KYUQUOT

COMMUNITY BROADBAND PLAN

Strathcona
REGIONAL DISTRICT

ABOUT KYUQUOT

The Kyuquot (Ka:'yu:'k't'h') and Checleseht (Chek'tles7et'h') First Nations make up the northernmost Nuu-chah-nulth communities on the west coast of Vancouver Island. Once separate bands, the Kyuquot and Checleseht officially amalgamated in 1962. Both are currently self-governing nations under the Maa-nulth Treaty.

Their traditional territory spans the area from the Brooks Peninsula (southern and eastern shores) to Porritt Creek, located north of Nootka Sound. The Kyuquot and Checleseht territories are accessible only by air and water.

The Kyuquot and Checleseht speak Northern Nuu-chah-nulth (Nuučaaˀnuɬ), which is part of the Wakashan language family and also each speak their own dialects of this language, which are endangered.

According to the federal government, the two nations have a combined membership of 578 people, 393 of whom live on reserve, as of September 2018.[1] Kyuquot's median age is 26.6 years old, with the largest age cohort being 15 to 64 years old. [2]

Median home value and median monthly cost of home ownership or rental is not available for Kyuquot, given the small population size. There is no accurate rental vacancy rate for Kyuquot however 50% of homes are rented and 50% are owned in Kyuquot and nearby Ehatis. [2]

Like neighbouring communities Zeballos, Ehatis or Oclucje, there is no or limited cell phone coverage in Kyuquot and most residents rely on landlines which cost approximately $40 per month, including unlimited local calling.[3] Cable, DSL, and wireless internet is available and an individual household can expect to pay between $40 and $130 per month, depending on desired speed and usage.[4]

Historically a fishing community, marine and wildlife are plentiful in Kyuquot. Home to several world-class parks, small islands, beaches, lush rainforests, hills and mountains are the many features that make up this incredible land and seascape.

[1] The Canadian Encyclopedia Nov, 2018
[2] Statistics Canada, Census 2016
[3] Telus.com,
[4] FindInternet.ca

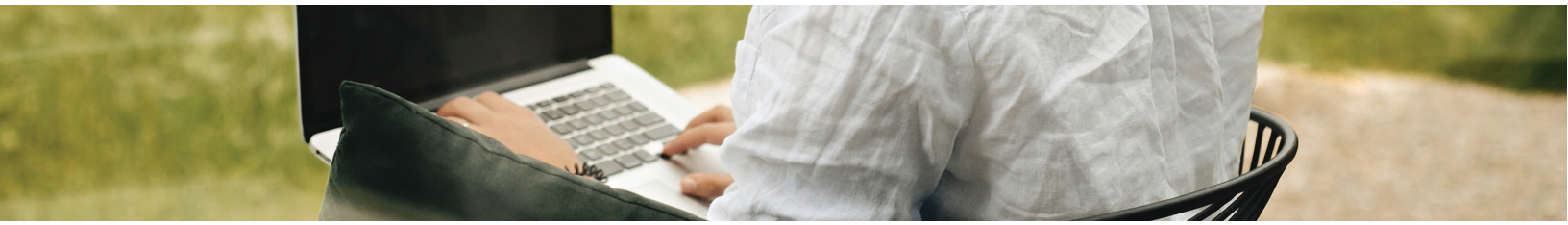
CONTENTS

Community Broadband Plan

Telecommunications Infrastructure Assessment

Prepared by:
Elaine Popove - Strathcona Regional District
Communications Coordinator (May, 2020)

This project is made possible through funding provided by Island Coastal Economic Trust.



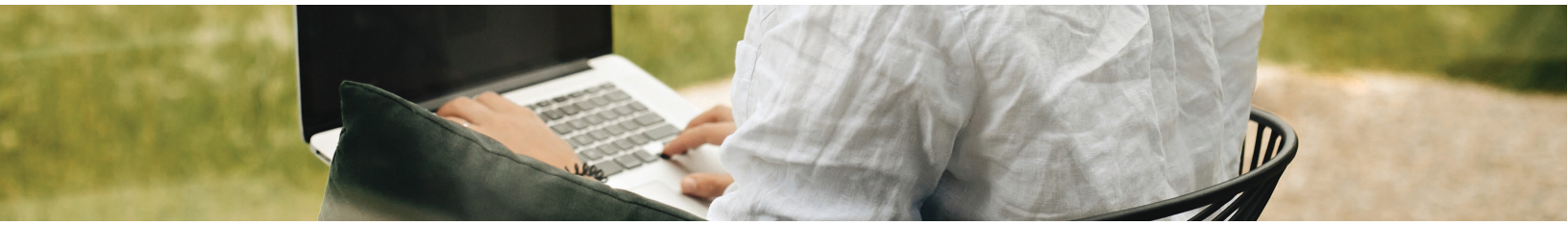
INTRODUCTION

The Strathcona Regional District (SRD) is a partnership of four electoral areas and five municipalities. These communities have relatively small populations and are often separated from each other by undulating landscapes and water.

Of the population of 44,000 residents, most reside within the City of Campbell River. Approximately 12,000 regional district residents live in rural and remote communities spread across a large geographic expanse of approximately 18,500 sq. kms that includes forested hills and alpine areas, islands and remote inlets.

Improved broadband connectivity for rural and remote communities has been a strategic priority of the SRD for several years. There is a significant gap between broadband service levels and affordability in urban areas versus rural areas in British Columbia (Connected Communities in BC, NDIT, 2018). Indeed, many communities within the SRD do not meet basic service levels, if they have any service at all.

Addressing this 'digital divide' will require intensive collaborative effort and multiple funding sources but the benefits are undeniable. It will increase the live-ability of rural and remote communities on Vancouver Island, enabling them to sustain their communities, attract investment and participate directly in social and economic initiatives.



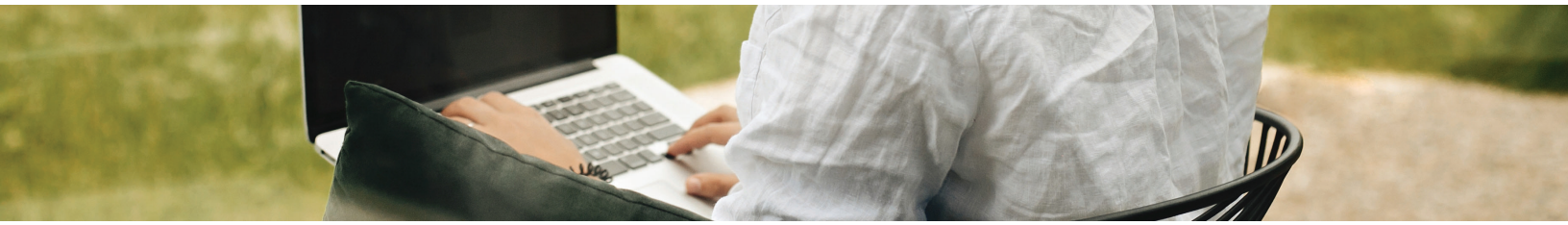
PROJECT METHODOLOGY

The Community Broadband Plans (CBP) project methodology was founded on design principles set-out by Connected Communities BC, weaving together a combination of diverse skill-sets; technical network engineers with community facilitators. 7 communities within the regional district were visited throughout a 2 week block in June of 2019.

Presentations from guest speakers and videos showcasing possibilities for a digital future while gathering ideas from the community about their current state of use as well as plans for housing, economic, environmental and social developments took place.

Information was presented about the SRD's broadband initiatives including the Connected Coast project (V.Smith, SRD), broadband technology and the existing connectivity landscape (D.Sinclair, Driftwood Communications), Innovate BC inspiration (G. Truax, Innovation Island) and the provincial Connected Communities program (C. McCormick and J.Wilkins, Ministry of Citizens' Services). A video produced by Connected Communities, showcasing how improved connectivity has been useful in Haida Gwaii was also shown.

An open discussion followed and participants provided a great deal of information about the current state of connectivity in their community as well as how improved broadband might be utilized to address community challenges and opportunities.



DIGITAL ASPIRATIONS

A Community Broadband Plan forum was held on June 3rd from 7:30 - 9:00 pm at the Java Hut, Kyuquot Inn. The forum was promoted as a 'Let's Connect' workshop advertised by posters hung in high traffic locations throughout the community and online via local social media channels and community websites.

The workshop was 1.5 hours in length with the first hour consisting of presentations, technical info and a Connected Communities video was featured while the last half hour included an open forum.

How would improved broadband address community challenges and opportunities in Kyuquot?

