area of the facility and will be entirely separated from any other uses on the site. The parking has been sized to accommodate 104 cars, which reflects the nature of the visiting workers staying at the facility and the overall transportation approach described later in this report.

4.3.1 Building Design Specifications

Engineering and design of the accommodation facility will take into consideration the following:

1. The facility is to be designed, supplied, installed and operated in strict compliance with the 2018 BC building, fire, electrical and plumbing code requirements (BCBC), the BC Wildfire Act and Wildfire regulation, the Drinking Water Protection Regulation and the Municipal Wastewater Regulation, WorkSafe BC OHS Regulation, BC Public Health Act Industrial Camps Regulation current to September 18, 2018 and the Ministry of Health, Health Protection Branch BC Guidelines for Industrial Camps Regulation dated October 1, 2017.
2. A design that contributes to the arrival and departure experience of residents, employees and compliments the community of Britannia.
3. A defined facility main entrance with pitched or gabled roof using materials such as timber frame, duroid, metal, or materials of similar visual appearance.

4. Building colours will be architecturally coordinated and conventional in appearance: greys, greens, browns, blues, beiges, are considered acceptable. Bright tones are not in keeping with the planned character of the area.
5. Commercial garbage and recycling containers, utility and unenclosed outdoor storage areas are to be screened from public view by facility layout, solid or wood landscape screen with landscaping or chain link fence treated with a solid interwoven surface in colors compatible with the primary buildings.
6. Loading zones to be located at the rear of the facility.
7. Outdoor lighting to be shielded by sharp cut-off dark sky lighting so that all light is directed below the horizontal plane towards the ground.
8. Plantings should be natural in appearance and grouped in natural arrangements rather than at regular intervals. Native plants and plants that have low irrigation and maintenance requirements are encouraged.
9. Exterior signs to be architecturally coordinated with the overall design of buildings and landscaping. Signs should be unobtrusive and not detract from the form and character of the site or adjacent properties and meet the guidelines
10. Preferred signage materials include those local to the corridor, including but not limited to wood, stone, or local artisan materials.

4.4 Project Amenities and Benefits

Though the project is only temporary in nature, the Proponent is a local company that is committed to the Britannia Beach community and the SLRD. As the process unfolds, the proponent is committed to discussing contributions that acknowledge this commitment with a focus on legacy contributions that can be utilized and enjoyed well after the workforce accommodation has ceased operation.

5 Project Servicing

5.1 Access and Transportation

A traffic impact study prepared by Bunt and Associates Transportation Planning and Engineering, and is attached as Appendix 2. The study reviews background traffic volumes on highway 99 and analyzes the potential implications of the proposed development, with particular attention to turning movements at the entrance to highway 99.

Access to and from the site will be from an existing full movement intersection at the entrance to the site and Highway 99. Currently this intersection is unused, except for sporadic film industry traffic.

The Bunt Study concludes that the proposed workforce accommodation use will function without significant impact on Highway 99 with or without the development of the proposed in South Britannia Market Temporary Use permit. Accordingly, there are no technical traffic limitations to the consideration of the Temporary Use Permit for the workforce accommodation.

The primary worker traffic flow for the anticipated projects will be accommodated by shuttle busses to move workers between the accommodation facility and project staging areas. Additional workers will generally commute in patterns that do not upset or affect background traffic volumes. The proposed transportation approach allows for the concentration of project generated traffic in buses as opposed to personal vehicles.

5.2 Utility Services

5.2.1 Water Supply

An analysis has been prepared by Arden Consulting Engineers Ltd. and is attached as Appendix 3. Water will be supplied from two existing {and licensed} wells located on the South Britannia lands on either side of Thistle Creek. These wells produce a proven maximum sustainable flow of between 53 to 72 litres-per-second with a sustainable yield of 47 litres per second. The sustainable yield of 47 litres per second translates to 746 US gallons per minute. At peak demand, the proposed workforce accommodation facility will draw 210 gallons per minute, representing only 28% of the available flow.

The Arden report also references a report by PS Turje & Associates which tested the water and confirms the water meets all chemical parameters for the Guidelines for Canadian Drinking Water Quality. Additional Treatment will be introduced as per

Coastal Health and in accordance with the Drinking Water Protection Regulation should further testing require this.

Onsite water storage will also connect to the projects fire suppression system to ensure firefighting capability during construction and throughout the facilities lifespan.

5.2.2 Sanitary Sewage Disposal

The sanitary sewage disposal system will consist of holding tanks within the proposed development that will be pumped to tanker truck for deposit in the Britannia Beach sanitary treatment facility.

The Arden report indicates there is ample capacity in the existing treatment plant to accept the additional sanitary discharge. See Attached Appendix 3.

5.2.3 Stormwater Management

Stormwater will be managed entirely on-site by sheet flow and ground infiltration in a manner similar to the current runoff scenario. Accordingly, post-development flows into adjacent watercourses and ditches will not increase over pre-development flows.

The drainage within the project will be accommodated by the current pervious gravel surface and site grading as necessary.

5.2.4 Solid Waste Management

Solid waste management will be undertaken in accordance with best practices for waste stream management and will consist of garbage, recycling, and compost sorting on site. Solid waste will be managed by contract with GFL or another solid waste provider to remove sorted waste in accordance with SLRD waste management practices.

5.2.5 Hydro, Gas, Telephone and Internet

Third party utilities and services will be provided in the normal manner through arrangements with the third-party providers.

6 Operational Practices

6.1 Availability and Bookings

The proposed accommodation will not be available to the public or the travelling public. Bookings will be made directly by employers on behalf of their workers, with a minimum stay requirement of 27 days. This ensures that the accommodation is used by specific employers' workers working on specific major projects. The project is anticipated to have two major tenants; Woodfibre LNG Project construction workers and contractors and the FortisBC Eagle Mountain Pipeline Project construction workers and contractors. Accommodations for these workers will be secured by their respective companies in blocks of rooms. There may be an opportunity to accommodate other major projects as they move forward, but the practice of only accepting bookings by companies on behalf of their workers for prescribed minimum stays will be applied.

6.2 Site Security

The Proponent appreciates the perceptions and fears about the potential for negative impacts arising from the operation of the facility and the behavior of the occupants. The Proponent is prepared to work closely with the SLRD to ensure that operational procures and policies are implemented to ensure there are minimal negative effects caused by the occupants.

Firstly, the proposed facility will be a drug and alcohol-free facility, meaning that drugs and alcohol (including cannabis) will not be sold, consumed, or permitted in any way on the site. There will be policies and procedures prohibiting consumption and of course, intoxication or impairment by drugs or alcohol while on the property. These policies form the employment contract between worker and employers and are a condition of occupancy. The proponent is committed to providing their clients with a restful and comfortable environment for their workers to recreate, eat and sleep.

Other security related policies and practices in include the following

- Unauthorized visitors are not permitted in the facility.
- Worker Check-In and Facility Safety Orientation Required
- Unauthorized vehicles are not permitted on the site.
- 24/7 Security and First Aid On Site.

6.3 Emergency Response Evacuation

The proposed facility will work with Britannia Fire Department and Squamish Fire Rescue to coordinate fire services. Additionally, the on-site operations will include fire

suppression and emergency evacuation training exercises to ensure the occupants are safe in the event of an emergency. A dedicated First Aid and security team will be onsite at all times to provide response and assistance.

7 Application Rationale

7.1 Housing Demand

A study prepared by Swift Creek Consulting entitled "Comparison of Workforce Housing Options in Squamish" is attached as Appendix 4 and establishes the increased housing demand in Squamish and the region resultant from several major approved or upcoming projects. The study concludes that these projects will place a large burden on the already saturated residential rental housing market in Squamish. This increased pressure will have potential implications on available rental stock, rental rates, and could potentially lead to the displacement of mid-range renters in Squamish.

The primary drivers of the increased housing demand are the increased number of construction, trades, and specialized workers required for these major projects. Typically, the influx of workers to staff these projects from outside of Squamish would have living out allowances made by their employers for housing. Accordingly, a large number of well-resourced workers will flood the Squamish rental market reducing available housing stock and increasing rental rates. The study notes that these impacts would hit an already saturated and inflated rental market, further limiting available housing to accommodate Squamish residents.

7.2 Local Employment

The proposed facility will have significant local employment benefits through both the construction and operation phases. As outlined in the SNC Lavalin Socio Economic Impact assessment, the construction costs equate to approximately $9 million, much of which will be paid to local labour and local suppliers and the estimated local economic benefit during on-going operations will equate to approximately $4.5 million per year.

Once operating the facility will employ approximately 30-50 people in a variety of food service and hospitality roles including senior level management positions and facility maintenance and support roles. Most of these positions will be fulfilled by local residents and room and board will be provided for any employees that are not local residents.

7.3 Socio-economic Impacts

A Socio-economic Impact Assessment has been prepared by SNC Lavelin and is attached as Appendix 5 to this submission. The analysis re-affirms many of the conclusions of the Swift Creek study with regards to the impacts on local housing

caused by the influx of major project workers to Squamish and the surrounding region.

The SNC report assesses additional impacts on municipal and regional services such as policing and health care. Though the addition of 500 additional workers into the region has foreseeable impacts on municipal, regional, and provincial services, the study makes clear that these impacts are not a result of the proposed workforce housing project. Rather, these impacts are a result of the influx of workers which will occur whether they are housed in the proposed facility or elsewhere in the community. As such, the proposal itself does not generate additional demand on services as the workers will occupy the region either in this proposed facility or in other parts of the community.

7.4 Commercial Catalyst

Britannia Beach has recently begun a commercial transformation. Several historic commercial uses in the townsite have closed, while new commercial development has been approved and is under active construction.

Commercial uses in Britannia Beach will benefit from the additional temporary residents as a catalyst for new commercial enterprises, and as additional support for existing business.

8 Policy Analysis

8.1 Introduction

The application is for a Temporary Use Permit which restricts the permission to 3 years under Section 497 of the Local Government Act. Under the Act, the Board may, at their discretion, extend the use for up to a maximum of three additional years. At the end of the term, the Owner may apply for a new TUP, apply for rezoning, or allow the permit to lapse and discontinue the use. The Act also makes provision for the municipality to hold a security to ensure that any improvements made under the permit will be deconstructed, decommissioned, or removed. In short, the TUP approval tool gives the Board a high degree of control over the use, and gives them the ability to discontinue the user

The temporary nature of the permit corresponds to the temporary nature of the proposed use as workforce accommodation for major construction projects with a definite construction horizon.

For these reasons, policy analysis of Temporary Use Permits is different than that typically undertaken for development applications such as Official Community Plan amendments and rezoning applications as it typically focuses more on the local government's authority to issue the permit, rather than impact-based policy statements. The following is a brief summary of the policy affecting the TUP application.

In summary, the notion of accommodating workforce housing within Britannia Beach is generally congruent with the Official Community Plan policy directions and represents a consistent interim use.

8.2 Official Community Plan Policy

Section 4.2.1.6 of the Squamish Lillooet Regional District Area D Official Community Plan establishes that Temporary Use Permits will be considered in all land uses within the Plan area. Accordingly, the application meets the first test of the Board's authority to issue the TUP.

The Plan provides additional direction supportive of the application. In general, the Britannia Beach area is identified as a mixed-use community with a significant increase in housing population and supporting commercial development over the long term. The proposed application is consistent with this future direction in that the workforce accommodation is within a similar range of uses to the long-term aspirations of the plan. Further, the application has the potential to serve as a catalyst for ongoing commercial development and expansion in Britannia Beach.

The Plan also establishes a general servicing approach and capacity in Section 3.5 which corresponds with the proposed servicing framework in the TUP.

8.3 Howe Sound East Sub Area Plan Policy

The Howe Sound East Sub Area Plan provides more detailed policy direction for the long-term buildout of Britannia Beach. It identifies several development nodes, identifying the subject lands as "Britannia South". These lands provide more detailed yet consistent policy direction for these lands as a mix of housing, employment, and commercial lands. As an interim measure the proposed workforce accommodation facility does not offend or run contradictory to the long-term aspirations for the Britannia South lands. Rather, the proposed use is more of a placeholder for future development while additional planning and approval works are completed. Following the completion of the Temporary Use Permit, there will not be lasting impacts on the lands that would alter the range of uses contemplated in the SAP.

8.4 Temporary Use Permit Policy

SLRD policy 4.7 (Temporary Use Permits) dated June 27/28, 2018 establishes several additional general considerations Planning Staff and the Board ought to consider in TUP applications. There is also specific policy guidance on consideration of "work camps" which would apply to the subject application. Each of these considerations is listed below with details on how each consideration has been satisfied in the subject application.

- *Servicing, environmental issues, neighbourhood impacts, and public safety issues will be considered as part of a TUP application.*

  This report details the impacts. As a cleared development site, there are no environmental issues with eth temporary use of the site. Neighbourhood and adjacent impacts are similarly limited by the site context and isolated nature of the site. Public safety issues are considered operational matters and have been addressed in this report.

- *Applicants may be asked to provide professional studies to prove that the temporary use will not negatively impact the environment or community.*

  Technical studies have been prepared as necessary and accompany this report. Namely, the Traffic Impact Study, Servicing Overview, Socio-Economic Impact Analysis, and Housing Overview. These reports address particular issues and concerns in support of the project and identify that the project can be undertaken with negligible additional impacts on the immediate community or the region.

- *Applicants may be asked to provide a geotechnical report to prove proposed buildings or structures within the temporary use area are located on land that may be used safely for the use intended in respect to natural hazards (Community Charter Section 56).*

  There are no known hazards associated with the site and there is no concern the land cannot be safely used for its intended purpose, particularly on a temporary basis.

- *Any properties that are designated as development permit areas will be required to also submit applications for the appropriate development permits.*

  If a DP is required, the proponents will submit an application under separate cover to run concurrently or in close succession to the TUP application.

- *Temporary uses must provide adequate parking and pedestrian and vehicular circulation. Applicants may be asked to provide traffic assessments to ensure impacts are understood and managed.*

  A Traffic Impact Analysis has been prepared by Bunt and Associates which concludes there will not be impacts on Highway 99 generated from the project, even should the TUP for the South Britannia Market proceed.

Work Camps:

- *TUP applications for work camps should support specific, defined projects and should not be put forward solely as an affordable housing option.*

  The subject TUP application has been submitted in anticipation of reaching formal agreements with the proponents and associated contractors of the FortisBC Eagle Mountain Pipeline Expansion Project and Woodfibre LNG Project as anchor tenants and would be available for additional specific major projects assuming all booking requirements are met.

- *The proximity to existing communities will be considered when reviewing TUP applications for work camps; required conditions for work camps in communities will differ from conditions for work camps in remote areas.*

  In this instance the proximity of the temporary worker accommodation facility to existing and emerging commercial area in Britannia Beach and the full service centre in Squamish is complimentary. As identified in the Housing Assessment, the pressure from the inundation of major project workers without temporary workforce accommodation will negatively impact an urban area whereas the proposed TUP is a means to avoid the

negative consequences on the local and regional housing market. The site is still remote enough that there will be negligible impacts on existing properties or the general public.

- *Generally, it is expected that work camps follow best practices as set out in the BC Guidelines for Industrial Camps Regulation, as regulated by the province.*

  The Proponent is experienced in the application of the BC Guidelines for Industrial Camps Regulation and is committed to following the best practices from that document in concert with the institutional knowledge of the Proponent as an operator of workforce accommodation faculties in BC.

Community Contributions

- *The SLRD may require community contributions as a condition of a TUP, to offset any impacts from the temporary commercial or industrial use. Community contribution conditions may be a one-time contribution, annual contribution, or both and will be considered on a case-by-case basis, taking into consideration the nature and scope of the temporary use.*

  The proponent is pleased to discuss a community contribution in the way of improvements or other benefits as the community needs become clear and the project progresses.

Site remediation:

- *The SLRD will require conditions in the TUP to ensure site remediation.*

  The Proponent expects to return the site to its pre-existing condition. As most of the major improvements and buildings will be leased, they will be retrieved by the building owner following completion of the operation. The Proponent expects to post security for the remaining site clean-up following building removal to restore the site to its pre-development condition.

9 Summary and Contact Information

9.1 Closure

The Proponents have undertaken a comprehensive analysis of the potential impacts of major projects in the SLRD, including the Woodfibre and the FortisBC Eagle Mountain projects, which together will generate an influx of workers into Squamish and the region. With current housing affordability and supply, this influx will negatively impact the local housing market, driving prices higher and reducing available rental stock.

The proposed Temporary Use Permit will provide an alternative to accommodate workers in a purpose-built facility to minimize the impacts on the inevitable inflow of workers into the region.

Traffic and utilities have been reviewed and confirmed and the project may be suitably serviced with minimal disruption to the community or local services.

Accordingly, the Proponents respectfully request favourable consideration of the application for Temporary Use Permit.

9.2 Applicant Contact Information

Cameron Chalmers, MCIP, RPP
Principal, Cameron Chalmers Consulting
1187 Village Green Way
Squamish, BC. V8B 0N5
Tel: 604.849.2138
Email: cameron@cameronchalmers.com

10 Appendices

Appendix 1: Site Plan

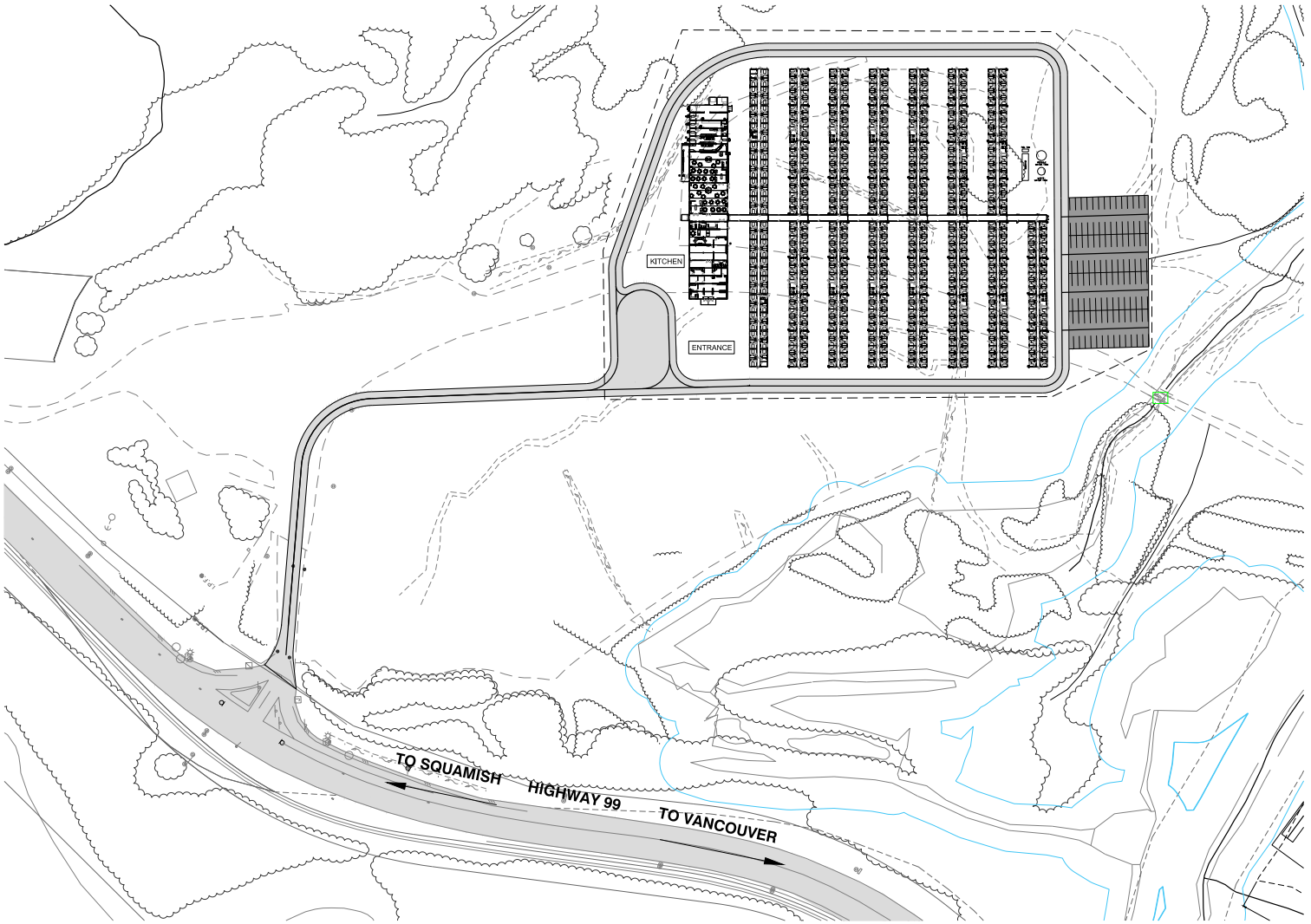
Appendix 2: Traffic Impact Assessment, Bunt and Associates

Appendix 3: Water Supply and Sanitary Analysis, Arden

Appendix 4: Comparison of Workforce Housing Options in Squamish, Swift Creek

Appendix 5: Socio Economic Impact Assessment, SNC Lavelin

Appendix 1: Site Plan



DRAFT

NOT FOR CONSTRUCTION

No.	DATE	REVISION	BY
1	2018-11-14	ISSUED FOR REVIEW	DM

BINNIE
Your Challenges. Our Solutions. Build with Binnie.

R.F. BINNIE & ASSOCIATES LTD.
201 - 40147 Glenalder Place,
Squamish, BC V8B 0G2
TEL 604 892 8222
BINNIE.com

CLIENT
LANDSEA
7-38921 PROGRESS WAY, SQUAMISH, BC, V8B 0K6

DRAWING DESCRIPTION
TEMPORARY WORKFORCE ACCOMMODATION LAYOUT

SURVEYED BY
DRAWN BY JF
DESIGNED BY DM
CHECKED BY PH

SCALES
0 1:1000 40m

DATE 2018-10-11
DRAWING No. 17-0176-L2
SHEET 1 OF 1 REV. 1
DESTROY ALL PRINTS BEARING PREVIOUS No.

Appendix 2: Traffic Impact Assessment, Bunt and Associates

December 28, 2018
04-17-0272

Long Cheng & Tony Petricevic
Tigerbay Development Corporation
PO Box 195, 27154 Sea to Sky Highway 99
Britannia Beach, B.C.
V0N 1J0

VIA E-MAIL: long@southbritannia.com, tony@southbritannia.com

Dear Long & Tony:

Re: South Britannia Workplace Accommodation Site – High Level Traffic Analysis
Transportation Assessment Letter (DRAFT)

As requested, Bunt & Associates Engineering Ltd. (Bunt) has conducted a high level transportation assessment for Tigerbay Development Corporation's (Tigerbay) proposed Workplace Accommodation Site located at the South Britannia site located approximately 12km south of the District of Squamish municipality.

This study reviews the existing site conditions, estimates the future vehicle trip generation based on the anticipated scheduling, analyzes the traffic operations of the site access to Highway 99, and includes a discussion on the parking needs for the proposed site.

Please do not hesitate to contact us should you have any questions.

Yours truly,
Bunt & Associates

Jordan Eccles, EIT
Transportation Analyst

Daniel Fung, M.Sc., P.Eng.
Associate

1. INTRODUCTION

Tigerbay is proposing a second temporary use for their South Britannia site. The proposed temporary use is a workplace accommodation site (WAS), which would provide temporary accommodation for construction and industrial workers. The WAS would be built adjacent to the currently proposed Britannia Market and is anticipated to be operate concurrently with the market.

The WAS is intended to operate between 2020 and 2022 with varying worker occupancy levels throughout the year. Bunt was retained to prepare a traffic analysis for the proposed land use and summarize the findings within a letter report. The transportation analysis includes a review of existing site conditions, an estimate of the trips generated by the site for three occupancy scenarios, an analysis of the the impact of the proposed WAS on the traffic operations at the site access on Highway 99, and an estimate of the parking needs of the site.

This letter is structured as follows:

- Section 2 presents the existing site conditions;
- Section 3 summarizes the estimated future vehicle forecasts;
- Section 4 analyzes the traffic operations of the site access;
- Section 5 reviews the parking needs of the site; and,
- Section 6 presents the conclusions.

1.1 Site Location and Context

The South Britannia site is located approximately 12km south of the District of Squamish municipality and 50km north of the Metro Vancouver region along Highway 99. As highlighted in **Exhibit 1.1**, it is situated just south of the Historic Britannia Beach town near the Britannia Mine Museum.

The South Britannia development site comprises approximately 186 acres of land adjacent to Howe Sound. Highway 99 (Sea to Sky Highway) provides access to the site and is the only link between Vancouver, Squamish, and Whistler and all of the communities in between. Upgrades to the Sea to Sky Highway were completed for the 2010 Winter Olympics and have increased safety and accessibility both to the site and between the various communities along the Sea to Sky corridor.

Highway 99 has a posted speed limit of 60km/h in the vicinity of the site and up to 90km/h south of the site and north of Britannia Beach. There is a traffic signal located to the north at the intersection of Highway 99/Copper Drive, which functions as the main access to North Britannia and the Mine Museum.

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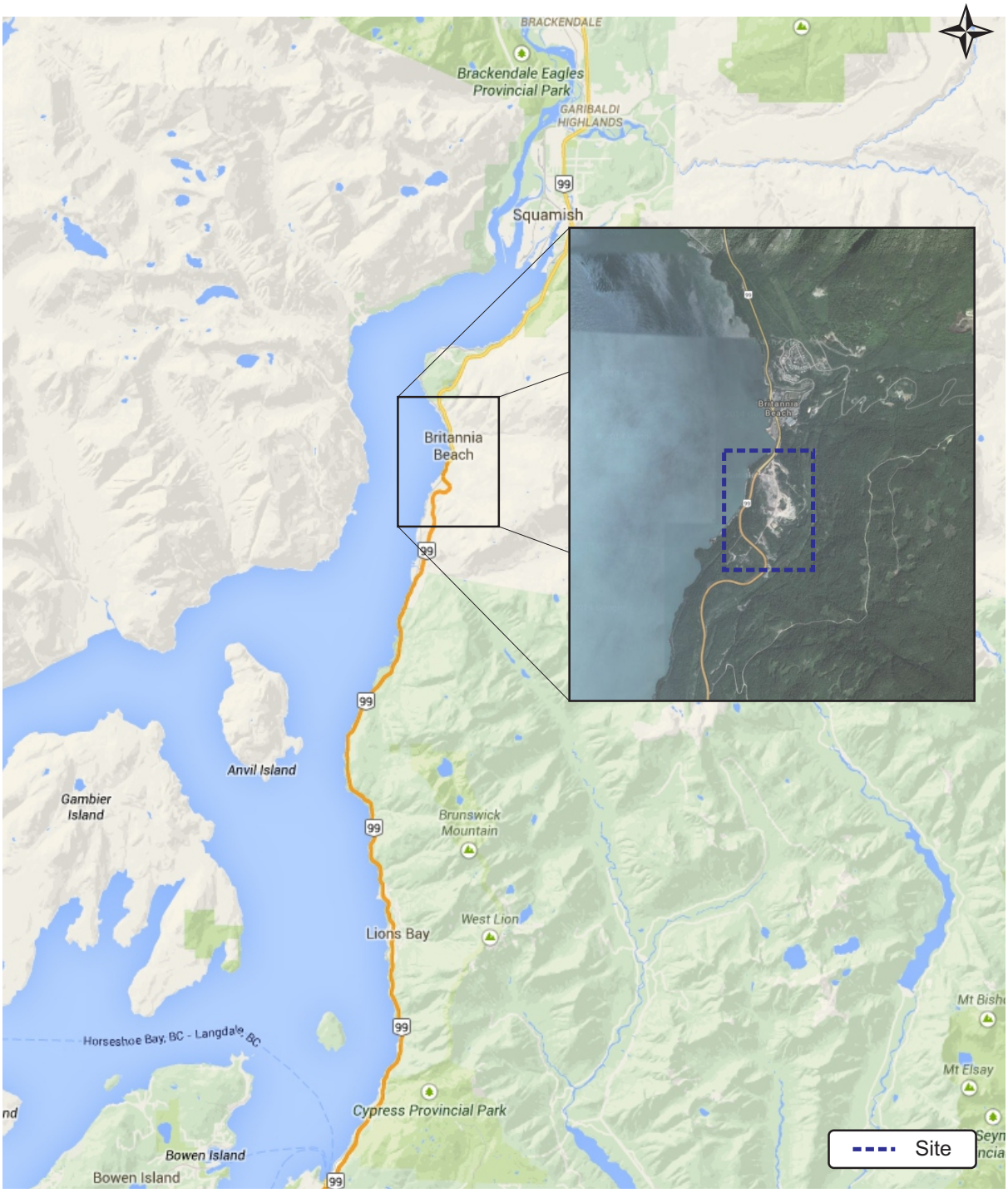

Exhibit 1.1
Site Location

South Britannia Workplace Accommodation Site
04-17-0272 December 2018

bunt & associates

1.2 Proposed WAS Occupancy and Scheduling

The proposed WAS is intended to provide temporary housing for up to 550 workers that are anticipated to be needed very soon to construct major projects in the Squamish area, including the FortisBC Eagle Mountain pipeline project and the Woodfibre LNG project. The WAS is proposed to operate from 2020 to 2022 with varying levels of worker occupancy throughout each year. Generally, the number of workers living in the lodging facility is intended to be higher in the winter months and anticipated to increase every year with the peak occupancy occurring in the winter of 2022. **Table 1.1** provides a summary of the anticipated worker population for the peak month of each year.

Table 1.1: Peak Worker Population Table

TENANT	2020	2021	2022
Anchor Tenant	360	495	550
Other Tenants	90	25	0
TOTAL	450	520	550

Worker population numbers have been rounded to nearest 5.

Workers living in the WAS will be transported by private buses between the WAS and staging areas in Squamish.

Bunt has been informed of the following proposed schedule and assumptions:

- Transportation to/from the WAS and staging areas will be provided by private buses. Each bus is assumed to have a capacity of 50 workers;
- In the morning, buses will depart the WAS at 5:00 a.m. and arrive at the staging area starting at approximately 5:20 a.m. After dropping-off the workers, buses will return to the WAS and remain parked until the evening;
- In the evening, buses will return to the staging area, pick-up workers beginning at 6:00 p.m. and arrive back at the WAS at approximately 6:20 p.m.;
- At the end of each week, 50% of workers are expected to travel down to Metro Vancouver on Friday evening for their days off and return back to the WAS on Sunday Evening. The remaining 50% of workers would remain for weekend shifts;
- 90% of the total workforce (and 100% of the workforce living in the WAS) is assumed to originate from Metro Vancouver. Of these Metro Vancouver workers, 80% are assumed to take the private buses to/from Metro Vancouver on Friday/Sunday shift changes. The remaining 20% of workers from Metro Vancouver are assumed to drive their own vehicles to/from the WAS on Friday/Sunday shift changes. However, all workers living in the WAS are assumed to use the buses to travel to/from the staging area during the work week;

- The remaining 10% of the workforce would live locally in Squamish and thus would be driving to/from the staging location directly, and would not represent a vehicle trip near the WAS; and,
- The WAS is intended to have a staff of 30 people. This would include kitchen staff; cleaning staff; lodge administration, etc. Of these 30 lodge staff, 50% are assumed to live locally in Squamish and drive to/from the WAS each day, while the remaining 50% are assumed to originate from Metro Vancouver but stay on-site. Of those 50% that originate from Metro Vancouver, 80% are assumed to take the private buses on Friday/Sunday shift changes and the remaining 20% would drive to/from Metro Vancouver at the beginning and end of each week.

2. EXISTING CONDITIONS

This section details the existing site and reviews the surrounding transportation networks covering streets and transit. Bunt's available data for Highway 99 volumes is also discussed.

2.1 Roadway System

Highway 99

Also known as the Sea to Sky Highway, Highway 99 is the major north-south corridor connecting the US Border to the Howe Sound Area through Greater Vancouver, Britannia, Squamish, Whistler and Pemberton. It runs north up to Cache Creek and connects to Highway 97.

The existing highway consists of a combination of one and two lanes per direction. Posted speeds range from 60km/h to 100km/h, with lower speed limits designated in urban areas such as Squamish and near signalized intersections.

At the proposed 3-way unsignalized site access, Highway 99 has one lane northbound, two lanes southbound, and deceleration/turning lanes provided for both northbound and southbound traffic approaching the site. No acceleration/merge lanes are provided, although both right turn movements are channelized. The speed limit is 60km/h.

2.2 Transit Service

Currently, public transit services along the Highway 99 corridor are limited. TransLink (officially known as South Coast British Columbia Transportation Authority) is the corporation responsible for the regional transportation network in Greater Vancouver. They provide transit services that extend north up to the community of Lions Bay (Routes 259 and 262) approximately 20km south of Britannia Beach. BC Transit, the transit authority responsible for transportation services outside of the Greater Vancouver area provides public transit services in Squamish, Whistler and Pemberton.

No regional transit connections are presently provided between Lions Bay and Squamish / Whistler. However, BC Transit's *Sea to Sky Transit Future Plan* (published in 2015) includes recommendations which call for the introduction of an interregional transit service between Squamish and Metro Vancouver by 2020.

Private coach bus companies offer transportation services along the corridor. Some of these private services do stop on request at specific locations along the Highway 99 corridor, including the existing Britannia Beach access and North Britannia (at Copper Drive).

