FUTURE COMMUNITIES

THE FIBRE FABRIC

ITS 2022
HOW DID WE GET HERE?

FROM SMOKE SIGNALS AND SEMAPHORES

TO COPPER TELEGRAPH AND PHONE LINES

TO FIBRE AND THE INTERNET

AND TODAY, MANY OF US BARELY HAVE "BROADBAND CONNECTIONS"

FOR MORE THAN A CENTURY THE TELCOS RULED

TELECOMMUNICATIONS WAS A WIRED UNIVERSE OF COPPER CABLES UNTIL ABOUT FORTY YEARS AGO

TWO THINGS WOULD CHANGE THAT

ETHERNET PACKET NETWORKS AND TCP/IP IN THE 70'S AND 80'S

OPTICAL FIBRE IN THE 90'S MADE A PUBLIC INTERNET POSSIBLE

IN THE 80'S ETHERNET LAN TECHNOLOGY

Made it possible to connect computers and printers and servers over copper cables.

The limits were speed and distance. Copper wired LAN technology scaled from 10 to 100 Megabits per second. The network was limited to 100 Meters from a switch In a single building.

A T1 internet connection then was $3000 per month at a speed of 1.5 Megabits per second. This was 80's internet.

It was slow but it worked.

IN THE 90'S ETHERNET REACHED A GIGABIT

- On twisted pair copper cables, but the LAN limit of 100 meters kept LAN's inside the building.

- In the same decade Single Mode Optical Fibre arrived and eliminated Satellite Relays, and Microwave Links but the Telco's made sure that this backbone "Was SONET SDH and "Not Ethernet" and connections were only available over very speed limited copper service lines.

- These decisions allowed them to keep "Internet Services" limited in speed and unable to compete directly with the telephone line universe.

AND IN THE NINETIES THE "ISP SERVICES" ARRIVED

This was when anyone that could access a T1 connection, and resell some of it over a dial up telephone modem bank.

The Telco's and a few ISP competitors set up Dial Port Modem banks where you could call in and connect at 300 bps

The Telco's got Sonet SDH as a backbone and the Internet began to crawl out of the closet. This was also where an entire generation got the impression that Telephone Companies were the internet…

THIS SAME PERIOD WAS WHEN TELCOS WERE PRIVATIZED

BCTel and AGT were privatized as TELUS. The once "public telephone systems" were replaced by what we now know as "for profit"

 Incumbent Local Exchange Carriers.

This was also the beginnings of KiN in Kaslo when the Telco refused to allow students north of Kaslo to dial the modem bank without long distance charges. KiN was formed by teachers in 1996 to put up a "proxy modem" in Kaslo to beat the toll charges.

The beginnings of WiFi and WISP's

A WHOLE GENERATION OF INTERNET SERVICE

Was built on T1 line services from a Telco and delivered by a Digital Subscriber Line service from a Telco or a T1 sold to a WISP who would deliver a 1.5 Mbps down and .2 Mbps service up over one of several generations of WiFi point to multipoint radios.

Not so much in cities because DSL in short distances was faster but in rural areas it was all that was available.

This is the KiN 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…

FROM 2001 TO 2014 THIS WAS AS GOOD AS I GOT IN RURAL BC

I became a property owner and taxpayer in Kaslo in late 2001. That property is where I will spend the rest of my days.

But I couldn't move there without a network connection. Dial up was useless and I ran a digital business.

In 2003 however a WISP offered a WiFi connection to an E1… and then the Telco offered 6MBps DSL. I finally ordered the DSL and moved in November.

- The Telco promised 6 down and 2 up

- I was only 2 Km from the TELUS circuit office but they covered their butts with escape clauses.

- What they delivered was 1.2 down and .2 up. The network connection at my 4 fibre equipped locations were 100 up and 100 down. They worked fine. In Kaslo it failed in spring & fall in the wet months….

- They stopped taking my complaints…

CBBC PROPOSES FIBRE 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, but after citizen pressure, handed it to a Broadband Committee.

- How could we turn it down?

