HJA Water Management Consulting

509 Foul Bay Road, Victoria, BC., V8S 4G9 250-885-3711 Jack.Hull@telus.net

To: Council, District of Oak Bay

From: J. A. (Jack) Hull, HJA Water Management Consulting, Project Manager

Date: September 5, 2016

Subject: Uplands Combined Sewer Separation Project – Geotechnical Investigation Report.

Introduction

At its regular meeting on May 24, 2016, Council awarded contract for a geotechnical investigation to WSP Canada Inc. (WSP), as part of the Uplands Combined Sewer Separation project. The objectives of the geotechnical investigation were to:

1. to undertake a geotechnical survey, to a maximum depth of five (5) metres, to determine the location of bedrock;
2. to assess the suitability of sub-surface soils as trench backfill; and
3. to record any other geotechnical information that would be of relevance to the installation of a sewer pipe, for example, the presence of groundwater, potential for trench sloughing etc.

WSP submitted a draft of the geotechnical report to Oak Bay on July 22 for review and comment. The final report was submitted on August 17 and is included as an attachment to this report.

The geotechnical investigation identified a more extensive presentation of rock than originally assumed, as well as a re-assessment of the potential for re-use of trench material for backfill in the construction process. This more comprehensive understanding of the geotechnical conditions will result in a re-assessment of cost and complexity in each of the six project options.

Implications of the Geotechnical Investigation

The results of the geotechnical investigation were summarized on colour coded plans as follows:

Results of the ground-penetrating radar (GPR) bedrock survey and the rock probing data have been combined to produce Figures 2A/B (Attached) which provide a probabilistic estimation of the bedrock profile along the proposed sewer alignment. Figures 2A/B display the relative probabilities of encountering bedrock within 5 m of the ground surface. Below is a further explanation of the colour system used in the drawings to describe the probabilities of bedrock.

Green - No bedrock was detected by GPR, rock probe, or surficial inspection within the green segments on Figures 2A/B. Accordingly, we anticipate a low probability of bedrock being encountered within 5 m of the ground surface along these segments.

Orange - Within the orange segments on Figures 2A/B the GPR and rock probe results suggest intermittent but erratically spaced bedrock knolls rising up to just below the road surface in some areas. Based on the GPR and rock probe results, we estimate that shallow (within 5 m of ground surface) bedrock knolls exist across 30 to 60% of the orange segments, reaching depths typically between 1 and 4 m below the road surface.

Red - The GPR survey and rock probing within the red segments shown in Figures 2A/B frequently detected bedrock knolls within 5 m of the ground surface. We anticipate the bedrock profile in these areas is globally much closer to the ground surface than within the orange segments and that bedrock will be encountered along much of the proposed trench excavations down to 5 m depth. Based on the GPR and rock probe results, we estimate that bedrock knolls exist across 50 to 80% of the red segments, at depths typically between 1 and 3.5 m below the road surface.

WSP noted that based on their experience, the subsurface bedrock profile across much of Victoria is typically very erratic and difficult to accurately map. Accordingly, caution should be applied when extrapolating between points of known bedrock and assuming depths along alignment segments. As can be seen with surficial bedrock outcrops near the study area such as along the shoreline below Beach Drive or near Uplands/Cattle Point Parks, the bedrock is typically shaped as rounded knolls protruding from the ground surface, from several centimeters wide and high to tens of meters wide and high. Bowls and valleys both shallow and deep often exist between these rounded protrusions of bedrock, which have been filled up with the glacial till, sand and clay during glaciation events.

The report was forwarded to the project consultant, McElhanney Consulting Services Ltd., (McElhanney) to incorporate results of the geotechnical investigation into the predesign report. McElhanney had made assumptions on, for example, the presence of rock based on information provided by a geotechnical consultant familiar with the Uplands area.

McElhanney is using the results of the geotechnical investigation to re-evaluate their assumptions on the presence of rock and the reuse of trench material for trench backfill in estimating the cost of each option. The results of the geotechnical investigation will have significant implications for the cost of the options, particularly those options with deeper trenches, because the presence of rock is more extensive than assumed and less material can be reused for trench backfill.

Updated cost estimates will be included as part of McElhanney's final pre-design report to be presented to Council at the Committee of the Whole meeting on October 5th, 2016. It is important to note that final costs will not be determined until the design of the option selected by Council has been completed.

Recommendation:

That the District of Oak Bay receive the 'Uplands Combined Sewer Separation Project, Oak Bay, BC, - Geotechnical Investigation Report, August 2016' for information.

HUMBER CATCHMENT

RUTLAND CATCHMENT

N

LEGEND:

- No bedrock detected within 5.0m of ground surface - Low probability of bedrock within 5m of ground surface
- Intermittent bedrock detected within 5.0m of ground surface - Moderate probability of bedrock within 5m of ground surface
- Frequent bedrock detected within 5.0m of ground surface - High probability of bedrock within 5m of ground surface
- Bedrock Observed at surface
- See section 5.2 for more detailed description of bedrock colour zones

Base Plan: McElhanney Consulting Services Ltd. - Uplands Combined Sewer Separation Option 2, Project Number 15-326, Dated: October 2015

REV. :	DESCRIPTION:	DATE : (M/D/YR)
1	FINAL	AUG/15/2016
0	ISSUED FOR CLIENT REVIEW	JUL/22/2016

PROJECT: Uplands Combined Sewer Separation Project

CLIENT: The District of Oak Bay

TITLE: Ground Penetrating Radar Survey Results - Humber Catchment

DATE: AUG 2016
DESIGN BY: PS
DRAWN BY: DP
CHECKED BY: CM
SCALE: 1:5000
PROJECT No.: 161-08447-00
FIGURE NO.: 2A

WSP Canada Inc.
Victoria, BC V8Z 6R4
T: 250.475.1000 F: 250.475.2211
E: victoria@levelton.com
www.wspgroup.com

HUMBER CATCHMENT

RUTLAND CATCHMENT

N

LEGEND:

- No bedrock detected within 5.0m of ground surface - Low probability of bedrock within 5m of ground surface
- Intermittent bedrock detected within 5.0m of ground surface - Moderate probability of bedrock within 5m of ground surface
- Frequent bedrock detected within 5.0m of ground surface - High probability of bedrock within 5m of ground surface
- Bedrock Observed at surface
- See section 5.2 for more detailed description of bedrock colour zones

Base Plan: McElhanney Consulting Services Ltd. - Uplands Combined Sewer Separation Option 2, Project Number 15-326, Dated: October 2015

REV. :	DESCRIPTION:	DATE : (M/D/YR)
1	FINAL	AUG/15/2016
0	ISSUED FOR CLIENT REVIEW	JUL/22/2016

PROJECT: Uplands Combined Sewer Separation Project

CLIENT: The District of Oak Bay

TITLE: Ground Penetrating Radar Survey Results - Rutland Catchment

DATE: AUG 2016
DESIGN BY: PS
DRAWN BY: DP
CHECKED BY: CM
SCALE: 1:5000
PROJECT No.: 161-08447-00
FIGURE NO.: 2B

WSP Canada Inc.
Victoria, BC V8Z 6R4
T: 250.475.1000 F: 250.475.2211
E: victoria@levelton.com
www.wspgroup.com