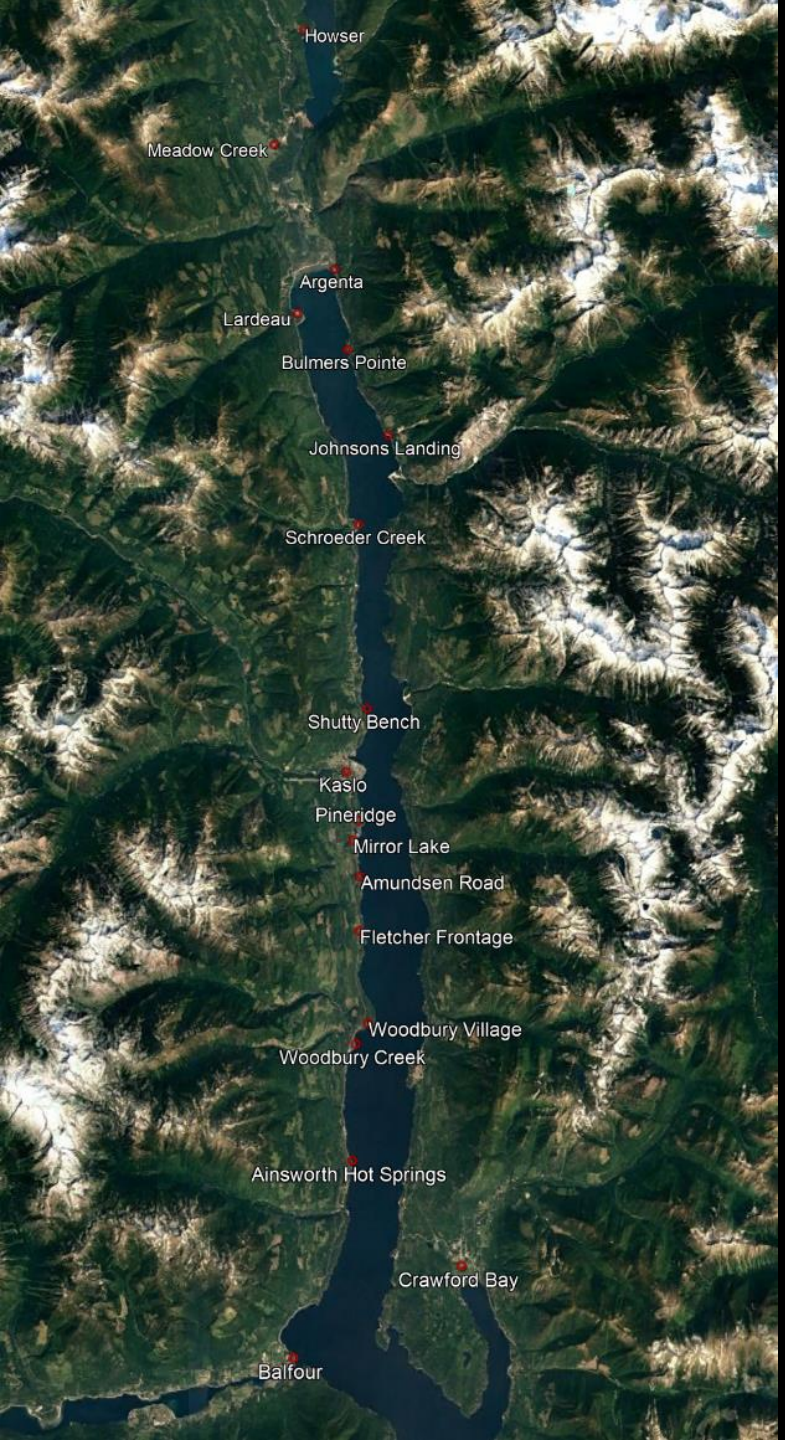
Kaslo infoNet Society
The Challenge!
Build Gigabit Fibre Networks in Rural B.C.

Kaslo InfoNet Society TimeLine

- 1996 Incorporated by community volunteers as a Not for Profit British Columbia Society.
- 1996-2010 Dialup Modem Bank ISP
- 2006-Present Wireless ISP
- 2014-Present Gigabit Fibre ISP
- 2017-Present CRTC Non Dominant Carrier


It’s a fabulous place to live…
but a challenging place to build networks!