Village of Kaslo Fiber Broadband Committee

Maggie Winters

Rob McLennan

John Addison

Don Scarlett

John Eckland

Peter Gustafson

Steve Hoffart

Tim Ryan

Jim Holland

Suzan Hewat

CBBC Representative

Mark Halwa

The committee was merged with KiN and negotiated a Municipal Access Agreement with the Village of Kaslo, and 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, In short the "CBBC Consultants"

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

If you retain "telco" consultants you get Telco solutions.

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 proceeded to build buried fibre on a tiny project budget.

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. In 2014 we completed the CBD and Kaslo Heights
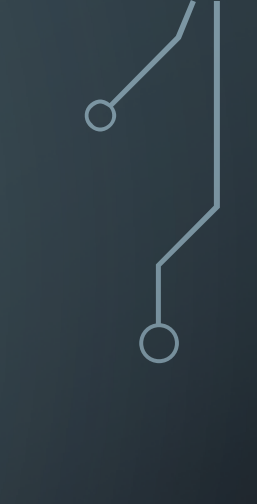
Its 2022, KiN cashflow and Grants have allowed 8 years of construction.

KiN has delivered about 80% of the "commitment to serve"

"Every taxable property in the Village of Kaslo and Area D of the RDCK with Gigabit Capable Optical Fibre Service"

It operates in positive cashflow, delivers what it promised, and has close to 1000 subscribers, and reinvests its cashflow in the community.

THIS IS WHAT REAL "BROADBAND" LOOKS LIKE

I have a single fibre that serves my residence in Kaslo Heights near the southern boundary of the Village of Kaslo Municipality

The only thing that will slow it down is a slower data source, and the "provisioning" of my 400 Mbps KiN subscription.

This fibre installed in 2014 is capable of

1000 Mbps today, or 1G

And 10 Gigabits tomorrow. 10G
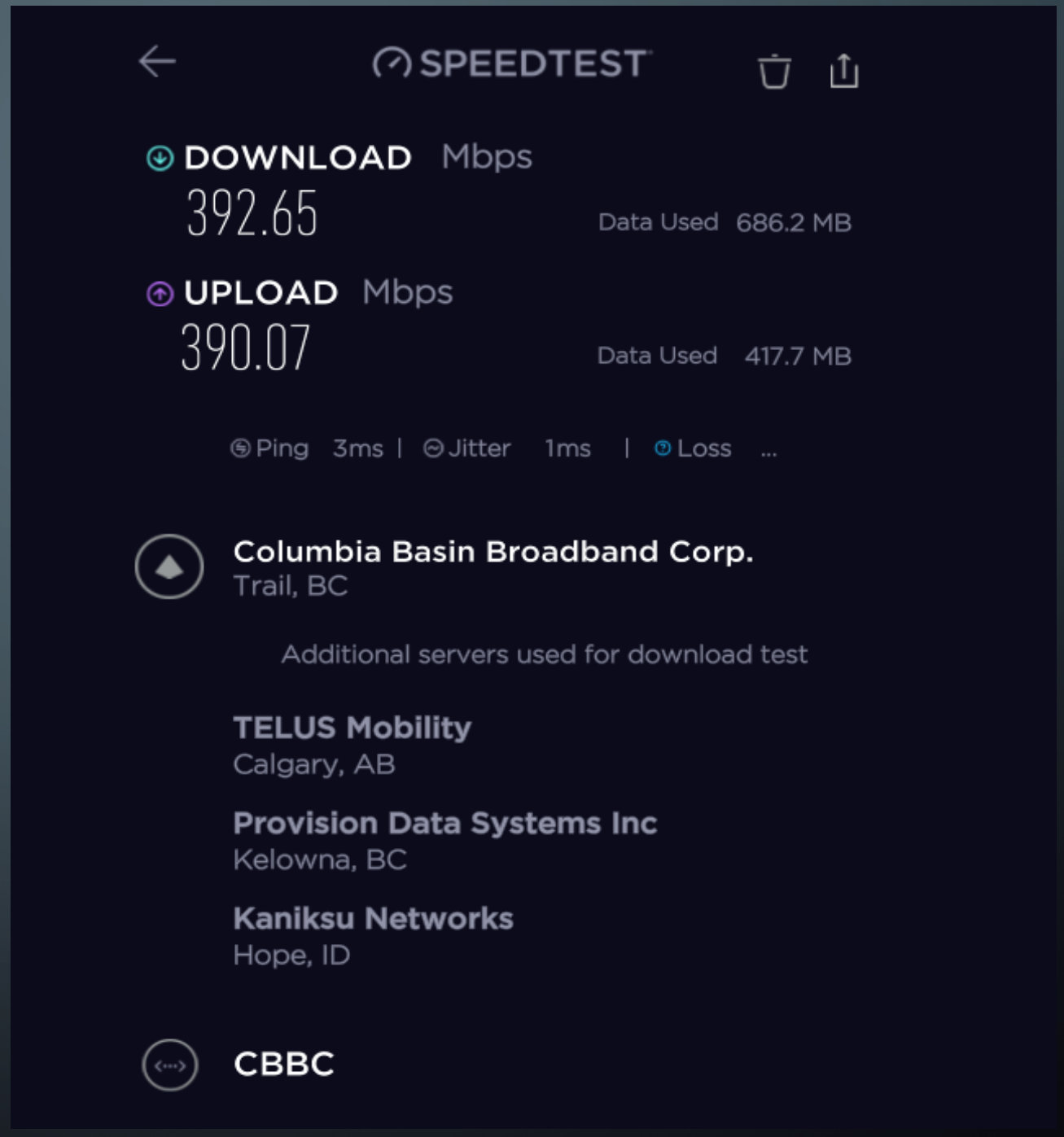
- So where do we go from here ?

