

Review of Stantec report - Nelson Park/Lord Roberts Annex: Proposed Underground Substation

Performed for the Vancouver School Board

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Introduction: The Stantec report - Nelson Park/Lord Roberts Annex - is a comprehensive but high level assessment. In many places throughout the report the authors make recommendations for further study on areas where more details are required before a more precise estimate can be made regarding anticipated levels of exposure to noise, air pollutants or magnetic fields. The Stantec report includes assessments related to geology and groundwater as well as potential sources of impacts on human and non-human species.

Sources of Potential Impact on Human Health

Construction Phase

Air Pollutants

Typical of any construction project, construction of the underground substation will have potential impacts on air quality associated with emissions from construction equipment and also from dust associated with excavation and removal of soil and rock from the construction site. While these sources of emissions to air cannot be eliminated, they can be mitigated. The Stantec report lists a number of mitigation measures that can be employed to reduce impacts on neighbourhood air quality. These appear appropriate and if employed during construction should be of some benefit in reducing exposure to dust and pollutants associated with the operation of construction equipment.

To ensure that a satisfactory level of control has been achieved, it may be useful to conduct some air monitoring for common air pollutants such as particulate matter (PM), oxides of nitrogen and carbon monoxide during construction. The results can be compared against background levels prior to construction and against national and provincial air quality standards. It may also be useful to have a hotline or other means by which local residents and others in the vicinity can report in a standardized manner, details of any problems related to air emissions associated with the construction. These can be reviewed regularly by those responsible for operation and oversight with a view to increasing the level of control if, when, and where necessary.

Noise and Vibration

Some degree of noise impact occurs with any construction project. The potential impacts of construction of the underground substation on noise levels are important because of the duration of the construction and because of the number of people not directly employed in the construction who will be in the vicinity. The Stantec report provides a number of suggestions as to how the impacts of noise can be mitigated. It would be helpful to have some more detailed

assessment of current background noise levels at the Nelson Park/Lord Roberts Annex site. The City of Vancouver does have noise standards which are referenced in the Stantec report. The noise levels permitted in Vancouver appear to be higher than those recommended in recent health based reviews such as the Night Noise Guidelines for Europe which recommend a health based night noise limit of 40 dBA L_{eq} with an interim target of 55 dBA L_{eq} . (World Health Organization. Night noise guidelines for Europe. 2009. Copenhagen: World Health Organization)

Night noise should be controllable by timing of construction activity.

Electromagnetic Fields (EMF)

The underground substation will not be a source of EMF until after construction is completed and it becomes operational.

Safety and the Built Environment

Movement of equipment and material during construction is associated with safety risks to those on the site as well as others in the vicinity. In principle, the work associated with the proposed underground substation is no different than any other major construction project in an urban area. The Stantec report outlines standard measures that can be used to reduce safety risks.

Operational Phase

Air Pollutants

Ventilation stacks for the underground substation will be located on the surface. There is little combustion occurring underground at the substation, and with the possible exception of some vehicle exhaust, it does not appear that there will be harmful emissions coming from the stacks.

Noise and Vibration

Noise and vibration at the site once the substation is commissioned will be lower than during construction.

A more detailed assessment of the likely noise and vibration from the underground station after it is in operation would be helpful. This can be assessed against current levels in the neighbourhood, particularly at night when they are likely to be most prominent. Although there are no standards for vibration, and the sound levels specified by the City of Vancouver should not be difficult to meet, perceptible differences in noise or vibration after start up may be a focus of complaints.

Electromagnetic Fields (EMF)

The EMF associated with the underground substation may be one of the most controversial aspects of the project.

Health Canada, the International Commission on Non-ionizing Radiation Protection (ICNIRP), and the World Health Organization do not believe there is evidence of adverse effects from community exposure to EMF at power frequencies. ICNIRP has a guideline for public exposure to magnetic fields at power frequencies of 2000 mG (milliGauss).