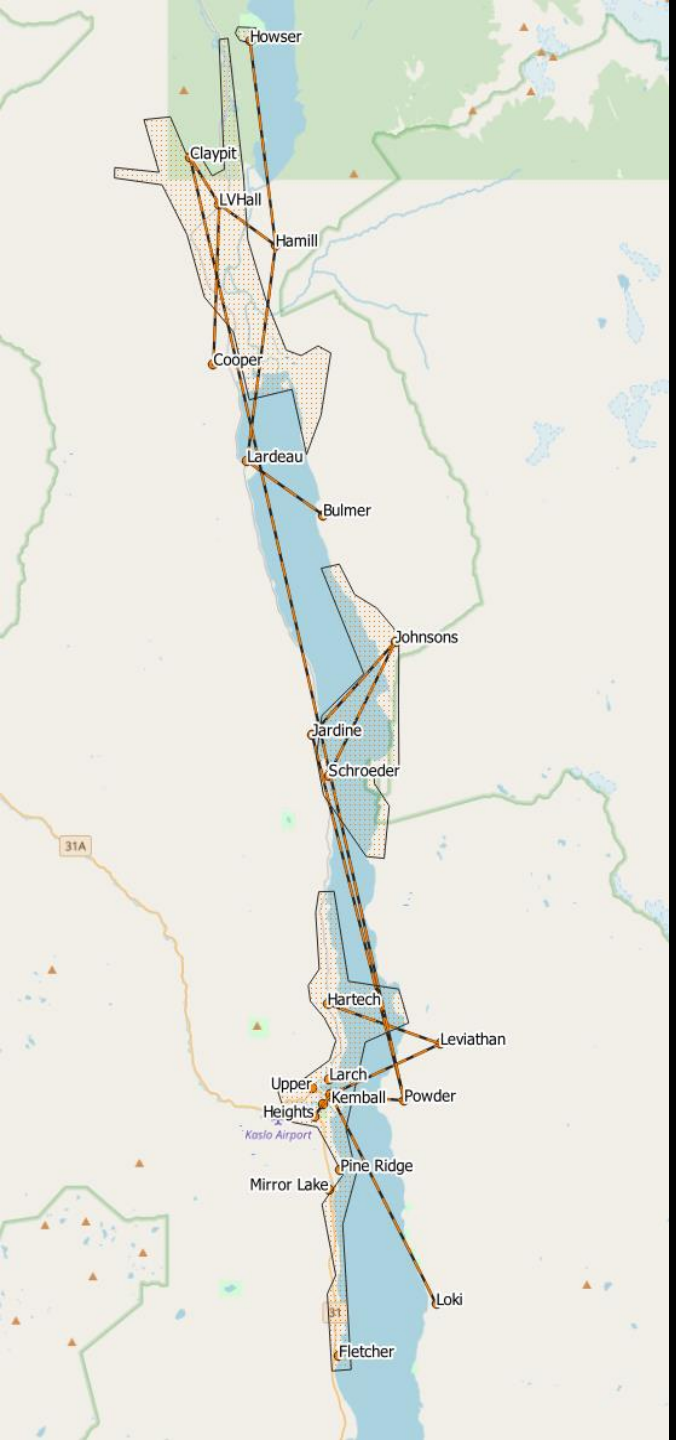


This is the Service Area

Between 2006 and 2012 KiN built a wireless network that served several hundred subscribers with 802.11 Wi-Fi from Howser in the north to
Fletcher Frontage, south of Kaslo.

1.5 Mbps down and 20GB per month…

It was “better than dial-up eh” and had better latency than satellite...



KiN Wireless Network in 2012 before Fibre

The hatched areas are the 1.5/.3 Mbps Wi-Fi served areas, and the dashed lines are backhaul connections via tower to tower links that connected the two networks backhaul locations.

The North Network

A 30 Mbps Fibre feed under the provincial CCA agreement with Telus in Meadow Creek served the North Network from a telecom closet in the Lardeau Valley Hall.

The South Network

In the south which was not accessible for CCA, multiple DSL circuits were aggregated in Kaslo and served the South Network which was everyone beyond reach of copper DSL in Kaslo

The total available bandwidth was about 50 Mbps.

CBBC Fibre Proposed for Kaslo

- 2012
- Columbia Basin Broadband Corporation offers the Village of Kaslo a 100 Mbps unlimited usage Fibre connection for $750 per month.
- IF, the Village would build a fibre last mile network.
- The Village declined the offer, until KiN stepped up to build the fibre network.
- How could we turn it down?

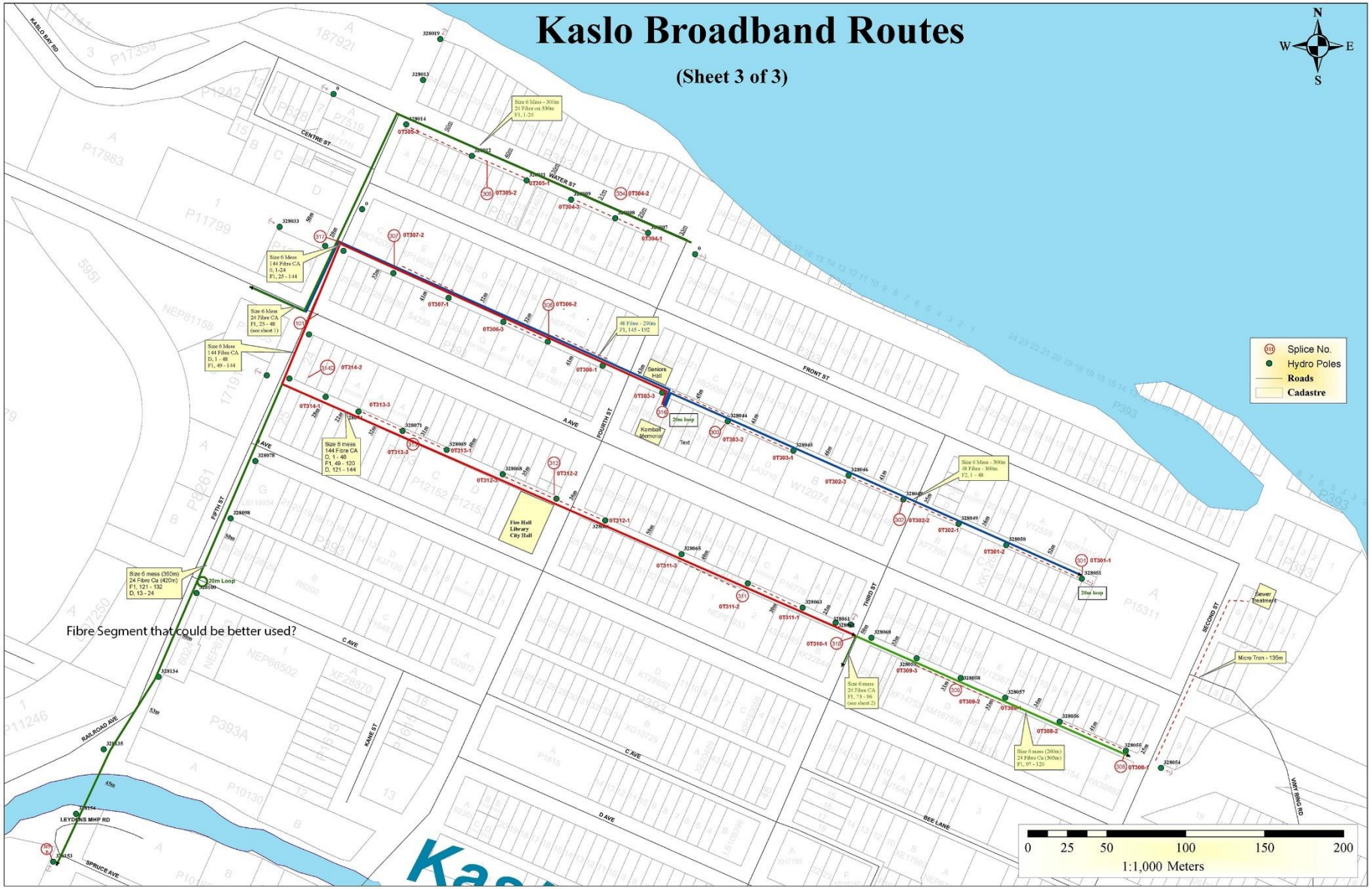
KiN spent 2013 planning and chasing funding…

