THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

INFRASTRUCTURE COMMITTEE MEETING

OF THE VILLAGE OF LIONS BAY
HELD ON THURSDAY, APRIL 22, 2021 AT 7:00 PM
COUNCIL CHAMBERS, 400 CENTRE ROAD, LIONS BAY
AND VIA ZOOM VIDEO CONFERENCE

To join the meeting, click on the following link: https://us02web.zoom.us/j/87675205300
To join by phone, dial 778-907-2071 and enter meeting ID 876 7520 5300

AGENDA

1. Call to Order

2. Appointment of Recorder

3. Approval of the Agenda
THAT the April 22, 2021 Infrastructure Committee agenda be approved, as circulated.

4. Public Questions & Comments

5. Approval of Minutes (Page 2)
THAT the February 18, 2021 Infrastructure Committee Meeting minutes be approved, as circulated.

6. Business Arising from the Minutes

7. Unfinished Business
A. PRV Update

8. New Business
A. PWM Information Report: Infrastructure Communications (Page 6)

9. Public Questions & Comments

10. Adjournment

11. Next Meeting - TBD

INFRASTRUCTURE COMMITTEE MEETING
OF THE VILLAGE OF LIONS BAY
HELD ON THURSDAY, FEBRUARY 18, 2021 at 7:00 PM
COUNCIL CHAMBERS, 400 CENTRE ROAD, LIONS BAY
AND ELECTRONICALLY VIA ZOOM

DRAFT MINUTES

In Attendance (most via video conference):

Committee:	Fred Bain (Chair/Councillor) Ron McLaughlin (Mayor) (In Chambers) Neville Abbott (Councillor) Karl Buhr (Resident Member) Tony Greville (Resident Member) Brian Ulrich (Resident Member)
Regrets:	Norm Barmeier (Councillor)
Staff:	Public Works Manager Nai Jaffer Chief Administrative Officer Peter DeJong
Public:	None

1. **Call to Order**
   The meeting was called to order at 1902 Hrs
2. **Appointment of Recorder**
   Fred Bain, Peter DeJong
3. **Approval of the Agenda**
   Approved with the addition of 8. F. - New Member Appeal
4. **Public Questions & Comments**
   None
5. **Delegations**

None

6. **Approval of Minutes**

November 19, 2020 Minutes approved as with corrections: p 3 Delegation, “confounded” to compounded, and on 8. Unfinished Business, “PVR” to PRV

7. **Business Arising from the Minutes**

A. Minutes from last meeting were reviewed and discussed.

B. Neville asked about Satellite Intenet for infrastructure communications. Karl did some research and satellite is too expensive.

8. **Unfinished Business**

-Included into New Business

9. **New Business**

A. Staff report on the investigation of infrastructure communications – deferred to March meeting.

I. CAO DeJong reported that the workload on staff has been prohibitive as to doing the necessary research.

B. 3 – PRV project Update

I. No update other that they are being worked on and soon to be completed

II. There was a discussion of dressing up the PRVs as there are larger than members and some residents anticipated

a. The size of the enclosure is dictated by the size of the hardware within

b. Possibility of wrapping them

c. Landscaping to “hide” them, respecting staff access to them

d. Maybe the Arts Council could have some input?

III. Anticipating the PRVs to be operating by mid-March

C. KG WWTP Update

I. Treatment plant is working, gear box was defective, new gear box installed, SCADA glitches being worked on.

II. Should be in full operation by final walkthrough February 19th

D. Water Treatment / Filtration Avoidance

a. Filtration avoidance application in 2010 was never completed – PWM working on requirements with the Drinking Water Protection Officer Discussions between the two included details of the run-down of the tank due to an intake blockage and chlorination cut-off point where can’t use for potable

b. Discussions regarding UV needs in liu of filtration.

i. We are not compliant with filtration avoidance – need to deal with NTUs over 1.0 and requirement for higher UV Treatment

ii. Looking into/recommending going to two more UV reactor bulbs at Harvey to deal with increased threat caused by an intake blockage/turbidity and tank run-down

iii. The Drinking Water Protection Officer has given us a look into the future so that we have the time to develop a useful Infrastructure Investment Strategy. Potential for grant funding when regulations change in future.

