WAYII AREA, UPSCHEEK TASHEE MULTI-USE PATH PACIFIC RIM NATIONAL PARK RESERVE, VANCOUVER ISLAND, BC

Geotechnical Assessment

WSP Canada Inc.
1935 Bollinger Road
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February 25, 2021

WSP File No.: 191-08875-02

Parks Canada / Government of Canada
300 – 300 West Georgia Street,
Vancouver, BC

Attention: **Tyler Wilson, P.Eng., Senior Project Manager**

Subject: **Geotechnical Assessment**
Wayii Area, Upscheek Tashee Multi-Use Path
Pacific Rim National Park Reserve, Vancouver Island, BC

Dear Sir,

WSP is pleased to submit a PDF copy of the Geotechnical Assessment for the above referenced project.

We trust that the enclosed report meets your current requirements. If you have any questions regarding this project, the enclosed report or our services, please do not hesitate to call the undersigned at (250) 753-1077.

Thank you for utilizing our professional services. We look forward to serving your future engineering needs.

Sincerely,

2021-02-25

Darryl Furey, M. Eng., P.Eng.
Senior Geotechnical Engineer

EXECUTIVE SUMMARY

This geotechnical assessment report has been prepared in support of detailed design and construction of the Wayii Area (Escarpment) portion of the Upscheek Tashee Multi-Use Path in the Pacific Rim National Park Reserve (PRNPR) on the west coast of Vancouver Island. Upscheek Tashee is an approximately 30 km long multi-use pathway through the PRNPR that is a component of a proposed regional project that will ultimately connect Tofino and Ucluelet. The Wayii Area, the subject of this report, is a 660 m long section of pathway located approximately 2 km southeast of the Tofino-Long Beach Airport. It includes a switchback that traverses a 15 to 20 m high foreshore slope from Highway 4 (Pacific Rim Highway) to approximate beach elevation below.

This report presents an overview of objectives, a summary of ground conditions and the results of detailed slope stability analyses. Geotechnical design and construction recommendations are provided. The steep slope at the site presents some geotechnical challenges that were addressed during design. A design configuration has been identified that improves upon existing slope stability conditions within the project constraints of limiting impacts to the natural environment. Further geotechnical input will be required during the tendering and construction phases of the project to ensure that the intent of the design recommendations is met.

Historical investigations and testing provided partial coverage of ground conditions across the project area. Supplemental subsurface assessment and laboratory testing was completed by WSP in December 2019 to confirm ground conditions in the mid and lower portion of the slope, establish a geologic model for the site and develop characteristic strength parameters for detailed global stability analyses.

The site is underlain by a veneer of organic soil over an intermediate to high plastic clay with low sensitivity that is generally over-consolidated. Below a desiccated crust the clay becomes soft to firm in a 5 m thick zone transitioning to stiff to very stiff with depth

Two-dimensional and three-dimensional Limit Equilibrium Method (LEM) stability analyses were conducted using parameters determined through a review of the available data. Drained and undrained analyses were conducted, and the modelling confirmed that there is a low Factor of Safety against deep seated global instability under existing conditions. Results indicate that a cumulative 30% increase in Factor of Safety for global slope stability is achieved with the post construction configuration that has been proposed for the trail. Portions of the trail will have a Factor of Safety for slope stability that is less than would typically be targeted and the potential for this has been acknowledged and accepted by Parks on the basis that the final trail configuration will improve the existing ambient static Factor of Safety.

The design includes a combination of an area of cut (unloading) at the top (upper switchback), construction of a buttress (fill) at the toe (lower switchback), and a series of retaining walls to facilitate trail grade. Recommendations are provided for permanent cut slopes, Envirogrid faced MSE retaining walls, a geogrid reinforced buttress, remediation of an existing slide above the lower switchback, and general trail construction. Highway 4 is to be locally widened to accommodate an extension to the existing roadside barriers. Highway ditch drainage is to be redirected away from the slope through a new culvert across the highway.

The proposed trail and stabilizing berm will add load to the ground at the toe of the slope. This load is expected to be within the pre-consolidation range of the clay. Settlements are expected to range from in the order of 50 mm near Walls 1 & 2, transitioning to up to 100 mm near the buttress. These movements will be differential and will be most noticeable near the cut/fill boundary in the vicinity of the lower switchback and discussion about mitigation is provided.

Construction sequencing and methodology will be critical to the successful construction of this project. Recommendations are provided for the contractor to engage a geotechnical engineer for temporary excavation stability considerations and to provide input into a construction sequencing and methodology submittal that is reviewed and approved by Parks prior to mobilization. It is expected that a series of site meetings and discussions with both Parks and the contractor's teams could be needed to prepare this plan. The contractor will need to co-ordinate work with the Owner's Geotechnical Engineer, Owner's Environmental Monitor and Owner's Archeological Monitor.

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LIST OF APPENDICES

1 INTRODUCTION

As requested, WSP Canada Inc. (WSP) has completed a geotechnical assessment and detailed design for the Wayii Area (Escarpment) portion of the Upscheek Tashee Multi-Use Path in the Pacific Rim National Park Reserve (PRNPR) on the west coast of Vancouver Island. Upscheek Tashee is an approximate 30 km long multi-use pathway through the PRNPR that is a component of a proposed regional multi-use pathway project that will ultimately connect Tofino and Ucluelet. The majority of Upscheek Tashee was constructed in 2019/2020.

The Wayii Area, the subject of this report, is located between Highway Stations 12+780 and 13+300 approximately 2 km southeast of the Tofino-Long Beach Airport at the approximate location shown on Figure 1. The Wayii segment of Upscheek Tashee is approximately 660 m long and includes a switchback that traverses a 15 to 20 m high foreshore slope from Highway 4 (Pacific Rim Highway) to approximate beach elevation below.

The geotechnical assessment and design were completed in general accordance with our proposal dated 18 October 2019, and update 23 November 2019, that were prepared under SoA 5P420-17-5023/001. Input from Parks was obtained during regular intervals of the design process.

This report presents an overview of objectives for this section of trail, a summary of ground conditions based on available background information, drilling, laboratory testing and analyses; a summary of the results of detailed slope stability analyses; and geotechnical design and construction recommendations in support of detailed design. The steep slope at the site presents some geotechnical challenges that were addressed during design. Further geotechnical input will be required during the tendering and construction phases of the project to ensure that the intent of the design recommendations is met.

A site plan, concept drawings, borehole logs, laboratory test results, inclinometer monitoring data, results of 2D and 3D Limit Equilibrium slope stability analyses and retaining wall design drawings are appended to this report.

A draft version of this report was issued for client review on 5 February 2021. This report incorporates feedback received from Parks on 24 February 2021.

2 PROJECT DESCRIPTION

2.1 GENERAL

The proposed Wayii section of the pathway will extend from the east end of the recently constructed pathway at the toe of the slope at approximate Elevation 6 m (approximately 1.4 km southeast of the Long Beach Parking Lot) to the west end of the recently constructed pathway at approximately Elevation 29 m (approximately 1 km west of the Parks Administration Building and Greenpoint Campground). In terms of highway stationing, the Wayii section is located between approximate Station 12+780 to 13+300. A local stationing system has been established for the Wayii project starting at (-0+130) at the end of the paved portion of the existing trail at the toe slope and finishing at Station 0+528 at the tie-in to the existing trail at the top of the slope. The new path will traverse up the existing slope with two switchbacks required for grade control. The top and bottom segments of the trail will be roughly parallel to the highway.

The approximate location of the site is shown on Figure 1 in Appendix 1 and the design concept is presented in plan and section views prepared by Parsons in Appendix 2. A series of 3D renderings are presented in Appendix 2 to assist with visualizing the finished trail and conveying geotechnically critical elements.

Key overall (generally non-geotechnical) design objectives include:

- Maintain the trail standards applied to the remainder of the project which include: minimum 3 m paved width, gravel shoulder, and safety railings adjacent to large grade changes;
- Minimize impacts to the natural environment, particularly the Veteran Class trees (i.e. greater than 1 m diameter) with consideration of optimizing the overall tree canopy[1];
- Minimize impacts to archeological resources;
- Maintain accessibility for multiple users, which involves limiting grades (target maximum 8%) and inclusion of rest areas at regular intervals;
- Create a visually appealing finished product with one or more viewpoints; and,
- Reduce the environmental footprint and cost of a stabilizing toe berm (50 m wide by 5 m high) that was presented by others during previous design stages.

Concrete roadside safety barriers are to be installed along the shoulder of Highway 4. This will require local widening of the highway embankment by approximately 1.5 m, locally increasing to approximately 3 m at the flare at the east end of the section of new barriers.

At the time of report preparation, the location of Rest Area 1 was under review.

[1] The previous alignment identified 17 large diameter trees for removal, 7 of which were Veteran Class trees.

2.2 DESIGN PHILOSOPHY

Based on a desktop review of background information, geotechnical conditions at the foreshore slope in the project area are considered marginal and sensitive with respect to slope stability. The computed Factor of Safety (FoS) of the existing slope is close to one (with one being the limiting value between movement and no movement). Evidence of historical landslides (i.e. scarps, benches, descriptions of vertical drops of ground, trees leaning forward and backwards on the slope, pistol butting and benches) was noted in the background documents. LIDAR imagery and topographic information show indications of historical shallow and deep-seated movements.

Due to the nature of the project and the environmental objectives described above, it was acknowledged by Parks that an impractical amount of effort could be required to improve ambient conditions to meet typical design Factors of Safety (FoS) (i.e. Minimum Static FoS of 1.5 and Minimum Seismic FoS of 1.1) for the entire section of pathway in the Wayii Area. As such, Parks have acknowledged a pragmatic approach in which they would accept an increase in the ambient stability but with a lower than typical design Factor of Safety for static conditions, and acceptance that failure may occur in a 475-year return design earthquake. Direction to proceed with detailed design and construction was provided under those conditions.

Based on this understanding, the proposed trail design described herein focuses on improving the ambient slope stability where the trail traverses the slope and reducing hazards, where practical, with a general acceptance of existing conditions beyond the switchback area. Slope movements are expected under seismic loading conditions, which could require the need to re-build or re-habilitate the slope area.

The general design approach that was applied to this section of the trail was to unload the “driving force” to improve global stability through the removal of soil from the upper part of the slope, to create an overall less steep configuration. Where this was not possible or sufficient, the design approach considered a geogrid reinforced toe buttress along the mid-slope section of the trail to improve resisting forces.

2.3 DESIGN CHALLENGES

Geotechnical conditions at the site include a relatively steep, 15 to 20 m high slope comprised of a thick deposit of a soft to firm, lightly over-consolidated clay that becomes stiff to very stiff with depth. The slope face on and adjacent to the trail shows evidence of previous slope movements and analyses indicate marginal global stability. In order to maintain low grades for the trails, the design requires a series of switchbacks. The switchbacks generate the need for some cutting and filling of the slope.

In light of these items, the design includes consideration of:

- Relatively low strength clay in the upper mid part of the slope;
- Marginal existing slope stability conditions and on-going slope movements which introduce both near-term (i.e. temporary construction period) and longer-term design challenges;
- An existing slide scarp and slide debris above the lower switchback;
- High annual rainfall with periods of heavy precipitation that result in heavy flows in the existing roadside ditch and will generate surface run-off from the finished slope;
- A zone of inferred seepage and ponded water in the lower part of the trail;
- Existing distress observed in Highway 4 asphalt surfacing west of the switchback area and above the proposed lower part of the trail;
- Increase in pore water pressures induced by addition of new fill and related reduced effective strengths and stability, particularly during construction;
- General limiting of removal of vegetation and impacts to the Veteran Class Trees which will restrict the working area and area available to remove load through excavation of the upper part of the slope;
- Keeping the grade on the trail below 8%; and,
- Several BC Hydro brace poles and guy anchors within the proposed upper part of the trail adjacent to the Highway. The brace pole and guy anchor near Station 0+390 will be relocated by others and the remaining two brace poles adjacent to the proposed trail will remain.

Various alternative alignments were reviewed during design. An alignment that extended further east that would have achieved the grading objective was ruled out due to the presence of a steep, unstable slope and increased environmental impacts on the slope. An alignment further west was limited by the presence of a deep ravine and northern limits were affected by the presence of Highway 4. In summary, to accommodate these "boundaries" and reduce the amount of fill and height of retaining walls along the lower portion of the trail, the trail grade has been locally increased to 11% from approximate Station 0+220 to 0+275.

3 SUBSURFACE CONDITIONS

3.1 BACKGROUND INFORMATION

WSP conducted a desktop review of background information which included:

1) "Geotechnical Site Assessment Report – Site G, Upscheek Tashee, Pacific Rim National Park Reserve" (including Raw CPT data for CPT17-09), dated March 18, 2019, report prepared by Wood Environmental & Infrastructure Solutions (Wood);
2) Layout and sections for the proposed design Option H of the multi-use path prepared by Wood, undated;
3) "Bioterrain, Terrain Stability and Soil Erosion Potential Mapping for the Pacific Traverse Trail", dated August 2016, report prepared by Polar Geoscience Ltd;
4) LIDAR imagery, dated 20 July 2016, provided by Parsons;
5) "Geotechnical Assessment – Sanitary and Watermain Upgrade", dated 20 August 2010, report prepared by Levelton Consultants Ltd. (Levelton, now WSP);
6) "Geotechnical Assessment – Highway 4", dated 12 March 2014, report prepared by Levelton;
7) "Geotechnical Desktop Assessment – Shower Buildings at Greenpoint Campground", dated 8 December 2014, report prepared by Levelton; and,
8) "Geotechnical Assessment – Wick Road Bridge and Road Upgrade", dated 30 July 2015, report prepared by Levelton.

The background work included several subsurface investigations, which involved a variety of exploration methods including: Cone Penetration Tests (CPT), solid-stem and hollow-stem augers in the general area and in the road shoulder upslope of the crest, and hand auger and portable hammer drill test holes on the slope. The approximate location of historical holes advanced at the project site is shown on Figure 2. Test hole logs are presented in Appendixes 6 and 7. The maximum depth reached during previous subsurface assessments ranged from:

- 30 m deep adjacent to the highway upslope of the crest (BH/CPT17-09);
- 6 m in the upper to middle portion of the slope (PH17-04, 05, and 06); and
- 2.2 m to 3.4 m in the lower part of the slope, where access was limited to hand equipment (PH17-07, PH17-08 and HA16-14).

Previous subsurface assessment on the slope and at the toe was limited by equipment access restrictions.

The soil stratigraphy described in the background reports typically includes a veneer of organic silt and forest debris underlain by a lightly over-consolidated marine clay deposit. The clay tends to be desiccated in its upper portion (i.e. several meters) then becomes softer. Some test holes encountered a veneer of granular fill associated with the highway (BH17-04 and 09) and/or beach deposits/older fill (PH17-07) in the lower part of the slope.

The 2014 Levelton report describes conditions in the vicinity of pavement distress on Highway 4 approximately 40 m west of the proposed switchbacks, with a low Factor of Safety against slope failures. Curvilinear cracking about 30 to 50 m in length was observed in the pavement of the lane closest to the slope, as shown in Photos 7 and 8 in Appendix 7. Adjacent to the area of cracking, the shoulder of the road was relatively narrow, and the terrain dropped down steeply about 10 m in elevation to the south from within about 0.3 m of the outside edge of the no-post barriers. At Borehole LBH14-04 advanced at this location, approximately 1.3 m of granular fill was encountered over firm to stiff, high plastic, organic, silty clay (OH) with some wood debris and organics. A geotextile was encountered at the base of the granular fill, inferred to be related to an attempt to improve road subgrade. In 2017, Wood advanced a borehole near to this location (BH17-04) and encountered similar conditions, although the thickness of granular fill was only 0.3 m and no geotextile was noted.

3.2 SUBSURFACE ASSESSMENT

Additional subsurface assessment was completed by WSP in December 2019 to confirm ground conditions in the mid and lower portion of the slope and develop characteristic strength parameters for detailed global stability analyses. Two hollow stem auger drill holes coupled with CPT probe holes were advanced to depths below ground surface ranging from 26.5 to 28 m at the approximate locations shown on Figure 2. The location of the borehole at the toe of the slope (BH/CPT19-01) was selected in part with consideration of a practical route for equipment access. Standard Penetration Tests were conducted at regular intervals to obtain samples and assess relative consistency. Vane shear testing was also conducted at regular intervals. Shelby tube samples were obtained at select depths for more rigorous laboratory testing. Field vane test results are summarized in Table 1 below.

Table 1 - Summary of Field Vane Shear Strength Testing (WSP)(*)

BOREHOLE	SAMPLE ELEVATION (m)	PEAK (kPa)	REMOULDED (kPa)	SENSITIVITY
BH19-02	10.8	61	30	2.0
BH19-02	9.3	71	30	2.4
BH19-02	3.2	121	61	2.0
BH19-01	-0.8	111	61	1.8
BH19-02	-2.4	162	101	1.6
BH19-01	-3.5	151	61	2.5
BH19-01	-8.5	121	81	1.5
BH19-01	-10	162	61	2.7
BH19-02	-10.5	172	121	1.4
BH19-01	-14.5	172	91	1.9
BH19-01	-19.0	242	121	2.0

(*) Note that the field vane shear tests were conducted between Elevations 10.8 m and (-19.0) m by WSP at mid-slope and toe of the slope (2019). In-situ strength in the upper part of the slope (above Elevation 13m) was tested during previous site exploration conducted by Wood (2017).

Based on the field vane peak strength measurements, the shear strength of the clay deposit increased with depth becoming stiff to very stiff. A relatively low sensitivity (strength difference between peak and remoulded material) of approximately 2, was measured *in situ*.

Slope inclinometer casing was installed at BH19-02 (mid-slope) and grouted in place for future monitoring of slope movements. BH19-01 (lower part of slope) was backfilled with drill cuttings upon completion.

3.3 LABORATORY TESTING

In-situ testing included SPT and field vane testing in undisturbed soil in the boreholes and Torvane and Pocket Penetrometer testing on disturbed samples in the SPT Sampler. Conventional laboratory testing included moisture content and Atterberg Limits. Direct Simple Shear (DSS) testing and Constant Rate of Strain (CRS) consolidation testing were conducted on four Shelby Tube samples (2 from each borehole). Laboratory test results are summarized in Tables 2 to 4 below and shown on the borehole logs in Appendix 3. DSS and CSR test results are presented in Appendix 4.

Table 2 - Summary of Atterberg Limit Testing (WSP)

BOREHOLE	SAMPLE ELEVATION (m)	MC (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX	LIQUIDITY INDEX	CLASS
BH19-02	14.2	37	22	50	28	0.53	CI
BH19-02	8.1	28	16	31	15	0.78	CI
BH19-02 (TT)	6.5	27	17	32	15	0.64	CI
BH19-02	2.0	32	17	52	35	0.42	CH
BH19-01	1.1	33	17	46	29	0.54	CI
BH19-01 (TT)	-1.9	25	19	47	28	0.20	CI
BH19-01	-5.0	28	17	38	21	0.53	CI
BH19-02 (TT)	-5.7	24	18	39	21	0.30	CI
BH19-01 (TT)	-11.1	37	22	53	31	0.46	CI
BH19-02	-13.7	25	17	39	22	0.38	CI

(TT) – Denotes testing completed by Tetra Tech laboratory.

Table 3 - Summary of Direct Simple Shear Tests

BOREHOLE	SAMPLE ELEVATION (m)	TEST EFFECTIVE VERTICAL STRESS (kPa)	SAMPLE PREP MAX CONSOL PRESSURE (kPa)	TEST OCR	e_o	e_F	STRENGTH (kPa)
BH19-02	6.5	65	140	2.15	0.75	0.67	40
BH19-01	-1.9	55	150	2.7	0.76	0.73	55
BH19-02	-5.7	155	300	1.95	0.75	0.61	75
BH19-01	-11.1	130	175	1.35	1.0	0.94	60

It is noted that the laboratory Direct Simple Shear test results were closer to those of the in situ (field) remolded tests reported in Table 1, above. The shear strength at large deformation did not reduce significantly.

Table 4 - Summary of Constant Rate of Strain (CRS) Consolidation Testing

BOREHOLE	SAMPLE ELEVATION (m)	e_o	e_F	P_c (kPa)
BH19-01	-1.9	0.7	0.36	240
BH19-02	-5.7	0.68	0.30	245

3.4 SOIL & GROUNDWATER CONDITIONS

In general, the borehole and laboratory testing confirmed that the site is underlain by a veneer of organic soil over an intermediate to high plastic clay with low sensitivity that is generally over-consolidated. The over-consolidation of the clay is interpreted to be associated with a combination of marine regression, soil erosion and, in the upper part, the desiccation process.

The near surface zone (i.e. upper 2 to 3 m) was generally found to be stiff to very stiff with some desiccation ("crust"). Below the crust, a zone of soft to firm clay that was variable and ranged from approximately 2 m to 5 m thick was encountered at the boreholes at the lower and mid slope locations (BH19-01 and 02) respectively). The clay then transitioned to very stiff with depth with a more defined increase in stiffness at approximately Elevation -8.5 m. Locally, some loose sandy deposits were present in the upper meter near the toe of the slope.

Groundwater levels were measured at the previous boreholes advanced by others and generally indicated a perched water condition with water near surface. Ponded water was present at ground surface in the lower part of the slope. Wood reports a stabilized groundwater level at about 3 m depth in boreholes advanced along the highway (i.e. BH17-04 and BH17-09).

3.5 SLOPE INCLINOMETER MONITORING

The slope inclinometer was read at various intervals throughout the year. Measurements are summarized in Appendix 5. Note that the Axis-B readings are based on gyroscope data obtained while the inclinometer is aligned with Axis-A (i.e. no readings were taken along Axis-B which is quasi parallel to the strike of the slope). There were no obvious signs of slope movements. In September 2020, the top of the slope inclinometer was cut-off to protect it from pending tree-falling activities and a new base-line reading was established for future monitoring.

