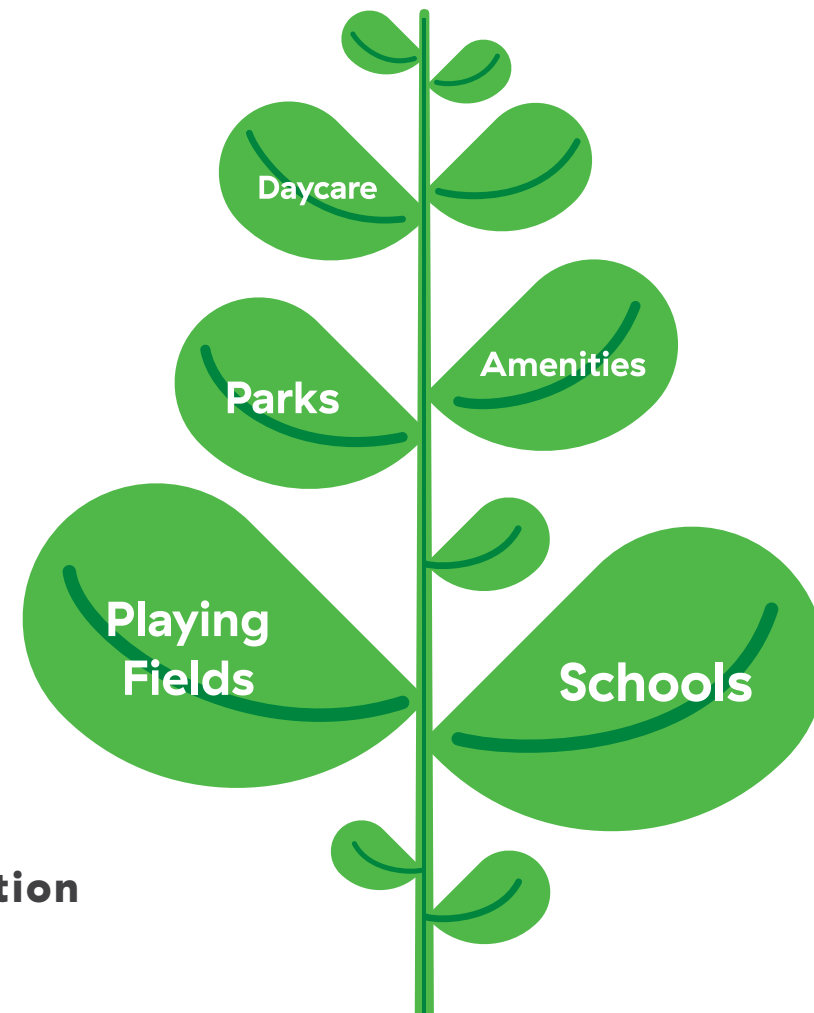


Community consultation: interests and ideas

Supplemental information: overview of impacts and mitigation
February 15, 2017



Clean & Reliable Energy



This supplemental information is meant to be read together with the consultation discussion guide and feedback form, available at bchydro.com/seed.

Seed at a glance.

Vancouver is one of the greenest, most livable cities in the world. Our population is growing and so is demand for energy. In fact, demand for electricity in Vancouver is expected to grow by 75% over the next 30 years. We can provide the clean renewable power that Vancouver needs, but our substations serving downtown Vancouver are aging and need to be upgraded or replaced.