2.3 Highway 99 Traffic Volume Counts

Bunt had previously collected traffic volume data in 2016 in order to gain an understanding of the existing traffic volumes in the vicinity of the site. Counts were conducted on Friday, April 22nd from 3:00 p.m. – 6:00 p.m. and Sunday, April 24th from 1:00 p.m. – 4:00 p.m. Friday PM and Sunday PM

were chosen as design hours because Ministry of Transportation (MoTI) permanent count stations north of Horseshoe Bay (P-99-01NS) and north of Squamish (P-15-3NS) indicated that these are the times of peak northbound and southbound traffic, respectively. Furthermore, the MoTI year-round count station data allowed the April Bunt data to be factored up to reflect winter peak hours. **Table 2.1** below summarizes the peak traffic volumes for each peak period.

Table 2.1: Existing 2018 Highway 99 Peak Hour Volumes (Based on 2016 Counts)

DIRECTION	2016 (VEHICLES PER HOUR)		
	WEEKDAY AM	WEEKDAY PM	SUNDAY
Northbound	530	1,020	370
Southbound	490	500	1,450

Note the above counts are the most recent data collected by Bunt and form the basis for this assessment. Further detail on assumptions regarding background traffic is provided in the following section.

3. FUTURE TRAFFIC CONDITIONS

The following section details the methodology employed to establish background traffic and site trip generation forecasts.

3.1 Background Traffic

The background traffic volumes for the three horizon years were calculated using a growth rate of 1.8% per year (compounded) for Highway 99 applied to the 2016 traffic volumes. The growth rate was based on previous Highway 99 forecast studies prepared by others as part of the 2004-era work for the Sea to Sky Improvement Project. This growth rate was confirmed looking at historic MoTI P-15-3NS count station data for the 100th highest peak hour on Highway 99.

Typically, a traffic analysis would review the peak of the adjacent street as this would represent the critical period for traffic operations, even though it may not necessarily represent the peak of the proposed site. From the permanent count station data, the highway peak hour typically occurs between 4:00 p.m. – 5:00 p.m on Friday and 3:00 p.m. – 4:00 p.m. on Sunday. However, based on the scheduling information provided to Bunt, the site is anticipated to generate a minimal amount of vehicle trips during the Friday and Sunday highway peaks. Furthermore, Tigerbay is aware of the general peak periods of the highway and intends to offset their schedule from these peak periods. Therefore, the peak of the site was considered the most appropriate period to analyze.

The peak of the site is anticipated to occur between 6:00 p.m. – 7:00 p.m. on both Friday and Sunday. These periods are when the site would generate the largest amount of vehicle trips and thus have the greatest effect on the highway operations. To estimate the highway volumes present during the site peaks, a ratio between the highway peak and site peak was established from the data available at the nearby permanent count station.

Bunt reviewed the ratio of hourly volumes between the highway peak and site peak for every Friday and Sunday between November 2017 – March 2018 and established an average. In this 5 month period, highway volumes between 6:00 p.m. – 7:00 p.m. on Friday were 67% of the highway peak while volumes between 6:00 p.m. – 7:00 p.m. on Sunday were 51% of the highway peak. Using these ratios, the forecasted highway volumes between 6:00p.m. – 7:00p.m. were established and are presented below in **Table 3.1**.

Table 3.1: Highway 99 Background Traffic Forecasts

DIRECTION	2020		2021		2022	
	FRIDAY	SUNDAY	FRIDAY	SUNDAY	FRIDAY	SUNDAY
Northbound	740	200	750	200	760	210
Southbound	360	790	370	810	370	820

3.2 Britannia Market Site Generated Traffic

Tigerbay has previously proposed a variety of temporary land uses on the South Britannia site collectively called "Britannia Market". This market would include but not be limited to: a farmers' market, food trucks, ticket sales offices for nearby attractions, and auxiliary/overflow parking for nearby sites. This market would operate concurrently with the proposed WAS and share an access to Highway 99. Bunt previously completed a high level traffic assessment letter reviewing the trip generation and traffic impact of the proposed market which can be found in **Appendix A**.

With the concurrent operations, the future vehicle trips estimated to be generated by the market have been included in this analysis. The traffic analysis for the market reviewed multiple sensitivity scenarios including minimum and maximum market sizes as well as standard and increased pass-by rates. As a conservative measure, the background market traffic accounted for in this analysis assumed the worst-case scenario (i.e maximum market size and standard pass-by rates). **Table 3.2** below summarizes the estimated trips generated by the market.

Table 3.2: Background Traffic Forecasts - Britannia Market Estimated Vehicle Trips

LAND USE	SIZE	PRIMARY TRIPS			PASSBY TRIPS			TOTAL TRIPS		
		IN	OUT	TOT	IN	OUT	TOT	IN	OUT	TOT
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	3,000 sq ft	13	16	29	6	8	15	19	24	43
Food Services: Food Carts	6 food cart	5	4	9	5	4	9	10	8	18
Recreational: Sports Demo Area	5,000 sq ft	1	1	2	0	1	1	1	2	2
Recreational: Kids Play Zone	3,000 sq ft	1	2	3	1	1	2	2	2	5
Office: Tigerbay Management	300 sq ft	0	0	1	0	0	0	0	0	1
TOTAL		20	23	43	12	14	26	32	37	69

Note: Due to rounding at the end of the analysis, the trip generation volumes numbers may be slightly off by one to two trips.

3.3 WAS Trip Generation

With the unique land use and extensive bus transportation plan proposed for the WAS, trip generation was derived from first principles estimates based on the scheduling and mode split assumptions detailed in Section 1.2 rather than using average trip generation rates.

Based on the proposed schedule, the peak times for site trip generation would occur on Friday evenings and Sunday evenings.

For Fridays, the following activities are assumed to take place in the peak hour between 6:00 p.m. – 7:00 p.m.:

- Buses would travel from the WAS to the staging area to pick up workers at the end of their shift;
- Buses would return from the staging area to the WAS;
- 50% of workers would gather personal belongings and return to Metro Vancouver for the weekend while the remaining 50% of workers would stay for the weekend shifts. Of the 50% of workers travelling back to Metro Vancouver, 80% would take the bus and the remaining 20% would drive;
- 15 local lodge staff and 5 service vehicles would drive from the WAS to Squamish and surrounding areas at the end of their shift; and,
- 50% of the remaining lodge staff (15 staff) that are from Metro Vancouver would return for the weekend. These camp staff were assumed to follow the same travel patterns as the workers (i.e. 80% bus and 20% drive).

Sundays would have similar activities except the number of buses going to/from the waterfront would be decreased with a reduced weekend workforce.

Tables 3.3, **3.4**, and **3.5** below summarize the trip generation for the peak site occupancy during the 2020, 2021, and 2022 horizon years, respectively.

Table 3.3: WAS 2020 Peak Hour Trip Generation

ACTIVITY	FRIDAY		SUNDAY	
	IN	OUT	IN	OUT
Buses to/from WAS and Waterfront	9	9	4	4
Buses to/from WAS and Metro Vancouver	-	4	4	
Worker private vehicles to/from WAS and Metro Vancouver	-	45	45	
Camp staff drivers /Service Vehicles from WAS to Squamish	-	20	-	20
Camp staff drivers from WAS to/from Metro Vancouver	-	3	3	
TOTAL	9	81	56	24

Table 3.4: WAS 2021 Peak Hour Trip Generation

ACTIVITY	FRIDAY		SUNDAY	
	IN	OUT	IN	OUT
Buses to/from WAS and Waterfront	10	10	5	5
Buses to/from WAS and Metro Vancouver	-	5	5	
Worker private vehicles to/from WAS and Metro Vancouver	-	52	52	
Camp staff drivers /Service Vehicles from WAS to Squamish	-	20	-	20
Camp staff drivers from WAS to/from Metro Vancouver	-	3	3	
TOTAL	10	90	65	25

Table 3.5: WAS 2022 Peak Hour Trip Generation

ACTIVITY	FRIDAY		SUNDAY	
	IN	OUT	IN	OUT
Buses to/from WAS and Waterfront	11	11	5	5
Buses to/from WAS and Metro Vancouver	-	5	5	
Worker private vehicles to/from WAS and Metro Vancouver	-	55	55	
Camp staff drivers /Service Vehicles from WAS to Squamish	-	20	-	20
Camp staff drivers from WAS to/from Metro Vancouver	-	3	3	
TOTAL	11	94	68	25

At the peak occupancy, the WAS is estimated to generate 105 trips (11 in, 94 out) and 93 trips (68 in, 25 out) during the Friday and Sunday peak hours, respectively.

Some of these activities, particularly the buses to and from the staging area and Metro Vancouver would have staggered departure times started at the beginning of each respective peak hour to allow adequate time for passenger loading. However, as a conservative measure, all these activities were assumed to occur in the same hour.

The base highway, Britannia Market, Site, and Total peak hour volumes for the 2022 horizon year are summarized in **Exhibit 3.1**

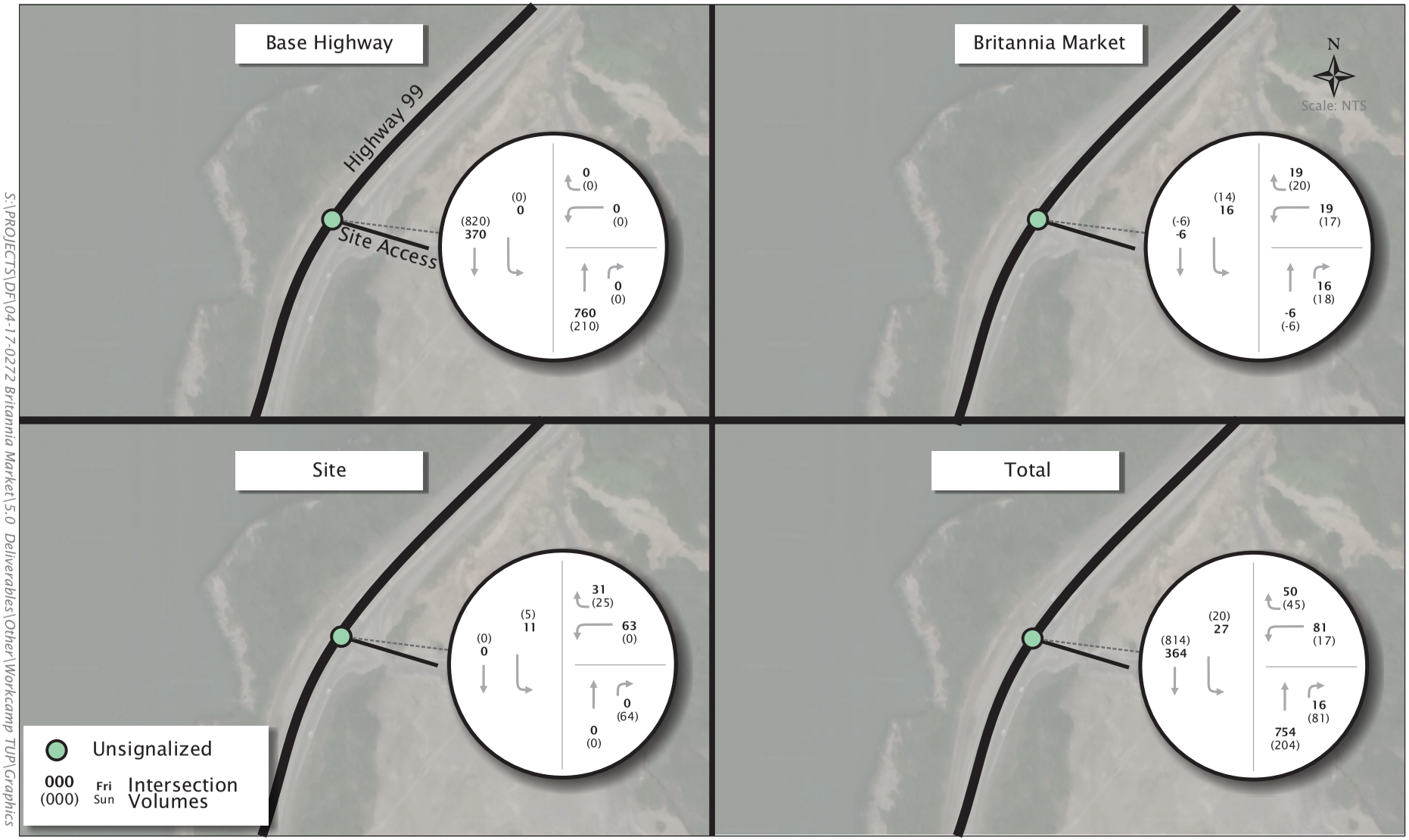

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Exhibit 3.1

Peak Hour Traffic Volumes

South Britannia Workplace Accommodation Site
04-17-0272 December 2018

bunt & associates

4. FUTURE TRAFFIC OPERATIONS

The future traffic operations at the site's unsignalized access to Highway 99 were assessed using Synchro/SimTraffic (Version 9.2) analysis software. The traffic operations were assessed using the performance measures of volume-to-capacity (V/C) ratio from Synchro while the Level of Service (LOS) and 95th percentile queue were assessed using SimTraffic. SimTraffic was used for assessing the delay and queue as Bunt believes it more accurately reflects the effect of the gaps created by nearby signal at Highway 99 / Copper Drive. The results of the analysis can be found below in **Tables 4.1** and **4.2** for the 2022 Friday and Sunday periods, respectively. Only the 2022 operations have been reported as they represent the highest scenarios for both the background highway volumes and site trip generation. Full Synchro/SimTraffic reports for all horizon years can be found in **Appendix B.**

Table 4.1: Friday 2022 Traffic Operations (6:00 PM – 7:00 PM)

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	PM			
		LOS	DELAY (S)	V/C	95TH Q (M)
Hwy 99 & Access A (Unsignalized)	*OVERALL*	*A*	*5.8*	-	-
	WBL	B	13.0	0.45	20
	WBR	A	2.2	0.20	-
	NBT	A	7.8	0.48	-
	NBR	B	10.2	0.01	2
	SBL	A	5.1	0.05	15
	SBT	A	0.8	0.12	-

Table 4.2: Sunday 2022 Traffic Operations (6:00 PM – 7:00 PM)

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	PM			
		LOS	DELAY (S)	V/C	95TH Q (M)
Hwy 99 & Access A (Unsignalized)	*OVERALL*	*A*	*2.3*	-	-
	WBL	A	6.8	0.05	12
	WBR	A	1.8	0.06	-
	NBT	A	4.6	0.13	-
	NBR	A	5.5	0.05	-
	SBL	A	2.9	0.02	5
	SBT	A	1.4	0.26	-

The site access was shown to operate well within typical acceptable performance thresholds for both peak hours. During the Friday PM peak, vehicles completing a westbound left (exiting the site towards Metro Vancouver) were shown to experience an average delay of 13.0 sec, which corresponds to a LOS 'B'. The northbound right was also shown to operate at a LOS 'B'. All other

movements would operate at a LOS 'A' (delay <10 sec). Similarly, for the Sunday PM peak, all movements were shown to operate at a LOS 'A'.

These well-performing operations are largely due to a combination of the peak site activity intentionally being offset from the peak periods of the highway as well as the extensive private bus system proposed to reduce the number of private worker vehicles.

5. PARKING REVIEW

Bunt conducted a high level review of the future parking needs of both the WAS and the staging area to help inform the continued site planning process. **Table 5.1** includes a summary of the estimated required parking supply based on the peak worker occupancy and assumptions detailed in Section 1.2.

Table 5.1: WAS Estimated Parking Supply Requirement

PARKING USER	PEAK NUMBER	BUFFER	REQUIRED PARKING SUPPLY
Workers from Metro Vancouver that drive	110	15%	126
Camp Staff from Squamish	15	15%	17
Camp Staff from Metro Vancouver that drive	3	15%	3
Service Vehicles	5	15%	6
Buses	11	0%	11
TOTAL (ROUNDED)			165

At the peak worker occupancy in 2022, it is estimated the site would require a parking supply of 165 stalls, 11 of which would be for buses.

Parking at the staging area would be required to accommodate the estimated 10% of workers who live locally in Squamish as well as auxiliary stalls to account for higher than anticipated local workers, service vehicles, or special circumstances where workers would drive from the WAS to the staging area, rather than taking the bus. **Table 5.2** provides an estimated required parking supply at the staging area.

Table 5.2: Staging area Estimated Parking Supply Requirement

PARKING USER	PEAK NUMBER	BUFFER	REQUIRED PARKING SUPPLY
Local workers that drive (10% of total work force)	55	15%	63
Auxiliary Stalls	20	-	20
Buses	-	-	-
TOTAL (ROUNDED)			85

At the peak worker occupancy in 2022, it is estimated the staging area would require a parking supply of 85 stalls.

As the arrival/departure times of the buses will be staggered, it is not anticipated that 11 buses would require parking at the staging area at one time. It is recommended that once the bus schedule, headways, and shift change logistics are further refined, the number of bus parking spaces required at the staging area be determined.

6. CONCLUSIONS

Based on Bunt's review of the proposed temporary use at the South Britannia site and its associated transportation impact, a summary of the conclusions of the study is provided below.

Proposed Development

- Tigerbay Development Corporation is proposing a second temporary use for a workplace accommodation site (WAS) at their South Britannia site located just south of the Britannia Beach town. The WAS is intended to provide temporary accommodations between 2020 and 2022 for up to 550 workers of nearby construction and industrial sites, including the Woodfibre LNG project and the FortisBC Eagle Mountain pipeline project.

- The main vehicle access point to the site is anticipated to be via an existing full-movement unsignalized intersection on Highway 99.

- Workers living in the WAS will be transported by private buses between the WAS and staging areas in Squamish. Each bus is assumed to have a capacity of 50 workers.

- In the morning, buses will depart the WAS at 5:00 a.m. and arrive at the staging area starting at approximately 5:20 a.m. After dropping-off the workers, buses will return to the WAS and remain parked until the evening.

- In the evening, buses will return to the staging area, pick-up workers beginning at 6:00 p.m. and arrive back at the WAS at approximately 6:20 p.m.

- At the end of each week, 50% of workers are expected to travel down to Metro Vancouver on Friday evening for their days off and return back to the WAS on Sunday Evening. The remaining 50% of workers would remain for weekend shifts.

- 90% of the workforce is assumed to originate from Metro Vancouver. Of these Metro Vancouver workers, 80% are assumed to take the private buses to/from Metro Vancouver on Friday/Sunday shift changes. The remaining 20% of workers from Metro Vancouver are assumed to drive their own vehicles to/from the WAS on Friday/Sunday shift changes. However, all workers living in the WAS are assumed to use the buses to travel to/from the staging areas during the work week;

- The remaining 10% of the workforce would live locally in Squamish and thus would be driving to/from the staging area directly, and therefore would not represent a vehicle trip near the WAS;

- The WAS is intended to have an average staff of 30 people. These staff would include kitchen staff; cleaning staff; lodge administration, etc. Of these 30 lodge staff, 50% are assumed to live locally in Squamish and drive to/from the WAS each day, while the remaining 50% are assumed to originate from Metro Vancouver and stay on-site. Of those 50% that originate from Metro

Vancouver, 80% are assumed to take the private buses on Friday/Sunday shift changes and the remaining 20% would drive to/from Metro Vancouver at the beginning and end of each week.

Existing Conditions

- Highway 99 runs adjacent to the site with one northbound lane and two southbound lanes with a speed limit of 60km/h at the site access.

- Previous studies and Ministry of Transportation permanent count station data support the idea that traffic characteristics along the Sea to Sky corridor are largely influenced by recreational traffic travelling between Metro Vancouver and Whistler, particularly on Friday and Sunday afternoons. Current site traffic at these peak times is minimal to none.

- Bunt had previously collected traffic volume data at the site access in 2016 to gain an understanding of the existing traffic volumes in the vicinity of the site. Counts were conducted on Friday April 22nd from 3:00 – 6:00 p.m. and on Sunday, April 24th from 1:00 – 4:00 p.m. These counts were then factored up to reflect winter peak hours based on information from the Ministry of Transportation (MoTI) permanent count stations north of Horseshoe Bay (P-99-01NS) and north of Squamish (P-15-3NS).

Future Traffic Conditions

- The background highway volumes for each of the three horizon years were calculated assuming a growth rate of 1.8% per year (compounded) for Highway 99 through traffic.

- Based on the site scheduling, the site is anticipate to generate a minimal amount of trips during the peaks of the highway so the peak of the site was selected as the most appropriate analysis period. The peak of the site is anticipated to occur between 6:00 p.m. – 7:00 p.m. on both Friday and Sunday while the peak hour of the highway typically occurs between 4:00 p.m. – 5:00p.m. and 3:00 p.m. and 4:00 p.m. on Friday and Sunday, respectively. The peak hour highway volumes were then multiplied by the average ratio between the highway peak hour volumes and the hourly volumes from 6:00 p.m. – 7:00 p.m. as informed by the MoTI permanent count station to reflect typical highway volumes during the site peak.

- The first proposed temporary use for the Britannia site was a variety of land uses collectively called “Britannia Market”. This market would include but not be limited to: a farmers’ market, food trucks, ticket sales offices for nearby attractions, and auxiliary/overflow parking. As this market would operate concurrently with the proposed WAS, the estimated trips generated by this market were included as background traffic.

- Trip generation for the proposed WAS was derived using first principles estimates based on the scheduling and mode split assumptions provided to Bunt by Tigerbay. Based on the scheduling provided, the peak times of the site would occur between 6:00 p.m. – 7:00 p.m. on Fridays and Sundays with the return of workers from the staging area at the end of their shift plus an

assumed maximum 50% of the workforce returning to Metro Vancouver for the weekend. At the peak site occupancy in 2022, the WAS is estimated to generate 105 trips (11 in, 94 out) and 93 trips (68 in and 25 out) for the Friday and Sunday peak hours, respectively.

- The site access was shown to operate well within typical acceptable performance thresholds in both peak hours. During the Friday PM peak, vehicles completing a westbound left and northbound right were shown to operate at LOS 'B' while all other movements would operate at LOS 'A'. For the Sunday PM peak, all movement were shown to operate at LOS 'A'. The well-performing traffic operations are largely due to a combination of the peak site activity being offset from the peak periods of the highway, as well as the extensive proposed private bus system.

Parking Review

- A high level review of the future parking needs of both the WAS and staging area was completed to help inform the continued site planning process.

- At the peak site occupancy, the WAS is estimated to require a parking supply of 165 stalls, 11 of which would be for buses. The 165 stalls would provide parking for the 20% of workers who drive to the WAS from Metro Vancouver, lodge staff, service vehicles, plus a 15% buffer.

- At the peak site occupancy, the staging area is estimated to require a parking supply of 85 stalls, The 85 stalls would provide parking for the 10% of workers who are estimated to live locally as well as some auxiliary stalls.

TRANSPORTATION PLANNERS AND ENGINEERS

APPENDIX A

South Britannia Market Traffic Analysis

October 8, 2018
04-17-0272

Mr. Long Cheng
Tigerbay Development Corporation
PO Box 195, 27154 Sea to Sky Highway 99
Britannia Beach, B.C.
V0N 1J0

VIA E-MAIL: long@southbritannia.com

Dear Long:

Re: South Britannia Market – Traffic Analysis for Temporary Use Permit (TUP)
High Level Transportation Assessment Letter (DRAFT)

As requested, Bunt & Associates Engineering Ltd. has conducted a high level transportation assessment for Tigerbay Development's proposed Britannia Market and auxiliary parking use at the South Britannia site located approximately 12km south of the District of Squamish municipality.

This study reviews existing site conditions and provides future vehicle forecast estimates, as well as a discussion of parking needs for the proposed site.

We trust this will assist with the development's TUP application. Please do not hesitate to contact me should you have any questions.

Yours truly,
Bunt & Associates

Daniel Fung, M.Sc., P.Eng.
Associate

Daniel Bragagnini, EIT
Transportation Analyst

1. INTRODUCTION

Tigerbay Development Corporation is proposing temporary land uses at the South Britannia site, which is planned to include the following elements:

- **Open Market:** uses will include an open air farmer and artisan market, highway rest area with children's play zone, food trucks, information kiosks, and adventure sports promotion with booking services and a pickup centre.
- **Auxiliary Parking / Passenger Bus Loop:** the parking lot is expected to serve market visitors and tourists destined for northerly sites such as the Britannia Mining Museum, Murrin Provincial Park, Shannon Falls and the Stawamus Chief Provincial Park in Squamish.
- **Film Production and Staging Lot:** auxiliary lot for production parking and circus operations.

The current plan and intent of the site design is to function as a market area mainly catering to traffic already travelling along Highway 99 as well as a rest and information stop. In addition, the auxiliary parking lot and passenger bus route is expected to provide an attractive solution to the high parking demand at destinations to the north. It is anticipated the parking lot would be operated privately in collaboration with the Britannia Mining Museum, as well as other venues potentially.

This letter is structured as follows:

- Section 2 presents the existing (pre-development) site conditions;
- Section 3 summarizes the estimated future vehicle forecasts;
- Section 4 analyzes the operations of the site access;
- Section 5 presents the findings of a parking review; and
- Section 6 presents the conclusions.

1.1 Site Location and Context

The South Britannia site is located approximately 12km south of the District of Squamish municipality and 50km north of the Vancouver Region along Highway 99. As highlighted in **Exhibit 1.1**, it is situated just south of the Historic Britannia Beach town near the Britannia Mine Museum.

The South Britannia development site comprises approximately 186 acres of land adjacent to Howe Sound. Highway 99 (Sea to Sky Highway) provides access to the site and is the only link between Vancouver, Squamish, and Whistler and all of the communities in between. Upgrades to the Sea to Sky Highway were completed for the 2010 Winter Olympics and have increased safety and accessibility both to the site and between the various communities along the Sea to Sky corridor.

Highway 99 has a posted speed limit of 60km/h in the vicinity of the site and up to 90km/h south of the site and north of Britannia Beach. There is a traffic signal located to the north at the

intersection of Highway 99/Copper Drive, which functions as the main access to North Britannia and the Mine Museum. The patron vehicle access point is anticipated to be via an existing full-movement unsignalized intersection off Highway 99. Use of an existing (gated) service entry is also planned on the north side of the property.

1.2 Proposed Land Uses

The proposal calls for a variety of land uses at the South Britannia site, which, based on latest plans, are anticipated to include the following:

- Artisan Farmers' market (likely operating on Friday and Sunday afternoons);
- Modular based vendors and kiosks (potentially open 7 days a week);
- Sales offices (such as for ticket sales);
- First Nations art and culture shop;
- Food trucks;
- Information display stands (for wayfinding and local businesses/ activities advertising);
- Central gathering area;
- Sports demo area;
- Highway signage with view tower;
- Kids play zone;
- Enclosed dog run area and water fountain; and
- Auxiliary parking use and passenger bus loop.

Table 1.1 summarizes a range of the anticipated minimum and maximum areas for each land use for the South Britannia site. Areas will become further defined as the project design progresses.

Table 1.1: Proposed Land Use Area Breakdown

LAND USE DESCRIPTION	SIZE RANGE	ESTIMATED AREA (SQ FT)	
		MINIMUM	MAXIMUM
Artisan / Farmer Market Zone, Vendors, Kiosks, and Sales Offices	25 – 150 vendors	3,000	16,000 (for special event)
Food Trucks	1 – 6 trucks	1,000	6,000
Information Display Stands	N/A	2,400	4,800
Central Gathering Area	N/A	5,600	12,000
Sports Demo Area	N/A	-	5,000
View Tower	N/A	-	5,000
Kids Play Zone	N/A	1,000	3,000
Dog Run Area	N/A	1,200	1,500
Site Office (Tigerbay Management)	N/A	-	300

Note #1: The artisan/farmer market is anticipated to include 75 vendors as a high end estimate, but could potentially be expanded to 150 vendors using pop-up tents on a special event market day (though this would occur more infrequently and expected to only happen once or twice a month).

When the Market first opens, it is expected to operate at the lower end of the size range provided in Table 1.1 and will not operate at maximum capacity. Film production uses are not expected to generate trips during the peak periods along Highway 99, as loading and unloading for filming

tends to happen either in the early morning hours or in the late evening (during off-peak hours) and can be moderated / scheduled through a tenancy agreement with each production.

Through discussion with the developer, it is expected that the Market would maintain seasonal hours to account for demand and daylight constraints. The Market may be open for business from 9:30-21:30 on summer weekends, while operation hours may shrink to 12:00-18:30 during winter weekdays. These hours of operation represent only the minimal capacity of the anchor kiosks – additional vendors and/or pop-up tent kiosks may open for shorter periods each day depending on customer attendance. Special events or customer requests may require these hours of operation be revisited as the development process continues.

In addition to the market kiosks, the current plans call for an auxiliary parking lot with a passenger bus loop that would help serve popular tourist destinations further to the north of the site, like the Britannia Mining Museum, Murrin Provincial Park, Shannon Falls and the Stawamus Chief Provincial Park in Squamish, where parking lots are known to often be over-capacity during peak periods.

A private park and ride presents an ideal solution for parking issues at tourist destinations along the Howe Sound corridor and would provide a vital connection and much needed alternative transportation mode. Any available parking in the area, coupled with promotion and adequate signage approved by MoTI, has a high potential to remove vehicles off Highway 99. For example, electronic signs notifying northbound drivers if parking lots are full at any of the Britannia Mining Museum, Murrin Provincial Park, Shannon Falls or Stawamus Chief Provincial Park sites would encourage the drivers to park at South Britannia and utilize the shuttle service rather than arriving at a full parking lot and being forced to continue elsewhere to seek parking.

S:\PROJECTS\DF\04-17-0272 Britannia Market\5.0 Deliverables\Other\Graphics

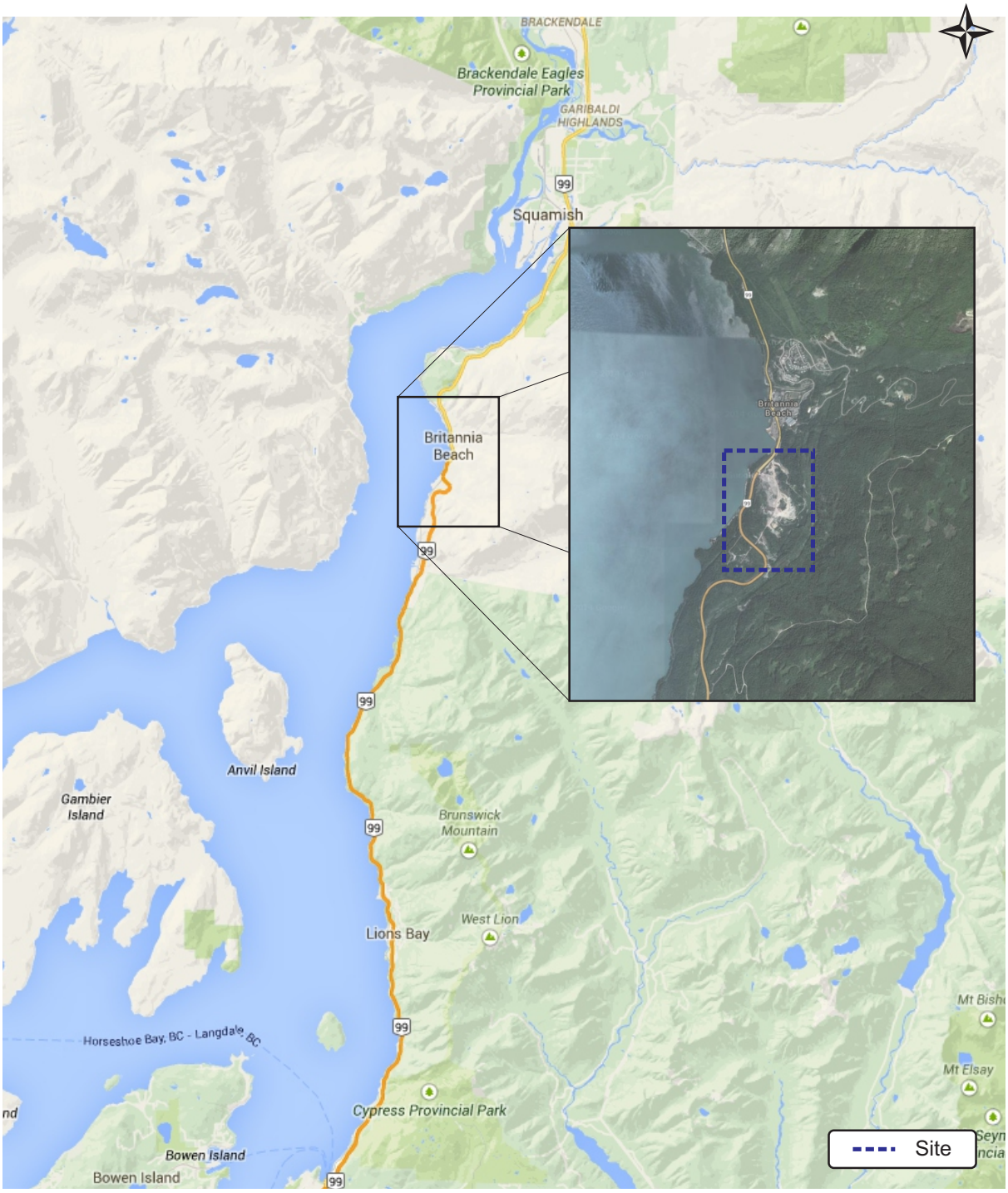

Exhibit 1.1
Site Location

South Britannia Market Transportation Assessment
04-17-0272 February 2018 Scale NTS

bunt & associates

2. EXISTING SITE CONDITIONS

This section details the existing site and reviews the surrounding transportation networks covering streets and transit. Bunt's available data for Highway 99 volumes is also discussed.

2.1 Roadway System

Highway 99

Also known as the Sea to Sky Highway, Highway 99 is the major north-south corridor connecting the US Border to the Howe Sound Area through Greater Vancouver, Britannia, Squamish, Whistler and Pemberton. It runs north up to Cache Creek and connects to Highway 97.