II. Some discussion about Watershed Protection Plan being another requirement for filtration avoidance – need source water protection plan – potential for IC to assist by researching other WSPs.

E. **Roads and Stormwater Management**

"Develop a plan for increased preventative maintenance of Roads and Drainage that relies on small scale projects using PW or service agreements with contractors."

Comments:

a. Drainage needs to be "Mapped Out"

b. Some ditches have been filled and need to be reinstated

c. Upper Bayview new pavement: water running on road and edge erosion

d. Lots of work on list for PW

i. Is there another way to do the work without using staff's time?

e. Residents should clear their own ditches (Ditches in form or their homes)

i. Need to develop Boulevard Maintenance and Open Watercourse Bylaw

f. Reference to service agreements above and

g. PWM: Need a plan for drainage on each street and a $/year budget for certain amount of work to be done

h. Scale down projects somehow to be affordable

i. should culvert repair and replacement be charged to residents?

i. Should we have neighbourhood input surveys?

i. Major plan? Maybe case specific?

F. **New Member Appeal**

A brief discussion about recommendations for a replacement of Jim Mutrie's seat on the IC

A couple of names were suggested

I. Members to make contact.

10. **Public Questions & Comments**

None

11. **Next Meeting: March 18, 2021, (every 3rd Thursday)**

12. **Adjournment**: The meeting was adjourned at 20:56hrs.

THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

Type	**Information Report**		
Title	**Infrastructure Communications**		
Author	**Nai Jaffer**	**Reviewed By:**	**Peter DeJong**
Date	**April 21, 2021**	**Version**	
Issued for	**April 22, 2021 Infrastructure Committee Meeting**		

Recommendation:

THAT the Information Report, "Infrastructure Communications" be received.

Attachments:

(1) VoLB Data Link Needs Assessment Spreadsheet

Key Information:

SCADA Communications

The Municipality's infrastructure network consists of equipment and processes that, if left unchecked, can cause significant damage within the community. Everything from extreme pressure fluctuations in a pressure reducing valve (PRV) stations, to a failure of the ultraviolet (UV) reactors at a water treatment plant or failure of the motor at the wastewater treatment plant. These causative factors can result in watermain breaks, contaminated drinking water, and environmental contamination, respectively.

Prior to the advent of Supervisory Control And Data Acquisition (SCADA) systems, operations staff would visit sites to record daily data and analyze system performance to ensure smooth operation of municipal infrastructure – a 7 day a week operation that resulted in an extensive labour investment. SCADA changed all of that – operators are now able to monitor systems from anywhere, receive warning alarms when systems are not acting normally, and control processes remotely without the need to visit plants.

This 24/7 operational ability has reduced costs and enabled municipal operations to direct manpower to other areas of operations and maintenance that require human involvement. Data logging and analysis helps operators troubleshoot systems before they fail and can

reduce damage caused by component failures. Further, the auto-generated reporting system enables comprehensive analytics and ensures compliance with regulatory principles. The SCADA communications network is the backbone of any municipal infrastructure system and provides the conduit for flow of data between a remote station and the SCADA Master computer. For example, in an automated PRV station (Figure 1), field data interface devices such as valve actuators, pressure sensors, and flow monitors, provide data to the local Remote Terminal Unit (RTU) which transmits this data over a network connection to the SCADA master computer. Operators wanting to adjust pressure settings or open and close valves can make changes through internet connected devices connected to the SCADA master computer via Virtual Private Networking (VPN) and these directions are transmitted back to the RTU which directs the field interface devices as required.