- The ISP or WISP as we knew it is how "The Internet" has been served so far.

- That operating model is limited and probably outdated.

- Modern networks inside a building connect to everything on premises at 1 Gigabit why not the Internet as well?

- Why not build a Fibre Fabric which connects everything in a community? Just as we build water and power supplies to every property, plan build and connect fibre along with it.

FUTURE PROOF FIBRE FABRIC

HOW WE GET COMMUNITIES PAST THE LIMITS OF OBSOLETE "BROADBAND"

What Can The Fibre Fabric Do ?

- The short answer is "anything" you wish

- Internet Access and service at any scale or speed

- Wide Area LAN connectivity, without "100 Meter limits"

- Edge Cloud Computing and Distributed IT and Storage

- A pervasive network for smart devices or IoT

- A transport layer for "Mobility" 4G LTE or 5G or 6G Wi-Fi

- Provide an accessible connection for any Ethernet device

- Support fully digital Telephone Services

WHO SHOULD BUILD IT ?

- What about the Community it is meant to Serve?

- Most communities are responsible for;

- Water and Sewer

- Roads and Maintenance

- Physical Infrastructure, Snow Clearance, and Facilities

- Fibre is just "light pipes" along with the water pipes

- Fibre Networks can be centrally managed at regional scale

- But really benefit from community supports at ground level

BROADBAND NETWORKS GENERATE LARGE REVENUES

- THE AVERAGE BROADBAND USER, <u>NO MATTER HOW POORLY SERVED</u> TYPICALLY PAYS AN ANNUAL BILL OF ROUGHLY HALF OR MORE OF THEIR PROPERTY TAXES

- IN BIG CITIES THERE ARE USUALLY SEVERAL CHOICES THAT MIGHT MAKE IT COMPETITIVE

- IN RURAL AREAS ITS PAY WHAT YOU MUST FOR WHATEVER IS AVAILABLE

- IN KASLO MY <u>400 MBPS UP AND DOWN</u> WITH <u>UNLIMITED USAGE</u> IS <u>$159.95</u> AND UNLIMITED LONG DISTANCE TELEPHONE IS $24.95 AND THESE FUNDS REMAIN IN MY COMMUNITY AND EMPLOY MY NEIGHBOURS

BUT FIBRE IS SO EXPENSIVE…

- REALLY?