4 ANALYSES

4.1 MODEL STRENGTH PARAMETERS

The data was reviewed to determine strength parameters for input into computer assisted slope stability analysis models. The data was assessed as a whole, and emphasis was placed on data obtained from more reliable testing methodologies including the CPT, Field Vane Tests, and DSS. Some discrepancies were observed. The DSS results were lower than the rest of the data, particularly so for samples from BH19-01, which is interpreted to be due to sample disturbance. Torvane and Pocket Penetrometer measurements infer a lower strength material. It should be noted that Torvane and Pocket Penetrometer measurements were obtained on disturbed samples and would tend to measure a disturbed strength, rather than the peak that exists in the field.

In general, it was found that the shear strength profiles at each of the test hole locations were similar when elevation was considered. For design under undrained conditions, a uniform S_u of 25 kPa was applied above 13 m Elevation and an increase in shear strength linearly with depth in accordance with the SHANSEP approach (per Ladd, 1991) was applied below 13 m Elevation.

Desiccation in the surficial 2 to 3 m was ignored in the slope stability modelling due to variations observed during drilling and expected excavation into this zone.

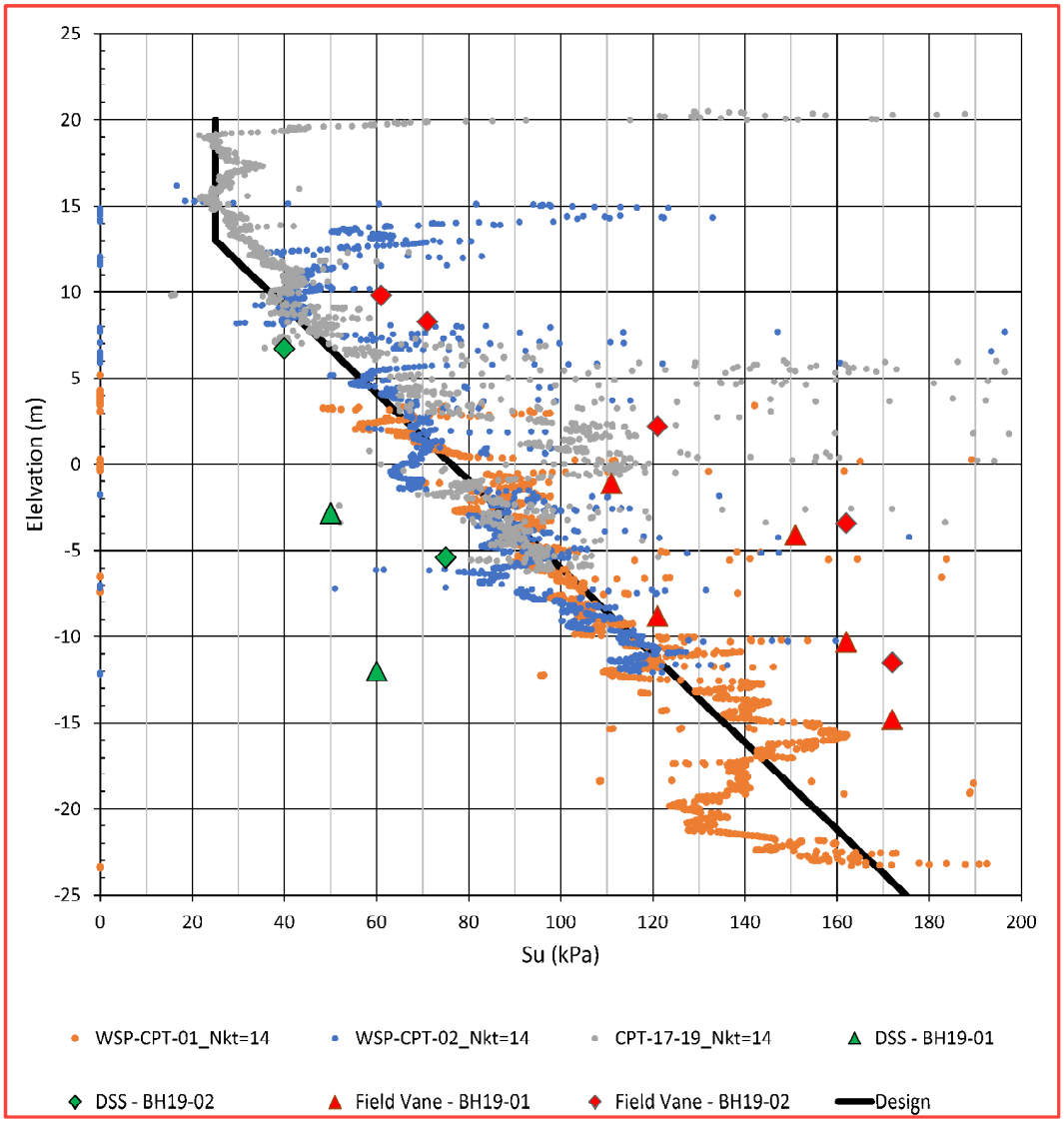
A plot of the strength profile that was applied in the undrained slope stability modelling is presented in Figure 3 below. Shear strength interpreted from CPT data using a N_{kt} factor of 14 for the test holes advanced at various parts of the slope (CPT17-09 (top), CPT19-02 (middle), and CPT19-01 (bottom)), peak field vane shear strengths, and Direct Simple Shear strengths are plotted against elevation.

The strength model did not include explicit consideration of the upper zone of over-consolidation nor any increase of shear strength associated with consolidation under the weight of the lower/toe berm and trail.

Table 5 - Design Undrained Shear Strength Versus Depth Formula

DEPOSIT	ELEVATION (M)	SU (KPA)
Upper Clay	25	25
	13	25
Lower Clay	z<13	25 + (13-z) x 3.95

Figure 3: Plot of Design Undrained Shear Strength Versus Elevation



For drained soil conditions, correlations between Atterberg Limit properties, moisture content, and soil description relative to friction angle were applied[2]. For estimation of effective cohesion of the over-consolidated clay, relationships to undrained shear strength were applied.

In summary, an apparent cohesion of 10 kPa and a long-term drained shear strength of 28 degrees were used in the stability analyses.

[2] US Navy, 1971 / Ladd et.al. 1977; Terzaghi, Peck & Mesri, 1984; Sorenson, Okkels - 2013

4.2 SLOPE STABILITY ANALYSES

4.2.1 ANALYSES

Computer assisted 2D Limit Equilibrium Method (LEM) Slope Stability analyses were conducted using Slope-W (Version 10.2.2.20559, 2020) on both existing and proposed slope configurations in both drained and undrained conditions. Geometry was based on cross-section data provided by Parsons. Strength parameters and soil/groundwater profiles were based on the information presented in the previous section of this report. Summary results of 2D slope stability analyses are presented in Appendix 8 and a summary of the Factor of Safety in existing and proposed conditions as determined from the 2D LEM stability analyses is presented in Table 6 below.

Table 6 - Summary of 2D-Slope Stability Analyses

FIGURE	CONDITION	SCENARIO	MINIMUM FACTOR OF SAFETY
A8-1	Undrained	Existing	1.02
	Drained	Existing	1.13
A8-2	Undrained	Buttress With Geogrid	1.20
	Drained	Buttress With Geogrid	2.23

The drained analyses were sensitive to groundwater elevations, for which limited data is available.

To better understand the limitations of the 2D LEM analyses in the context of the actual geometry of the site and a Factor of Safety that is less than typically targeted for design, 3D LEM analyses were conducted. Modelling was completed with Soil Vision SVSlope-3D (Version 10, 2020) with soil input parameters described above for undrained conditions and geometry (contour information) provided by Parsons. The focus of the 3D modelling was to evaluate limitations inherent in the 2D model and better characterize stability conditions and Factor of Safety results are intended to be reviewed in comparative context rather than as direct values. Comparative 2D analyses were run under the same assumptions. A summary of 3D stability analyses results is presented in Appendix 9.

The Factor of Safety in the 3D models were approximately 10% to 15% higher than those calculated in the 2D models.

4.2.2 DISCUSSION OF SLOPE STABILITY ANALYSES RESULTS

The modelling confirmed that deep seated global stability under existing conditions is marginal. Review of stability analyses indicated that the most effective approach to improving the stability of the slope was to cut material from the top to reduce disturbing forces and reduce the net slope angle to less than 2H:1V.

2D-analyses indicated that inclusion of a continuous layer of geogrid from mid-slope, through a berm and below the lower trail would provide additional stability by generating a stabilizing force. Results indicate that the Factor of Safety increased with a geogrid reinforced berm from near a FoS of 1 to approximately 1.2 under undrained conditions. Comparative 3D modelling indicated that a further 10% to 15% increase in FoS is present when considering geometric aspects such as side friction.

The post construction Factor of Safety increases towards 2 as the slope transitions to the drained condition over time.

The analyses also confirmed that the Factor of Safety reduces across the project area in a west to east direction and is lowest through the area where the design incorporates limits to excavation at the crest of the slope.

An area of slope at the east edge of the project area is identified as marginally stable. The main area of this slope movement is outside of the project area and, apart from some localized reduction of hazard through excavation to reduce the steepness of the slope at the edge of the trail, improvements to stability of this off-site slope are expected to be limited unless the project area is expanded. It is important to note that slope movements are expected to be progressive and could impact the trail in this area.

4.2.3 SENSITIVITY ANALYSES

Sensitivity analyses of the undrained shear strength parameters indicate that another approximate 15 to 20% increase in Factor of Safety may be present if the undrained strength of the clay above 13 m Elevation is in the order of 35 kPa. A value a of 35kPa represents the upper bound for the undrained shear strength in the upper part of the clay deposit (below the crust).

4.3 SETTLEMENT

Settlement below the trail will result from primary consolidation and secondary settlement of the clay deposit caused by the additional weight from grade increases, and long-term creep type movements. The anticipated settlements are largely load driven and they will, therefore, be differential based on contemplated grade changes. Settlements in areas of new fill are anticipated to vary from small (i.e. less than 25 mm) in the middle part of the slope (i.e. near Walls 4 and 5) and greatest in the area of the buttress berm, trail embankment, and retaining walls along the toe of the slope. In general, the maximum load increase from new fill is expected to be less than pre-consolidation pressures estimated from the CPT data and CRS Consolidation Test results. As such, the clay is expected to recompress, rather than experience virgin consolidation. Calculated long term settlements less than 100 mm could occur in the area of the proposed buttress, reducing to less than 50 mm in the narrower zone of fill at Walls 1 & 2.

5 GEOTECHNICAL DISCUSSION

5.1 GENERAL

In summary, geotechnical conditions at the proposed switchback trail down from Highway to beach elevation (Wayii Area) are judged to be marginal with respect to slope stability for the proposed trail. A design configuration has been identified that improves upon existing slope stability conditions (i.e. increases the Factor of Safety against movement) within the project constraints of limiting impacts to the natural environment, in particular, Veteran Class trees (i.e. >1 m diameter). The design approach includes a combination of an area of cut (unloading) at the top (upper switchback), construction of a buttress (fill) at the toe (lower switchback), and a series of retaining walls to facilitate trail grade. The proposed alignment reduces the total number of mapped larger diameter trees that are impacted to six and includes only two Veteran Class trees, versus the seven Veteran Class trees that were identified for removal from the previous design concept. In preparation for trail construction, six of the impacted trees along the alignment were felled in the fall of 2020. The ability to maintain the remaining intermediate diameter trees (i.e. the next generation of Veteran Class trees) that are present on the boundaries of the work zone will depend on exposed conditions. We understand that the contractor will be advised by Parks to make efforts to protect those trees. Special approaches to construction sequencing may be required to achieve this objective.

The constraint of protecting the Veteran Class Trees impacts grading options and results in the Factor of Safety on a portion of the slope being less than is typically used for design in new construction (i.e. Minimum Static FoS of 1.5 and Minimum Seismic FoS of 1.1). The proposed design provides an approximate 30% increase to the Factor of Safety for ambient conditions when 3D geometry is taken into consideration. As described in Section 4.2 a further increase in FoS of up to approximately 20% might be present if the strength of the clay above Elevation 13 m is in the upper end of the undrained shear strength range to. Such considerations would provide a FoS that is more in line with commonly accepted design Factors of Safety.

The potential for the Wayii portion of the trail to have areas with a Factor of Safety for slope stability lower than would typically targeted has been acknowledged and accepted by Parks on the basis that the final trail configuration will improve the existing ambient static Factor of Safety. Should there be a desire to improve the Factor of Safety further, modelling has indicated that further unloading of the slope by removal of soil from the top would be an effective method but one that would require removal of more trees. This approach can be revisited if requested by Parks.

Existing potential slope stability hazards to the west (i.e. Highway 4 embankment) and east (i.e. adjacent to the lower switchback) of the portion of the trail that traverses the slope are not proposed for remediation. We understand that Parks is aware of these conditions that might impact the trail and has determined that remediation is beyond the scope of this project.

Remnants of an existing slide on the slope are present above Station 0+290 and recommendations to remediate this slide are included herein. Further discussion is provided in Sections 5.2 and 5.3 below.

The proposed trail has been designed to maintain environmental resources and as a result, some of the cuts have been optimized. It is important to appreciate that small changes made through errors or poor planning in construction have high potential to have a negative impact on greater stability issues. Accordingly, construction sequencing will be critical to the success of the project and to protecting environmental resources and maintaining safe work conditions. We recommend that a detailed construction sequencing and methodology plan be prepared (by the contractor) in advance of mobilization and construction to allow for sufficient interaction between the contractor and their geotechnical engineer and the Owner's team. Further discussion on construction sequencing is presented in Section 5.3 below.

In light of the marginal stability of the slope, the fine-grained nature of the soils, and the sensitive environment, the work should be undertaken during better weather in the summer (i.e. not during the rainy winter season). At this time, construction is proposed for the summer of 2021. We understand that clearing work is being planned for early March 2021 (i.e. prior to bird nesting season). To reduce the potential for unplanned excavation into or damage to the permanent cut slope, the contractor that is retained to do the clearing work (i.e. removal of logs, shrubs, etc) should refrain from excavation and/or equipment tracking on the slope above the proposed trail between Station 0+290 and 0+300. Impacts to the subgrade should be limited as discussed in Section 5.3, below. Extra caution should also be applied for work in the vicinity of the existing Slope Inclinometer to avoid damaging it.

The proposed trail design (i.e. alignment, cut/fill, retaining walls, buttress, etc.) is based on survey data provided by others. Although a series of survey checks were conducted during design, we understand that the tree canopy may have influenced some of the data. Accordingly, we recommend that an updated survey be completed as soon as possible after clearing / removal of the large trees such that adjustments to the design (if needed) can be incorporated prior to a contractor having mobilized to site. WSP should attend site with the surveyor to verify that key geotechnical elements are surveyed.

There is the potential for post construction differential settlements to occur in the transition areas from cut to fill, with the largest differential movements generally expected near the lower switchback (i.e. Station 0+290 to 0+270). Some differential settlement could also occur in the area of fill between Station 0+220 to 0+270, with higher potential at the west edge of the buttress near Station 0+240. While not significant in terms of stability, local cracking and vertical stepping of the asphalt could occur near the cut/fill boundary. The proposed geogrid will help to mitigate the differential nature of the settlement but will not prevent total settlements. Settlements are expected to be long term due to the low permeability of the underlying deposits and could continue past the initial earthworks stage. Delaying the placement of asphalt by a season could be considered as a means to reduce potential impacts of settlement on the asphalt surface, but we understand this may not be possible within the project timeline. In that case, a routine monitoring program should be incorporated into the

long-term maintenance program with an expectation of the need to grind, patch or replace asphalt at some future time.

Further geotechnical discussion about design and construction is presented below.

5.2 DESIGN

As noted, the design configuration improves upon existing slope stability conditions while limiting impacts on the natural environment. The proposed modest cut adjacent to the highway combined with an area of more significant cut near the upper switchback, effectively reduces the net slope angle to a more stable configuration. The geogrid reinforced buttress in the lower part of the slope near the lower switchback creates additional resisting force where removal of soil from the upper part of the slope is restricted. A series of retaining walls are proposed to achieve design grades and limit impacts to adjacent vegetation. An existing slide area above Station 0+290 is to be remediated to improve stability and create relatively uniform improvements through this part of the slope.

An overview of the design is presented in Appendix 2 and is supplemented by Retaining Wall and Buttress Design Drawings in Appendix 10. Further geotechnical discussion about permanent slopes, retaining walls, buttress, slide remediation, general trail structure, and several other design items is provided in the following sections.

5.2.1 PERMANENT SLOPES

Permanent cut and fill slopes are to be shaped to maximum 2H:1V or gentler, as shown on the drawings in Appendix 2.

Locally steeper slopes (up to maximum steepness of 1.5H:1V and height of less than about 2 m (locally up to 3 m) are expected to be required:

- adjacent to Highway 4 (Station 0+340 to 385);
- in the ditch near the brace pole at Station 0+437;
- above the east end of Wall 5 near Station 0+280; and,
- potentially on the downslope side of the trail near to Station 0+260 at Trees 245 to 247.

Localized areas of steep cuts supported with stacked boulder facing are anticipated at:

- Trees 196 and 197 (near Station 0+370) to limit encroachment into the root zone of the trees; and,
- guy anchors supporting brace poles at Stations 0+437 and 0+501.

Slope surfaces are to be remediated with a veneer of salvaged on-site organics covered with C32BD Erosion Control Blanket (ECB) (or approved equivalent) secured with 0.45 m long, 10M rebar hooked pins secured with Staple Pattern C per North American Green specifications (i.e. 1 m horizontally, 0.6 m vertically). We understand that Parks has a stockpile of ECB available from previous phases of the project. From a geotechnical surface stability perspective, the thickness of organics should be less than about 150 mm.

However, the final thickness of organics will be determined with input from Parks and Owner's Environmental Monitor (OEM) based on review of the performance over the winter of the cut slope near Tofino Airport that was constructed in early 2020. Woody debris will also be placed in accordance with direction provided by Parks and the OEM. To maintain stability the size and quantity of woody debris may need to be restricted and the thickness of organics should be maximum 100 mm on the tall cut slope above Wall 5 and steeper cut below Highway 4 near Station 0+360. As a component of restoration plans, planting benches approximately 0.6 m wide (above Wall 5) and 1 m wide (Buttress) with a local 1.5H:1V cut at the back of the bench are proposed at regular intervals.

5.2.2 RETAINING WALLS

Retaining walls are proposed along the toe of the slope to reduce encroachment of the buttress into existing treed areas (Walls 1 and 2), at Rest Area 3 near the lower switchback (Wall 3) and across the middle terrace of the trail (Walls 4 and 5). The approximate locations of the retaining walls are shown on Figure 2. Retaining walls are to be Mechanically Stabilized Earth (MSE) walls and constructed with geogrid reinforced imported fill and an Envirogrid facing. Walls will range in height from approximately 1 m (Wall 3) to a maximum of approximately 4.2 m (Wall 1).

Retaining wall design drawings are presented in Appendix 10 and a summary of the proposed walls is presented in Table 7, below.

Table 7 - Summary of Retaining Wall Design

WALL	STATION	APPROXIMATE LENGTH (M)	TYPICAL HEIGHT (M)	UNIAXIAL GRID LENGTH (M)	FOUNDATION PAD
1	217 to 250	33	3.8 to 4.4 m	4	• TE-BXC30 Composite Geogrid • TE-BX30PP Biaxial
2	227.5 to 236.5	9	3 m	4	• TE-BXC30 Composite Geogrid • TE-BX30PP Biaxial
3	275.3 to 278.3	5	1 m	None	• TE-BXC30 Composite Geogrid only
4	290 to 330	40	1.4 m (320 to 330) 2.2 m	2.5	• TE-BXC30 Composite Geogrid only west of buttress (Station 310 to 330) • Uniaxial Grid from Buttress • TE-BX30PP Biaxial at Tree 241/242
5	283 to 309	26	1.9 m	None	• Uniaxial Grid from Wall 4

Key retaining wall design elements include:

- All walls are to be supported on a 0.5 m thick foundation pad constructed with 75 mm minus crushed granular subbase placed and compacted in two lifts to a minimum of 95% Modified Proctor Maximum Dry Density (MPMDD).
    - The foundation pad is to be placed on an approved surface of non-organic, natural subgrade (expected to be firm to stiff clay or firm sandy clay.
    - At Walls 1, 2, 3 and the west end of Wall 4 (i.e. upslope of the buttress), geotechnically approved subgrade is to be covered with a layer of composite grid (TE-BXC30, or approved equivalent)
    - At Walls 1 & 2 a reinforcing layer of biaxial geogrid is to be installed at mid depth within the foundation pad; and,
    - At Walls 4 & 5 the reinforcing layers from the buttress and Wall 4, respectively, are to extend below the walls within the foundation pad.
- Retaining wall designs are based on Envirogrid EGA40 panels and TEUX20PET uniaxial geogrid that Parks has in stock from the previous phase of the project. The EGA panels are 0.9 m wide and two panels are to be secured together at each row with large "zap straps" provided by the manufacturer to form the facing zone;
- Envirogrid cells are to be filled with 19 mm granular base compacted to minimum 95 % MPMDD. The outer cell of the Envirogrid panels is to be filled with salvaged organics that are approved by the OEM;
- Walls are to have a minimum toe embedment of 0.5 m into mineral soil. Embedment depths are included in the heights that are shown in Table 7;
- The wall facing is to be constructed with a batter of 14 degrees relative to vertical (Approximately 1H:4V). A gentler batter could be locally considered to increase the area available for vegetation within the wall at locations where existing vegetation or slope geometry does not restrict the lateral extent of excavation;
- The walls are designed for static loading plus a uniform live load of 5 kPa. Internal wall design is based on 0.28g (1:475 year design earthquake). Seismic design is excluded for global stability as described herein;
- The hand rail post footing sleeve is to be installed at the time of wall construction. Envirogrid panels are not to be cut. A wall detail has been established to facilitate installation of the footing sleeves without cutting the Envirogrid panels;
- Wall backfill is to be 75 mm well graded, clean (low fines content), sand and gravel (referred to as 75 mm Pit Run in the project documents) that is placed and compacted in 200 mm thick lifts to a minimum 95% MPMDD;
- Uniaxial grid is to be installed at vertical intervals of 400 mm (every second lift). Geogrid lengths are measured relative to the back of the organic filled facing cell; and,
- Drainage is to be provided for each wall as shown on the drawings in Appendix 10.