Improve Economic Development

- Transportation - product based work is currently difficult when living remotely
- Aquaculture farms
- Photography - best place to photograph sea otters
- Forestry operations
- Fair Harbour Marina & Campground
- Attract research facilities (like Hakai Institute)
- Work from home – currently not a possibility
- Possibility of tech-based jobs for youth

Increase Tourism

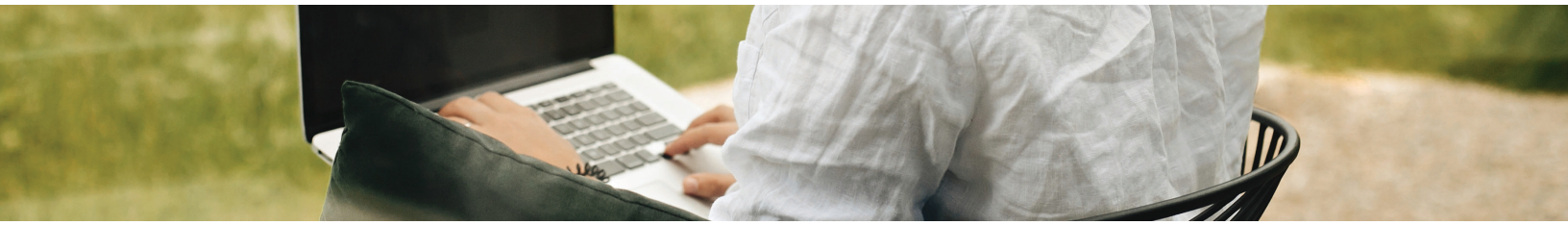
- Eco-tourism
- Sail boat destination
- Cultural tourism
- Possible interpretive trail

Provide More Educational Opportunities

- Access to education without leaving community
- Currently the Nation has a school
- For example, there was a time there were no teachers and volunteers filled in

Improve Community Identity

- Language revitalization
- Big House site planning in progress
- Many cultural modified trees (CMTs)



DIGITAL ASPIRATIONS (cont.)

Improve Community Health

- Currently some telehealth capacity; but it's fairly new
- Opens new options of psychiatrists, speech pathologists, etc…
- Island Health has presence in Kyuquot nation
- Currently need to verify with doctor before a prescription can be filled which requires video because of remoteness of village

Improve Emergency Management

- Currently, experience no cell phone, landline or power access simultaneously
- For emergency, cell phone use on WIFI occasionally works
- Currently weather is an issue, clouds and rain disrupt service
- For example, During an emergency call, doctor asked local nurse to find a better cell phone and call back

Improve Well-Being

- Cellular towers are invasive, want a place where it isn't available
- Improve current Warriors Program - youth learn multiple skills while building a cabin

Improve Safety

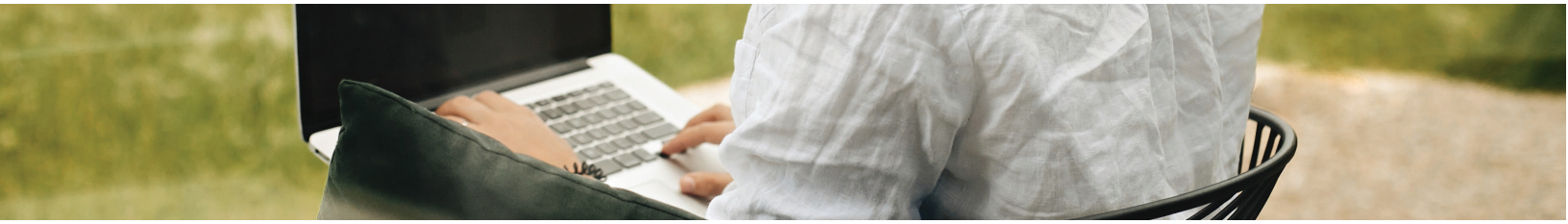
- Boaters, forestry workers, residents, visitors, kayakers expect cell phone service
- Prevent domestic violence with a safety line to call for help; RCMP not nearby
- Search & Rescue – need more effective and cheaper communication options
- For example, seaplane crash; lone survivor hiked to mountain top to get cell service
    - Young people on water, ran out of gas with darkness coming, used handheld device to call Coast Guard, who called community member to go get them

Improve Tsunami Warning Effectiveness

- More effective for communities on low-lying land
- Nation needs faulty siren on tower outside band office replaced

Better Utilize Existing Assets

- Health clinic facility
- Island Health presence in health clinic
- RCMP office space in health clinic
- Video equipped board room in clinic lower level



CONCLUSION

The information gathered from the Let's Connect CBP forums has created a unique snapshot of the community's digital readiness and aspirations.

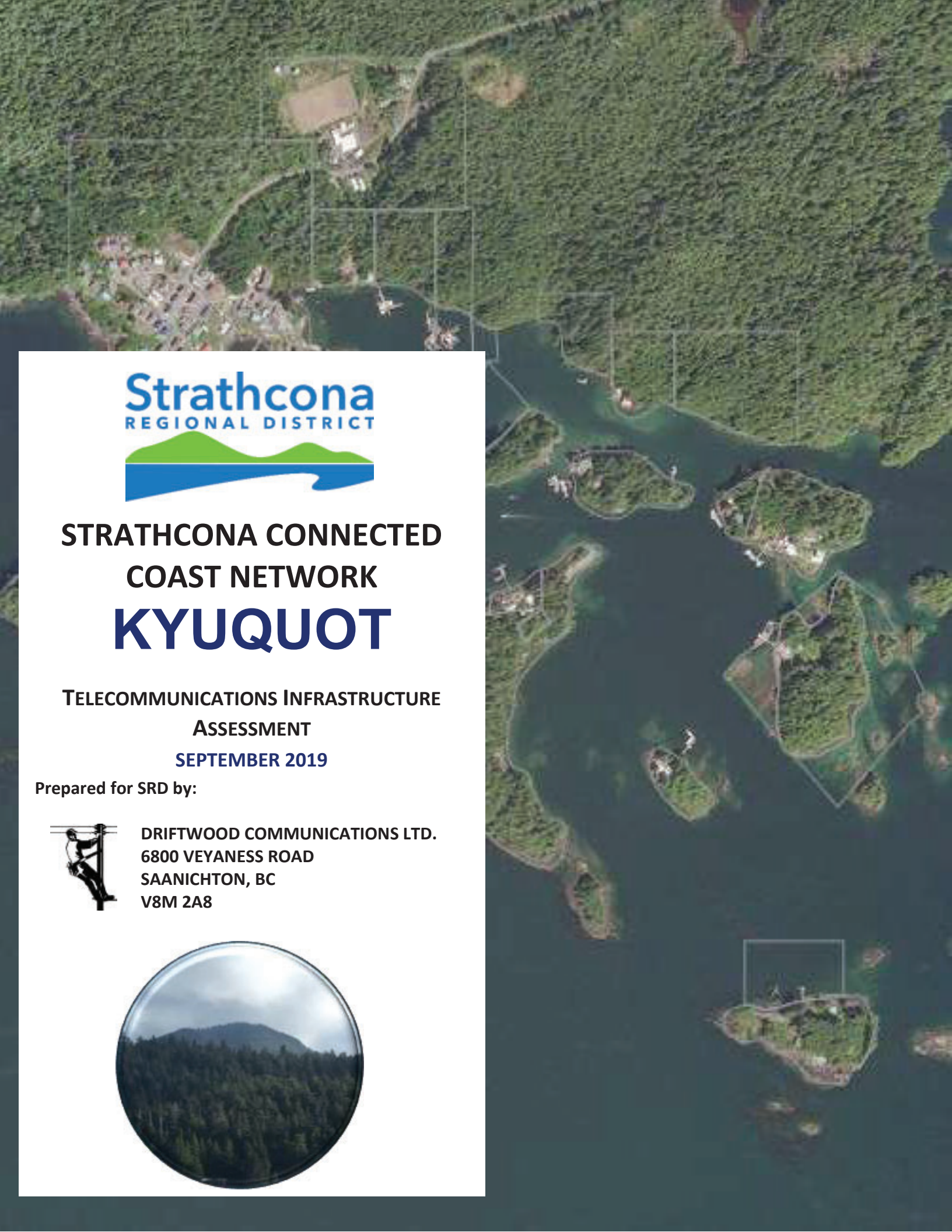
The world is increasingly 'online' bringing opportunities for information exchange, social connection, improved service delivery and income generating opportunities along with it. In the Regional District, improved connectivity will allow residents in rural and remote communities access to essential services, participation in the modern economy and civic life.

New economic development opportunities will allow residents to work remotely and participate on e-commerce and online business development. Access to phone and internet services is necessary for reasons related explicitly to health – including access to health and emergency services and opportunities for telehealth – but also to meet other needs as aforementioned. Improved internet connectivity will also significantly enhance the ability to take part in civic and social participation, education and professional development, improve connection to friends and family, and entertainment, among others.

For some residents, this can mean the difference between staying and improving the capacity in local communities versus having to move or board elsewhere which can be prohibitive.

This snapshot will be provided to last-mile broadband infrastructure solution designers to develop a plan based on the community snapshot along with analysis of the community's topography, climate, housing density, location of key institutions.

In this way, the infrastructure is informed by the community aspirations amongst other important technical considerations.



