QUADRA ISLAND

COMMUNITY BROADBAND PLAN

Strathcona
REGIONAL DISTRICT

ABOUT QUADRA ISLAND

Quadra Island is the central community of the Discovery Islands, a group of small islands located along the Inside Passage seaway between Vancouver Island and mainland British Columbia. The Island is about 35 kilometres (22 miles) from its northernmost point to its southernmost point, about 310 square kilometres (120 square miles) in area.

Like many west coast communities, Quadra Island was inhabited by Indigenous peoples prior to colonization. Salish people lived in the area until the Laichwiltach people expanded their territory, likely in the late 18th century. Pre-contact and colonization, most Indigenous settlement was at Cape Mudge, which has been restored and is now the home of We Wai Kai First Nation reserves and the Nuyumbalees Cultural Centre.[1]

Today, 4.4% of the population of Quadra Island is Indigenous.[2] The population of Strathcona Electoral Area C, of which Quadra Island is the largest community, is 2,431. The largest age cohort in Area C is the population aged 15-64 years old, comprising of 61.1% and the remainder is comprised of seniors (28.6%) and children 14 years old and younger (10.5%). The median age of the population is 56.3 years, considerably higher than the provincial median of 43.0.[2] The population increases in the summer, as Quadra Island sees nearly 100,000 tourist visits. Of these, about half stay in lodging on the island while the other half are day-trippers.

Housing costs in Area C are amongst the highest within the Strathcona Regional District. The median value of a home is $349,451. The median monthly cost of home ownership is $408 which includes the total cost for a mortgage, property taxes, utililities and other municipal services.[2]

There is cell phone coverage on Quadra Island but many residents continue to rely on landlines, or have both a landline and a cell phone. A landline can cost $40 per month or more, depending on whether or not additional features are needed.[3] An individual household can expect to pay between $35 and $120 per month, depending on desired speed and usage.[4] In Area C, 18.5% of the workforce works from home.[2]

Area C's median household after-tax income is $43,563 – nearly $20,000 less than the provincial average. It is also lower than neighbouring Campbell River, and less than the Strathcona Regional District median of $55,487.[2] Most income in Area C is generated by employment (53.1%), while 17.7% comes from government transfers.[2]

Quadra's people enjoy a rural lifestyle surrounded by breathtaking coastal scenery and a clean unspoilt environment. The First Nations residents and global migrants together create a harmonious community rich in art and culture. The diversity of people, professions, lifestyles and pastimes is what makes Quadra Island a truly great place to live or visit.

[1] Jeanette Taylor, Quadra Island History – A Turbulent Past, http://www.quadraislandtourism.ca/discover/history.html
[2] Statistics Canada, Census 2016 – Strathcona C, Regional District Electoral Area [Census Subdivision]
[3] Telus.com, Home phone plans
[4] Yellow Pages, Internet Service Providers for Quadra Island, BC

CONTENTS

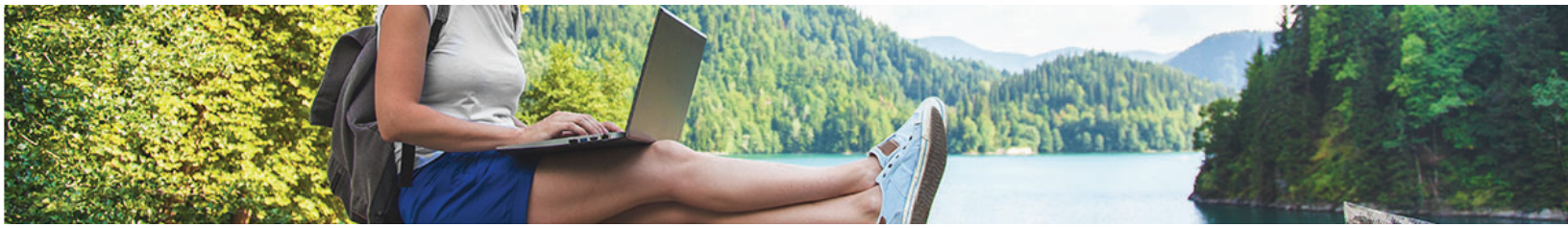
Community Broadband Plan

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.

Photo Credit: Bluetree Photography



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 6th from 7:00 – 9:00 pm at the Quadra Island Community Centre. 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 2 hours in length with the first hour consisting of presentations, technical info and a Connected Communities video was featured while the second hour included an open forum.

How would improved broadband address community challenges and opportunities on Quadra Island?

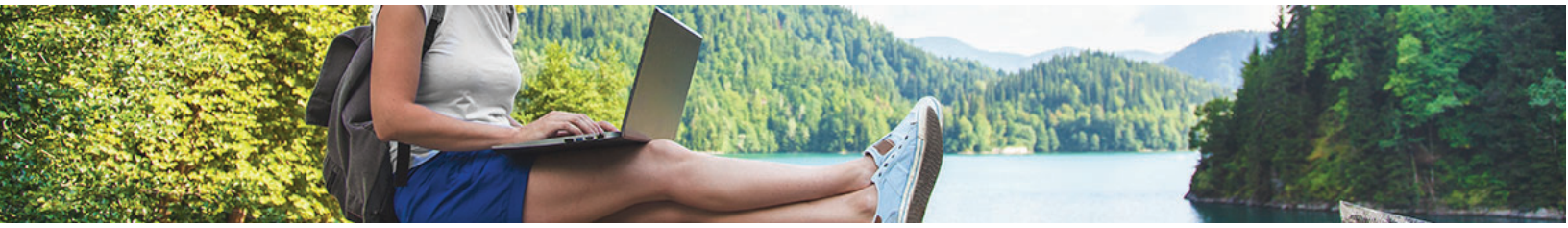
Improve Well-Being

Less travel
- Reduce green house emissions

Public Safety
- Provide alert notification to visitors & residents
- Currently areas without electricity and connectivity still exist
- Remote monitoring opportunity (i.e. of fires in real time to protect workers, using drones)
- Safety personnel require better means of communication on trails for improved outcomes (increased trail traffic in summer increases personnel demand)

Improve Technology Deficit
- Some areas have no landline service
- Internet calls would be an improvement

Import Replacement
- Less imported goods & services
- Reduce import dependency, save money & travel
- Create local goods to sustain the community



DIGITAL ASPIRATIONS (cont.)

Improve Quality of Life

- Many have left a growing community to live on the Island
- Escape the rat race, noise, traffic & crowds
- Provide more opportunities for the Arts Community

Economic Development

- Increase capacity in shoulder season
- Encourage more software development (currently 10 software developers on the island)
- Potential for retreats if connectivity in place
- Improved video conferencing (enable more local people to attend conferences & meetings)

Encourage Working Remotely

- Live here, telework elsewhere

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, and 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

Quadra Island & Read Island

TELECOMMUNICATIONS INFRASTRUCTURE ASSESSMENT

OCTOBER 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 on Quadra Island 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 Quadra Island through the Connected Coast project, as well as responding to the community's digital aspirations.

Methodology

A visit to Quadra Island was completed on Tuesday, June 6th, 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.

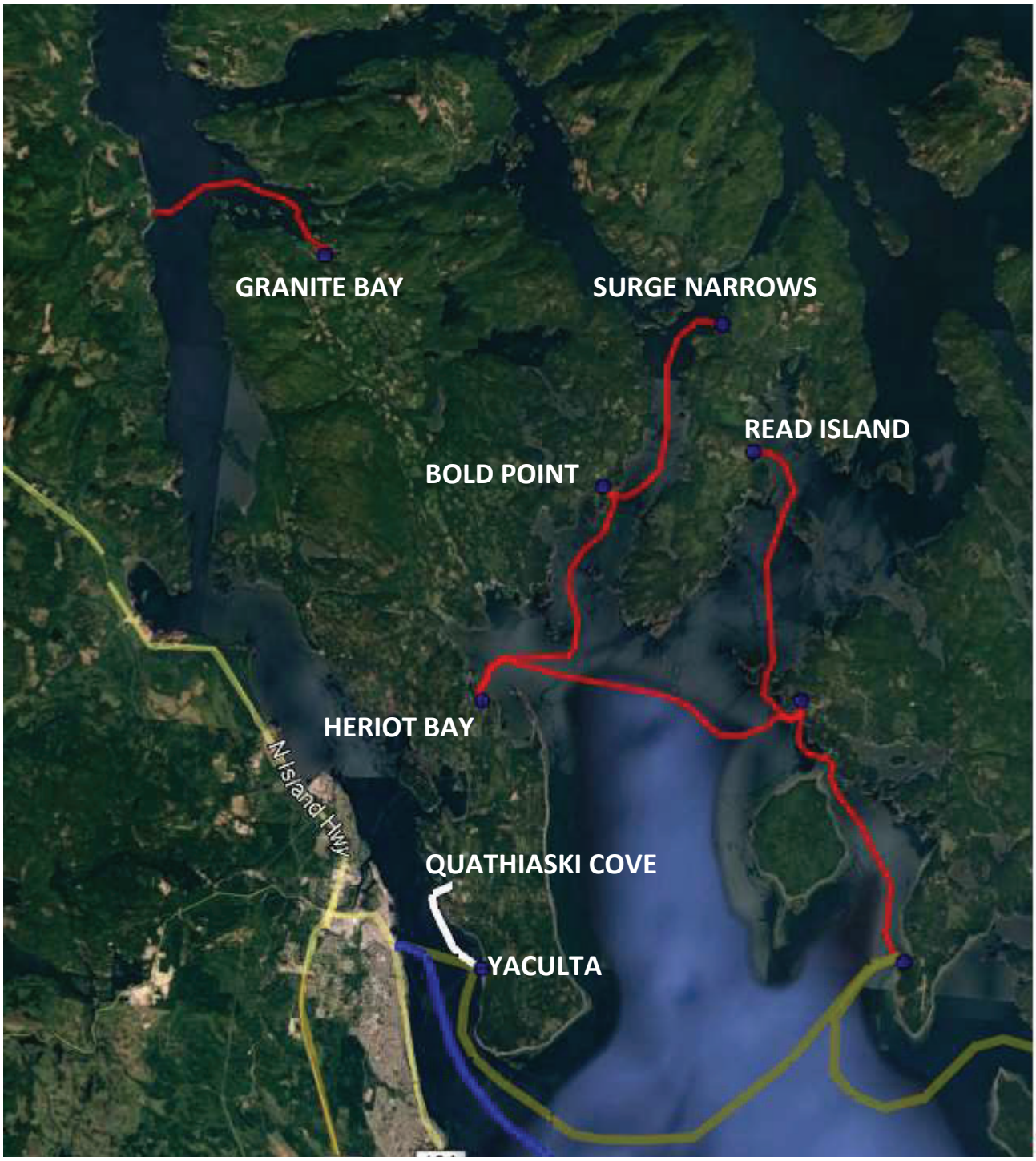
A representative from Driftwood participated in a community Let's Connect forum on Quadra Island on June 6th. The purpose of the forum was to share the Connected Coast plan and what benefits it could bring to the community. Driftwood delivered a presentation of the various types of technologies that 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.

There are seven fibre landing sites proposed for the SRD Connected Coast in the areas of Quadra and Read Islands which are included in this report.