The recently upgraded Highway 99, a legacy of the 2010 Olympics, is a lifeline for all communities along the Sea to Sky Corridor. At Britannia Beach, Highway 99 provides for the safe and efficient movement of longer distance highway traffic while also supporting good access to development.

The existing highway consists of a combination of one and two lanes per direction. Posted speeds range from 60km to 100km, with lower speed limits designated in urban areas such as Squamish and near signalized intersections.

At the proposed 3-way unsignalized site access, Highway 99 is one lane northbound, two lanes southbound, and deceleration/turning lanes are provided both for northbound and southbound traffic approaching the site. No acceleration/merge lanes are provided, although both right turn movements are channelized. The speed limit is 60km/h.

2.2 Transit Service

Currently, public transit services along the Highway 99 corridor are limited. TransLink (officially known as South Coast British Columbia Transportation Authority) is the corporation responsible for the regional transportation network in Greater Vancouver. They provide transit services that extend north up to the community of Lions Bay (Routes 259 and 262) approximately 20km south of Britannia Beach. BC Transit, the transit authority responsible for transportation services outside of the Greater Vancouver area provides public transit services in Squamish, Whistler and Pemberton.

No regional transit connections are presently provided between Lions Bay and Squamish / Whistler. However, BC Transit's *Sea to Sky Transit Future Plan* (published in 2015) includes recommendations which call for the introduction of an interregional transit service between Squamish and Metro Vancouver by 2020.

Private coach bus companies offer transportation services along the corridor. Greyhound, Pacific Coach Lines (PCL), Squamish Shuttle (Squamish Connector), and Whistler Shuttle provide connections from the Vancouver International Airport through Downtown Vancouver, Squamish and Whistler. Some of these services do stop on request at specific locations along the Highway 99 corridor, including the existing Britannia Beach access and North Britannia (at Copper Drive).

2.3 Highway 99 Traffic Volume Counts

Bunt had previously collected traffic volume data in 2016 in order to gain an understanding of the existing traffic volumes in the vicinity of the site. Counts were conducted on Friday, April 22nd from 3-6 PM and Sunday, April 24th from 1-4 PM. Friday PM and Sunday PM were chosen as design hours because Ministry of Transportation (MoTI) permanent count stations north of Horseshoe Bay (P-99-01NS) and north of Squamish (P-15-3NS) indicated that these are the times of peak northbound and southbound traffic, respectively. Furthermore, the MoTI year-round count station data allowed the April Bunt data to be factored up to reflect winter peak hours. **Table 2.1** below summarizes the peak traffic volumes for each peak period.

Table 2.1: Existing Highway 99 Peak Hour Volumes (Based on 2016 Counts)

DIRECTION	2016 (VEHICLES PER HOUR)		
	WEEKDAY AM	WEEKDAY PM	SUNDAY
Northbound	530	1,020	370
Southbound	490	500	1,450

Note the above counts are the most recent data collected by Bunt and form the basis for this assessment. Further detail on assumptions regarding background traffic is provided in the following section.

3. ESTIMATED FUTURE TRAFFIC FORECASTS

The following section details the vehicle trip rates used for the trip generation forecast estimates, as well as assumptions taken with regards to pass-by trips. A summary of the net impact on directional traffic volumes on Highway 99 is also presented.

3.1 Background Traffic

The background traffic volume is calculated using a growth rate of 1.8% per year (compounded) for Highway 99 imposed on the 2016 traffic volumes noted above with no highway traffic capacity constraints. The growth rate was based on previous Highway 99 forecast studies prepared by Apex Engineering as part of the 2004-era work for the Sea to Sky Improvement Project. This growth rate was confirmed looking at historic MoTI P-15-3NS count station data for the 100th highest peak hour on Highway 99. The traffic forecast estimates for the year 2018 are shown in **Table 3.1** below.

Table 3.1: Projected Highway 99 Volumes

DIRECTION	YEAR 2018 (VEHICLES PER HOUR)		
	WEEKDAY AM	WEEKDAY PM	SUNDAY
Northbound	550	1,060	380
Southbound	510	520	1,500

3.2 Estimated Trip Generation

Table 3.2 summarizes the trip generation rates assumed, which are based on trip rates for similar land use types in the ITE Trip Generation Manual (10th edition). The weekday AM peak hour was not analyzed since the traffic volumes on Highway 99 are lower during that time period than in the Friday and Sunday afternoon peak periods. In addition, any resulting morning trip generation would be small in comparison to the afternoon peak periods.

Opus International Consultants' *2031 District Wide Multi-Modal Transportation Study* (September, 2011), which was prepared for the District of Squamish and is based on Ministry of Transportation permanent count station data, indicates that traffic characteristics on the corridor are largely influenced by recreational traffic travelling between Metro Vancouver and Whistler as the weekend approaches. Moreover, the study states that "Sunday and Friday hourly patterns support the idea that Highway 99 experiences heavy recreational traffic on weekends".

Of note, Sunday trip rates for all uses have been assumed to be the same as the weekday PM trip rates, with no reductions applied. As discussed in previous sections, the filming use is not expected to generate trips during the peak periods and loading/unloading would likely occur during off-peak periods along the highway. Furthermore, this caliber filming use has occurred at the site for a number of years; as such, this use has been excluded from the analysis. The view tower is part of signage along the highway and is not expected to generate any substantial amount of trips. In any

case, it is anticipated that several of the view tower patrons would already be at the site for the market and other uses that are expected to generate more trips.

Table 3.2: ITE Vehicle Trip Rates

LAND USE	SOURCE	VARIABLE	WEEKDAY PM & SUNDAY PEAK HOUR		
			IN	OUT	TOTAL
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	ITE (826) – Specialty Retail Centre	Per 1000 sq. ft. of GLA	44%	56%	2.71
Food Services: Food Carts	ITE (926) – Food Cart Pod	Per food cart	55%	45%	3.08
Recreational: Sports Demo Area	ITE (460) – Arena	Per 1000 sq. ft. of GFA	36%	64%	0.47
Recreational: Kids Play Zone	ITE (436) – Trampoline Park	Per 1000 sq. ft. of GFA	48%	52%	1.50
Office: Tigerbay Office	ITE (712) – Small Office Building	Per 1000 sq. ft. of GFA	32%	68%	2.45

Note #1: Area provided in plans for the commercial component is assumed to be GLA and includes some circulation space.
Note #2: ITE (826) rates were used for the PM peak hour (from 9th Edition Trip Generation Manual). However, as the AM peak hour of adjacent street traffic rate is not available for ITE (826), the ratio of the PM Average Rate for ITE (826) to the PM Average Rate for ITE (820) was applied to the ITE (820) AM rate to determine an approximate ITE (826) AM rate.
Note #3: PM peak hour directional distributions for ITE (926) are not available. As such, the PM directional distributions for ITE (930) – Fast Casual Restaurant were used.

Based on discussions with the project's development manager, the farmers' market will predominantly entail the sale of high end goods and souvenirs (primarily targeting vendors with goods such as jewellery and pottery) and is expected to generate fewer trips than a conventional farmers' market.

3.2.1 ITE Pass-by Rates

Primary trips have a destination that is the primary purpose of the trip. Pass-by trips represent an intermediate stop along the way from an origin to a primary destination. ITE pass-by standards have been applied to the commercial, food cart, and recreational uses of the site. For the commercial component, ITE (820) – Shopping Centre pass-by rates were applied at a rate of 34% for the Weekday PM and Sunday peak hours. For the food service component, ITE (934) – Fast Food Restaurant pass-by rates of 50% were applied for the Weekday PM and Sunday peak hours.

Given the likely heavier recreational traffic along Highway 99 travelling between Metro Vancouver and destinations to the north (as the weekend approaches), it is expected that there would also be some pass-by for the recreational uses of the site. The ITE commercial pass-by rates of 34% were also applied to the recreational land uses for both the Weekday PM and Sunday peak hours.

As the project's site design is still progressing, low end and high end trip generation forecasts have been estimated and are presented as a range in the tables below. **Table 3.3a** below shows the estimated trip generation forecasts if the site were to develop with the minimum land use sizes listed in the preceding Table 1.1. **Table 3.3b** presents the estimated trip generation with maximum anticipated land use sizes. Note, the information provided under "Total Trips (With Passby)" is shown for the purpose of understanding the net trips added to the network. Any assessments made were completed using the information from the "Total Trips (without passby)" along with anticipated passby volumes included.

Table 3.3a: Site-Generated Vehicle Trips (with <u>minimum</u> anticipated land use sizes)

LAND USE	MIN SIZE	TOTAL TRIPS (WITHOUT PASSBY)			PASSBY TRIPS			TOTAL TRIPS (WITH PASSBY)		
		IN	OUT	TOT	IN	OUT	TOT	IN	OUT	TOT
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	3,000 sq ft	4	5	8	1	2	3	2	3	5
Food Services: Food Carts	1 food cart	2	1	3	1	1	2	1	1	2
Recreational: Sports Demo Area	5,000 sq ft	1	2	2	0	1	1	1	1	2
Recreational: Kids Play Zone	1,000 sq ft	1	1	2	0	0	1	0	1	1
Office: Tigerbay Management	300 sq ft	0	0	1	0	0	0	0	0	1
TOTAL		7	9	16				4	6	10

Note: Due to rounding at the end of the analysis, the trip generation volumes numbers may be slightly off by one to two trips.

Table 3.3b: Site-Generated Vehicle Trips (with maximum anticipated land use sizes)

LAND USE	MIN SIZE	TOTAL TRIPS (WITHOUT PASSBY)			PASSBY TRIPS			TOTAL TRIPS (WITH PASSBY)		
		IN	OUT	TOT	IN	OUT	TOT	IN	OUT	TOT
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	3,000 sq ft	19	24	43	6	8	15	13	16	29
Food Services: Food Carts	6 food cart	10	8	18	5	4	9	5	4	9
Recreational: Sports Demo Area	5,000 sq ft	1	2	2	0	1	1	1	1	2
Recreational: Kids Play Zone	3,000 sq ft	2	2	5	1	1	2	1	2	3
Office: Tigerbay Management	300 sq ft	0	0	1	0	0	0	0	0	1
TOTAL		32	37	69				20	23	43

Note: Due to rounding at the end of the analysis, the trip generation volumes numbers may be slightly off by one to two trips.

Based on this assessment, the proposed South Britannia Market is expected to generate between 10 and 43 trips in the weekday PM and Sunday peak hours, assuming standard ITE pass-by.

3.2.2 Pass-by Sensitivity Analysis

As per latest plans, some of the modular based vendors and kiosks are planning to provide sports equipment/gear rentals, as well as adventure sports sales and booking for other destinations. It is very possible that the heavy recreational traffic already traveling between Metro Vancouver and destinations further to the north could be stopping by the site as pass-by traffic in greater numbers, whether to pick up food, rent sports equipment, or shop for souvenirs; as such, standard ITE commercial pass-by rates may not directly apply to the planned uses at the site. Nonetheless, it would be difficult to quantify the actual rate of pass-by without a study or survey at a nearby site with similar land uses (potentially like the Sea to Sky Gondola) to determine whether the study site is the primary destination of the patrons or if it is a stop enroute to another destination. Even with a survey, it would still be challenging to accurately quantify pass-by as the uses of the study site may not entirely represent the unique uses that are planned for the South Britannia Market site.

Given the difficulty in quantifying the amount of recreational traffic, a sensitivity scenario was conducted in which the ITE pass-by rates were doubled. **Table 3.4a** and **3.4b** below shows the estimated trip generation forecasts with the higher pass-by rates applied.

Table 3.4a: Site-Generated Vehicle Trips (with minimum anticipated land use sizes and increased pass-by rate)

LAND USE	MIN SIZE	TOTAL TRIPS (WITHOUT PASSBY)			PASSBY TRIPS			TOTAL TRIPS (WITH PASSBY)		
		IN	OUT	TOT	IN	OUT	TOT	IN	OUT	TOT
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	3,000 sq ft	4	5	8	2	3	6	1	1	3
Food Services: Food Carts	1 food cart	2	1	3	2	1	3	0	0	0
Recreational: Sports Demo Area	5,000 sq ft	1	2	2	1	1	2	0	0	1
Recreational: Kids Play Zone	1,000 sq ft	1	1	2	0	1	1	0	0	0
Office: Tigerbay Management	300 sq ft	0	0	1	0	0	0	0	0	1
TOTAL		7	9	16				2	3	5

Note: Due to rounding at the end of the analysis, the trip generation volumes numbers may be slightly off by one to two trips.

Table 3.4b: Site-Generated Vehicle Trips (with maximum anticipated land use sizes and increased pass-by rate)

LAND USE	MIN SIZE	TOTAL TRIPS (WITHOUT PASSBY)			PASSBY TRIPS			TOTAL TRIPS (WITH PASSBY)		
		IN	OUT	TOT	IN	OUT	TOT	IN	OUT	TOT
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	3,000 sq ft	19	24	43	13	17	29	6	8	14
Food Services: Food Carts	6 food cart	10	8	18	10	8	18	0	0	0
Recreational: Sports Demo Area	5,000 sq ft	1	2	2	1	1	2	0	0	1
Recreational: Kids Play Zone	3,000 sq ft	2	2	5	1	2	3	1	1	1
Office: Tigerbay Management	300 sq ft	0	0	1	0	0	0	0	0	1
TOTAL		32	37	69				7	9	17

Note: Due to rounding at the end of the analysis, the trip generation volumes numbers may be slightly off by one to two trips.

Based on this assessment with higher pass-by assumed, the proposed development is expected to generate between 5 and 17 trips in the weekday PM and Sunday peak hours.

3.2.3 Auxiliary Parking Lot and Bus Service

The planned auxiliary parking lot and bus service (for destinations further north) at the site would also play a role in pulling northbound traffic off Highway 99. At this point, it would be difficult to

quantify the amount of vehicles that would be parking at the site and using the bus service without a survey of parking demand at destinations to the north of the site. In addition, pass-by traffic that has already been accounted for in this analysis could entail Market patrons that then use the bus service to continue on northwards.

Current plans are for a bus service (with capacity for approximately 30 passengers) to depart every 45 minutes during the peak periods on the highway. As discussed previously, with implementation of this bus service and adequate promotion, there is a high potential to pull vehicles headed to northern tourist destinations off the highway. **Nonetheless, as presented in the following section, the net impact of the site traffic on Highway 99 during peak hours is minimal, regardless of whether or not the impacts of the bus service are considered.**

3.3 Net Traffic Impact

The impact of the estimated net site traffic is shown in **Tables 3.5a** and **3.6b**. The impact may vary since a range in the amount of pass-by traffic was considered (as discussed in Section 3.2.2). The percent change presented below corresponds to the analysis using standard ITE pass-by rates; as such, the impact may be even lower than what is shown below.

Table 3.5a: Low End Estimate of Net Change in Traffic Volumes on Highway 99

DIRECTION	WEEKDAY PM PEAK HOUR VOLUMES			SUNDAY PEAK HOUR VOLUMES		
	YEAR 2018 (VEH/HR)	NET NEW (VEH/HR)	PERCENT CHANGE	YEAR 2018 (VEH/HR)	NET NEW (VEH/HR)	PERCENT CHANGE
North-bound & South-bound	1,580	9 to 14	<1%	1,880	9 to 14	<1%

Table 3.5b: High End Estimate of Net Change in Traffic Volumes on Highway 99

DIRECTION	WEEKDAY PM PEAK HOUR VOLUMES			SUNDAY PEAK HOUR VOLUMES		
	YEAR 2018 (VEH/HR)	NET NEW (VEH/HR)	PERCENT CHANGE	YEAR 2018 (VEH/HR)	NET NEW (VEH/HR)	PERCENT CHANGE
North-bound & South-bound	1,580	21 to 48	~3%	1,880	21 to 48	~2%

As the table shows, the net increase of traffic volume on Highway 99 is expected to be 3% at the very most during the weekday PM peak hour, assuming all of site's land uses were to develop with the maximum possible areas. **It is expected that fewer southbound vehicles would stop at the site (particularly during the Sunday peak period), as recreational traffic would likely be intending to return directly to Metro Vancouver from northern destinations after the weekend. Moreover, the site programming is more attractive to northbound visitors than southbound travelers.** This is discussed more in Section 4.2.

3.4 Comparison with South Britannia Master Plan

Phase 1 of the South Britannia Master Plan Transportation Impact Analysis included development of 16 single family homes, 418 multi-family residential units, 5,382 square feet of commercial space, 17,222 square feet of institutional space, and 5,000 square feet of space for a municipal building. This initial phase was originally planned for completion in 2025. These uses combined were expected to generate approximately 236 trips in the weekday PM peak hour and 188 trips in the Sunday peak hour.

According to the South Britannia Master Plan Transportation Impact Assessment dated April 29, 2016, the existing unsignalized access to the site would be appropriate for Phase 1. In other words, any upgrades would not be required until after that point. The currently planned farmers' market and other land uses of the site will result in significantly fewer trips when compared to Phase 1 of the South Britannia Master Plan.

4. SITE ACCESS ANALYSIS

4.1 Existing Condition

As explained in Section 2.1, an existing unsignalized T-intersection is proposed to be the sole patron access to the South Britannia Market. At present, the access is usually blocked by a locked gate, thus traffic at the intersection solely consists of through movements on Highway 99. During periods of filming activity, the production truck convoy typically arrives around 6 AM, remains on site until the end of filming, and then leaves around midnight. While the operations of the access point are unknown for these scenarios, they are expected to be acceptable given the low volume of night traffic on Highway 99.

4.2 Operations with Market Traffic

The estimated traffic generated by the proposed site was distributed based on existing highway traffic patterns and observations at other communities along the Sea to Sky corridor, as well as per discussions with SLRD staff. **Table 4.1** summarizes the northbound and southbound split distributions along the highway. These splits are consistent with those applied in the South Britannia Beach Master Plan. It is likely that Market programming will result in a traffic distribution more skewed to northbound traffic; however, as southbound traffic wishing to enter and exit the site makes up the critical turning movements, this more even split was assumed as a conservative estimate.

Table 4.1: Traffic Distribution – Highway Splits

TIME PERIOD	HIGHWAY TRAFFIC	
	NORTHBOUND	SOUTHBOUND
Weekday AM	50%	50%
Weekday PM	50%	50%
Sunday	55%	45%

As it was expected that the traffic signal at Highway 99 / Copper Drive 750m north of the site access would cause gaps in southbound traffic due to vehicle platooning, the micro-simulation software SimTraffic was used to give a better estimate of potential actual operations.

Assuming total vehicle trips associated with the **maximum** anticipated land use sizes (including pass-by trips), the site access operates acceptably during both the Friday PM peak and the Sunday PM peak, as described in the upcoming subsections.

4.2.1 Market Traffic Only

All results are based on SimTraffic analysis of the road network. During the Friday PM peak, vehicles exiting the site to the south (WBL) experience an average delay of 13.8 sec, which corresponds to Level of Service (LOS) B. All other movements operate at LOS A (delay <10 sec).

During the Sunday peak, the WBL movement remains the critical movement, though delay is only calculated to be 8.0 sec. As such, all movements operate at LOS A at this time.

4.2.2 Operations Sensitivity Analysis

As the site access operated acceptably with the addition of Market traffic only, a further case was tested to understand the operational capabilities of the existing intersection. Analysis of the maximum site traffic volumes possible was conducted, assuming LOS E is the limit of acceptable operation for each movement at the site access.

During the Friday PM peak, more than 5 times the forecasted maximum Market traffic was found to be able to utilize the intersection (188 in, 220 out), at which point the WBL manoeuvre experienced an average delay of 45 sec, or LOS E.

During the Sunday peak, more than 8 times the forecasted Market traffic was found to be able to utilize the intersection (289 in, 331 out), at which point the WBL manoeuvre experienced an average delay of 34 sec, or LOS D.

4.3 Results

Based on the aforementioned analysis, the existing unsignalized site access is more than sufficient to handle projected Market traffic, even during the times of peak traffic volume. This analysis includes multiple safety factors, including the fact that the critical movement, WBL, most likely experiences significantly less than 50% of traffic exiting the site, based on Market programming. Furthermore, even assuming a 50/50 northbound/southbound directional split, **the intersection has been shown to operate acceptably at site traffic levels 5 times the projected maximums.**

5. PARKING REVIEW

5.1 Vehicle Parking Bylaw Review

At this stage of the planning process, a detailed parking allocation and analysis has not been undertaken. Bunt has however conducted a review of the existing SLRD Zoning Bylaw parking supply requirements to identify the District's existing regulatory parking supply requirements for the proposed South Britannia Market.

The Squamish-Lillooet Regional District Electoral Area D Zoning Bylaw No.1350 (consolidated November 2016) specifies off-street parking rates for different land uses. **Table 5.1** summarizes the rates and corresponding spaces required for the proposed development.

Table 5.1a: Bylaw Parking Supply Requirement (with minimum anticipated land use sizes)

LAND USE	MIN SIZE	BYLAW RATE	SPACES REQUIRED
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	3,000 sq ft	3 spaces per 100m² of GFA	8
Food Services: Food Carts	1,000 sq ft	6 spaces per 100m² of GFA	6
Recreational: Sports Demo Area	5,000 sq ft	3 spaces per 100m² of GFA	14
Recreational: Kids Play Zone	1,000 sq ft	3 spaces per 100m² of GFA	3
Office: Tigerbay Management	300 sq ft	1 space per 50m² of GFA	1
Recreational: Dog Run Area	1,200 sq ft	3 spaces per 100m² of GFA	3
		TOTAL	35

Note #1: Recreational use rates are not provided in Zoning Bylaw. Commercial rates were used in lieu.

Table 5.1b: Bylaw Parking Supply Requirement (with maximum anticipated land use sizes)

LAND USE	MIN SIZE	BYLAW RATE	SPACES REQUIRED
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	16,000 sq ft	3 spaces per 100m² of GFA	45
Food Services: Food Carts	6,000 sq ft	6 spaces per 100m² of GFA	33
Recreational: Sports Demo Area	5,000 sq ft	3 spaces per 100m² of GFA [1]	14
Recreational: Kids Play Zone	3,000 sq ft	3 spaces per 100m² of GFA [1]	8
Office: Tigerbay Management	300 sq ft	1 space per 50m² of GFA	1
Recreational: Dog Run Area	1,500 sq ft	3 spaces per 100m² of GFA [1]	4
			105

Note #1: Recreational use rates are not provided in Zoning Bylaw. Commercial rates were used in lieu.

Based on the Bylaw, a total of between 35 and 105 stalls would be required, depending on whether the site develops with the minimum or maximum land use areas.

5.2 ITE Parking Generation Review

A high level parking generation review was undertaken by Bunt in order to provide a comparison against the Bylaw rates. It should be noted that these rates are for informational purposes only and are provided as a point of reference. ITE rates were not available for several of the unique planned land uses of the site, and as such, the most similar land uses were selected as part of the analysis. For the recreational component, an average of rates for similar land uses was taken and applied.

Table 5.2 summarizes the ITE rates and corresponding spaces calculated as a point of reference.

Table 5.2a: ITE Parking Space Calculation (with minimum anticipated land use sizes)

LAND USE	MIN SIZE	SOURCE	ITE RATE	SPACES
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	3,000 sq ft	ITE 820 – Shopping Centre	2.94 spaces per 1000ft² of GFA	9
Food Services: Food Carts	1,000 sq ft	ITE 934 – Fast Food Restaurant	9.98 spaces per 1000ft² of GFA	10
Recreational: Sports Demo Area	5,000 sq ft	Average of: ITE 435 – Multi-purpose Rec. Facility, ITE 464 – Roller Skate Rink, ITE 465 – Ice Skate Rink	6.79 spaces per 1000ft² of GFA	34
Recreational: Kids Play Zone	1,000 sq ft	Average of: ITE 435 – Multi-purpose Rec. Facility, ITE 464 – Roller Skate Rink, ITE 465 – Ice Skate Rink	6.79 spaces per 1000ft² of GFA	7
Office: Tigerbay Management	300 sq ft	ITE 701 – Office Building	2.83 spaces per 1000ft² of GFA	1
Recreational: Dog Run Area	1,200 sq ft	ITE 411 – City Park	15.0 spaces per acre	1
				62

Table 5.2b: ITE Parking Space Calculation (with maximum anticipated land use sizes)

LAND USE	MAX SIZE	SOURCE	BYLAW RATE	SPACES
Commercial: Farmers' Market, Vendors/ Kiosks, Sales Offices	16,000 sq ft	ITE 820 – Shopping Centre	2.94 spaces per 1000ft² of GFA	48
Food Services: Food Carts	6,000 sq ft	ITE 934 – Fast Food Restaurant	9.98 spaces per 1000ft² of GFA	60
Recreational: Sports Demo Area	5,000 sq ft	Average of: ITE 435 – Multi-purpose Rec. Facility, ITE 464 – Roller Skate Rink, ITE 465 – Ice Skate Rink	6.79 spaces per 1000ft² of GFA	34
Recreational: Kids Play Zone	3,000 sq ft	Average of: ITE 435 – Multi-purpose Rec. Facility, ITE 464 – Roller Skate Rink, ITE 465 – Ice Skate Rink	6.79 spaces per 1000ft² of GFA	21
Office: Tigerbay Management	300 sq ft	ITE 701 – Office Building	2.83 spaces per 1000ft² of GFA	1
Recreational: Dog Run Area	1,500 sq ft	ITE 411 – City Park	15.0 spaces per acre	1
				165

Based on these rates, a total of between 62 and 165 stalls would be needed, depending on whether the site develops with the minimum or maximum land use areas.

6. CONCLUSIONS

6.1 Proposed Land Uses

- The proposed South Britannia Market site is located just south of the Historic Britannia Beach town near the Britannia Mine Museum (about 12km south of Squamish). The land uses will consist of an open market with modular based vendors, kiosks, kids' activities, and food trucks, along with an auxiliary parking lot and passenger bus loop expected to help serve destinations further to the north. A staging lot is also planned for film production uses.

- The patron vehicle access point is anticipated to be via an existing full-movement unsignalized intersection off Highway 99. Use of an existing (gated) service entry is also planned on the north side of the property.

- Film production uses are not expected to generate trips during the peak periods along Highway 99, as loading and unloading for filming tends to happen either in the early morning hours or in the late evening (during off-peak hours) and can be moderated/scheduled by the Production Manager.

- A park and ride presents an ideal solution for parking issues at tourist destinations along the Howe Sound corridor, where parking lots are known to often be over-capacity during peak periods. In addition, plans call for a bus service departing every 45 minutes during peak periods (with expected capacity of approximately 30 passengers), which would help provide a vital connection in the area and a much needed alternative transportation mode.

- Coupled with adequate signage and promotion, the auxiliary lot and bus service has a high potential to remove vehicles off Highway 99. All signage will be subject to MoTI approval due to proximity to Highway 99.

6.2 Existing Corridor and Site Conditions

- Highway 99 runs adjacent to the site and consists of a combination of one and two lanes per direction. Posted speeds range from 60 to 100 km/h, with lower speed limits designated in urban areas such as Squamish and near signalized intersections. The highway is one lane northbound and two lanes southbound at the Market site, with a speed limit of 60 km/h.

- No regional transit connections are presently provided between Lions Bay and Squamish / Whistler. However, BC Transit's *Sea to Sky Transit Future Plan* (published in 2015) includes recommendations which call for the introduction of an interregional transit service between Squamish and Metro Vancouver by 2020, potentially bringing regular transit service to Britannia.

- Previous studies and Ministry of Transportation permanent count station data support the idea that traffic characteristics along the Sea to Sky corridor are largely influenced by recreational traffic travelling between Metro Vancouver and Whistler, particularly on Friday and Sunday afternoons. Current site traffic at these peak times is minimal to none.

6.3 Estimated Future Traffic Forecasts

- Trip rates used are based on trip rates for similar land use types in the ITE Trip Generation Handbook (10th edition).

- Pass-by trips represent an intermediate stop along the way from an origin to a primary destination. In other words, pass-by would represent existing vehicles already travelling on Highway 99 (between Metro Vancouver and northern tourist destinations) that would stop by the site. Two analyses were carried out using standard ITE pass-by rates and a sensitivity scenario in which pass-by rates were doubled.

- Assuming standard ITE pass-by trip rates, approximately 10 to 43 net trips (on the network inclusive of passby assumptions) are expected to be generated by the South Britannia Market Site during the weekday PM and Sunday peak hours, depending on whether the site develops with the minimum or maximum anticipated land use sizes. **The maximum size is expected to occur infrequently and only during special event market days once or twice a month.**

- Given heavy recreational traffic traveling on Highway 99 between Metro Vancouver and destinations further to the north, pass-by trip rates could be higher than the standard ITE rates. With higher pass-by rates applied, the site would be expected to generate approximately 5 to 18 trips during the weekday PM and Sunday peak hours, depending on whether the site develops with the minimum or maximum anticipated land use sizes.

- The net increase of volumes on Highway 99 is expected to be minimal and at most 1 to 3% in the weekday PM peak hour (assuming maximum land use area build out and a special event market day), depending on the amount of pass-by considered.

- It would be difficult to quantify the actual rate of pass-by without a study or survey at a nearby site with similar land uses (such as the Sea to Sky Gondola) to determine whether the study site is the primary destination of the patrons or if it is a stop en route to another destination. Even with a survey, it would still be challenging to accurately quantify pass-by as the uses of the study site may not entirely represent the unique uses that are planned for the South Britannia Market site.

- Phase 1 of the South Britannia Master Plan was expected to generate approximately 236 trips in the weekday PM peak hour and 188 trips in the Sunday peak hour. In comparison, the currently planned farmers' market is expected to result in significantly fewer trips.

6.4 Future Traffic Performance

- Based on the projected maximum traffic case and SimTraffic analysis, the unsignalized site access operates acceptably at all times, with the critical movement and time being westbound left turns (WBL) during the Friday PM peak operating at LOS B.

- The existing unsignalized intersection can handle site volumes more than 5 times the projected volumes and still operate under acceptable conditions (LOS E or better).

6.5 Parking Review

- Based on the Squamish-Lillooet Regional District Electoral Area D Zoning Bylaw No.1350 (consolidated November 2016), a total of between 35 and 105 stalls would be required, depending on whether the site develops with the minimum or maximum land use areas. As other parking lots in the area are overcapacity during peak times, it is recommended to provide the maximum number of parking spaces.

- A high level parking generation review was undertaken by Bunt using ITE parking generation rates in order to compare with the Bylaw rates. Based on these rates, a total of between 62 and 165 stalls would be needed, depending on whether the site develops with the minimum or maximum land use areas.