5.2.3 BUTTRESS

A geogrid reinforced angular rock fill buttress is recommended to enhance global slope stability between Station 0+240 and 280. Slope stability analyses indicate that the geogrid reinforcement should extend from the upper side of the trail at mid-slope to the downslope side of the lower trail. As shown on the drawings in Appendix 10, Uniaxial geogrid TE-UX20 PET (or approved equivalent) is to be installed at 0.3 m vertical intervals to within 0.4 m of the top of the buttress. We understand that Parks has this material in stock and will provide it to the contractor for use. The lower three rows of geogrid that extend below the lower trail are to be stronger: TE-UX150 PET Uniaxial Geogrid (or approved equivalent). The strong axis of all geogrid in the buttress is to be oriented perpendicular to the strike of the slope (i.e. in an approximate north-south direction). Cross-sections through the buttress that illustrate configuration and geogrid layout are shown on the attached Retaining Wall Drawings WD-3 and WD-4 in Appendix 10 and Sections E and F in Appendix 2.

Subgrade preparation will include the removal of organics and soft soils to expose the underlying, non-organic clay (locally this may be sand or a sandy clay). Excavation into the toe of the slope will be required to achieve enough embedment for the geogrid to mobilize strength. A geotextile separator is to be installed at the interface of the buttress fill and the fine-grained natural soils. A veneer of granular fill is to be installed between the geotextile and the first layer of geogrid.

Engineered fill for the buttress is to consist of 75 mm minus Crushed Granular Subbase, placed and compacted in loose lifts of maximum 300 mm thickness and compacted to a minimum of 95% Modified Proctor Maximum Dry Density (MPMDD). Where possible, a heavy vibratory roller is to be used. Locally near trees, the compaction effort may need to be reduced to protect roots under the approval of both WSP and the OEM. The outside face of buttress slopes is to be overbuilt horizontally by 1 m to enable full compaction to the final finished slope prior to cutting back to the final configuration.

The area of the proposed buttress is a local low, and wet conditions are expected. A 0.5 m to 1 m thick foundation drainage blanket is to be constructed with 150 mm clear, angular rock fill wrapped in a non-woven geotextile (TE-6, or approved equivalent) and extend from the east end of Wall 1 eastward to where the ground surface starts to rise near Trees 241/2/3/4. The western and eastern limits of the drainage blanket will need to be confirmed on site based on local topography variations with input from WSP and the OEM. The drainage blanket is to discharge unhindered on the downslope side of the trail.

A 1 m wide planting terrace varying from Elevation 12 m to 12.3 m has been incorporated into the design of the buttress. Recommendations for surface restoration are to be provided separately by Parks and the OEM.

5.2.4 REMEDIATION OF SLOPE FAILURE

There is a failure scar present in the eastern portion of the proposed lower switchback. This will need to be remediated through removal of failed soil and replacement with a geogrid reinforced fill slope. A 1.5 m high retaining wall is proposed along the upslope edge of the trail at the toe of the new fill. Biaxial Geogrid (TE-BX20PP or approved equivalent) is to be installed at 0.3 m intervals to Elevation 18 m. Subject to conditions exposed the geogrid may need to continue to a higher elevation. Similar to the buttress, the outside face of the new slope in the former slide area is to be overbuilt horizontally by 1 m to enable full compaction to the final finished slope prior to cutting back to the final configuration. 75 mm Crushed Granular Subbase is to be placed in 0.3 m thick lifts and compacted to a minimum 95% Modified Proctor Maximum Dry Density (MPMDD). Planting benches 0.6 m wide with locally maximum 1.5H:1V back slopes are proposed at Elevations 16, 18, and 20 m.

Excavation into the slope will need to extend past the failure surface and the new fill will need to be notched into the intact existing ground to avoid the creation of a weakened new fill/natural ground interface. The depth of the failure surface is not known at this time. An inferred failure surface and schematic notched interface is shown on Section I in Appendix 2 to illustrate the concept.

The lateral extent of excavation into the existing slope is to be restricted as much as possible to limit removal of trees near the crest.

Final surface restoration is to be completed as described in the permanent slope section of this report (Section 5.2.1).

5.2.5 TRAIL STRUCTURE

We understand that the trail structure is to be similar to that used for the main trail project, which generally involves a 50 mm thick asphalt surface with a 100 mm thick granular base underlain by 300 mm of a well graded sand and gravel (75 mm Pit Run). Subgrade conditions are expected to range from firm to stiff clay, with softer and wetter conditions anticipated in the base of larger cuts near the upper switchback and in the lower part of the trail (i.e. generally from Station 0+190 to 370). A composite geotextile/geogrid layer is recommended at the clay/pit run interface to reduce punching of the imported aggregates.

For the upper east section of trail parallel to Highway 4 (i.e. Station 0+410 to 528) the minimum subbase thickness has been increased to 450 mm for this section of trail which allows for removal of the composite geogrid from the design for this part of the trail. Note that in the area of the buttress (Station 0+250 to 280) the subbase material for the trail changes from pit run to 75 mm Crushed Granular Subbase to reduce construction complexity.

For the 1.5 m to 3 m widening of the highway for barrier support, the proposed minimum 75 mm of asphalt is considered geotechnically suitable. The widening of the highway embankment is to be overbuilt horizontally by 0.5 to 1 m to enable full compaction to the final finished slope prior to cutting back to the final configuration. For reinstatement of asphalt at the culvert crossing, the minimum pavement structure should be the greater of existing conditions or 125 mm asphalt over crushed granular base. We understand that asphalt cutting, grinding, and joint details at the interface between new and existing asphalt will be based on the previous phase of the project.

Pavement structures should be constructed atop geotechnically approved native subgrades, or on approved engineered fill placed on geotechnically approved subgrade. All subgrade should be shaped to promote drainage with drainage provided to underside of subbase elevation (or base of retaining wall elevation as noted in Section 5.2.2 above). All granular materials should be compacted to a minimum 95% Modified Proctor Maximum Dry Density. Compaction should be confirmed through in place density testing.

Recommendations are limited to the geotechnical strength parameters of the pavement section materials and subgrade. Civil engineering design such as grades, drainage, layout and compatibility with surrounding structures are the responsibility of others. Site specific pavement section design was beyond the scope of this assignment. If a formal pavement design is required, we would be pleased to assist.

A summary of minimum pavement structure recommendations is presented in Table 8 below:

Table 8 - Minimum Pavement Structure Thickness

LOCATION	ASPHALT (MM)	BASE COURSE (19 MM)	SUBBASE (PIT RUN) (MM)	CRUSHED GRANULAR SUBBASE (MM)	COMMENT ON SUBGRADE TREATMENT
Trail 195 to 250	50	100	300		Composite Geogrid
Trail 250 to 260	50	100		450	Drainage Blanket (i.e. Geotextile)
Trail 260 to 285	50	100		450	Geotextile
Trail 285 to 310	50	100	300		Geotextile as needed (Walls 4 & 5)
Trail 310 to 410	50	100	300		Composite Geogrid
Trail 410 to 528	50	100	450		No Composite Geogrid
Highway: Barrier Widening	75	100		450	No Separator
Highway: Culvert Crossing	125	325 to 575			Pipe is too shallow to warrant multiple materials.

5.2.6 OTHER DESIGN ELEMENTS

An overview of other aspects of the general design is presented below:

1. In general, review by WSP and the Owner's Environmental Monitor (OEM) will be required for excavation and subgrade preparation, especially prior to excavation within 5 m of larger diameter trees;
2. Stump removal within the trail footprint area will require input from WSP in relation to overall trail support and slope stability;
3. Drainage along the south highway ditch is to be redirected away from the slope through a new culvert crossing. Based on a review of the background soil logs and overall location, subgrade conditions at the crossing location are inferred to consist of firm, silty clay below an unconfirmed thickness of variable quality granular fill. In the unlikely situation that poor soils are encountered (i.e. such as has been the case at other locations along Highway 4), sub-excavation to remove these poor soils and expose the underlying firm to stiff clay could be required. Subgrade is to be reviewed and approved by the Owner's geotechnical engineer prior to covering;
4. An existing sanitary force-main is present near the south edge of Highway 4 and its location will need to be confirmed prior to trail construction, highway widening, ditch excavation or culvert installation. A watermain and fibre optic cable are present on the north side of the highway. At this time, excavations are not expected to expose these lines but that should be confirmed by the contractor;
5. The existing natural and fill soils are not considered suitable for reuse as engineered fill under settlement sensitive elements due to their variable nature and excessive fines and organic contents. As local exceptions, reuse of existing trail fill materials is anticipated at the tie-ins to the existing trail, and possibly at the temporary drilling equipment access at the crest of the slope; and,
6. Archeological resources present at the toe of the slope have been salvaged by others. The potential for more items exists and work in the toe area of the slope will require oversight from the Owner's Archeological Monitor (OAM).

5.3 CONSTRUCTION CONSIDERATIONS

Construction sequencing and methodology will be critical to the successful construction of this project. As such it will be critical that construction planning is completed well in advance of mobilization of equipment such that there is sufficient time for review and modifications. All excavation should be conducted in accordance with the Occupational Health and Safety Regulation administered by WorkSafeBC. We recommend that the contractor be required to retain a geotechnical engineer to provide input into construction sequencing and methodology in relation to temporary excavation support with a focus on the trail construction work on the slope.

The following general sequence is envisaged:

1. Contract Award
2. On-site meeting with WSP, Parsons, and other members of Parks team and the contractor and their geotechnical engineer;
3. Submittal of a detailed construction sequencing and methodology plan by the contractor. We recommend that this submittal include a stamped letter from their geotechnical engineer that comments on the details of the proposed construction work plan in relation to temporary excavation conditions;
4. Review by Parks' team;
5. On-site meeting to review and discuss specifics of the plan, potentially supplemented with one or more conference calls as necessary; and,
6. Resubmittals as needed followed by acceptance from Parks well in advance of equipment mobilization.

Construction planning will need to consider the following items:

1. Temporary excavation stability.
    a. Current slope conditions are marginally stable and excavation to remove organics and to build the trail will require local steepening, which will reduce short term stability;
    b. Work may need to be conducted in smaller sections (i.e. slot cuts, rather than opening a large area), particularly if large vertical cuts are proposed;
    c. During design it was anticipated that to maintain stability, the buttress and drainage blanket would be constructed prior to excavation further upslope to facilitate the construction of Walls 4 and 5, remediation of the adjacent slide area, and final slope cuts and surface restoration; and,
    d. Excavation into the historical slide area will need to be completed in relatively small advances with limited access from the top.

2. Access to the slope above Wall 5 is to be maintained (or created) for shaping and placement of organics/woody debris.
    a. Trees at the top of the slope are to remain and will restrict access from the top;
    b. Consideration could be given to scheduling the large cut near Rest Area 2 to maintain access to the upper part of the slope above Wall 5. Equipment traffic through this area will need to be conducted with final cut slope elevations in mind; and,
    c. The final slope configuration and ability to maintain long term support for Trees 195, 196 and 197 will generally not allow for further cutting back of the slope to accommodate construction damage to the soil structure.
3. General equipment access to the slope area for soil removal and delivery. It is noted that there is limited space for the storage of imported soil and other materials at the site. We understand that Parks has approved the construction of a temporary construction access near the proposed culvert crossing;
4. Protection of subgrade from construction damage.
    a. It is not recommended to strip and expose the entire length of trail prior to placement of composite grid and/or trail structure; and,
    b. It may be appropriate to place a thicker structure or stronger material to support construction vehicles.

New loads from trail, berm and retaining wall construction at the base of the slope will generate excess pore pressure in the underlying clay. Increases in pore water pressure reduce effective stresses in the ground and result in a lower resistance to slope instability and local bearing support. While for the most part, this is not expected to be of concern, the potential impact of construction induced pore pressure increases in the areas of thickest fill on temporary excavation stability should be considered by the contractor's geotechnical engineer. Where possible, new or temporary fill greater than 3 m in thickness relative to pre-construction ground surface should be applied incrementally to allow for some pore pressure dissipation prior to moving to the next stage of filling.

The on–site soils contain particles of various sizes, including silt and clay sizes (fines). To manage these fines and reduce generation and transport of sediment, an erosion and sediment control plan using best management practices should be in place prior to carrying out any earthwork.

Groundwater seepage is anticipated in the lower part of the slope where ponding water has been observed (i.e. deeper area at the base of the buttress and in the area of Walls 1 and 2). Temporary stability of the exposed soil will be influenced by groundwater conditions at the time of construction with seepage acting as a destabilizing force. It may be necessary to use static compaction for the lower portion of the fills to avoid further disturbance to the approved subgrade soils. Use of a reduced level of compaction (if appropriate) will require review and approval from WSP.

As noted above, construction should be scheduled for a dry period and is currently planned for the summer of 2021. Depending on conditions exposed on the slope it may be necessary to reduce or stop construction activity during or after periods of heavy rain.

It is recommended that WSP be onsite full time during all excavation work in the mid-slope area to review subgrade for trail, wall, and buttress construction and observe that the contractor's temporary excavation plan is being implemented in accordance with the approved submittal. It is also expected that the contractor's geotechnical engineer would maintain a heavy presence at site during construction, particularly during excavation in the mid-slope area and excavation for the buttress.

5.4 FUTURE GEOTECHNICAL INPUT

Future geotechnical work is expected in support of final design, tender, and construction and may include the following tasks:

- Geotechnical engineering support during final preparation of tender documents in the context of geotechnical recommendations;
- Support during tender (as needed);
- Geotechnical support for removal of fallen timber to limit impacts to permanent slope configuration;
- Geotechnical field review and support during the ground elevation survey check proposed after clearing of large trees;
- Review and update design if required based on the survey data;
- Review contractor submittals with respect to materials, construction sequencing and methodology, and any changes that are proposed;
- Field review during construction – subgrade preparation, final shaping of buttress, drainage blanket, foundation pad excavations for retaining walls, and geogrid installation; and,
- QA materials testing.

6 CLOSURE

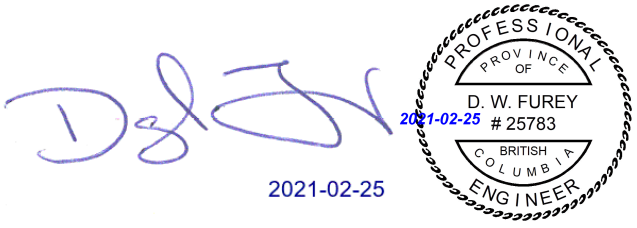
This report has been prepared by WSP Canada Inc. exclusively for Parks Canada and their design team in relation to the Wayii segment of the Upscheek Tashee Multi-Use Pathway in the Pacific Rim National Park Reserve on the west coast of Vancouver Island. The report has been prepared in accordance with the attached Standard Limitations.

We trust this information meets your immediate requirements. If you have any questions or require further information, please contact the undersigned.

Yours sincerely,

WSP Canada Inc.

Reviewed by:



Darryl Furey, M.Eng., P.Eng.
Senior Geotechnical Engineer

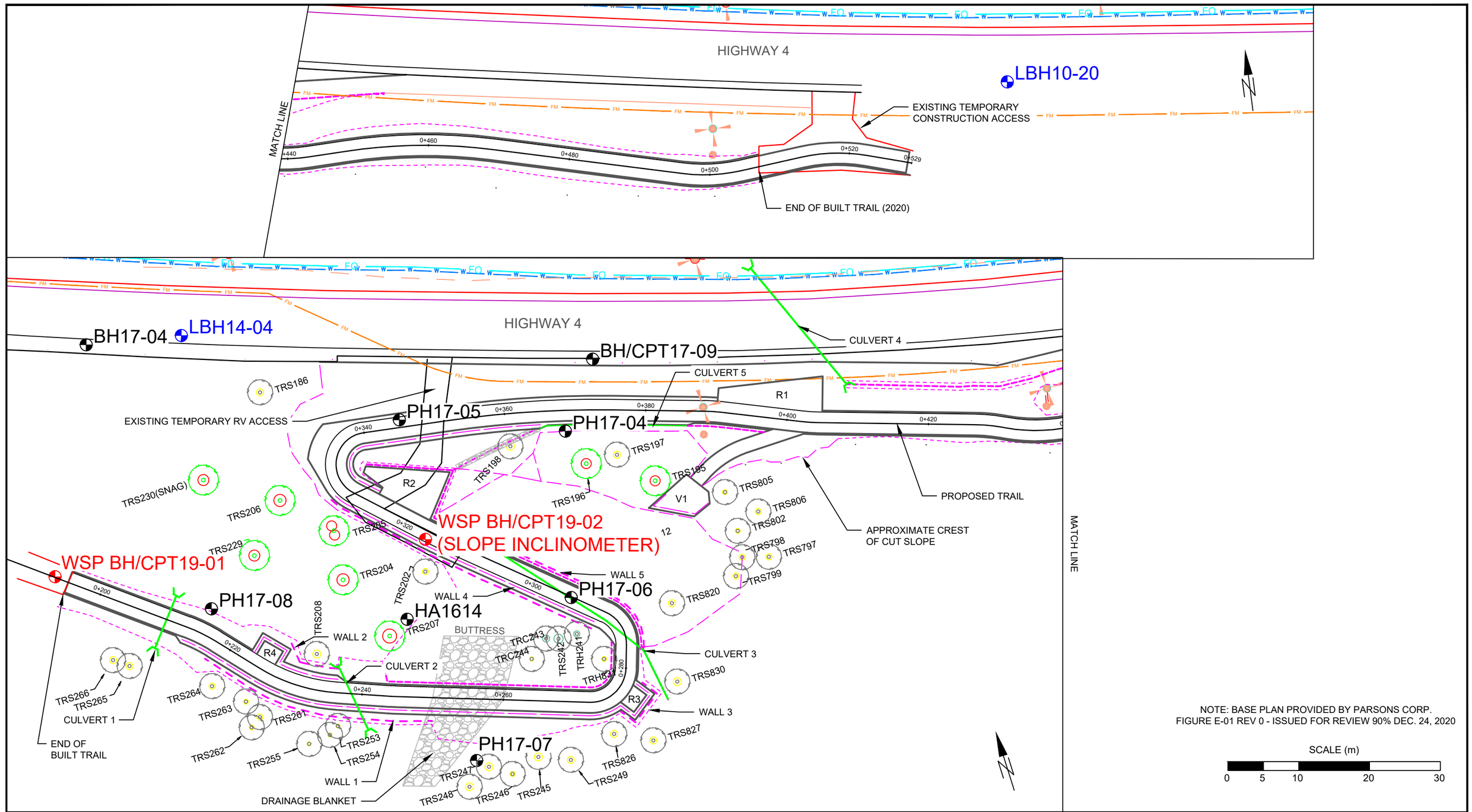
Carl Miller, M.Sc., P.Eng.
Senior Geotechnical Engineer

APPENDIX

1. FIGURES AND PHOTOGRAPHS

	PROJECT: UPSCHEEK TASHEE PATHWAY – WAYII AREA GEOTECHNICAL ASSESSMENT				
	TITLE: SITE LOCATION PLAN – PACIFIC RIM NATIONAL PARK RESERVE				
	CLIENT: PARKS CANADA				
FIGURE NO.: 1	DATE: FEBRUARY 2021	FILE NO.: 191-08875-02	SCALE: NTS	DRAWN BY: DF	REV NO.: -

WSP Canada Inc., 1935 Bollinger Road, Nanaimo, B.C., V9S 5W9 Phone: 250/753-1077



LEGEND:

- APPROXIMATE LOCATION OF HOLLOW STEM AUGER BOREHOLE AND CONE PENETRATION TEST PAIR (2019)
- APPROXIMATE LOCATION OF TEST HOLE (WOOD)(2011/17)
  BH = AUGER BOREHOLE
  CPT = CONE PENETRATION TEST
  HA = HAND AUGER
  PH = PORTABLE HAMMER DRILL
- APPROXIMATE LOCATION OF AUGER BOREHOLE (LEVELTON)(2014, & 2010)
- EXISTING TREE
- TREE 1m DIAMETER OR LARGER
- UTILITY POLE
- R PROPOSED REST AREA
- V PROPOSED VIEW POINT

REV. :	DESCRIPTION:	DATE : (M/D/YR)
1	GEOTECHNICAL ASSESSMENT	02/25/21
0	GEOTECHNICAL ASSESSMENT (CLIENT REVIEW)	02/04/21

PROJECT: UPSCHEEK TASHEE MULTI-USE PATHWAY
WAYII AREA GEOTECHNICAL ASSESSMENT
PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC

CLIENT: PARKS CANADA

TITLE: TEST HOLE LOCATION PLAN

DATE: FEB 2021
DESIGN BY: DF
DRAWN BY: BPK
CHECKED BY: DF
SCALE: AS SHOWN

PROJECT No.: 191-08875-02

FIGURE NO.: 2

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PHOTO TABLE

Photo	Description
	**Photo 1:** 2019-12-10 View of conditions at BH19-01 at the base of the slope looking east at time of drilling. Note ponded water in background.
	**Photo 2:** 2019-12-10 View of stiff clay at BH19-01 SPT-4 (10.6 m depth).