Quadra Island	Read Island
Bold Point	Read Island
Granite Bay	Surge Narrows
Heriot Bay	
Quathiaski Cove	
Yaculta	

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



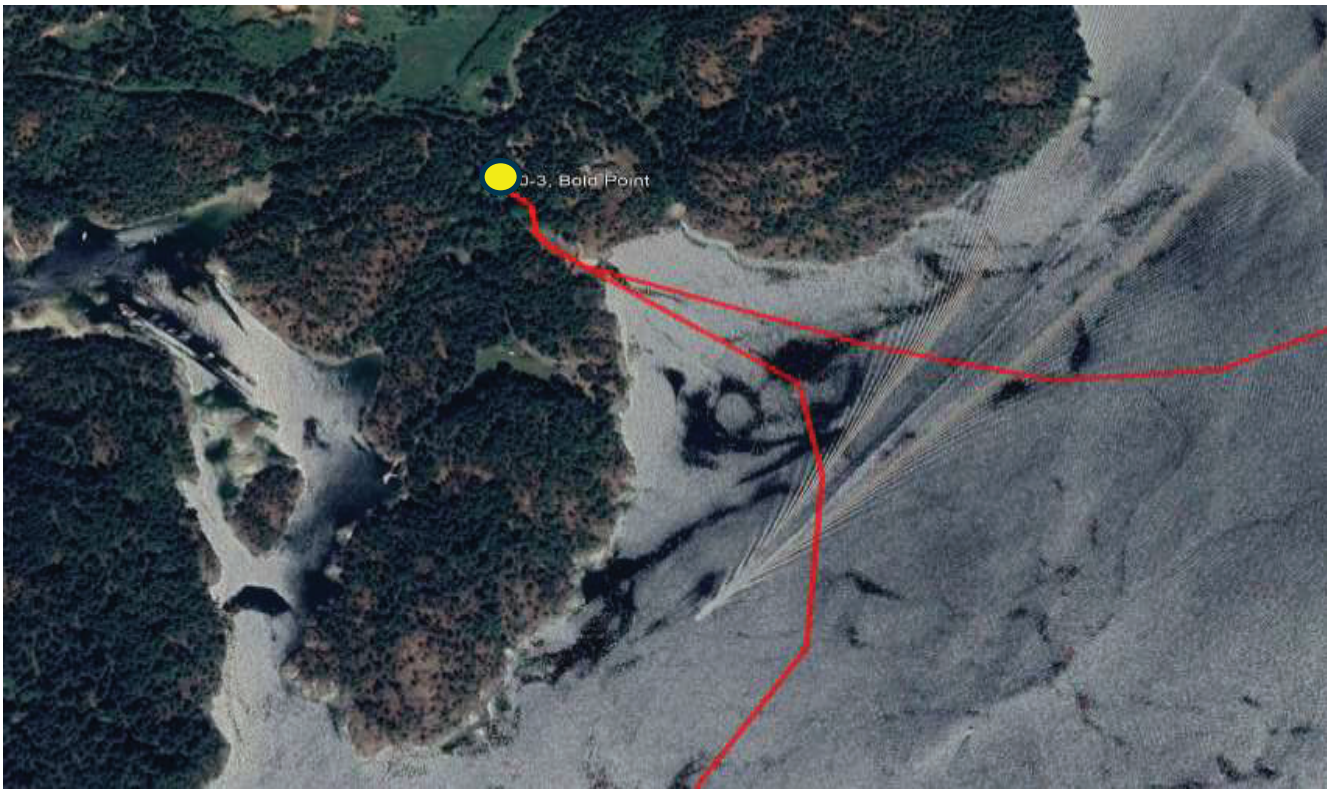
Connected Coast - Proposed backbone submarine fibre path and landing points
(Estimated Completion 2021)
Red, Blue & Green = Main submarine fibre

Connected Coast Landing Locations & Terrestrial Fibre Routes

Granite Bay

Connected Coast submarine fibre landing site at Granite Bay. There is no proposed terrestrial fibre.
Red = Submarine fibre

Bold Point

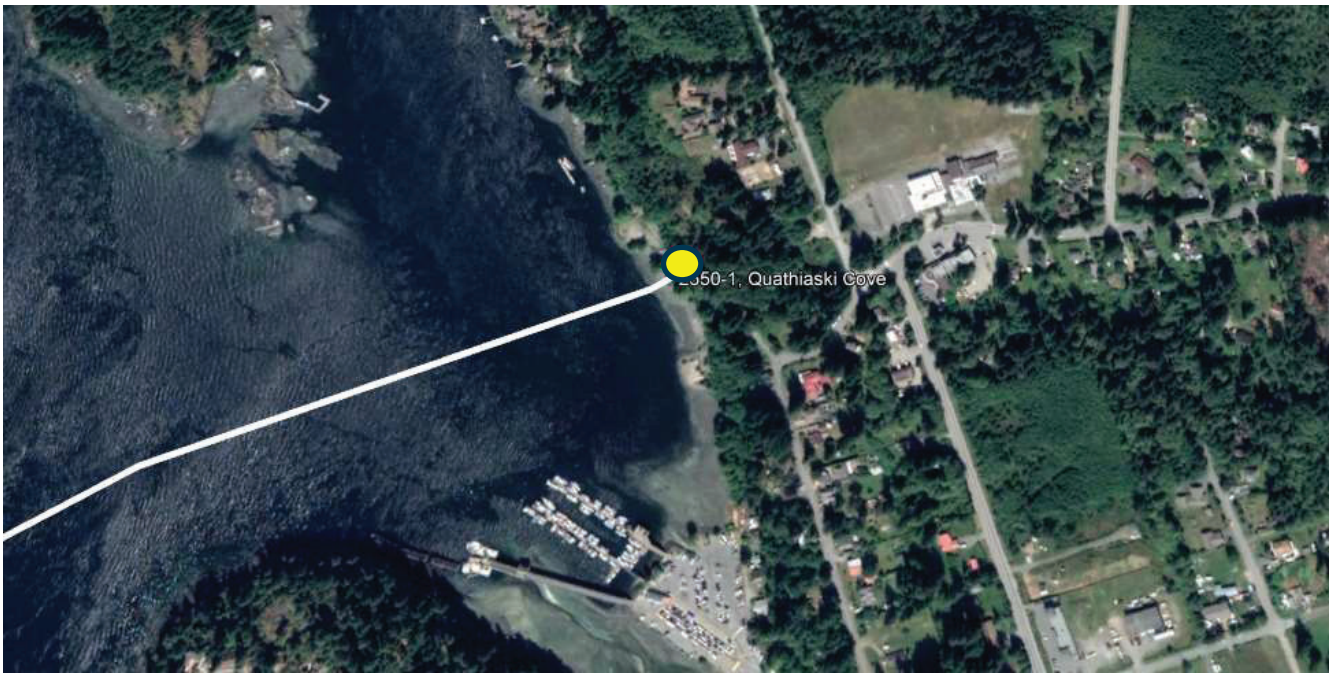


Connected Coast submarine fibre landing site at Bold Point. There is no proposed terrestrial fibre.
Red = Submarine fibre

Heriot Bay

Connected Coast submarine fibre landing site at Heriot Bay. There is no propose terrestrial fibre.
Red = Submarine fibre

Quathiaski Cove



Connected Coast submarine fibre landing site at Quathiaski Cove. There is no proposed terrestrial fibre.
White = Submarine fibre

Yaculta

Connected Coast submarine fibre landing site at Yuculta.
Red = Submarine fibre
Yellow = Proposed terrestrial SRD fibre

Surge Narrows

Connected Coast submarine fibre landing site at Surge Narrows
Red = Submarine fibre
Yellow = Proposed terrestrial SRD fibre

Read Island

Connected Coast submarine fibre landing site at Read Island. There is no proposed terrestrial fibre.
Red = Submarine fibre

QUADRA ISLAND

Better Internet is Coming!

Let's Connect About the Possibilities.

The SRD is planning for better connectivity in your area. Learn about new infrastructure projects & share ideas on your community's digital future over coffee & treats.

Quadra Island Community Centre
Thurs. June 6 I 7:00 - 9:00 pm

Strathcona REGIONAL DISTRICT

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

Space is limited, please contact the SRD to RSVP at 1-877-830-2990 ext: 6724 or email rsvp@srd.ca

Granite Bay

October 21, 2019

1:75,000

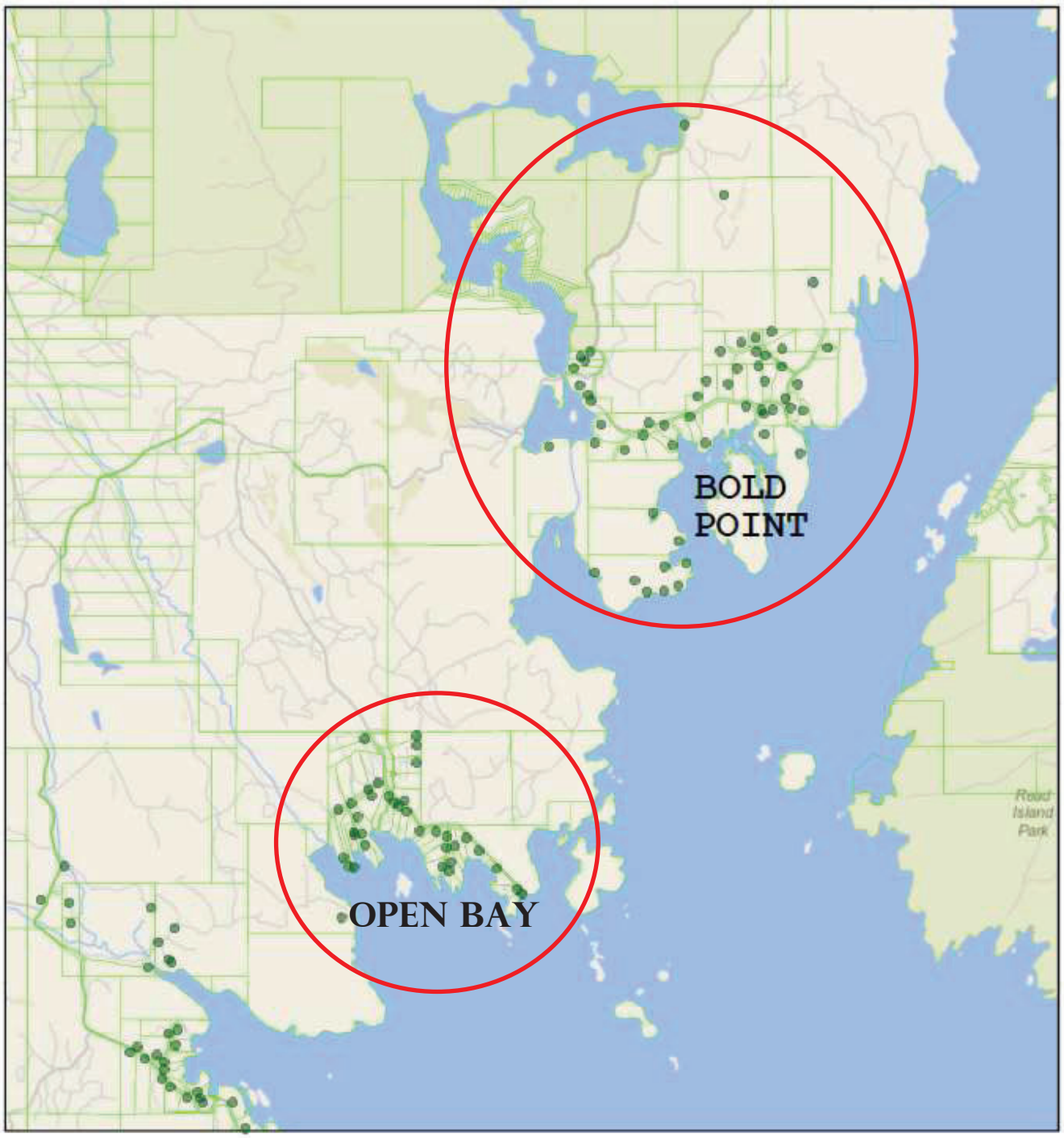
0 0.5 1 2 mi

0 1 2 4 km

Address Locations

Description	Quantity	Source
Addresses within Granite Bay Area	36	2019 ICI Society Address BC

Bold Point / Open Bay



October 21, 2019

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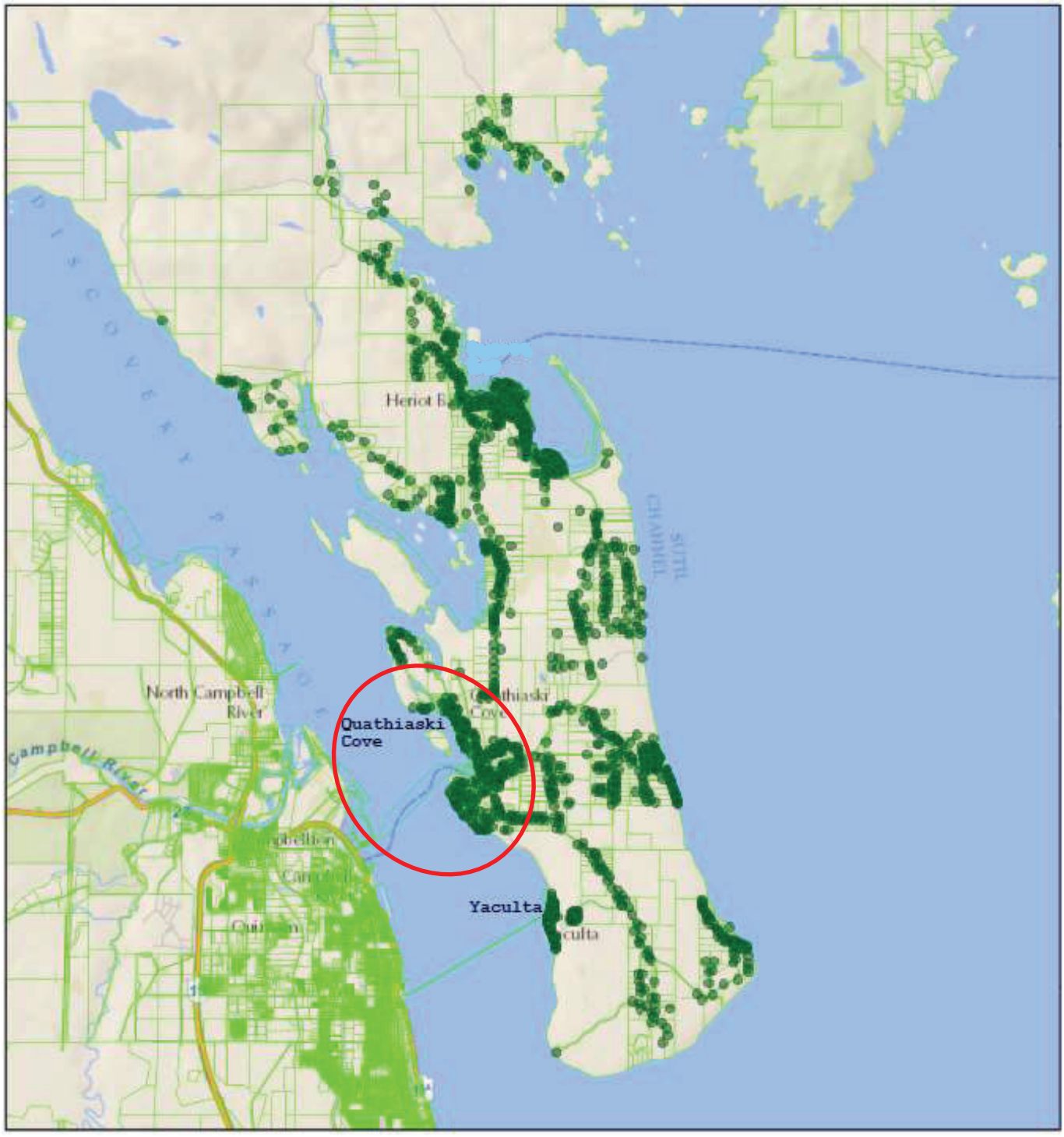
Address Locations