The CBBC fibre consultants insisted that we had to use aerial cable on poles owned by the Hydro/Telco monopoly. And pay rent of $60 a year for every pole forever.

What's more, pole permitting only allowed for “Hydro approved” plans and technicians.

We were never to be allowed access for our own technicians. There was a lesson to be learned...

2013 Early Kaslo Fiber Plans On Poles Budgeted at $93,000



If you retain “telco” consultants you get Telco solutions.

We decided to do our own research.

In Europe the most developed fibre networks are in the Scandinavian countries where community fibre networks are most of the internet services available.

Some of it is on poles, but most of it is buried fibre.

The telco consultants told us that underground fibre would be triple the costs of aerial.

We now know that’s simply not true, particularly in rural areas where roads may not be paved, and bare earth road allowances allow the use of direct buried fibre cable.

We had assembled a $93,000 funding package to cover the Kaslo Central Business District.

When it became obvious that we were never going to be able to build our own pole based network we threw out the consultants plans!

KiN negotiated a 30 year renewable municipal access agreement with the Village of Kaslo and prepared to build a fibre network.

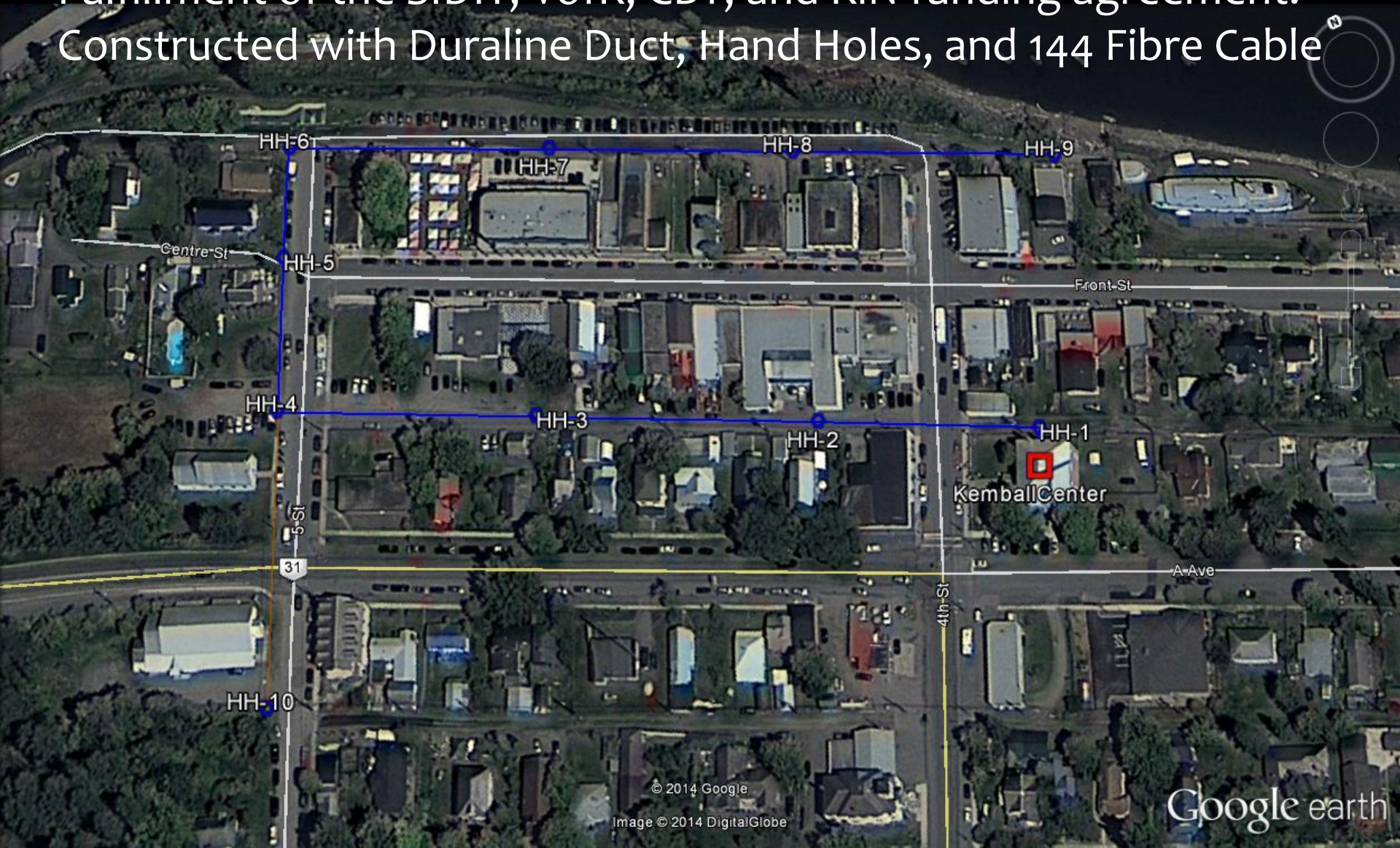
The KiN plan proposed to use buried ducts and hand holes where changes are likely on an ongoing basis. (CBD)
And use direct buried cable in areas where significant changes are unlikely.