Photo 3:
2019-12-11

View of very stiff clay at BH19-01 SPT-6 (26 m depth)

Photo 4:
2019-12-12

View of conditions at BH19-02 in the middle part of the slope looking southeast from near the proposed upper switchback. Note Tree 199 on the left (upslope) side of the drill rig in an area of proposed cut (proposed Rest Area 2) and Tree 202 on the right (downslope) side of the drill rig that is to be kept.

Photo 5:
2019-12-12

View of firm to stiff clay at BH19-02 SPT2 (2.8 m depth) near the base of the proposed cut elevation.

(i.e. approximate order of magnitude of proposed cut).

Photo 6:
2010-12-12

View of firm clay in a local sandy zone at BH19-02 SPT3 (7.5 m depth).

Photo 7:
2020-10-30

General view looking East along the proposed trail from near Station 0+400.

Photo 8:
2020-10-30

View looking East from Highway 4 towards the general area of the proposed viewpoint prior to cutting of trees. Note the Hydro pole (proposed trail centerline at +/- Station 0+388) and guy anchor in the foreground that are to be relocated.

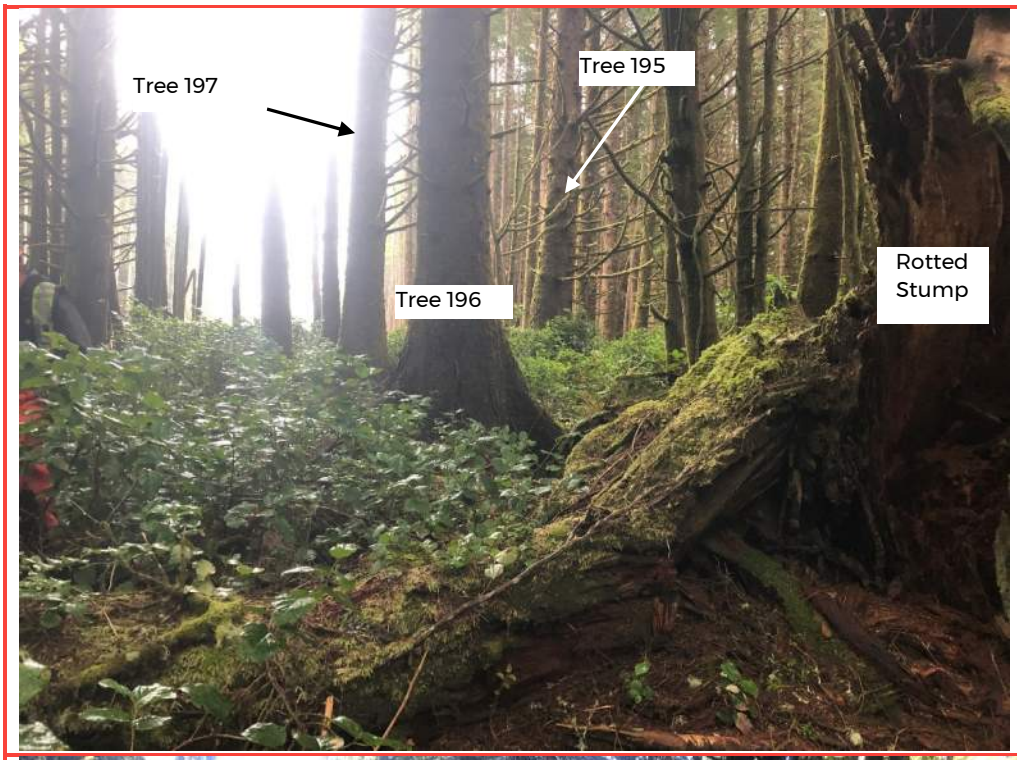


Photo 9:

View looking East towards Trees 195, 196, 197 which are to be protected during construction.

Photo 10:

View looking Northwest from near Station 0 + 320 towards upper switchback. Note the clay in the background that will be excavated.

Photo 11:
2020-01-30

View from near Station 0+320 looking Northwest towards Trees 205 & 206 that are to remain. The edge of the proposed trail is in the foreground right.

Photo 12:
2020-02-20

View looking Southeast towards lower switchback. Note Trees 830 & 831.

Photo 13:
2020-02-20

View looking Southwest from near Station 0 + 290 towards local, low wet area where blanket drain and buttress are proposed.

Photo 14:
2020-02-20

View looking West from near Station 0 + 300 up the former slide area that is to be remediated.

APPENDIX

2. CONCEPT PLANS

- Base Plan
- Sections A to I
- 3D Images

APPENDIX 2-1

Select Design Drawings

- Drawing E-01 – Site Plan
- Drawing E-02 – Trail Plan
- Drawing E-03 – Trail Profile
- Drawing E-04 – Cleared Tree Plan (Shows Locations of Sections A to I)
- Drawings X-03 to X-11 – Slope Sections A to I

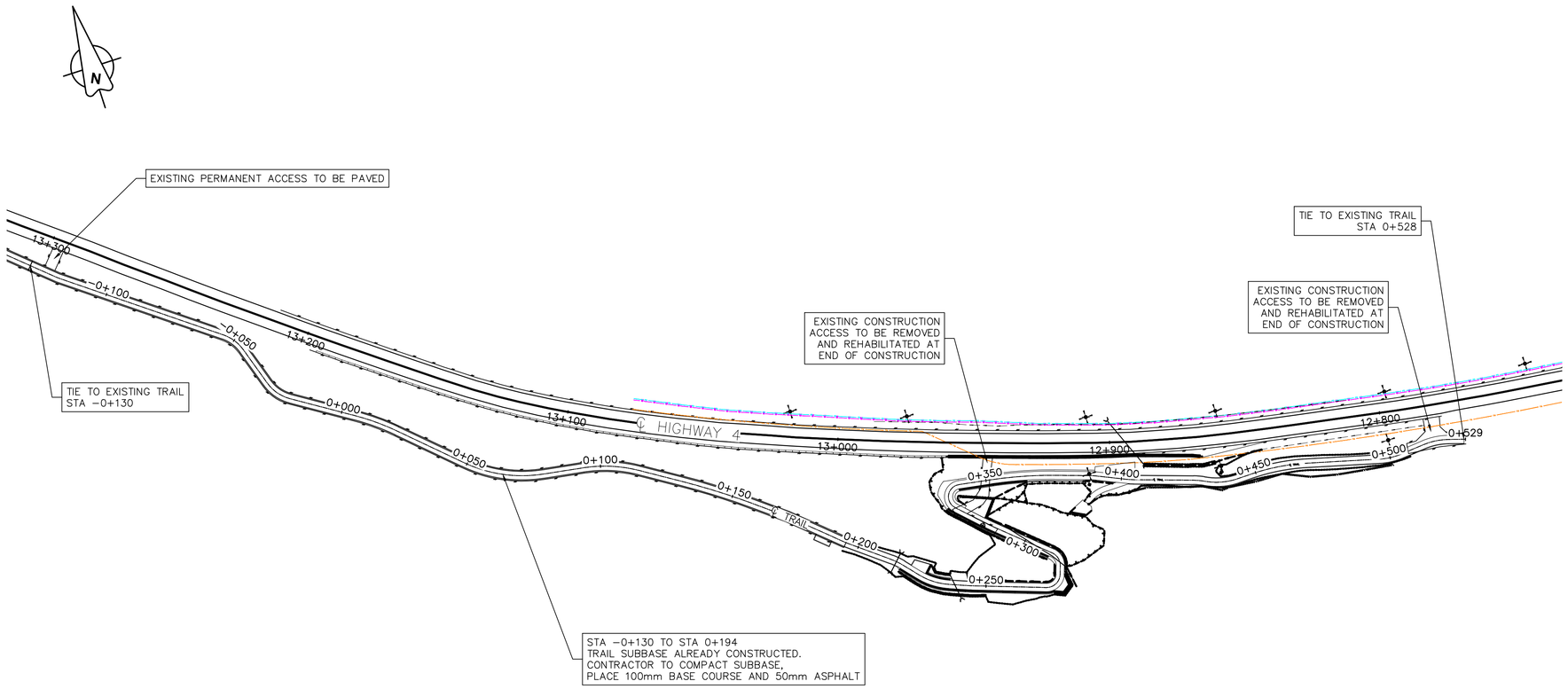
LEGEND

EXISTING

- EDGE OF PAVEMENT
- SHOULDER OF HIGHWAY
- CONCRETE ROADSIDE BARRIER
- TOP OF BANK
- CENTER OF CREEK/DITCH
- UTILITY POLE

PROPOSED

- EDGE OF TRAIL
- CONCRETE ROADSIDE BARRIER
- SAFETY RAIL
- RETAINING WALL
- TOE OF FILL
- CREST OF CUT
- CENTER OF CREEK/DITCH
- EXISTING TREE
- TREE 1m DIAMETER OR LARGER
- CULVERT
- SANITARY LINE
- WATER LINE
- FIBER OPTIC



PLAN
1:1000

NOTES:

1. SURVEY DATA IS BASED UPON THE UTM NAD83 COORDINATE SYSTEM.
2. THE CONTRACTOR SHALL ADHERE TO ALL ENVIRONMENTAL AND ARCHAEOLOGICAL REGULATIONS AS SPECIFIED IN THE CONTRACT.
3. UTILITY LOCATIONS ARE AN APPROXIMATION BASED ON ISL 2014 RECORD DRAWING. UTILITY LOCATES MUST BE CONDUCTED PRIOR TO CONSTRUCTION TO IDENTIFY EXACT LOCATIONS OF UTILITIES.
4. ALL EXPOSED CUT AND FILL SLOPES TO BE COVERED IN MIN 150mm DEEP OF NATIVE ORGANICS, SALVAGED FROM THE SITE DURING GRUBBING/STRIPPING. NATIVE ORGANICS ARE NOT TO BE MIXED WITH UNDERLYING MINERAL SOIL (CLAY, SAND, ETC.) AND MUST BE STORED SEPARATELY TO BE RE−USED ON THE SLOPE. ORGANICS TO BE COVERED (AS DIRECTED BY THE GEOTECHNICAL ENGINEER) WITH C32BD EROSION CONTROL BLANKET (ECB) SECURED WITH HOOKED REBAR "PINS". LARGE WOODY DEBRIS (STUMPS, LOGS, ETC.) SALVAGED FROM THE SITE DURING GRUBBING/STRIPPING TO BE PLACED ON TOP OF THE ECB, AS DIRECTED BY THE GEOTECHNICAL ENGINEER AND OEM.
5. POSTED HIGHWAY SPEED 80 km/hr.

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PARSONS

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Revision/ Revision	Description/Description	Date/Date
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0	ISSUED FOR TENDER	21/02/18

Client/client

Parks Canada Agency | L'Agence Parcs Canada

Western and Northern Region | Ouest et Nord du Canada

Project title/Titre du projet

TOFINO

PACIFIC RIM NATIONAL PARK RESERVE
ʔapscīik ƫasīi
(Ups-cheek ta-shee)
"Going in the right direction on the trail"

Consultant Signature Only

Designed by/Concept par
ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin

WAYII AREA TRAIL DESIGN

SITE PLAN

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	E-01 OF	0

\\VCCANSBFS01\VAN\YV\603121 - PWGSC SOA 2016-19\PACIFIC TRAVERSE TRAIL\DWGS\ESCARPMENT\PT\ESCARPMENT E-01 PLAN.DWG PLOTTED ON 2021/02/17 4:11pm BY PDOZBIBE

PWGSC – A1 – 841X594

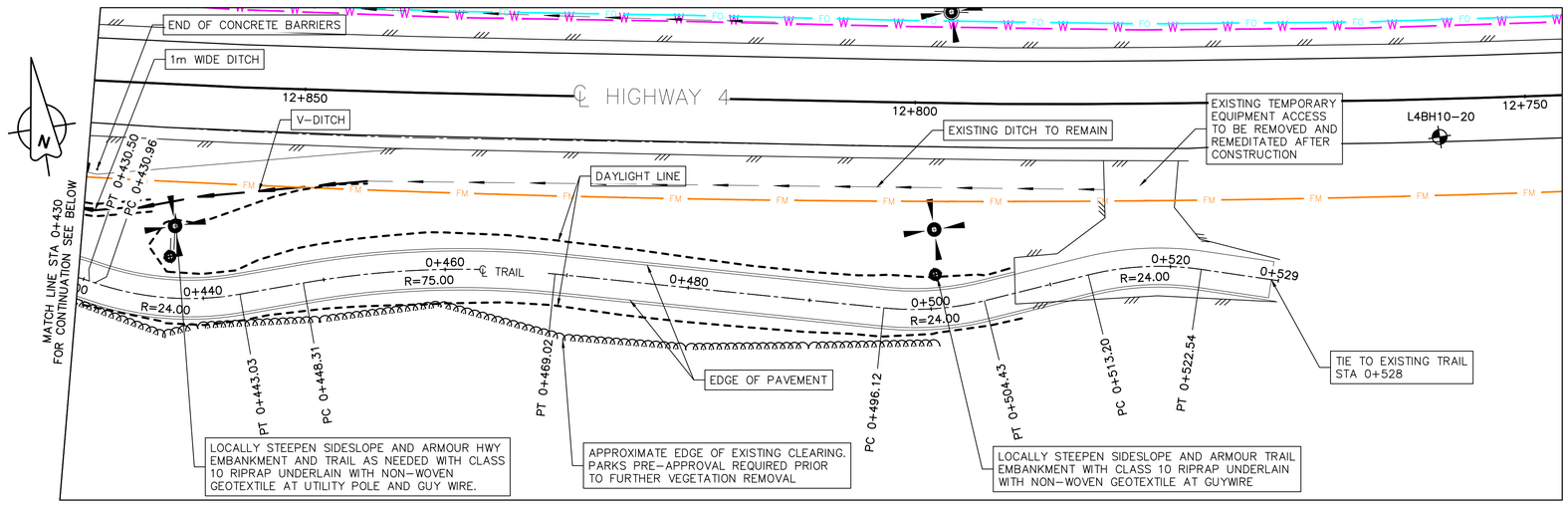
LEGEND

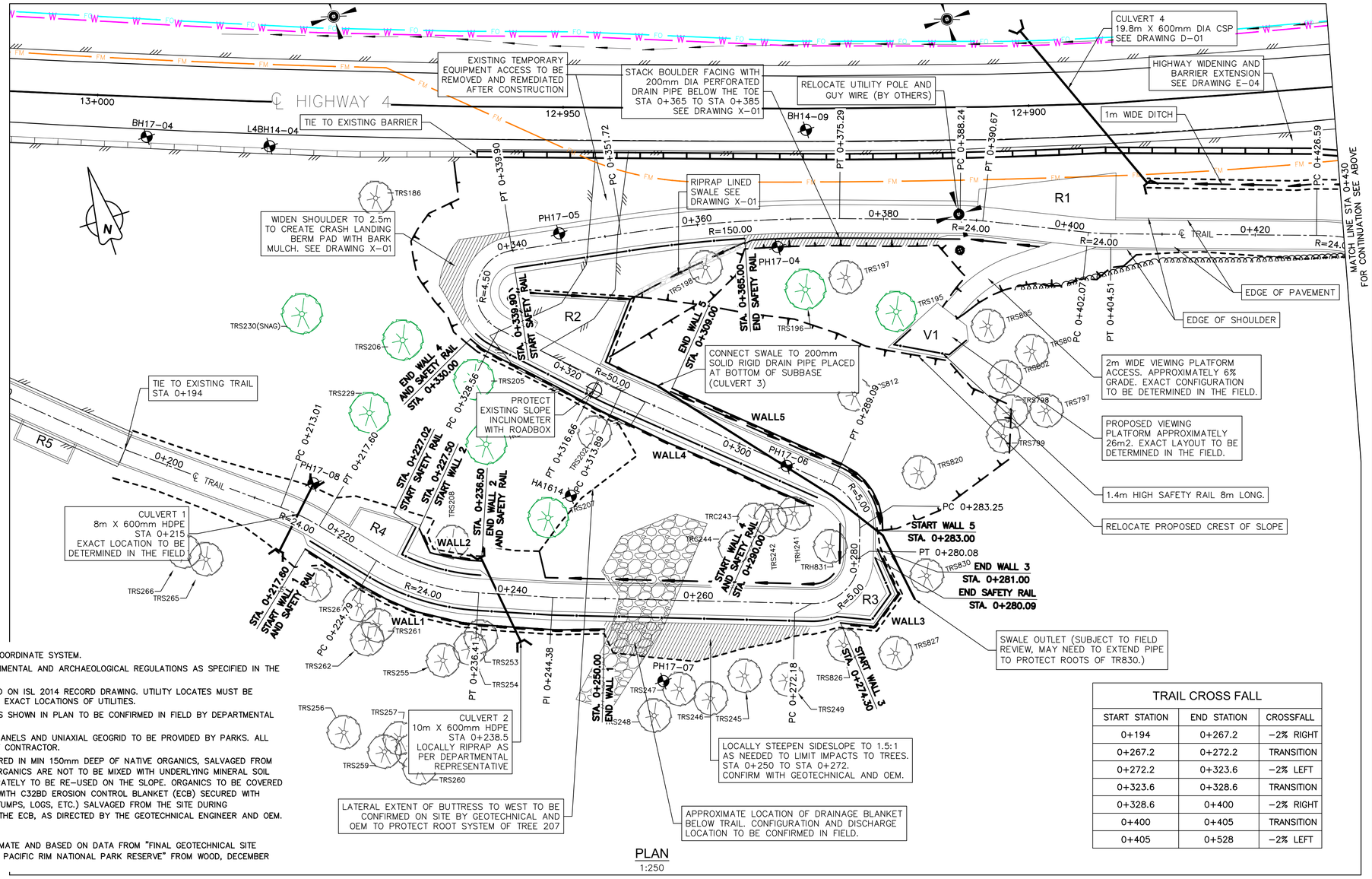
EXISTING

- EDGE OF PAVEMENT
- SHOULDER OF HIGHWAY
- CONCRETE ROADSIDE BARRIER
- TOP OF BANK
- CENTER OF CREEK/DITCH
- UTILITY POLE

PROPOSED

- EDGE OF TRAIL
- CONCRETE ROADSIDE BARRIER
- SAFETY RAIL
- RETAINING WALL
- TOE OF FILL
- CREST OF CUT
- CENTER OF CREEK/DITCH
- CLASS 10 RIPRAP
- EXISTING TREE
- TREE 1m DIAMETER OR LARGER
- V1 VIEWING PLATFORM
- R1 REST AREA
- CULVERT
- SANITARY LINE
- WATER LINE
- FIBER OPTIC
- APPROXIMATE BOREHOLE LOCATIONS





PLAN
1:250

TRAIL CROSS FALL		
START STATION	END STATION	CROSSFALL
0+194	0+267.2	−2% RIGHT
0+267.2	0+272.2	TRANSITION
0+272.2	0+323.6	−2% LEFT
0+323.6	0+328.6	TRANSITION
0+328.6	0+400	−2% RIGHT
0+400	0+405	TRANSITION
0+405	0+528	−2% LEFT

NOTES:

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2. THE CONTRACTOR SHALL ADHERE TO ALL ENVIRONMENTAL AND ARCHAEOLOGICAL REGULATIONS AS SPECIFIED IN THE CONTRACT.
3. UTILITY LOCATIONS ARE AN APPROXIMATION BASED ON ISL 2014 RECORD DRAWING. UTILITY LOCATES MUST BE CONDUCTED PRIOR TO CONSTRUCTION TO IDENTIFY EXACT LOCATIONS OF UTILITIES.
4. EXACT LOCATIONS AND SIZES OF RETAINING WALLS SHOWN IN PLAN TO BE CONFIRMED IN FIELD BY DEPARTMENTAL REPRESENTATIVE.
5. RETAINING WALLS SHALL BE ENVIROGRID. EGA40 PANELS AND UNIAXIAL GEOGRID TO BE PROVIDED BY PARKS. ALL OTHER ENVIROGRID ELEMENTS TO BE SUPPLIED BY CONTRACTOR.
6. ALL EXPOSED CUT AND FILL SLOPES TO BE COVERED IN MIN 150mm DEEP OF NATIVE ORGANICS, SALVAGED FROM THE SITE DURING GRUBBING/STRIPPING. NATIVE ORGANICS ARE NOT TO BE MIXED WITH UNDERLYING MINERAL SOIL (CLAY, SAND, ETC.) AND MUST BE STORED SEPARATELY TO BE RE-USED ON THE SLOPE. ORGANICS TO BE COVERED (AS DIRECTED BY THE GEOTECHNICAL ENGINEER) WITH C32BD EROSION CONTROL BLANKET (ECB) SECURED WITH HOOKED REBAR "PINS". LARGE WOODY DEBRIS (STUMPS, LOGS, ETC.) SALVAGED FROM THE SITE DURING GRUBBING/STRIPPING TO BE PLACED ON TOP OF THE ECB, AS DIRECTED BY THE GEOTECHNICAL ENGINEER AND OEM.
7. POSTED HIGHWAY SPEED 80 km/hr.
8. BACKGROUND BOREHOLE LOCATIONS ARE APPROXIMATE AND BASED ON DATA FROM "FINAL GEOTECHNICAL SITE ASSESSMENT REPORT – PACIFIC TRAVERSE TRAIL, PACIFIC RIM NATIONAL PARK RESERVE" FROM WOOD, DECEMBER 17, 2018.