Description	Quantity	Source
Bold Point	54	2019 ICI Society Address BC
Open Bay	36	2019 ICI Society Address BC

Quathiaski Cove



October 23, 2019

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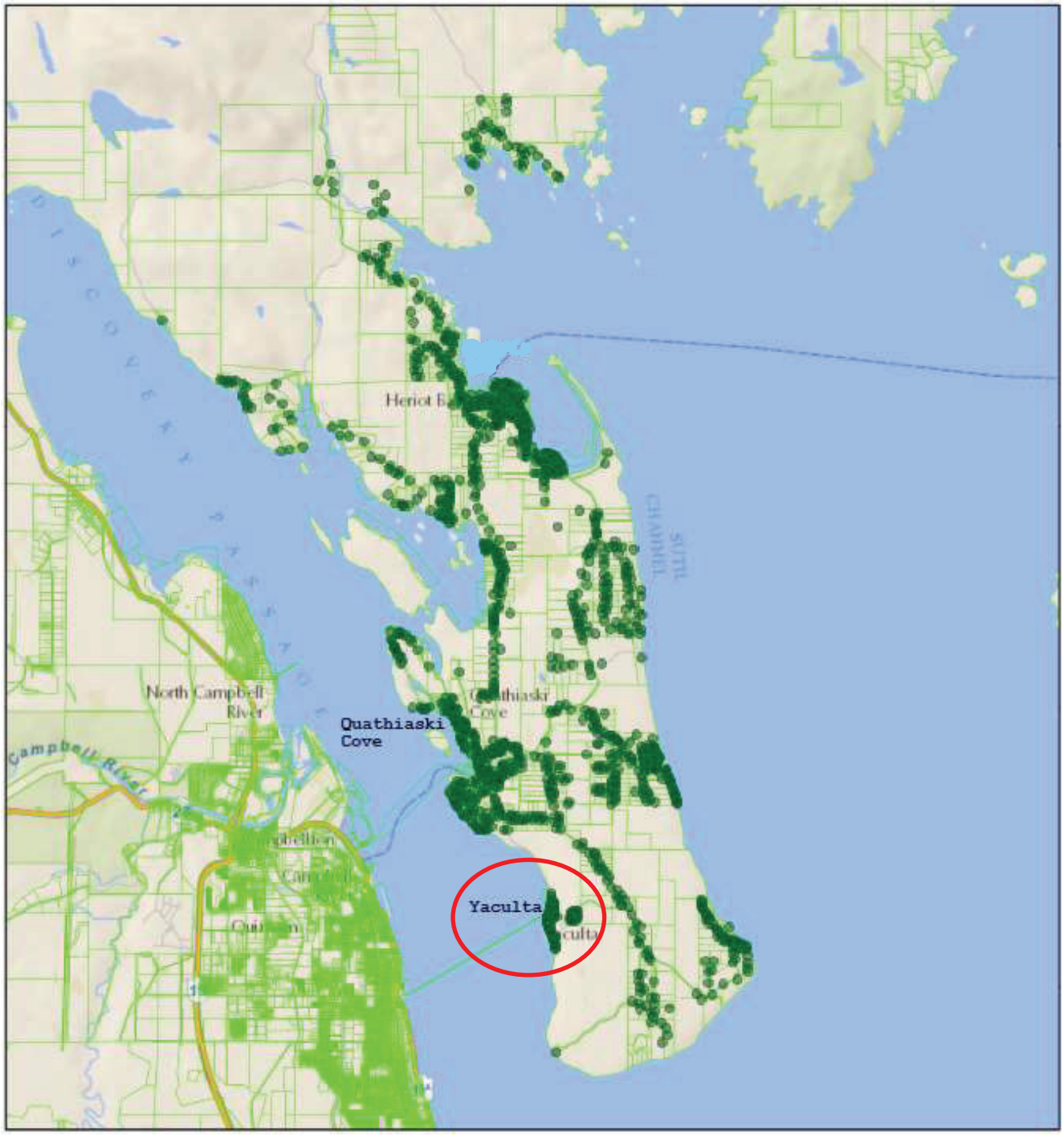
0 2 4 8 km

Address Locations

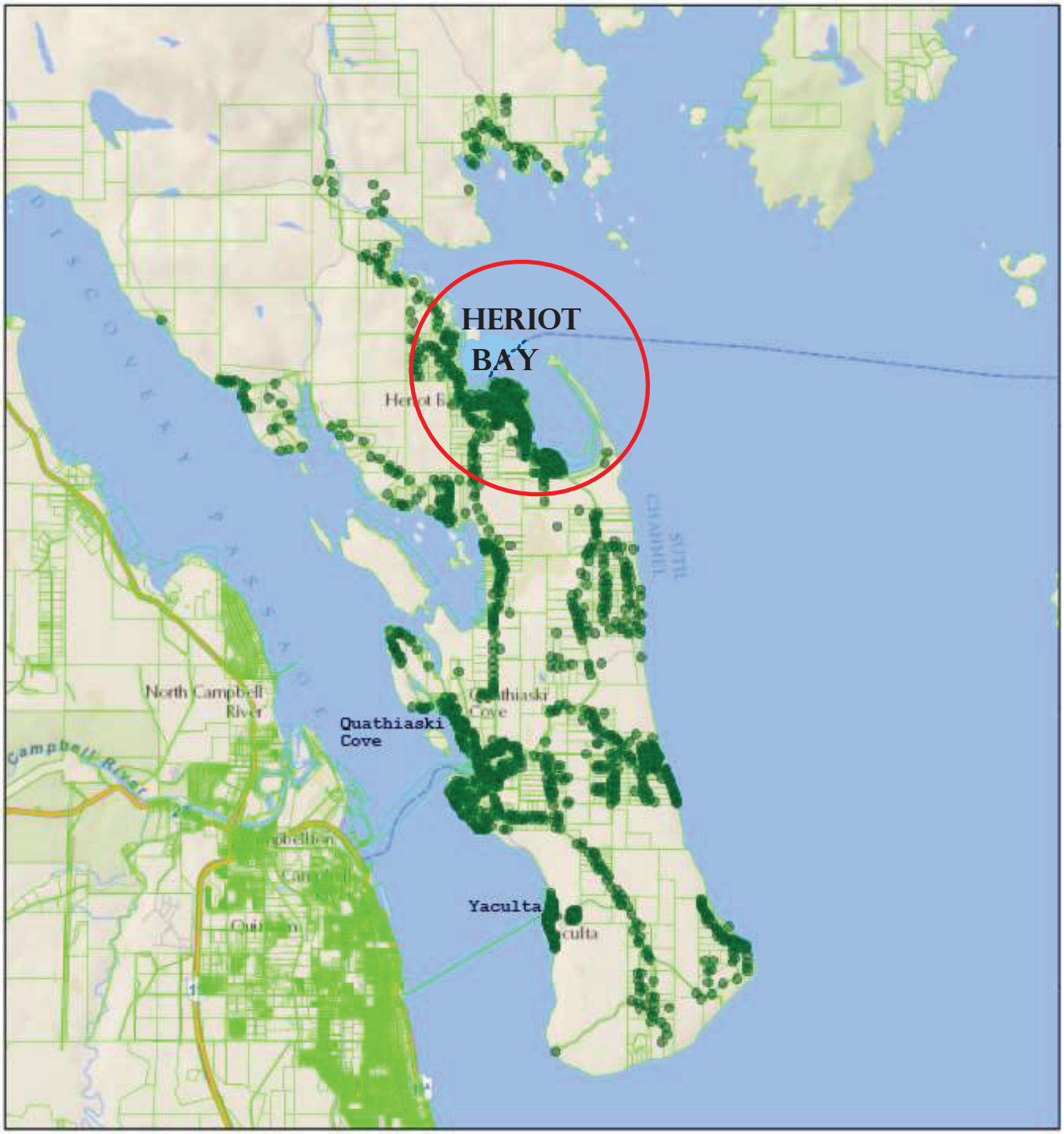
Description	Quantity	Source
Addresses within Quathiaski Cove Area	251	2019 ICI Society Address BC

Yaculta



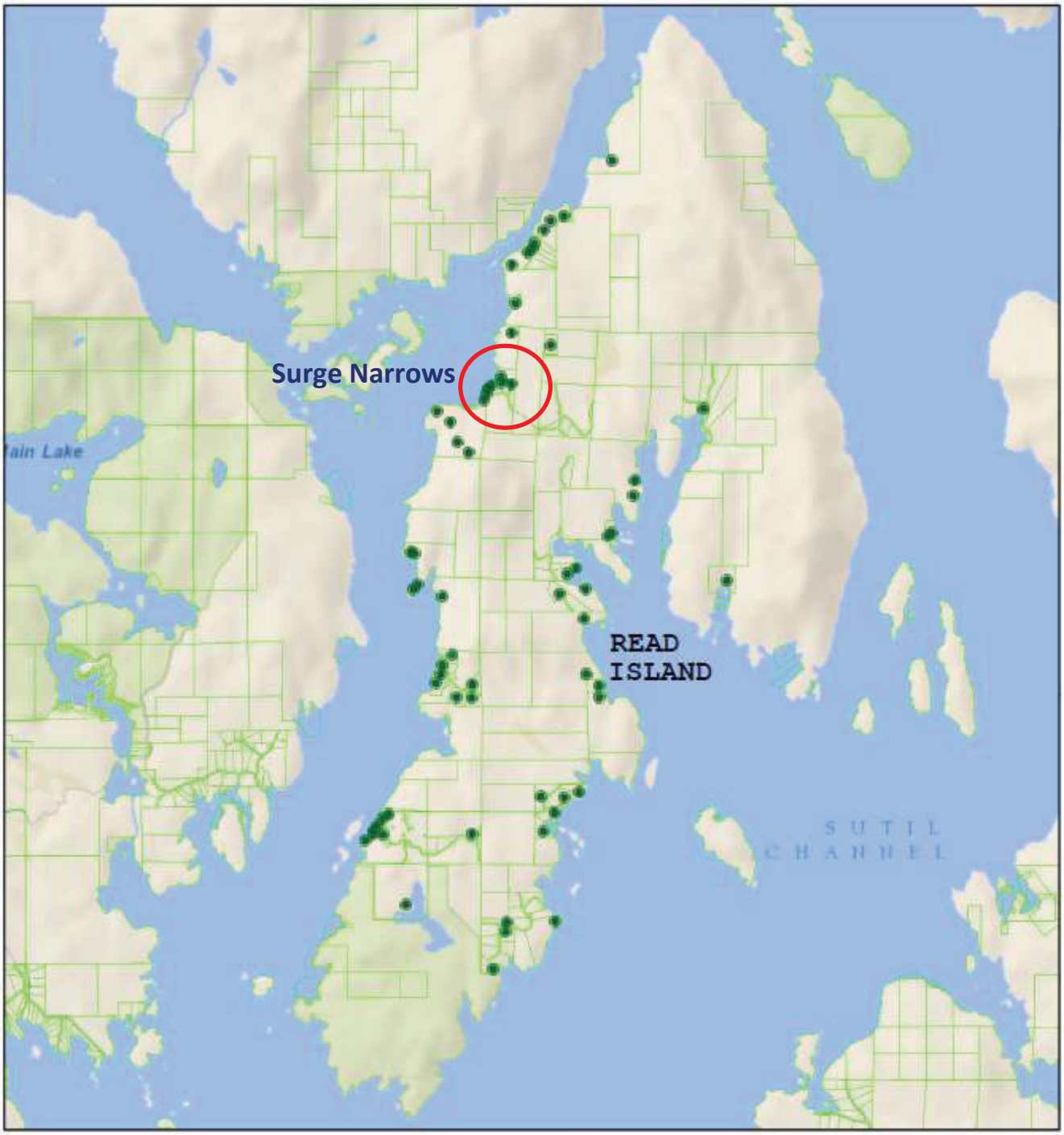
Description	Quantity	Source
Addresses within Yaculta Area	78	2019 ICI Society Address BC