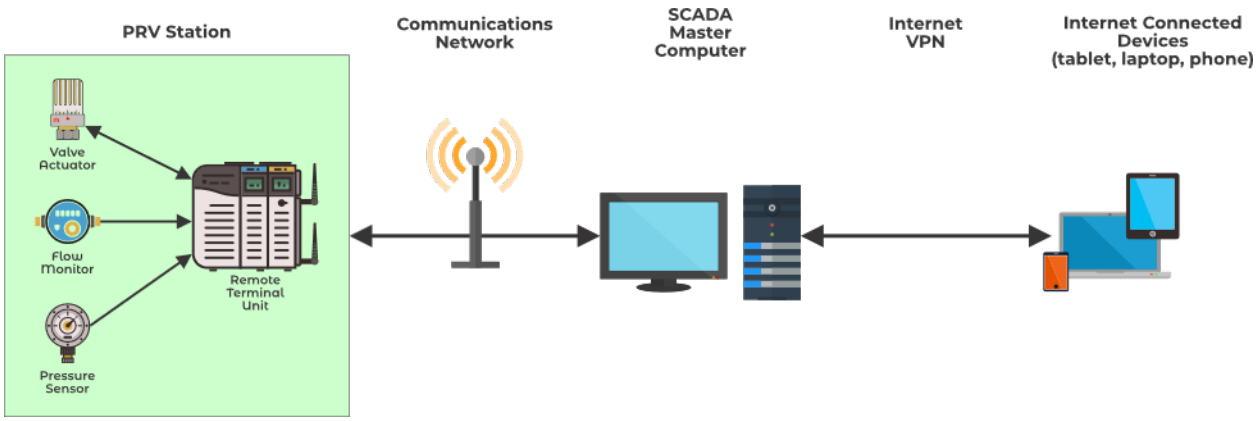

FIGURE 1

When considering SCADA communications networks, several key factors ought to be considered:

Affordability	In order to minimize costs, consider established and reliable communications that take advantage of off-the-shelf technologies and services and existing infrastructure.
Scalability	The selected communications should allow for increased capacity to variable bandwidth requirements.
Reliability	The telecommunications system must perform consistently and precisely with a high degree of confidence. Typically, reliable systems are well established technologies with a robust history of improvement, security, and stability.
Survivability	Data services must be able to survive under a broad range of damage scenarios – man made or natural disasters.
Security	Data services must prevent corruption of or unauthorized access to the data through the provision of established encryption techniques and user authentication.
Restorability	Should a service disruption occur, voice and data services must be capable of being reprovisioned, repaired, or restored to required service levels on a priority basis.

Data transmission between the RTU and SCADA Master can be transmitted through a variety of different communications platforms that can be segregated into two common groups: wired and wireless communications.

Wired Communications

Wired communication refers to the transmission of data over a physical wire buried underground or strung between poles throughout a community. Examples include telephone networks, cable networks, and fiber-optic communication.

	Advantages	Disadvantages
Telephone Line	• Exists within the community. • Very mature technology. • Requires very small capital outlay. • Maintained circuit quality. • No communications expertise required to establish a network. • Adaptable to changing bandwidth requirements.	• Typically, slower, and limited data transmission. • Repair and maintenance are not controlled by the lessee. • Subject to breakage (windstorms, tree debris, etc.). • Line connectors subject to lightning strikes • Continual leasing costs per location. • Failures may be difficult to pinpoint.
Fiber Optic	• Best direct connection with the fastest data transmission. • Large bandwidth allows for video applications (i.e. security cameras) to be part of the SCADA system. • Immune to electromagnetic interference • Immune to lightning strikes • High channel capacity. • No licensing requirement.	• Significant monthly lease charge(s) per location. • Extensive capital costs for the initial installation. • Expensive repair costs. • Expensive test equipment. • Cable subject to breakage and water ingress.

Coaxial Cable	• Exists within the community. • Very mature technology. • Better data bandwidth than telephone.	• Continual leasing costs per location. • Subject to breakage • Subject to water ingress • Failures may be difficult to pinpoint.

A key consideration for the installation of wired communications is the signal degradation over long distances. Degradation varies by cable size, type, and distance but typically distances over 150 meters require some form of signal boost to ensure the quality of the signal. Signal boosters require power to operate thus a second conduit would be required to provide power along the cable run.