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0	ISSUED FOR TENDER	21/02/18

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Parks Canada Agency / L'Agence Parcs Canada

Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet

TOFINO

PACIFIC RIM NATIONAL PARK RESERVE
ʔapscīik ta·sii
(Ups-cheek ta-shee)
"Going in the right direction on the trail"

Consultant Signature Only

Designed by/Concept par
DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

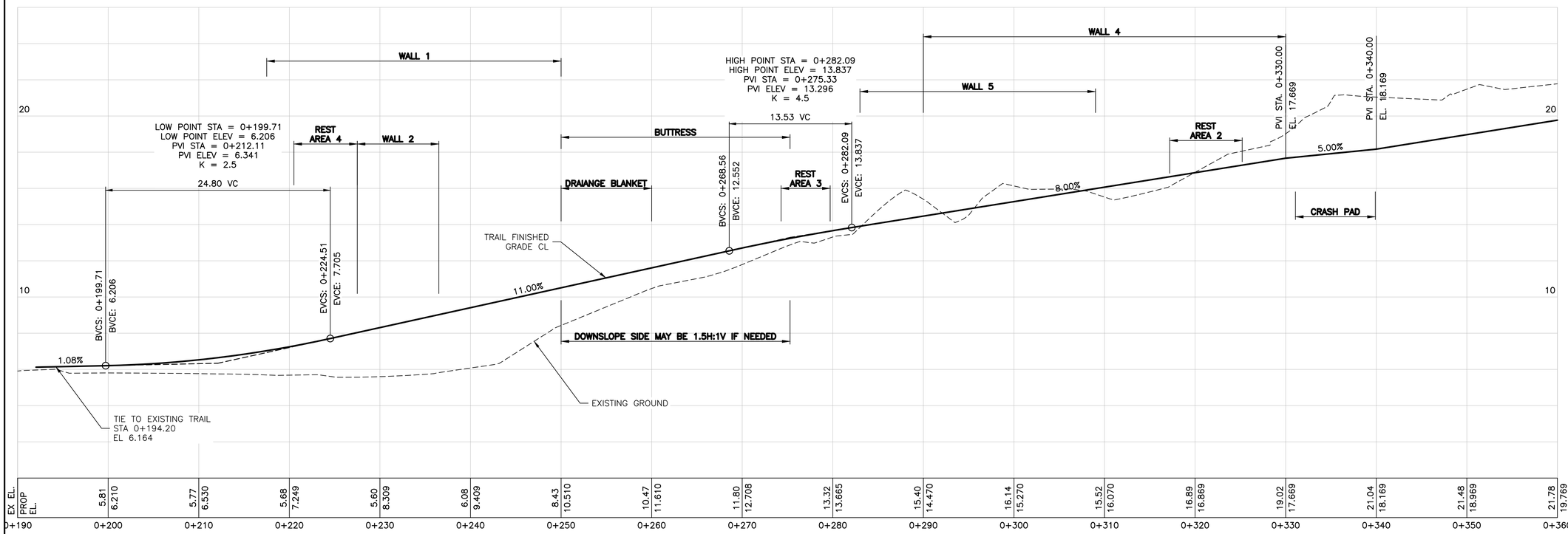
PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

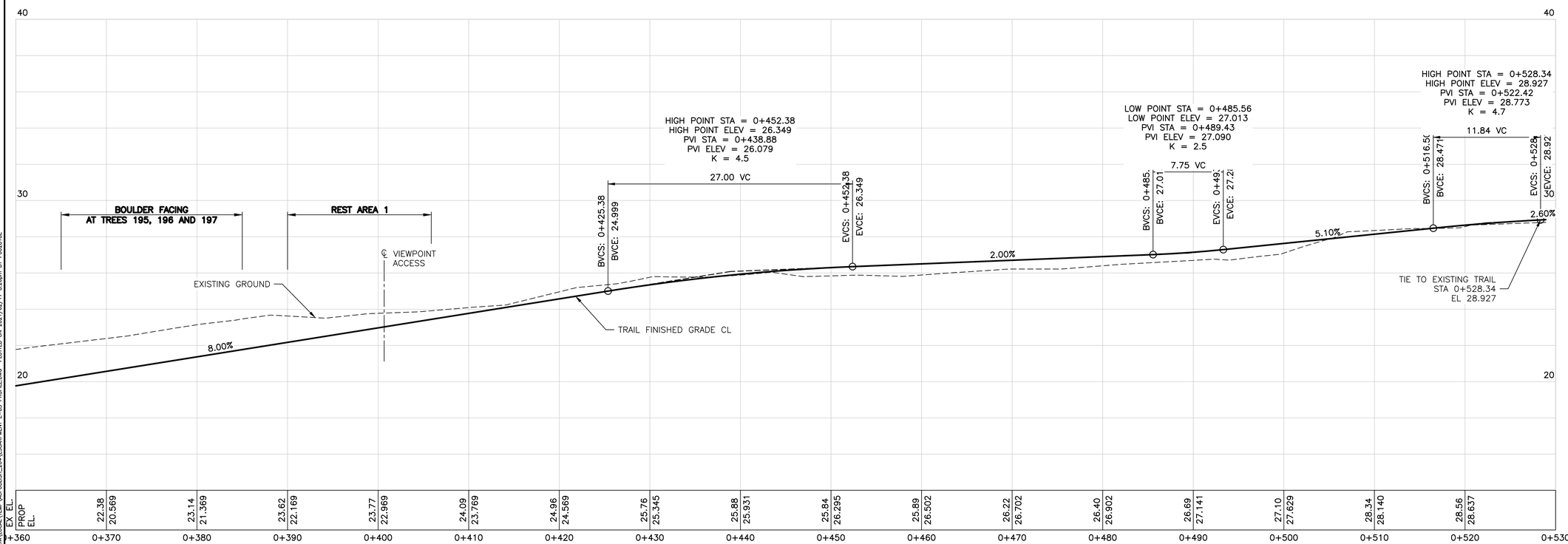
Drawing title/Titre du dessin

WAYII AREA TRAIL DESIGN

TRAIL PLAN

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	E-02 OF	0





PROFILE
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Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin

WAYII AREA TRAIL DESIGN

TRAIL PROFILE

Project No./No. du projet	Sheet/ Feuille	Revision no./ La Révision no.
PCA #1522	E-02 OF	0

PWGSC – A1 – 841X594

LEGEND

EXISTING

- EDGE OF PAVEMENT
- SHOULDER OF HIGHWAY
- CONCRETE ROADSIDE BARRIER
- TOP OF BANK
- CENTER OF CREEK/DITCH
- UTILITY POLE

PROPOSED

- EDGE OF TRAIL
- CONCRETE ROADSIDE BARRIER
- SAFETY RAIL
- RETAINING WALL
- TOE OF FILL
- CREST OF CUT
- CENTER OF CREEK/DITCH
- CLASS 10 RIPRAP
- TREE REMOVED DURING CLEARING
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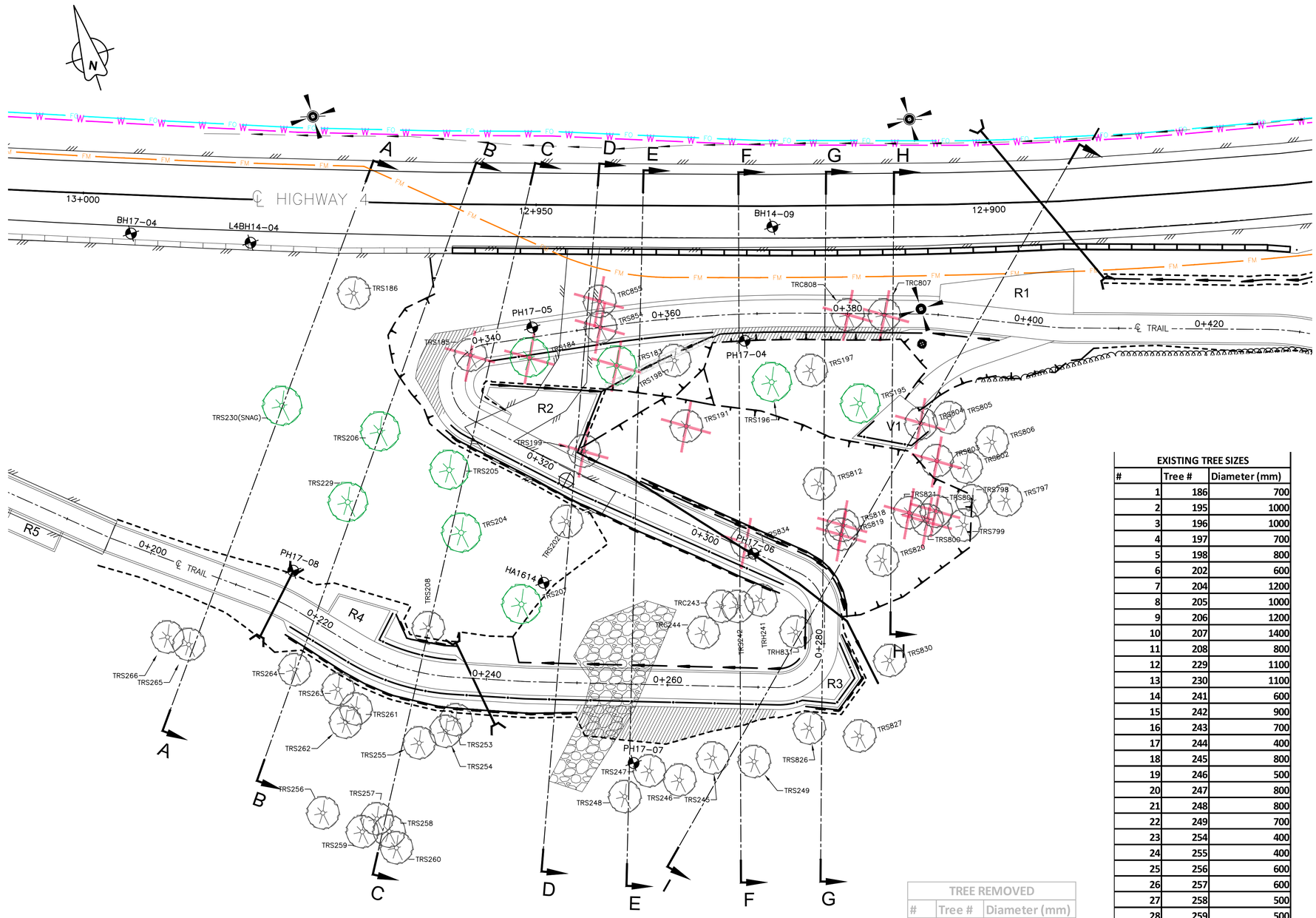
- V1 VIEWING PLATFORM
- R1 REST AREA
- CULVERT
- SANITARY LINE
- WATER LINE
- FIBER OPTIC
- BOREHOLE



PLAN
1:250

NOTE:

1. TREE DIAMETERS ARE AN APPROXIMATION.
2. TREES NOTED AS HAVING BEEN REMOVED: STUMPS REMAIN AND WILL NEED TO BE REMOVED (EXCAVATED) AS PART OF THIS CONTRACT. EXPECT ZONE OF DISTURBANCE THAT WILL NEED TO BE REINSTATED. FOR STUMPS ON CUT SLOPES THAT ARE NEAR THE FINISHED SLOPE FACE CONFIRM WITH WSP PRIOR TO REMOVAL
3. CONTRACTOR MUST EMPLOY METHODS THAT PROTECT MATURE TREES (>500mm) IN THE WORK AREA TO AVOID ADDITIONAL REMOVALS, OR DAMAGE TO LIMBS AND ROOT SYSTEMS.
4. TREES TO REMAIN: TRIMMING, CLIMBING OR ANY OTHER MODIFICATION TO EXISTING TREE REQUIRES WRITTEN APPROVAL FROM PARKS. TREES 1m DIAMETER OR LARGER ARE OFF LIMIT AND NOT TO BE MODIFIED.
5. TREES REQUIRING REMOVAL: IF, AFTER CONSULTATION WITH GEOTECHNICAL ENGINEER AND OEM, IT IS DETERMINED THAT A TREE MUST BE REMOVED TO FACILITATE CONSTRUCTION, THIS MAY BE ALLOWED AFTER ADVANCED NOTICE, BREEDING BIRD SURVEY AND WRITTEN APPROVAL FROM PARKS.
6. BACKGROUND BOREHOLE LOCATIONS ARE APPROXIMATE AND BASED ON DATA FROM "FINAL GEOTECHNICAL SITE ASSESSMENT REPORT – PACIFIC TRAVERSE TRAIL, PACIFIC RIM NATIONAL PARK RESERVE" FROM WOOD, DECEMBER 17, 2018.

TREE REMOVED		
#	Tree #	Diameter (mm)
1	183	1000
2	184	1000
3	185	700
4	191	700
5	199	600
6	800	600
7	801	500
8	803	500
9	804	500
10	807	700
11	808	400
12	818	400
13	819	700
14	821	400
15	834	500
16	854	500
17	855	500

EXISTING TREE SIZES		
#	Tree #	Diameter (mm)
1	186	700
2	195	1000
3	196	1000
4	197	700
5	198	800
6	202	600
7	204	1200
8	205	1000
9	206	1200
10	207	1400
11	208	800
12	229	1100
13	230	1100
14	241	600
15	242	900
16	243	700
17	244	400
18	245	800
19	246	500
20	247	800
21	248	800
22	249	700
23	254	400
24	255	400
25	256	600
26	257	600
27	258	500
28	259	500
29	260	600
30	261	600
31	262	500
32	263	500
33	264	600
34	265	700
35	266	700
36	797	600
37	798	600
38	799	600
39	802	500
40	805	500
41	806	600
42	812	500
43	820	700
44	826	700
45	827	700
46	830	800
47	831	500

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PARSONS

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Revision/ Revision	Description/Description	Date/Date
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Client/client

Parks Canada Agency / L'Agence Parcs Canada
Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet

TOFINO

PACIFIC RIM NATIONAL PARK RESERVE
ʔapscɨik ta̓sɨi
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"Going in the right direction on the trail"

Consultant Signature Only

Designed by/Concept par
DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin

WAYII AREA TRAIL DESIGN

CLEARED TREE PLAN

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	E-04 OF	0

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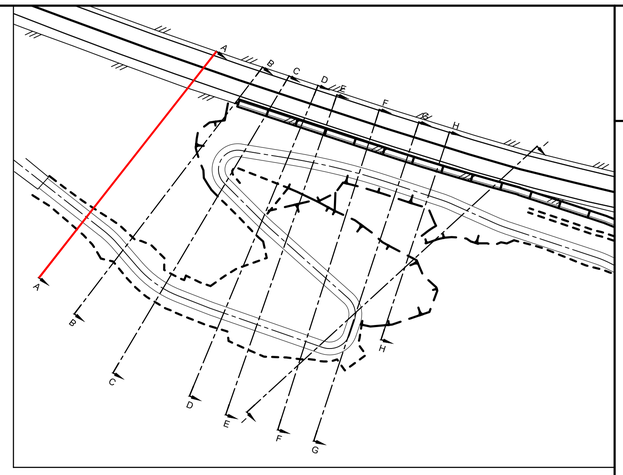
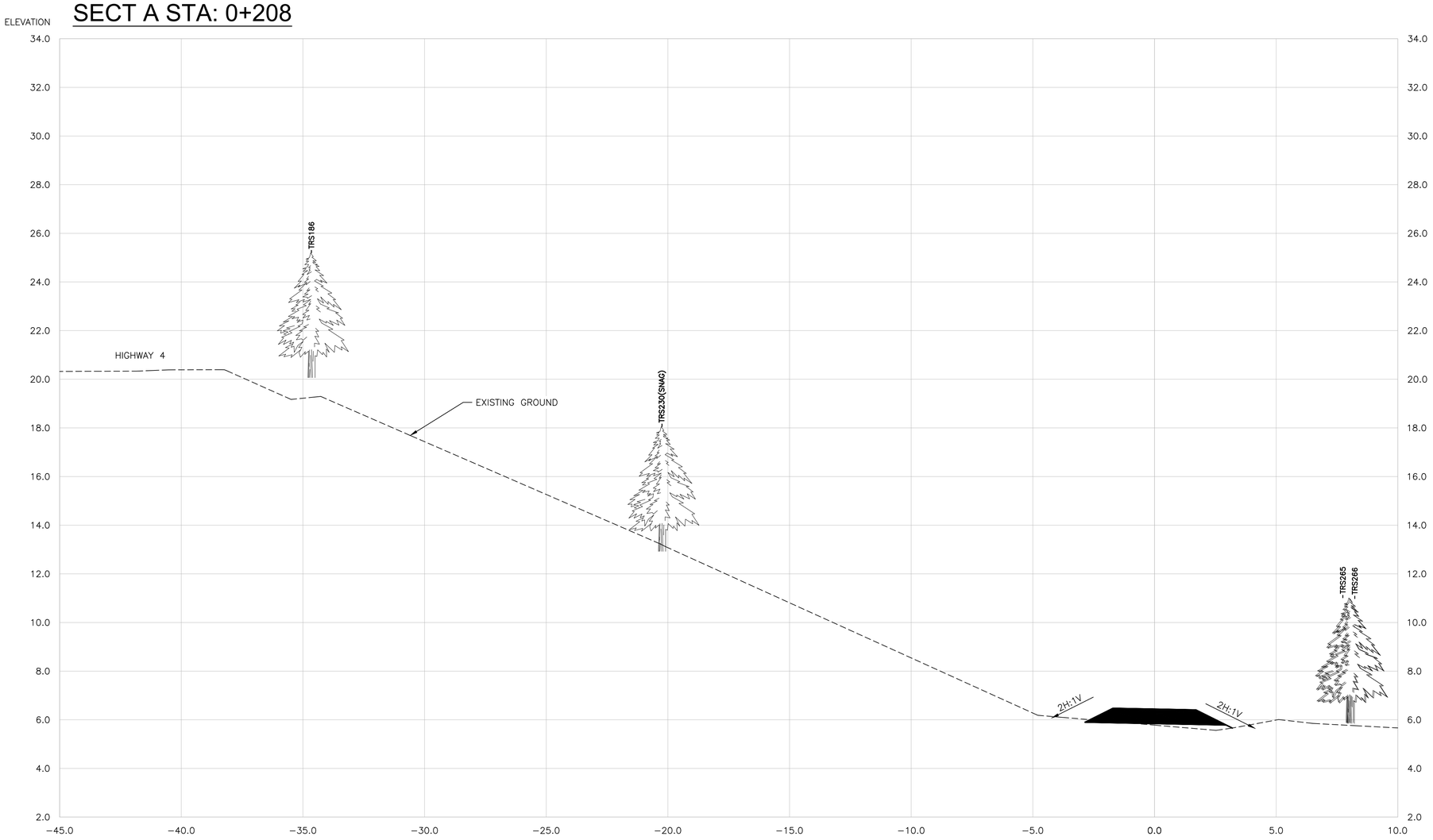


KEY PLAN
NTS

SECT A STA: 0+208



SECTION
1:100 HOR – 1:100 VER

NOTE:
1. FOR DETAILS ON ORGANICS, EROSION CONTROL BLANKET AND WOODY DEBRIS PLACEMENT ON SIDESLOPE SEE ENVIRONMENTAL DRAWING EN–01 TO EN–04.

Parks Canada Agency / L'Agence Parcs Canada

PARSONS

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Revision/ Revision	Description/Description	Date/Date

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Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin

WAYII AREA TRAIL DESIGN

SLOPE SECTION A
STA 0+208

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	X-03 OF	0

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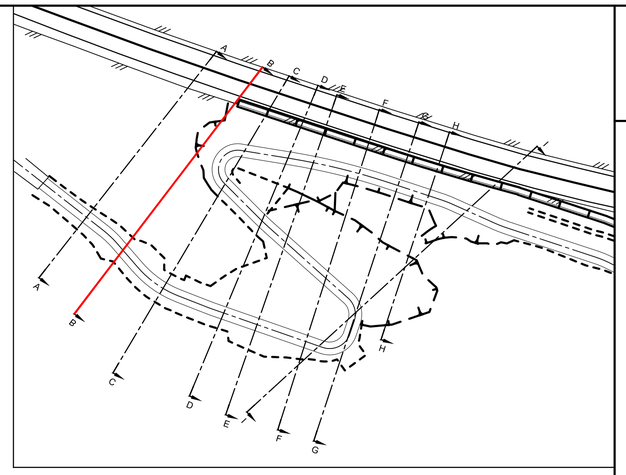

KEY PLAN
NTS

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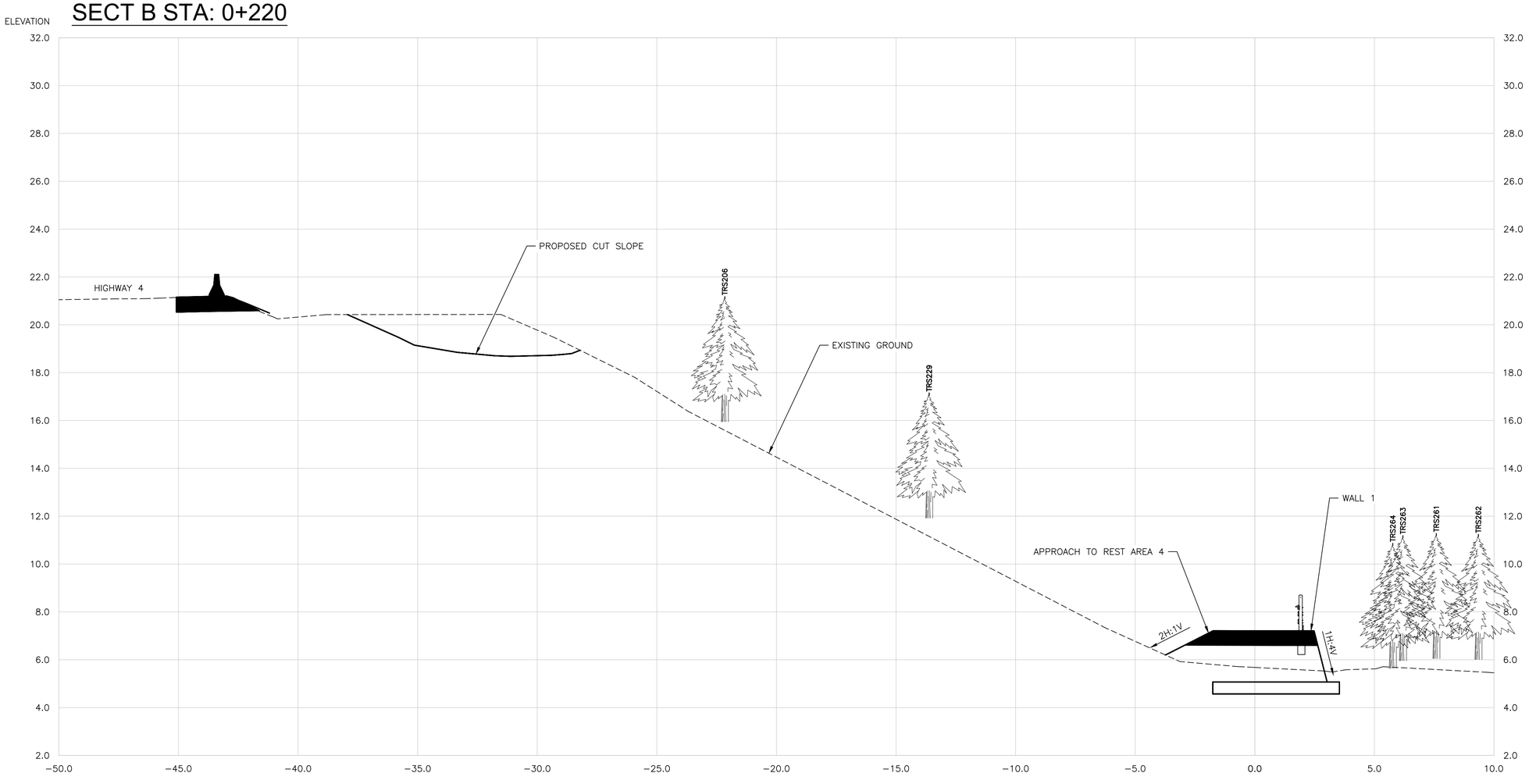

NOTE:
1. FOR DETAILS ON ORGANICS, EROSION CONTROL BLANKET AND WOODY DEBRIS PLACEMENT ON SIDESLOPE SEE ENVIRONMENTAL DRAWING EN−01 TO EN−04.