Heriot Bay



Description	Quantity	Source
Addresses within Heriot Bay Area	323	2019 ICI Society Address BC

Surge Narrows & Read Island



October 23, 2019

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Address Locations

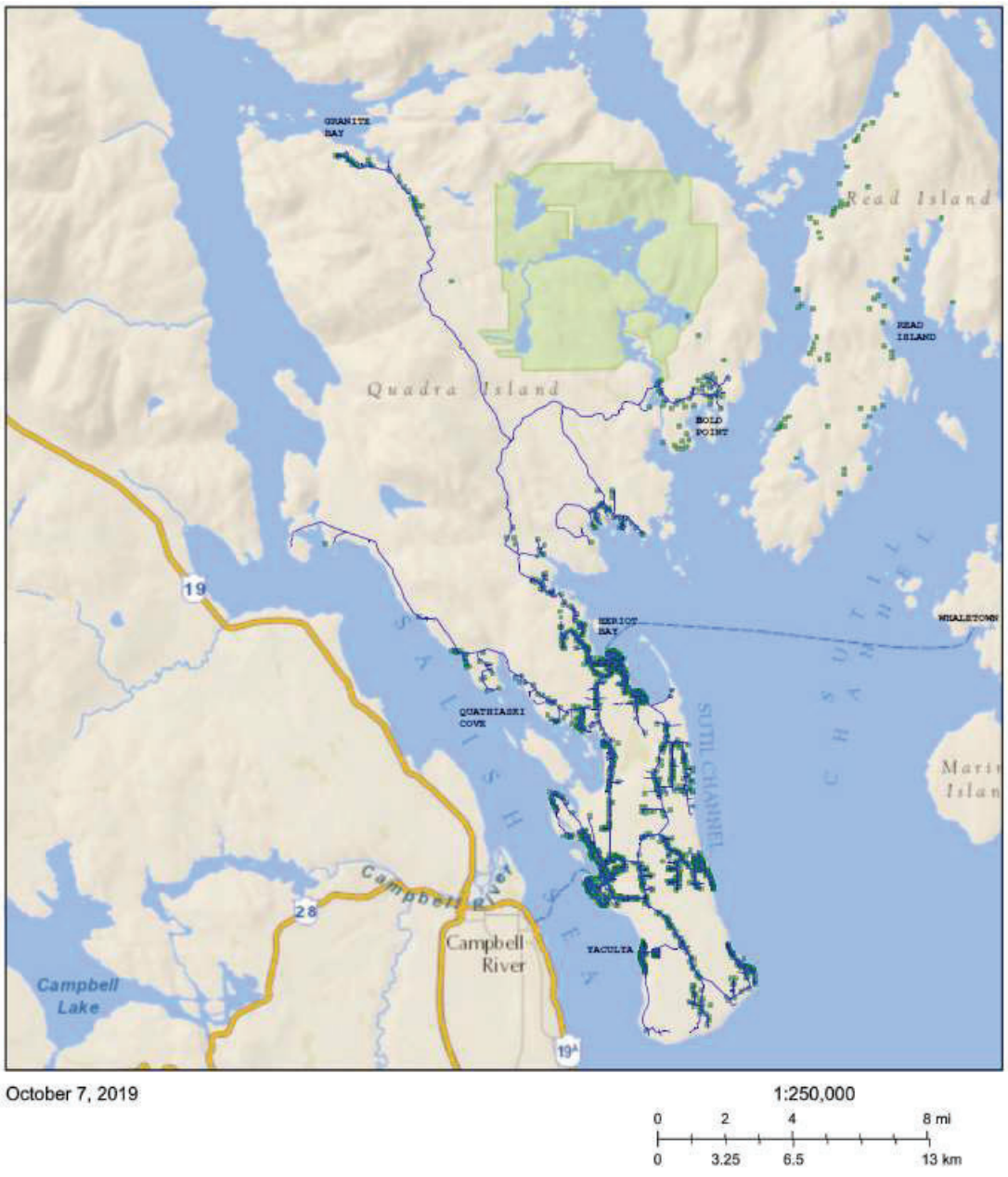
Description	Quantity	Source
Addresses within Surge Narrows	7	SRD – Positioned with ortho photos
Addresses on Read Island other areas	59	SRD – Positioned with ortho photos
Total Addresses on Read Island	66	SRD – Positioned with ortho photos

Site Visit Observations

Utility Service Provider	Services
Gulf Island Cable	Television, Internet & Phone
TELUS	Landline telephone, Internet
Twincomm	Internet
Xplornet	Satellite internet services
BCHydro	Electricity

Existing Support Structures

Utilities on the islands are provided via a Joint Venture aerial pole network owned by BCHydro and TELUS



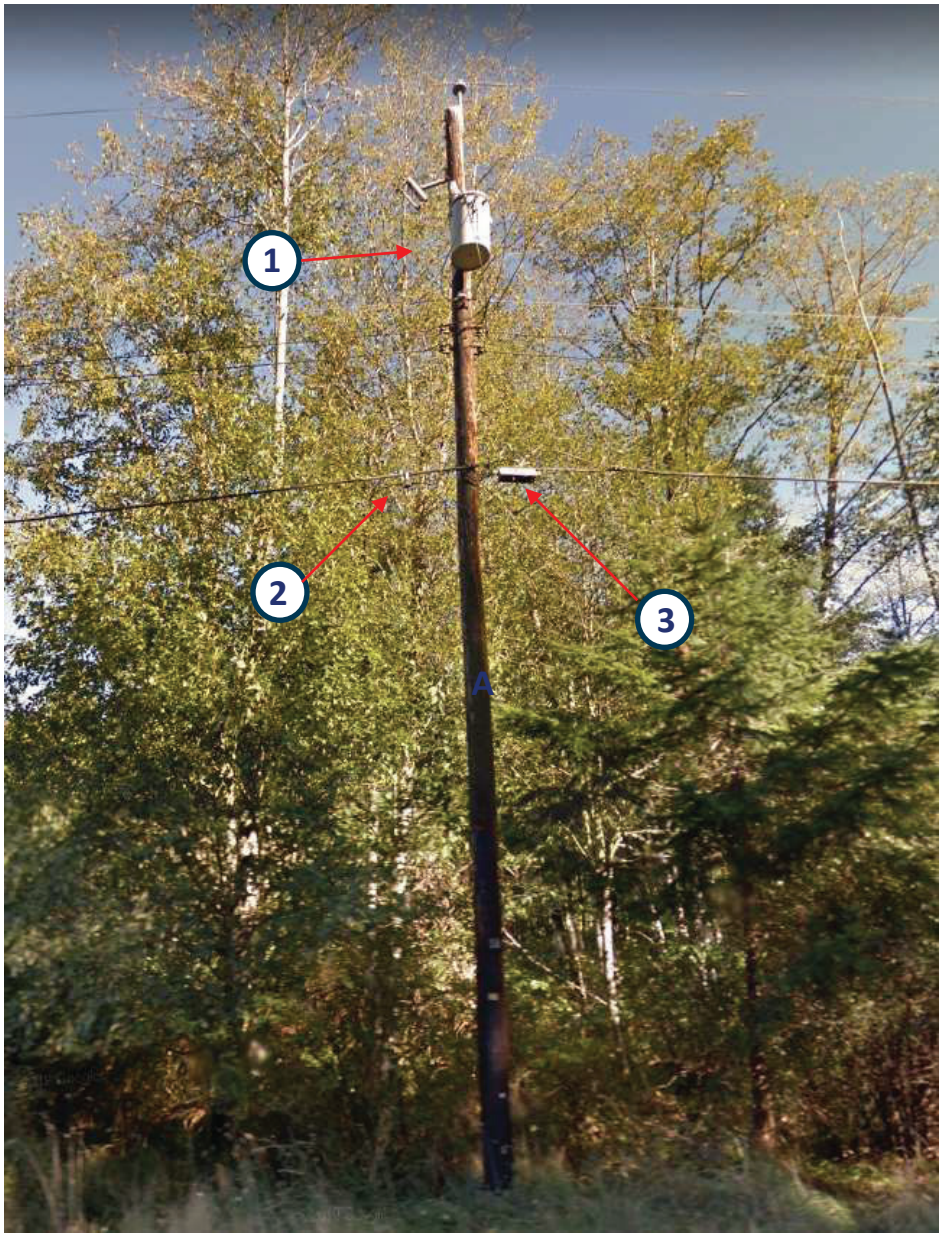
Aerial utilities

Quadra Island (~152,000 meters)

Read Island (Records of roads & utilities were unavailable)

Aerial Structure Example

1	BCHydro power
2	Coaxial cable plant
3	TELUS cables



Existing Internet Connectivity

Presently there are up to four internet service options for Quadra Island. The number of options available is dependent on location.

1. Gulf Island Cable has a 550 MHz HFC (Hybrid Fibre Coaxial) cable system and a DOCSIS 3.0 internet service provided to the southern island area of Quadra Island. Gulf Island Cable receives its internet connectivity via a TELUS fibre connection. TELUS currently provides a 1000 Mbps input connection.

Packages	Internet Lite	Internet 10	Internet 10+	Internet 15	Internet 25
Download	8 Mbps	10 Mbps	10 Mbps	15 Mbps	25 Mbps
Upload	1 Mbps	2 Mbps	2 Mbps	3 Mbps	5 Mbps

2. TELUS provides an ADSL Internet[i] service from their CO located on Hariot Bay Rd just east of Sarah Rd. Service appears to be limited to a ~2 Km radius from the CO. With service level availability reduced as one get further from the centre

Packages	Internet 6	Internet 15	Internet 25
Download	6 Mbps	15 Mbps	25 Mbps
Upload	1 Mbps	1 Mbps	5 Mbps

3. Twincomm provides WIFI internet services to Desolation Sound and surrounding areas.

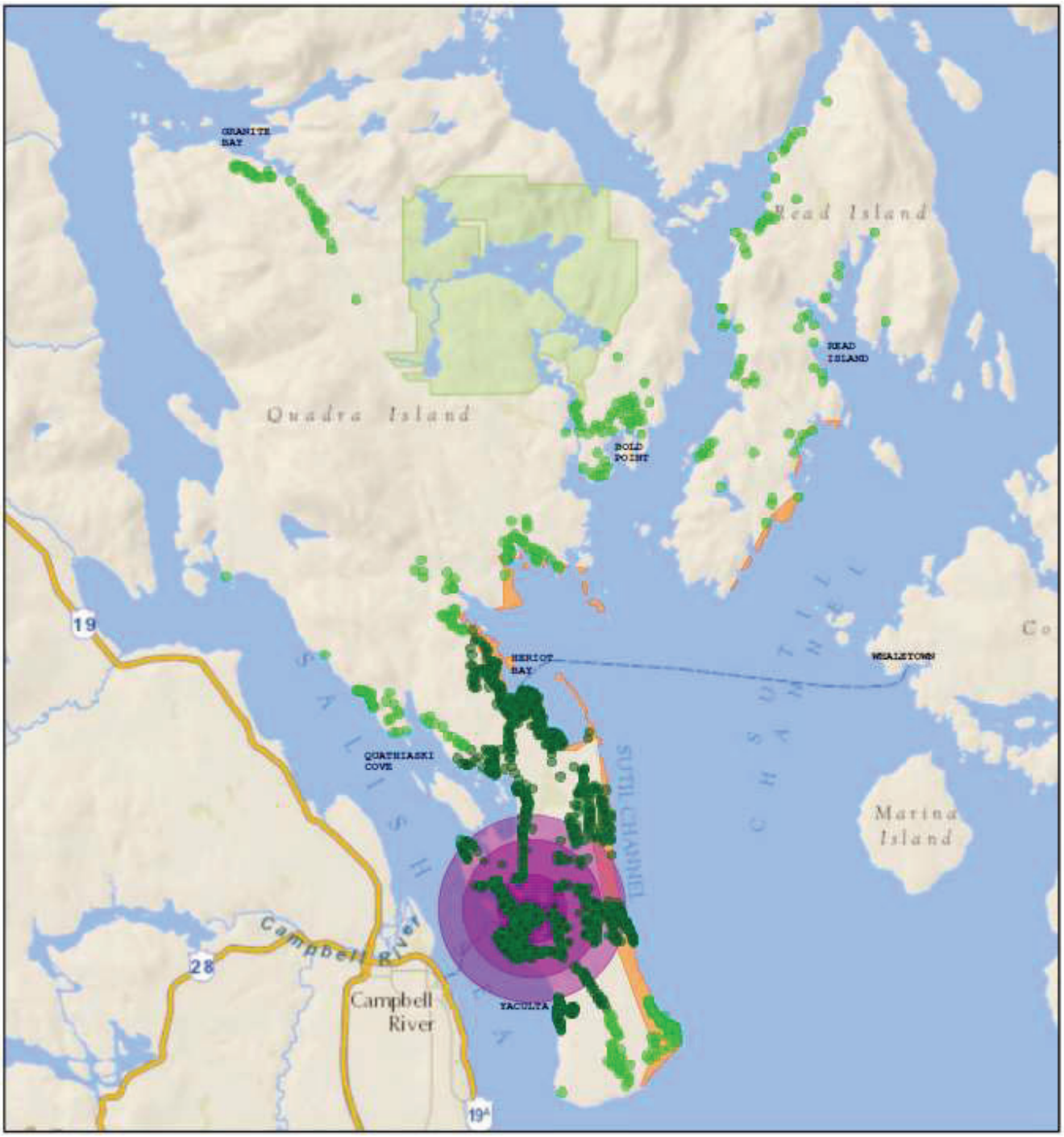
Packages	Lite	Standard	Standard +	Entertainment	Entertainment +
Download	8 Mbps	10 Mbps	10 Mbps	10 Mbps	10 Mbps
Upload	3 Mbps	5 Mbps	5 Mbps	5 Mbps	5 Mbps

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

4. Satellite internet through Xplornet[ii]

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.