- COMMUNITY FIBRE BUILT IN KASLO HAS COST FROM $700 FOR TOWN LOCATIONS TO $2000 TO $4000 PER SITE IN VERY RURAL SITES.

- IS THAT REALLY EXPENSIVE???

START WITH THE FIBRE

This cable in a 2F version costs about 20 cents a meter. It comes on 4 Km spools and is used to connect a premises box like you see here to a splice case that links 12 of these to a 24F cable. The big magic is that unlike wire cables, optical fibre carries what you decide to put into it.

Today our default is 1 Gbps. It could be 10 Gbps. It could be 800 Gbps too.

It is a light pipe, and it is permanent plumbing for the long haul. The beginning of my case for the Fibre Fabric is that this light plumbing <u>can and should be a permanent piece of the community infrastructure in every community</u>. What's the life cycle? We only know this. <u>Almost all of the fibre</u> laid since the late 80's is still in service and short of "physical damage" will remain in service for the foreseeable future.

INSIDE THE "SUBSCRIBER PREMISES"…

- THIS IS THE PUBLIC NETWORK ENDPOINT, AND THE PRIVATE SUBSCRIBER NETWORKS INTERFACE AND FIREWALL

- IT COULD BE AT 1GIGABIT OR AT 10 GIGABIT DEPENDING ON THE ELECTRONICS ON EACH END OF THE FIBRE.

- THE ETHERNET PORTS ON THE BOTTOM ARE 1GIGABIT ETHERNET SWITCH PORTS

- THE **SUBSCRIBER'S** NETWORK IS CONTROLLED BY THE **SUBSCRIBER, AND SUPPORTED BY THE COMMUNITY NETWORK OPERATOR.** (IT COSTS ABOUT $100 TO INSTALL)

THE LOCAL SERVICE NETWORK

- THIS IS WHERE **YOUR COMMUNITY** CAN BUILD WHAT IS REQUIRED TO SERVICE THE NEEDS OF;

- RESIDENTIAL SUBSCRIBERS

- BUSINESS SUBSCRIBERS

- COMMUNITY ORGANIZATIONS

- THE COMMUNITY OR MUNICIPALITY ITSELF

- THINK OF IT AS A WIDE AREA LAN THAT CAN SPAN THE LENGTH AND WIDTH OF ANY COMMUNITY FROM A SET OF SWITCH CABINETS. THIS IS TYPICALLY UP TO **20 KILOMETERS** FROM ANY **SWITCH CABINET**. EACH AND EVERY FIBRE LINE IS CONNECTED FROM A SEPARATE PRIVATE AND COMPLETELY SECURED PORT.