Wireless Communications

Wireless communication refers to the transfer of information between two or more points without the use of an electrical conductor as a medium by which to perform the transfer. The most common wireless technologies use radio waves.

	Advantages	Disadvantages
UHF and VHF Voice Radio	• Low maintenance costs. • No ongoing subscription costs. • Own your own equipment. • Well established security. • Minimum interference. • Not dependent on power lines and common carriers	• Frequency assignments controlled by the Federal Government. • Annual license fees along with periodic renewal costs. • Limited frequencies available • Requires line of sight resulting in tall antennae towers to ensure transmission success. • Towers require significant costs to construct and maintain. • Moderate equipment costs. • Low channel capacity and digital data bit rate.

900Mhz spread spectrum and 2.4Ghz Data Radio	• Low maintenance costs. • No FCC license necessary and transmit data at a higher rate than Voice Radio. • No subscription required. • No repeating costs other than maintenance • Secure data transmission method using over the air encryption.	• Requires line of sight resulting in tall antennae towers to ensure transmission success. • Moderate equipment costs. • Towers require significant costs to construct and maintain. • Signal is dramatically affected by physical interference (trees, foliage, buildings, & mountains). • Highly subject to interference from co-channel transmitters • Limited path lengths because of restrictions on Radio Frequency (RF) power output
Microwave	• Independent from power lines and common carriers • Large bandwidth for data transfer • More antenna gain is possible. • Low power consumption as the signals are of higher frequencies.	• Requires line of sight resulting in tall antennae towers to ensure transmission success. • Towers require significant costs to construct and maintain. • Requires expert assistance with installation. Some frequencies require licensing through the Federal Government. • Specialized test equipment and training required. • Requires expensive site development. • Cost of equipment and installation is high. • Electromagnetic interference may occur.

Cellular	• Does not require a line. • Negligible signal interference. • Cell companies have a vested interest and deploy massive resources committed to keeping their networks active at all times. • Low infrastructure and overall system investment.	• Cellular coverage is the primary limitation. • Requires a monthly subscription per location; however, costs can be reduced by restricting the amount of data being transferred.
Satellite	• Good for extreme terrains and remote locations. • Wide area coverage and low error rates. • Easy Access to remote sites.	• Infrastructure is costly. • Monthly subscription costly. • Less control over transmission. • Transmission time delay.

As previously mentioned, SCADA has changed the landscape of municipal operations and maintenance; however, this vast improvement comes with a significant risk – security. As recently as of February 5, 2021, malicious cyber actors obtained unauthorized access to the SCADA system at a U.S. drinking water treatment plant and used the SCADA system to adjust the treatment process. System personnel immediately noticed the change in chemical dosing amounts and corrected the issue before the SCADA system's software detected the manipulation and reacted immediately due to the unauthorized change.

SCADA security is a critical component of a SCADA systems operation that directly impacts the communications network that data is carried over. Established communication technologies have weathered the storm and their strengths and shortcomings are well known, as are the solutions and work arounds to ensure system security. Newer communications technologies such as Umbrella Mesh or WiMax bring with them a greater potential for failure or breach due to hidden vulnerabilities resulting in hidden costs and increased downtime. The vast majority of SCADA communications networks run on established technologies; however, as newer technologies withstand the test of time, they may become established alternatives.

Finally, it is important to remember that when creating a SCADA communications network, communications do not have to be mutually exclusive. A combination of technologies can be used to develop a robust and secure network.

Municipal Communication Needs

The Municipality has a wide variety of SCADA nodes that communicate with the Works Yard SCADA Master Computer (SMC) via wired connections; unfortunately, none of these connections has a backup redundant connection method in the event of an emergency. For critical infrastructure, when lines go down, this requires that staff come in to monitor and make system adjustments on site. During normal working hours, this does not pose a significant cost; however, on weekends and after hours, downed communications require staff to periodically come in to monitor, record data, and make system adjustments – all of which occur at premium overtime hours.