Strathcona REGIONAL DISTRICT

STRATHCONA CONNECTED COAST NETWORK

KYUQUOT

TELECOMMUNICATIONS INFRASTRUCTURE ASSESSMENT

SEPTEMBER 2019

Prepared for SRD by:

DRIFTWOOD COMMUNICATIONS LTD.
6800 VEYANESS ROAD
SAANICHTON, BC
V8M 2A8

Purpose of Study and Methodology

The SRD engaged Driftwood Communications to provide an understanding of the current connectivity landscape in Kyuquot and to investigate any improvements required to last-mile infrastructure in order to better serve the community. Suggestions for last-mile improvements must consider the proposed new high-speed capacity link being planned for Kyuquot through the Connected Coast project, as well as responding to the community's digital aspirations.

Methodology

A visit to Kyuquot was completed on Tuesday, June 3rd, 2019

A general survey of the area was conducted to identify:

- the proposed fibre landing location
- existing utility infrastructures, conditions and capacities
- existing ISP infrastructure
- potential anchor tenant locations
- potential opportunities

Interviews with the local ISP were undertaken to further understand their existing capabilities and where the gaps exist to achieve the targeted service levels.

A representative from Driftwood participated in a community Let's Connect forum in Kyuquot on June 3rd. The purpose of the forum was to share the Connected Coast plan and what benefits it could bring to the community. Driftwood delivered a presentation of the various types of technologies that could potentially be deployed to provide these services. The open forum also provided the important opportunity for community members to share any concerns they may have had about any particular delivery method or any specific need within their community.

Observations and information gathered was then analyzed by our staff to determine what potential options could best meet the objectives of providing the desired service levels to the community.

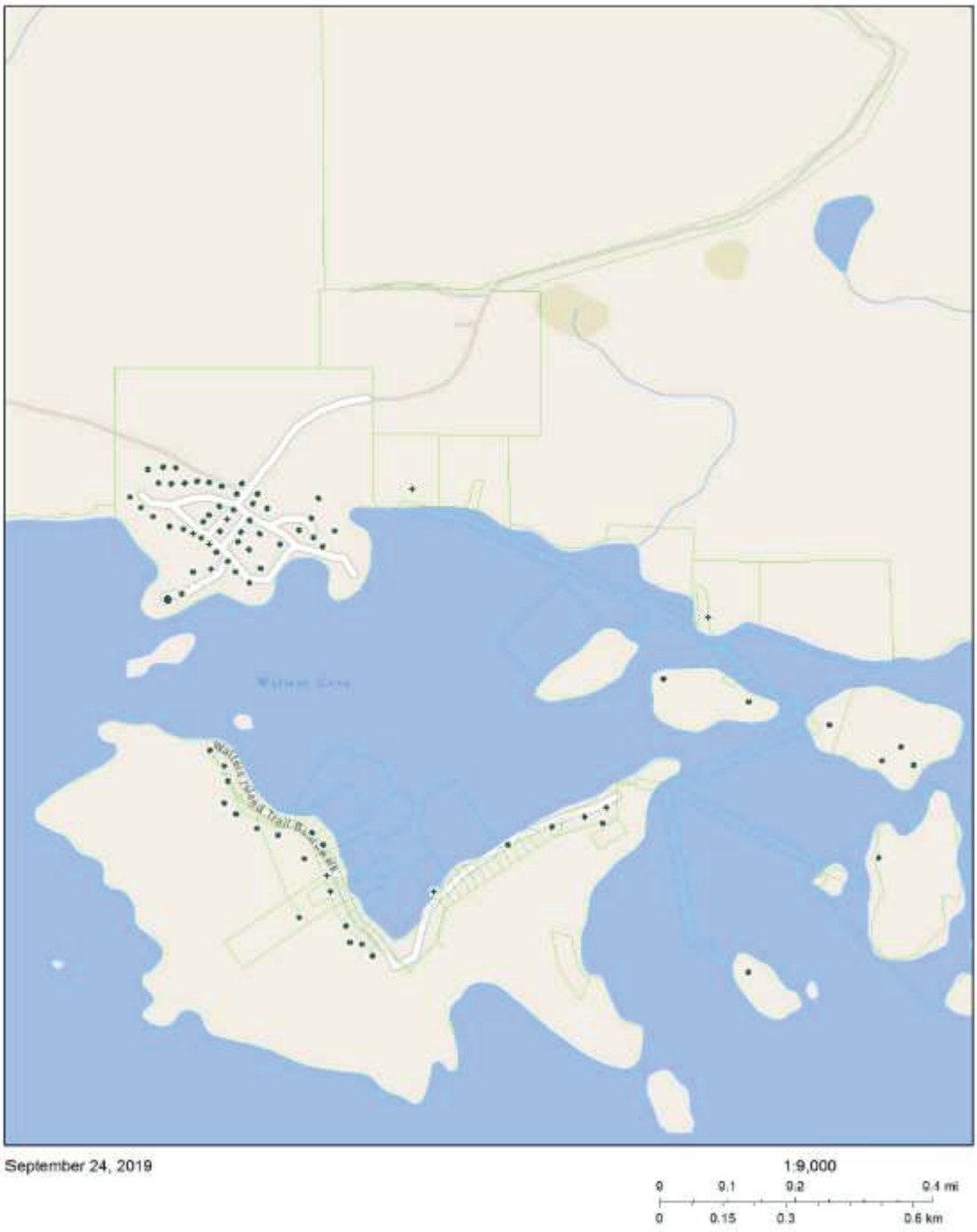
Connected Coast Submarine Fibre Routes

Connected Coast - Proposed backbone submarine fibre path and landing points
(Estimated Completion 2021)
Green = Main Submarine Fibre

Connected Coast Terrestrial Fibre Routes

Connected Coast submarine fibre landing site at Kyuquot and terrestrial fibre build
Green = Submarine Fibre Yellow Line = Terrestrial Fibre

Population & Address Density



Building Locations

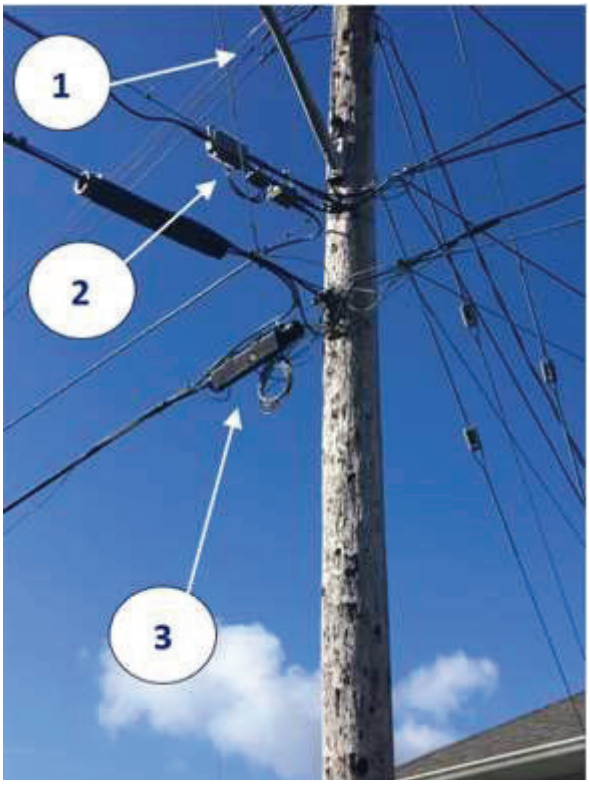
Description	Quantity	Source
Population	181	Village and Islands (2016 Census)
Estimated Buildings	81	2019 Google Earth – Manual Count
First Nation Buildings	50	2019 Google Earth – Manual Count
Islands	31	2019 Google Earth – Manual Count
Report Number Used	81	2019 Google Earth – Manual Count

Site Visit Observations

Utility Service Provider	Services
Kyuquot and Checleseht First Nations	Internet service for First Nations only
Xplornet	Satellite television and internet services
TELUS	Landline telephone
BCHydro	Electricity

Existing Support Structures

Utilities in the community are provided via a Joint Venture aerial pole network owned by BCHydro and TELUS. The presence of a Coaxial Cable Network which provides Internet service to the Kyuquot and Checleseht First Nations residents was also identified only existing on First Nations lands.