Health Canada's opinion is summarized in the following quote from their website: *"Health Canada does not consider that any precautionary measures are needed regarding daily exposures to EMFs at ELFs. There is no conclusive evidence of any harm caused by exposures at levels found in Canadian homes and schools, including those located just outside the boundaries of power line corridors."* <https://www.canada.ca/en/health-canada/services/home-garden-safety/electric-magnetic-fields-power-lines-electrical-appliances.html>

The assessment by Aura Health and Safety (Appendix E in the Stantec report) indicates that any magnetic fields above the substation are likely well within the ICNIRP guidelines. The final design of the substation will be important to more accurately predict the maximum magnetic fields which will be present on the ground above the substation. There are 3 ways in which the magnetic fields can be attenuated: the depth at which the high voltage cables are buried, shielding around the lines and the arrangement or phasing of the multiple lines entering the station.

BC Hydro has measured magnetic fields at their Cathedral Square underground substation; the results are included as Appendix G in the Stantec report. The assessment indicates that peak magnetic fields would be no more than 10% of ICNIRP guidelines even during contingency events. Under normal operating conditions magnetic field levels are substantially below this. While these results are not a substitute for more detailed assessment of the magnetic fields that would be present at the proposed substation, they do serve as a measure of what would likely be an upper limit. It should also be noted that the exposure to any individual will depend on where they spend their time. It is unlikely that anyone would be present for extended periods at locations where the magnetic fields are at their maximum.

A more precise assessment of the magnetic fields at the new substation should be possible as more details of the design become available. Selecting a target level below the ICNIRP guideline may be challenging but could take into account levels elsewhere in the community or what measures could be practically employed to minimize magnetic fields.

Exposure to magnetic fields associated with power transmission is considered “possibly carcinogenic” by the International Agency for Research on Cancer (IARC) based on a 2002 assessment. Evidence that has accumulated since then would not be likely to warrant a change in this classification. The IARC classification is based on *limited evidence* in humans of an association with childhood leukemia.

IARC uses the categories “probably carcinogenic” or “carcinogenic” for those risk factors where there is stronger evidence to make a link with cancer. IARC classifies anabolic steroids and consumption of red meat as “probably carcinogenic”; while outdoor air pollution, diesel engine exhaust and consumption of processed meat are classified as “carcinogenic”.

The IARC classification is not an assessment of the risk of developing cancer. Risk is a function of the potency of a carcinogen and the frequency, intensity and duration of exposure.

Built Environment

The positioning of ventilation stacks, vehicle access points and some other details of the above ground landscaping are not finalized. As these may have implications for a range of future uses, additional input from site users would be helpful. There has already been consideration of the layout of the site with respect to a variety of future recreational uses and sight lines to minimize opportunities for criminal activity.

Conclusions and Suggestions for Further Work

The proposal by BC Hydro appears to be an innovative approach to locating transmission infrastructure in a densely populated area while preserving space for other community uses at ground level. Many of the potential impacts associated with underground substations (e.g., EMF) also occur with above ground substations.

The Stantec report provides a comprehensive but high level assessment of the potential impacts of the project on site users and neighbours. As details of the project have not been finalized, it is not possible to perform a more detailed assessment at this time.

Consistent with the assessment performed by Vancouver Coastal Health, based on the information in the Stantec review, I agree that the concept can be accomplished in principle without significant negative impacts on public health.

Should the project go ahead to a more detailed design, there are some areas where a more rigorous assessment of exposures to site users and neighbours would be helpful. These include noise and air emissions during the construction phase. During the operational phase, these include noise, vibration and magnetic fields.

Although the substation would appear likely to meet all applicable regulatory requirements during its operational phase, there may be discussion as to the extent the project should go beyond current standards or guidelines. To inform these discussions it may be helpful to compare projected noise, vibration and magnetic field levels associated with the substation to current background and to levels at other sites in the community.

Details of any final design will likely involve trade-offs between a variety of desired and undesired features. There will likely be a variety of perspectives on what constitutes the *optimal* design. Community acceptance of any final design will likely be influenced by the extent to which community members have had input and opportunity to influence the final design.

If meeting certain levels of noise and magnetic fields is important, post start up measurement of these levels to demonstrate that a promised level of performance has been met can be useful in building confidence and trust with site users and neighbours.