2014

Fiber Construction starts in the Kaslo Central Business District.

Fulfillment of the SIDIT, VofK, CBT, and KiN funding agreement.

Constructed with Duraline Duct, Hand Holes, and 144 Fibre Cable



Capital Equipment Required:

Trenching Machine	$5600	For 400 mm micro trenching
Diamond Saw	$1300	For cutting concrete and curbs
PortaMole Boring Unit	$7000	used for under Hwy bores

KF4A Fusion Fibre Splicer	$8700
EXFO 700B OTDR with VFL	$7900
EXFO Endpoint Microscope	$1300

Outside Plant Materials Required

Hand Hole Tier 22		$800 each
Duraline Duct		$245/1000' 5000' MOQ
144F Cable		$4/Meter 5000M MOQ
2F Drop Cable		$0.41/Meter 5000M MOQ
Dome Splice Case	(144) fibre	$275 each
LCC Splice Case	(24) fibre	$64 each
Splice protectors		$25/100
144 Circuit Rack Mount ODF		$1200 each
Genexis Hybrid Fibre Endpoints		$200 each
Fibre Demarcation Boxes		$9 each

2014

Quality inspection of fiber on delivery. Three month lead time from order!

KiN invests in fiber inventory and locally trained personnel. SIDIT, Village of Kaslo, and KiN funds at work. CBBC funds the POP installation and planning cycle.

In the summer of 2014 KiN completed the Kaslo CBD, and in September connected the Kaslo Hotel, the first paying subscriber after the Village of Kaslo.

The Fibre POP is located on the Village of Kaslo Kemball Centre Property and connected with the leased fibre 100 Mbps circuit provided by Columbia Basin Broadband Corporation as agreed.

The drop fibre circuits were capable of 1 Gigabit per second but there was no real surplus of bandwidth to use it.

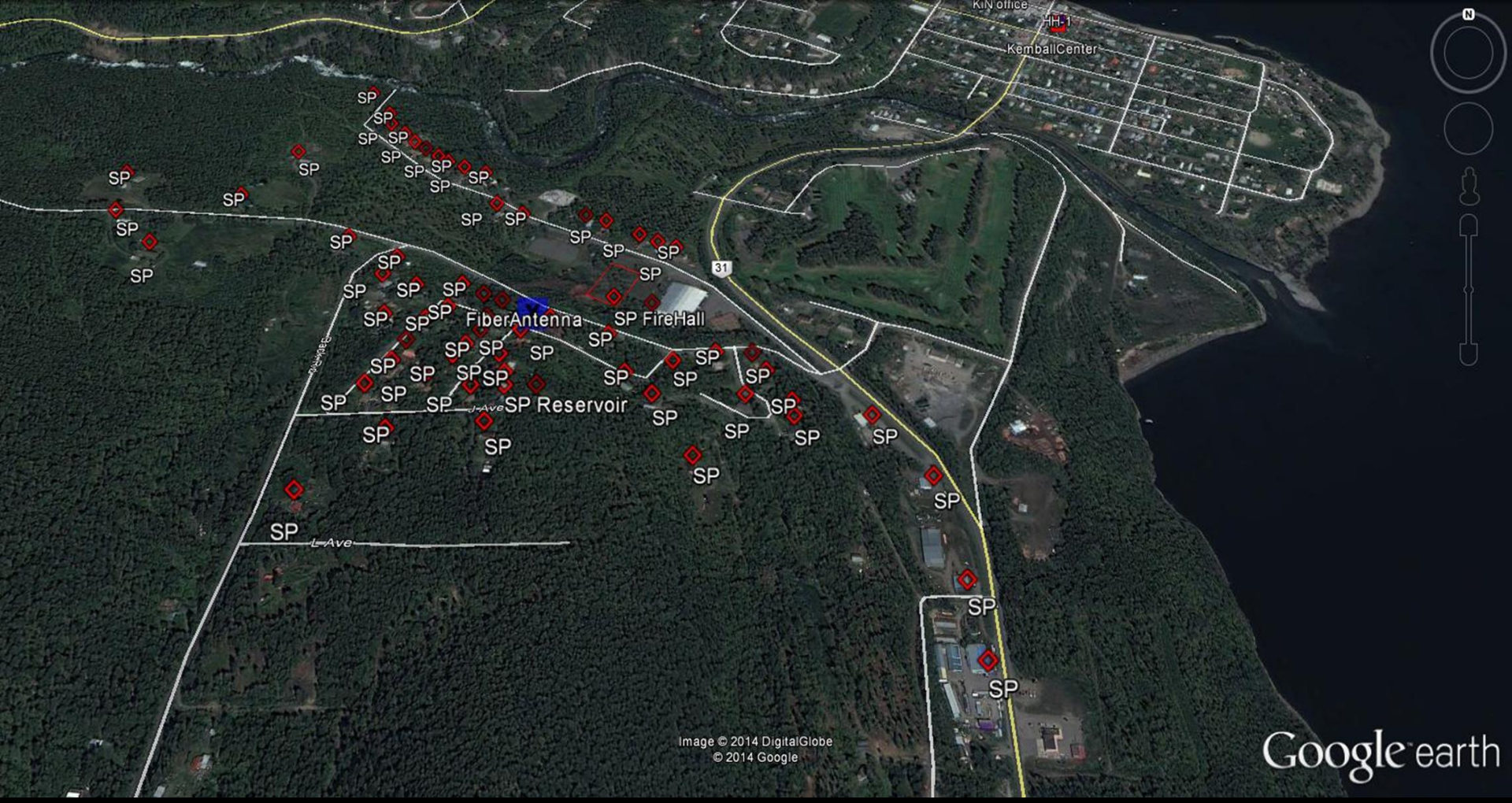
This completed the commitment made by KiN to the Village of Kaslo, Southern Interior Development Initiative Trust, and Columbia Basin Trust for the project funding.

