Incident Summary #II-1116466-2020 (#20151) (FINAL)

SUPPORTING INFORMATION	Incident Date		December 10, 2020
	Location		Coquitlam
	Regulated industry sector		Electrical - High voltage electrical system (greater than 750V)
	Impact – Injury	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Impact – Damage	Damage description	Underground high voltage conductors were damaged and severed with fuse blown.
		Damage rating	Major
	Incident rating		Major
	Incident overview		While excavating for the installation of new sewer lines at a public community center and school, a high voltage 12.5KV (12,500 volt) underground electrical feeder cable was struck by a mechanical excavator, severing the feeder cable, and creating a short circuit arc fault.
INVESTIGATION CONCLUSIONS	Site, system and components		The electrical supply for the buildings on the property consists of the following (Image 1): • Utility owned overhead power lines with fused cut outs mounted on a utility owned power pole located on public property. • A high voltage (12.5KV) utility supply service cable that runs down the utility power pole and then underground feeding power to the first building located on privately owned property. • A privately owned high voltage (12.5KV) electrical feeder cable that runs underground from the first building to a second building on privately owned property. Underground high voltage supply feeder cables require a minimum of one meter earth covering and markings or cautionary notification indicating that high voltage cables are buried below earth grade surface. “BC 1 Call” is an organization that provides a free service supplying “call before you dig” information on many types of underground utility fed energy systems and equipment in BC including electrical utilities. Their service uses a mapping system to locate the site then sends requests to utility owners who are registered members with “BC 1 Call”. The utilities themselves then supply information directly to the requestor or will physically locate known underground utilities. The service does not provide information on any utility services from organizations that are not registered members with “BC 1 Call”, any services that are unknown by registered utility members or any privately owned buried underground services or privately owned electrical equipment located on any property. Facilities having privately owned electrical equipment greater than 750 volts require an electrical operating permit. The permit holder must have a Field Service Representative (FSR) named on their electrical operating permit to represent the owner in code, technical and worker qualification matters and must ensure that the regulated work complies with all requirements under the Safety Standards Act (the Act).

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	The owner of the property is responsible for the work excavators perform on the property. The owner should consult and work with an appropriate qualified person as it pertains to buried underground electrical equipment prior to digging. The contractor, excavator and their workers also must ensure to meet all applicable regulatory requirements and as required by the owner and the owner's authorized qualified person (example an FSR named on an operating permit or an installation permit who provides professional guidance to the owner) regarding any excavation on private premises that affects or involves alterations to an electrical equipment installation. Digging near buried electrical equipment or affecting and altering an electrical equipment installation may require an appropriate permission or appropriate permit and must be authorized, as required under the Act, before any digging occurs. BC Electrical Code 2018 defines a qualified person as: One familiar with the construction and operation of the apparatus and the hazards involved.
Failure scenario(s)	In approximately 1955, a private high voltage underground feeder cable was installed between the two buildings on site. Some time after the installation, a paved roadway was built above the feeder cable and the original amount of protective earth covering above the feeder cable was reduced from 1 meter to 30cm (Image 1). In 2020 new sewer lines were being installed at the site that required excavation. The owner had taken actions to identify and locate underground hazards and prepare for excavation using "BC 1 Call" services and also referencing a document showing ground penetrating radar (GPR) scans which had been conducted previously in 2018 for finding buried electrical equipment. When the tests were conducted the GPR scans were not performed on the entire premises. The owner had requested to scan only certain portions of the site and did not include the portion of premises where the buried high voltage feeder cable was struck and damaged. There was no reason available or provided as to why certain portions of the premises were not scanned and tested using GPR testing. The FSR named on the electrical operating permit was not contacted regarding the buried high voltage feeder cable that was struck and damaged on private property. No other actions were taken by the owner of the property or others to identify and locate privately owned underground electrical equipment buried on privately owned premises where the high voltage feeder cable was struck and damaged. "BC 1 Call" does not provide information pertaining to privately owned electrical equipment on any property. While excavating for the sewer lines, the excavating contractor was unaware a private high voltage feeder cable was in the vicinity. No markings identifying the location of the feeder cable or any mechanical protection or protective boards were found above the feeder cable where this feeder cable was struck and completely severed by the excavating bucket of the machine.
Facts and evidence	**Witness statements** - The feeder cable that was struck was originally installed in approximately 1955. - The area above the feeder cable had been excavated down and a portion of earth covering had been removed from above the feeder cable due to the installation of a paved roadway installed sometime after 1955.