SECTION
1:100 HOR − 1:100 VER

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PARSONS

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Revision/Revision	Description/Description	Date/Date
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0	ISSUED FOR TENDER	21/02/18

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Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin
WAYII AREA TRAIL DESIGN

SLOPE SECTION B
STA 0+220

Project No./No. du projet	Sheet/Feuille	Revision no./La Révision no.
PCA #1522	X-04 OF	0

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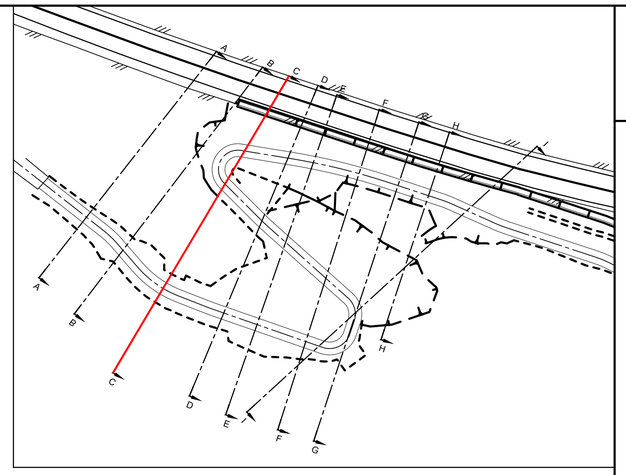
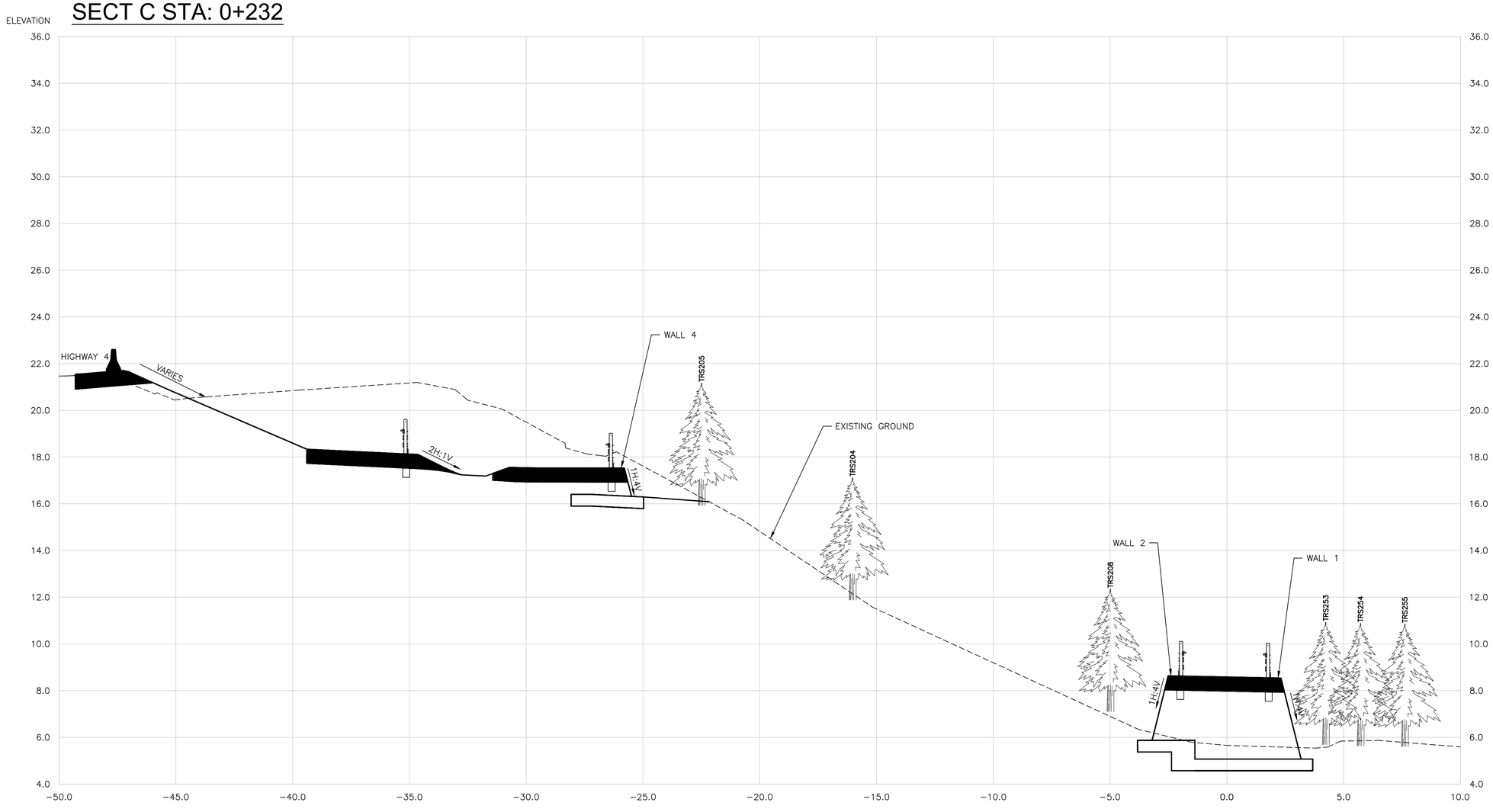
PWGSC - A1 - 841X594



KEY PLAN
NTS

SECT C STA: 0+232



NOTE:
1. FOR DETAILS ON ORGANICS, EROSION CONTROL BLANKET AND WOODY DEBRIS PLACEMENT ON SIDESLOPE SEE ENVIRONMENTAL DRAWING EN−01 TO EN−04.

SECTION
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Parks Canada Agency / L'Agence Parcs Canada

PARSONS

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Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

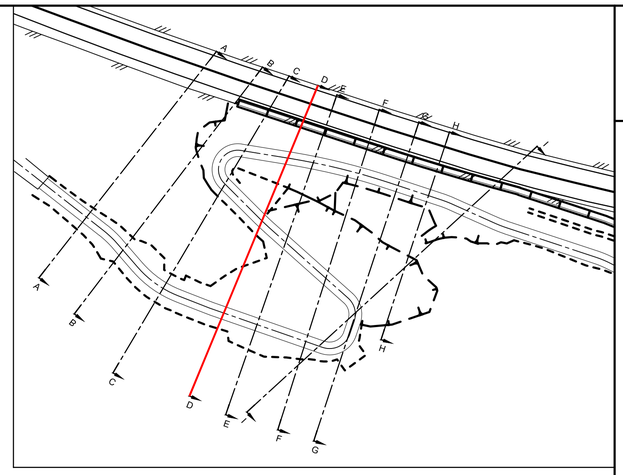
Drawing title/Titre du dessin
WAYII AREA TRAIL DESIGN

SLOPE SECTION C
STA 0+232

Project No./No. du projet	Sheet/ Feuille	Revision no./ La Révision no.
PCA #1522	X-05 OF	0

\\VCOANSFS01\VANTYA\603121 - PWGSC SOA 2016-19\PACIFIC TRAVERSE TRAIL\DWGS\ESCARPMENT\PT\ESCARPMENT X-03-24 CROSS SECTIONS.DWG PLOTTED ON 2021/02/17 4:41pm BY FDOSENBE

PWGSC - A1 - 841X594



KEY PLAN
NTS

SECT D STA: 0+248

NOTE:
1. FOR DETAILS ON ORGANICS, EROSION CONTROL BLANKET AND WOODY DEBRIS PLACEMENT ON SIDESLOPE SEE ENVIRONMENTAL DRAWING EN−01 TO EN−04.

SECTION
1:100 HOR − 1:100 VER

Parks Canada Agency L'Agence Parcs Canada

PARSONS

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0	ISSUED FOR TENDER	21/02/18
Revision/ Révision	Description/Description	Date/Date

Client/client

Parks Canada Agency / L'Agence Parcs Canada
Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet
TOFINO
PACIFIC RIM NATIONAL PARK RESERVE
ʔapscīik ƫasïi
(Ups-cheek ta-shee)
"Going in the right direction on the trail"

Consultant Signature Only

Designed by/Concept par
DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

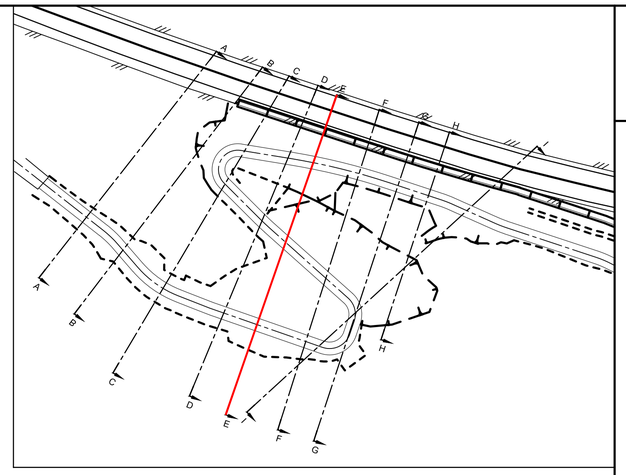
Drawing title/Titre du dessin
WAYII AREA TRAIL DESIGN

SLOPE SECTION D
STA 0+248

Project No./No. du projet	Sheet/ Feuille	Revision no./ La Révision no.
PCA #1522	X-06 OF	0

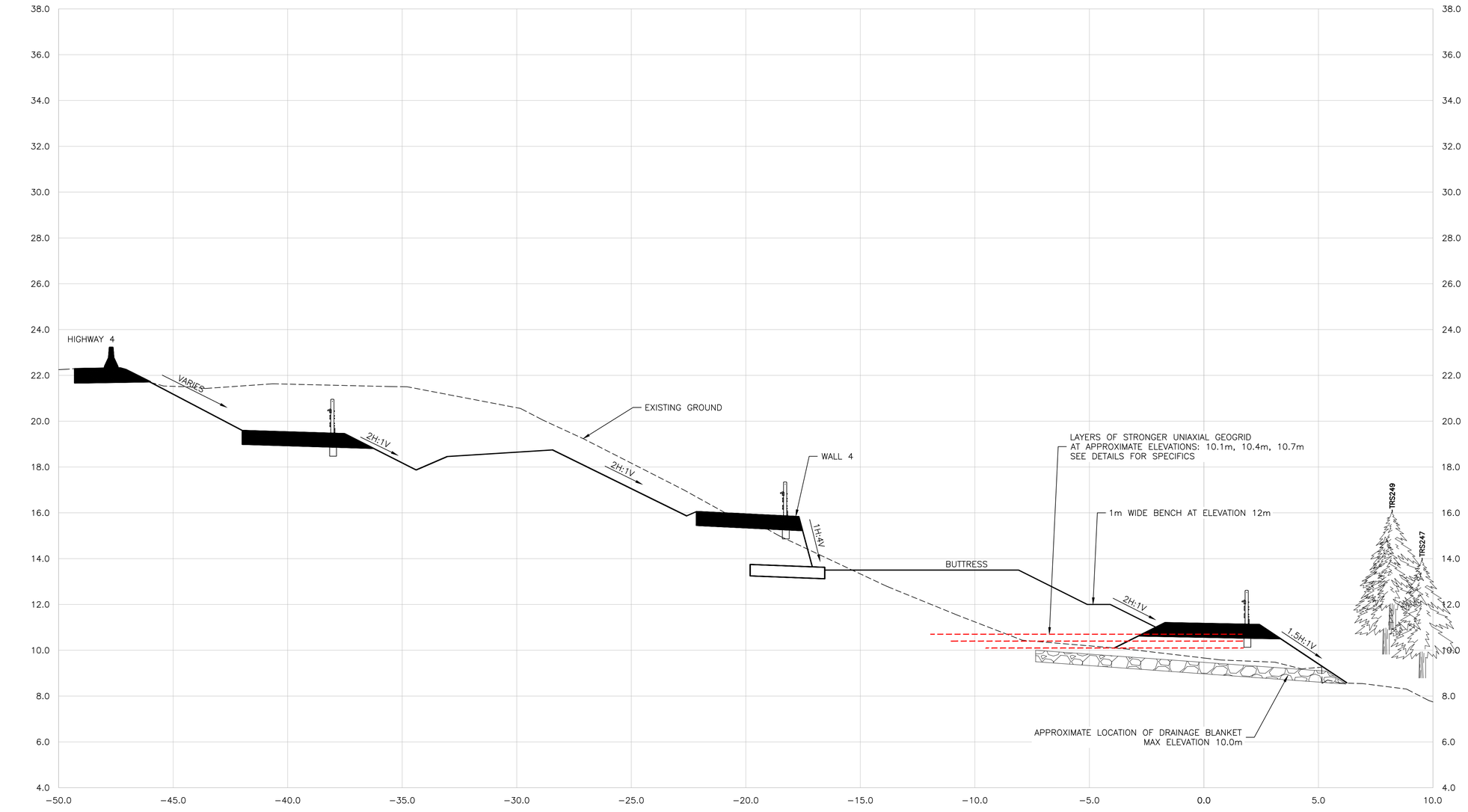
\\VCOANSFS01\VAN\YA\603121 - PWGSC SOA 2016-19\PACIFIC TRAVERSE TRAIL\DWGS\ESCARPMENT\PT\ESCARPMENT X-03-24 CROSS SECTIONS.DWG PLOTTED ON 2021/02/17 6:41pm BY PDOZIER

PWGSC - A1 - 841X594



KEY PLAN
NTS

SECT E STA: 0+256



NOTE:
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SECTION
1:100 HOR − 1:100 VER

Parks Canada Agency / L'Agence Parcs Canada

PARSONS

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0	ISSUED FOR TENDER	21/02/18
Revision/ Révision	Description/Description	Date/Date

Client/client

Parks Canada Agency / L'Agence Parcs Canada
Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet
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DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

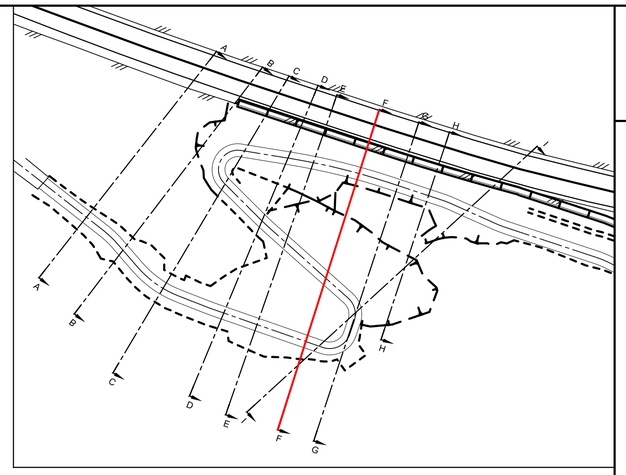
Drawing title/Titre du dessin
WAYII AREA TRAIL DESIGN

SLOPE SECTION E
STA 0+256

Project No./No. du projet	Sheet/ Feuille	Revision no./ La Révision no.
PCA #1522	X-07 OF	0

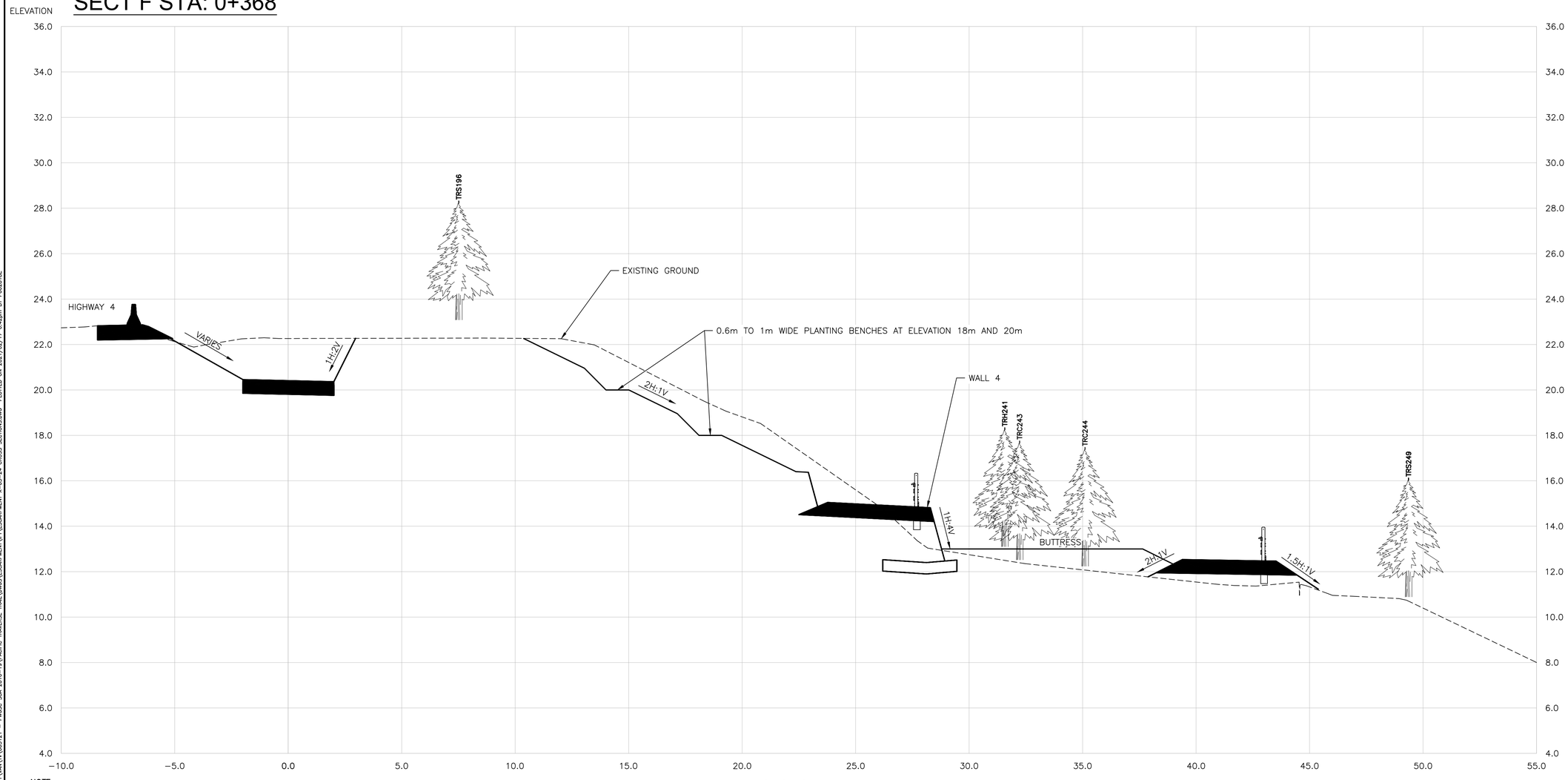
\\VCOANSFS01\VAN\TA\603121 - PWGSC SOA 2016-18\PACIFIC TRAVERSE TRAIL\DWGS\ESCARPMENT\PT\ESCARPMENT X-03-24 CROSS SECTIONS.DWG PLOTTED ON 2021/02/17 6:42pm BY PDOSHE

PWGSC - A1 - 841X594



KEY PLAN
NTS

SECT F STA: 0+368



NOTE:
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SECTION
1:100 HOR − 1:100 VER

Parks Canada Agency / L'Agence Parcs Canada

PARSONS

wsp

Revision/ Revision	Description/Description	Date/Date
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0	ISSUED FOR TENDER	21/02/18

Client/client

Parks Canada Agency / L'Agence Parcs Canada
Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet
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DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