1	BCHydro power
2	**Coaxial cable plant**
3	**TELUS cables**

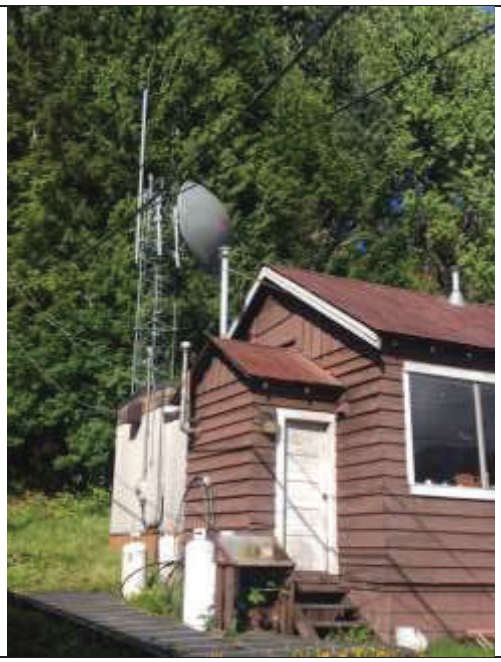
Pole located in Kyuquot Village

Existing Internet Connectivity & Structures

The Kyuquot First Nations community receives internet connectivity via a TELUS microwave feed arriving on Walter Island with a wireless point to point connection to the village

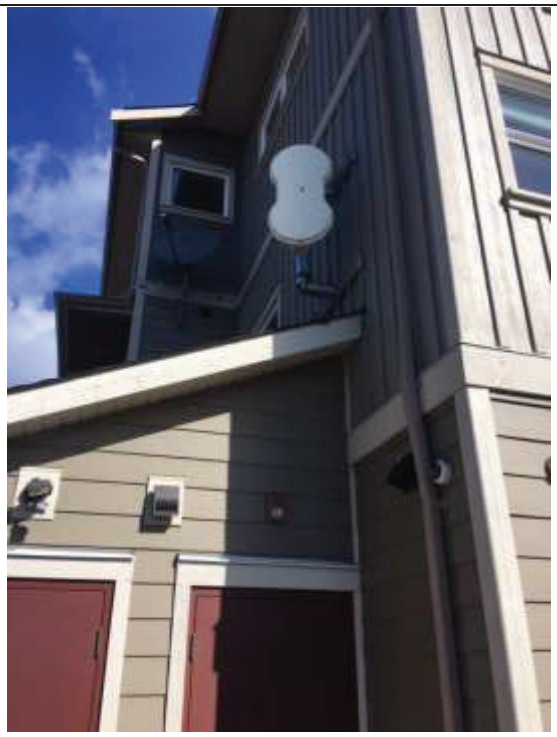
The connection from the TELUS microwave receive site (1) to the First Nations transceiver site (2) (Walters Landing – First Nations Fishing Lodge) is achieved with a TELUS fibre cable.

	Description
1	TELUS microwave site
2	WIFI transceiver location – Building Mount
3	WIFI transceiver location – Building Mount
4	Tower of undetermined use



1. TELUS microwave receive site on Walters Island

2. Point to point radio transceiver at Walters Lodge on Walter Island



3. Point to point radio transceiver on Kyuquot First Nation Band Office

4. Tower on Kyuquot First Nation land. Undetermined use.

Existing TELUS Structures

Microwave Receiver/Transmitter point that is part of the same network that feeds to Zeballos.

Along the pole line TELUS has copper cables that are providing a land-based telephone system to the residents of Walters Island and the Kyuquot Village.

We also noted they have fibre routed on the strand that feeds to the transceiver site at Walters Lodge. It was also noted that there was fibre on pole lines hitting certain First Nations buildings on the mainland. Evidence of fibre was confirmed at the school as shown below, most likely connected to the Band office.

Presents of Telus fibre on Walters Island directly adjacent to the TELUS microwave site

Fibre Entrance Panel within school building

Existing Connectivity

Presently there are two internet service options for the community of Kyuquot.

1. Coaxial cable system DOCSIS 2.0 Internet for the Kyuquot First Nations Community only.

   TELUS currently provides a 30 Mbps input connection in place.

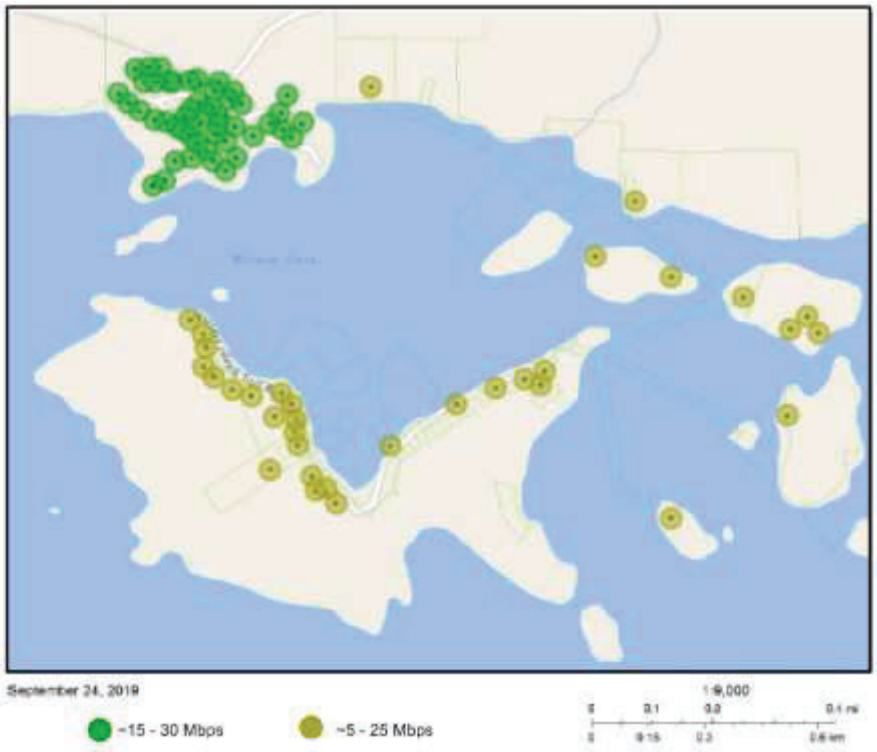
Package	Unknown
Download	< 30 Mbps
Upload	unknown

2. Satellite internet through Xplornet[i]

Packages	SAT 5	SAT 10	SAT 25
Download	5 Mbps	10 Mbps	25 Mbps
Upload	1 Mbps	1 Mbps	1 Mbps

   Satellite signals are also subject to weather conditions that will cause periods of degradation in service levels.

Residents of Walters Island have taken actions to install their own shared WIFI radio system enabling connectivity to some locations that could not receive Xplornet directly most likely due to not having satellite line of sight.



Delivery Methods Comparisons

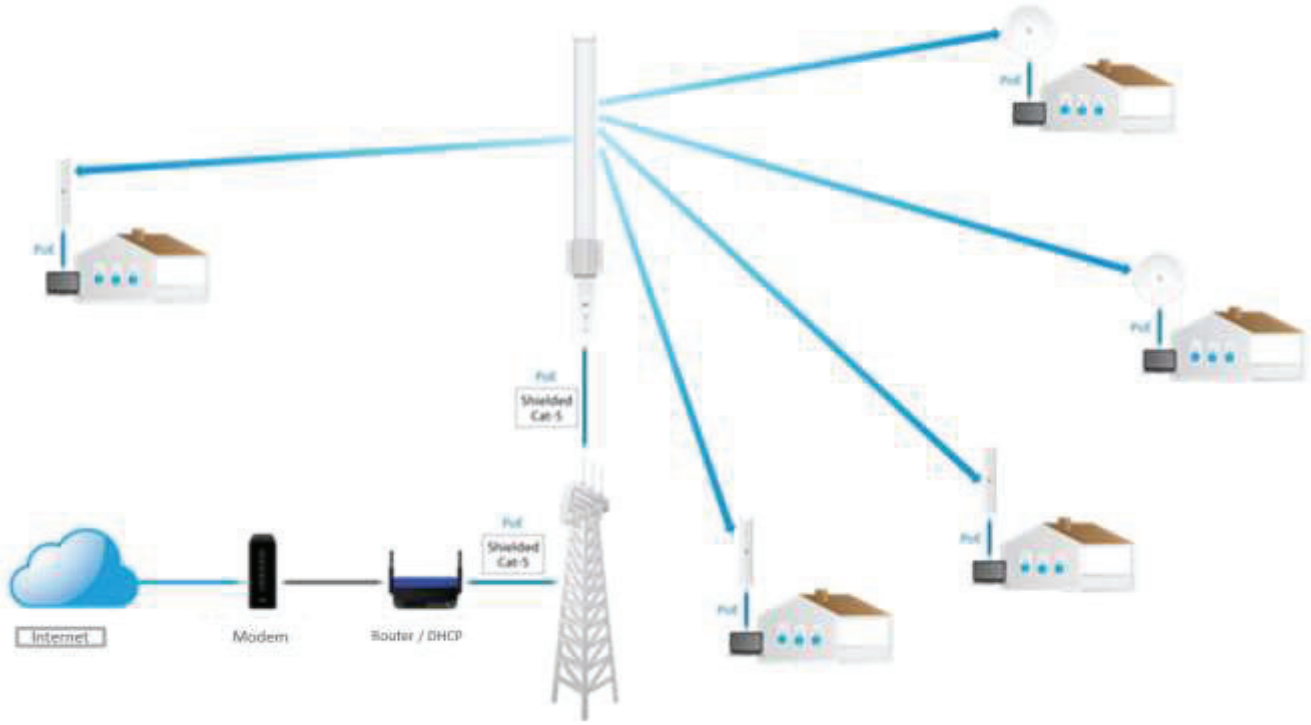
	F.T.T.H. Fibre to the Home	HFC or Coaxial Cable Network	WIFI Wireless Network	Satellite
Current Industry Offerings	Download/Upload 940 Mbps / 940 Mbps	Download/Upload 1Gbps / 125Mbps	Download/Upload 25 Mbps / 12 Mbps	Download/Upload 25Mbps / 1Mbps
Future Planned Offerings	Virtually Unlimited	10 Gbps/10Gbps	Unknown	Unknown
Build Costs	High	Medium	Low	Low
Construction	Aerial &/or underground fibre placement, splicing, drops to buildings, building wiring and transceiver installation	Aerial &/or underground coax &/or fibre placement, splicing, outdoor active & passive installation, drops to buildings, building wiring and transceiver installation	Single &/or multiple towers &/or building mounted transceiver installation, user building external antenna (if required) building wiring and transceiver installation	Mount dish antenna at a location that provides line of sight to satellite. Could be building, pole or tower. Wiring to building, building wiring and appliance installation
Maintenance	Very Low Typically, once the fibre has been installed there is little to no maintenance other that unpredicted damage or forced relocation.	Medium to High Requires ongoing maintenance of outside active electronics, battery maintenance	Low Requires tower safety maintenance, repairs to unpredicted damage and electronic equipment failures	Low Dish antenna may move or be pushed out of alignment, unpredicted damage or electronic equipment failure
Vulnerabilities	Direct damage from exterior forces such as tree falling, auto accident, cut by excavator etc... water infiltration into a splice	Direct damage, electronics failure, power outages	Direct damage, electronics failure	Direct damage, electronics failure
Service Impacting	Fibre break, electronic device failure, water in splice location	Fibre or coaxial cable break, electronic equipment failure, extended power outage	Anything that impedes the line of sight will impact the service quality i.e. rain, snow, fog, obstructions such as tree and buildings, other WIFI signals interference	Anything that impedes the line of sight will impact the service quality i.e. rain, snow, fog, obstructions such as tree and buildings.