TRANSPORTATION PLANNERS AND ENGINEERS

bunt & associates

APPENDIX B

Synchro Reports

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	13	33	822	21	7	399
v/c Ratio	0.05	0.13	0.53	0.02	0.02	0.26
Control Delay	24.6	12.0	4.8	1.2	2.5	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.6	12.0	4.8	1.2	2.5	2.9
Queue Length 50th (m)	1.1	0.0	30.6	0.0	0.2	10.6
Queue Length 95th (m)	5.7	6.7	58.5	1.2	0.9	20.3
Internal Link Dist (m)	177.0		427.8			136.4
Turn Bay Length (m)				65.0	75.0	
Base Capacity (vph)	660	611	1883	1601	557	1883
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.05	0.44	0.01	0.01	0.21

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	12	30	756	19	6	367
Future Volume (vph)	12	30	756	19	6	367
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	1883	1601	1789	1883
Flt Permitted	0.95	1.00	1.00	1.00	0.30	1.00
Satd. Flow (perm)	1789	1601	1883	1601	558	1883
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	33	822	21	7	399
RTOR Reduction (vph)	0	31	0	6	0	0
Lane Group Flow (vph)	13	2	822	15	7	399
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	3.2	3.2	36.4	36.4	36.4	36.4
Effective Green, g (s)	3.2	3.2	36.4	36.4	36.4	36.4
Actuated g/C Ratio	0.06	0.06	0.73	0.73	0.73	0.73
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	115	103	1381	1174	409	1381
v/s Ratio Prot	c0.01		c0.44			0.21
v/s Ratio Perm		0.00		0.01	0.01	
v/c Ratio	0.11	0.02	0.60	0.01	0.02	0.29
Uniform Delay, d1	21.9	21.7	3.1	1.8	1.8	2.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.7	0.0	0.0	0.1
Delay (s)	22.3	21.8	3.8	1.8	1.8	2.3
Level of Service	C	C	A	A	A	A
Approach Delay (s)	22.0		3.8			2.3
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	49.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	74	44	734	16	25	354
Future Volume (Veh/h)	74	44	734	16	25	354
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	80	48	798	17	27	385
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1044	798			798	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1044	798			798	
tC, single (s)	6.9	7.4			4.8	
tC, 2 stage (s)						
tF (s)	3.6	3.5			2.6	
p0 queue free %	62	83			96	
cM capacity (veh/h)	209	286			633	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	80	48	798	17	27	192	192
Volume Left	80	0	0	0	27	0	0
Volume Right	0	48	0	17	0	0	0
cSH	209	286	1700	1700	633	1700	1700
Volume to Capacity	0.38	0.17	0.47	0.01	0.04	0.11	0.11
Queue Length 95th (m)	12.8	4.5	0.0	0.0	1.0	0.0	0.0
Control Delay (s)	32.6	20.1	0.0	0.0	10.9	0.0	0.0
Lane LOS	D	C			B		
Approach Delay (s)	27.9		0.0		0.7		
Approach LOS	D						

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

1: Hwy 99 & Copper Dr Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	4.1	0.3	0.1
Total Del/Veh (s)	7.8	1.5	4.9	4.8	7.1	0.9	3.6

2: Hwy 99 & Access A Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	1.2	0.0	0.0
Total Del/Veh (s)	11.2	2.1	7.4	9.1	5.2	0.8	5.5

Total Network Performance

Denied Del/Veh (s)	0.5
Total Del/Veh (s)	18.5

Intersection: 1: Hwy 99 & Copper Dr

Movement	WB	NB	SB	SB
Directions Served	L	T	L	T
Maximum Queue (m)	8.5	29.1	5.7	14.8
Average Queue (m)	3.4	6.3	1.2	3.7
95th Queue (m)	10.1	26.2	5.9	15.5
Link Distance (m)	192.9	437.5		156.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			75.0	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Hwy 99 & Access A

Movement	WB	SB
Directions Served	L	L
Maximum Queue (m)	21.0	11.2
Average Queue (m)	12.4	3.0
95th Queue (m)	21.6	11.9
Link Distance (m)	755.3	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		75.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	13	34	843	22	7	410
v/c Ratio	0.05	0.14	0.54	0.02	0.02	0.26
Control Delay	25.3	12.1	4.8	1.2	2.5	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.3	12.1	4.8	1.2	2.5	2.8
Queue Length 50th (m)	1.2	0.0	31.9	0.0	0.2	11.0
Queue Length 95th (m)	5.8	7.0	61.5	1.2	0.9	21.1
Internal Link Dist (m)	177.0		427.8			136.4
Turn Bay Length (m)				65.0	75.0	
Base Capacity (vph)	649	603	1883	1601	541	1883
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.06	0.45	0.01	0.01	0.22

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	12	31	776	20	6	377
Future Volume (vph)	12	31	776	20	6	377
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	1883	1601	1789	1883
Flt Permitted	0.95	1.00	1.00	1.00	0.29	1.00
Satd. Flow (perm)	1789	1601	1883	1601	541	1883
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	34	843	22	7	410
RTOR Reduction (vph)	0	32	0	6	0	0
Lane Group Flow (vph)	13	2	843	16	7	410
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	3.2	3.2	37.3	37.3	37.3	37.3
Effective Green, g (s)	3.2	3.2	37.3	37.3	37.3	37.3
Actuated g/C Ratio	0.06	0.06	0.74	0.74	0.74	0.74
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	113	101	1390	1182	399	1390
v/s Ratio Prot	c0.01		c0.45			0.22
v/s Ratio Perm		0.00		0.01	0.01	
v/c Ratio	0.12	0.02	0.61	0.01	0.02	0.29
Uniform Delay, d1	22.3	22.2	3.1	1.7	1.7	2.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.1	0.8	0.0	0.0	0.1
Delay (s)	22.8	22.3	3.9	1.7	1.8	2.3
Level of Service	C	C	A	A	A	A
Approach Delay (s)	22.4		3.8			2.3
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	50.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	80	47	744	16	26	364
Future Volume (Veh/h)	80	47	744	16	26	364
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	51	809	17	28	396
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1063	809			809	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1063	809			809	
tC, single (s)	6.9	7.4			4.9	
tC, 2 stage (s)						
tF (s)	3.6	3.5			2.6	
p0 queue free %	57	82			95	
cM capacity (veh/h)	201	279			608	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	87	51	809	17	28	198	198
Volume Left	87	0	0	0	28	0	0
Volume Right	0	51	0	17	0	0	0
cSH	201	279	1700	1700	608	1700	1700
Volume to Capacity	0.43	0.18	0.48	0.01	0.05	0.12	0.12
Queue Length 95th (m)	15.3	5.0	0.0	0.0	1.1	0.0	0.0
Control Delay (s)	36.0	20.8	0.0	0.0	11.2	0.0	0.0
Lane LOS	E	C			B		
Approach Delay (s)	30.4		0.0		0.7		
Approach LOS	D						

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

1: Hwy 99 & Copper Dr Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.1	3.6	0.4	0.2
Total Del/Veh (s)	9.0	1.4	5.3	5.2	7.3	0.9	3.9

2: Hwy 99 & Access A Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	1.3	0.0	0.0
Total Del/Veh (s)	12.3	2.1	7.7	9.1	5.6	0.9	5.8

Total Network Performance

Denied Del/Veh (s)	0.6
Total Del/Veh (s)	19.3

Intersection: 1: Hwy 99 & Copper Dr

Movement	WB	NB	SB	SB
Directions Served	L	T	L	T
Maximum Queue (m)	8.3	34.2	3.4	14.5
Average Queue (m)	3.5	7.5	0.6	3.9
95th Queue (m)	10.6	32.8	4.0	15.0
Link Distance (m)	192.9	437.5		156.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			75.0	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Hwy 99 & Access A

Movement	WB	SB
Directions Served	L	L
Maximum Queue (m)	23.2	15.0
Average Queue (m)	12.5	4.2
95th Queue (m)	21.9	14.8
Link Distance (m)	755.3	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		75.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	13	34	843	22	7	410
v/c Ratio	0.05	0.14	0.54	0.02	0.02	0.26
Control Delay	25.3	12.1	4.8	1.2	2.5	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.3	12.1	4.8	1.2	2.5	2.8
Queue Length 50th (m)	1.2	0.0	31.9	0.0	0.2	11.0
Queue Length 95th (m)	5.8	7.0	61.5	1.2	0.9	21.1
Internal Link Dist (m)	177.0		427.8			136.4
Turn Bay Length (m)				65.0	75.0	
Base Capacity (vph)	649	603	1883	1601	541	1883
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.06	0.45	0.01	0.01	0.22

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	12	31	776	20	6	377
Future Volume (vph)	12	31	776	20	6	377
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	1883	1601	1789	1883
Flt Permitted	0.95	1.00	1.00	1.00	0.29	1.00
Satd. Flow (perm)	1789	1601	1883	1601	541	1883
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	34	843	22	7	410
RTOR Reduction (vph)	0	32	0	6	0	0
Lane Group Flow (vph)	13	2	843	16	7	410
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	3.2	3.2	37.3	37.3	37.3	37.3
Effective Green, g (s)	3.2	3.2	37.3	37.3	37.3	37.3
Actuated g/C Ratio	0.06	0.06	0.74	0.74	0.74	0.74
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	113	101	1390	1182	399	1390
v/s Ratio Prot	c0.01		c0.45			0.22
v/s Ratio Perm		0.00		0.01	0.01	
v/c Ratio	0.12	0.02	0.61	0.01	0.02	0.29
Uniform Delay, d1	22.3	22.2	3.1	1.7	1.7	2.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.1	0.8	0.0	0.0	0.1
Delay (s)	22.8	22.3	3.9	1.7	1.8	2.3
Level of Service	C	C	A	A	A	A
Approach Delay (s)	22.4		3.8			2.3
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	50.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	81	50	754	16	27	364
Future Volume (Veh/h)	81	50	754	16	27	364
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	88	54	820	17	29	396
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1076	820			820	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1076	820			820	
tC, single (s)	6.9	7.4			4.9	
tC, 2 stage (s)						
tF (s)	3.6	3.6			2.6	
p0 queue free %	55	80			95	
cM capacity (veh/h)	196	272			597	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	88	54	820	17	29	198	198
Volume Left	88	0	0	0	29	0	0
Volume Right	0	54	0	17	0	0	0
cSH	196	272	1700	1700	597	1700	1700
Volume to Capacity	0.45	0.20	0.48	0.01	0.05	0.12	0.12
Queue Length 95th (m)	16.1	5.5	0.0	0.0	1.2	0.0	0.0
Control Delay (s)	37.5	21.5	0.0	0.0	11.3	0.0	0.0
Lane LOS	E	C			B		
Approach Delay (s)	31.4		0.0		0.8		
Approach LOS	D						

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

SimTraffic Performance Report

12/18/2018

1: Hwy 99 & Copper Dr Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.1	4.4	0.3	0.1
Total Del/Veh (s)	7.6	1.3	5.2	4.6	5.8	0.6	3.7

2: Hwy 99 & Access A Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	1.3	0.0	0.0
Total Del/Veh (s)	13.0	2.2	7.8	10.2	5.1	0.8	5.8

Total Network Performance

Denied Del/Veh (s)	0.5
Total Del/Veh (s)	19.4

Intersection: 1: Hwy 99 & Copper Dr

Movement	WB	NB	B18	SB	SB
Directions Served	L	T	T	L	T
Maximum Queue (m)	7.6	32.7	44.5	4.1	10.2
Average Queue (m)	2.8	7.8	0.0	0.7	1.8
95th Queue (m)	9.2	33.0	0.0	4.3	10.1
Link Distance (m)	192.9	437.5	445.0		156.9
Upstream Blk Time (%)			0		
Queuing Penalty (veh)			0		
Storage Bay Dist (m)				75.0	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 2: Hwy 99 & Access A

Movement	WB	NB	SB
Directions Served	L	T	L
Maximum Queue (m)	19.4	0.6	15.2
Average Queue (m)	11.0	0.1	4.1
95th Queue (m)	20.4	1.4	14.7
Link Distance (m)	755.3	965.0	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			75.0
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	22	28	199	26	27	853
v/c Ratio	0.09	0.11	0.13	0.02	0.03	0.54
Control Delay	25.9	12.6	2.5	1.2	2.5	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.9	12.6	2.5	1.2	2.5	5.0
Queue Length 50th (m)	2.0	0.0	4.8	0.0	0.6	33.8
Queue Length 95th (m)	8.2	6.3	10.1	1.4	2.2	64.1
Internal Link Dist (m)	177.0		427.8			136.4
Turn Bay Length (m)				65.0	75.0	
Base Capacity (vph)	643	594	1883	1601	1192	1883
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.05	0.11	0.02	0.02	0.45

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	20	26	183	24	25	785
Future Volume (vph)	20	26	183	24	25	785
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	1883	1601	1789	1883
Flt Permitted	0.95	1.00	1.00	1.00	0.63	1.00
Satd. Flow (perm)	1789	1601	1883	1601	1192	1883
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	28	199	26	27	853
RTOR Reduction (vph)	0	26	0	7	0	0
Lane Group Flow (vph)	22	2	199	19	27	853
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	3.4	3.4	37.8	37.8	37.8	37.8
Effective Green, g (s)	3.4	3.4	37.8	37.8	37.8	37.8
Actuated g/C Ratio	0.07	0.07	0.74	0.74	0.74	0.74
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	118	106	1390	1181	880	1390
v/s Ratio Prot	c0.01		0.11			c0.45
v/s Ratio Perm		0.00		0.01	0.02	
v/c Ratio	0.19	0.02	0.14	0.02	0.03	0.61
Uniform Delay, d1	22.6	22.3	2.0	1.8	1.8	3.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	0.1	0.0	0.0	0.0	0.8
Delay (s)	23.4	22.4	2.0	1.8	1.8	4.0
Level of Service	C	C	A	A	A	A
Approach Delay (s)	22.8		2.0			3.9
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	4.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	51.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	45	194	69	19	784
Future Volume (Veh/h)	17	45	194	69	19	784
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	49	211	75	21	852
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	679	211			211	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	679	211			211	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	94			98	
cM capacity (veh/h)	379	794			1357	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	18	49	211	75	21	426	426
Volume Left	18	0	0	0	21	0	0
Volume Right	0	49	0	75	0	0	0
cSH	379	794	1700	1700	1357	1700	1700
Volume to Capacity	0.05	0.06	0.12	0.04	0.02	0.25	0.25
Queue Length 95th (m)	1.1	1.5	0.0	0.0	0.4	0.0	0.0
Control Delay (s)	15.0	9.8	0.0	0.0	7.7	0.0	0.0
Lane LOS	B	A			A		
Approach Delay (s)	11.2		0.0		0.2		
Approach LOS	B						

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

1: Hwy 99 & Copper Dr Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	3.2	0.9	0.7
Total Del/Veh (s)	10.3	1.3	2.2	2.9	2.8	1.9	2.1

2: Hwy 99 & Access A Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	8.1	1.8	4.8	5.9	2.7	1.4	2.4

Total Network Performance

Denied Del/Veh (s)	0.7
Total Del/Veh (s)	15.5

Intersection: 1: Hwy 99 & Copper Dr

Movement	WB	NB	SB	SB
Directions Served	L	T	L	T
Maximum Queue (m)	8.4	7.8	6.0	32.5
Average Queue (m)	3.6	1.7	1.0	10.9
95th Queue (m)	10.3	8.8	5.5	33.5
Link Distance (m)	192.9	437.4		156.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			75.0	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Hwy 99 & Access A

Movement	WB	SB
Directions Served	L	L
Maximum Queue (m)	12.3	4.3
Average Queue (m)	4.8	0.7
95th Queue (m)	13.7	4.7
Link Distance (m)	755.2	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		75.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	15	29	204	26	28	876
v/c Ratio	0.06	0.12	0.13	0.02	0.03	0.56
Control Delay	26.7	13.2	2.4	1.1	2.4	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	13.2	2.4	1.1	2.4	4.9
Queue Length 50th (m)	1.4	0.0	4.9	0.0	0.6	34.9
Queue Length 95th (m)	6.7	6.7	10.0	1.3	2.1	65.2
Internal Link Dist (m)	177.0		427.8			136.4
Turn Bay Length (m)				65.0	75.0	
Base Capacity (vph)	635	587	1883	1601	1187	1883
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.05	0.11	0.02	0.02	0.47

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	14	27	188	24	26	806
Future Volume (vph)	14	27	188	24	26	806
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	1883	1601	1789	1883
Flt Permitted	0.95	1.00	1.00	1.00	0.63	1.00
Satd. Flow (perm)	1789	1601	1883	1601	1186	1883
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	29	204	26	28	876
RTOR Reduction (vph)	0	27	0	7	0	0
Lane Group Flow (vph)	15	2	204	19	28	876
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	3.2	3.2	38.9	38.9	38.9	38.9
Effective Green, g (s)	3.2	3.2	38.9	38.9	38.9	38.9
Actuated g/C Ratio	0.06	0.06	0.75	0.75	0.75	0.75
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	109	98	1405	1195	885	1405
v/s Ratio Prot	c0.01		0.11			c0.47
v/s Ratio Perm		0.00		0.01	0.02	
v/c Ratio	0.14	0.02	0.15	0.02	0.03	0.62
Uniform Delay, d1	23.1	23.0	1.9	1.7	1.7	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.1	0.0	0.0	0.0	0.9
Delay (s)	23.7	23.0	1.9	1.7	1.7	4.0
Level of Service	C	C	A	A	A	A
Approach Delay (s)	23.3		1.9			3.9
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	52.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	45	194	77	20	804
Future Volume (Veh/h)	17	45	194	77	20	804
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	49	211	84	22	874
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	692	211			211	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	692	211			211	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	94			98	
cM capacity (veh/h)	372	794			1357	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	18	49	211	84	22	437	437
Volume Left	18	0	0	0	22	0	0
Volume Right	0	49	0	84	0	0	0
cSH	372	794	1700	1700	1357	1700	1700
Volume to Capacity	0.05	0.06	0.12	0.05	0.02	0.26	0.26
Queue Length 95th (m)	1.2	1.5	0.0	0.0	0.4	0.0	0.0
Control Delay (s)	15.2	9.8	0.0	0.0	7.7	0.0	0.0
Lane LOS	C	A			A		
Approach Delay (s)	11.3		0.0		0.2		
Approach LOS	B						

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	32.2%	ICU Level of Service	A
Analysis Period (min)	15		

1: Hwy 99 & Copper Dr Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	3.0	0.9	0.8
Total Del/Veh (s)	6.8	1.5	2.2	3.0	3.0	1.5	1.8

2: Hwy 99 & Access A Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.9	1.8	4.8	5.2	3.1	1.4	2.3

Total Network Performance

Denied Del/Veh (s)	0.8
Total Del/Veh (s)	15.2

Intersection: 1: Hwy 99 & Copper Dr

Movement	WB	NB	SB	SB
Directions Served	L	T	L	T
Maximum Queue (m)	9.1	5.5	7.3	26.6
Average Queue (m)	3.0	1.0	1.5	8.2
95th Queue (m)	9.8	6.9	7.6	28.3
Link Distance (m)	192.9	437.4		156.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			75.0	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Hwy 99 & Access A

Movement	WB	SB
Directions Served	L	L
Maximum Queue (m)	10.4	5.2
Average Queue (m)	5.1	1.0
95th Queue (m)	12.7	5.5
Link Distance (m)	755.2	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		75.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	23	29	207	27	28	885
v/c Ratio	0.09	0.12	0.13	0.02	0.03	0.56
Control Delay	27.0	12.9	2.4	1.1	2.5	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.0	12.9	2.4	1.1	2.5	5.1
Queue Length 50th (m)	2.2	0.0	5.1	0.0	0.6	36.2
Queue Length 95th (m)	8.7	6.6	10.5	1.4	2.2	69.6
Internal Link Dist (m)	177.0		427.8			136.4
Turn Bay Length (m)				65.0	75.0	
Base Capacity (vph)	630	583	1883	1601	1183	1883
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.05	0.11	0.02	0.02	0.47

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	21	27	190	25	26	814
Future Volume (vph)	21	27	190	25	26	814
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	1883	1601	1789	1883
Flt Permitted	0.95	1.00	1.00	1.00	0.63	1.00
Satd. Flow (perm)	1789	1601	1883	1601	1183	1883
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	29	207	27	28	885
RTOR Reduction (vph)	0	27	0	7	0	0
Lane Group Flow (vph)	23	2	207	20	28	885
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	3.4	3.4	39.1	39.1	39.1	39.1
Effective Green, g (s)	3.4	3.4	39.1	39.1	39.1	39.1
Actuated g/C Ratio	0.06	0.06	0.74	0.74	0.74	0.74
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	115	103	1402	1192	881	1402
v/s Ratio Prot	c0.01		0.11			c0.47
v/s Ratio Perm		0.00		0.01	0.02	
v/c Ratio	0.20	0.02	0.15	0.02	0.03	0.63
Uniform Delay, d1	23.3	23.0	1.9	1.7	1.8	3.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.1	0.0	0.0	0.0	0.9
Delay (s)	24.1	23.1	2.0	1.7	1.8	4.2
Level of Service	C	C	A	A	A	A
Approach Delay (s)	23.5		1.9			4.1
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	4.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	52.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	45	204	81	20	814
Future Volume (Veh/h)	17	45	204	81	20	814
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	49	222	88	22	885
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	708	222			222	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	708	222			222	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	94			98	
cM capacity (veh/h)	363	782			1344	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	18	49	222	88	22	442	442
Volume Left	18	0	0	0	22	0	0
Volume Right	0	49	0	88	0	0	0
cSH	363	782	1700	1700	1344	1700	1700
Volume to Capacity	0.05	0.06	0.13	0.05	0.02	0.26	0.26
Queue Length 95th (m)	1.2	1.5	0.0	0.0	0.4	0.0	0.0
Control Delay (s)	15.4	9.9	0.0	0.0	7.7	0.0	0.0
Lane LOS	C	A			A		
Approach Delay (s)	11.4		0.0		0.2		
Approach LOS	B						

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	32.5%	ICU Level of Service	A
Analysis Period (min)	15		

1: Hwy 99 & Copper Dr Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	3.1	0.8	0.6
Total Del/Veh (s)	12.9	1.4	2.5	3.4	2.8	2.1	2.4

2: Hwy 99 & Access A Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.8	1.8	4.6	5.5	2.9	1.4	2.3

Total Network Performance

Denied Del/Veh (s)	0.7
Total Del/Veh (s)	16.3

Intersection: 1: Hwy 99 & Copper Dr

Movement	WB	NB	SB	SB
Directions Served	L	T	L	T
Maximum Queue (m)	10.4	11.3	6.0	32.3
Average Queue (m)	4.3	2.3	1.1	10.5
95th Queue (m)	12.1	11.3	5.8	31.6
Link Distance (m)	192.9	437.4		156.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			75.0	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Hwy 99 & Access A

Movement	WB	SB
Directions Served	L	L
Maximum Queue (m)	9.6	5.2
Average Queue (m)	4.2	0.9
95th Queue (m)	12.1	5.2
Link Distance (m)	755.2	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		75.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Appendix 3: Water Supply and Sanitary Analysis, Arden

ARDEN CONSULTING ENGINEERS LTD.

January 28, 2019 File 18-87

Landsea Camps
#7-38921 Progress Way
Squamish, BC
V8B 0K6

Dear Mr. Coyne:

Re: Proposed Feasibility of 300-550 Person Workforce housing in South Britannia Lands area.

Further to your request, Arden Consulting Engineers Ltd. (ACE) has completed a review of the plans for a 300-550 workforce housing solution at the South Britannia lands and the necessary water and sewer infrastructure required.

Background

It is our understanding that you wish to establish a 550 maximum person workforce housing solution at the South Britannia lands with an average occupancy of 380 persons. Feasibility for a future development to be located at the South Britannia lands area has previously been completed, which includes an analysis of the capacity of the aquifer and the existing Britannia Wastewater Treatment Plant (WWTP). A well has already been drilled and could potentially be used to service the workforce housing solution proposed. Table 1 below depicts the peak (Maximum Day Demand) and average daily flow rates which will guide both the requirements for the camp's water source and wastewater treatment requirements.

Table 1: Daily Design Flow Rate for proposed workforce housing

Occupancy	Flow/Person (L)[1]	Total Daily Design Flow rate (m^3)
380	230	87.4 m^3
550	230	126.5m^3

Water

Two test production wells have previously been drilled in the South Britannia lands area; the wells were drilled on either side of Thistle Creek. Three ground water monitoring wells were also drilled. A summary produced by P.S. Turje and Associates Ltd. (May 11, 2016-Rev.1) shows that the maximum sustainable flow from the underlying aquifer might range from a low estimate of 53 L/s to high estimate of 72 L/s with a proven yield

[1] Design Guidelines for Rural Residential Community Water Systems (2012)

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of 47 L/s. (746 US GPM). The design guidelines for Rural Residential Water Systems (DGRRWS) use a maximum day demand (MDD) for domestic water of 230 L/day per capita for basic sanitation purposes only (i.e. bathing, food preparation, laundry and toilet flushing. For populations less than 5,000 the Peak Hourly Demand (PHD) is calculated to be 4 times the MDD or 93 US GPM. Accordingly, the treatment works must be capable of treating an instantaneous flow rate of 93 US GPM or 12.5% of the maximum sustainable flow capacity of the aquifer, not inclusive of fire flow. According to the summary report by P.S. Turje & Associates, the concentrations of all chemical parameters tested met the 2017 Guidelines for Canadian Drinking Water Quality (GCDWQ). Additionally, hydrocarbons and herbicide concentrations were non-detectable. Because the ground water is likely to be considered groundwater at risk of pathogen contamination (GARP), due to the unconfined nature of the aquifer, disinfection would be required.

Wastewater Treatment

According to the summary report by P.S. Turje & Associates the existing North Britannia community is serviced by a Wastewater Treatment Plant (WWTP) located on the north side of Britannia Creek east of Highway 99. The total design capacity of the existing Britannia WWTP is shown in Table 2 below:

Component	North Britannia	South Britannia	TOTAL
Population Equivalent	2042	4000	6042
Outfall Design Flow			11,000 m3/d
Average Dry Weather Flow (ADWF)	715 m3/d	1400 m3/d	2,115 m3/d

Table 2: Daily Design Flow Rate for proposed workforce housing (PS Turje & Assoc.)

The flow from both North and South Britannia is accounted for in the design of the current WWTP, including the headworks and outflow. However, the plant power supply and treatment system were built only for the flow from North Britannia. Additional treatment units and components would be required for the treatment of future flows from South Britannia. Current treatment criteria by the Ministry of Environment are a higher standard of treatment than what was in force at the time of building for the current WWTP. According to conversations with the Squamish-Lillooet Regional District engineering department, current usage from North Britannia is approximately less than 100 $m^{3/}$day, or 14% of design capacity. Therefore, there is approximately 615 $m^{3/}$day of current surplus capacity at the WWTP, with existing equipment, without the need for upgrades to accommodate the peak daily sewage flow rate of 126 $m^{3/}$day from the proposed workforce housing.

The conclusions made in this report reflect ACE's best judgement in light of the information available at the time of this letter. Any use which a third party makes of this

report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. ACE accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions based on this letter.

The findings and conclusions documented in this report have been prepared for specific application to this site and the size of camp proposed by Landsea Camps and have been developed in a manner consistent with that level of care normally exercised by septic design professionals currently practicing under similar conditions in the area.

Should Landsea camps submit this report to the SLRD, the SLRD is authorized to rely on the results within the limitations of the preceding paragraphs for the purpose of determining whether the Landsea Camps have fulfilled their obligations with respect to demonstrating that their temporary 300-550 person workforce housing solution will produce less waste water than the unused capacity currently at the Town of Britannia's wastewater treatment plant.

We trust that this provides the information you currently require. If you have any questions or require comment, please feel free to contact the undersigned.

Yours truly,

ARDEN CONSULTING ENGINEERS LTD.

PER:

Brad Driediger, EIT

Appendix 4: Comparison of Workforce Housing Options in Squamish, Swift Creek

Comparison of Effects of Workforce Housing Options in Squamish

October 31, 2018

Chris Joseph, MRM PhD

Swift Creek Consulting

PO Box 1513

Garibaldi Highlands, BC

V0N 1T0

604-848-9804

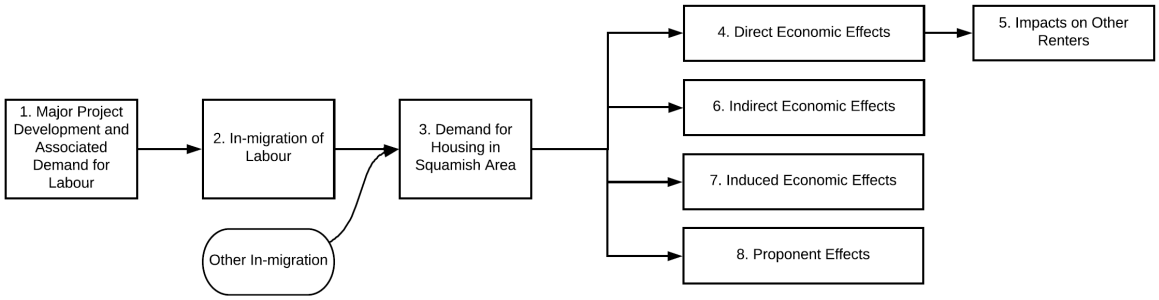
cjoseph@swiftcreekconsulting.com

Executive Summary

LandSea-Stalkaya, a joint venture between a Squamish-based private business and a Squamish Nation member-owned business with support from the Squamish and Tsleil-Waututh First Nations, is proposing to provide temporary workforce accommodation in Britannia Beach. This accommodation would house major project workers that are anticipated to be needed very soon to construct the Woodfibre LNG project and other major projects in the Squamish area. In support of a temporary use permit application to the Squamish-Lillooet Regional District, Swift Creek Consulting was hired by LandSea-Stalkaya to examine and provide information on the economic effects associated with the construction, operation, and decommissioning of workforce accommodation in the Britannia Beach area, just south of Squamish. To assess these effects, the alternative scenario of housing the same number of workers in existing rental units in Squamish was considered.

To carry out this work, Swift Creek Consulting gathered information on the proposed workforce accommodation, identified the key pathways of effect (Figure ES-1), considered readily available secondary data and evidence to forecast likely incremental effects of both scenarios, and examined the distribution of effects. Incremental effects are those effects above and beyond what can reasonably be expected to otherwise occur. Another consultant was hired to examine the potential social, community, and environmental effects of the two accommodation options.

Figure ES-1. Economic effect pathways examined in this study.



After considering the evidence, several incremental effects were identified under both scenarios.

If LandSea-Stalkaya's workforce accommodations are built then there would be incremental economic benefits flowing to: local businesses; local labour; the SLRD and Britannia Beach associated with direct, indirect, and fiscal economic effects; the local proponent; and by extension communities in the Sea-to-Sky Corridor for the anticipated three years that the accommodations would be provided. These benefits would include:

- local purchases amounting to approximately $4.5 million a year, and local employment that wouldn't otherwise occur to operate the accommodations;
- amenity and community benefit payments and contributions, as well as tax revenue, flowing to the SLRD and Britannia Beach for use of infrastructure and services of roughly $400,000 per year; and
- local subcontractor revenues and employment due to their servicing of the construction, operations, and decommissioning of the workforce accommodation;
- revenues for the proponent and associated local employment and local economic activity.

On the other hand, if no workforce accommodation is built, then there would be some incremental economic benefits flowing to landlords but also incremental economic costs incurred by other renters. These benefits and costs would include:

- incremental rent earnings flowing to landlords as a result of further inflation of the Squamish rental market; and
- higher rental costs for other renters, and moving costs for renters forced to move.

The expected distribution of economic effects is summarized in Table ES-1.

Table ES-1. Expected winners and losers under worker housing options.

Worker Housing Option	Winners	Losers
Workforce accommodations	Local businesses, local labour, local subcontractors, local government, proponent (which includes First Nations)	None identified
Workers rent in Squamish	Landlords	Other renters, especially low-income households

Overall, what is evident from this effects assessment is that there would be a variety of economic gains to a variety of parties under both worker housing options, but that there would be substantial negative effects if the LandSea-Stalkaya workforce accommodation option was not taken. If workforce accommodation is not built to house the influx of 600 or more workers that can be expected to migrate to the Squamish area help construct the Woodfibre LNG and other major projects, and instead these workers are given a living out allowance to find their own local rental accommodation, then it's hard not to imagine further and substantial inflation in the already tight rental housing market. While landlords would benefit under such a scenario, there are many renters

already paying more than what is considered an acceptable amount on their housing, and this situation would worsen for at least a couple of years. This conclusion is consistent with concerns and experiences elsewhere in BC facing major project booms. The Kitimat housing plan, for example, recommends workforce accommodation to house anticipated LNG workers to minimize effects on the community's rental market, and it is hard not to argue for a similar course of action for Squamish based upon the evidence reviewed in this study.

Statement of Limitations

This document was prepared by Swift Creek Consulting for the exclusive use and benefit of LandSea-Stalkaya JV Partnership ("Client"). This document represents the best professional judgment of Swift Creek Consulting based on the information available at the time of its completion and as appropriate for the scope of work. Services were performed according to normal professional standards in a similar context and for a similar scope of work.

Acknowledgements

Swift Creek Consulting acknowledges Brayden Harrington and Mike Coyne of LandSea for providing purchasing and related data to inform this study. Despite this input from LandSea, this study was conducted at arm's length from LandSea-Stalkaya and thereby presents Swift Creek Consulting's professional opinion.

Acronyms

CMHC	Canada Mortgage and Housing Corporation
EA	environmental assessment
LNG	liquefied natural gas
SCC	Swift Creek Consulting
SLRD	Squamish-Lillooet Regional District
TUP	temporary use permit

Contents

1. Introduction

LandSea-Stalkaya JV Partnership (hereafter "LandSea-Stalkaya") is in the business of providing workforce accommodation, and LandSea-Stalkaya is interested in providing accommodations in the Squamish area to house workers for the Woodfibre LNG project and other major projects in the Squamish area. LandSea-Stalkaya requires a temporary use permit (TUP) from the Squamish-Lillooet Regional District (SLRD) to do so, and in applying for a TUP LandSea-Stalkaya must provide a variety of information.

Swift Creek Consulting (SCC), a consulting firm with expertise in economic impact assessment (see Appendix A), was hired by LandSea-Stalkaya to examine and provide information on the economic effects associated with the construction, operation, and decommissioning of workforce accommodation that would house 500 workers in the Britannia Beach area, just south of Squamish. As with any effects assessment, an alternative scenario for comparison against is required, and for this study the alternative is housing the same number of workers in existing rental units in Squamish. This report describes SCC's professional judgement of the anticipated effects of both scenarios.

To carry out this work, SCC undertook the following steps:

- gathering information on the proposed workforce accommodation relevant to this economic effects assessment;
- identifying the key pathways of effect by reviewing relevant reports and using professional judgement based on past similar studies carried out or reviewed by SCC;
- considering readily available secondary data and evidence to identify likely incremental effects of both scenarios; and
- examining the distribution of anticipated effects.

Incremental effects are those effects above and beyond what would reasonably be expected to otherwise occur.

Note that SCC was only retained to examine economic effects of the worker housing options; another consultant was retained by LandSea-Stalkaya to examine the potential social, community, and environmental effects of the options.

2. Proposed Workforce Accommodation

LandSea-Stalkaya proposes to build and operate temporary workforce accommodations on the Tiger Bay Lands in south Britannia Beach. The accommodations would be constructed of adjoining modular buildings which together would provide sleeping, cooking, eating, and recreational space. Construction would utilize the services of local

companies and a substantial portion of the materials to construct the accommodations would be purchased from local suppliers.

The accommodations would house approximately 500 major project workers at any one time. The public would not be allowed to rent rooms; only major project proponents on behalf of their workers would be able to utilize the accommodation, and there would also be minimum duration stays so as to further ensure that the accommodation only serves major project workers. Most workers would be associated with Woodfibre LNG, who has already secured a guarantee to 75% of the rooms, while the rest of the workers would be associated with various other construction projects in the Squamish area. LandSea-Stalkaya assumes that accommodations would be required for three years in concert with expected construction phases of the Woodfibre LNG project and other major projects in the Squamish area.

The accommodation would be operated by around 55 staff, many who are expected to be local or who could be provided housing at the camp. Local subcontractors would service the accommodation, such as waste disposal by GFL (formerly Carney's) and security by Sko-mish Valley Security.