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- An appropriate qualified FSR was not contacted and was not aware of proposed regulated work prior to excavation of earth above existing high voltage feeder cable where the feeder cable was struck and damaged.
- The presence of the private high voltage feeder cable near the excavation was not known to the workers.
- No marking tape, markers or cautionary notices indicating high voltage feeder cable conductors were buried below earth grade were found at, near or above the cable at the location where the feeder cable was struck and damaged.
- The feeder cable was found to be installed too close to the surface of the finished earth grade.
- The consultant and owner failed to acquire the archived municipal site drawings which showed the location of the high voltage feeder cable as it pertained to where this feeder cable was stuck and damaged.

Site observations / Photos

- Measurements were taken and the feeder cable was found to be only 30cm deep below the paved roadway surface which is 70 cm less than the required 100cm burial depth for the feeder cable.
- The feeder cable was damaged and completely severed during excavation.
- A test hole was dug approximately 15-20 meters horizontally away from the paved roadway where the feeder cable was struck and damaged. This test hole found this same feeder cable was buried at the appropriate required depth but still without identification, warning markers or mechanical protection as required for the high voltage feeder cable.

Utility location service report "BC 1 Call"

- The "BC 1 Call" website states" *Some utility owners do not identify services on private property. Private property services are sometimes referred to as secondary lines or house lines as they have been installed by a developer and not the utility owner. Secondary lines can be located by engaging private contractors to do the work."*
- The confirmation email from "BC 1 Call states "*Note that facility owners will locate only those facilities that they own and/or operate. Customer-owned or privately buried facilities will not be marked"*

Older archived site drawings

- Drawings show the existence of the high voltage feeder cable location at the location of the excavation where the incident occurred.
- The existence of a high voltage feeder cable was not identified onto the newer construction drawings that were to be used for the most recent construction project.
- The original drawings show 1 meter of ground cover and mechanical protection wooden planks installed above the feeder cable.

There was no appropriate permit and/or no appropriate permission in place before regulated work was performed and alterations to electrical equipment installation occurred involving existing buried high voltage feeder cable that was struck and damaged on premises.

There was no supervision of workers and regulated work by a person that is qualified, permitted and authorized to provide supervision, as required under the Act, to ensure that the persons performing regulated work under a permit have the qualifications that are appropriate for that type of work.

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Causes and contributing factors	It is highly likely that inadequate steps were taken to identify the presence of the existing high voltage feeder cable that was buried on the site where the excavator struck the feeder cable and caused the incident. The persons responsible for the excavation were not aware that an appropriate qualified person was required to be involved in the regulated work as required under the Act. Contributing factors include: • The reduction in above ground cover when the paved roadway was installed. • Lack of marker or cautionary notices above the feeder cable. • Not consulting the appropriate FSR for ensuring compliance with the Act. • Not having the required supervision by qualified persons. • Not obtaining an installation permit whereas having an installation permit would have necessitated the involvement of qualified persons ensuring compliance with the Act.