Construction Methods Comparison

	Advantages	Disadvantages
Aerial Leased	• Widely available • Can be several potential leasers • Not responsible for structure or its maintenance costs • Construction costs generally lower than underground	• Open to weather & traffic • More susceptible to service interruption due to damage • Approval to use required • Ongoing lease costs
Aerial Built & Owned	• No leasing cost	• Rarely done as there are usually poles already on both sides of road or little desire by local government to approve if not already there • Expensive to build • Structure maintenance costs • Approval to construct is required • Taxable asset cost
Underground Leased	• Commonly available • Less susceptible to weather • Not responsible for structure maintenance costs • Construction cost comparable or slightly higher than aerial leased	• Available capacity issues more likely • Approval to use required • Ongoing lease costs
Underground Built & Owned	• Less susceptible to weather	• More costly • Approval to construct is required • Structure maintenance costs • Taxable asset cost
Submarine	• Provides connectivity where no other viable or cost-effective option is available	• Expensive • Approval to construct is required
Towers	• Fewer locations • Less infrastructure overall	• Unpopular to public • Land availability challenging • Land leasing cost • High construction cost • Approval to construct is required

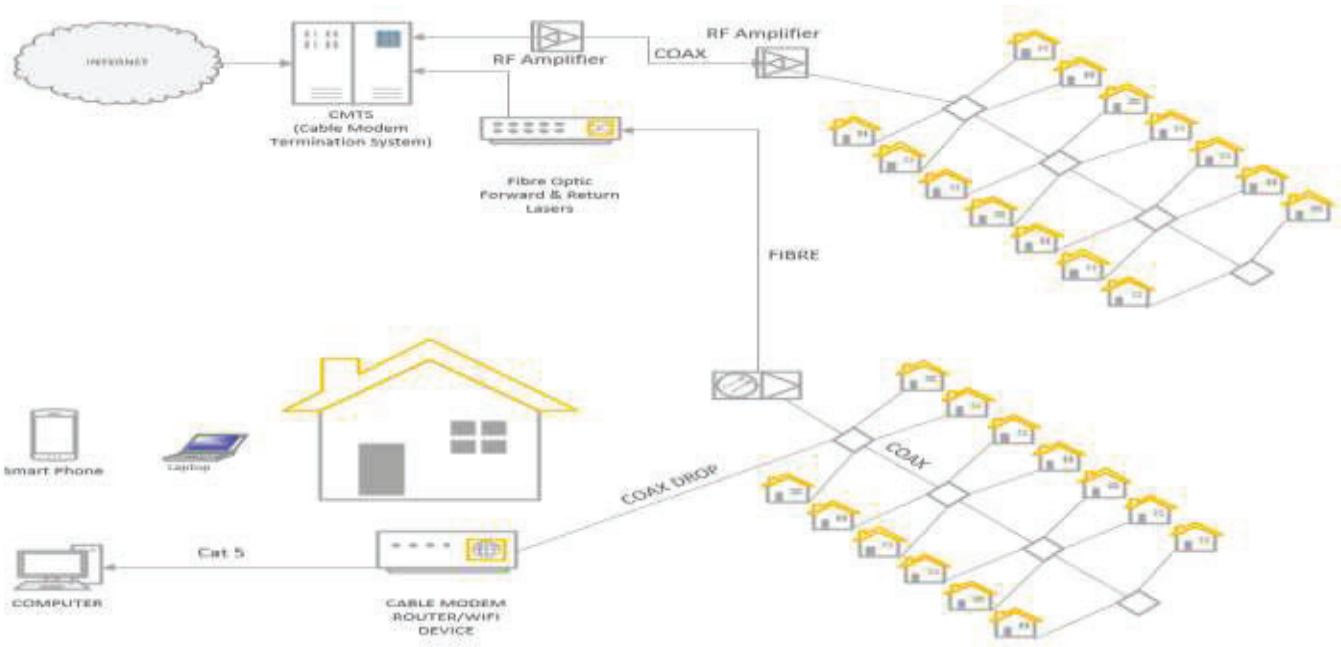
WIFI Network Example

Wireless WIFI



PtMP (Point to Multi Point) links are used routinely to serve up to 100 locations from a single Access Point. There are many approaches to providing PtMP services. This example is the simplest, using a single Ubiquiti radio with an omnidirectional antenna to create a bridged network. Clearly, a more complex approach is often desired, one that uses multiple Ubiquiti radios with sector antennas along with a fully routed (rather than bridged) configuration.

Broadband Coaxial Cable Network Example



Coaxial cable system technologies continue to evolve at a rapid pace. With the latest version being developed to provide 1 Gbps up and 1 Gbps down connections. This method requires customers to be serviced via coaxial cables connected to a local area fibre node with no additional amplifiers.

Today there are two basic methods of design.

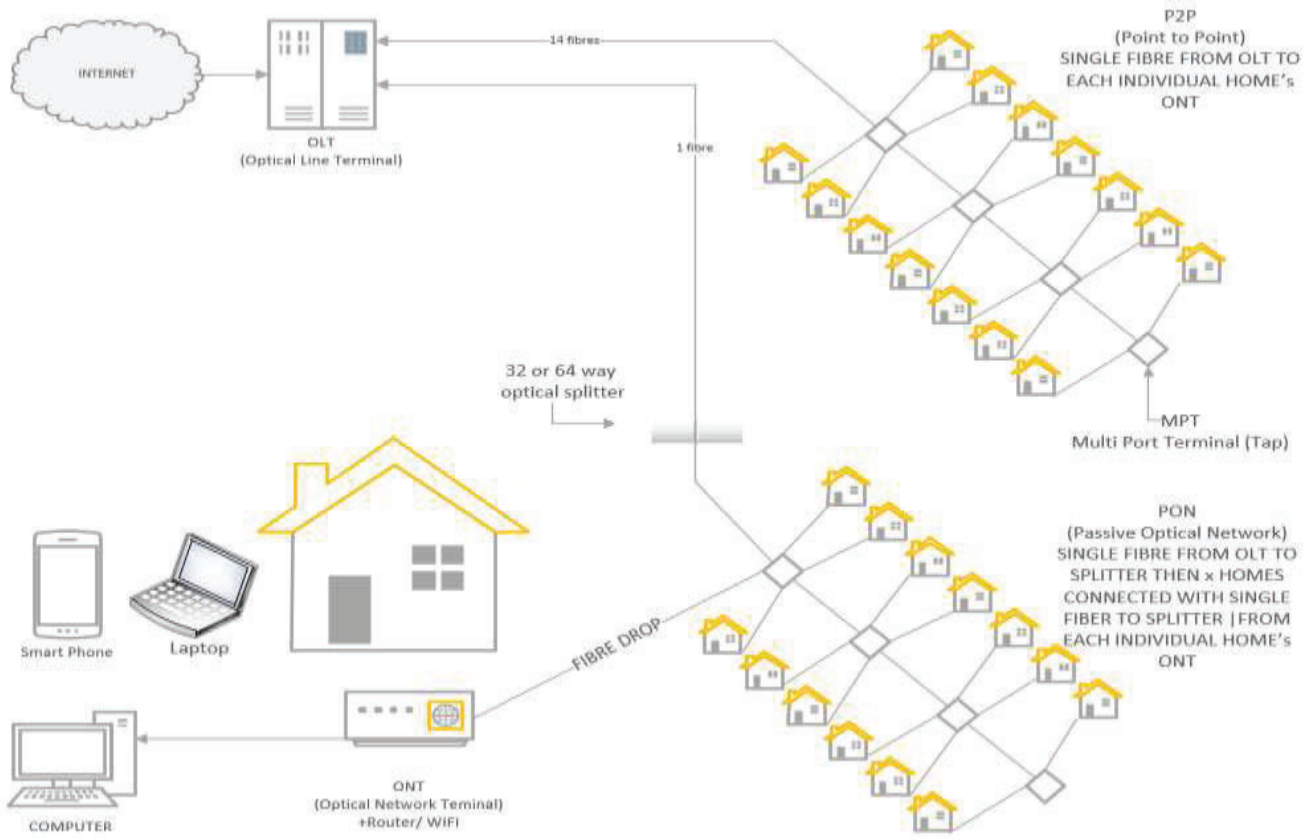
1. A coaxial cable only system with amplifiers placed at intervals to extend the area serviced. For the delivery of internet only services this method would work well in a smaller community with a few hundred customers.