Existing Infrastructure Connections

Currently, both the Harvey and Magnesia Creek treatment plant SCADA systems are connected to the SMC via Telus lines; however, there is not any redundancy built into the system and windstorms often result in downtime. Because of its low infrastructure cost, a cellular backup system would be ideal to provide redundancy to this system.

Similarly, the three new pressure reducing valve (PRV) stations; Upper Bayview, Mountain Drive, and the Bayview School site will all be connected via Telus land lines. None of these stations will have any redundancy when it comes to SCADA; however, for the Upper Bayview and Bayview School site, this is of relatively low importance as above ground stations are easy to monitor and adjust and do not require constant observation. The Mountain Control Valve is critical to the operation of the water distribution system on a number of levels but most importantly, it regulates the amount of water stored in the Harvey Tank to help eliminate stagnation and to provide fire flows to the Magnesia Creek side of the system.

Finally, the new Kelvin Grove wastewater treatment plant (WWTP) is connected via a hard-wired Shaw Cable connection. Like the water treatment plants, redundancy does not exist

but is essential to ensure smooth operations of the new plant. Again, cellular redundancy offers the simplest most cost-effective solution.

Potential Future Connections

Primary consideration for remote connections to the SCADA system is the installation of monitoring equipment at each of the two creek intakes. The raw water intakes for both creeks are contained by steep, rocky, unstable terrain upslope on one side, and steep flowing creeks subject to debris torrents on the other. Access to the intakes is via narrow gravel roads that are subject to rock fall and tree throw hazards from above. Strict safe working guidelines for unstable terrain upslope prohibit crews from entering the watershed areas and water intakes if rainfall parameters are exceeded. This prevents crews from being able to investigate decreased water flow or increased raw water turbidity levels during periods of heavy rain – the exact times most likely to cause either event. Remote still cameras and water level transducers could give staff vital information during an intake blockage event and will would help in recovery preparations. Solar and battery powered equipment is continually evolving and there are compact units that can provide the required information, but for a cellular connection.

Similarly, access to remote PRV's such as PRV 8, 9, 10, 11, and 12 as well as the fill stations at the Highway Tank, Magnesia Tank, and Harvey Tank could all be managed via solar and battery powered remote terminal units such as the Telog RU-32 monitoring system. Systems like this are designed to provide low power data gathering and communication via cellular networks in order to connect remote sites.

It is not just water infrastructure that can benefit from SCADA connections, for example, our existing solar and battery powered radar traffic sign can be connected via a cellular connection to provide real time traffic and speed data via the SCADA system, as would trail counters, pavement temperature sensors, and water meters.

Non-SCADA Communication Needs

Currently, critical emergency communications between the Municipality and interagency groups such as Emergency Management BC (EMBC), ECOMM-911, the Ministry of Transportation and Infrastructure (MOTI), and others is facilitated using ultra and variable

high frequency radio communications through the ECOMM-911 network. This network has recently undergone a significant upgrade and in 2018, the Municipality bought into this network through the purchase of new high-powered radios for Lions Bay Fire Rescue and Public Works operations staff.

Lions Bay Search and Rescue (LBSAR) typically use hand-held two-way radios for their incident communication needs. More wide-ranging communications needs are facilitated by a high-power mobile radio at the Dale Klatt Emergency Building. For private communications between members during an incident, LBSAR members rely on their cell phones. Where this is complicated by cellular coverage, LBSAR does have satellite texting capabilities using proprietary Garmin InReach devices. However, from a localized Municipal emergency standpoint, communications become a weak link. LBSAR uses cellular communications for voice, messaging, and text with photos to converse with Public Works, LBFR, Lions Bay Emergency Social Services, and Municipal emergency response staff – this relies upon good cellular coverage.

The majority of the other non-SCADA communications needs consist of cellular related signal requirements such as parking meters, bylaw ticketing cellular phones, users of on-street parking through a cellular application, residential cellular coverage, and back country cellular signals.