- **ITS 90% TRENCHING AND 10% TECHNOLOGY**

- **AND EVERY COMMUNITY HAS FOLKS THAT CAN TRENCH!**

THE NON TECHNOLOGY PART - TRENCHING
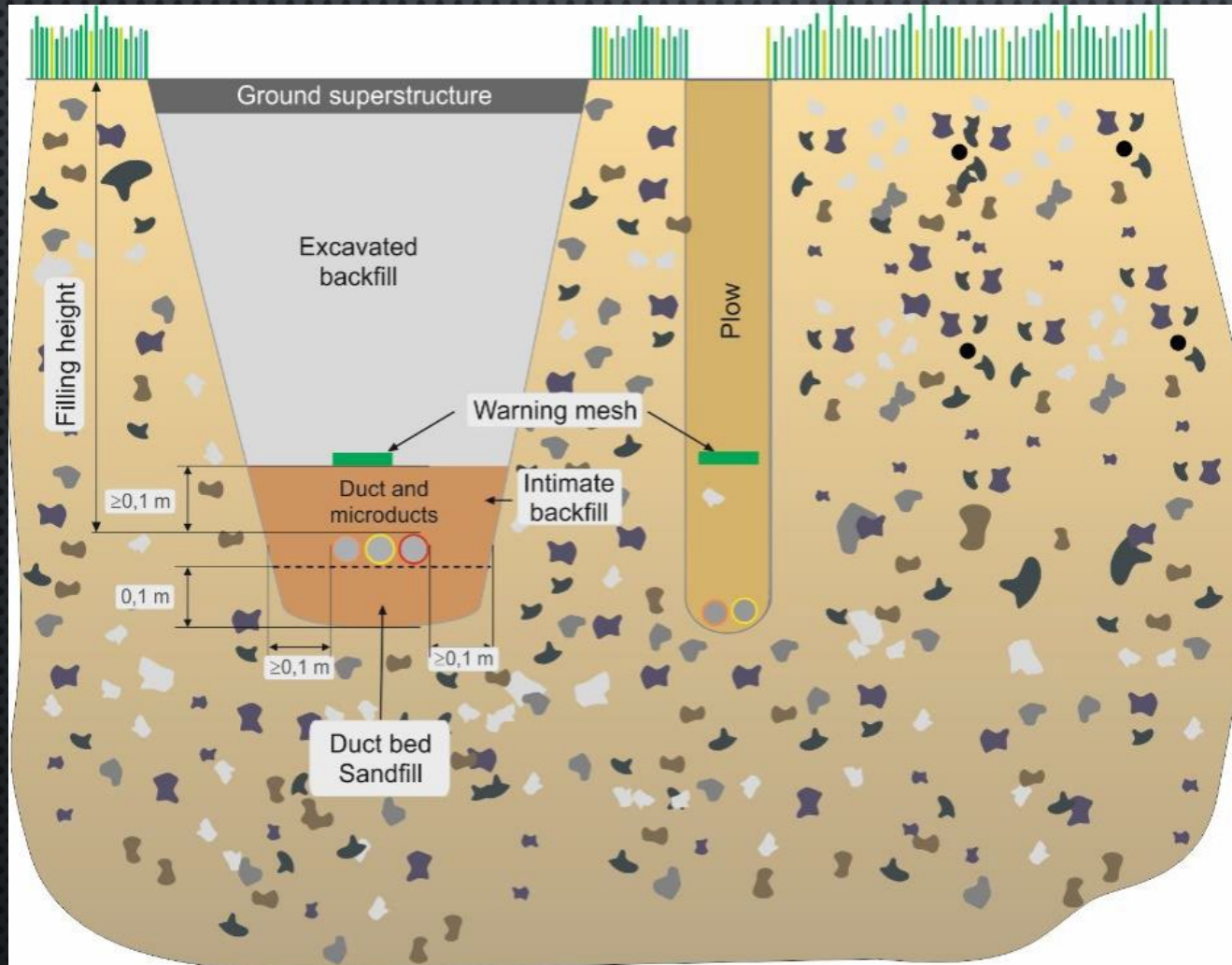
- IN A WORLD OF FOREST FIRES, GLOBAL WARMING, AND UNUSUAL WEATHER EVENTS THE TRADITIONAL TELEPHONE POLE LINES ARE **ESSENTIALLY OBSOLETE**

- ROBUST FIBRE METHODS PLACE BURIED FIBRE OR DUCTS WHERE DAMAGE IS VERY UNLIKELY.

- THIS IS WHAT **LYTTON** IS BEING FORCED TO DO NOW

- AND **KIN** HAS BEEN DOING FROM THE START.