2. With the addition of Fibre optic nodes placed closer to the customers the design now allows for segmentation of groups of customers. In addition to higher quality service and greater reliability it also results in increased internet connection speeds.

F.T.T.H. (Fibre to the Home) Network Example

An Optical Line Terminal (OLT) is the endpoint hardware device in a Passive Optical Network (PON). An OLT has two primary functions: Converting the standard signals used by a FiOS service provider to the frequency and framing used by the PON system.

ONT stands for Optical Network Terminal. The ONT connects to the optical fibre cable.
It connects to your router via a LAN / ethernet cable and translates light signals from the fibre optic line into electronic signals that your router can read.



Potential Solution Option 1 – Kyuquot First Nation Connects to SRD Service

With the Connected Coast terrestrial fibre in place as outlined, all that would be required would be a fibre drop connection to the Kyuquot First Nations Cable System headend located in the new Health Band Office.

The connection of their existing network to the SRD system would result in an immediate improvement in customer internet service levels with their existing 750 MHz cable plant and DOCSIS 2.0 system. With the ability to offer 40 Mbps down / 30 Mbps up.

Upgrading their DOCSIS system to 3.0 would provide significant additional improvements going above the Federal Government objective.

DOCSIS release	Max download	Max upload
DOCSIS 2	40 Mbps	30 Mbps
DOCSIS 3	1.2 Gbps	200 Mbps
DOCSIS 3.1	10 Gbps	1 Gbps
DOCSIS 3.1 Full Duplex	10 Gbps	10 Gbps

Headend equipment to upgrade to DOCSIS 3.0 estimated to be between $15,000 - $25,000.

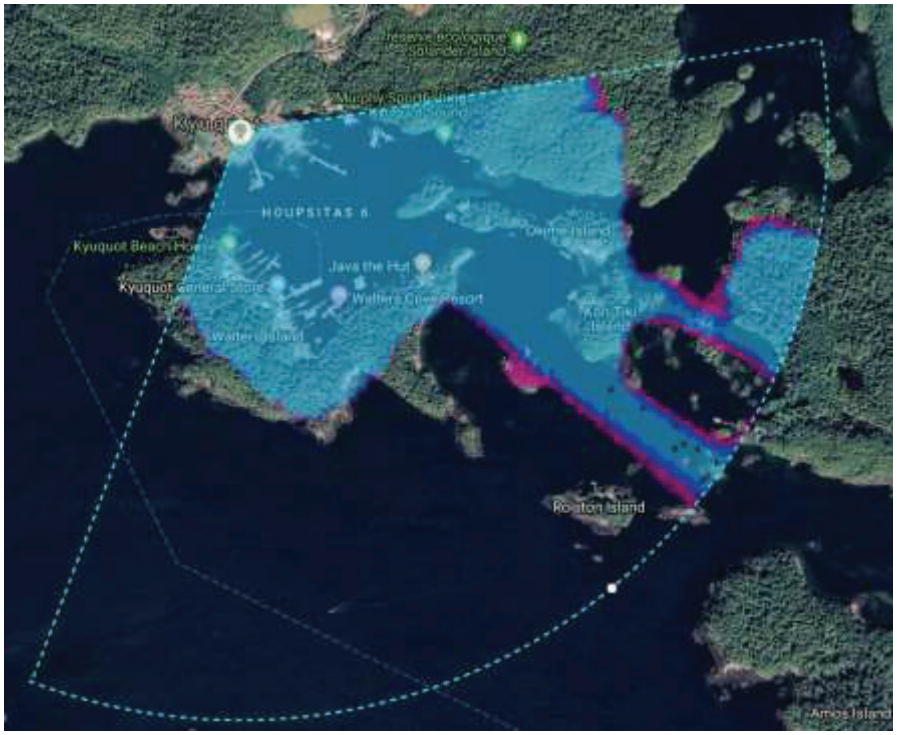
Modem upgrades would also be required to DOCSIS 3.0. Prices for these units can range from $75 - $150 each dependent on features selected, such as additional WIFI ability.

DOCSIS 3.0 Upgrade Estimated Cost			
	Low Cost	Medium Cost	High Cost
Headend Equipment 3 cards	$15,000	$20,000	$25,000
50 Modems	$3,750	$5,000	$7,000
	$18,750	**$25,000**	**$32,000**

Potential Solution Option 1 – Walters Island and Adjacent Islands

With the SRD Fibre connected to the First Nations network and their DOCSIS 3.0 upgrade completed, they may have an interest in providing a WIFI service offering to the residents on Walters Island and the adjacent islands.

It is possible the existing tower could be used for WIFI service antenna mounting.
The desktop example below shows a potential coverage area based on simple topographical details.



A complete site area examination and network design would be necessary to determine what is possible and required to build a viable WIFI service network.
Depending on their location in the above area, some customers may require specialized antennas or towers at their site.

ANTENNA EQUIPMENT

Rocket 5AC Prism Gen2 - 5Ghz

CPE EQUIPMENT

The CPE (Customer Premise Equipment) is selected from the above units. This will be selected on a case by case basis depending on the available signal quality and the necessity for spectrum re-use and efficiency. Most customers will be using equipment mounted to the outside of their buildings with a small WIFI router on the inside to allow for the use of smart phones, tablets and smart TV's without running cables.

Description	Low Cost	Medium Cost	High Cost
Infrastructure	$2,500	$15,000	$80,000
Base Station 3 AP + 3 Antenna(s)	$2,000	$3,500	$7,000
Routers / Switches / Security / Cloud Key	$2,000	$3,500	$5,000
Installation	$3,700	$9,250	$18,500
Engineering	$5,000	$12,800	$25,000
CPE 31 Units including building mount install	$9,300	$15,500	$21,700
Headend Equipment 3 cards	$15,000	$20,000	$25,000
50 Modems	$3,750	$5,000	$7,000
Combine DOCSIS 3.0 upgrade & build costs	**$43,250**	**$84,550**	**$189,200**

Cost variables such as existing tower replacement, increased antenna needs, increase customer equipment needs, number of customers to be serviced and logistics will play all role in the final cost.