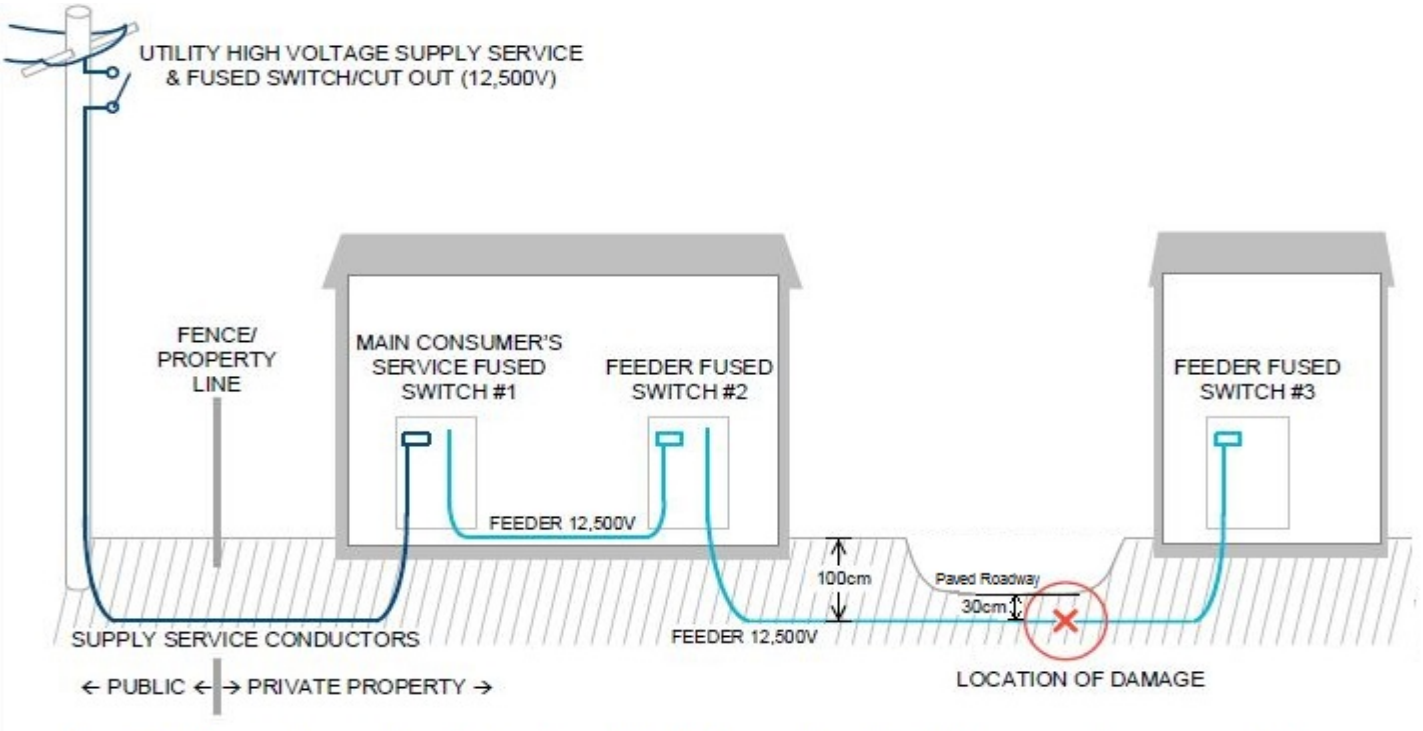

Image 1 – Diagram showing the electrical supply to buildings on the site. The black conductors are utility owned and identified through ”BC 1 Call” services. The blue “feeder” conductors are privately owned and not identified through “BC 1 Call” services.