TRENCH LINE WITH MARKER TAPE   EXCAVATOR

THIS IS A 72 CIRCUIT SWITCH CABINET

This is a 12 Rack Unit Cabinet
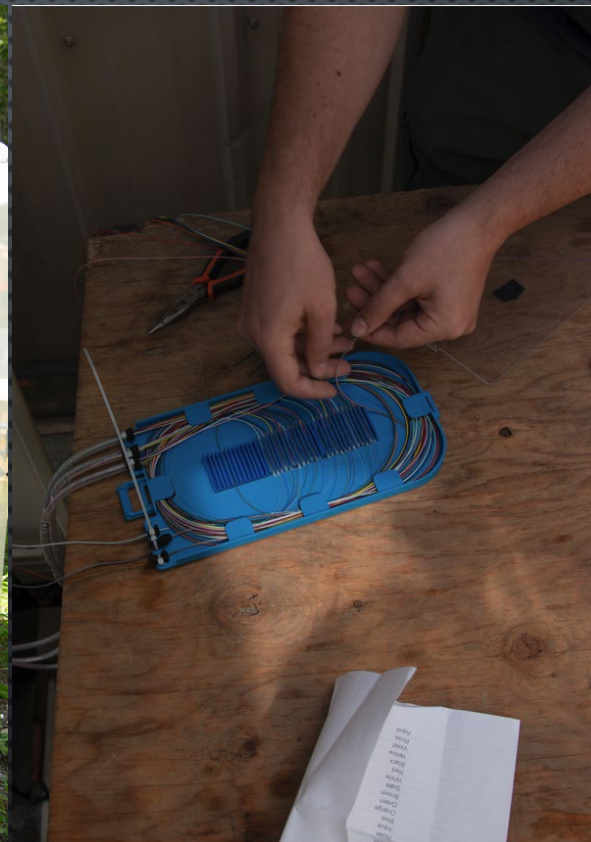It can be up to 20Km from the
last cabinet point.

It can serve up to 72 circuits
This one serves a small
subdivision called PineRidge
south of Kaslo

It is grid powered with a 30
Hour battery backup

The switches are Waystream
devices fed at 10G and each
serves 24 1G ports

Costs about $250 per user

THIS IS A 144 USER 29 RACK UNIT CABINET

This is where fibre cables are spliced to individual fibre connectors on an Optical Distribution Frame and then connected to Switch Ports. Main line fibres are 10 Gbps and service fibres are 1 Gbps at the Switch 144 circuits served but with room for 72 more

This is how you plan for Fibre Routing in

Silverton for example, There are some advantages. The community is compact and a well laid out grid.

A Fibre PoP site has already been chosen and constructed.

What remains is to create a cable placement plan and service map for endpoints and cable routing.
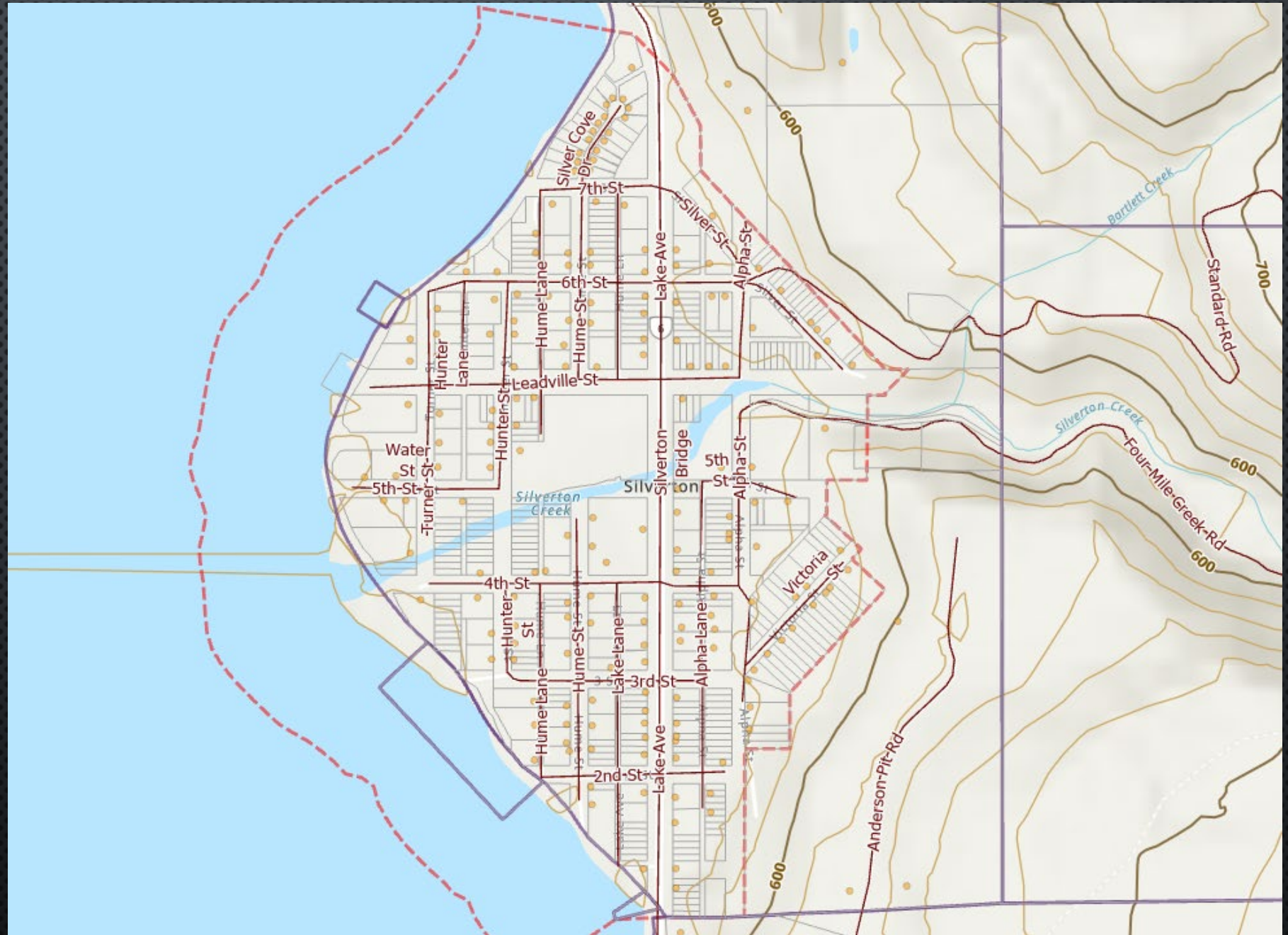
HOWEVER BEFORE YOU DIG YOU MUST PLAN AND BE GRANTED A PERMIT!