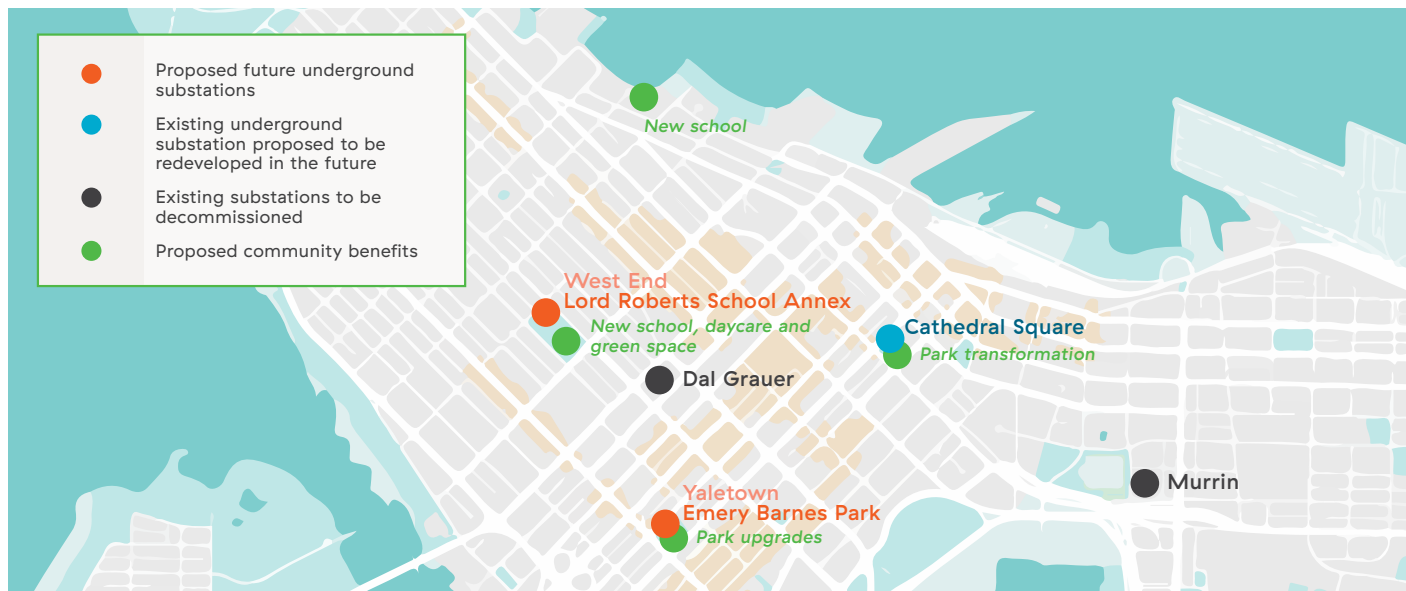
Our usual way of doing things would be to find and buy a piece of land and build a substation on it. But that means putting a

substation on land that could otherwise be used for housing, businesses, schools, or parks. A substation that neighbours would always see.

A better idea?

Instead, what if we used money and land more wisely and built two new electricity substations below ground, while using the space above them for new schools, new daycare spaces and improved parks.

That's our idea. That's **seed**.



- A complete transformation of **Cathedral Square Park** to make it a more desirable place to visit (2020)
- Possible added amenities to **Emery Barnes Park** in Yaletown, if requested by the community (2020)
- New **school in Coal Harbour** (2020)
- New **school, daycare spaces** and **green space** in the West End (2025)
- New underground substation in the West End (2025)
- Refurbishment of **Emery Barnes Park** (2039)
- New underground substation under **Emery Barnes Park** (2041)
- Upgrades to the existing underground **Cathedral Square** substation (2050)
- Significant funds that the Vancouver Park Board could use to provide other potential benefits, such as a new park or recreational facilities

Substation safety.

Our top priority at BC Hydro is safety.

We work to ensure the public is safe around our electricity system and that our employees go home safely every day.

We operate and maintain more than 300 substations throughout the province. This includes our underground substation at Cathedral Square Park which has been operating safely for more than 30 years.

Each BC Hydro substation is designed and built to rigorous safety and environmental standards. This includes installing monitoring equipment that detects and responds to conditions that might lead to equipment failure, before the failure occurs. An underground substation would be no different.

Any new underground substations in downtown Vancouver would use the most modern technology available.

In a modern underground substation, the use of oil is eliminated through the use of gas-insulated technology for the equipment, including gas-insulated transformers. This type of gas is not flammable so the risk of fire or explosion is virtually eliminated.