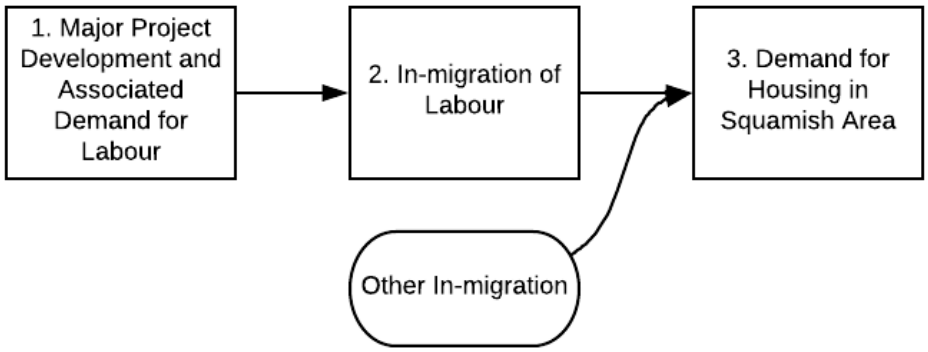
The accommodation would be decommissioned when it is no longer needed, such as when construction of the major projects is completed.

3. Effects Assessment

3.1 Major Projects Lead to Demand for Housing in Squamish

The development of major projects in Squamish – including Woodfibre LNG and Eagle Mountain pipeline, but also other major industrial, commercial, and residential projects – can reasonably be expected to induce in-migration of some of their workforce (Figure 1).

Figure 1. Major projects lead to increased demand for housing in Squamish (on top of other in-migration and associated demand for housing).



3.1.1 Effect 1: Major Project Development and Associated Demand for Labour

There is currently high demand for construction workers in Squamish, and this demand is anticipated to grow if additional major projects are undertaken. Future major projects in Squamish, including both those underway and proposed, include:

- the Woodfibre LNG, requiring roughly 650 construction workers in the Squamish area for each of the two-years of construction, and about 100 local operations workers for each year in the life of the project (BC EAO 2015);
- the Eagle Mountain LNG pipeline, requiring roughly 800 construction workers which will have to be in the Squamish area for a portion of the 1.5- to 2-year construction period, and about 400 operations workers for the life of the project but only some portion of who would be based in Squamish (FortisBC Energy Inc. and CH2M HILL Energy Canada 2015); and
- a variety of major residential projects including the Cheekye Fan housing and landslide barrier development, Newport Beach development, and Garibaldi Springs.

While not all major projects currently proposed for Squamish may actually be developed, overlap in time of construction of some of these major projects can nonetheless be expected. For example, portions of the Woodfibre LNG and Eagle Mountain pipeline projects can be expected to overlap, and both of these projects would presumably overlap some of the various residential development projects underway and proposed.

This demand for labour will contribute further to the current tight labour market in the region, province, and country (BC MAEST 2018) and is consistent with long-term expectations of a continued labour shortage (BuildForce Canada 2018a; BuildForce Canada 2018b; Government of BC Undated). Unemployment rates between roughly 5%

and 7% indicate a balanced labour market, but rates below the rough threshold of 5% indicate a shortage of labour.[1] As can be seen in Table 1, the region and province has a tight labour market. This is due, in part, to the large amount of residential and other types of construction underway. In the Mainland/Southwest region, for example, there are over $3 billion in major projects under construction and close to $4 billion in additional, proposed major projects (BC MAEST 2018).

Table 1. Unemployment rates, 2018.[1]

Geographic Unit	May 2018	June 2018	July 2018	August 2018	September 2018
British Columbia	4.9%	4.9%	4.8%	5.1%	4.8%
Lower Mainland-Southwest	4.4%	4.4%	4.5%	4.8%	4.5%
Canada	6.1%	5.9%	5.9%	6.1%	6.0%

Note: 1. Data for 2018 is based on the most recent data available at time of writing. Source: Statistics Canada (Undated-b).

3.1.2 Effect 2: In-migration of Labour

While some of the major projects in Squamish will utilize workers that already live in the community and nearby areas, recent environmental assessment (EA) applications for the Woodfibre LNG and Eagle Mountain pipeline projects concluded that there are insufficient workers in Squamish and as such concluded that much of the necessary workforce would come from the Greater Vancouver area or further away (BC EAO 2015; FortisBC Energy Inc. and CH2M HILL Energy Canada 2015). Woodfibre LNG estimated that only 5% of the construction workforce would come from Squamish, 55% from Metro Vancouver, and the rest from elsewhere in BC, Canada, and even internationally (BC EAO 2015, 127, 127).[2]

These conclusions of in-migration of a portion of major project workforces makes sense. The need for workers from outside of Squamish is a function of the specialized skillsets required for construction of particular aspects of planned major projects construction, but also due to the high demand on the available labour supply posed by these projects on top of all of the other construction work occurring in the Squamish area.

Some non-local workers can be expected to commute daily to Squamish worksites if they live within commuting distance (e.g., Vancouver, Whistler) while others can be expected to move to the Squamish area, at least for the short-term while the projects they are working on are being constructed. Taking Woodfibre LNG's estimate of roughly 650 construction workers per year for two years, if we assumed all Metro Vancouver

[1] The 5% to 7% range is known as the *natural rate of unemployment* and reflects the fact that there are always people in between jobs or unwilling to work at the time.
[2] I did not identify information on proportions of workers by location of residence in the Eagle Mountain EA application.

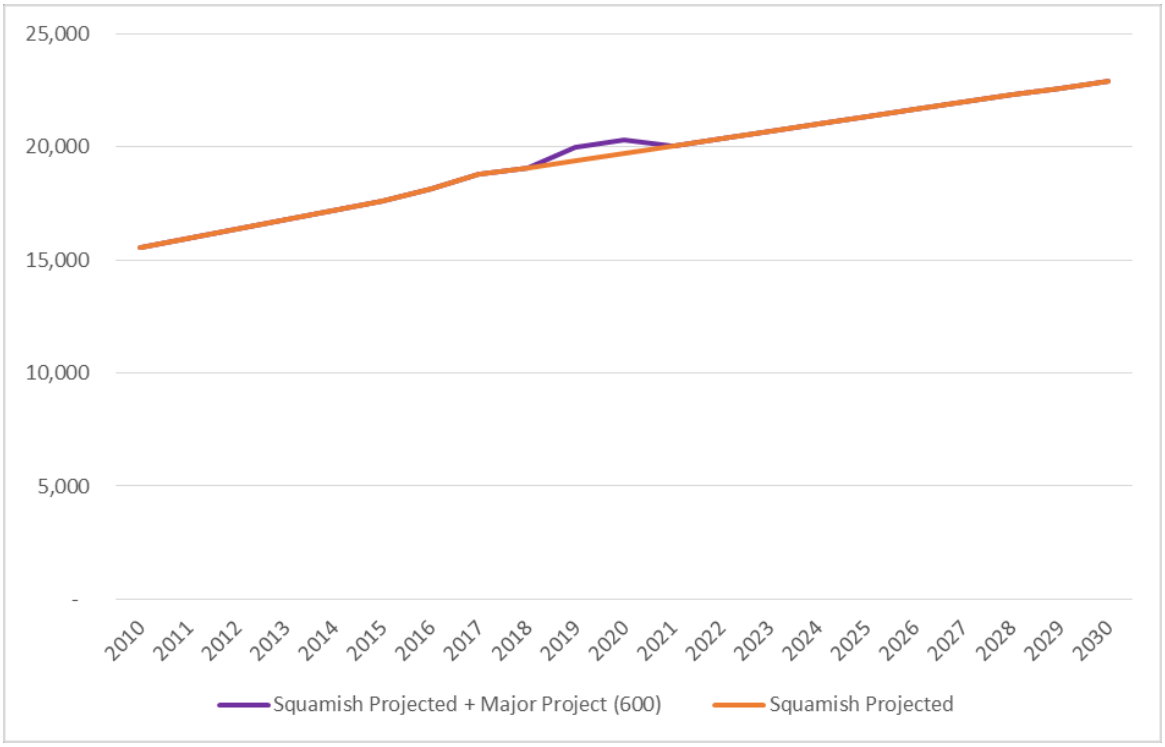
workers commuted, then the remaining 40% of workers – about 260 – would need local accommodation. If the Eagle Mountain pipeline construction workforce is similarly geographically distributed, then roughly 320 would require accommodation in the Squamish area for up to two years. I have no data on how many workers associated with other major projects might also need local accommodation, but it is apparent that 600 or more workers would need accommodation in Squamish while the Woodfibre LNG and Eagle Mountain pipeline projects are under construction.

This number of workers requiring accommodation would be even higher if all Metro Vancouver workers did not want to commute, which I expect to be the case. Given existing traffic congestion and distances to Squamish from many locations within Metro Vancouver, I expect that fewer workers to want to commute than Woodfibre LNG estimated, and thus I expect that more workers would require housing in the Squamish area than the number I presented above. It was out of scope for this study to examine the residencies of major project workers but I consider this uncertainty in the rest of my analysis.

In any case, this in-migration to Squamish will occur on top of the ongoing in-migration that Squamish has been experiencing for many years now and projected to continue for reasons of lifestyle and costs of living (Figure 2)(CBC 2018; Thompson 2017). There was a 13% growth in population in Squamish between the 2011 and 2016 censuses, from 15,554 to 17,587 (Statistics Canada Undated-a), and this followed a 15% rate of growth from the prior 2006 census (District of Squamish Undated). BC Statistics expects 12% growth in population by 2025 and 20% by 2030 in the Howe Sound Local Health Area (BC Statistics 2018).[3] Applying BC Statistics' projected growth rate for the Howe Sound Local Health Area to Squamish leads to an average population increase of 354 per year. If the estimate of 600 major project workers is accurate, then these people are added to the projected population for two years (shown in Figure 2 as the purple "bump" on the orange line on the assumption (for the purposes of illustration) that major project construction occurs over 2019 and 2020). The number of workers appears relatively small in Figure 2, but as I discuss further below in s.3.2.1, this number of people is significant if compared to the existing number of rental households under a scenario in which major project workers enter the rental housing market.

[3] The Howe Sound Local Health Area includes the communities of Squamish, Britannia Beach, Whistler, and Pemberton.

Figure 2. Historical and projected population for Squamish.



Sources: BC Statistics (2018), Statistics Canada (Undated-a).

3.1.3 Effect 3: Demand for Housing in Squamish Area

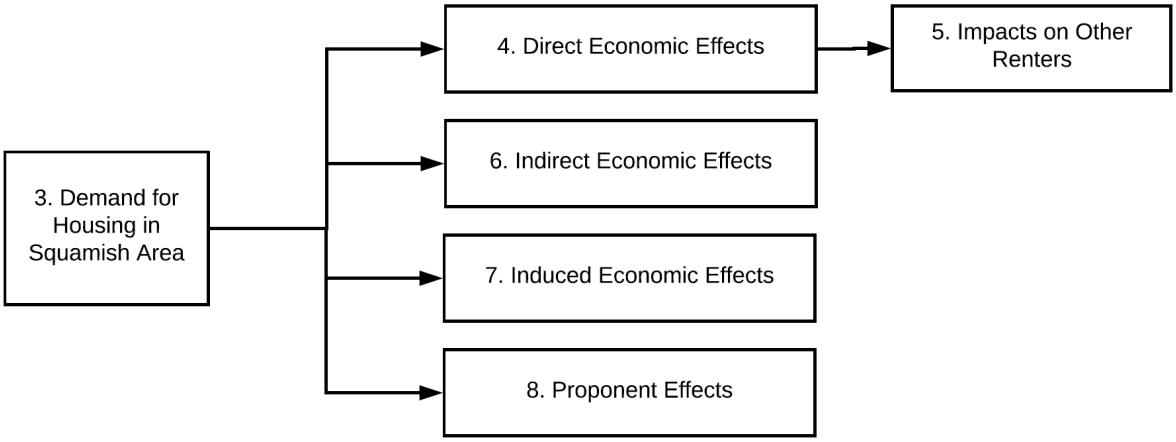
Major project workers moving to Squamish, but also others in-migrating to Squamish, will place demand on housing. While some in-migrating workers may be interested in purchasing a home in Squamish and have the financial means to do so, I assume that the majority of in-migrating workers will seek temporary accommodation until work takes them elsewhere or after such time as they decide they want to stay in Squamish longer term. As discussed above, the Woodfibre and Eagle Mountain LNG projects alone may draw 600 or more workers to the Squamish area for up to two years, which would occur on top of the estimated 350 others moving to the region per year.

Given this expectation of demand for housing in the Squamish area, a choice must be made as to how to provide accommodation for major project workers. One option is to build workforce accommodations to house workers as proposed by LandSea-Stalkaya, and a second option is simply to leave workers to find their own accommodations in Squamish and vicinity within the local rental market. I explore the effects of both options below.

3.2 Effects of Worker Accommodation Options

Depending on which worker accommodation option is chosen, a variety of economic effects can be expected to occur (Figure 3). If workforce accommodation is built, then particular direct and other economic effects can be expected to occur; if no accommodation is built then a separate set of direct and other economic effects can be expected to occur.[4] While fiscal effects (i.e., taxes) are usually lumped into the other economic effect categories, I separate them out in my analysis for ease of comprehension. I also include effects on the workforce accommodation proponent (LandSea-Stalkaya) in Figure 3 given that the proponent is based in Squamish.

Figure 3. Economic effects of accommodation options on the local economy, depending on whether or not workforce accommodation is built.



3.2.1 Effect 4: Direct Economic Effects

If the workforce accommodation is built, several "direct" economic effects can be expected.

- First, LandSea-Stalkaya will make several local purchases specifically associated with this accommodation. LandSea-Stalkaya currently anticipates spending around $9 million locally on construction including site preparation, construction materials, equipment, and labour. Local suppliers might include Rona and Home Depot, Alta Lake Electric, Black Tusk Fire and Security, BCT Fencing, Ken Harris Trucking, and Galileo Coffee. During operations, which for planning purposes are assumed to last three years, LandSea-Stalkaya anticipates spending about $300,000 to $400,000 locally per year on supplies

[4] Direct effects are the initial inputs required to develop a project, e.g., the cost of project capital, operating costs, and the labour directly employed on the project. Indirect effects are the project's purchases of supplies and services. Induced effects are the purchases of project employees.

such as food, linen, and toiletries, about $2 million a year on utilities (e.g., sewage haulage, propane, internet, etc.), and over $2 million a year locally on bus transport and security. Local suppliers would include department stores (Squamish Walmart) and services (e.g., Black Tusk Fire and Security, local trucking subcontractor). Decommissioning the accommodations after three years or when required would cost about 60% of the construction spending, and thus this amount would likewise be spent locally.

- Second, LandSea-Stalkaya will require about 20 to 25 workers over six months to build the accommodations, about 55 staff to operate the accommodations (about 35 full-time and about 20 casual, each provided housing at the site if desired), and about 20 to 25 workers to decommission the accommodations. LandSea-Stalkaya currently estimates that labour income earned during operations would amount to about $2.5 million a year. LandSea-Stalkaya has indicated to me that they intend to hire as many local and Squamish and Tsleil-Waututh First Nation members as possible but cannot make guarantees at this time of actual numbers. Regardless, all of the jobs building, operating, and decommissioning the workforce accommodations, and the wages earned in these jobs, are direct economic effects of the accommodations separate from those effects associated with employment on major projects themselves.
- Third, LandSea-Stalkaya would make amenity and community benefit contributions and tax payments to the SLRD and Britannia Beach of roughly $400,000 per year associated with use of infrastructure and services.

The incrementality of these direct economic effects of the workforce accommodations is contingent upon what would otherwise happen.

- With respect to local purchases, one consideration is what would otherwise happen on the Britannia Beach lands to be used by the workforce accommodation, an issue raised in a recent media article (Chua 2017). With this in mind, the above-described direct economic effects would be incremental unless there would be alternative uses of the Britannia Beach lands which provide direct economic effects. If the workforce accommodations are built then other development of the Britannia Beach lands, such as permanent residential development, may not occur while the workforce accommodations exist. Such alternative development may also lead to local purchases, employment, and community contributions. However, I have no information indicating that such alternative development can reasonably be expected, and thus I have no basis to believe that there actually would be lost opportunities from building the LandSea-Stalkaya workforce accommodation. A second and related consideration is whether other residential development would occur with the specific purpose to house the

same number of major project workers, in Squamish or elsewhere, on top of any residential development already planned. Such alternative worker accommodations would presumably also lead to local purchases, employment, and perhaps also community contributions. However, again I'm not aware any such alternative workforce accommodations that are planned, and so I don't expect any alternative source of such direct economic effects, and thus I expect that LandSea-Stalkaya's local purchases would be incremental.

- With respect to the incrementality of employment, the jobs and associated earnings from constructing, operating, and decommissioning the LandSea-Stalkaya workforce accommodations will only be incremental to the extent that LandSea-Stalkaya staff wouldn't otherwise be working or would otherwise be earning less. Given the tight labour market in the region, province, and country (s.3.1.1) it is reasonable to expect that few of these jobs would be incremental, though LandSea-Stalkaya expects that some of the employment would be incremental because of jobs would be filled by local First Nations people in which high unemployment rates are prevalent and that much of the casual employment offered during accommodation operations would be taken up by residents of Squamish that would otherwise not be working due to schedule constraints (such as mothers who are only available to work at atypical hours). I agree that it is possible that some portion of the construction, operations, and decommissioning employment associated with the workforce accommodations option would be incremental if the accommodation is built.
- Payments for use of SLRD and Britannia Beach infrastructure and services would be net beneficial if any of this infrastructure and services are otherwise underutilized, though I have no information to confirm if this is the case or not.
- Contributions and payments to the SLRD and Britannia Beach would be incremental unless some other developer was to build some other development in the place of what LandSea-Stalkaya plans. As I have no information on such an alternative, I expect that this revenue to the SLRD would be incremental.

Given the lack of concrete information on likely alternative uses of the Britannia Beach lands or other proposals specifically designed to house major project workers, and the potential for employing some First Nations and local casual workers, it is reasonable to consider much or all of the direct economic effects of the LandSea-Stalkaya workforce accommodations described above to be incremental if the accommodations are built.

In addition to the above, there will be an additional set of direct economic effects if the workforce accommodations are built associated with a proportion of the major project workforce who would still rent accommodation in Squamish. LandSea-Stalkaya expects that about 10-20% of the major project workforce to be senior management who will not stay at any workforce accommodation that might be built at Britannia Beach (or for that matter, elsewhere). Using the Woodfibre LNG and Eagle Mountain estimate of 600 construction workers, this means around 60-120 of these workers (and potentially their families) could enter the Squamish rental market. The direct economic effects of these in-migrants on the rental market will add to existing pressures on the rental market with consequent effects on landlords and other renters as I describe in greater detail next.

If LandSea-Stalkaya's workforce accommodations are not built, then a different set of direct economic effects associated with 600 major project workers or more finding accommodation in Squamish would occur (under the assumption that these workers would pursue rental accommodation in Squamish and not elsewhere in the region). This number of people are added to the baseline rental population, the baseline being the current rental population plus net additions of anticipated future renters moving to Squamish for other reasons (such as the greater affordability of Squamish relative to other locations in the Lower Mainland, and the lifestyle attractions of Squamish). According to the 2016 census there were 1,760 households in Squamish that were renting (Statistics Canada Undated-a), and this number has presumably grown since that census data was collected.

According to LandSea-Stalkaya, major project workers are currently anticipated to be provided with a living out allowance of at least $90 – $150 per day, or about $2,700 – $4,500 per month, which they will use to participate in the Squamish rental market, a direct economic effect flowing to landlords. With such high living out allowances, workers should each be able to rent their own accommodation if sufficient supply is accessible, though some workers may choose to share accommodation for social reasons or to retain a greater portion of the allowance. As such, the total number of rental units taken up by these workers would be a maximum of 600, again pending availability and the accuracy of this estimate of 600 workers needing local accommodation. The addition of 600 or more major project workers – if each were to try to rent their own accommodation for up to two years – would be a 34% increase in rental demand on top of the rental household number presented in the 2016 census.

Recent rental housing data from the Canada Mortgage and Housing Corporation (CMHC) indicates the low level of supply of rental units relative to existing demand in Squamish (Table 2), consistent with media reports and local anecdotal evidence (CBC 2018; Thuncher 2018). While the data presented in Table 2 is specific to rental apartments and townhouses and does not cover a variety of other types of rental accommodation (e.g., rooms for rent in homes, whole homes for rent, etc.), the data

clearly show the high demand for rental accommodation in Squamish. For the rental units tracked by the CMHC, rent in Squamish was the third highest in the province in 2017, eclipsed only by Vancouver and Victoria (CMHC 2017). A scan of current online rental prices suggests that the current market prices for rental units in Squamish is actually much higher.[5]

Table 2. Rental statistics for private apartments and townhouses, Squamish, 2017.[1]

	Bachelor	1 bedroom	2 bedroom	3 bedroom +	Total
Vacancy rate	poor data, suppressed	0%	0%	1.6%	0.3%
Average rent	poor data, suppressed	$1,036	$1,170	$1,327	$1,128

Note: 1. The CMHC has not published its 2018 study by time of writing. Source: CMHC (2017).

While residential development currently underway and planned in Squamish will add to supply, thus potentially offsetting in-migration and associated effects on the rental market, I have no evidence to indicate that new development will reverse the tight rental market.[6] It takes time to construct new housing and such development takes time to pay off, and with the uncertainty about the timing of the LNG projects and uncertainty about the demand for this housing space once construction of these projects has ended, I have no reason to expect any residential development to occur specifically to house major project workers; I expect developers to respond to longer-term demand expectations, not short-term fluctuations in demand.

Despite the high level of competition that already exists for the limited number of rental units, I expect the cost to rent in Squamish to be less than what workers will have available ($2,700 – $4,500 per month of living out allowance, as well as wages). As such, these workers can be expected to successfully compete for the majority of rental units not already occupied under current contractual arrangements (such as rental leases) or managed by landlords not wishing to rent to workers. It is outside the scope of my work to attempt to predict the precise effects on the Squamish rental market, such as how high rental prices may climb to, but it is difficult to see how major project workers would not have a substantial effect on rental housing in Squamish during the construction period of LNG and other major projects, especially if projects' construction periods overlap substantially in time.

If major project workers do participate in the Squamish rental market, there will be direct economic effects in the form of landlords receiving rental income. Under the basic

[5] Internet search of Craig's List for Squamish, October 31, 2018.

[6] District of Squamish planner Aja Philp (personal communication to C. Joseph September 27, 2018) indicated that about 400 rental units are in consideration for development in Squamish but their timing are uncertain.

principles of economics, the jump in demand from workers entering the rental market would lead to a rise in rental prices unless there is an offsetting increase in supply which as I have already discussed is not expected. As such, this increase in demand would lead to incremental income flowing to landlords that wouldn't otherwise be earned. If only 60 – 120 or so major project workers participate in the Squamish rental market – under the scenario of LandSea-Stalkaya building their workforce accommodation but where about 10 – 20% of major project workers enter the rental market – then this rise might not be very substantial. However, if the whole 600 or more of the estimated major project workers with their high purchasing power pursue rental accommodation then I would expect a substantial jump in rental prices.

If no workforce accommodation is built, then an additional direct economic effect can also be expected in the form of purchases from local businesses that service rental properties, such as property managers and cleaners. However, little of this seems likely to be incremental. Unless major project workers rely on such service businesses more than other renters, or unless fees charged by such businesses are a function of rental prices (which would appreciate with workers entering the Squamish rental market) there would be no incremental revenue flowing to such businesses.

3.2.2 Effect 5: Higher Costs of Living for Renters

Under the basic principles of economics, and backed by the experiences of communities like Kitimat which have experienced major project development and workers with living out allowances entering the rental market (CitySpaces Consulting 2015), the added competition to the Squamish rental market of major project workers with their higher purchasing power will lead to a rise in the cost of living for existing renters in Squamish. This effect would be most pronounced if all of the estimated 600 or more workers enter the rental market.

Lower income individuals currently renting but facing lease renewal, or those looking to enter the Squamish rental market, will be the first to be pushed from the rental market, adding to out-migration that is already ongoing (FortisBC Energy Inc. and CH2M HILL Energy Canada 2015; Thuncher 2018). However, given the high amount of purchasing power of major project workers with their living out allowances and wages, it is reasonable to expect that only the highest income renters will be able to compete with major project workers.

It's hard to imagine how major project workers with large living out allowances will not dramatically affect the existing rental market landscape during the construction periods of the projects on which they are working. These effects will add to an already high proportion (37%) of households in Squamish paying more than 30% of their income on housing (Statistics Canada Undated-a), a situation that the CMHC calls 'unaffordable' (CMHC 2014). While construction workers might only compete for rental housing for a

couple of years, the social, health and other effects on those pushed out of their housing could be much longer-lasting. Additionally, renters unable to afford their housing in this new rental market would face moving costs within Squamish to other potentially still-affordable housing, or at greater cost to other communities with less expensive housing.

Lastly, it is important to note that higher costs of living for rental households can and should be expected to create further challenges for local employers. When costs of living are high, it is harder to attract employees to fill local labour gaps. In theory wages will rise to attract this labour, but in reality many employers may not be able to do so, with the potential that some businesses close down or relocate, should increased revenues earned from a growing local population not offset these higher operating costs. It is beyond the scope of the current work to try to estimate such net effects on employers.

3.2.3 Effect 6: Indirect Economic Effects

If the workforce accommodations are built, "indirect" economic effects can be expected to flow to any supplier to LandSea-Stalkaya. Local subcontractors, such as GFL, 99 Transport, Black Tusk Fire, Sko-mish Valley Security Services, West Barr, New Era, Rona-Squamish, Pac West, and Home Depot-Squamish will provide employment to their own employees and make their own purchases of supplies, some of which would be made from other local businesses.

However, these indirect effects would only be incremental under two conditions.

- First, their incrementality depends on whether there would be alternative uses of the Britannia Beach lands or other worker accommodation development, which would also have indirect economic effects presumably including local subcontractor employment and associated local purchases. Without further concrete information on such alternatives, though, the likelihood and scale of such alternatives are hypothetical, and thus I expect that such indirect economic effects of the workforce accommodations would be incremental.
- Second, the incrementality of LandSea-Stalkaya's indirect economic effects depends on whether LandSea-Stalkaya's demand on local subcontractors would be incremental for these suppliers. I don't see how LandSea-Stalkaya's demand on local subcontractors would displace existing business, and so I expect that local businesses servicing LandSea-Stalkaya's accommodations would expand in order to be able to do so, providing incremental revenues and potential incremental employment.

All considered, it seems reasonable to conclude that the indirect economic effects of the LandSea-Stalkaya workforce accommodations would be incremental in part if not in full.

3.2.4 Effect 7: Induced Economic Effects

Woodfibre LNG and FortisBC both argued in the project benefit sections of their EA applications that there will be "induced" economic effects of their workers spending some portion of their wages in the Squamish area. Such effects would be things like workers' expenditures on food and alcohol, automobile fuel, at restaurants and bars, clothing, and sporting goods. The question for the present analysis is whether there are incremental induced economic effects of either worker housing option. I would expect that two types of induced economic effects can be expected, but the issues are one of scale and whether there would be any difference of effects between the two housing options.

If the workforce accommodations are built there will be spending by LandSea-Stalkaya's own operational staff (numbering about 55 at peak, with annual wages totalling roughly $2.5 million) in Britannia Beach, Squamish, and perhaps in other communities in the region, which will contribute to local businesses in the form of additional revenue and associated possible profits, and contributing to these business' provision of employment. This effect would be incremental under two conditions.

- The incrementality of induced effects from LandSea-Stalkaya's staff spending depends on whether there would be alternative uses of the Britannia Beach lands or other worker accommodation development, which would also provide induced economic effects. This alternative development would presumably have employees which spend a portion of their income locally. Without further information on such alternatives, though, such effects are merely hypothetical, thus suggesting that the induced effects of LandSea-Stalkaya staff would be incremental.
- However, the incrementality of these induced economic effects from LandSea-Stalkaya's staff spending depends also on whether the workforce accommodation employees have incremental employment or not. If LandSea-Stalkaya staff would otherwise be employed in the area then they would otherwise spend a portion of their income locally and there would not be any incremental induced effects. On the other hand, if these staff would not be employed, or be employed at lower wages, then they would spend less locally. As I discussed in s.3.2.1, I would expect that some of this employment would be incremental and therefore I would expect some of these induced economic effects to be incremental.

A second type of induced effect – while not technically that of the worker housing options themselves but shaped by worker accommodation options – would stem from major project workers spending some portion of their earnings in Britannia Beach, Squamish, and perhaps in other communities in the region, which also supports local

businesses and their employee base. This induced effect was covered in the Woodfibre LNG and Eagle Mountain EA applications but I raise it here as there is a distributional effect that would result from which worker accommodation option is chosen. Given the limited commercial sector currently in Britannia Beach (a general store and a coffee shop) relatively little major project earnings can be expected to be spent in this community if the workforce accommodation is built and no other commercial development occurs in Britannia Beach. On the other hand, Squamish is a full-service community and can expect a much greater receipt of major project workers' earnings, especially if workers are renting accommodation in Squamish, though much can also be expected to be spent in (i.e., "leaked to") Vancouver and workers' home communities where an even greater selection of stores and opportunities to spend one's wages exists.

However, beyond the distributional aspect, none of this induced effect of major project workers should be expected to be incremental because these workers would otherwise be in the area spending their income and thereby supporting local businesses and these business' employee bases. In other words, whether major project workers are living in a workforce accommodation or in rental housing in Squamish they can be expected to spending some portion of their wages locally.

All considered, there will be an incremental induced effect associated with operational staff at the LandSea-Stalkaya workforce accommodation should that accommodation option be chosen given that some of these staff would not otherwise be working, but there would only be variation in where the induced effects of major project workers themselves occurs depending on which accommodation option is chosen. If LandSea-Stalkaya is permitted to build their proposed workforce accommodation then a greater portion of the induced economic effects would occur in Britannia Beach.

3.2.5 Effect 8: Proponent Effects

Typically impact assessments examine the effects of a non-local developer on a local region, but in this case the proponent is local. LandSea-Stalkaya is a joint venture between Squamish-based LandSea, the firm Stalkaya which is privately owned by members of the Squamish First Nation, and the Squamish and Tsleil-Waututh First Nations themselves. Anticipated net revenues from building and operating the proposed workforce accommodations are confidential, but the venture is expected to be revenue-positive to venture partners, provide local employment within these partners, and also support the partners' other economic activities in their respective communities, such as making local purchases themselves to run their operations and community contributions.

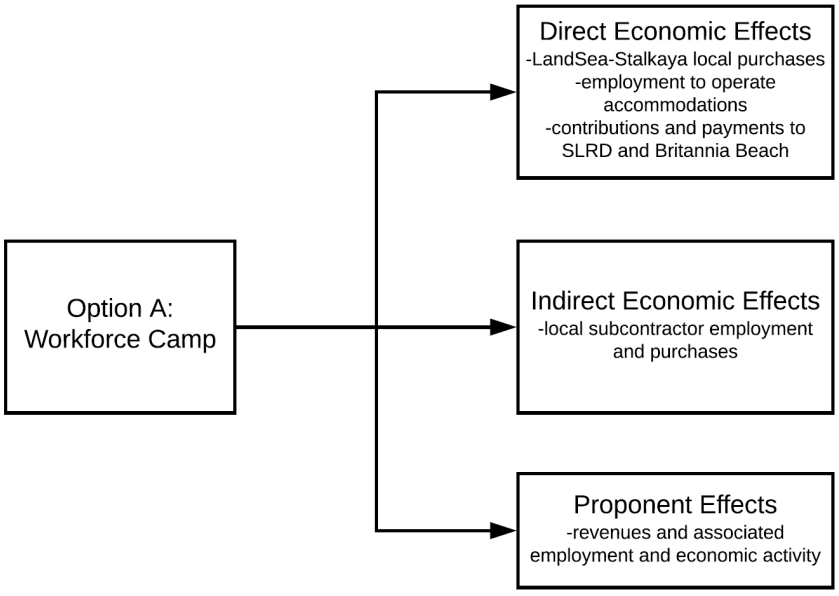
3.3 Summary of Expected Incremental Economic Effects

If LandSea-Stalkaya's workforce accommodation is built then I would expect some incremental economic benefits flowing to local businesses, local labour, the SLRD and Britannia Beach associated with direct, indirect, and fiscal economic effects, and the local proponent (Figure 4). These benefits would include:

- local purchases, and local employment and earnings that wouldn't otherwise occur associated with operations of the workforce accommodations;
- amenity and community benefit contributions and tax payments to the SLRD and Britannia Beach of roughly $400,000 per year associated with use of infrastructure and services; and
- local subcontractor revenues and employment due to their servicing of the construction, operations, and decommissioning of the workforce accommodations;
- revenues for the proponent and associated local employment and local economic activity.

I don't expect that other economic effects discussed above in s.3.2 would be incremental, and so I omit these effects from Figure 4.

Figure 4. Anticipated incremental effects if workforce accommodation is built.



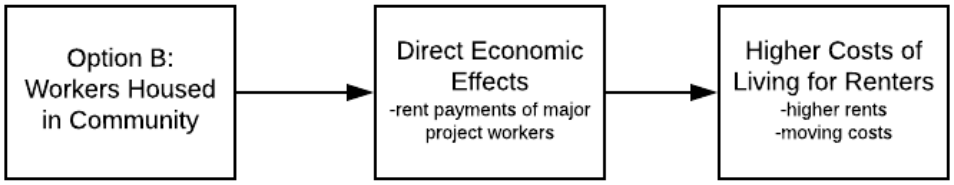
On the other hand if no workforce accommodation is built, then I would expect some incremental economic benefits flowing to landlords, but also incremental economic

costs flowing to other renters in the form of higher rental prices and moving costs (Figure 5). These benefits and costs would include:

- incremental rent earnings flowing to landlords as a result of further inflation of the Squamish rental market; and
- higher rental costs for other renters, and moving costs for renters forced to move.