- THE FIRST STEP WHEN PLANNING AN AREA IS BC ONE CALL

- REGISTER AS A MEMBER AND PLAN FROM THEIR DATA

- REQUEST A LOCATE TICKET

- HTTPS://WWW.BC1C.CA/CONTRACTORS/

- THIS WILL NOT GUARANTEE THAT THERE ARE NOT SURPRISES BUT IT WILL GUARANTEE THAT YOU HAVE DONE YOUR HOMEWORK AND MAKE IT EASIER TO GET A PERMIT

PLANNING A NETWORK IS A JOB FOR GIS
SO IS DOCUMENTATION

- We strongly recommend to everyone we encounter QGIS

- HTTPS://QGIS.ORG/EN/SITE/

- GIS Software has traditionally been expensive. This one is Free Open Source and very very capable.

- It is the fundamental tool for network planning and network "As Built" documentation. Qgis allows photographic documentation to be embedded in the mapping projects and linked to the mapping points.

THE PLANNING AND MAPPING MUST TAKE INTO CONSIDERATION THE ENTIRE MUNICIPAL INFRASTRUCTURE.

- POWER LINES

- WATER LINES

- SEWER LINES

- MUNICIPAL ROADS

- PROVINCIAL HIGHWAYS

- LONG TERM PLANNING FOR THE FUTURE

- WHO IS BETTER EQUIPPED TO DO THIS THAN THE MUNICIPALITY?

THE BUSINESS CASE FOR COMMUNITY NETWORKS

- THE AVERAGE RESIDENTIAL SUBSCRIBER SPENDS

- $20 TO 40 PER MONTH FOR LANDLINE TELEPHONE - $240 TO $480 PER YEAR

- $75 TO $150 PER MONTH FOR INTERNET - $900 TO $1800 PER YEAR

- ONCE CONSTRUCTED THIS MEANS "REVENUES" OF $1200 TO $2280 PER SERVED SITE

- ONCE CONSTRUCTED MOST FIBRE NETWORKS ARE LOW MAINTENANCE.

- WITH MODERN OPERATING SOFTWARE BILLING AND SUPPORT CAN BE AUTOMATED

DISCUSSION FOR THE FUTURE

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