Our substation facilities are designed to meet the latest building codes and our substation structures are built to withstand a very large earthquake, the kind that would be expected to happen only once in every 2,475 years. There are firm soils under the proposed underground substation locations which are preferred when designing large structures to withstand a large earthquake.



Inside the Mount Pleasant substation

Safety and EMF.

Electric and magnetic fields.

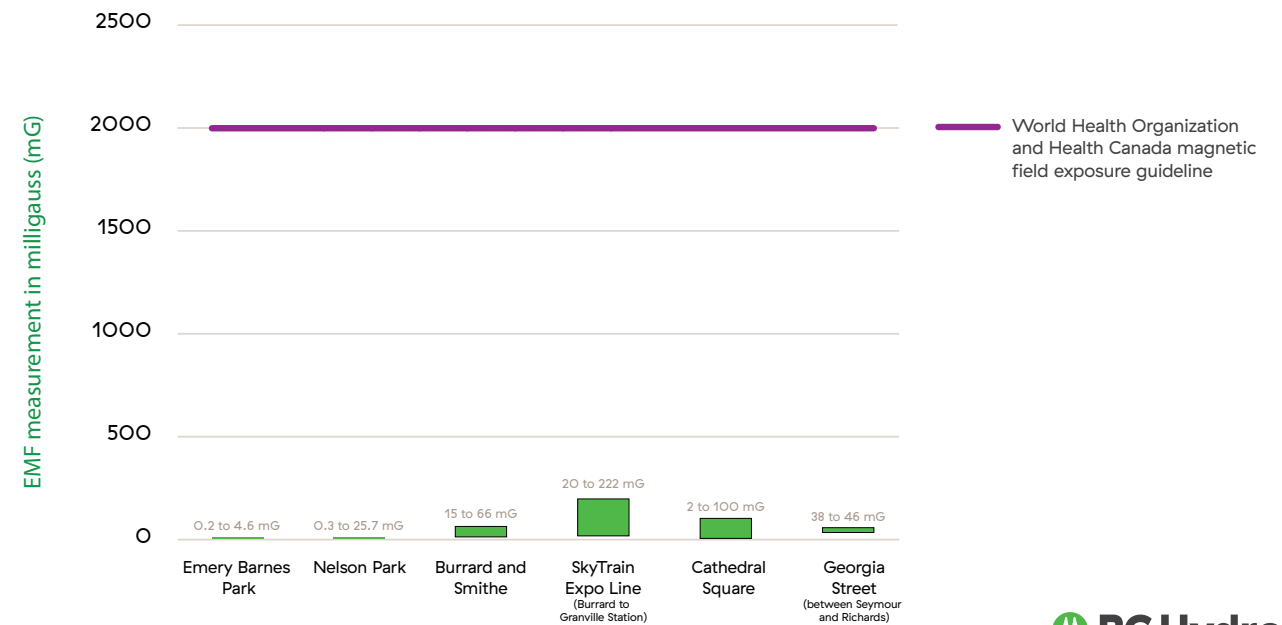
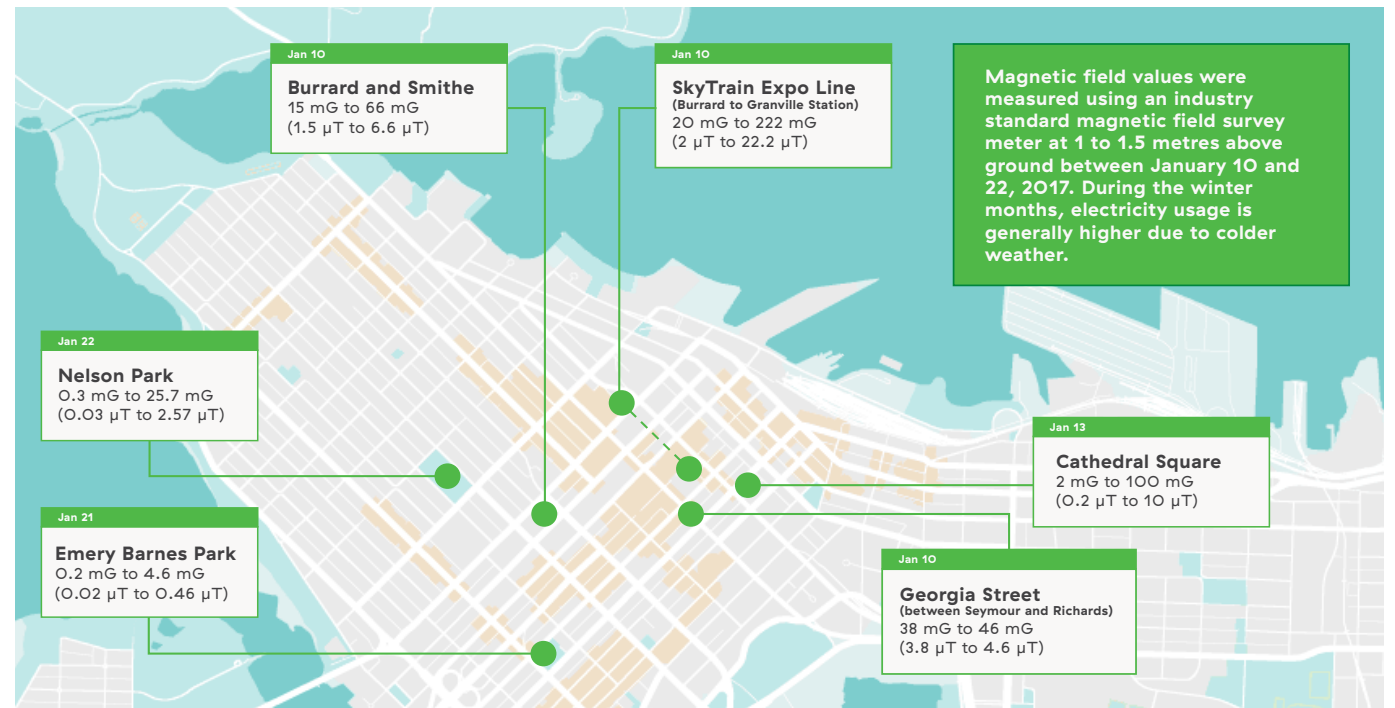
We recognize there is some public concern about electric and magnetic fields (EMF) and possible health effects. BC Hydro safely operates 37 substations in Metro Vancouver north of the Fraser. Of the ones BC Hydro owns, over half are within 100 to 200 metres of public spaces such as parks, schools or shopping centres.