I don't expect that other economic effects discussed above in s.3.2 would be incremental, and so I omit these effects from Figure 5.

Figure 5. Anticipated incremental effects if no workforce accommodation is built and workers enter Squamish rental market.



I make no attempt to judge the significance of the above effects in the EA sense of the word. Such a characterization of significance is out of the scope of this work.

3.4 Distribution of Anticipated Effects

Examining who wins and who loses is an important part of any effects assessment.

Under the workforce accommodation scenario, local businesses and labour, the SLRD and Britannia Beach, and the local proponent can be expected to gain economically (Table 3). Local businesses and labour would benefit from selling to and working for LandSea-Stalkaya; the SLRD and Britannia Beach would benefit in terms of garnering financial contributions and tax revenue; and the local proponent would benefit in terms of net revenues and the employment of their own staff. There might also be some minor incremental induced effects from worker spending in Britannia Beach itself if workers are housed there. I don't identify any economic "losers" in the workforce accommodation scenario.

Table 3. Expected winners and losers under worker housing options.

Worker Housing Option	Winners	Losers
Workforce accommodations	Local businesses, local labour, local subcontractors, local government, proponent (which includes First Nations)	None identified

Workers rent in Squamish	Landlords	Other renters, especially low-income households

Under the scenario where major project workers are housed in rental units in Squamish, there would be an economic benefit in the form of higher rental revenue flowing to landlords than wouldn't otherwise be earned due to the added demand by workers with large living out allowances at their disposal (Table 3). On the other hand, other renters – especially low-income households – would be negatively affected by the resulting higher rental prices, and I would expect that many of these households would have to move and thereby also incur moving costs.

4. Conclusions

LandSea-Stalkaya is proposing to provide temporary workforce accommodations to house major project workers anticipated to be needed very soon to construct the Woodfibre LNG project and other major projects in the Squamish area. In support of a temporary use permit application to the Squamish-Lillooet Regional District, Swift Creek Consulting was hired by LandSea-Stalkaya to examine and provide information on the economic effects associated with the construction, operation, and decommissioning of workforce accommodation in the Britannia Beach area, just south of Squamish. To assess these effects, the alternative scenario of housing the same number of workers in existing rental units in Squamish was considered.

To carry out this work, Swift Creek Consulting gathered information on the proposed workforce accommodations, identified the key pathways of effect, considered readily available secondary data and evidence to forecast likely incremental effects of both scenarios, and examined the distribution of anticipated effects. Incremental effects are those effects above and beyond what can reasonably be expected to otherwise occur. Another consultant was hired to examine the potential social, community, and environmental effects of the options.

The conclusion is that there would be a variety of economic gains to a variety of parties under both worker housing options, but that there would be substantial negative effects if the LandSea-Stalkaya workforce accommodations option was not taken. If workforce accommodations are not built to house the influx of 600 or more workers that can be expected to migrate to the Squamish area help construct the Woodfibre LNG and other projects, and instead these workers are given a living out allowance to find their own local rental housing, then it's hard not to imagine the current tight rental housing market to tighten further. While landlords would benefit under such a scenario, there is a large proportion of renters already paying more than what is considered an acceptable amount on their housing, and things would get worse for at least a couple of years. This conclusion is consistent with conclusions reached in Kitimat which is also facing the

prospect of LNG development (CitySpaces Consulting 2015), and this conclusion is consistent with that of the Fortis Eagle Mountain LNG pipeline environmental assessment which also encourages the development of temporary workforce housing (FortisBC Energy Inc. and CH2M HILL Energy Canada 2015). It is hard, based upon the evidence reviewed in this study, to argue against this course of action for Squamish.

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Appendix A: Chris Joseph CV

Chris Joseph MRM, PhD

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cjoseph@swiftcreekconsulting.com; 604-848-9804; www.swiftcreekconsulting.com

Expertise and Skillsets

- environmental assessment including the assessment of economic impacts, the impacts of energy development, and the theory of environmental assessment and cumulative effects
- environmental and ecological economics, including cost-benefit analysis and non-market valuation
- megaproject development and their valuation
- collaborative planning, multi-stakeholder engagement, and facilitation
- policy evaluation and policy implementation
- literature synthesis and surveying/questionnaires
- structured decision-making
- project management and group leadership
- instruction and communications

Education

PhD (Resource Management), 2006 - 2013
School of Resource and Environmental Management. Simon Fraser University
"Megaproject Review in the Megaprogram Context: Examining Alberta Bitumen Development"
Recipient of several scholarships and awards, including Canada Graduate Scholarship – Doctoral (SSHRC) 2006-2009

Masters of Resource Management, 2002 - 2004
School of Resource and Environmental Management. Simon Fraser University
"Evaluation of the B.C. Strategic Land-Use Plan Implementation Framework"

Bachelor of Science (Honours with Distinction; Geography), 1993 - 1998
University of Victoria
"The Impact of Rock Climbing on the Soils and Vegetation at the Base of Cliffs within Greater Victoria, British Columbia"

Professional Affiliations

International Association of Impact Assessment

International Association of Impact Assessment – Western and Northern Canada

Past membership with the Association of Professional Economists of BC, International Association of Energy Economics, the Planning Institute of BC, Canadian Institute of Planners, and Connecting Environmental Professionals

Summary of Professional Experience

2016 - present
Principal, Swift Creek Consulting, Squamish, BC

2016 – 2018
Senior Socio-economic Specialist, SNC Lavalin, Vancouver BC

2003 – 2017
Sessional Instructor and Teaching Assistant, SFU, Burnaby BC
Courses: REM 321 Ecological Economics, REM 356 Resource Management Institutions, GEOG 389 Political Ecology, HSCI 845 Occupational and Environmental Health

2010 - 2016
Associate, Compass Resource Management, Vancouver BC

2000 - Present
Owner, Chris Joseph Photography, Squamish BC
Photography and writing published in national and international publications, websites, and catalogues including Globe and Mail, Patagonia, Explore, Climbing, BC Paraplegic Association, Canada Science and Technology Museum, British Columbia Magazine, Mountain Equipment Co-op, Readers Digest, Ski Canada, Pique, Vancouver Sun, Westworld (BCAA), and National Post.

2003 - 2013
Researcher, Sustainable Planning Research Group, SFU, Burnaby BC

2005 – 2009
Independent Consultant, Vancouver BC

2005 – 2006
Research Associate, MK Jaccard & Associates, Canadian Industrial Energy End-Use Data and Analysis Centre, Vancouver BC

2004 – 2005
Assistant, Melting Mountains Awareness Program (David Suzuki Foundation / Alpine Club of Canada / Environment Canada), Vancouver BC

2000 – 2001
Project Supervisor, Outland Reforestation, Toronto / Thunder Bay ON

Past Assignments

Athabasca-Chipewyan First Nation / Pembina Institute: Teck Frontier Bitumen Mine: Review of Economic Benefits and Cost-Benefit Analysis. Critiqued Teck's assessment of economic benefits including employment, and conducted a cost-benefit analysis of the proposed Teck Frontier bitumen mine. Provided written and in-person expert testimony to inform the joint Alberta-federal environmental assessment review panel. (2018)

West Moberly First Nations: Impacts of a Suspension of the Site C Project on Construction Workers and Municipalities. Wrote expert testimony to inform the court with respect to an application for injunction with regards to how suspension of the project may affect current construction workers and municipalities in the region. (May 2018)

Indian and Northern Affairs Canada: Technical Review of Socio-economic Impact Assessment of the proposed Hope Bay Phase 2 Mine. Team lead of SNC Lavalin's technical review of socio-economic

material in the final environmental impact statement of TMAC Resources' proposed Hope Bay Phase 2 mine in Nunavut. Review included reviewing regulatory and proponent documentation and advising INAC on appropriate responses. (Winter and Spring 2018)

BC Parks: Development of Living Labs climate change research framework. Developed a funding framework for climate change research in BC parks and protected areas. Work included developing a database of recent climate change research in BC Parks through literature review and survey, a database of potential research and funding partners, and facilitating sessions at a meeting with BC government staff. Oversaw two subcontractors in this work. (Fall 2017-Spring 2018)

BC MFLNRO: Socio-economic profiles and scenario development – Caribou Range Planning in NE BC. Subcontracted to Green Analytics. Developed scenarios of forestry and gas development, and provided strategic advice. (Spring 2018)

Alberta Environment and Parks: Advice on Improved Integration of Project-level Environmental Impact Assessment and Regional Cumulative Effects Management. Reviewed existing linkages between project-level EIA in the South Athabasca Oil Sands area with regional cumulative effects management, including through expert interviews. Provided recommendations to improve the contribution of project-level EIA to regional cumulative effects management. (Fall 2017 – Spring 2018)

Environmental Law and Policy Center (USA): Assessment of the need for the Enbridge Line 3 Replacement Program. Provided written and in-person expert testimony of the need for the Enbridge L3R project, including an assessment of supply and demand of oil transport capacity, costs to Minnesota, and economic benefits of the project. (Fall 2017)

Centremount Coal: Socio-economic lead for SNC Lavalin's environmental assessment of the proposed Bingay coal mine. Scoping, baseline, and impact assessment studies of potential social, economic, and community health effects of the proposed Bingay coal mine in south-east BC. (2016-2018)

Pacific Future Energy: Socio-economic lead for SNC Lavalin's environmental assessment of the proposed Pacific Future Energy green refinery. Scoping and baseline studies of potential social, economic, and community health effects of the proposed green refinery in north-west BC. Advising to proponent on Aboriginal engagement, and engagement with Kitselas First Nation representatives. (2016-2017)

Gitga'at First Nation: Environmental assessment advisor. Since 2013, on an as-needed basis, provided advice to the Gitga'at First Nation regarding EA applications and processes, generally pertaining to socio-economic topics. Assignments included critiquing proponent EA applications, preparing Information Request submissions to EA bodies, and examining issues in EA application content and methodology with proponent consultants. (2013-2017)

Ng Ariss Fong: Assessment of the economic impacts of the Nathan E. Stewart tug spill on the Heiltsuk First Nation. Supported First Nation's legal claim against shipping company by gathering quantitative data, interviewing community representatives and members regarding traditional and commercial harvests, and estimating monetary impact of spill on Heiltsuk harvests. (2016)

Stk'emlupsemc te Secwepemc First Nation: Economic Review of Ajax Mine. Critiqued environmental assessment application of the KGHM Ajax mine project in Kamloops, BC with respect to economic impacts and value of the project. Conducted a multiple-accounts cost-benefit analysis of the project. Identified potential additional mitigation measures. Testified to the Nation's environmental assessment review panel. (2016)

International Pacific Halibut Commission: Facilitation of Management Strategy Evaluation workshops and design of outreach strategy. Over 2015 and 2016 designed and facilitated meetings for

Management Strategy Advisory Board in support of their management strategy evaluation (a collaborative analysis of optimal fishery management actions). Also supervised the development of an outreach strategy for the board. (2015-2016)

Hemmera / Yukon Energy: Stakeholder engagement, meeting facilitation, and options assessment pertaining to the mitigation of impacts of the Southern Lakes Storage Enhancement Concept. Designed and facilitated two rounds of engagement with stakeholders regarding their preferences for erosion mitigation, including small and large group meetings. Conducted options assessment with engineering team (NHC) and explored options collaboratively with stakeholders. (2015)

Tsawout First Nation, Upper Nicola Band, Living Oceans Society: Public Interest Evaluation of the Kinder Morgan Trans Mountain Expansion Project. Contributing editor. Deliverable included an evaluation of Kinder Morgan's economic impact assessment of their proposed Trans Mountain Expansion Project and a cost-benefit analysis of the project. (2015)

Instream Fisheries Research: Facilitation of Gates Creek Sockeye Workshop. Designed and facilitated workshop focused on bringing together the variety of scientists and Aboriginal knowledge-holders, finding research gaps, and identifying steps forward with respect to information gathering, collaboration, and support of management. (2015)

Gitga'at First Nation: Impact Assessment of Prince Rupert LNG Projects. Led a two-person team and was the lead analyst in screening-level analyses of potential socio-economic impacts of three LNG projects (Prince Rupert LNG, Aurora LNG, Pacific Northwest LNG) and a detailed economic impact assessment of the Kitimat LNG project. Examined issues including: economic opportunities including jobs and contracts, access to goods and services, housing, human resources in remote communities, social cohesion, commercial fishing, tourism, carbon offsets, and economic development. Also supervised the writing of a baseline data report to help proponents fill their data gaps. (2014)

Metlakatla First Nation: Assessment of potential impacts of LNG development. Led a six-person team including subcontractor, and was lead analyst, examining the potential impacts of the Pacific Northwest LNG, Prince Rupert LNG, Westcoast Connector LNG pipeline, and Prince Rupert Gas Transmission LNG pipeline projects). Identified seven valued components through document review, interviews, and community workshop. Topic matter covered the economic, health, heritage, and social pillars. Developed baselines and gathered data for proponents. Developed a spreadsheet-based database and model to examine cumulative effects. Assessed the effects of projects in the context of cumulative effects of other development and stresses. Conducted a final workshop with community representatives to validate draft results. Researched mitigation opportunities. Developed a plain language summary for client in addition to detailed report. (2013-2014)

Gitga'at First Nation: Assessment of the potential economic impacts of LNG Canada project. Led a three-person team, and was the lead analyst. Identified six economic valued components through document review and interviews. Developed baselines. Developed a spreadsheet-based database and model to examine cumulative effects. Assessed the effects of projects in the context of cumulative effects of other development and stresses. Researched mitigation opportunities. Conducted a workshop with community representatives to validate draft results. (2013-2014)

Canadian Oil Sands Innovation Alliance: Structuring and gathering thinking on innovations in oil sands mine reclamation. Worked with two other firms on a multiple component project that gathered knowledge across oil sands mining companies on how to reclaim watersheds and to identify research priorities. (2013)

BC Ministry of Forests, Lands, and Natural Resources Operations: Recommendations for a Provincial Trails Advisory Body. Led a two-person team researching alternative governance models

across Canada for recreational trails advisory bodies. Used a structured approach to identify key desired design elements, alternative governance structures, evaluate alternative models, and make recommendations for the BC trails context. (2013)

Marine Planning Partnership: Socio-economic data and editing. Supported MaPP planning team by gathering data on socio-economics including commercial fisheries and sport fishing along the BC coast and editing relevant sections of MaPP plans. (2013)

Environment Canada: Guidance on the valuation of ecosystem services for use in environmental assessment decision-making. Reviewed literature to identify existing gaps in the practice of environmental valuation in the environmental assessment context. Advised on the design of an expert workshop used to gather guidance on key issues in environmental valuation. Facilitated major portions of the workshop. Wrote guidance for Environment Canada to improve their in-house economic valuations of environmental impacts. (2012-2013)

Port Metro Vancouver: Facilitation of Technical Advisory Group in Support of Pre-EA Work for Marine Terminal Expansion at Roberts Bank. Co-designed a multi-meeting, multi-month process to engage technical experts to gather advice for Port Metro Vancouver (PMV) and their consultants to improve their baseline studies and environmental assessment methods for the proposed Terminal 2 project. Facilitated meetings over Fall 2012 and Winter/Spring 2013 in support of process, and worked with PMV consultants to refine issues and enhance their ability to engage with the technical experts. Lead facilitator for the Coastal Geomorphology technical advisory group (one of four such groups convened as part of this contract). (2012-2013)

Gitgaʼat First Nation: Assessment of the potential economic impacts of the Enbridge Northern Gateway Project. Assessed the potential economic impacts of the Enbridge Northern Gateway pipeline and tanker project on the Gitgaʼat Nation and examined broader issues such as how to incorporate risk information into decision-making. Critiqued the proponent's application, established baseline data, conducted original impact assessment work, and wrote evidence that was submitted to the Joint Review Panel examining the project. Testified to the Panel in April 2013. (2011-2013)

BC Environmental Assessment Office: Refinement of Impact Assessment Methodology. Co-wrote discussion paper for the BC EAO making suggestions with respect to how the BC government might modify the existing environmental assessment process in order to strengthen the process, particularly with respect to cumulative effects assessment. This work involved identifying key outstanding issues, interviewing experts, and writing policy guidance. (2012)

Cumulative Environmental Management Association: Support for a structured decision-making process to identify solutions to linear footprint management issues in the oil sands. Developed objectives and measurement criteria, and led workshop discussion on these topics, for work on the linear footprint management plan for the Stony Mountain 800 Area south of Fort McMurray. The objective of this project was to identify recommendations for government to address multiple uses of the area, including SAGD, forestry, trapping, and recreation. (2012)

City of Merritt: Water planning and conservation. Researched water conservation tools in support of recommendations to the City of Merritt for their new water plan, including interviewing of water experts in municipalities across BC and ranking of water conservation tools used across BC. Analyzed the City of Merritt's water use data. (2011)

Department of Fisheries and Oceans: Facilitation of SARA consultations for species recovery. Developed consultation strategies with DFO and facilitated two evening open-house meetings and five day workshops for stakeholder consultations required under the Species at Risk Act for the Salish Sucker, Nooksack Dace, Cultus Pygmy Sculpin, and Rocky Mountain Ridged Mussel. (2010-2011)

Haida First Nation: Evaluation of environmental and economic impacts of proposed NaiKun offshore wind project. Provided a third-party review of BC, federal, and consultant environmental assessments of the project in terms of gaps in data and logic, identified potential significant impacts, and advised on financial viability of the project. (2011)

Tides Foundation: Benefits of Marine Planning: An Assessment of Economic and Environmental Values. Reviewed the social and economic context for marine development on the BC coast and examined the benefits of marine planning with respect to environmental protection, economic development, and social capital. This research was also published in the journal Environments. (2009)

Department of Fisheries and Oceans: Review of potential impacts of renewable ocean energy development in BC. Reviewed the potential social and economic impacts of renewable ocean energy development in BC. Examined the potential for renewable ocean energy development (tidal, wave, and wind) on the BC coast, reviewed current levels of development, reviewed the socio-economic context of the BC coast, and explored how such development might affect employment, existing industries (e.g., air travel, aquaculture, forestry, and marine navigation), energy supply in rural areas, recreation, rural demographics, traditional activities, and other values. (2008)

Coastal First Nations: Review of environmental and socio-economic impacts of port development and shipping on BC North Coast. Reviewed the potential impacts of port expansion and shipping (including tankers) on the BC North Coast. Characterized the significance of potential impacts and reviewed potential mitigation measures, including Impact Benefit Agreements. (2008)

David Suzuki Foundation: Toward a National Sustainable Development Strategy in Canada. Researched and contributing writer of an examination of the legal and policy framework for sustainability planning across jurisdictions in Europe, Japan, the US, and Canada. Identified components across jurisdictions that facilitate a jurisdiction's ability to plan for and achieve greater sustainability. Report proposed a draft federal law which in 2008 was adopted by Parliament (Federal Sustainable Development Act). (2007)

Natural Resources Canada: National Circumstances Affecting Canada's Greenhouse Gas Emissions. Contributed to a quantitative study of factors shaping Canada's GHG emission patterns. Conducted analysis of emission patterns and contributing factors to emissions of Canada's residential housing, transportation, and wood processing sectors. This research was also published in the Energy Journal. (2005)

National Round Table on the Environment and the Economy: Canada's Energy and Greenhouse Gas Context. Contributed to a study on the linkages between Canada's energy sources and economy, international comparisons, and policy options for reducing GHG emissions. (2005)

Coastal First Nations: Review of offshore oil and gas development in BC. Literature review of the legal, environmental and socio-economic issues of offshore oil and gas development in BC and evaluation of the relevant planning process. Highlighted issues relevant to strategic and project-level decision-making. (2004)

Peer-Reviewed Publications

Joseph, C., T. Gunton, and M. Rutherford. 2017. A Method for Evaluating Environmental Assessment Systems. *Journal of Environmental Assessment and Policy* 19(3): 33 pp.

Joseph, C., T. Zeeg, D. Angus, A. Usborne, and E. Mutrie. 2017. Use of Significance Thresholds to Integrate Cumulative Effects into Project-level Socio-economic Impact Assessment in Canada. *Environmental Impact Assessment Review* (67): 1-9.

Joseph, C., T. Gunton, and M. Rutherford. 2015. Good practices for effective environmental assessment. *Impact Assessment and Project Appraisal* 33(4): 238-254.

Joseph, C., and A. Krishnaswamy. 2010. Factors of resiliency for forest communities in transition in British Columbia. *BC Journal of Ecosystems and Management* 10(3): 127-144.

Gunton, T. and C. Joseph. 2010. Economic and Environmental Values in Marine Planning: A Case Study of Canada's West Coast. *Environments* 37(3): 111-127.

Joseph, C., T.I. Gunton, and J.C. Day. 2008. Implementation of resource management plans: Identifying keys to success. *Journal of Environmental Management* 88: 594-606.

Bataille, C., N. Rivers, P. Mau, C. Joseph, and J. Tu. 2007. How malleable are the greenhouse gas emission intensities of high-intensity nations? A quantitative analysis. *Energy Journal* 28(1): 145-169.

Expert Evidence

Teck Frontier Oil Sands Mine. Written testimony to the Joint Review Panel. 2018.

Site C Clean Energy Project. Written testimony to the Supreme Court of British Columbia. 2018.

Enbridge Line 3 Replacement project. Written and in-person testimony to the Minnesota Public Utilities Commission. 2017.

Ajax Copper/Gold Mine. Written and in-person testimony to Stk'emlupsemc te Secwepemc Nation Review Panel. 2016.

Kinder Morgan Expansion Project. Written testimony to the National Energy Board. 2015.

Enbridge Northern Gateway Pipeline. Written and in-person testimony to National Energy Board. 2013.

Peer Review of Research

Environmental Management

Journal of Environmental Assessment Policy and Management

Select Other Professional Publications

Joseph, C., and T.I. Gunton. 2010. Net economic and environmental benefits of an oil sands mine. Proceedings of the 29th USAEE/IAEE North American Conference in Calgary, Alberta, Canada, October 14-16, 2010.

Joseph, C. 2010. The Tar Sands of Alberta: Exploring the Gigaproject Concept. Proceedings of the Prairie Summit geography conference, June 1-5, 2010, Regina, SK.

Joseph, C., and T. I. Gunton. 2009. Benefits of Marine Planning: An Assessment of Economic and Environmental Values. Marine Planning Research Report No. 4. Prepared for Tides Canada Foundation. Burnaby, BC: School of Resource and Environmental Management, Simon Fraser University. 34 pp.

Nyboer, J., and C. Joseph. 2006. Development of Energy Intensity Indicators for Canadian Industry 1990-2004. Prepared for Canadian Industry Program for Energy Conservation and Natural Resources Canada. Canadian Industrial Energy End-use Data and Analysis Centre, Simon Fraser University. 32pp.

Nyboer, J., C. Joseph, and P. Mau. 2006. Development of Greenhouse Gas Intensity Indicators for Canadian Industry, 1990 to 2004. Prepared for Environment Canada and Natural Resources Canada. Canadian Industrial End-Use Energy Data and Analysis Centre, Simon Fraser University. 584pp.

Nyboer, J., C. Joseph, N. Rivers, and P.Mau. 2006. A Review of Energy Consumption and Related Data Canadian Aluminium Industries 1990-2003. Prepared for Aluminium Industry Association. Canadian Industrial Energy End-use Data and Analysis Centre, Simon Fraser University. 36pp.

Nyboer, J., C. Joseph, N. Rivers, and P.Mau. 2006. A Review of Energy Consumption and Related Data Canadian Mining and Metal Smelting and Refining Industries 1990-2003. Prepared for Mining Association of Canada. Canadian Industrial Energy End-use Data and Analysis Centre, Simon Fraser University. 159pp.

Nyboer, J., N. Rivers, P. Mau, K. Muncaster, S. Groves, and C. Joseph. 2006. A Review of Renewable Energy in Canada, 1990 – 2004. Canadian Industrial End-Use Energy Data and Analysis Centre, Simon Fraser University. 27pp.

Bataille, C. M. Jaccard, N. Rivers, B. Sadownik, R. Murphy, P. Mau, and C. Joseph. 2005. Canada's Energy and Greenhouse Gas Context. Report for National Round Table on the Environment and Economy. NRT-2005085. M.K. Jaccard & Associates. 93pp.

Bataille, C., N. Rivers, P. Mau, and C. Joseph. 2005. National Circumstances Affecting Canada's Greenhouse Gas Emissions. Report for Natural Resources Canada. NRCan-05-0623. M.K. Jaccard & Associates. 95pp.

Presentations, Guest Lectures, and Workshops

Presentation at Canadian Institute's Cumulative Effects 2018 conference entitled "Development in a Full World: Cumulative Effects, Significance, and Justification", June 5, 2018. Calgary, AB.

Lead workshop for environmental professionals entitled "Environmental Assessment in Canada: Current Issues and Prospects for Improvement" for Faculty of Environment, Simon Fraser University, October 26, 2017. Vancouver, BC.

Lead workshop entitled "Valued Components Masterclass" at Canadian Institute's Cumulative Effects conference, June 21, 2017. Calgary, AB.

Presentation at Canadian Institute's Cumulative Effects conference entitled "Improving Cumulative Effects Assessment in Project-Level Assessment", June 20, 2017. Calgary, AB.

Presentation to SNC Lavalin staff entitled "Megaprojects: Navigating Failures, Bias, Symbolism, and Other Interesting Stuff", April 19, 2017. Vancouver, BC.

Presentations at IAIA'17 entitled "Benefits Assessment in Western Canada: Case studies and Lessons", April 6, 2017, and "Significance Thresholds to Integrate CEA in Project-level EA", April 7, 2016. Montreal, QC.

Presentation to the Federal EA Review Panel, December 11, 2016, Vancouver, BC.

Guest lecture to undergraduate economics class on economic impact assessment and the public interest, Simon Fraser University, March 13, 2014, Burnaby, BC.

Public presentation for Moving Planets on Enbridge Northern Gateway project, March 27, 2012, Squamish, BC.

Guest lecture to undergraduate environmental studies class on megaproject review and the Enbridge Northern Gateway pipeline project at Quest University, March 15, 2012, Squamish, BC

Guest lecture to masters environmental assessment class on tar sands project review, School of Resource and Environmental Management, Simon Fraser University, February 28, 2011, Burnaby, BC.

Presentation at Unwrap the Research Conference entitled "The Tar Sands of Alberta: Exploring the Gigaproject Concept", October 24, 2010, Fort McMurray, AB.

Presentation at 29th USAEE/IAEE North American Conference entitled "Net economic and environmental benefits of an oil sands mine", October 16, 2010, Calgary, AB.

Presentation at Prairie Summit 2010 geography conference entitled "The Tar Sands of Alberta: Exploring the Gigaproject Concept", June 4, 2010, Regina, SK.

Guest lecture to ecological economics class on cost-benefit analysis of tar sands development at Quest University, April 26, 2010, Squamish, BC

Presentation at community meeting on the economic risks of the Garibaldi at Squamish ski and residential project proposal, April 12, 2010, Squamish, BC.

Guest lecture on environmental assessment of large-scale projects to Geography 319 "Environmental Impact Assessment" at March 17, 2010, University of British Columbia, Vancouver, BC.

Public presentation hosted by Squamish Climate Action Network on Alberta Tar Sands, May 25, 2009, Squamish, BC.

Guest lecture entitled "Energy: A Love and Hate Relationship" to students at Capilano College, September, 2008, North Vancouver, BC.

Presentation to Butterfield & Robinson travel group on oil sands development, August 20, 2008, Calgary, AB.

Panel presenter at Whistler Energy Forum on energy and sustainability, June 8, 2008, Whistler, BC.

Presentation for REM seminar series entitled "Can Cost-Benefit Analysis be Improved with Stakeholder Involvement?", Simon Fraser University, November 1, 2007, Burnaby, BC.

Presentation at Canadian Pollution Prevention Roundtable entitled "Pricing Oil Sands Pollution? Balancing Expert and Stakeholder Input", June 14, 2007, Winnipeg, MB.

Presentation at ISSRM 2006 Conference entitled "Implementing Resource Plans: Lessons from BC", June 5, 2006, Vancouver, BC.

Presentation at PIBC Conference as part of session entitled "Planning Implementation: Lessons from the Field", April 19-22, 2005, Vancouver, BC.

Invited Speaker at "Dialogue Café" on climate change, February, 2005, Whistler, BC.

Co-presenter for REM Seminar series entitled "Offshore Oil and Gas in BC", Simon Fraser University, February 28, 2005, Burnaby, BC.

Presentation at BC Land Summit 2004 as part of session entitled "BC's Crown Land Planning Process - Does it Work?", May 14, 2004, Vancouver, BC.

Presentation at CONFOR 2004 conference entitled "An assessment of the British Columbia strategic land use plan implementation framework and an identification of best practices for plan implementation", Dalhousie University, February 6, 2004, Halifax, NS.

Presentation for REM Seminar Series entitled "An Evaluation of the BC Strategic Land Use Planning Implementation Framework: Best Practices, Current Practices.", Simon Fraser University, November 14, 2003, Burnaby, BC.

Presentation at Annual Meeting of the Western Division of the Canadian Association of Geographers entitled "The Impact of Rock Climbing on the Soils and Vegetation at the Base of Cliffs.", Kwantlen University College, March 12-14, 1998, Richmond, BC.

Co-presenter at Annual Meeting of the Western Division of the Canadian Association of Geographers entitled "The Geomorphology of Small Push Moraines at Hilda Glacier, Banff National Park, Alberta", Kwantlen University College, March 12-14, 1998, Richmond, BC.

Awards

Sustainable Prosperity research grant, 2011

Waterhouse Graduate Fellowship in Organizational Change and Innovation, 2009

Jake McDonald Memorial Scholarship, 2007

Canada Graduate Scholarship – Doctoral (SSHRC), 2006-2009

2nd Place, Photography, Vancouver International Mountain Film Festival, 2003

Treeplanter of the Year, Outland Reforestation, 1996

Student Leadership, Ontario Secondary School Teachers' Federation, 1993

Additional Professional Development

IAIA Webinar "Understanding Impacts on Vulnerable Populations through Psycho-Social Impact Assessment" by Michael R. Edelstein. July 19, 2017, online.

Organized Reasoning Workshop with Glenn Brown. September 28, 2016, Vancouver.

Lifecycle Analysis Workshop with Rob Sianchuk and Alex Vigneault. February 4, 2012, Vancouver.

Facilitation Workshop with Charles Holmes. November 8, 2007, Vancouver.

Presentation Skills Workshop with Michelle Ray. December 2, 2006, Vancouver.

Appendix 5: Socio Economic Impact Assessment, SNC Lavelin

Workforce Accommodation Study

Environmental, Social, and Economic Impacts Analysis

December 3, 2018

Internal Ref: 659166

Prepared for:

LandSea

SNC·LAVALIN

Executive Summary

Purpose

This study is intended to provide supplemental information with respect to potential environmental, social, and community effects in support of a Temporary Use Permit (TUP) Application to be submitted by LandSea to the Squamish Lillooet Regional District (SLRD).

The objective of this report is to present an assessment of future conditions related to labour workforce requirements in the SLRD, specifically Squamish and Britannia Beach. The assessment will look at the effects within these communities with and without the proposed temporary workforce accommodation. Included in the report is a trade-off analysis between the two scenarios: a) utilizing a temporary workforce accommodation opportunity to accommodate all workers and b) accommodating anticipated workers in existing and future housing inventory in the Sea-to Sky area, concentrated in Britannia Beach and Squamish.

Scope

Environmental

The scope of the environmental portion of the analysis focused on the proposed TUP site in Britannia Beach. A preliminary Environmental Overview Assessment (EOA) was conducted. A preliminary EOA is intended to provide a high-level, desktop review to establish the baseline environmental setting. Information and data is collected through a desktop review of ecological and regulatory databases and search engines including local, regional and federal government sites, and combined with Project scope and site information provided by LandSea to identify conditions at the Project site and adjacent land uses that may be affected by the Project. The scope of work for the preliminary EOA does not include detailed field studies including species specific surveys, plant sampling, fish sampling, fish habitat assessments or rare species investigations. Site photos are available in Section 3.

Community

On a broad scale, community indicators often focus on common themes that relate to quality of life leading to physical and mental well-being of individuals within a community such as access to and quality of services, public safety, affordability, employment, and civic engagement. This assessment focused on indicators that have been identified as either important to the community and/ or sensitive to change based on existing conditions within the SLRD.

The scope of the community assessment focused on the potential effects on two main areas:

- Housing and Services (i.e., access to housing, health, emergency, childcare and education services);and
- Community Wellness (i.e., access to recreation, public safety, transportation [traffic]).

Housing and Services

Housing and services may be directly affected as a result the anticipated influx of workers over the next five years. The quality and capacity of housing and services has the ability to affect to the overall quality of life for people living within the communities of the SLRD. An influx of permanent and temporary populations are the main drivers of change related to effects on housing and services. Effects related to increased labour workforce requirements, taxes, housing affordability, and local spending will be explored by Swift Creek Consulting (2018), *Comparison of Effects of Workforce Housing Options in Squamish,* which has been included with the TUP application by LandSea.

Community Wellness

Community wellness is often correlated to 'quality of life' and 'livability'. Quality of life often refers to multiple factors related to safety, employment opportunities, environmental health, ease of travel, access to services and quality of recreational access. The community wellness assessment focuses on the potential effects on public safety, access to recreation, and traffic.

Economic

Economic considerations have been summarized and used to inform the trade-off analysis. Information has be drawn upon from a study conducted by Swift Creek Consulting (2018).