Under the terms of the Kaslo Municipal Access Agreement it also made it possible for KiN to fund and build a second project, the Kaslo Heights subdivision.

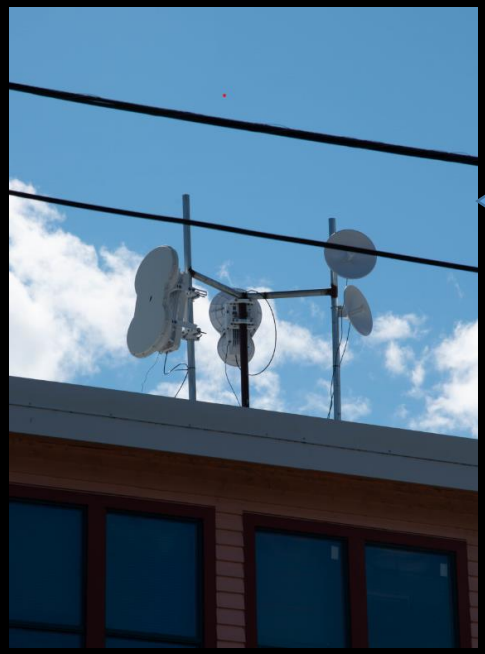
This was a proof of concept that housing developments in difficult terrain can be served effectively with a buried direct fibre system connected by an AirFiber bridge.

Kaslo Heights is about 2Km away, across a river, a Highway and 400 foot elevation gain.

This AirFiber antenna site provides a 740 Megabit bridge link between the POP and a switch cabinet that serves about 50 subscribers in Kaslo Heights, Arena Road, and Balfour Avenue. In 2014 this was brand new technology and many said it would fail in rain.



This was direct buried fibre cable, slot trenched at 400mm, overlaid with warning tape, and has served without issue since placement in 2014. The SP are the service points. AF24 radios are rated at 740 Mbps Full duplex and at 2 Km they deliver.



Fibre from the POP goes to the AF24 Bridge at our office roof, AF24 Pair ~$5000

To another AF24 on Harkness Avenue where it is connected to the distribution cabinet at the Firehall. Waystream Fibre switches feed individual Fibre drops at each SP

At the Firehall
A Multilink 12RU Cabinet w 72 circuit ODF and 72 Gigabit SFP Switch Ports With 30 hour power Support
$11,900

Each endpoint can provide;
4x 1 gigabit ports
2x RJ11 Telephone
1x 802.11N WiFi AP