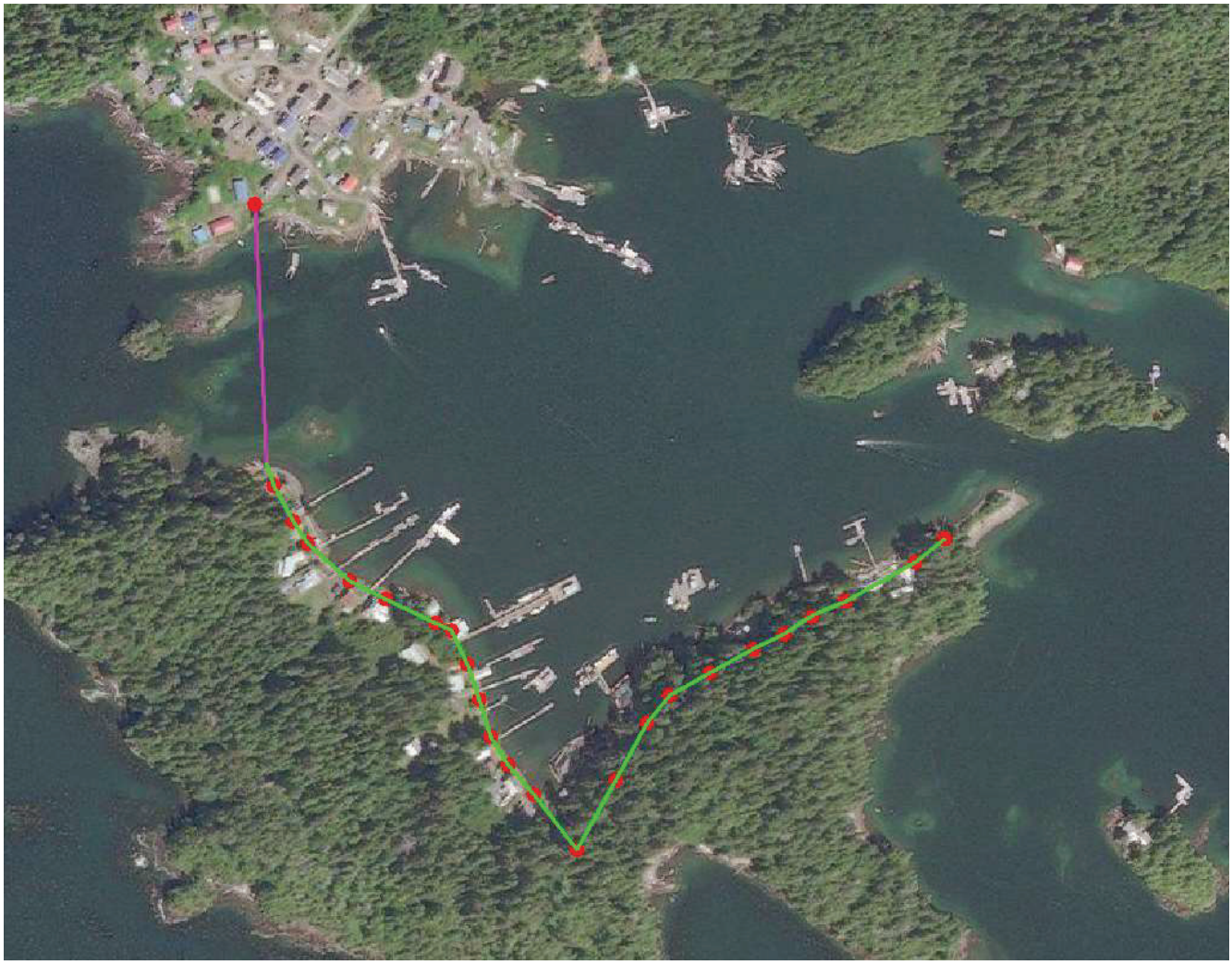
A properly designed and managed WIFI network such as this would meet and/or exceed the 50 Mbps Down / 10 Mbps Up service levels.

Potential Service Option 2 - Walters Island and Adjacent Islands

The First Nations could extend their coaxial cable system with a ~280 meter submarine cable crossing to Walters Island then construct ~1000 meters of new aerial coaxial network on the existing pole line.

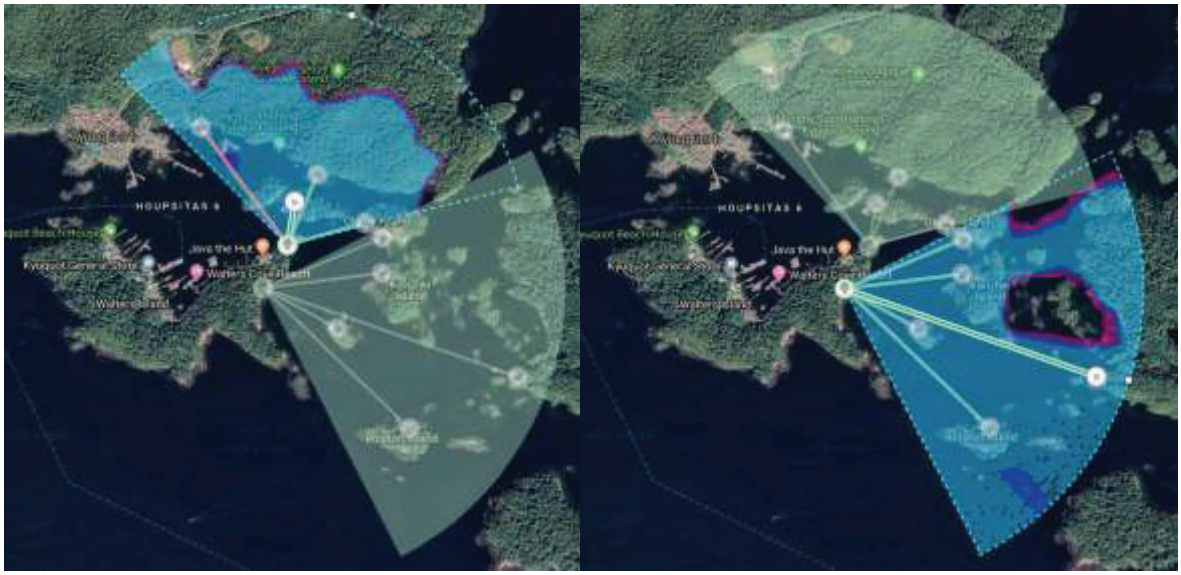
We are presuming that they already have an access agreement with TELUS based on the presence of their existing coaxial cable infrastructure.

Many coaxial cable submarine crossings like this have been successfully completed before. This would require a permit application to Front Counter BC and will most likely involve a marine biologist and archeologist in the process. Including this with the SRD submarine fibre placement would be an opportunity for cost savings. It is assumed that resources for maintenance must already be in place to maintain the existing coaxial network.



- Approximate submarine cable length - ~280 meters
- Existing pole line structure length - ~1000 meters

In addition, two WIFI transceivers situated at the northeast end of Walters Island could enable the extension of services to the residents on the adjacent islands. It would be necessary to secure suitable locations for the transceivers to be mounted and establish a connection to the cable network. The desktop example below shows viable links based on topographical input. A complete site survey and network design would be required to determine what would be required to achieve this outcome.



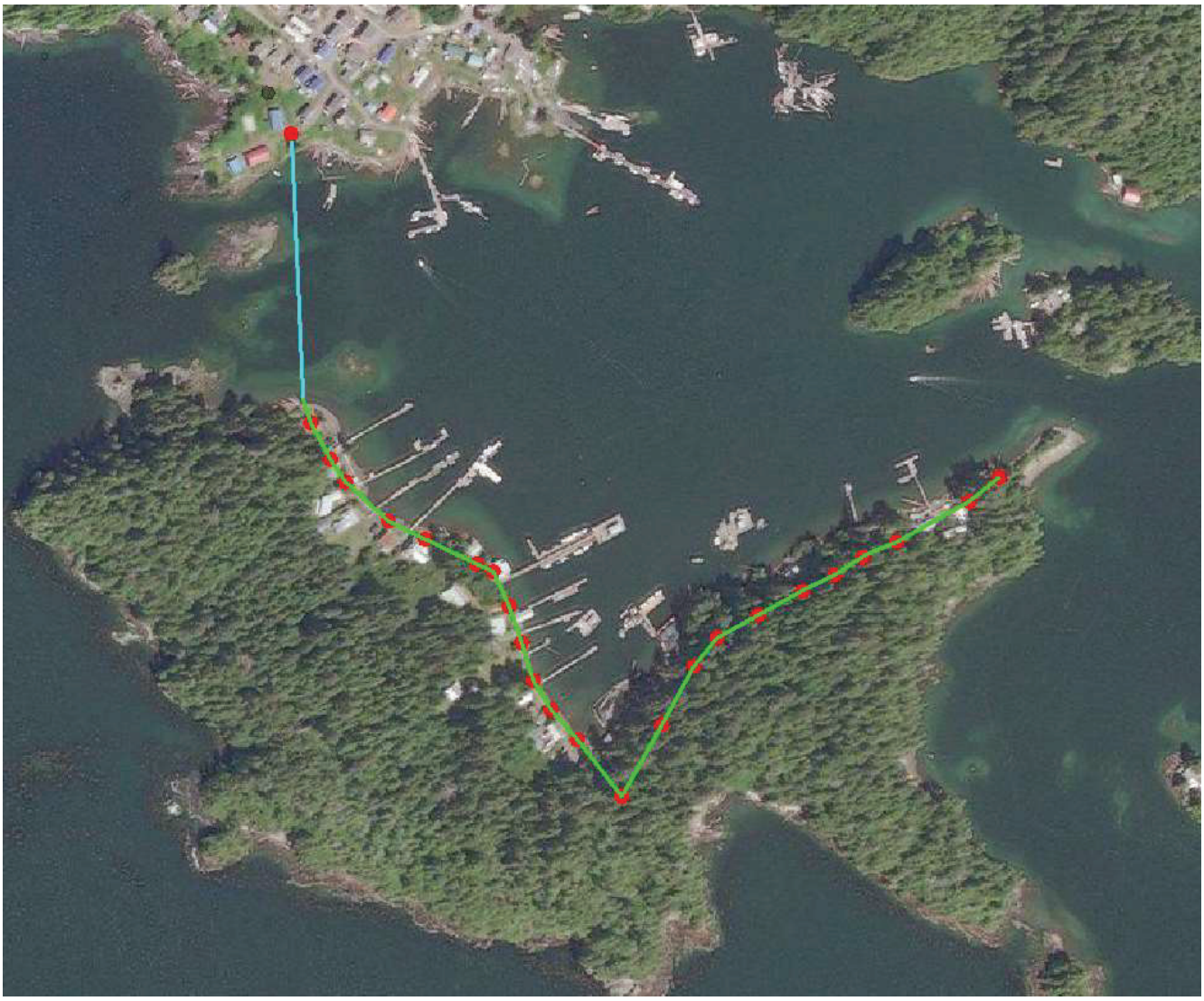
Description – Island service build	Low Cost	Medium Cost	High Cost
Submarine coaxial cable	$25,200	$33,000	$43,000
Infrastructure	$5,500	$8,000	$25,000
AP+ Antenna(s)	$1,500	$2,500	$4,000
CPE including building mount installations	$3,500	$5,000	$7,000
Modems/Switches	$2,500	$6,250	$12,500
Installation	$3,700	$9,250	$18,500
Engineering	$5,000	$12,800	$25,000
Coaxial cable build	$25,000	$35,000	$40,000
Make-ready	$7,000	$12,000	$22,000
Headend equipment 3 cards	$15,000	$20,000	$25,000
50 modems	$3,750	$5,000	$7,000
Combine upgrade & build costs	**$97,650**	**$148,800**	**$229,000**

There are many variables that will impact the final cost of these types of projects including the condition and capacity of existing infrastructure and resulting Make-ready costs. A complete engineering and permitting application process and tendering of construction would be required to ascertain a true final cost. This option does not include the DOCSIS 3.0 upgrade to the existing First Nations Network.