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AVAILABLE SERVICE LEVELS

Up to 25 Mbps down / 5 Mbps up	Gulf Island Cable
Up to 25 Mbps down / 5 Mbps up	TELUS
(speed available reduces as distance from centre increases)	
Up to 10 Mbps down / 5 Mbps up	Twincomm WIFI
Up to 25 Mbps down / 1 Mbps up	Xplornet Satellite

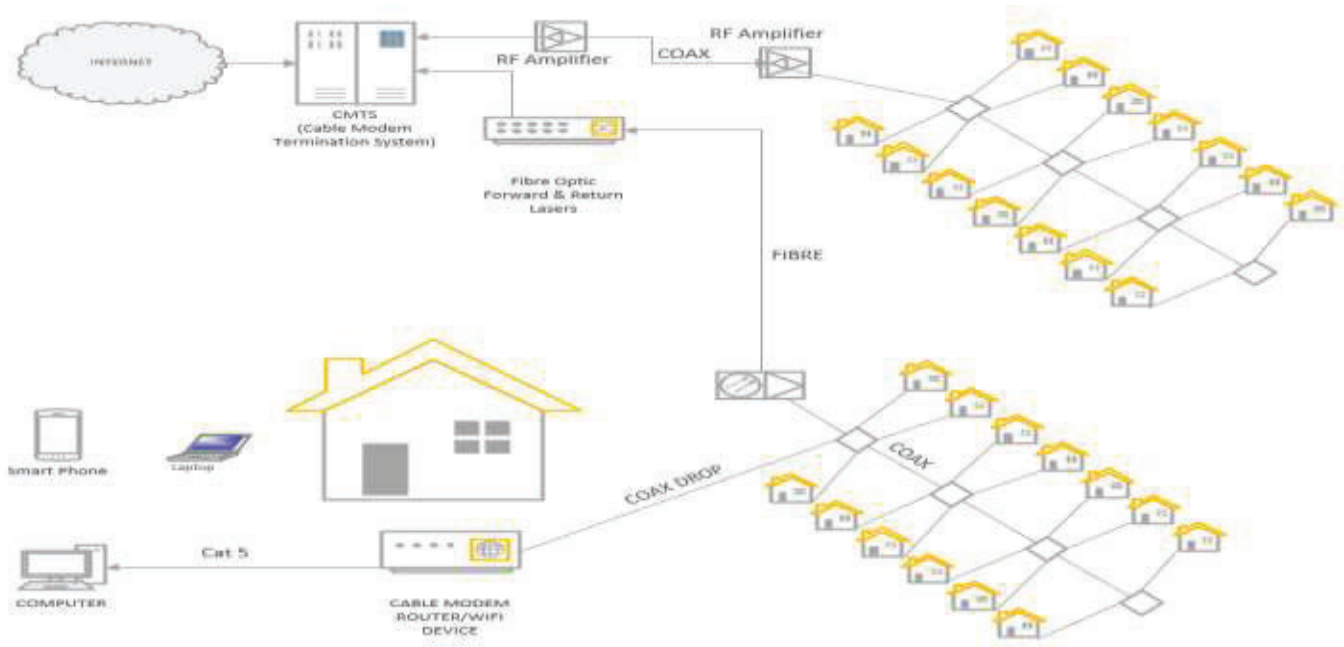
Delivery Methods Comparisons

	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 1.2 Gbps / 200 Mbps	Download/Upload 25 Mbps / 12 Mbps	Download/Upload 25 Mbps / 1Mbps
Future Planned Offerings	Virtually Unlimited	10 Gbps / 10 Gbps	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 Comparisons

	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

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.

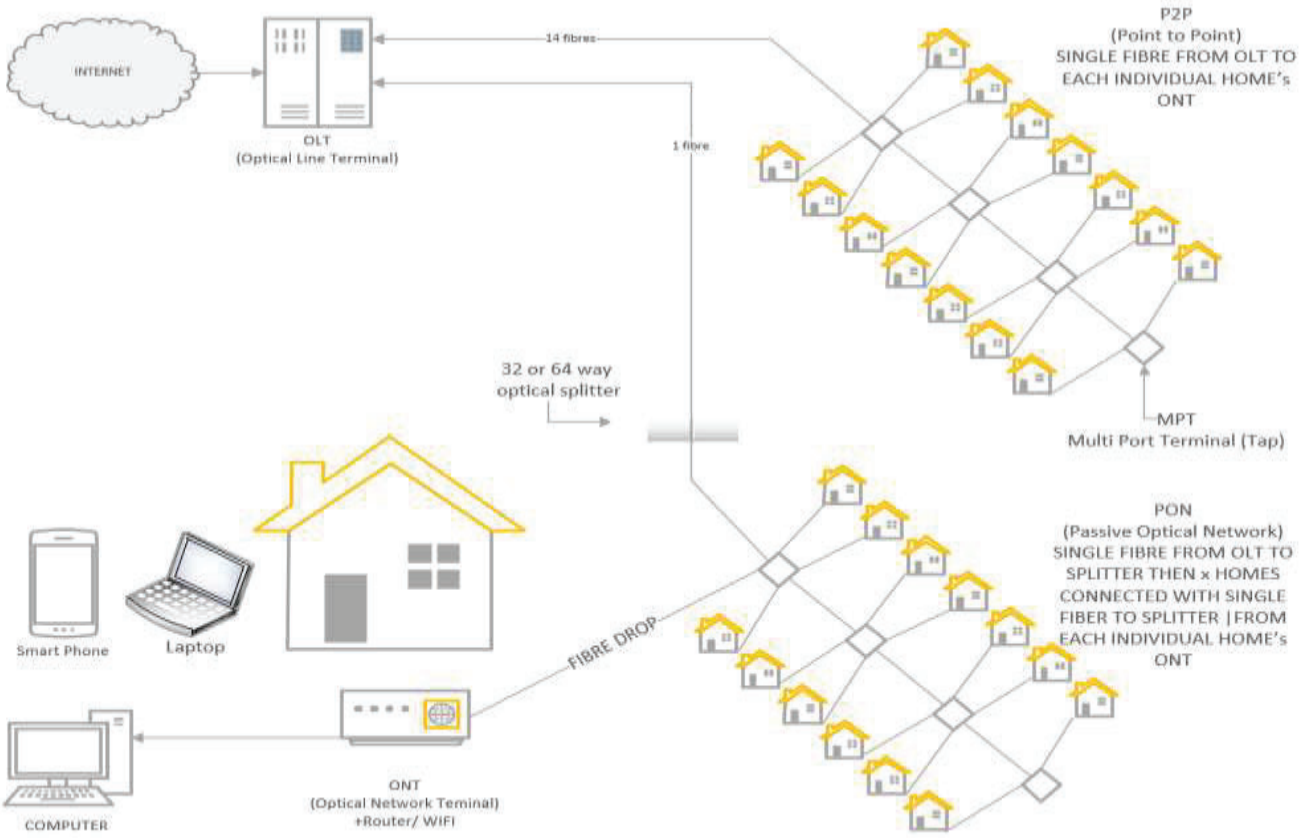
1. A coaxial cable only system with amplifiers placed at intervals to extend the area serviced. For the delivery of internet only services this method would work well in a smaller community with a few hundred customers.

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.

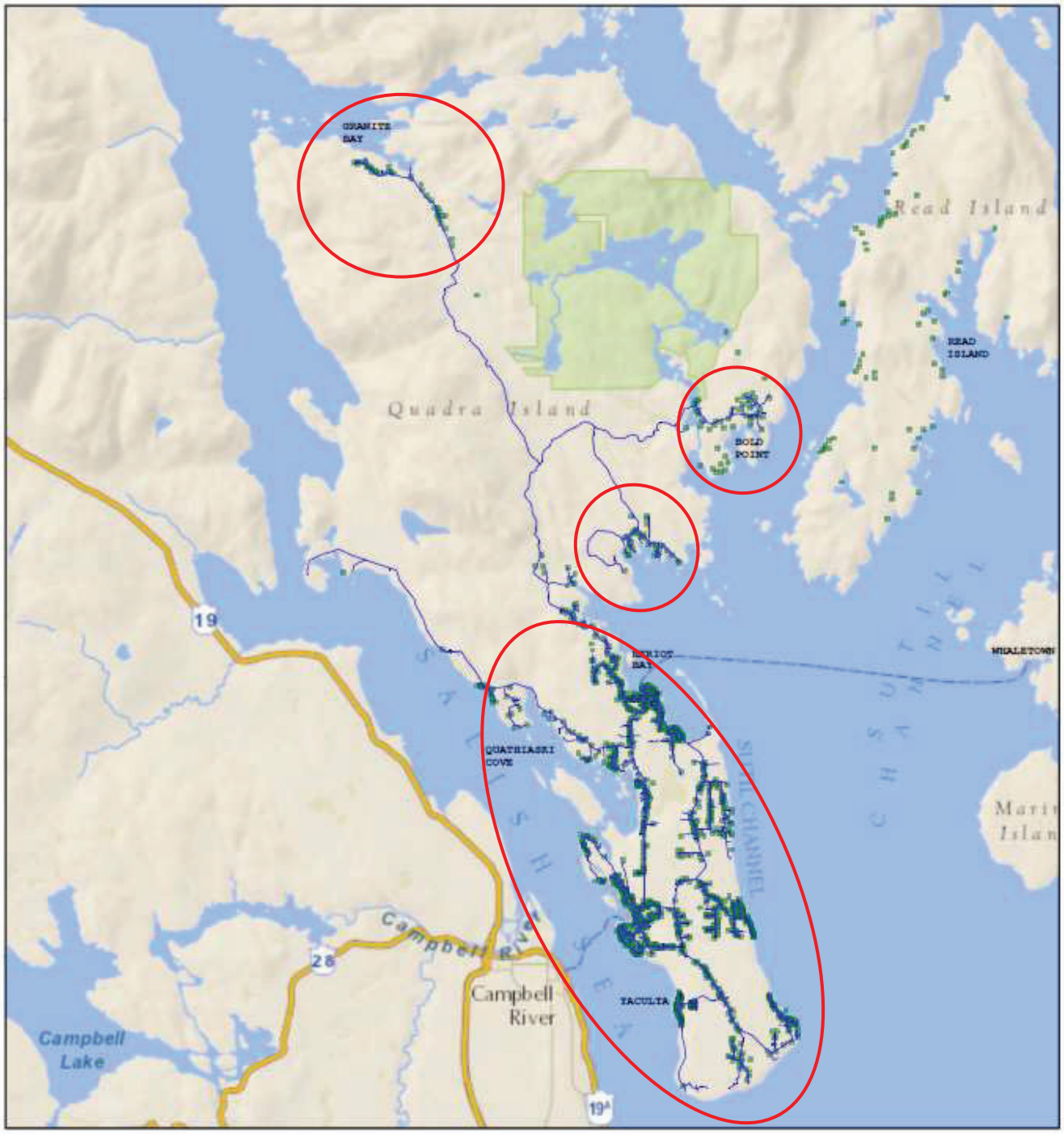
ONT stands for Optical Network Terminal. The ONT connects to the optical fibre cable.
It connects to your router via a LAN / ethernet cable and translates light signals from the fibre optic line into electronic signals that your router can read.



Quadra Island Potential Service Options

Quadra Island is generally comprised of pockets of population concentrated in four general areas.

