RYZUK GEOTECHNICAL
Engineering & Materials Testing

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November 15, 2017
File No: 8-112-4

Spar Consultants
700 Demel Place
Victoria, BC
V9C 3L6

Dear Sir,

Re: Proposed Tower Upgrade
Mount Douglas Summit – Saanich, BC

As requested, we visited the above referenced site to carry out a visual assessment of the geotechnical conditions in the area of the existing communications tower near the summit of Mount Douglas. We understand that the District of Saanich wishes to upgrade the tower foundation. Our associated observations, comments, and recommendations in this regard are contained herein.

Our work consisted of a combination of a desktop study and a brief site reconnaissance. The desktop study included a review of available information regarding the tower, as well as the review of local geological maps and aerial photography. A site reconnaissance was completed on August 31, 2017, and consisted of traversing the site by foot and documenting features of geological significance.

The subject property is located atop Mount Douglas roughly 30 m south of the parking lot and viewing area at the end of Churchill Drive. The site is characterized by a local topographic high approximately 150 m south of the summit. The area of the tower is steeply inclined towards the north and undulating to moderately sloping towards the east, west and south. The ground conditions within the area of the tower consist of lightly weathered gneiss associated with the west coast crystalline complex, typical for the Victoria area. The ground conditions encountered are consistent with the geological mapping we reviewed during our desktop study. Vegetation in the area consists of intermittent deciduous trees and intermittent brush with little ground cover. We did not identify any significant drainage courses to be present within the site.

Based on a tower detail provided by Spar Consultants, the existing communications tower is 36 m from the top of the concrete foundation to the top of the antenna. The concrete base is approximately 1.2 m in length by 1.8 m in width and 1.2 m in height from existing grade. We understand that there is limited information available associated with the foundation elements of the tower.

Based on our preliminary analysis, we have determined that the concrete foundation alone could not prevent the tower from overturning in high wind speeds, therefore it is likely that anchors, or at a minimum, grouted dowels, were installed at the time of construction. It is almost impossible to determine the characteristics of the support system installed within the foundation and no indicators of such were observed during our site visit.

Rock anchors are typically designed based on cone uplift capacity or bond strength capacity (grout bond to rock/bond to bar), and are designed using a safety factor of 3 or more. Based on our experience, we have not observed rock failure associated with cone uplift. If the anchors within the foundation were designed on this basis, it is likely that the anchors have significantly more capacity than the design numerically determined. If the anchors were designed on the basis of bond strength, a similar additional capacity can also be expected. The installation of grouted dowels opposed to rock anchors is unlikely, however if this is the case, we typically observe relatively large bond capacities. Shear failure of the bar can be expected prior to any rock associated failures. Previous experience with gneiss bedrock in the area indicates compressive strength capacities of 5000 kPa using a Serviceability Limit States (SLS) design and 7500 kPa for Ultimate Limit States (ULS) design.

The size and condition of the uplift elements are unknown. There was no damage to the existing concrete foundation or indication that corrosion has been adversely affecting the foundation elements. Anchor corrosion is not expected to be significant, considering a 50 to 100 year lifespan of the tower.

Other unknown aspects of the foundation include the quality of the bedrock underlying the foundation and the condition of the concrete bond with the bedrock subgrade. It is important to note that since the construction of the tower, seismic design considerations have become more rigorous and given a large earthquake event, the risk involved with the unknown foundation elements could be much greater.

In the event that the proposed tower upgrades incorporate significant additional loading or load balance alteration, we recommend considering the installation of additional anchors. This would include anchor installations through the existing foundation, or perhaps adjacent to the foundation with a tie in structure. If anchor installation is desired, we envision that three #14 bars with a 5 m free zone and a 5 m bonded zone oriented in a triangular fashion would be adequate to support additional loading, based on a 2002 kN/m moment provided by Spar Consultants. Anchor specifications are subject to refinement if such installations are required.

In summary, we consider that the existing foundation is capable of providing stable, long term support to the monopole structure so long as significant additional loading or alterations in load balancing is not expected as related to the proposed tower upgrade. Our assessment considers a design seismic occurrence with a 2% probability of exceedance in 50 years.

We trust the preceding is suitable for your current requirements. Please contact us if you have any questions or concerns.

Yours very truly,
Ryzuk Geotechnical

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