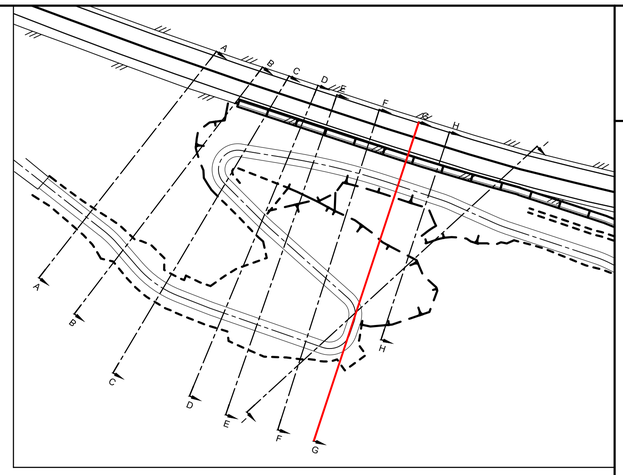
Drawing title/Titre du dessin
WAYII AREA TRAIL DESIGN

SLOPE SECTION F
STA 0+368

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	X-08 OF	0

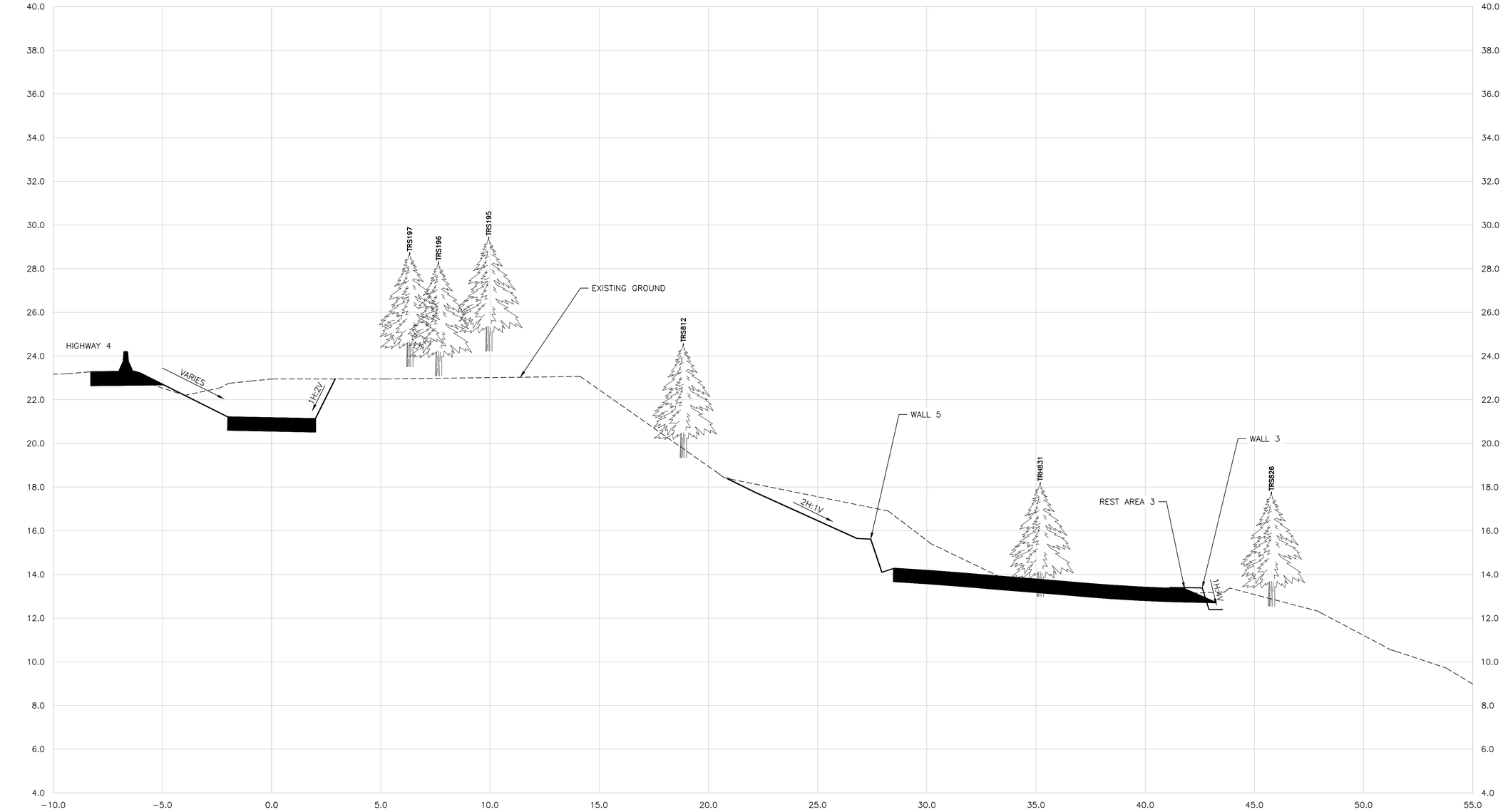
\\VICDMSFS01\VAN\YX\603121 - PWGSC SOA 2016-19\PACIFIC TRAVERSE TRAIL\DWGS\ESCARPMENT\PT\ESCARPMENT X-03-24 CROSS SECTIONS.DWG PLOTTED ON: 2021/02/17 6:42pm BY: PIOSIHE

PWGSC - A1 - 841X594



KEY PLAN
NTS

SECT G STA: 0+378



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SECTION
1:100 HOR − 1:100 VER

Parks Canada Agency / L'Agence Parcs Canada

PARSONS

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Revision/ Revision	Description/Description	Date/Date
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0	ISSUED FOR TENDER	21/02/18

Client/client

Parks Canada Agency / L'Agence Parcs Canada
Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet

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DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin

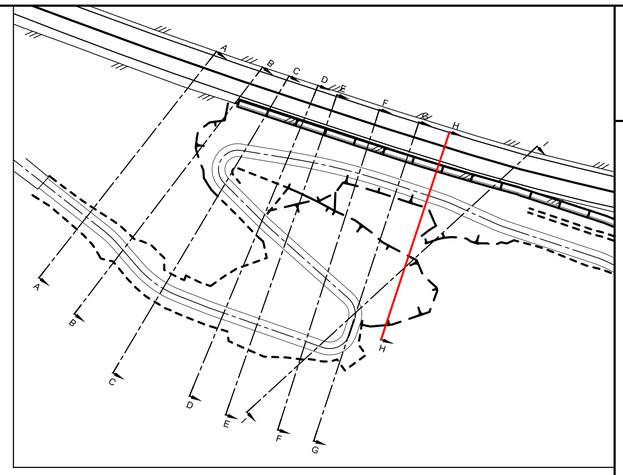
WAYII AREA TRAIL DESIGN

SLOPE SECTION G
STA 0+378

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	X-09 OF	0

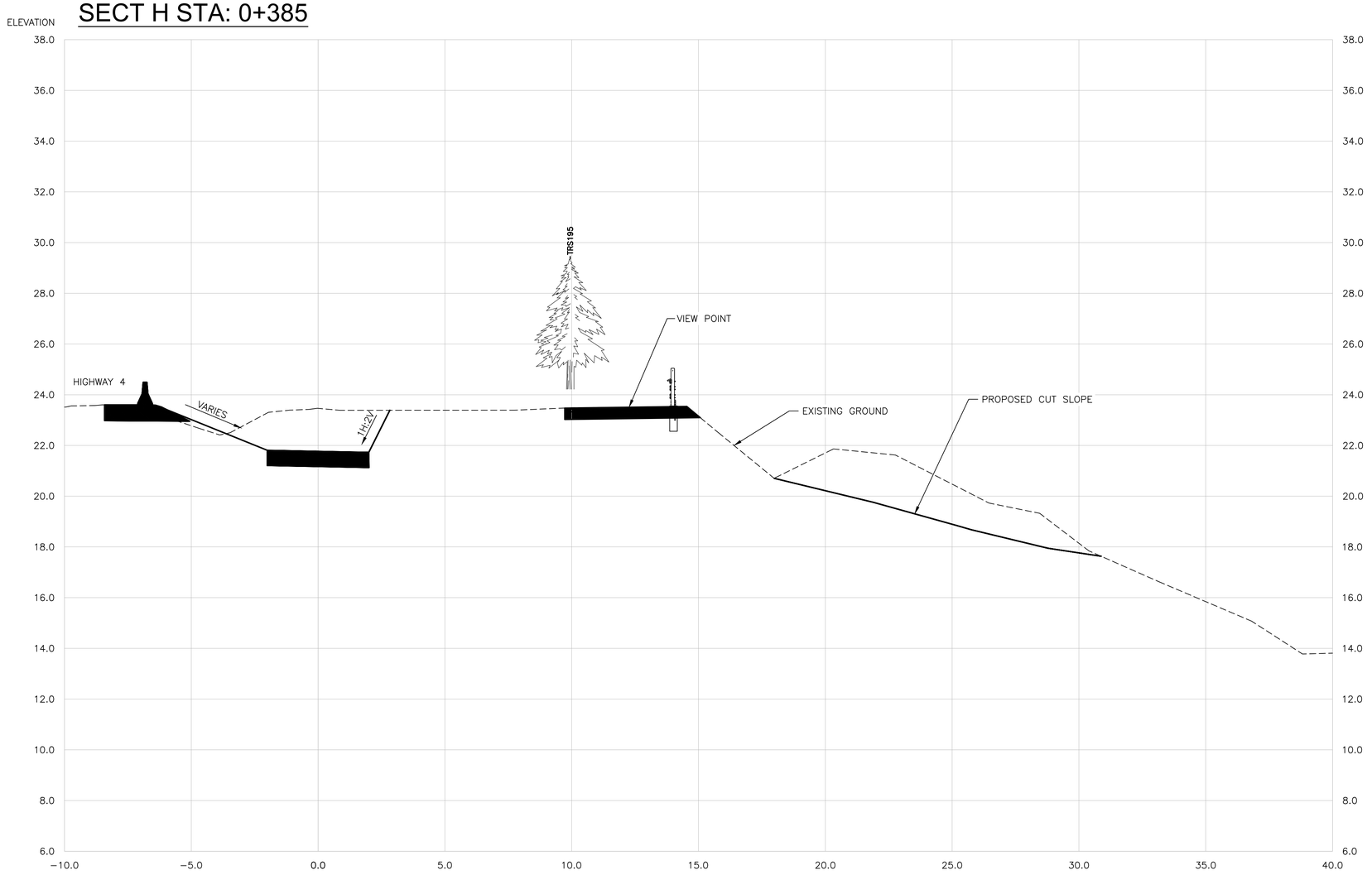
\\VICSAMSFS01\VAN\YX\603121 - PWGSC SOA 2016-19\PACIFIC TRAVERSE TRAIL\DWGS\ESCAPMENT\PT\ESCAPMENT X-03-24 CROSS SECTIONS.DWG PLOTTED ON: 2021/02/17 8:43pm BY: PGOSNELL

PWGSC - A1 - 841X594



KEY PLAN
NTS

SECT H STA: 0+385



SECTION
1:100 HOR – 1:100 VER

NOTE:
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Parks Canada Agency | L'Agence Parcs Canada

PARSONS

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Revision/ Revision	Description/Description	Date/Date
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0	ISSUED FOR TENDER	21/02/18

Client/client

Parks Canada Agency | L'Agence Parcs Canada
Western and Northern Region | Ouest et Nord du Canada

Project title/Titre du projet
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"Going in the right direction on the trail"

Consultant Signature Only

Designed by/Concept par
DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

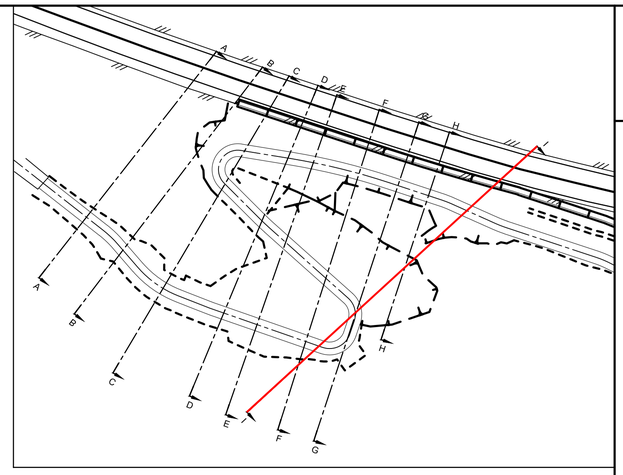
Drawing title/Titre du dessin
WAYII AREA TRAIL DESIGN

SLOPE SECTION H
STA 0+385

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	X-10 OF	0

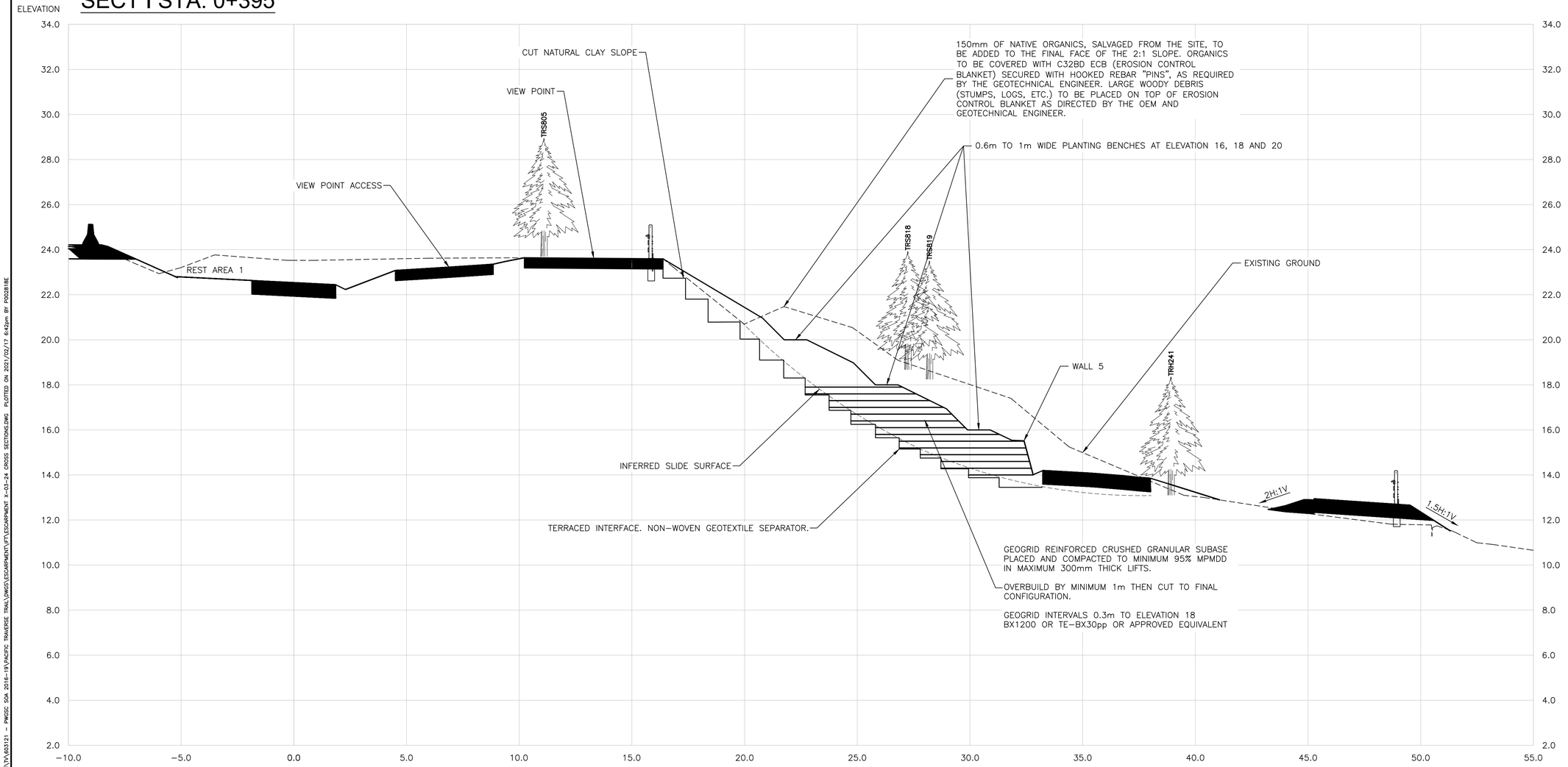
\\VCOANSFS01\VAN\TV\663121 - PWGSC EDA 2016-18\PACIFIC TRAVERSE TRAIL\DWGS\ESCAPMENT\PT\ESCAPMENT X-03-24 CROSS SECTIONS.DWG PLOTTED ON 2021/02/17 6:42pm BY PDOZBIBE

PWGSC – A1 – 841X594



KEY PLAN
NTS

SECT I STA: 0+395



SECTION
1:100 HOR − 1:100 VER

NOTE:
1. FOR DETAILS ON ORGANICS, EROSION CONTROL BLANKET AND WOODY DEBRIS PLACEMENT ON SIDESLOPE SEE ENVIRONMENTAL DRAWING EN−01 TO EN−04.

\\VCOANSFS01\VAN\TV\603121 - PWGSC SOA 2016-19\PACIFIC TRAIL\DWGS\ESCARPMENT\PT\ESCARPMENT X-03-24 CROSS SECTIONS.DWG PLOTTED ON 2021/02/17 6:42pm BY RROZBIE

PWGSC − A1 − 841X594

Parks Canada Agency / L'Agence Parcs Canada

PARSONS

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Revision/ Revision	Description/Description	Date/Date
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0	ISSUED FOR TENDER	21/02/18

Client/client

Parks Canada Agency / L'Agence Parcs Canada
Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet
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PACIFIC RIM NATIONAL PARK RESERVE
ʔapscīik ta̓sɨ̓i
(Ups-cheek ta-shee)
"Going in the right direction on the trail"

Consultant Signature Only

Designed by/Concept par
DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessiné par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin
WAYII AREA TRAIL DESIGN

SLOPE SECTION I
STA 0+395

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	X-11 OF	0

APPENDIX 2-2

3D Images of Proposed Trail

- Dark Grey – Existing Surface
- Red – Proposed Finished Surface & Approximate Zone of Disturbance

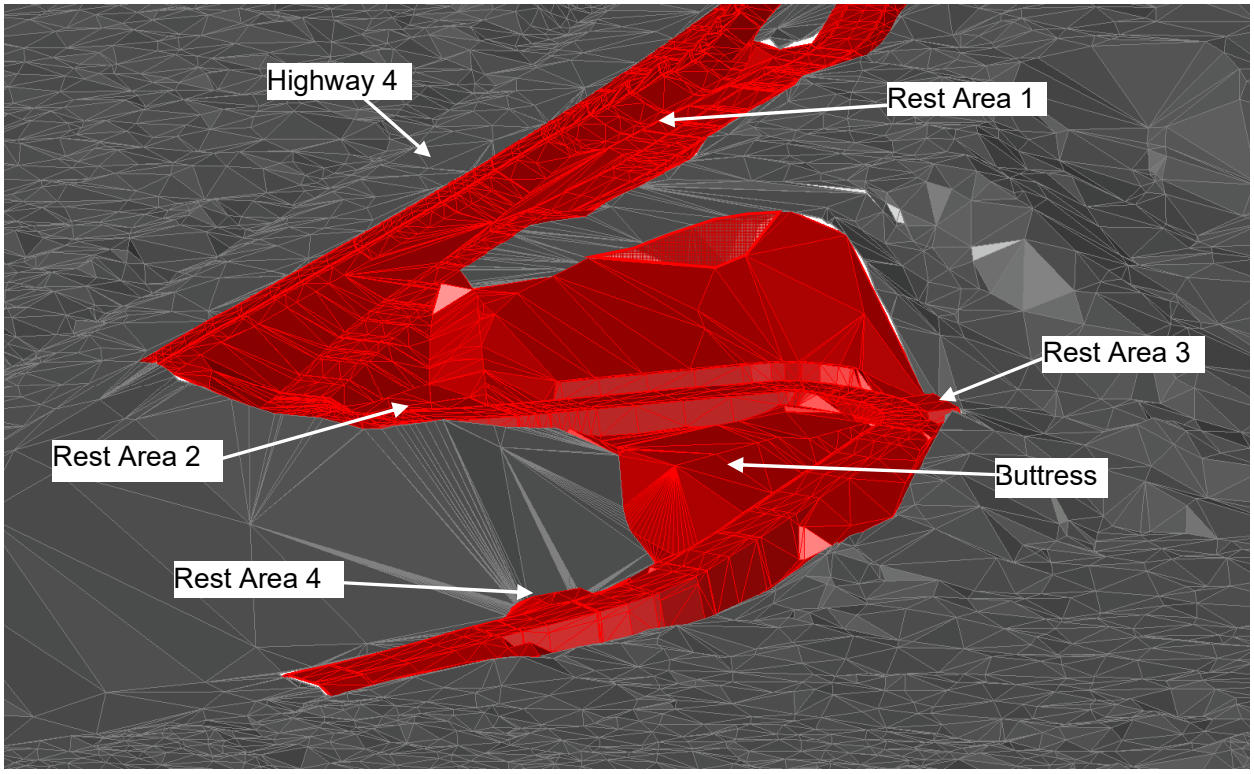


Figure A2-1A 3D Rendering of proposed trail looking northeast (from low to high)
Image provided by Parsons.