Finally, the last but not the least communication requirement is for the University of British Columbia's (UBC) Hydrology study requirements. The UBC system of field devices consists of battery powered instrumentation that transmit their data using Long Range Wide Area Network (LoRaWAN) technology. Signal data from the field devices is collected at a gateway where it is then transmitted via a cellular signal back to UBC, a diagrammatic representation is illustrated in figure 2.

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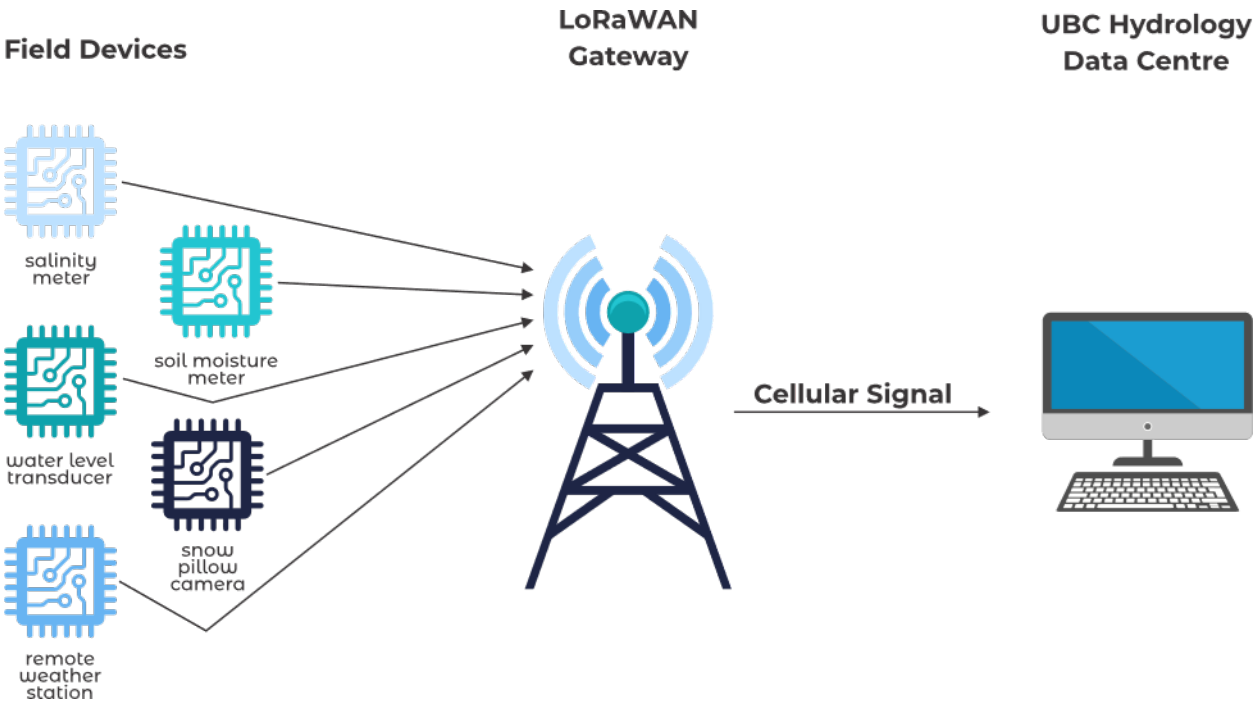

FIGURE 2

LoRaWan technology is constrained by line-of-sight communications and the diversity of locations for field data sensors may require multiple LoRaWan Gateways which will collect and transmit data between them and a master gateway on a tower to ultimately transmit data to the UBC Hydrology Data Centre.