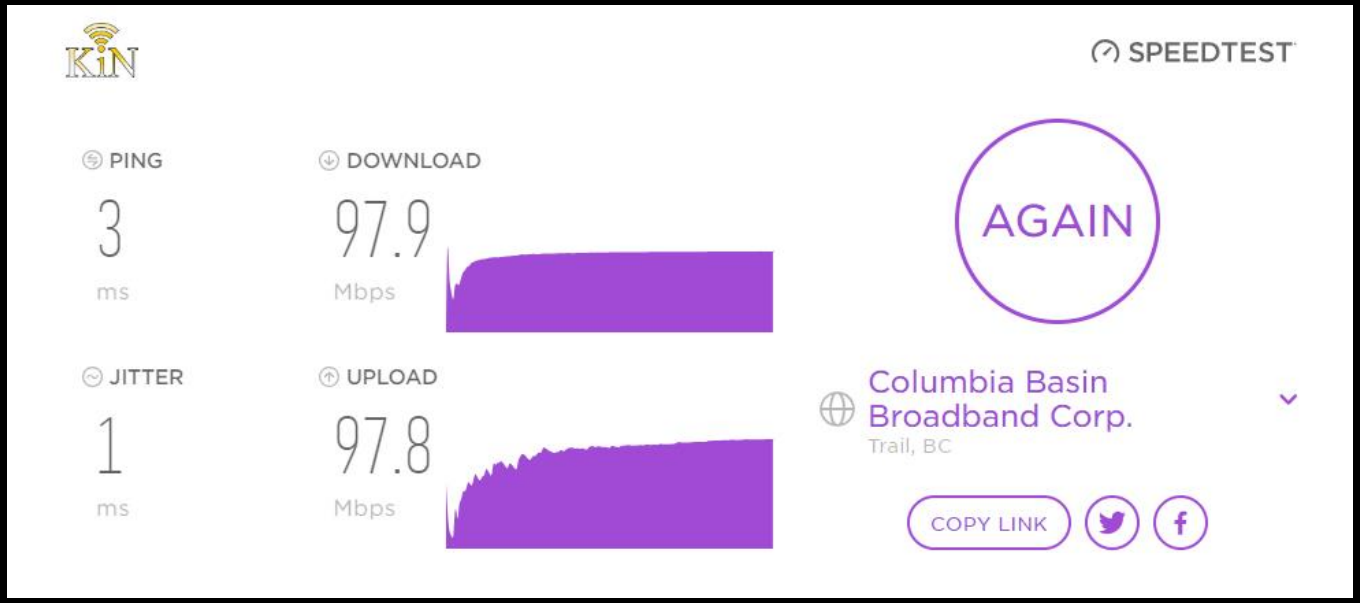
Hardware cost
$200 per user

genexis

We completed Kaslo Heights as winter arrived in 2014.

It has been 100% subscribed since 2015 when we commenced 10/10, 20/20, and 30/30 Mbps symmetric service.

As of 2017 this has been scaled to 25/25, 50/50, and 100/100 Mbps with unlimited usage as well as near gigabit local point to point connections.



KiN's case for "point to point" Gigabit Fibre

When a single fibre is connected from your switch cabinet to a subscriber endpoint. The default speed is 1 Gigabit full duplex. You provision internet connection speeds from there. The fibre spec is ITU G652D Single Mode Fibre.

The same fibre could conceivably be lit at even faster speeds by changing out the switch and endpoint electronics.

Backbone fibre, and any single mode fibre can be used as backbone, can carry 10 Gbps to 100 Gbps

Installed Fibre cables are long term return investments!

In 2014 The Federal Government ISED Ministry announced the Connecting Canadians Project 150

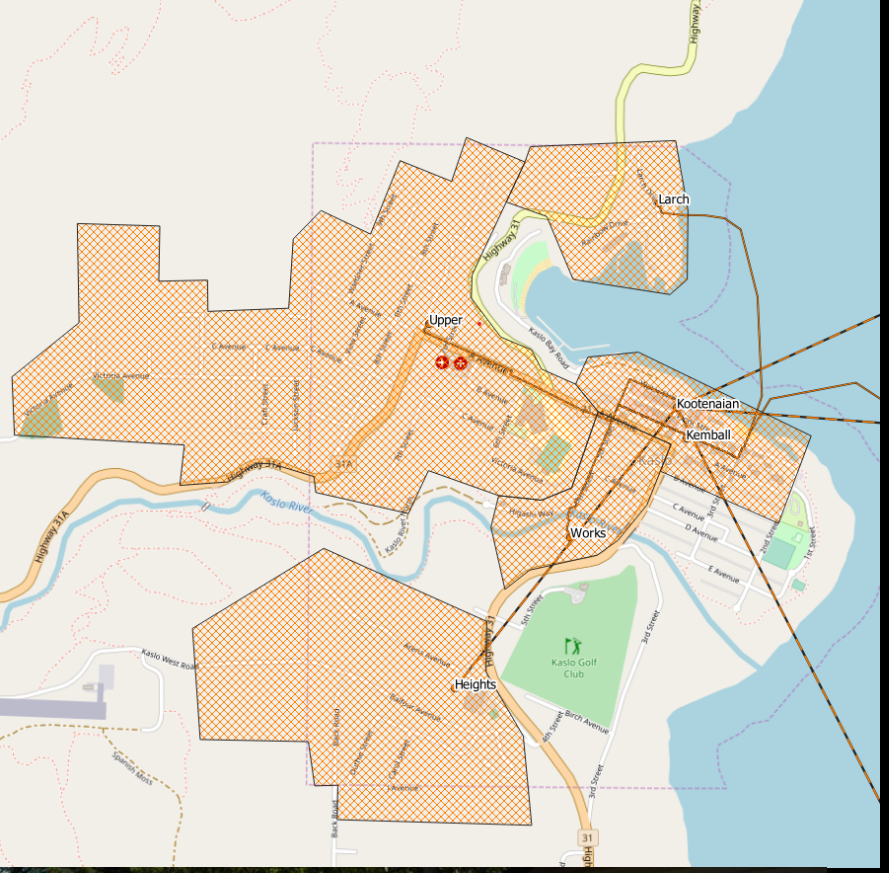
Columbia Basin Broadband asked ISP's to join a large project to bring better connectivity to underserved areas

KiN proposed a large extension of last mile fibre projects on Kootenay Lake to and were funded to build last mile fibre with AirFiber backhauls at;

Ainsworth Hot Springs
Fletcher Frontage
Mirror Lake
Pineridge
Kaslo – 4 sites
Schroeder Creek
Lardeau

In 2015 KiN was awarded a $740,000 CCP-150 Grant to build the planned fibre Last Mile projects. This would allow us to deliver gigabit fibre endpoints and upgrade our wireless network from 3/1 to 10/10. We had originally planned a Fibre in The Lake backhaul as the closest network points were in Crawford Bay more than 40 Km away.

This was refused as too risky and expensive, and we reengineered with an AirFiber chain rather than lose the funding. By mid summer 2015 we had yet to see the funds and the season was slipping away. We had three sites in Upper Kaslo and one on Larch Drive that were to be linked by an AirFiber loop. We had fibre on hand, so we trenched up the hill to Upper Kaslo with a 12F cable and we laid a 2F drop cable across Kaslo Bay.