1. Southern Quadra (Hariot Bay, Quathiaski Cove & Yaculta)
2. Open Bay
3. Bold Point
4. Granite Bay



October 7, 2019

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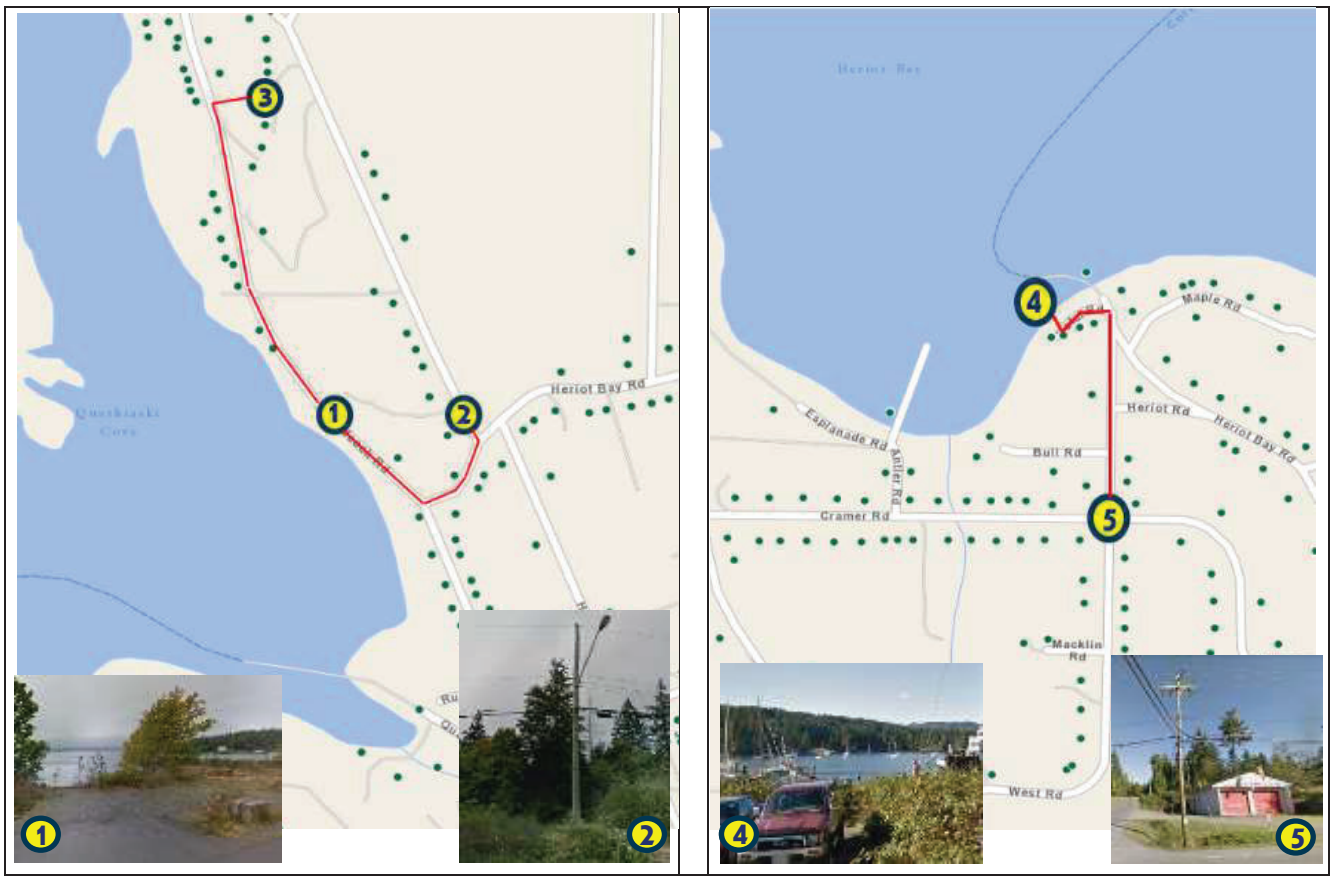
Option 1 - Southern Quadra – Gulf Island Cable Connects to the SRD Service

Gulf Island Cable currently has a 500 MHz HFC cable system with four existing fibre optic nodes. They have an existing fibre presence near both the Quathiaski Cove and Heriot Bay SRD landing site locations. The Quathiaski SRD landing location (1) is within 586 meters of the Gulf Island Headend (3) and only ~350 meters from a potential GIC existing splice location. (2)
The Heriot Bay SRD landing location (4) is within 586 meters of a potential GIC existing splice location. (5)
The placement of a new terrestrial fibre from either of the SRD landing locations to any of the Gulf Island fibre presence locations could be achieved using the existing aerial utility pole infrastructure.

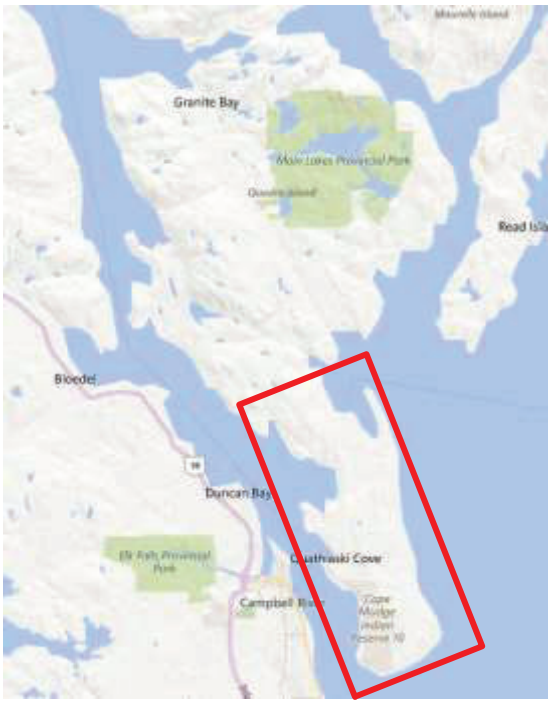


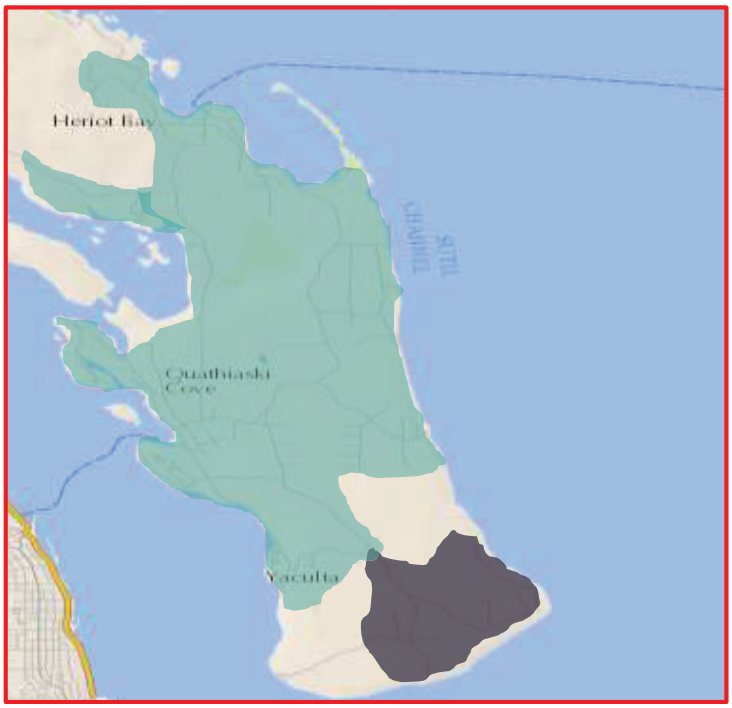
Proposed route of Connected Coast terrestrial fibre placement

The SRD currently has no proposed plans to build any terrestrial fibre from this landing location, the submarine fibre would have an underground service vault on land near the landing location. A fibre splice would be in the service vault and represent the meet me location.

Gulf Island Cable could place a conduit connection between the SRD Vault and the nearest aerial pole. They could then place new fibre along any one of the above proposed routes to establish fibre continuity to their headend. SRD equipment necessary to establish the service connection would be housed in the Gulf Island Cable headend building.

We estimate the cost range to complete one of these optional routes to be from $15,000 - $35,000 dependent on make-ready and civil construction variables.





Gulf Island Cable Approximate service area Proposed Expansion areas

Gulf Island Cable is presently considering the following projects:

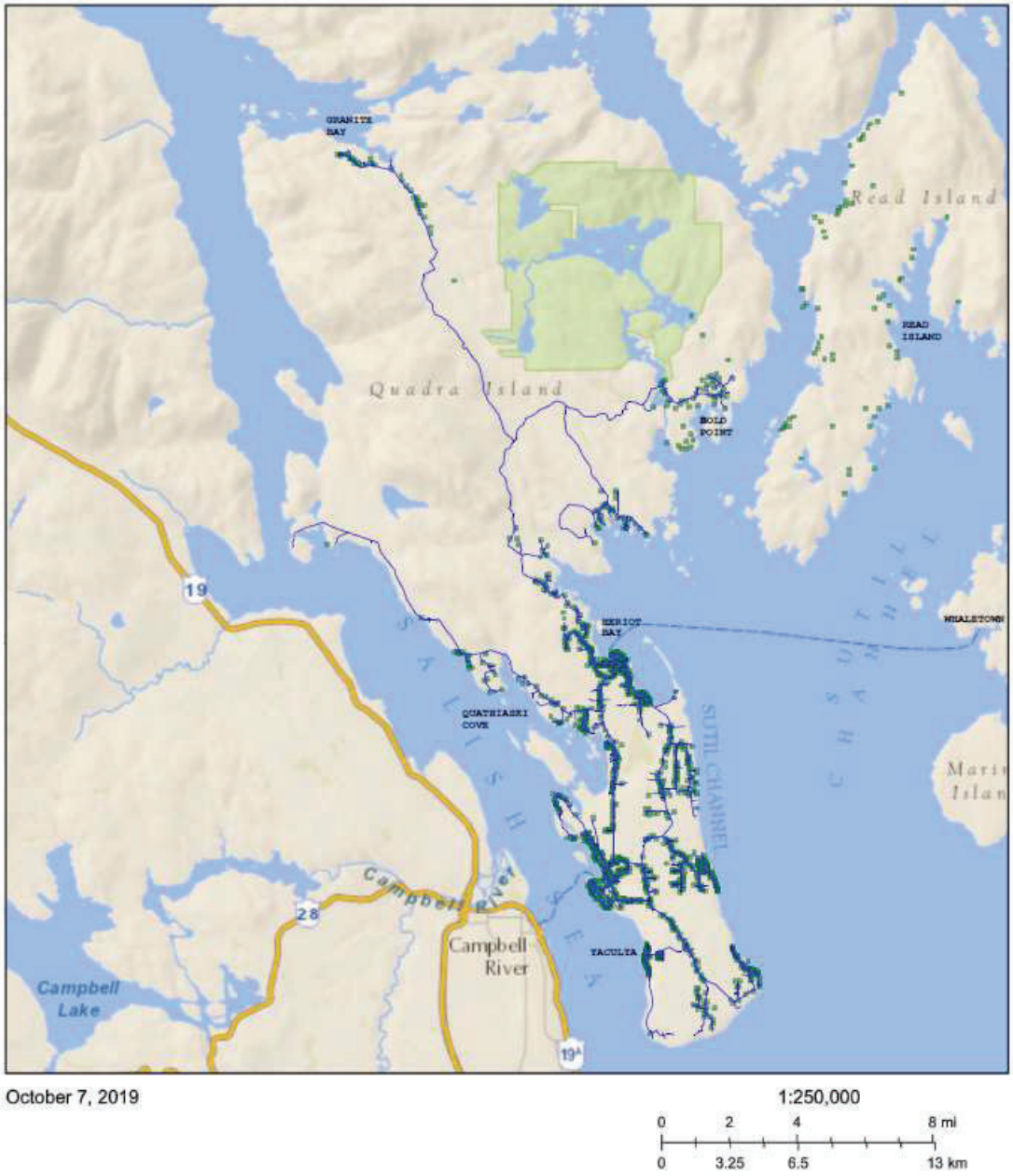
- Upgrading their existing cable system to 860 MHz bandwidth
- Placing new fibre and installing five new fibre nodes
- Extending their cable plant to bring services to new areas on the southern tip of Quadra Island

The connection of their existing network to the SRD system would result in an immediate improvement to internet customer service levels. Once connected, the existing 550 MHz cable plant and DOCSIS 3.0 system could offer service levels greater than the 50 Mbps down / 10 Mbps up 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

Option 2 - New FTTH ISP – All of Quadra Island

If a new ISP were to construct a FTTH network to provide service to all addresses on Quadra Island.