Effects and Trade-off Analysis

The table below summarizes the results of the effects assessment as presented in the report. The table shows the trade-offs that exist between a scenario with no workforce accommodation and a scenario with workforce accommodation provided for workers, at a minimum, associated with the construction of the Woodfibre LNG Project. Where one alternative is better than another according to the criteria, it has been shaded green, where it is worse than the other it is red. Alternatives that rank relatively similar to each other are shaded yellow. In order to properly compare environmental effects between scenarios, site details need to be considered. The alternative scenario with no workforce accommodation facility offers no specific site for comparison purposes, therefore no trade-off analysis is presented. As previously stated, potential negative environmental impacts are expected to be negligible and the construction and operation of the camp would be completed using appropriate environmental management plans. Any potential effect to the environment can be reduced or eliminated through mitigation.

Amongst community and economic impacts, building a work force accommodation facility will alleviate pressure on housing capacity and provide more direct economic benefits to local businesses. It will also reduce any negative impacts related to traffic congestion associated with additional rides required to move workers to and from their places of work. The workforce accommodation scenario also allows for closer management of the labour force population with potential benefits to public safety and recreation.

Without the accommodation facility local residents and small businesses would be greatest effected with vulnerable populations (e.g., women, low to moderate income families) at greatest risk. Housing affordability and availability would likely be temporarily and artificially inflated more than it already is, local businesses would be competing with high wage paying employers to retain workers, existing employees of small businesses would struggle to find housing.

Negative impacts on public safety exist in both scenarios, however, in the case of workforce accommodation, increased oversight and regulation of tenants of the facility would potentially alleviate some public safety risks. Workers with recreational amenities on site would be less likely leave the facility, as well drug and alcohol policies with conditional links to continued employment would create incentive for employees to avoid these behaviours. Workers without workforce accommodations would have more freedom in their off hours with less oversight and accountability for their actions.

Table A: Trade-off Analysis of Temporary Accommodation vs. No Temporary Accommodation

Criteria		Future without Temporary Accommodation	Future with Temporary Accommodation
Environment	--	N/A	Minimal disturbance to environment because of previous land uses. Impacts can be eliminated through mitigation
Community	Housing	Increase to housing capacity strain. Artificial inflation of rental prices and decrease in supply. Greater risk for local residents from vulnerable demographics	Decrease housing capacity strain (relative to no lodging being built).
	Services	No temporary lodging will have a neutral effect on strain on health care, education, emergency response and child care as many of these services are operating at capacity and will likely continue to do so.	Temporary accommodation may alleviate some future pressure on services such as social housing services and medical services.
	Public Safety	Neutral. Existing emergency response and crime reduction programs will also grow with project population increases. Potential security/safety issues for women and marginalized groups due to lack of enforcement/oversight of afterhours activities.	Increased oversight of workforce population. Employment/housing conditions related to drug and alcohol use enforced. On site security On site amenities to encourage residents to stay at the facility.
	Traffic	Increased traffic strain due to increase in commuting.	Reduced traffic strains due to reduced number of commuters.
	Recreation	Increased access to lakes, (e.g., Alice Lake, Brohm Lake), ocean beaches (e.g., Minaty Bay), and hiking and biking trails.	Increased access to lakes, (e.g., Alice Lake, Brohm Lake), ocean beaches (e.g., Minaty Bay), and hiking and biking trails. However, a Fitness Centre and other onsite amenities would alleviate pressure on local infrastructure (i.e., gyms).

Table A (Cont'd): Trade-off Analysis of Temporary Accommodation vs. No Temporary Accommodation

Criteria		Future without Temporary Accommodation	Future with Temporary Accommodation
Economic		Incremental rent earnings flowing to landlords as a result of further inflation of the Squamish rental market. Higher rental costs for other renters, and moving costs for renters forced to move. Wage competition harming local small business.	Local purchases amounting to approximately $4.5 million a year for three years, and local employment ~ 55 staff Local subcontractor revenues and employment due to their servicing of the construction, operations, and decommissioning of the workforce accommodation. Contributions, amenities and community benefits in excess of $1 million which includes tax revenues and potential revenues flowing to the SLRD and Britannia associated with use of infrastructure and services. Revenues for the proponent with resulting local employment and local economic activity.

Summary and Recommendations

While there are trade-offs associated with building a temporary accommodation unit for workers, the positive benefits for the communities of Squamish and Britannia Beach outweigh negative ones.

It is apparent that a community such as Squamish faced with the issues it currently is, would benefit from a temporary workforce accommodation in the absence of any other solution on the horizon for this volume of workers. The alternative to this, workers living within the community with significant living out allowances, would further erode the livability of the community and contribute to deepening the affordability issue which has knock on effects to community wellness, traffic volume, local businesses and employee retention, and increased risk for vulnerable populations (women and low and middle income households).

SNC-Lavalin would recommend continued consultation on the TUP application to allow the community to have more insight and input into how the accommodations would be managed, and how employers utilizing the facility would facilitate the integration and participation of their employees into the community.

In addition the following mitigation measures to reduce any potential effects of the workforce accommodation facility:

Environmental

Applicable Acts, regulations and standards, as well as adopting best management practices such as those in the BC Guidelines from Industrial camps (Gov BC, 2017) should be adopted. Work Camps must also comply with applicable Provincial and Federal legislation and local bylaws (Gov BC, 2018). Effective sewage, stormwater and waste management (housekeeping, elimination of wildlife interactions, etc.) of the camp will be key issues during camp construction and operation.

Community

It is understood that LandSea-Stalkya will develop a Code of Conduct for employers. This includes keeping the lodging facility “dry”. Alcohol and marijuana will not be sold or allowed on site. LandSea is planning to develop a number of recreational opportunities for workers at the lodging facility. This includes, but is not limited to a fitness centre, a video game room, Recreation Room (e.g., pool, poker tables, games tables, etc.), and provide high speed internet, and TV/movies for occupants. While workers will be allowed to go in and out of the camp, if they return to the lodging intoxicated, it is grounds for dismissal. Further workers and supervisors should be trained in recognizing the symptoms of substance abuse.

It is expected that all major employers using the lodging facility will have Employee Assistance Programs that provide workers with benefits related to mental health including personal and work counselling, including issues such as substance abuse. Nevertheless, workers can remain reluctant to pursue support for mental health and substance abuse issues “due to embarrassment, the fear of losing their employment and concerns with trust and confidentiality, or they may not be aware of the services available through their employer” (Northern Health, 2012). In places like Kitimat, BC, employers such as Bechtel have been providing workers with information packages to promote health tips concerning nutrition, exercise, and healthy weights (Northern Health, 2012).

It is also expected that LandSea-Stalkya will consult with the community to determine what types of additional mitigation may take place.

Economic

It is expected that any expenditures related to construction and operation of the workforce accommodation will be subject to local procurement policies. LandSea is planning on building and operating this development with its joint-venture partnership with Squamish Nation member-owned Stalkaya. LandSea has made training, employment, sub-contracting and revenue sharing agreements to Stalkaya and the Squamish Nation.

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Appendix A

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1 Introduction

SNC-Lavalin has been retained by LandSea to prepare an Environmental and Social Analysis (the “Study”) for a proposed temporary workforce accommodation in the Britannia Beach area (Figure 1).

This study is intended to provide supplemental information with respect to potential environmental, social, and community effects in support of a Temporary Use Permit (TUP) Application to be submitted by LandSea to the Squamish Lillooet Regional District (SLRD).

An economic effects assessment has also been prepared independently by Swift Creek Consulting (Swift Creek) to provide additional supplemental information for the TUP Application from LandSea. Parts of this assessment have been summarized here.

The objective of this report is to present an assessment of future conditions related to labour workforce requirements in the SLRD, specifically Squamish and Britannia Beach. The assessment will look at the effects within these communities with and without the proposed temporary workforce accommodation. Included in the report is a trade-off analysis between the two scenarios: a) utilizing a temporary workforce accommodation opportunity to accommodate all workers and b) accommodating anticipated workers in existing and future housing inventory in the Sea-to Sky area, concentrated in Britannia Beach and Squamish.

1.1 Proposed Workforce Accommodation

LandSea proposes to build and operate workforce accommodation located off Highway 99 in Britannia Beach, BC (Figure 1). The site is located at coordinates 49°37'02.9"N 123°12'26.5"W. The accommodation would be constructed of adjoining modular units which together would provide sleeping, cooking, eating, first aid, and recreational space. Construction would take place prior to the construction of major developments such as the proposed Woodfibre LNG Project and Fortis Eagle Mountain gas line expansion.

LandSea, a private company based in Squamish, is planning on building and operating this temporary development with its Squamish Nation member owned joint-venture partner - Stalkaya, and with support from the Squamish and Tsleil-Waututh First Nations. The accommodation would be able to house 500 major project workers at any one time. The workforce accommodation is intended to be an open facility with a majority of the 500 beds slated for anchor tenant Woodfibre LNG and Fortis. Remaining beds would be available to employees related to other developments that may apply for beds in the facility. All bookings would be schedule and availability dependent. The public would not be allowed to rent rooms; only major project proponents on behalf of their workers/contractors would be able to utilize the accommodation, and there would also be minimum duration stays so as to further ensure that the accommodation only serves major project workers. The accommodation would be operated by around 55 staff at peak occupancy, many who are expected to be local or who could be provided housing at the workforce accommodation facility. The accommodation would be decommissioned when it is no longer needed (i.e., when construction of major projects such as Woodfibre and Fortis would be complete).

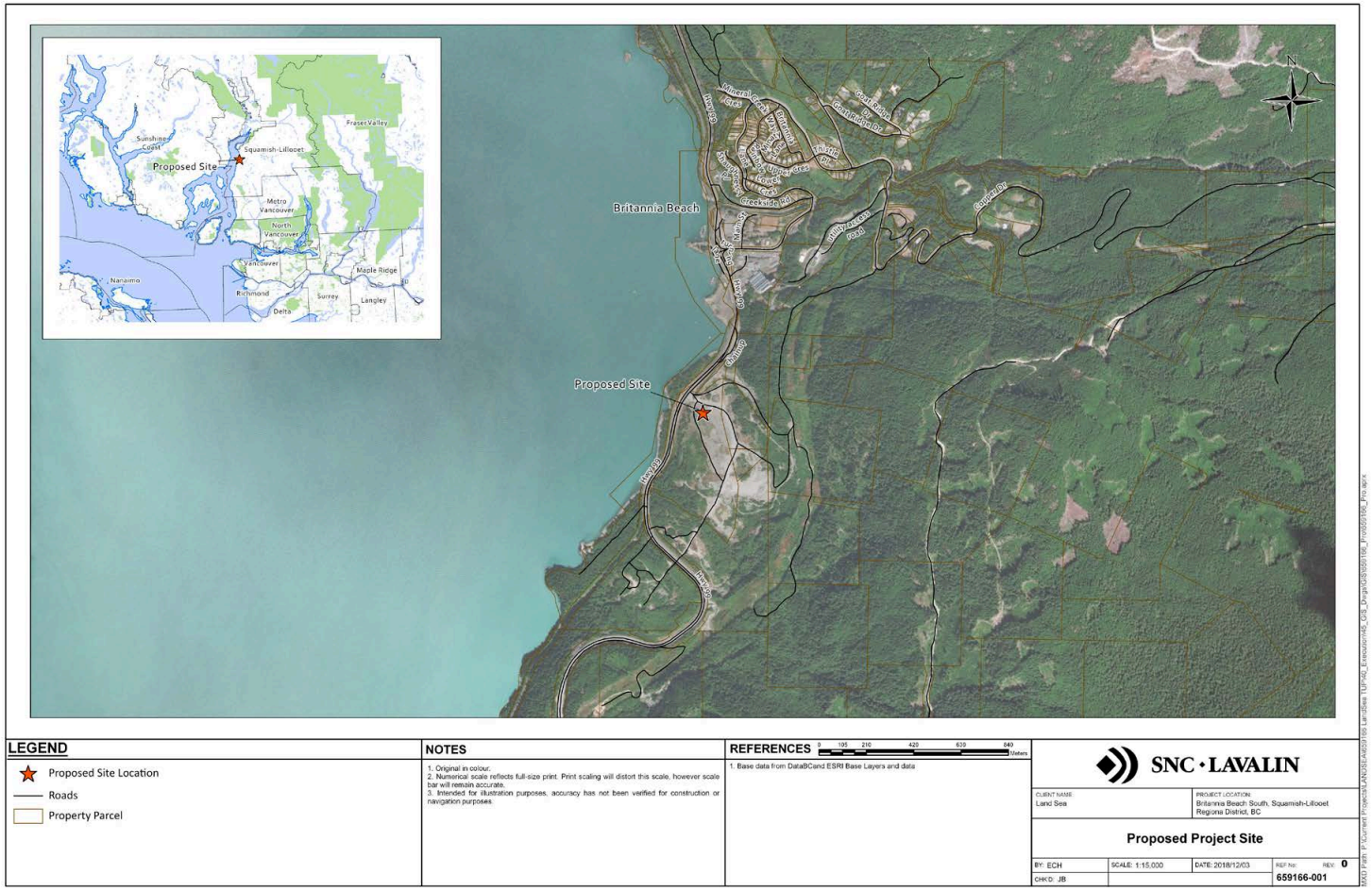

Figure 1: Proposed Project Site

2 Methods

The following section provides an outline of the method used to form the baseline for the assessment and determine expected future conditions in the Sea-to-Sky area.

2.1 Information Sources

Key guidance and legislation (Tables 1 and 2 below) form the context for the assessment. The assessment will also draw upon existing studies completed in the region (Table 3).

Environmental

Baseline data for the environmental section was provided using existing regulatory databases.

Community

For the community (social) section, the Analysis relied on additional secondary sources of data. Interviews with key community members representing service providers, business owners, realtors etc. informed the assessment.

Economic

Economic considerations have been drawn upon the study conducted by Swift Creek (2018), *Comparison of Effects of Workforce Housing Options in Squamish*.

2.1.1 Relevant Guidance and Legislation

Table 1 presents relevant guidelines and policies drawn upon to inform the assessment.

Table 1: List of Relevant Guidance and Policies Reviewed

Author	Guidance Document
Squamish Lillooet Regional District	Temporary Use Permit Policy, 2018
Government of BC, Ministry of Agriculture and Lands	Guidelines for Socio-Economic and Environmental Assessment (SEEA), Land Use Planning and Resource Management Planning, 2007
Community Development Institute, University of Northern British Columbia	Best Practices Guiding Industry-Community Relationships, Planning, and Mobile Workforces, 2015
Government of BC, Ministry of Environmental & Climate Change Strategy	Fact Sheet Industrial Camps, Version 1.1. June 2018 Waste Authorizations and Best Practices
Government of BC, Ministry of Community, Sport and Cultural Development	Briefing Note for Minister for Information – Mitigating the effects of natural resource-based industrial work camps, April 23, 2015
Government of BC, Ministry of Health, Health Protection Branch	BC Guidelines for Industrial Camps Regulation, October 1, 2017
District of Squamish	Official Community Plan 2100, 2009 – Repealed June 5, 2019
Taicheng Development Corporation	South Britannia Beach Master Plan, November 2014

Table 2 presents relevant legislation drawn upon to inform the assessment.

Table 2: List of Relevant Legislation

Legislation	Enforcement Responsibility	Relevance
Public Health Act, Industrial Camps Regulation, BC Reg. 70/2012	BC Ministry of Health, Health Protection Branch	› Siting and Size of Camps › Water Supply › Sanitation › Waste management › Sleeping quarters
Public Health Act, Food Premises Regulation, BC Reg. 210/99	BC Ministry of Health, Health Protection Branch	› Applies to a place where food intended for public consumption is sold, offered for sale, supplied, handled, prepared, packaged, etc.
Drinking Water Protection Act SBC 2001, c9, and Regulation, BC Reg. 200/2003	BC Ministry of Health, Health Protection Branch	› Specifies requirements for drinking water intended for human consumption, food preparation or sanitation.
Environmental Management Act, Waste Discharge Regulation, BC Reg. 320/2004	BC Ministry of Environmental and Climate Change Strategy	› Waste must be disposed of by incineration in an approved incinerator and/or transported to a municipal landfill.
Workers Compensation Act, Occupational Health and Safety Regulation, Part 25 Camps, BC Reg. 296/97	WorkSafe BC	› Applies to camps which have workers such as cooks, maintenance people, etc.

2.1.2 Existing Information

Table 3 lists existing information sources that were drawn upon to form baseline information for the current and expected conditions within the SLRD.

Table 3: List of Additional Information Sources Reviewed

Source	Title, Year Published/Updated
Woodfibre LNG, Hemmera Envirochem Inc., Golder Associates Ltd., and Keystone Environmental Ltd.	Application for an Environmental Assessment Certification for the Proposed Woodfibre LNG Project, 2015
FortisBC Energy Inc. and CMH2Hill Energy Canada	Application for an Environmental Assessment Certificate for the Proposed FortisBC Energy Inc. Eagle Mountain - Woodfibre Gas Pipeline Project, 2015
Swift Creek	Draft Report - Comparison of Effects of Workforce Housing Options in Squamish, 2018
Statistics Canada	Census Profile, 2016 Census. Squamish, BC
Squamish Nation	XAY TEMIXW (Sacred Land) Land Use Plan, 2001
District of Squamish	Strategic Plan 2015-2018, 2018 Update
Government of BC	Sea-to-Sky Land and Resource Management Plan, 2008
BC Conservation Data Centre	BC Species and Ecosystems Explorer (Accessed September 26, 2018) iMapBC (Accessed September 26, 2018)

2.1.3 Field Interviews (Community)

Interviews will be conducted with key community members and service providers, as available. The interviews will be used to provide current information on capacity of community services and community feelings of livability as well as to gauge response to an influx of population as a result of proposed construction activities.

Individuals who were contacted for interviews represented the following community services or affiliations:

- Squamish Fire Service;
- Howe Sound Women's Centre;
- Local Business Owner; and
- Squamish Crime Stoppers representative.

2.2 Scope of the Analysis

The following sections define the scope of the analysis of environmental and community components of the proposed TUP site that have been identified as important or sensitive to changes based on existing conditions within the SLRD.

2.2.1 Environmental

The scope of the environmental portion of the analysis focused on the proposed TUP site in Britannia Beach. A preliminary Environmental Overview Assessment (EOA) was conducted. A preliminary EOA is intended to provide a high-level, desktop review to establish the baseline environmental setting. Information and data is collected through a desktop review of ecological and regulatory databases and search engines including local, regional and federal government sites, and combined with Project scope and site information provided by LandSea to identify conditions at the Project site and adjacent land uses that may be affected by the Project. The scope of work for the preliminary EOA does not include detailed field studies including species specific surveys, plant sampling, fish sampling, fish habitat assessments or rare species investigations. Site photos are available in Section 3.

2.2.2 Community

On a broad scale, community indicators often focus on common themes that relate to quality of life leading to physical and mental well-being of individuals within a community such as access to and quality of services, public safety, affordability, employment, and civic engagement. This assessment focused on indicators that have been identified as either important to the community and/ or sensitive to change based on existing conditions within the SLRD.

The scope of the community assessment focused on the potential effects on two main areas:

- Housing and Services (i.e., access to housing, health, social and emergency services); and
- Community Wellness (i.e., access to recreation, public safety, transportation [traffic]).

2.2.3 Housing and Services

Housing and services may be directly affected and as a result of the anticipated influx of workers over the next five years. The quality and capacity of housing and services has the ability to affect to the overall quality of life for people living within the communities of the SLRD. An influx of permanent and temporary populations are the main drivers of change related to effects on housing and services. Effects related to increased labour workforce requirements, taxes, housing affordability, and local spending will be explored by Swift Creek (2018) report, which has been included with the TUP application by LandSea.

2.2.4 Community Wellness

Community wellness is often correlated to ‘quality of life’ and ‘livability’. Quality of life often refers to multiple factors related to safety, employment opportunities, environmental health, ease of travel, access to services and quality of recreational access. The community wellness assessment focuses on the potential effects on public safety, access to recreation, and traffic.

2.2.5 Economic

Economic considerations have been summarized and used to inform the trade-off analysis. Information has be drawn upon from a study conducted by Swift Creek (2018).

3 Current and Expected Future Conditions

The following sections describe the current and expected future conditions within the SLRD with a focus on Britannia Beach and Squamish. This section is intended to form the baseline of the assessment in order to identify potential effects with and without the proposed temporary workforce accommodations. The assessment of potential effects on environment, social, community, and economic values with and without workforce accommodation is presented in Section 4.

3.1 Environmental

The proposed site is located near Britannia Beach along the Sea-to-Sky highway (Highway 99) leading from Metro Vancouver to communities of the SLRD. The site is within the SLRD but outside of the District Municipality of Squamish (DOS).

The site is located between Highway 99 and the BC Hydro right-of-way (ROW) for transmission line 2L013, 2L009, and 60L069. Adjacent to the highway is a railway main operated by Canadian National Railway Company with other users including Rocky Mountaineer Rail tours. The proposed site is an existing brownfield site that has previously been cleared and graded. The site is also proposed for future development. The following information was gathered as part of a preliminary EOA and has been gathered for general context of the proposed site. Photos of the proposed site are seen below in Figure 2. Figure 3 represents spatial social and environmental attributes at or near the proposed site.

Figure 2: Site Photos of proposed workforce accommodation facility in Britannia Beach, BC.

3.1.1 Drainage, Groundwater, and Water Quality

Several unnamed and unclassified roads existing at the site running from the highway to the BC Hydro ROW. Stormwater is managed by a drainage system along the highway including catch basins, manholes, and culverts.

The terrain of the site is flat but the surrounding area is mountainous with steep elevation gains away from the water. The site elevation is under 20 m above sea level with surrounding mountain elevation as high as 1,300 m in close proximity to the site. There are no water wells within 500 m of the Project area (iMapBC 2018).

The surface water in the area flows from higher elevations in the east towards Howe Sound in the west via several watercourses in the area. The site is adjacent to Thistle Creek, Daisy Creek, and Gravel Creek (not shown on map). Thistle Creek includes several tributaries with Gravel Creek described by local sources (Master Plan) as connected to Thistle Creek.

Highway 99 includes multiple drainage structures directing flow under the highway. There are several water licenses and points of diversions that historically existed in the area, however, these appear to be have been abandoned. To the north along Britannia Creek there is a community watershed, as well as several small dams along creeks in the area.

3.1.2 Vegetation

The Project is located within the Coastal Western Hemlock very dry, maritime (CWHdm) biogeoclimatic subzone.

The Project area has been cleared and prepared for development. Vegetation and habitat types in proximity to the Project site include:

- Surrounding the site to the north east and west are trees, shrubs, and grasses; and
- Riparian vegetation to the west alongside the Howe Sound, separated from the project by Highway 99.

The surrounding habitat is a combination of forests, human uses, cleared ROWs, cutblocks, and roads. The surrounding forests are part of the Soo Provincial Forest and include Big-Leaf Maple (*Acer macrophyllum)*, Douglas-fir *(Pseudotsuga menziesii)*, Red Alder *(Alnus rubra),* and Western Hemlock *(Tsuga heterophylla)* as dominant species.

There are several stands of old growth forest classified as Old Growth Management Areas by the provincial government. In the surrounding area there are several designated ungulate winter range areas.

A search of the BC Conservation Data Centre (BC CDC) database was conducted using BC Species and Ecosystems Explorer (BC CDC, 2018) to determine the potential presence of federally and provincially listed plant or fungus species within the Project area and surroundings. The following search parameters were used to identify potential plant and fungus species at risk: SLRD, and the Coastal Western Hemlock biogeoclimatic zone.

Based on the search results, there are 19 provincially Red-listed or Blue-listed species at risk with the potential to occur in the vicinity of the Project site or the surrounding area. These are listed in Appendix A. Two of those species are also listed as Endangered on *SARA*'s Schedule 1.There are 18 ecological communities at risk within the Very Dry Maritime biogeoclimatic subzone that have the potential to occur in areas surrounding the Project site. These are listed in Appendix A.

The expected future conditions of this site include development within the existing disturbed footprint.

3.1.3 Fish and Wildlife

There are 52 federally and/or or provincially at-risk wildlife taxa that may occur in the vicinity of the Project site (BC CDC, 2018). These include three amphibians, 15 birds, 17 invertebrates, six mammals, four fishes, and one reptile (Appendix A). Near the project location (but not overlapping) there are several areas that are identified by the Federal Government as critical habitat for federally-listed species at risk, such as Marbled Murrelet (Schedule 1 [Threatened], *Species at Risk Act*).

Thistle Creek is fish-bearing based on field observations in the area (21 occurrences). Species present include Cutthroat Trout (*Oncorhynchus clarkii*), Rainbow Trout (*Oncorhynchus mykiss)* Sculpin (*cottus sp*), and Stickleback (*Gasterosteus aculeatus)*.

3.1.4 Air Quality

Overall air quality within the SLRD can be considered good with localized (i.e., industrial) impacts. Air quality is interpreted from data obtained from the nearest air quality station to the Project site, Squamish Elementary. Air quality at the monitoring station is considered 'good' (i.e., low health risk) based on the most recent readings (BC Gov, Accessed September 26, 2018).

3.1.5 Land Use

The Project site is not within the Agricultural Land Reserve. There are four BC listed registry sites in the surrounding area including the proposed site which is listed as BC site 3444 Makin Pulp and Paper Property. These sites are either contaminated or were contaminated in the past.

An archaeological assessment has been completed by the landowner in 2012, no archaeological or heritage sites were identified.

Figure 3: Environmental and Social Attributes in the Surrounding Area

3.2 Community

The following is a description of existing conditions and expected future conditions over the next five years for the following attributes:

› Housing and Services:

- Accommodation;
- Health and medical services; and
- Social services.

› Community Wellness:

- Recreation;
- Public Safety; and
- Traffic Volume.

In addition, existing and expected future conditions related to population and labour force is also discussed. Population and labour force is an indicator that can be used to measure strain on housing and services and community wellness.

3.2.1 Population and Labour Force

In 2017, the population of District of Squamish was 19,893. This represents an increase of approximately 13% from 2011 and was more than double the growth for the rest of BC. BC Statistics expects 12% growth in population by 2025 and 20% by 2030 in the Howe Sound Local Health Area (BC Statistics, 2018)[1].

Squamish's labour force totalled 10,465 in 2016. In 2016, the main sources of employment were accommodation and food services at 1,374, construction at 1,240, and health care and social assistance at 1,165 (Statistics Canada, 2016). Between 2011 and 2016, the proportion of the construction labour force doubled in the SLRD Electoral Area A, from 6.5% to 13.6%. Participation in the construction sector labour force is above the provincial average in the community (Woodfibre LNG *et al.*, 2015).

Squamish had an unemployment rate of 5.6%, below the Provincial average of 6.7% (Statistics Canada, 2016). Projected population growth in the SLRD includes anticipated labour demand resulting from future planned development. Some of these immediate and future developments are described below.

It is expected that the proposed Woodfibre LNG will require approximately 650 construction workers in the Squamish area for each of the two-years of construction. During operation, 100 local workers for each year in the life of the project is anticipated (Woodfibre LNG *et al.*, 2015);

The proposed Eagle Mountain LNG pipeline, will require nearly 800 construction workers, which will have to be in the Squamish area for a portion of the 1.5 to 2 year construction period. Approximately 400 operations workers will be required for the life of the project but only some portion of who would be based in Squamish (FortisBC Energy Inc. and CH2M HILL Energy Canada, 2015).

Additional developments that are anticipated in the near future and will require specific trade's workforce:

› Two multi-tenanted warehouse buildings of 3,190 square metres;

[1] The Howe Sound Local Health Area includes the communities of Squamish, Britannia Beach, Whistler, and Pemberton.

- Indoor bike park;
- Newport Beach Developments;
- ElevateBC Management, South Britannia Beach TUP; and
- Residential developments approved or expected:
  - University Heights;
  - Cheekeye fan housing and landslide barrier development;
  - Taicheng South Britannia, 1,650- 2,000 units (SLRD, 2018);
  - Waterfront Landing, 130 townhomes;
  - Aqua Development; 61 townhouses (DOS, 2018); and
  - Squamish Senior Citizens' Home; New building of 232 apartments (DOS, 2018).

Future population growth in the SLRD will continue to rise and may be further accelerated by the high demand for labour workforce requirements as described above.

3.2.2 Housing and Services

3.2.2.1 Accommodation

Temporary Accommodation

Temporary accommodation includes hotels and campgrounds. In Squamish, there are 20 temporary accommodation facilities, including nine hotels and motels, four bed and breakfasts and seven campgrounds/cabins (Tourism Squamish, 2018). Existing capacity for temporary accommodations in Squamish includes 1,127 available units, consisting of 476 hotel rooms, 73 motel rooms, 30 bed and breakfast rooms and 548 recreational vehicle (RV)/camping units (DOS, 2010). Tourism activity and contractors keeps these accommodations frequently at capacity. It has been recorded that hotels and motels in the DOS experience an increase in capacity during summer festivities, the ski season and when climbers are in town. At times, the accommodation in the District of Squamish may be booked up to six months before an event (FortisBC Energy Inc. and CH2M HILL Energy Canada, 2015).

AirBnB units also are utilized in Britannia Beach and Squamish, however accurate data is limited and therefore not included in this assessment. Additionally, management or limitations to short term rentals in the District of Squamish is currently being explored due to the impact it has on long term rental inventory.

There are proposals for more temporary accommodations in the SLRD, however, these proposals would meet the anticipated growth in tourism and short term accommodation needs and are not being built to accommodate the anticipated temporary labour force.

Rental Accommodation

Swift Creek (2018) reported that recent rental housing data from the Canada Mortgage and Housing Corporation (CMHC) indicated a low level supply of rental units relative to existing demand in Squamish with an average vacancy rate of 0.3%. This is consistent with media reports and local anecdotal evidence (Canadian Broadcasting Corporation, 2018; Thuncher, 2018). Rental demand is very high in Squamish and demand has driven prices up. CMHC data records it as the third highest rental rates in the province (CMHC, 2017). Rental housing availability in Squamish is expected to continue to be tight with little purpose built rental housing developments planned in the near future. Future growth in rental inventory will occur through building of apartments, and installation of secondary rental suites in existing and planned single

detached homes. However, it is anticipated the rental inventory will remain low with respect to existing and future demand by local residents.

Affordable Housing

Affordable rental accommodations are in low supply and in high demand. Affordable units are provided through some non-profit social service organizations in the SLRD. Specifically in Squamish, the Howe Sound Women's Centre has two rental units for women and children. Each unit is at capacity with long term tenants, the center also provides transition housing which has been at capacity since August 2018, and currently has a wait list for the children, family and youth programs (pers. comms. October 2018). Affordable housing plans are in the works within the District of Squamish and SLRD however the timelines for these programs are not certain and units being proposed are often far less than what is required. Given existing affordability pressures are not anticipated to change, the affordable housing inventory and demand is expected to remain out of sync for the near future.

3.2.2.2 Health Care and Emergency Services

Medical Services

The Squamish General Hospital is the only hospital in the area. The Regional Municipality of Whistler has a number of clinics, but the Lions Gate Hospital in Vancouver would be the next closest in proximity. The Squamish General Hospital has 21 beds and offers services including general medicine and surgery, obstetrics, palliative care, physiotherapy, pharmacy, diagnostic imaging, laboratory, ambulatory care, chemotherapy and emergency services (Canadian Institute for Health Information, 2016).

In 2017, it was announced that Squamish General Hospital had opened a second operating room to reduce surgical wait times. Vancouver Coastal Health anticipates an additional 576 surgeries will be performed annually at the Hospital (Vancouver Coastal Health, 2017).

Fire and Police services

Britannia Beach is serviced by a volunteer fire rescue service. The District of Squamish is serviced by the Squamish Fire Rescue which consists predominately of volunteers and some career staff (Table 4). The Squamish Fire Rescue recruits for volunteer firefighters annually. The SFR anticipated through the sustained growth they will continue to be able to recruit enough members to continue to deliver service to those within the District of Squamish boundaries.

Table 4: Fire Service by the Numbers

Community	Resources	Services Provided
District of Squamish	Fire Chiefs (2), Admin Assistant, 6 career firefighters and 50 on call/volunteers firefighters	First response emergency service, education and inspection services within the District of Squamish.
Britannia Beach Fire Department	Fire Chief, Volunteer firefighters	Servicing Britannia Beach, Furry Creek, Poteau Cove, and Squamish. Making Britannia Beach a FireSmart community.

Squamish and Britannia Beach are serviced by the Royal Canadian Mounted Police force stationed in Squamish. Services are summarised in Table 5 below.

Table 5: Policing Service by the Numbers

Community	Resources	Services Provided
Squamish/Lions Bay/Furry Creek/Britannia Beach	One Staff Sergeant as head of the detachment and municipal employees supporting the force.	Police reports, criminal record checks, police certificates, pardon applications, fingerprinting, Special Occasion Licenses and Victim Services
Integrated First Nations Unit	Squamish RCMP partnership with Squamish and Tsleil-Waututh First Nation	The Integrated First Nations Unit work with Squamish and Tsleil-Waututh Nations partners, assisting with patrol and general duty members in emergency services, and consulting extensively with First Nations communities and members (West Vancouver Police Department 2014).

Social Services

Social Service capacity in Squamish and Britannia outlined below:

- Drug/alcohol clinics – 11 (drugrehab, 2018);
- Emergency shelters – One shelter, 12 beds (BC Housing, undated), and one Transition House with four beds (Squamish Helping Hands, Undated); and
- Mental health and addition services – 40 programs and services (SSCS, undated).

These services are showing to be at capacity, particularly housing services. Future conditions will require more purpose built affordable housing, shelter bed funding, as well as services for mental health and addiction.