Larch received a small 12RU site cabinet and a 1 Gigabit feed fibre

Upper Kaslo received 12 Fibres and a lit pair at 10 Gigabit for trial, and we consolidated the three sites into one large 60 RU cabinet with a 288 fibre ODF, and laid 144 fibre distribution runs to cover the areas we had planned. It all worked.

Then we had to apologize for breaking the plan and file “engineering change orders” for approval.

Our Change Orders were accepted by the ISED team sent out to examine our project. It helps a lot if it all works under stress testing.

The underwater cable was it seems no longer a “liability” and was now an Opportunity!

CBBC found a contractor to build a link from Balfour to Kaslo and we approved of their choice. Together we built out the backhaul link that we needed to make this a really functional system. And just in time….

Disaster Struck in late 2017

A wind event took out power in north Kootenay Lake for a little under 30 hours and took out our Powder Creek relay site as well.

We had a failover on power and bandwidth was reduced dramatically. This does not happen anymore with underwater fibre!

Since then there have been repeated wind driven power outages. This may well be the “new normal”.

IMHO dependence on poles and towers is going to be a challenge in the future. We will be building direct fibre, underground, and in the lake, and with redundant power and redundant routing. We are expanding the power support time objectives as well.

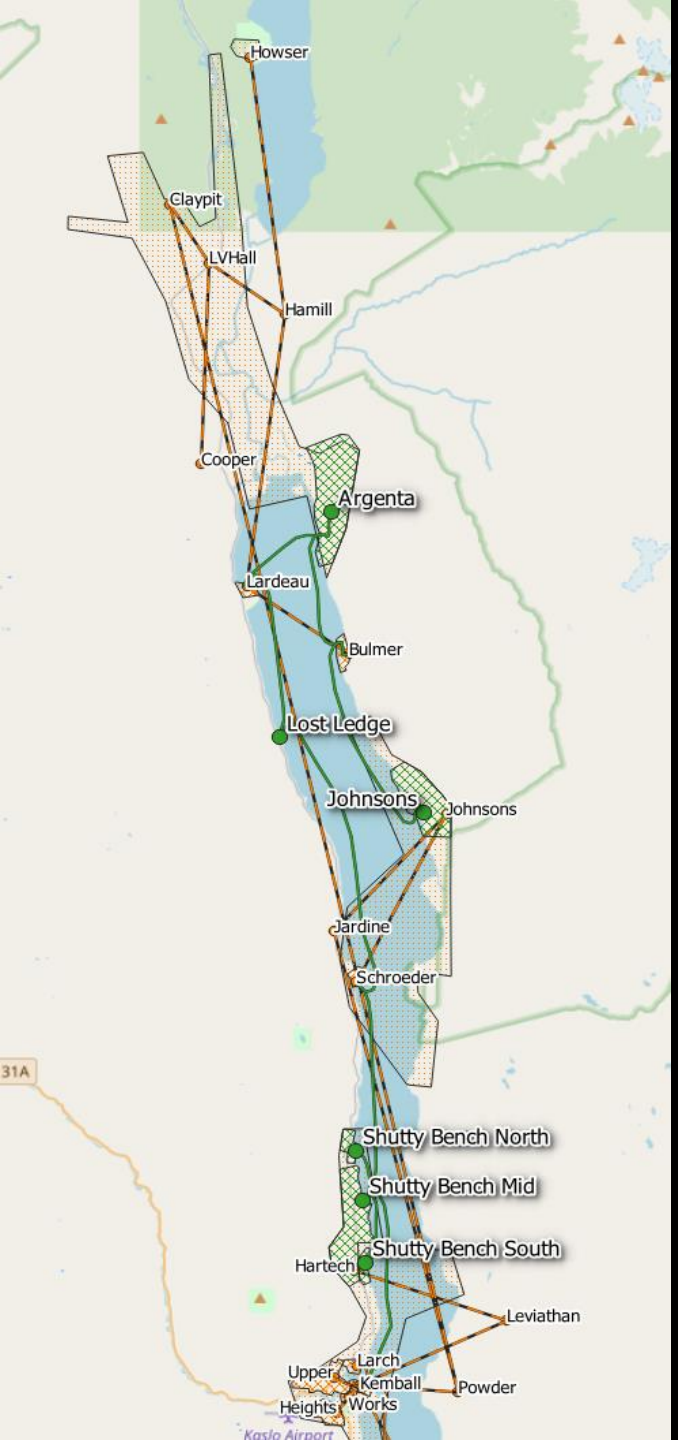
This map contains the extents of the direct fibre served projects completed by KiN as of late 2018.
The lines in the lake are 24 fibre backhaul cables laid in Kootenay Lake for CBBC with CBT/NDIT funding.

Cable and Landings engineered By

BAYLINK networks

With construction support by KiN
If you need cable in the water
Call Darren Dofher 604-786-5074

You will be glad you did



proposed-points-of-presence
proposed-fiber-links
proposed-fiber-coverage
existing-fiber-coverage
existing-wireless-coverage
fibre-links
microwave-links
points-of-presence

In 2019 We hope to build a Backhaul expansion North from Kaslo to the top of Kootenay Lake.

We have three completed fibre last mile sites in Schroeder Creek, Lardeau, and Bulmer that are on an AirFibre AF5 500 Mbit wireless backhaul.

We have an application in front of NDIT/Networks BC for a 24Fibre lake fibre run from Kaslo to Shutty Bench, Schroeder Creek, Lost Ledge Park, Lardeau, Argenta, Bulmer Pointe, and Johnsons Landing.

We propose to build last mile fibre systems in the lake communities that have only wireless at the moment.