When it comes to matters of health and electricity infrastructure, we rely on the independent research and findings of health authorities including Health Canada and the World Health Organization.

Health Canada and the World Health Organization have indicated that there is no confirmed evidence of any health risks from magnetic field measurements below the recognized exposure limit of 2,000 milligauss (shortened as mG) or 200 Microtesla (shortened as μT).

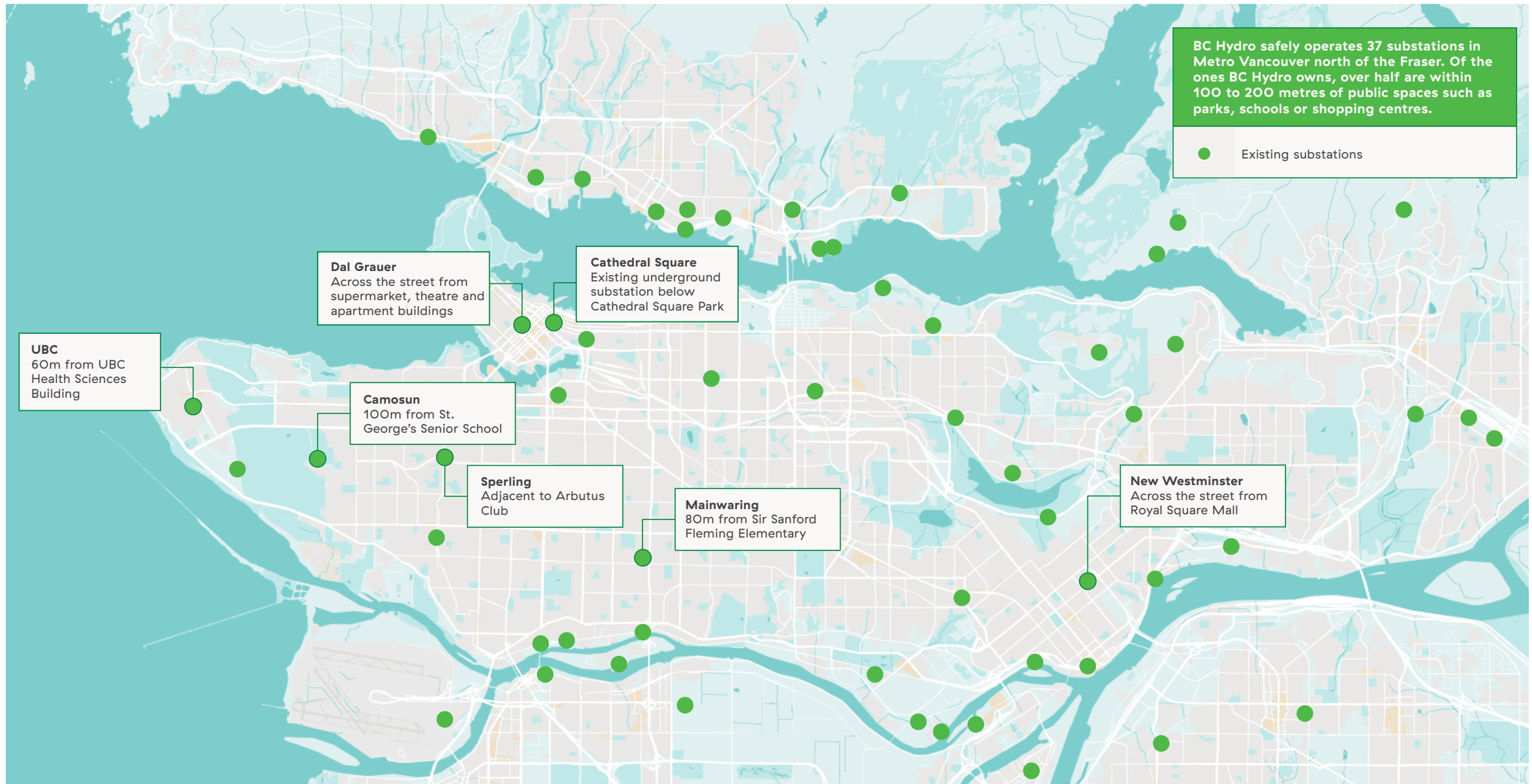
At Cathedral Square Park, above our existing underground substation in downtown Vancouver, measurements range from 2 mG to 100 mG (0.2 μT to 10 μT), or approximately 0.1 to 5% of these conservative exposure limits. For comparison, dishwashers and washing machines emit around 20 mG (2 μT), SkyTrain ranges between 10 and 200 mG (1 μT and 20 μT), and hairdryers and portable heaters emit around 300 mG (30 μT).

For more information, please visit bchydro.com/emf.



EMF readings in downtown Vancouver

Vancouver area substations.



Overview of potential impacts and mitigation.

We recognize that the construction of substations, schools, daycares and park improvements would affect those who live, learn, work and play in these neighbourhoods. We're studying what the impacts of **seed** may be, so that we can propose ways to avoid or mitigate them.

Stantec, an internationally-recognized independent engineering, consulting and design firm, has completed a preliminary technical, environmental and socio-economic study looking at the following topics for each of the West End – Lord Roberts Annex and Nelson Park, and Yaletown – Emery Barnes Park sites.