3.2.3 Community Wellness

3.2.3.1 Recreation

The Squamish area offers a range of both outdoor and indoor recreational facilities. The Brennan Park Recreation Centre includes an ice arena, aquatics centre, tennis courts, soccer fields, baseball diamonds and a community centre (DOS, 2014). There is also a golf course, athletic club, trail networks, bird watching areas and community garden plots (DOS, 2014). The Sea to Sky Gondola opened in May 2014 and also provides access to trails and backcountry areas (Sea to Sky Gondola, 2014).

Britannia Beach also has recreational resources in its trail system and nearby oceanfront access to beaches such as those at Minaty Bay.

In the North Shore/Coast Garibaldi Health Services Delivery Area 68.6% of the population aged 12 and older have reported a level of physical activity were considered 'moderately active' or 'active'. This is over 8% higher than the provincial average of 60.4% (Statistics Canada, 2013). Recreation is an important value to the communities of Squamish and Britannia Beach.

Indoor recreational facilities in the Squamish area include Brennan Park Recreational Centre, which has an aquatic centre, ice area, and tennis facility. Outdoor recreational opportunities include recreational hunting and fishing, mountain biking, wind sport activities, kayaking, paddle boarding, driving, hiking, and camping (DOS, 2018).There are several culture and arts community organizations in Squamish and Britannia, including arts festivals, theatre and music.

Squamish and Britannia Beach are attracting residents due to the outdoor recreational opportunities. These amenities are showing a visible increase in use and overcrowding, local residents anticipate this to be an increasing problem in the future (pers. comm. October 2018).

3.2.3.2 Public Safety

There were 1,568 Criminal Code Offences out of a recorded population of 20,241 in Squamish for 2017 (Gov BC. 2017). There were 557,271 Criminal Code Offences out of a recorded provincial population of 4,817,160. This puts Squamish above the provincial average for number of crimes per 1,000 of the population (77.5 for every 1,000 persons in Squamish versus the provincial average of 74.2 for every 1,000). Criminal Code Offences exclude traffic offences.

A comparison of RCMP statistics in 2017 to 2016 show a decrease in crimes such as bike theft, vehicle collisions and residential break and enters. However, an increase in assault, thefts over $5,000, and domestic violence saw an increase year of year.

Concerns have been raised over the potential for more drug and alcohol related crime in the Squamish area due to an increase in young men in the community during construction. Several sources have noted that this could increase demand on local police services (FortisBC Energy Inc. and CH2M HILL Energy Canada, 2015).

3.2.3.3 Traffic Volume

The main transportation route through the SLRD is Highway 99. It is the primary access route between Vancouver, Britannia Beach, Squamish, Whistler, and Pemberton. Traffic volumes have statistically been increasing over the past 10 years since highway improvements. The proposed developments listed in Section 3.2.1 will require the use of the highway to move personnel, equipment and materials. Data obtained from KBR, predicts average daily traffic volume to and from the workforce facility would be approximately eight buses with a peak construction volume of 11 buses.

Even in the absence of industrial project requirements traffic volume on Highway 99 is anticipated to increase based on anticipated residential population growth and the known factor that a large portion of the Squamish working demographic commutes to the lower mainland for work weekly. In the absence of any major commuter infrastructure or services currently, the number of cars commuting south from Squamish to the Lower Mainland is anticipated to grow each year.

4 Effects Assessment

The following sections describe the expected potential effects related to the future expected conditions as described in Section 3 with and without a temporary workforce accommodation. The assessment also takes into consideration any applicable mitigation measures including: existing best management practices, regulations, policy and procedures of LandSea.

4.1 Environmental

All works associated with the workforce accommodation facility are within previously disturbed areas, the land has been developed and is proposed for future development. No ground disturbance, oil management or concrete works are anticipated and no new access roads will be required for this Project.

Based on the information that is publicly available and given the location within a previously disturbed area, the overall environmental sensitivity of the Project is considered to be low. Potential effects to the surrounding environment, such as sedimentation, soil erosion, and loss of vegetation can be minimized through mitigation or implementation of best practices including, as required, sediment and erosion control, project siting of facilities and laydown areas.

With the presence of a workforce accommodation facility, potential impacts to vegetation, vegetation communities at risk, and wildlife species at risk are anticipated to be very low due to the current condition and use of the site. Appropriate wildlife and vegetation management plans will be implemented to avoid any effects, as required.

Potential effects of the workforce accommodation facility would be avoided as LandSea's facilities would have all appropriate water and waste management infrastructure in place following best management practices. All required permitting will be completed by LandSea.

If no workforce accommodation was constructed at the site, future environmental conditions at the site would not change until planned future use of the site was developed. Potential environmental effects of the site are considered low with no measurable difference when compared to the future with or without the workforce accommodation.

4.2 Community

It is anticipated that future planned developments in the SLRD could create upwards of 600 direct employment positions centered in Squamish area for up to two years during the construction phase of these projects (Swift Creek, 2018). This does not consider the indirect employment that would be generated to support this influx of workers.

As current supply of skilled workers is limited, efforts to hire locally will be challenging for employers. Woodfibre LNG estimated that 95% of hires will be from outside of Squamish. If the assumption is made that all those that are from the Lower Mainland of Vancouver (55%) will commute, then at least 40% will still require accommodation and therefore an influx of temporary and permanent workers can be expected (Woodfibre *et al.*, 2015).

The following assessment will consider this information in the context of housing and services, community wellness and economic values. The assessment will look at expected potential effects on these values based on expected future conditions with and without the temporary workforce accommodation.

4.2.1 Housing and Services

Housing Availability

Demand on the rental market is already at capacity. Planned housing development includes, 76 purpose built rentals to be constructed by fall 2021 (DOS, 2018). These units are in response to an existing demand and are not intended to support workforce housing; however, the additional demand due to potential major developments is expected to far exceed current and future rental capacity in Squamish and Britannia. While it may be feasible that workers may choose to live outside of Squamish or Britannia and commute from places such as Whistler or Metro Vancouver; however, these housing markets are also known to be at capacity and the additional housing requirements required to keep up with planned development in the SLRD will exceed current capacity, putting upward pressure on rental prices and housing prices.

Considering current capacity and future known capacity, there is insufficient supply of temporary and permanent housing in the SLRD to satisfy the anticipated increased demand anticipated for the years of construction of the Woodfibre LNG project or Eagle Mountain Pipeline Project. Workers from Woodfibre LNG would be provided a living out allowance in the absence of purpose built workforce accommodation. A high living out allowance would temporarily and artificially inflate the rental market putting local, permanent, residents at risk, and particularly impact vulnerable demographics including women and children, low to middle income renters (District of Kitimat, 2014).

With the anticipated persistence of a less than one percent rental vacancy rate, the growing affordability gap will worsen in the absence of new rental supply. Rental pressures such as these, in an existing rental capacity stressed environment, tends to have additional effects on rates of poverty and food insecurity.

Personal communications with the Howe Sound Women's Centre confirm this prediction. These crucial service providers suggest:

> *'...that any major influx of population would certainly impact demand on our services particularly as the housing market becomes more and more unaffordable. Women fleeing violence are among the most vulnerable when it comes to finding affordable adequate housing for themselves and their children. As Squamish already has a 0% vacancy rate, a large influx of temporary workers, who are unlikely to purchase their home and rent instead, would significantly impact the ability to find adequate housing for women in need. (Personal communication, Howe Sound Women's Centre, 2018).'*

In addition to the displacement of vulnerable local residents, other challenges could arise such as an increase in illegal camping. Illegal camping is an issue presently and construction workers using temporary accommodation in the area might increase illegal camping by other visitors.

Some workers may see a future in the Sea-to-Sky for work and with higher than average salaries may choose to enter housing real estate market. Further pressure could lead to an increase in housing rates in the District of Squamish, which are already recorded as high for the provincial average. For example, during the 2010 Olympics, Smiths (2014) observed that added pressure on the housing market led to an increase in house rates, which could also be the case in Squamish. An in-depth assessment of effects on real estate prices locally are out of the scope of this assessment.

These anticipated housing challenges affects the community's ability to provide adequate workforce housing and therefore dampens the ability to attract and retain employees, which is a vital indicator for a vibrant economic community.

Purpose-built temporary workforce accommodation, such as that proposed by LandSea, would have the capacity to house the anticipated workforce required to construct anticipated industrial development, putting minimal pressure on the rental market. The facility would supply 500 beds with a majority slated for the anchor tenants, Woodfibre LNG and Fortis, and associated contractors, thus reducing the number of anticipated workers moving into the rental and ownership markets of nearby communities of Squamish and Britannia.

The use of temporary workforce accommodations would be conditional to the employment of any non-local employee, no living out allowances would be provided to workers that did not live in the workforce accommodation.

The potential effects on the housing market, in particular those effects most felt by vulnerable populations, could be alleviated with the use of a temporary workforce housing while at the same time providing direct and indirect jobs associated with the running and servicing of the work force lodging.

Services

The Sea to Sky Community Services Society noted the potential for increased pressure on health care services capacity if future developments take place. The Squamish General Hospital has limited services. Past projects such as the 2010 Winter Olympics and the expansion of the Highway 99 (FortisBC Energy Inc. and CH2M HILL Energy Canada, 2015) has demonstrated there is a shortage of physicians. Industrial proponents (e.g., Woodfibre LNG) will inevitably have on-site first aid facilities to treat construction workers for minor incidents; however, an increased demand on emergency services and medical treatment will occur with increased populations.

An increase in demand resulting from an influx of non-local workers and families could affect quality, access to vital community services including health care (including mental health and drug addiction support), emergency response, and education and child care. With or without temporary workforce accommodation, the effects to these services would be the same regardless of either scenario because the same population would utilize these services.; however, the use of a temporary workforce facility will lower the demand for some medical services as the facility would have an onsite medical facility staffed by a nurse practitioner, thus reducing the number of required hospital visits for non-major medical needs. It would be anticipated that the use of a temporary workforce accommodation would alleviate some of the stresses on community services, already near capacity.

4.2.2 Community Wellness

Recreation

Recreational opportunities were identified as a concern when community members are asked about population growth to the SLRD. Specifically access to local recreational destinations as well as facilities within the SLRD are of particular concern to local residents (pers. Comm. Oct. 2018). The future predicted

influx of required workforce may result in a similar effect to access to lakes, (e.g., Alice Lake, Brohm Lake), ocean beaches (e.g., Minaty Bay), and hiking and biking trails.

However, the use of a temporary workforce facility at Britannia Beach would supply an on-site fitness facility (i.e., gym), games room and other amenities to the residents and therefore could reduce demand at other resources utilized by the general public.

Public Safety

Community members and health care workers are often concerned about an influx of alcohol and drugs coming into communities as a result of high disposable incomes of workers in industrial employment with minimal living expenses. In both scenarios, the future with and without a workforce accommodation, the influx of workers to a community may raise concerns within the community of an increase in assaults, intimate relationship abuse, drug and alcohol abuse, and disturbance type activity (e.g., loud behaviour in or near residential neighbourhoods, fighting, being drunk in public places etc.).

LandSea recognizes these concerns and has worked in similar communities where they operate workforce accommodation to confront and resolve these concerns through extensive community consultation, professional management of the facility and the residents in the interest of public safety and the safety of the tenants.

Personal communication with the Chief Administrative Officer (CAO) of Port Edward, BC, where LandSea recently opened a workforce accommodation to support industrial development construction at nearby marine port facility, suggested the community addressed public safety issues directly and overall the facility and its residents have been a positive addition to the community.

The District of Port Edward considers the use of the Workforce accommodation as a remedy to potential public safety issues with the influx of temporary workforce that might otherwise use hotels. The use of the workforce accommodation facility allows for the management and oversight of drugs and alcohol use, for which there is zero tolerance on site as the facility is operated as a dry facility, and often drug and alcohol use would be a condition of continued employment.

Other public safety considerations that would be associated with the workforce accommodation include:

- On site security monitoring who is on site at all times;
- Separate dorms for female employees;
- Extensive safety protocols for all its tenants;
- On site amenities (e.g., games room, movie room, and gym facility), to encourage workers to stay on site after hours;
- Measures will be taken to reduce the number of personal vehicles by restricting number of parking stalls. Workers would have limited vehicle use after work hours. Ride sharing may be provided to discourage vehicle use after hours; and
- Ongoing community engagement throughout the facilities lifespan through the formation of a committee made up of representatives from the Britannia Beach Community Association, LandSea, local government and first nation representatives, and anchor tenants to meet monthly or quarterly to address and solve any concerns or issues that may arise.

In the absence of temporary workforce accommodation these same workers would be living within the community with a higher than average disposable income. Rates of alcohol and drug abuse would not be monitored with zero oversight of the employees after hours. Personal communications with representatives of Howe Sound Women's Centre suggests a concern for a potential increase in victimization of already

marginalized populations, as well as an increase in sexual assaults and intimate partner violence (pers. comms, Oct 2018).

Concerns related to the temporary workforce accommodation include a potential for increased drinking and driving between nearby communities and the facility location in Britannia Beach; however, as mentioned, LandSea will work to limit use of personal vehicles to reduce this risk.

Traffic Volume

In the absence of a workforce accomodation facility an additional 500 workers could mean increased traffic in the SLRD. KBR, a possible contractor for Woodfibre LNG predicts that by 2021, it would expect 40 buses, 115 cars and 23 boats commuting to and from site every day. In the absence of a workforce accommodation facility, it would be expected the number of vehicles related to commuting to increase significantly as most workers would be commuting using their own vehicles from their place of residence and no communal employee shuttle bus would be provided.

In the case of Woodfibre employees living at a workforce accommodation facility in Britannia Beach, workers would be bused to the ferry terminal in order to reach the work site. In both scenarios ferry traffic remains the same; however, with the use of the temporary workforce accommodations one would expect reduced car traffic on Highway 99. In addition, workers commuting from Britannia towards Darrel Bay (i.e., potential location of worker ferry) would be commuting counter the traffic flow typically found in the morning and evening commuting times on Highway 99 south of Squamish (morning commute to Lower Mainland south from Squamish and Britannia, and north from the Lower Mainland to Britannia and Squamish in the afternoon).

4.2.3 Economic

Swift Creek (2018) reports that if LandSea-Stalkaya's workforce accommodation is built then there would be incremental economic benefits flowing to: local businesses, local labour, the SLRD associated with direct, indirect, and fiscal economic effects. There would also be benefits flowing to the local proponent. These benefits would include:

- local purchases amounting to approximately $4.5 million a year for three years, and local employment that wouldn't otherwise occur of a portion of the 55 anticipated operational staff and associated earnings;
- local subcontractor revenues and employment due to their servicing of the construction, operations, and decommissioning of the workforce accommodation; and
- Contributions, amenities and community benefits in excess of $1 million which includes tax revenues and potential revenues flowing to the SLRD and Britannia associated with use of infrastructure and services; revenues for the proponent with resulting local employment and local economic activity.

If no workforce accommodation is built, then there would be some incremental economic benefits flowing to landlords but also incremental economic costs incurred by other renters. These benefits and costs would include:

- incremental rent earnings flowing to landlords as a result of further inflation of the Squamish rental market; and
- higher rental costs for other renters, and moving costs for renters forced to move.

There would be a variety of economic gains to multiple parties under both worker housing options, but there would be substantial negative effects if the LandSea-Stalkaya workforce accommodation option was not taken.

If workforce accommodation is not built to house the influx of 600 or more workers that can be expected to migrate to the Squamish area to help construct the Woodfibre LNG and other major projects, and instead these workers are given a living out allowance to find their own local rental accommodation, then further and substantial inflation would put strain on an existing tight rental housing market. While landlords would benefit under such a scenario, there are many renters already paying more than what is considered an acceptable amount on their housing, and this situation would worsen for at least a couple of years putting low-to moderate income earners and vulnerable populations most at risk. This conclusion is consistent with concerns and experiences elsewhere in BC facing major project booms.

Personal communications with a local business owner confirms these potential concerns and suggests an even greater concern related to employee retention. Local businesses already struggling to retain employees, could find this problem exacerbated in the absence of workforce accommodation, due to the direct effects on rental and housing affordability for their employees. As well, in both scenarios, local businesses may also be in wage competition with higher than average wages offered by proponents such as Woodfibre LNG, thus further reducing their ability to retain or attract potential employees (pers comms, October 2018).

4.3 Trade-off Analysis

The table below summarizes the effects as presented in the previous sections. The table shows the trade-offs that are made between choosing between a scenario with no workforce accommodation and a scenario with workforce accommodation provided for workers, at a minimum, associated with the construction of the Woodfibre LNG Project. Where one alternative is ‘better than’ another according to the criteria, it has been shaded green, where it is ‘worse than’ the other it is red. Alternatives that rank relatively similar to each other are shaded yellow. In order to properly compare environmental effects between scenarios, site details need to be considered. The alternative scenario with no workforce accommodation facility offers no specific site for comparison purposes, therefore no trade-off analysis is presented. As previously stated, potential negative environmental impacts are expected to be negligible and the construction and operation of the camp would be completed using appropriate environmental management plans. Any potential effect to the environment can be reduced or eliminated through mitigation.

Amongst community and economic impacts, building a work force accommodation facility will alleviate pressure on housing capacity and provide more direct economic benefits to local businesses. It will also reduce any negative impacts related to traffic congestion associated with additional rides required to move workers to and from their places of work. The workforce accommodation scenario also allows for closer management of the labour force population with potential benefits to public safety and recreation.

Without the accommodation facility, local residents and small businesses would be greatest affected with vulnerable populations (women, low to moderate income families) at greatest risk. Housing affordability and availability would likely be temporarily and artificially inflated more than it already is, local businesses would be competing with high wage paying employers to retain workers, existing employees of small businesses would struggle to find housing.

Negative impacts on public safety exist in both scenarios; however, in the case of workforce accommodation, increased oversight and regulation of tenants of the facility would potentially alleviate some public safety risks. Workers with recreational amenities on site would be less likely leave the facility, as well drug and alcohol policies with conditional links to continued employment would create incentive for employees to avoid these behaviours. Workers without workforce accommodations would have more freedom in their off hours with less oversight and accountability for their actions.

Table 6: Trade-off Analysis of Temporary Accommodation vs. No Temporary Accommodation

Criteria		Future without Temporary Accommodation	Future with Temporary Accommodation
Environment	--	N/A	Minimal disturbance to environment because of previous land uses. Impacts can be eliminated through mitigation.
Community	Housing	Increase to housing capacity strain. Artificial inflation of rental prices and decrease in supply. Greater risk for local residents from vulnerable demographics.	Decrease housing capacity strain (relative to no lodging being built).
	Services	No temporary lodging will have a neutral effect on strain on health care, education, emergency response and child care as many of these services are operating at capacity and will likely continue to do so.	Temporary accommodation may alleviate some future pressure on services such as social housing services and medical services.
	Public Safety	Neutral. Existing emergency response and crime reduction programs will also grow with project population increases. Potential security/safety issues for women and marginalized groups due to lack of enforcement/oversight of afterhours activities.	Increased oversight of workforce population. Employment/housing conditions related to drug and alcohol use enforced. On site security. On site amenities to encourage residents to stay at the facility.
	Traffic	Increased traffic strain due to increase in commuting.	Reduced traffic strains due to reduced number of commuters.
	Recreation	Increased access to lakes, (e.g., Alice Lake, Brohm Lake), ocean beaches (e.g., Minaty Bay), and hiking and biking trails.	Increased access to lakes, (e.g., Alice Lake, Brohm Lake), ocean beaches (e.g., Minaty Bay), and hiking and biking trails. However, a Fitness Centre and other onsite amenities would alleviate pressure on local infrastructure (i.e., gyms).

Table 6 (Cont'd): Trade-off Analysis of Temporary Accommodation vs. No Temporary Accommodation

Criteria		Future without Temporary Accommodation	Future with Temporary Accommodation
Economic		Incremental rent earnings flowing to landlords as a result of further inflation of the Squamish rental market. Higher rental costs for other renters, and moving costs for renters forced to move. Wage competition harming local small business.	Local purchases amounting to approximately $4.5 million a year for three years, and local employment ~ 55 staff. Local subcontractor revenues and employment due to their servicing of the construction, operations, and decommissioning of the workforce accommodation. Contributions, amenities and community benefits in excess of $1 million which includes tax revenues and potential revenues flowing to the SLRD and Britannia associated with use of infrastructure and services. Revenues for the proponent with resulting local employment and local economic activity.

4.3.1 Summary and Recommendations

While there are trade-offs associated with building a temporary accommodation unit for workers, the positive benefits for the communities of Squamish and Britannia Beach outweigh negative ones.

Similar scenarios have been experienced in smaller communities faced with similar social and economic impacts from an influx of construction related workforce for larger scale development. The District of Kitimat, for example, faced with an influx of construction workers due to industrial development and low rental inventory, worked with proponents to mitigate social and economic pressures from an influx of workers by building temporary workforce accommodation.

Living out allowances were not recommended due to their ability to temporarily and artificially inflate a rental market. The District of Kitimat, after this experience, recommends this approach for other communities faced with similar issues (District of Kitimat, 2014)).

The community of Fort McMurray experienced similar issues; however, in the absence of workforce accommodation, proponents provided employees with rental assistance and local residents were displaced from their community, local businesses suffered, and overall sense of community cohesion and wellness was decreased.

In speaking with the CAO of Port Edward, a community that most recently has been faced with an influx of new labour due to new construction projects, the existence of the workforce accommodation has been 'a huge success story' (pers comms. November 2018). The CAO of Port Edward offers a variety explanations for the success of the workforce accommodation; however, the consultation with the community beforehand about how the facility would be run, the professional management and experience of LandSea in running the accommodation, as well as the positive relationship and integration of the workers within the community.

It is apparent that a community such as Squamish faced with the issues it currently is, would benefit from a temporary workforce accommodation in the absence of any other solution on the horizon for this volume of workers. The alternative to this, workers living within the community with significant living out allowances, would further erode the livability of the community and contribute to deepening the affordability issue which has knock-on effects to community wellness, traffic volume, local businesses and employee retention, and increased risk for vulnerable populations (women and low and middle income households).

SNC-Lavalin would recommend continued consultation on the TUP application to allow the community to have more insight and input into how the accommodations would be managed, and how employers utilizing the facility would facilitate the integration and participation of their employees into the community.

In addition, the following mitigation measures to reduce any potential effects of the workforce accommodation facility:

Environmental

Applicable Acts, regulations and standards, as well as adopting best management practices such as those in the *BC Guidelines for Industrial Camps Regulation* (Gov BC, 2017) should be adopted. Work Camps must also comply with applicable Provincial and Federal legislation and local bylaws (Gov BC, 2018). Effective sewage, stormwater and waste management (housekeeping, elimination of wildlife interactions, etc.) of the camp will be key issues during camp construction and operation.

Community

It is understood that LandSea will develop a Code of Conduct for employers. This includes keeping the lodging facility “dry”. Alcohol and marijuana will not be sold or allowed on site. LandSea is planning to develop a number of recreational opportunities for workers at the lodging facility. This includes, but is not limited to, a fitness centre, a video game room, Recreation Room (e.g., pool, poker tables, games tables, etc.), and provide high speed internet, and TV/movies for occupants. While workers will be allowed to go in and out of the camp, if they return to the lodging intoxicated, it is grounds for dismissal. Further workers and supervisors should be trained in recognizing the symptoms of substance abuse.

It is expected that all major employers using the lodging facility will have Employee Assistance Programs that provide workers with benefits related to mental health including personal and work counselling, including issues such as substance abuse. Nevertheless, workers can remain reluctant to pursue support for mental health and substance abuse issues “due to embarrassment, the fear of losing their employment and concerns with trust and confidentiality, or they may not be aware of the services available through their employer” (Northern Health, 2012). In places like Kitimat, BC, employers such as Bechtel have been providing workers with information packages to promote health tips concerning nutrition, exercise, and healthy weights (Northern Health, 2012).

It is also expected that LandSea will consult with the community to determine what types of additional mitigation may take place.

Economic

It is expected that any expenditures related to construction and operation of the workforce accommodation will be subject to local procurement policies. LandSea is planning on building and operating this development with its joint-venture partnership with Squamish Nation member-owned Stalkaya. LandSea has made training, employment, sub-contracting and revenue sharing agreements to Stalkaya and the Squamish Nation.

5 Closure

We trust this provides you with the information you currently require. If you have any questions, please contact the undersigned at your earliest convenience.

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Jeff Cook, Squamish Crime Stoppers, Local Business Owner, October 29, 2018.

Ashely Oakes, Howe Sound Women's Centre, Community Engagement Manager, November 2, 2018.

Bob Payette, CAO Port Edward, November 1, 2018.

Appendix A

Table 1: At-Risk Animal Taxa

Table 2: At-Risk Plant and Fungus Taxa

Table 3: At-Risk Ecological Communities

Table 1: At-Risk Animal Taxa.

Source: B.C. Conservation Data Centre. 2018. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Nov 30, 2018).

Scientific Name	English Name	COSEWIC Status	BC List	*SARA* Schedule 1 Status
Fish				
Acipenser medirostris	Green Sturgeon	Special Concern	Red	Special Concern
Acipenser transmontanus	White Sturgeon	Endangered	No Status	Endangered
Oncorhynchus clarkii clarkii	Cutthroat Trout, *clarkii* subspecies	None	Blue	None
Salvelinus confluentus pop. 28	Bull Trout - South Coast Population	Special Concern	Blue	None
Amphibians				
Ascaphus truei	Coastal Tailed Frog	Special Concern	Yellow	Special Concern
Anaxyrus boreas	Western Toad	Special Concern	Yellow	Special Concern
Rana aurora	Northern Red-legged Frog	Special Concern	Blue	Special Concern
Charina bottae	Northern Rubber Boa	Special Concern	Yellow	Special Concern
Reptiles				
Contia tenuis	Sharp-tailed Snake	Endangered	Red	Endangered
Birds				
Podiceps nigricollis	Eared Grebe		Blue	None
Patagioenas fasciata	Band-tailed Pigeon	Special Concern	Blue	Special Concern
Chordeiles minor	Common Nighthawk	Special Concern	Yellow	Threatened
Aeronautes saxatalis	White-throated Swift	None	Blue	None
Cypseloides niger	Black Swift	Endangered	Blue	None

Table 1 (Cont'd): At-Risk Animal Taxa.

Source: B.C. Conservation Data Centre. 2018. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Nov 30, 2018).

Scientific Name	English Name	COSEWIC Status	BC List	*SARA* Schedule 1 Status
Birds (Cont'd)				
Numenius americanus	Long-billed Curlew	Special Concern	Blue	Special Concern
Brachyramphus marmoratus	Marbled Murrelet	Threatened	Blue	Threatened
Ardea herodias fannini	Great Blue Heron, *fannini* subspecies	Special Concern	Blue	Special Concern
Butorides virescens	Green Heron	None	Blue	None
Accipiter gentilis laingi	Northern Goshawk, *laingi* subspecies	Threatened	Red	Threatened
Megascops kennicottii kennicottii	Western Screech-Owl, *kennicottii* subspecies	Threatened	Blue	Threatened
Strix occidentalis	Spotted Owl	Endangered	Red	Endangered
Melanerpes lewis	Lewis's Woodpecker	Threatened	Blue	Threatened
Falco mexicanus	Prairie Falcon	Not At Risk	Red	None
Falco peregrinus anatum	Peregrine Falcon, *anatum* subspecies	Not At Risk	Red	Special Concern
Contopus cooperi	Olive-sided Flycatcher	Special Concern	Blue	Threatened
Hirundo rustica	Barn Swallow	Threatened	Blue	Threatened
Coccothraustes vespertinus	Evening Grosbeak	Special Concern	Yellow	None
Euphagus carolinus	Rusty Blackbird	Special Concern	Blue	Special Concern
Mammals				
Sorex bendirii	Pacific Water Shrew	Endangered	Red	Endangered
Myotis keenii	Keen's Myotis	Data Deficient	Blue	none
Myotis lucifugus	Little Brown Myotis	Endangered	Yellow	Endangered
Gulo gulo luscus	Wolverine, *luscus* subspecies	Special Concern	Blue	Special Concern
Pekania pennanti	Fisher	None	Blue	None

Table 1 (Cont'd): At-Risk Animal Taxa.

Source: B.C. Conservation Data Centre. 2018. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Nov 30, 2018).

Scientific Name	English Name	COSEWIC Status	BC List	*SARA* Schedule 1 Status
Mammals (Cont'd)				
Ursus arctos	Grizzly Bear	Special Concern	Blue	Special Concern
Oreamnos americanus	Mountain Goat	None	Blue	None
Insects				
Argia emma	Emma's Dancer	None	Blue	None
Argia vivida	Vivid Dancer	Special Concern	Blue	None
Enallagma clausum	Alkali Bluet	None	Blue	None
Ophiogomphus occidentis	Sinuous Snaketail	None	Blue	None
Cicindela hirticollis	Hairy-necked Tiger Beetle	None	Blue	None
Erynnis propertius	Propertius Duskywing	None	Red	None
Euphyes vestris	Dun Skipper	Threatened	Red	Threatened
Parnassius clodius claudianus	Clodius Parnassian, *claudianus* subspecies	None	Blue	None
Parnassius clodius pseudogallatinus	Clodius Parnassian, *pseudogallatinus* subspecies	None	Blue	None
Callophrys eryphon sheltonensis	Western Pine Elfin, *sheltonensis* subspecies	None	Blue	none
Danaus plexippus	Monarch	Endangered	Blue	Special Concern
Gastropods				
Sphaerium striatinum	Striated Fingernailclam	None	Blue	None
Galba bulimoides	Prairie Fossaria	None	Blue	None
Galba dalli	Dusky Fossaria	None	Blue	None
Physella propinqua	Rocky Mountain Physa	None	Blue	None
Physella virginea	Sunset Physa	None	Blue	None
Gyraulus crista	Star Gyro	None	Blue	None

Search Criteria: Animals AND Regional Districts: Squamish-Lillooet (SLRD)
Sort Order:Phylogenetic Ascending

Table 2: At-Risk Plant and Fungus Taxa.

Source: B.C. Conservation Data Centre. 2018. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Nov 30, 2018).

Scientific Name	English Name	COSEWIC Status	BC List	*SARA* Schedule 1 Status
Vascular Plants				
Pinus albicaulis	whitebark pine	Endangered	Blue	Endangered
Bidens amplissima	Vancouver Island beggarticks	Special Concern	Blue	Special Concern
Claytonia washingtoniana	Washington springbeauty	none	Red	None
Polemonium elegans	elegant Jacob's-ladder	None	Blue	None
Nonvascular Plants				
Brachythecium holzingeri	no common name	None	Blue	None
Brotherella roellii	Roell's brotherella	Endangered	Red	Endangered
Bryum schleicheri	no common name	None	Blue	None
Callicladium haldanianum	no common name	None	Blue	None
Claopodium pellucinerve	no common name	None	Red	None
Diphyscium foliosum	no common name	None	Blue	None
Funaria muhlenbergii	no common name	None	Blue	None
Grimmia anomala	no common name	None	Blue	None
Hygrohypnum alpinum	no common name	None	Blue	None
Pohlia cardotii	no common name	None	Blue	None
Pohlia elongata	no common name	None	Blue	None
Sphagnum contortum	no common name	None	Blue	None
Tripterocladium leucocladulum	no common name	None	Blue	None
Fungi				
Cladonia grayi	gray's pixie-cup	None	Red	None
Sphaerophorus fragilis	cushion coral	None	Blue	None

Search Criteria: Plants and Fungi AND Regional Districts: Squamish-Lillooet (SLRD)
Sort Order: Phylogenetic Ascending

Table 3: At-Risk Ecological Communities

Source: B.C. Conservation Data Centre. 2018. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Nov 30, 2018).

Search Criteria: Ecosystem Realm-Groups: Flood Group (F) OR Forest OR Grassland Group (G) OR Hydrogenic Group (H) OR Rock Group (R) OR Subalpine Shrub Group (S) OR Mineral Wetland Group OR Peatland Group OR Estuarine Realm OR Alpine Group (A) OR Beach Group (B) AND Regional Districts: Squamish-Lillooet (SLRD).

AND BGC Zone: Subzone, Variant, Phase: CWHdm.

Scientific Name	English Name	BC List
Leymus mollis ssp. mollis - Lathyrus japonicus	dune wildrye - beach pea	Red
Picea sitchensis / Rubus spectabilis Dry	Sitka spruce / salmonberry Dry	Red
Populus trichocarpa - Alnus rubra / Rubus spectabilis	black cottonwood - red alder / salmonberry	Blue
Populus trichocarpa / Salix sitchensis	black cottonwood / Sitka willow	Blue
Pseudotsuga menziesii - Pinus contorta / Holodiscus discolor / Cladina spp.	Douglas-fir - lodgepole pine / oceanspray / reindeer lichens	Red
Pseudotsuga menziesii - Tsuga heterophylla / Gaultheria shallon Dry Maritime	Douglas-fir - western hemlock / salal Dry Maritime	Blue
Pseudotsuga menziesii / Polystichum munitum	Douglas-fir / sword fern	Blue
Rhododendron groenlandicum / Kalmia microphylla / Sphagnum spp.	Labrador-tea / western bog-laurel / peat-mosses	Blue
Thuja plicata - Picea sitchensis / Lysichiton americanus	western redcedar - Sitka spruce / skunk cabbage	Blue
Thuja plicata / Carex obnupta	western redcedar / slough sedge	Blue
Thuja plicata / Lonicera involucrata	western redcedar / black twinberry	Red
Thuja plicata / Polystichum munitum - Lysichiton americanus	western redcedar / sword fern - skunk cabbage	Blue

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