We believe that we have taken wireless as far as it can go, and it must be replaced with direct fibre backhaul and direct fibre subscriber connections.

The Logical Network Structure

The Central Kaslo POP Site connects to CBBC's network and feeds 10 Gigabit 2,12, or 24 Fibre Backhaul Circuits from 0 to 40 Km to feed

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Multiple KiN Site Distribution Cabinets with 2 to 6, 24 port Waystream MS4000 Switches, Each switch contains up to 24, 1 Gigabit SFP fibre transceivers, Terminating in a 72 to 144 fibre ODF. Each distribution fibre drop can serve

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One subscriber endpoint at 1 or 10 Gigabit >

- Could be a single residence
- Could be a commercial subscriber
- Could be an MDU premises

The Central Fibre POP Site

(Kemball Centre in Kaslo)

1. Manages up stream connectivity
2. Manages routing to the 10 Gigabit Backhaul Circuits
3. Provides a central Data facility for, Email, Storage, Provisioning, Admin, and Enterprise Data Services.
4. Provides Compute and Interconnection for VoIP services
5. Must have 48 Hour or better power support
6. Should have redundant upstream connections

The Last Mile Site Distribution Cabinets

- We use Multilink 12RU, 29RU and 60RU Enclosures
- That hold Optical Distribution Frames of 72 or 144 Fibres
- That provide splice trays to connect distribution cables with LC jumpers to fibre switch ports
- We use Waystream MS4000 Switches with 4x10G SFP+ uplink ports and 24x1G SFP downlink ports
- These cabinets are grid powered, and supported with
- Alpha FXM Series Charger, Inverter standby power supplies
- These are supported by 24V series pairs of SP-100-12 Silicone Salt Batteries in sets to support the cabinet for 36 to 48 hours without grid power

Assembling a MultiLink 29RU double door enclosure.

At the top is a 144 Circuit ODF fed from a 144F Cable. The blue trays are 36 circuit splice trays. 1 to 6 MS-4000 Switches will be mounted below the ODF.

And below that is an Alpha FXM 350 Power supply and on the floor of the cabinet are two SP-100-12 Silicone Salt Batteries. Each pair provides 100 Amp Hours at 24 Volts and will support this cabinet without grid power for 30 hours.
And will do so in -40 to +70C temperatures and up to 1600 full discharge and recharge cycles.

They are also the ONLY batteries that will do so without risk to the electronics that share the cabinet.

For Single Residential Service

A Genexis Hybrid or FiberTwist endpoint provides;

- Line Speed Gigabit Router and Firewall
- 4 Gigabit Ethernet RJ45 Switch ports
- Support for Distributed Wi-Fi AP and VoIP Service
- Support for remote provisioning of services
- Support for VLAN porting

For Multi Site Small Business Locations

A Genexis FiberTwist endpoint provides;

- Line Speed Gigabit Router and Firewall
- 4 Gigabit Ethernet RJ45 Switch ports
- Support for Secured Location to Location VLANS
- Support for Distributed Wi-Fi AP and VoIP Service
- Support for Distributed Storage Systems

For Multi Dwelling Unit Applications

We use a small wall mount rack cabinet with power support and locate Waystream MS4000 switches at the MDU location. This allows us to serve individual

Genexis FiberTwist endpoints;

- Line Speed Gigabit Router
- 4 Gigabit Ethernet RJ45 Switch ports
- Support for Distributed Wi-Fi AP and VoIP Service
- Support for remote provisioning of services

- Using 3mm Simplex ITUG657B Bend insensitive inside building distribution cable

What we have learned….

1. If you place twice the fibre you will ever need.
2. Run a 2Fdrop line to every taxable property boundary and mark it with detectable warning tape.
3. Document fully what you have placed and where.
4. Then other than for installations, as property is developed you will never need to trench again.
5. Fibre cable is far less expensive than trenching

- 1 Meter of 600mm x 200mm trench = $7.00 (the KiN way)
- 1 Meter of 24 Fibre G652D Flat cable = $0.99
- 1 Meter of 2 Fibre G652D Flat cable = $0.39
- 1 Meter of Metallized Warning Tape = $0.99
- 1 24 Fibre Splice case = $90.00
- 24 Single fibre splices = $6 each labor and materials

So here's how we got our trenching costs down to $7 per meter

There are folks in your community that can do the same. Our guy Bueno Bauer is kept busy pretty much all summer. This is how we do "distribution" trenching on the unpaved shoulder and road allowances. This must be done to 600mm depth to keep MOTI happy and signing off on our permits. For under the roads we use a PortaMole drill and for drop lines to premises we use a GeoRipper chain trencher. However, long before that...

BC One Call is always your First Call!

https://www.bconecall.bc.ca

The maximum size for a Regular Ticket is 1000 sq meters.

The maximum size for a Project Ticket (Urban Area) is 60,000 sq meters (Minimum 1000 sq meters)

The maximum size for a Project Ticket (Rural Area) is 4.2 sq kilometers. (Minimum 1000 sq meters)

And that's because;

You can't effectively plan a project without a "locate" map first. You must know what else is in the ground!

And a permit approval on your plan is a lot easier to get if they can see that you have done your homework and present a fully documented and viable plan.

Your best friends will be the Municipality, the Regional District, Front Counter BC, and

MOTI, The Ministry of Transport and Infrastructure

You will need a GIS System, we like https://qgis.org/en/site/about/index.html

KiN's goal is to provide metropolitan class gigabit fibre internet service to every subscriber in Kaslo and the surrounding north Kootenay Lake communities.

You can make this happen in your community too.

Talk to us about a Fibre Engineering Co-op project we have under way.

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