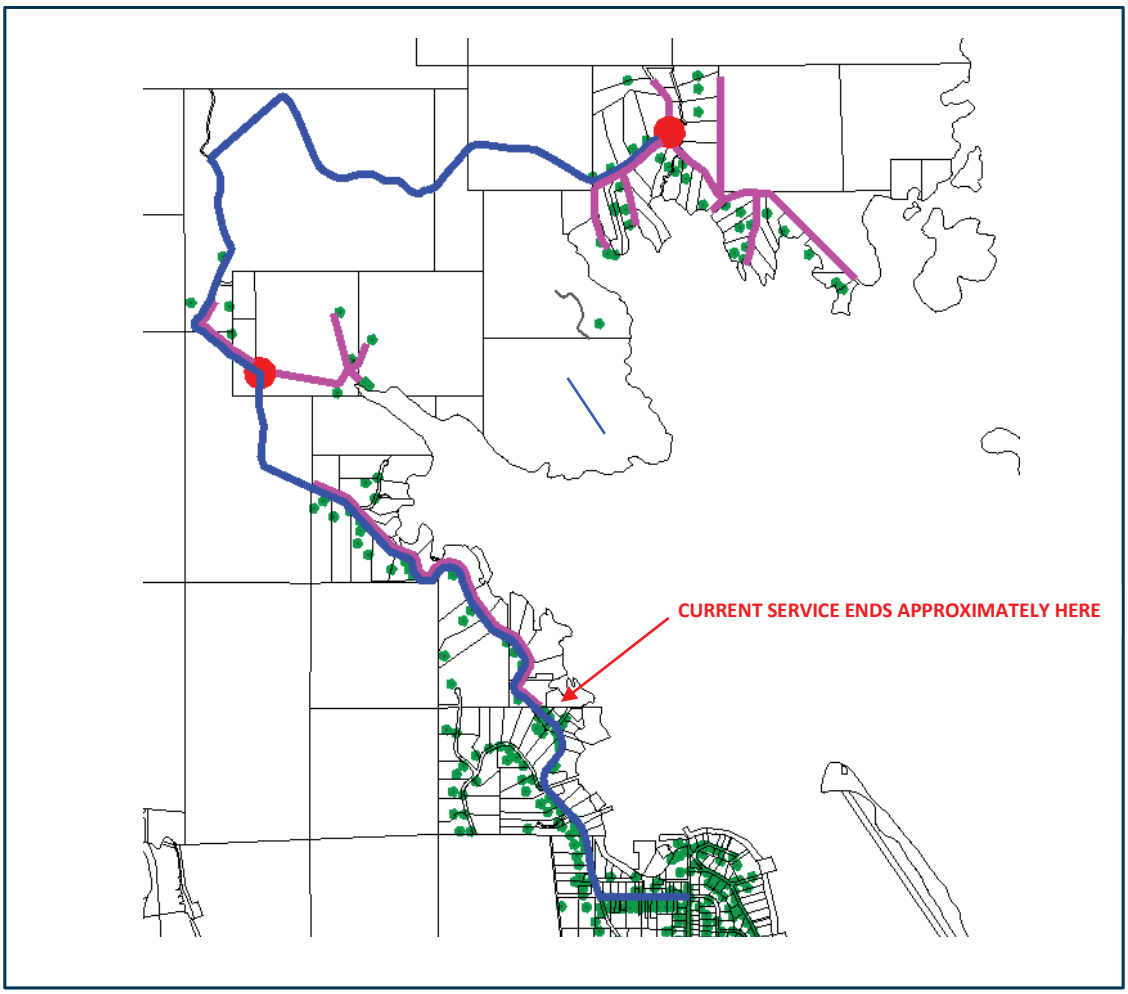
Cost Estimate

	Customers	Cost Per Address	Route Meters	Cost Per Meter	Total
Low Make-Ready	1588	$3,918.00	152,000	$41.00	$6,222,000.00
Medium Make-Ready	1588	$4,301.00	152,000	$45.00	$6,830,000.00
High Make-Ready	1588	$4,684.00	152,000	$49.00	$7,438,000.00

Cost estimate includes all electronic, material, design and installation.
Land agreement & building costs are not included in the cost estimate

Option 3 - Open Bay – Gulf Island Cable extends HFC (Hybrid Fibre/Coax)

It is approximately 11 Km to Open Bay from the existing Gulf Island Cable fibre splice located at the intersection of Cramer Rd & W Road. The placement of a new fibre cable to Open Bay along with fibre optic nodes and ~ 9 Km of coaxial cable plant to service the homes in this area. Including the homes passed along the route would provide services to ~ 70 homes.



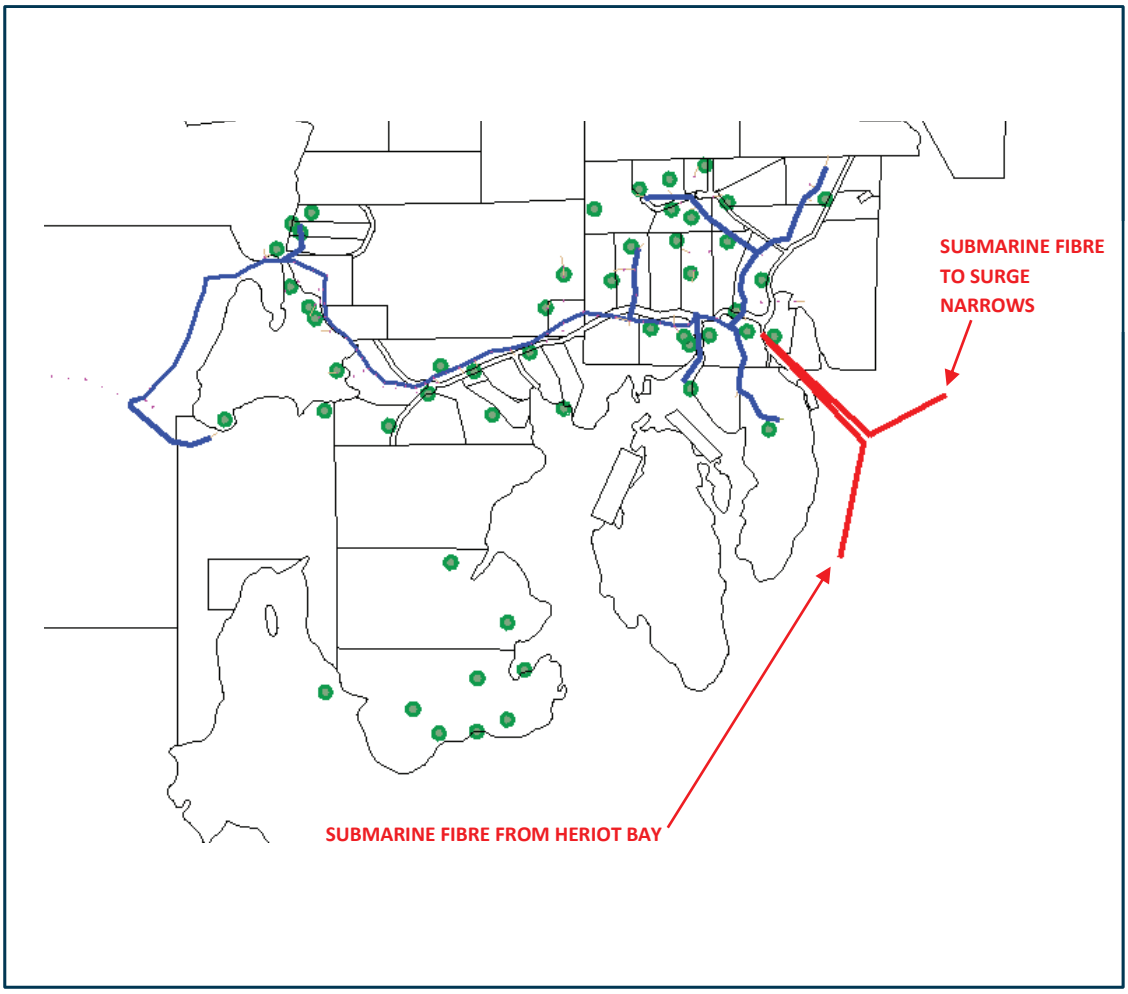
Cost Estimate

	Customers	Cost Per Address	Route Meters	Cost Per Meter	Total
Low Make-Ready	70	$4,814.00	17,000	$19.81	$337,000.00
Medium Make-Ready	70	$5,786.00	17,000	$23.81	$405,000.00
High Make-Ready	70	$6,757.00	17,000	$27.81	$473,000.00

Cost estimate includes all electronic, material, design and installation.

Option 4 - Bold Point – Gulf Island Cable - FTTH (Fibre To The Home)

If the SRD were to allocate a single fibre between the Heriot Bay landing site and the Bold Point Landing site, Gulf Island Cable could use this cable to establish a connection from their headend to Bold Point. In Bold Point a new FTTH network could be constructed on the existing aerial infrastructure. With the SRD placement of an underground service vault at the Bold Point landing site, Gulf Island Cable could construct a conduit connection to the nearest utility pole to connect to a new fibre network.



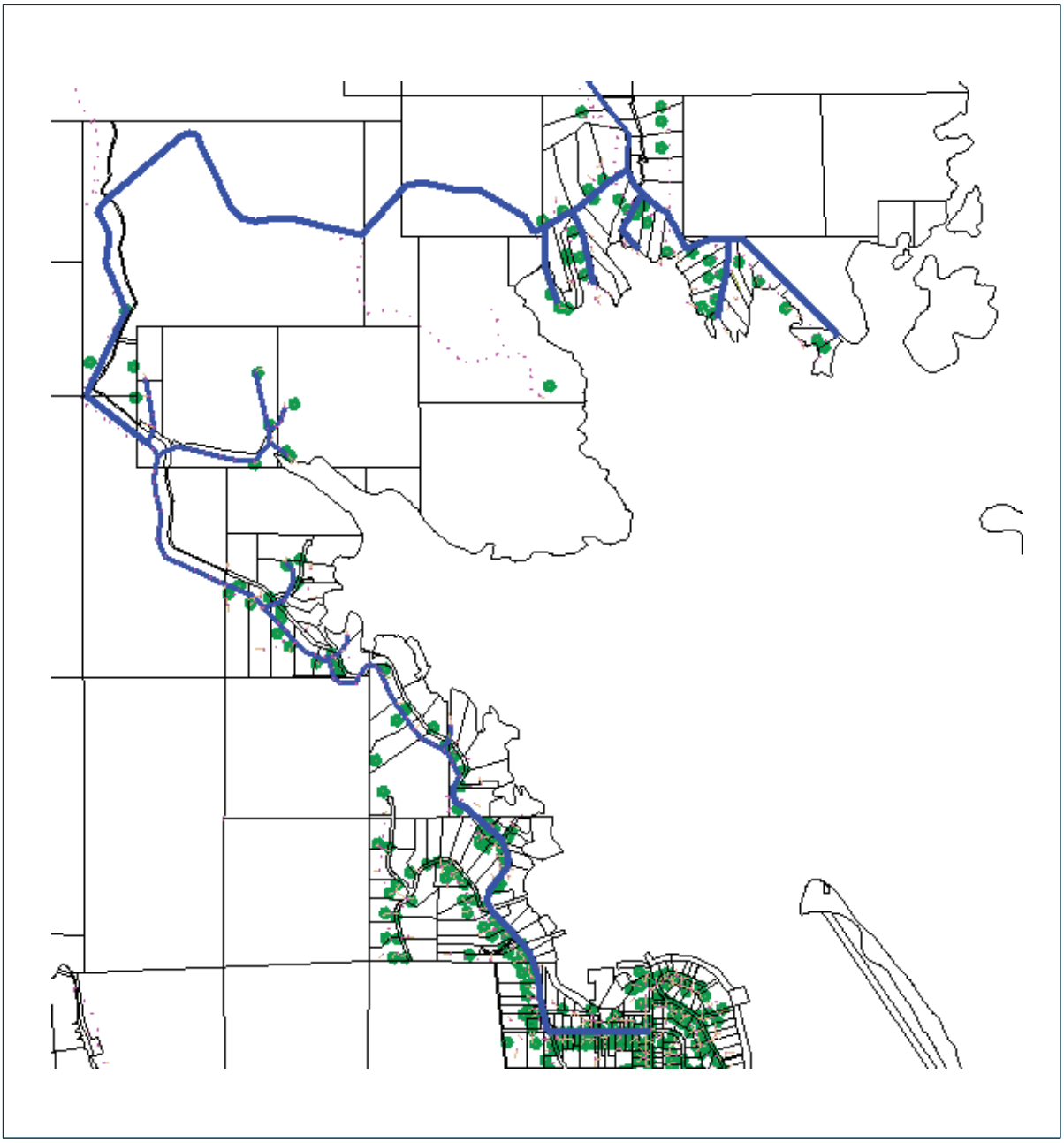
Cost Estimate

	Customers	Cost Per Address	Route Meters	Cost Per Meter	Total
Low Make-Ready	54	$5,815.00	6,000	$52.00	$314,000.00
Medium Make-Ready	54	$6,259.00	6,000	$56.00	$338,000.00
High Make-Ready	54	$6,704.00	6,000	$60.00	$362,000.00

Cost estimate includes all electronic, material, design and installation.