Potential Service Option 3 – Walters Island New ISP

A new ISP for the servicing of Walters Island and the surrounding islands could be established.

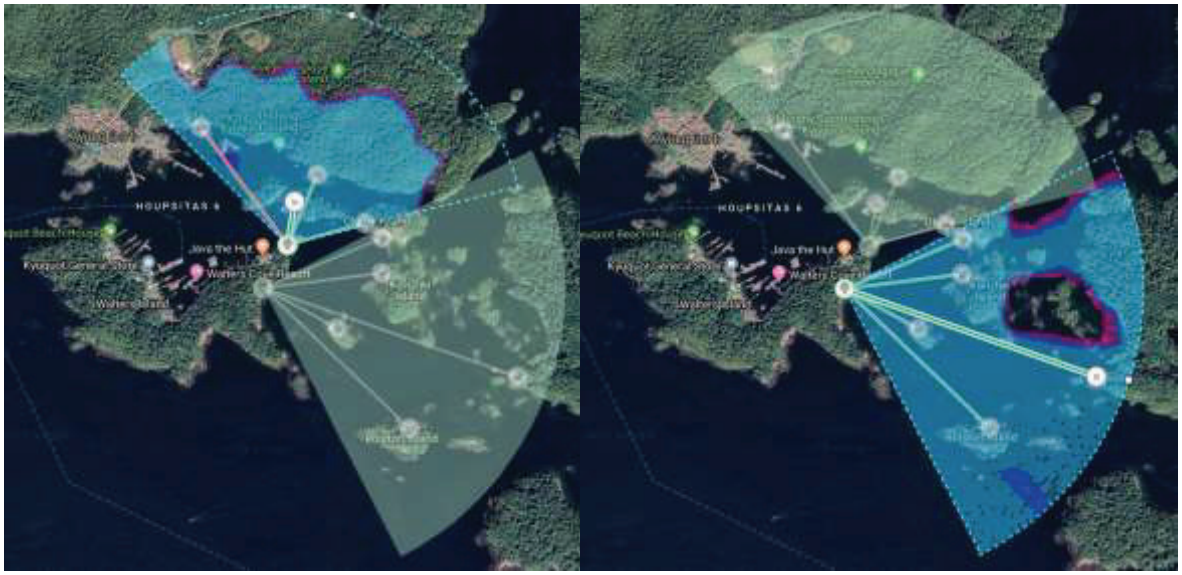
- A new submarine fibre could be placed from the SRD landing site to north west end of the island. There is a potential cost saving if this were included with the SRD fibre build.
- Once on Walters Island a building space with power would be required for network equipment.
- Either a coaxial network or a Flex Nap fibre network could be constructed on the existing pole line.
- This would require an access agreement to be signed with TELUS.
- And a application for use of the support structure would also be required.



Proposed Submarine Fibre Estimated Pole Locations Proposed Aerial Coaxial Cable or Flex Nap Fibre

- Approximate submarine cable length - ~280 meters
- Existing pole line structure length - ~1000 meters

In addition, two WIFI transceivers situated at the northeast end of Walters Island could enable the extension of services to the residents on adjacent islands. It would be necessary to secure suitable locations for the transceivers to be mounted and establish a connection to the cable network. The desktop example below shows probable viable links based on topographical input. A complete site survey and network design would be required to determine what would be required to achieve this outcome.



There are many variables that will impact the final cost of these types of projects including the condition and capacity of existing infrastructure, land access agreements and various permit approvals. A complete engineering and permitting application process and tendering of construction would be required to ascertain a true final cost.

There are several factors that have a direct impact on the construction costs for a specific project and are unpredictable.

I. Make-ready
   a. Condition of existing poles and need for remediation or replacement
   b. Capacity of existing strand and need for replacement or new additional strand placement
   c. Adequate anchoring and need for replacement or additional anchoring
   d. Easement agreements with landowners for additional anchors that extend into private property
   e. Engineering and application costs

II. Mobilization/demobilization – cost is increased for remote areas relative to the contractor's home base and local per diem rates. Other factors may be transportation costs such as ferry or barge costs to get equipment and materials to the build site.

III. Land access agreements for building space of the headend location as well as positions of small towers and routes for connections to the fibre network.

Access Agreements

An access agreement will need to be signed with either BCHydro or TELUS to build and maintain an aerial network. These access agreements come with annual lease costs and responsibilities including construction standards and maintenance aspects.

BCHydro	Master Service Agreement
TELUS	Support Structure Agreement

BCHydro Support Structure Rental Fees
(These rates were not available at the time of this report)

TELUS Support Structure Annual Lease Fees[ii]

TELUS General Tariff – CRTC-21461			
Structure Type	**Tariff Rate**	**Estimated Usage**	**Annual Fees**
Monthly Pole Rental Rate	$1.61	23	$ 444.36
Monthly Strand Rental Rate (per 30 Meters)	$0.43	1000	$ 172.00
		Total	$ 616.36

Operating costs would include such items as building space lease, land lease(s), electricity, backup power maintenance, support structure fees and equipment repair in addition to internet connection fees.

	Customers[iii]	Cost Per Address	Route Meters	Cost Per Meter	Total
Low Make-Ready	21	$476.19	1,000	$10.00	$10,000.00
Medium Make-Ready	21	$714.29	1,000	$15.00	$15,000.00
High Make-Ready	21	$952.38	1,000	$20.00	$20,000.00

Cost Estimate

Description	Low Cost	Medium Cost	High Cost
Submarine fibre cable, design/permits/placement	$25,000	$40,000	$55,000
Infrastructure (building space)	$10,000	$20,000	$35,000
AP(s) + Antenna(s)	$2,000	$3,500	$5,000
10 – CPE's including building mount installations	$3,500	$5,000	$7,000
Modems/Switch	$3,500	$6,250	$12,500
Installation	$2,500	$4,550	$7,500
Engineering	$5,000	$12,800	$25,000
Make-Ready	$10,000	$15,000	$20,000
Flex Nap Fibre design/permit/build	$70,000	$82,500	$93,000
Estimated Total with Fibre Build Option	**$131,500**	**$189,600**	**$260,000**
Coaxial cable design/permit/build	$25,000	$35,000	$40,000
Estimated Total with Coaxial Build Option	**$86,500**	**$142,100**	**$207,000**

Conclusions

[iv]	OPTION 1	OPTION 2	OPTION 3
	Kyuquot DOCSIS 3.0 Upgrade & New WIFI service offering	Kyuquot Coaxial extension to Walters Island and WIFI build (with DOCSIS 3.0)	New ISP Walters Island with WIFI build (Fibre or Coaxial option)
Downstream Data	>60 Mbps	> 60 Mbps	>60 Mbps
Upstream Data	>10 Mbps	>10 Mbps	>10 Mbps
Reliability	Cable - Excellent WIFI - Good	Cable - Excellent WIFI - Good	Excellent (wind, storms, car accident)
Maintenance Requirement	Low	Low	Coax – Medium Fibre - Low
Operating Costs	Low	Low	Medium
Quality of Service	Cable - Excellent WIFI - Good	Cable - Excellent WIFI - Good	Cable - Excellent WIFI - Good

Any one of the above options would achieve the desired internet service levels once connected to the SRD Connected Coast fibre service. There may be instances where a WIFI connection is not possible due to obstructing terrain.

Options two and three are somewhat stronger as proposed WIFI connection paths would be shorter and paths would be available to a greater area of the adjacent islands.

References

[i] **Extranet Website**
[ii] **TELUS website September 2019**
[iii] **Google 2019 Building count**
[iv] **WIFI & Data Rates information provided by High Pro Computer Consulting**

STRATHCONA REGIONAL DISTRICT
990 Cedar Street Campbell River, BC V9W 7Z8

PH 250-830-6700
FAX 250-830-6710
EMAIL communications@srd.ca
WEB www.srd.ca

KYUQUOT
Community Broadband Plan

Strathcona
REGIONAL DISTRICT