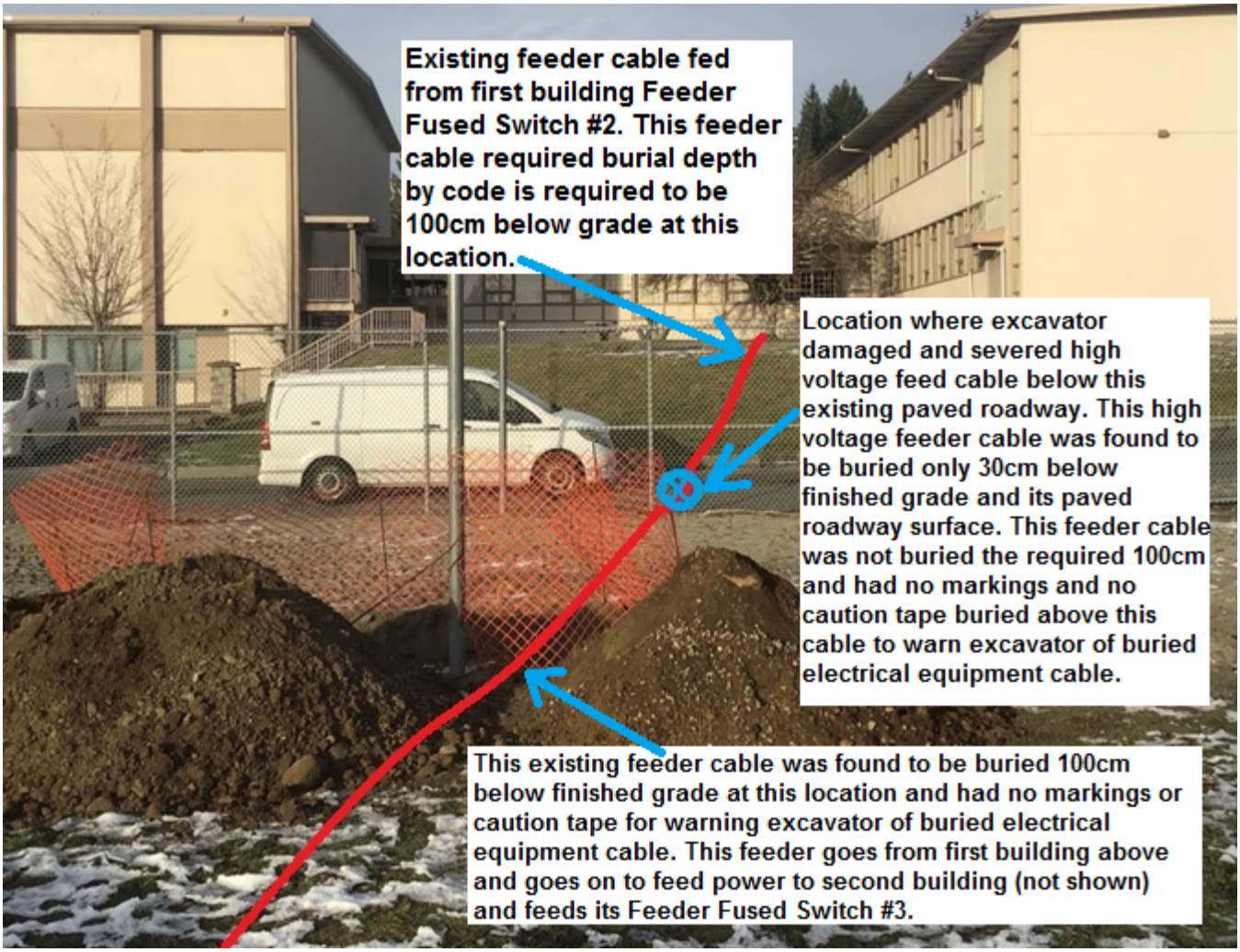

Image 2 - The red line represents the existing high voltage feeder cable. At the top of the photo is the existing earth grade that requires high voltage feeder to be buried to 100cm. The blue circled “X” at the middle of paved roadway the same feeder cable was found buried only 30cm due to the previous excavation of the earth grade for installation of the paved roadway.

Image 3 - The measuring tape shows the high voltage cable is only buried 30cm below finished grade at roadway and there is no caution tape buried in earth above the cable to warn excavator of buried electrical equipment cable. This cable is required to be buried at least 100cm below finished grade surface and must have a cautionary marker tape or other markings to warn excavators of buried electrical equipment.

Image 4 - Test hole excavated away from roadway showing the cable was buried to proper 100cm depth but did not have any markings caution tape or mechanical protection.