- Current park use
- Park aesthetics
- Electric and magnetic fields
- Environmental and socio-economic considerations of a new school, new daycare and park improvements
- Park feature inventory
- Air quality
- Property values
- Subsurface hydrology (underground water)
- Vancouver Park Board strategies and initiatives
- Noise and vibration
- Public safety
- Urban forestry
- Human health
- Stormwater management
- Vancouver School Board strategies and initiatives
- Environmental management during construction

Over the next few pages, you'll find a brief overview of the key findings and potential mitigation measures from Stantec's report.

For more information, please read Stantec's report at bchydro.com/seed

Impacts of our traditional approach.

Stantec's scope of work was to study the potential impacts and mitigation measures for the construction of underground substations at these sites and the ongoing operation of the substations once construction is complete. Should **seed** not be advanced, instead of investing in schools, daycares and park improvements, we would need to use those resources to take our traditional approach to buy land and build above-ground indoor substations somewhere in the West End and Yaletown. These above-ground indoor substations would likely be within a three-block of the radius of the currently proposed sites. The potential construction impacts of building these above-ground indoor substations have not yet been studied but, based on our experience with both types of substations, would be comparable to those identified by Stantec. However, the longer term impacts to the public of an above-ground indoor substation, such as public and operational safety, visual impact, and noise, would be greater than an underground substation.

West End

Overview of potential impacts and mitigation.

Stantec studied potential impacts and mitigation measures of a proposed underground substation located in the West End, on both Lord Roberts Annex (proposed substation location) and the adjacent Nelson Park. The following provides an overview of the key potential impacts and mitigation for each site determined by Stantec as well as the key topics that have been raised by members of the community to-date.

Lord Roberts Annex

Typical construction impacts would be mitigated

- Temporary increase in air contaminants, noise and vibration, consistent with construction of new condo or office towers
- Construction management practices would be in place, such as suppressing dust, minimizing construction emissions, building noise barriers, traffic management, and scheduling works during least impactful time of day and year

No net loss of trees

- Most of the 39 trees currently on the Lord Roberts Annex site would need to be removed, and would be replaced at a ratio of at least 1:1 on the site, within Nelson Park or nearby, in consultation with the Vancouver School Board and Vancouver Park Board
- Clearing activities would be undertaken outside of bird breeding windows to minimize impacts to birds and wildlife

Minimal impacts during operations

- For information about safe operations of substations, please refer to [Substation safety](#) on page 3
- Operation of the underground substation would not be expected to have any air quality or vibration impacts compared to current conditions
- Warm air vented from the substation would be without any contamination or particulates, and could be captured and used to heat and cool the new school to reduce operating costs, subject to further discussion with the Vancouver School Board
- Noise from the ventilation system would be below quiet zone noise limits and state-of-the-art technology would reduce noise as much as possible
- The substation would be operated remotely, with a team of two to three electricians typically visiting the site two to three times per week, using a standard-size truck or van
- Entrance and venting structures associated with the underground substation would be designed to blend into the site and maximize greenspace, and could double as public art

Risk of impacts from electric and magnetic fields (EMF) is low

- The risks of impacts from EMF at a new school at the Lord Roberts Annex site are considered to be low
- A new school would be located a minimum of 70 metres from the underground transmission cables, the main source of EMF; therefore levels at the school would be expected to be similar to levels at the site today (without a substation)
- Anticipated EMF levels on the proposed playing field directly above the underground transmission cables would be similar to or lower than those at Cathedral Square Substation (approximately 100 mG at peak loads, and less than 25 mG 95% of the time), well below the International Commission on Non-Ionizing Radiation Protection, World Health Organization and Health Canada-endorsed guideline value of 2,000 mG
- Should the substation proceed, EMF levels would be modelled in detail based on final design, presented to the public through a comprehensive consultation process, and monitored post-construction to verify predicted levels

For more information, please read Stantec's report at [bchydro.com/seed](https://www.bchydro.com/seed)

West End

Overview of potential impacts and mitigation.