Option 5 - Open Bay – FTTH (Fibre To The Home)

Gulf Island cable could also choose to construct a ~ 29 Km FTTH network rather than HFC.



Cost Estimate

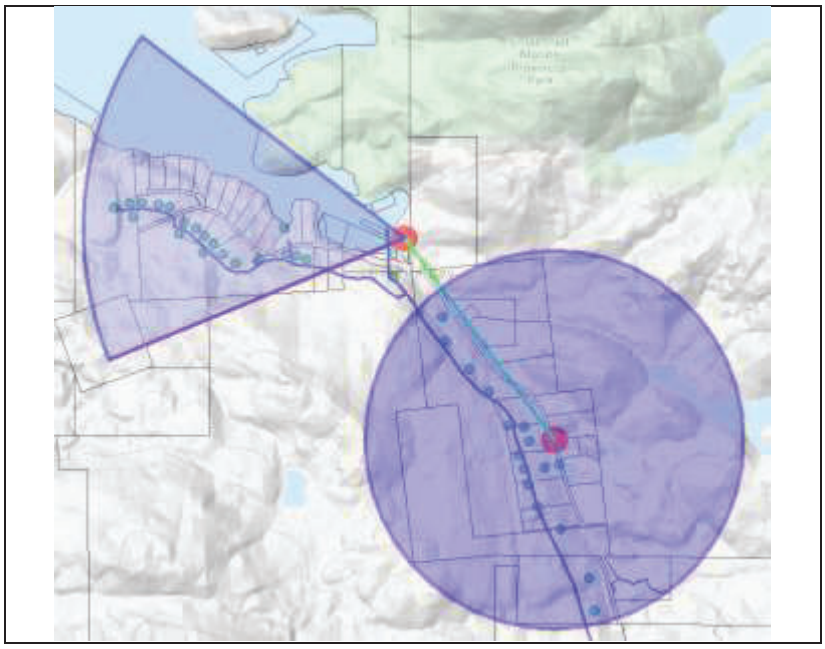
	Customers	Cost Per Address	Route Meters	Cost Per Meter	Total
Low Make-Ready	70	$9,800.00	18,000	$38.11	$686,000.00
Medium Make-Ready	70	$10,829.00	18,000	$42.11	$758,000.00
High Make-Ready	70	$11,857.00	18,000	$46.11	$830,000.00

Cost estimate includes all electronic, fibre material, drops, design and installation.

Option 6 – Granite Bay – New WIFI ISP

A new WIFI ISP could connect to the SRD Connected Coast fibre in Granite Bay. A desktop examination indicates that two tower location would likely be required to obtain the coverage to area residents. The two towers would be connected via a PTP (Point to Point) connection with a PTMP (Point to Multi Point) on each tower. A fibre connection from the SRD fibre landing site to the nearest tower would be necessary as well a small structure with power and heat to house the minimal electronics. SRD termination equipment would be placed in this same building.

A full site survey and design would be required to determine exact requirements and final cost. Due to the topology of the area, we anticipate the need for the tower to be placed at a higher hilltop location to reach those addresses south of Granite Bay. A structure agreement with TELUS or BCHydro would be necessary to allow the ~ 1Km fibre route placement. A new ~ 200 meter pole line would need to be constructed to create a route from the existing pole line to the tower.



Utility Pole Line **PTP Link** **Tower** **Addresses**

Cost Estimate

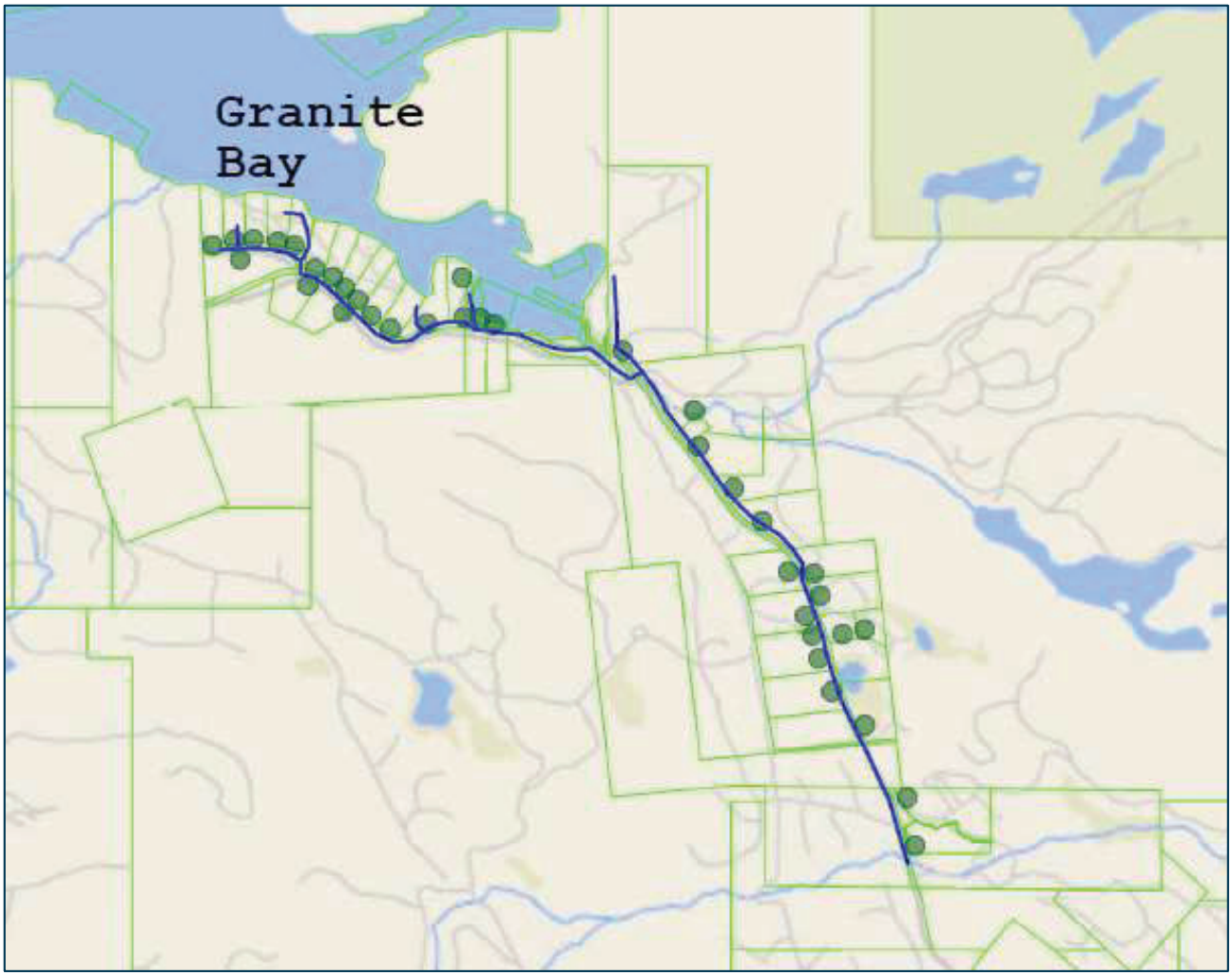
	Customers	Cost Per Address	Total
Low	36	$2,500.00	$90,000.00
Medium	36	$4,167.00	$150,000.00
High	36	$5,833.00	$210,000.00

Land agreement costs for tower/building are not included in the cost estimate

NOTE: The delivery of WIFI services are subject to degradation due to terrain, obstructions such as vegetation, structures, topology and interfering WIFI signals. Each individual subscriber's service level may vary.

Option 7 – Granite Bay – New FTTH ISP

A new or existing ISP would connect to the SRD Connected Coast fibre at an underground service vault located near the landing site. They would then place a FTTH network to connect all local addresses. A small building with power service and heating would be required for the network equipment. The small building or room in an existing building could be located anywhere along the fibre route.



Cost Estimate

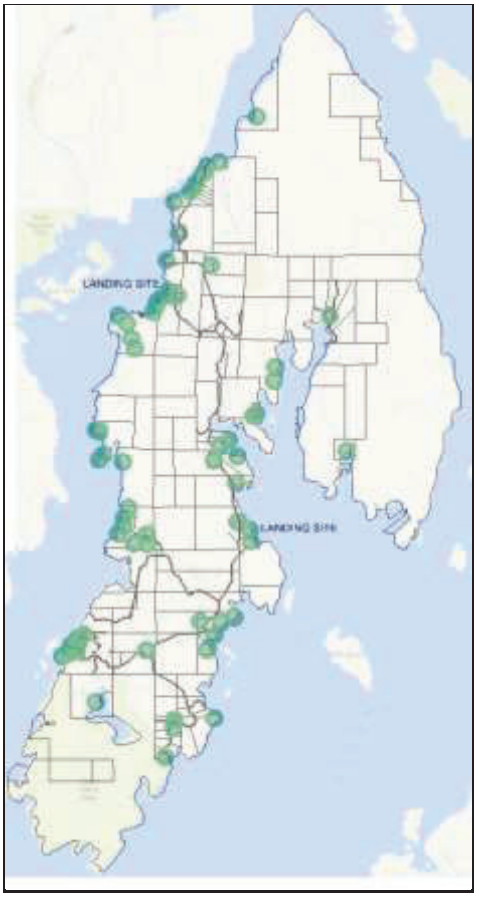
	Customers *(see page 6)*	Cost Per Address	Route Meters	Cost Per Meter	Total
Low Make-Ready	36	$6,485.00	5,000	$46.69	$233,450.00
Medium Make-Ready	36	$7,040.00	5,000	$50.69	$253,450.00
High Make-Ready	36	$7,596.00	5,000	$54.69	$273,450.00

Land agreement costs and building are not included in the cost estimate

Option 8 – Read Island / Surge Narrows New ISP FTTH

The information necessary to perform an assessment of Read Island; such as roads, utility structure types and routes are currently unavailable. Without this information we can only speculate as to what options are available.

With the use of available ortho photos we can speculate that there are ~ 30 Km of roads for a connected path to all the addresses as positioned.



Cost Estimate

	Customers *(see page 16)*	Cost Per Address	Route Meters	Cost Per Meter	Total
Low Make-Ready	66	$16,623.00	30,000	$36.57	$1,097,000.00
Medium Make-Ready	66	$18,442.00	30,000	$40.57	$1,217,000.00
High Make-Ready	66	$20,260.00	30,000	$44.57	$1,337,000.00

A desktop analysis of WIFI options clearly showed significant challenges with both the spread-out locations of addresses and the topology of the island. Because of these two factors we do not see a new WIFI network as a viable solution for providing the desired service levels for all residents of the island.

Cost Estimate Variables/ Operating Cost Items

There are many variables that will impact the final cost of these types of projects including the condition and capacity of existing infrastructure. 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/duct and need for remediation/replacement or new duct
   b. Capacity of existing strand/duct and need for replacement or new additional 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
III. Transportation costs to get equipment and materials to the build site

Access Agreements

An access agreement will need to be signed with either BCHydro and/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[iii]

TELUS General Tariff – CRTC-21461			
Structure Type	**Tariff Rate**	**Estimated Usage**	**Annual Fees**
Monthly Pole Rental Rate *(Route Meters/50 Meters avg. span)*	$1.61	0	$0
Monthly Strand Rental Rate (per 30 Meters)	$0.43	0	$0
		Total	$0

Additional operating costs would include such items as:

- building space lease
- property taxes
- plant maintenance
- internet connectivity fees

Conclusions

[iv]	OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5	OPTION 6	OPTION 7	OPTION 8
	Gulf Island Cable Connects to SRD	F.T.T.H New ISP All Quadra Island	HFC Service area extension Open Bay	F.T.T.H. Service area Bold Point	F.T.T.H. Service area Open Bay	WIFI New ISP Granite Bay	F.T.T.H. New ISP Granite Bay	F.T.T.H. New ISP Read Island
Downstream Data	Up to 1.2 Gbps	Up to 940 Mbps	Up to 1.2 Gbps	Up to 940 Mbps	Up to 940 Mbps	> 50 Mbps	Up to 940 Mbps	Up to 940 Mbps
Upstream Data	Up to 200 Mbps	Up to 940 Mbps	Up to 200 Mbps	Up to 940 Mbps	Up to 940 Mbps	>10 Mbps	Up to 940 Mbps	Up to 940 Mbps
Reliability	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Excellent	Excellent
Maintenance Requirement	Medium	Low	Medium	Low	Low	Low	Low	Low
Operating Costs	Medium	Low	Medium	Low	Low	Low	Low	Low
Quality of Service	Excellent	Excellent	Excellent	Excellent	Excellent	Medium	Excellent	Excellent

References

[i] **TELUS Website address service lookup**
[ii] **Xplornet Website**
[iii] **TELUS website September 2019**
[iv] **WIFI & Data Rates information provided by High Pro Computer Consulting**

QUADRA ISLAND
Community Broadband Plan

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