Follow Up Action: To be determined

Point to point comm links	Field device	Field device power requirements		Hardwire network accessible (Telus/Shaw/VOLB ethernet?)	Smaller strategically placed LB owned antennae	SBA Cell tower (Free tower revenue positive)	Consumer WiMAX (Wi-Fi mesh)	Satellite link	Comments
		Existing	Needed						
Harvey & Magnesia Intake Weirs	Camera	No	No	No	Yes*	Yes	No	Yes**	Battery powered surveillance cameras exist, but require cellular signal. Smaller towers may be potential options; however, would require line-of-site and may need several towers to accomplish transmission needs. Smaller towers themselves will require power. Satellite infrastructure and monthly costs prohibitive.
Harvey & Magnesia settlment chambers	Level Transducer	No	No	No	Yes*	Yes	No	Yes**	Low power units that transmit via cellular exist. Same issues with smaller towers and satellite.
Harvey & Magnesia Treatment Plants	Various (flows, chemical stats, equipment status, etc.)	Yes	No	Yes	Yes*	Yes	Yes	Yes**	Plants are connected via wired connection. No redundancy exists. Cellular could provide redundancy at minimal costs. WiMAX network would need to be built out - no data on security robustness for this technology.
3-PRV's (Mountain, Bayview, Upper Bayview)	Flow meter, actuated valves, pressure transmitters	Yes	No	Yes	Yes*	Yes	Yes	Yes**	These 3 stations will be wired connections. Ideally the Mountain Control Vavle would have a redundant backup communications system.
PRV's 8,9, 10, 11, 12	Flow meter, actuated valves, pressure transmitters	No	No	No	Yes*	Yes	No	Yes**	Remote PRV sites - can be battery powered, require cellular signal.
PRV's 1-7	Flow meter, actuated valves, pressure transmitters	Yes	No	Yes	Yes*	Yes	Yes	Yes**	Battery powered monitoring units exist for cellular data; howerver, if communications is wired then the site will require power for the equipment.
Kelvin Grove WWTP	Various (drum rotation, generator status, flow measurement, etc.)	Yes	No	Yes	Yes*	Yes	Yes	Yes**	Plant is connected via wired connection. No redundancy exists. Cellular could provide redundancy at minimal costs.
Radio Comms (PW, LBFR, LB SAR)	Radio Communications	No	No	No	Yes*	No	No	No	Radio comms for LB PW and FR services on the ECOM-911 network. Signal strength robust as is. LB SAR uses two-way point to point radios (see written report). LB SAR also relies upon cellular signal. Same would be true for North Shore SAR.
UBCM hydrology study equipment	Various	No	No	No	Yes*	Yes	Yes	No	Field instruments are battery powered. Point to point communcitions required for the gateway which receives field data then transmits over cellular. Signal strength often too weak to complete data transmission.
Resident cell coverage	Cell phone	Yes		No	No	Yes	No	No	Anecdotal information about lack of reception, dropped calls and general poor quality of cellular services at various areas throughout the municpality.
Back-country cell coverage	Cell phone	Yes		No	No	Yes	No	No	Reported as spotty, which affects SAR operations and public safety.

Point to point comm links	Field device	Field device power requirements		Hardwire network accessible (Telus/Shaw/VOLB ethernet?)	Smaller strategically placed LB owned antennae	SBA Cell tower (Free tower revenue positive)	Consumer WiMAX (Wi-Fi mesh)	Satellite link	Comments
		Existing	Needed						
Resident wifi coverage	Home modems	Yes		Yes	No	No	Yes	No	Residential wifi is almost exclusively hard wired provider (Telus, Shaw)
Parking meters	Solar powered modems	Yes	No	No	No	Yes	No	No	Parking Meters use cellular signal. We are not aware of satellite option meters. Current cellular reception spotty and often insufficient to transmit encrypted data to/from Visa/MC
Trail / Traffic Counters	Sensors	No	No	No	No	Yes	No	No	Units are battery operated / solar powerd - rely on cellular signal to transmit data.
Water Meters	Flow meters	No	No	No	No	Yes	No	No	Meter heads are battery operated, signal sent to hand-held device via RF. RF data can be collected by hand held meter or sent to gateway devices for transmission via cellular signal.

**** Smaller towers may be potential options; however, would require line-of-site and may need several towers to accomplish transmission needs. Smaller towers themselves will require power. Cost and placement becomes an issue.***