Nelson Park

No permanent changes to Nelson Park

- The only construction activities within Nelson Park would be the installation of underground transmission and distribution cables, which would take approximately one to two months to install – construction would take place in late fall/winter months to reduce impacts to park users
- The direct impacts of operation of the substation on Nelson Park amenities and programming would be limited

Typical construction impacts would be mitigated

- Temporary increase in air contaminants, noise and vibration, consistent with construction of new condo or office towers
- Construction management practices would be in place, such as suppressing dust, minimizing construction emissions, building noise barriers, traffic management, and scheduling works during least impactful time of day and year

No net loss of trees

- Based on the conceptual design of the underground substation, of the 131 trees currently in Nelson Park, approximately 5 trees may need to be removed for the installation of underground distribution and transmission cables. Should **seed** move forward, additional design would be undertaken to further minimize impacts to trees in Nelson Park. Any trees that are removed would be replaced by planting new trees at a ratio of at least 1:1 in the park or nearby, in consultation with the Vancouver Park Board.
- Clearing activities would be undertaken outside of bird breeding windows to minimize impacts to birds and wildlife

Risk of impacts from EMF is low

- Risk of impacts from electric and magnetic fields (EMF) in Nelson Park are considered to be low
- EMF levels directly above the underground transmission cables would be similar to or lower than those at Cathedral Square Substation (approximately 100 mG at peak loads, and less than 25 mG 95% of the time), well below the International Commission on Non-Ionizing Radiation Protection (ICNIRP), World Health Organization and Health Canada-endorsed guideline value of 2,000 mG



Artist's conceptual rendering

For more information, please read Stantec's report at bchydro.com/seed

Yaletown

Overview of potential impacts and mitigation.

Stantec studied potential impacts and mitigation measures of a proposed underground substation at Emery Barnes Park in Yaletown. The following provides an overview of the key potential impacts and mitigation for each site determined by Stantec, as well as the key topics that have been raised by members of the community to-date.

Emery Barnes Park

Temporary park space could replace affected areas of Emery Barnes Park

- Should the underground substation proceed, during construction, there would be temporary impacts to approximately 55% of the usable space within Emery Barnes Park, disruption to pathways and travel routes, and interference with existing park amenities
- A temporary park space could be established nearby for the duration of the construction period, in consultation with the Vancouver Park Board and City of Vancouver

Typical construction impacts would be mitigated

- Temporary increase in air contaminants, noise and vibration, consistent with construction of new condo or office towers

- Construction management practices would be in place, such as suppressing dust, minimizing construction emissions, building noise barriers, traffic management, and scheduling works during least impactful time of day and year

No net loss of trees

- Of the 111 trees currently in Emery Barnes Park, 65 would need to be removed prior to construction, and would be replaced by planting new trees at a ratio of at least 1:1 within the park or nearby, in consultation with the Vancouver Park Board
- Clearing activities would be undertaken outside of bird breeding windows to minimize impacts to birds and wildlife

Minimal impacts during operations

- For information about safe operations of substations, please refer to [Substation safety](#) on page 3
- Operation of the underground substation would not be expected to have any air quality or vibration impacts compared to existing conditions
- The substation would be operated remotely, with a team of two to three electricians typically visiting the site two to three times per week, using a standard-size truck or van

- Noise from the ventilation system would be below quiet zone noise limits and state-of-the-art technology would reduce noise as much as possible
- Entrance and venting structures associated with the underground substation would be designed to blend into the site and maximize greenspace, and could double as public art – these would use up to 3% of the existing Emery Barnes Park site

Risk of impacts from electric and magnetic fields (EMF) is low

- Risk of impacts from EMF in Emery Barnes Park are considered to be low
- EMF levels directly above the underground transmission cables would be similar to or lower than those at Cathedral Square Substation (approximately 100 mG at peak loads, and less than 25 mG 95% of the time), well below the International Commission on Non-Ionizing Radiation Protection (ICNIRP), World Health Organization and Health Canada-endorsed guideline value of 2,000 mG

For more information, please read Stantec's report at bchydro.com/seed