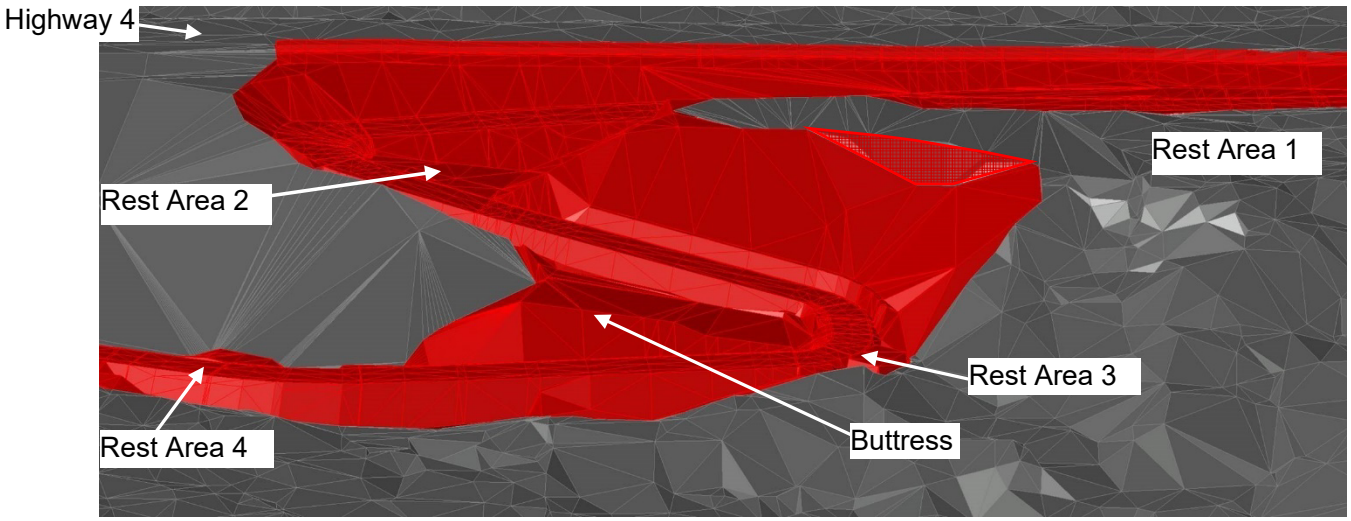


Figure A2-1B 3D Rendering of proposed trail looking north (from low to high)
Image provided by Parsons.

wsp	PROJECT: PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC UPSCHEEK TASHEE PATHWAY – WAYII AREA GEOTECHNICAL ASSESSMENT				
	TITLE: 3D RENDERINGS OF PROPOSED TRAIL				
	CLIENT: PARKS CANADA				
DRAWING NO.: A2-1	DATE: FEBRUARY 2021	FILE NO.: 191-08875-02	SCALE: NTS	DRAWN BY: MG/DF	REV NO.: 0

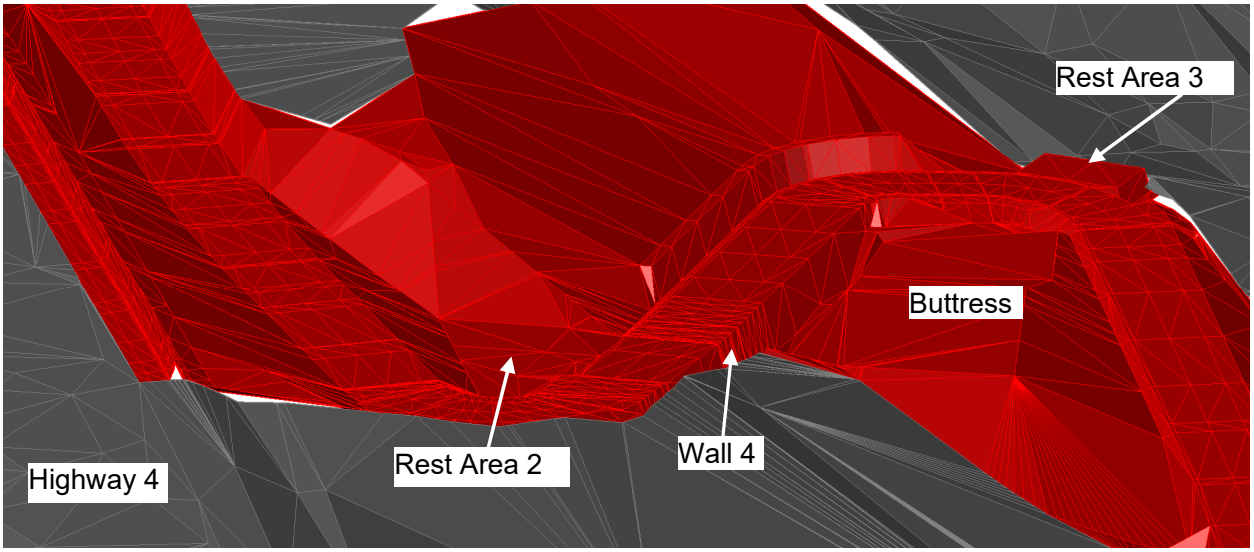


Figure A2-2A 3D Rendering of proposed trail looking southeast at switchbacks, the largest rest area (Rest Area 2) and the buttress (low to right). Image provided by Parsons.

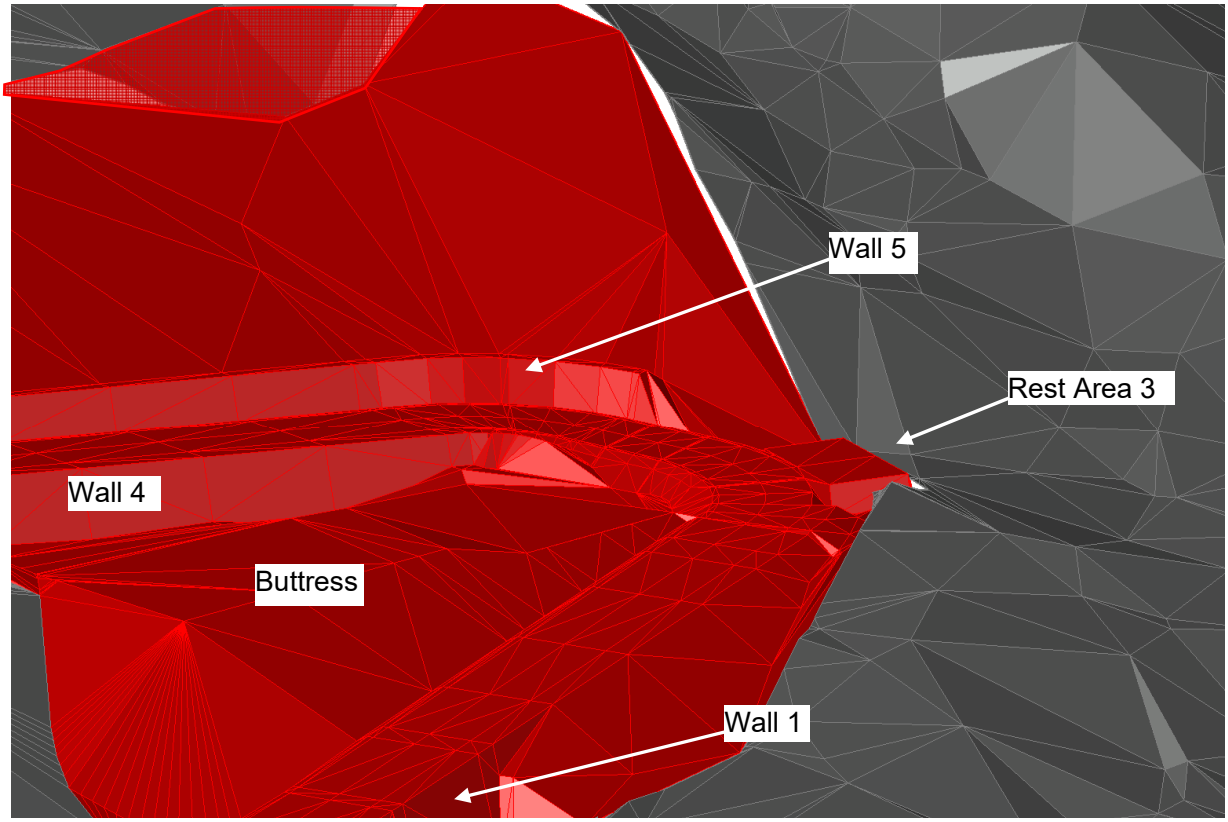


Figure A2-2B 3D Rendering of proposed trail at lower switchback and buttress looking northeast (from low to high). Image provided by Parsons.

wsp	PROJECT: PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC UPSCHEEK TASHEE PATHWAY – WAYII AREA GEOTECHNICAL ASSESSMENT				
	TITLE: 3D RENDERINGS OF PROPOSED TRAIL				
	CLIENT: PARKS CANADA				
DRAWING NO.: A2-2	DATE: FEBRUARY 2021	FILE NO.: 191-08875-02	SCALE: NTS	DRAWN BY: AP/DF	REV NO.: 0

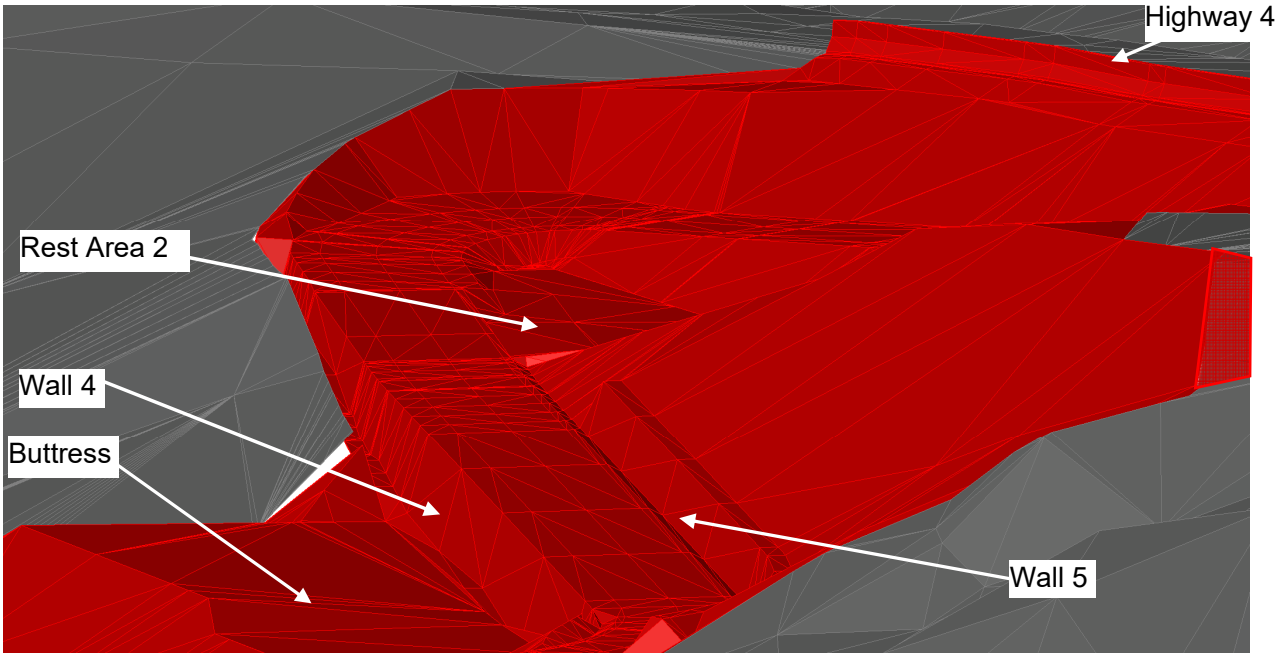


Figure A2-1A 3D Rendering of proposed trail looking northwest at upper switchback and Rest Area 2. Buttress to left, high to right. Image provided by Parsons.

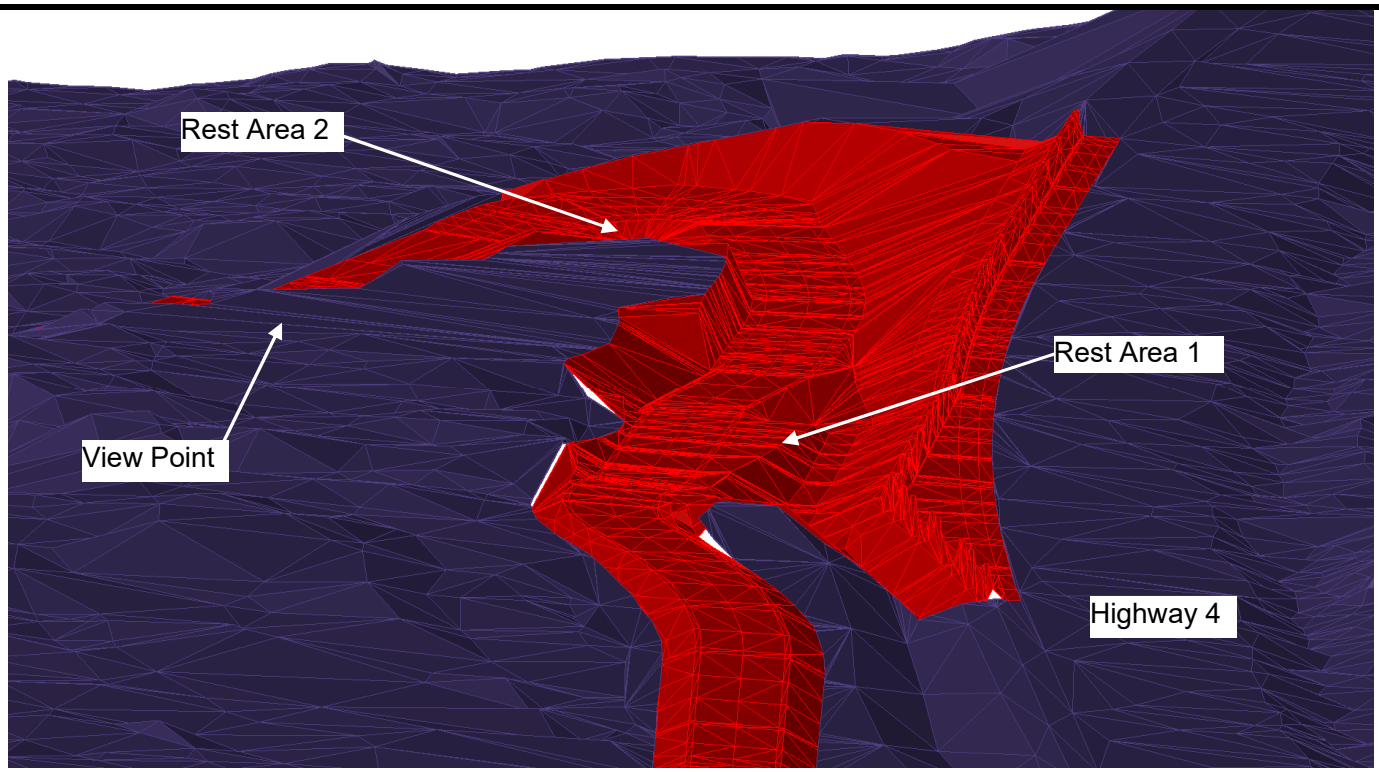
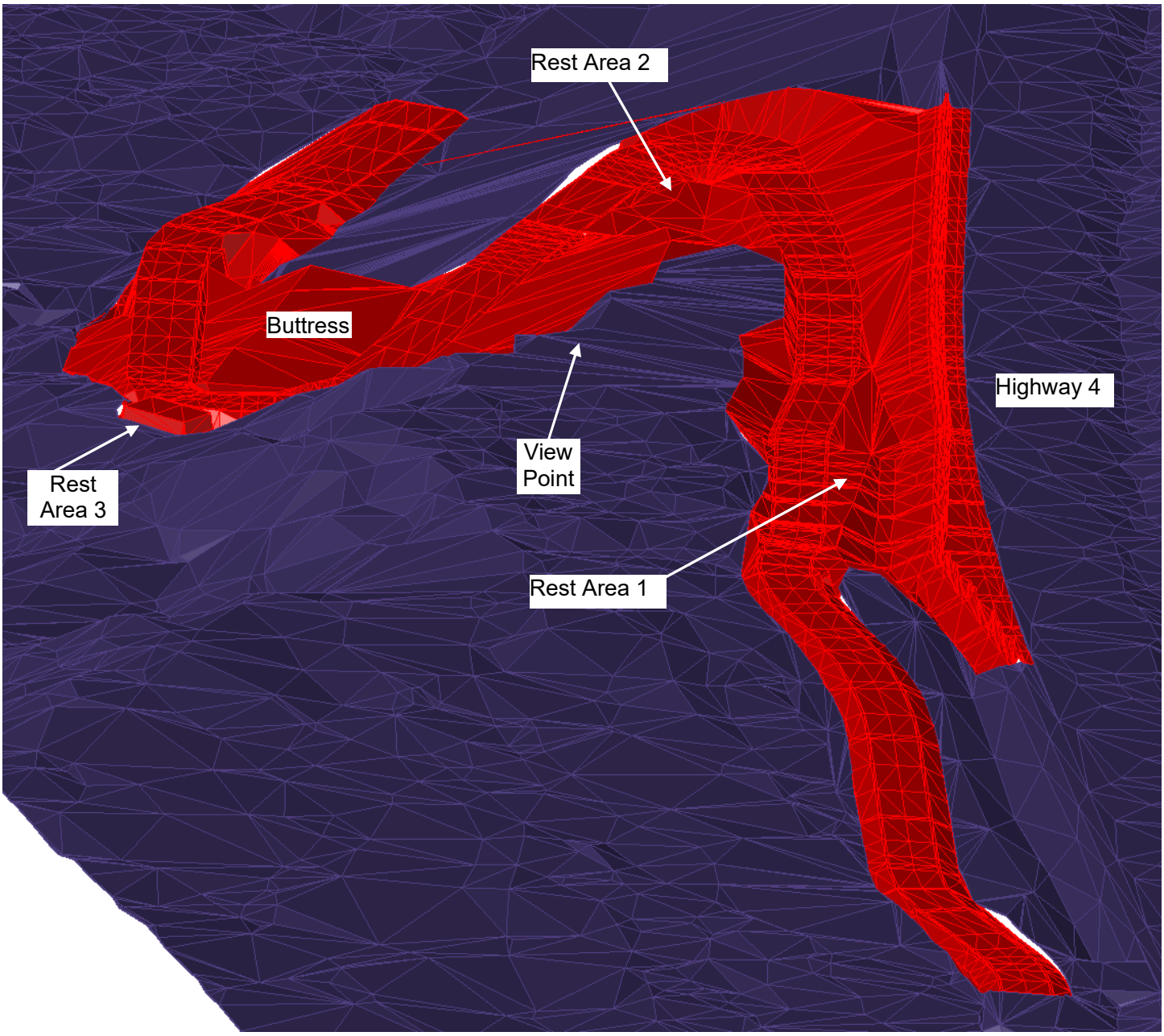


Figure A2-3B 3D Rendering of proposed trail looking southwest from near highway elevation (from high to low) Image provided by Parsons.

wsp	PROJECT: PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC UPSCHEEK TASHEE PATHWAY – WAYII AREA GEOTECHNICAL ASSESSMENT				
	TITLE: 3D RENDERINGS OF PROPOSED TRAIL				
	CLIENT: PARKS CANADA				
DRAWING NO.: A2-3	DATE: FEBRUARY 2021	FILE NO.: 191-08875-02	SCALE: NTS	DRAWN BY: AP/DF	REV NO.: 0



wsp	PROJECT: PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC UPSCHEEK TASHEE PATHWAY – WAYII AREA GEOTECHNICAL ASSESSMENT				
	TITLE: 3D RENDERINGS OF PROPOSED TRAIL – PROVIDED BY PARSONS				
	CLIENT: PARKS CANADA				
DRAWING NO.: A2-4	DATE: FEBRUARY 2021	FILE NO.: 191-08875-02	SCALE: NTS	DRAWN BY: AP/DF	REV NO.: 0

APPENDIX

3. WSP TEST HOLE LOGS (2019)

- Boreholes
- Cone Penetration Test

APPENDIX 3-1

BH19-01 & CPT19-01

BOREHOLE RECORD: **BH19-01/CPT1**

Prepared by: **LM**
Reviewed by: **DF**

Date (Start): **12/10/2019**
Date (End): **12/11/2019**

Project Name: **Upscheek Tashee Trail**
Site: **Waii Area (Escarpment)**
Sector: **Pacific Rim National Park Reserve**
Client: **Parks Canada**

Project Number: **191-08875-02**
Geographic Coordinates: X = W
Y = N
Surface Elevation: 6 m *(Approximate)*
Plunge / Azimuth:

Drilling Company: Drillwell
Drilling Equipment: Acker Soil Sentry III
Drilling Method: Hollow Stem Auger
Borehole Diameter: 254 mm

WELL DETAILS
COPING Elevation :
SCREEN Bottom Depth :
Length :
Opening :
WATER Elevation:
WATER Date:
Water Level Free phase

SAMPLE TYPE
AS - Auger sample
GS - Grab sample
MA - Manual Auger
SS - Split Spoon
ST - Shelby Tube
TA - Auger
TR - Trowel
TU - DT32 Liner

ANALYSIS
AL - Atterberg Limits
DCPT - Dynamic Cone Penetration Test
GSA - Grain Size Analysis
PENTEST - Blow Counts/300mm
Sg - Specific Gravity
SPT - N Value (Blow Counts/300mm)
UCS - Uniax. Comp. Strength
w - Moisture Content
wL - Liquidity Limit
wP - Plasticity Limit

SAMPLE STATE
Undisturbed
Remoulded
Lost
Cored

DEPTH ELEVATION (m)	STRATIGRAPHY	DESCRIPTION	TYPE & NO.	STATE	% RECOVERY (RQD)	Blows Counts/300 mm N Value = SPT DCPT= Blows Counts	GEOTECHNICAL	DIAGRAM	WATER LEVEL DATE	Elevation (m)
6.0		Ground surface.					RQD (%) PLASTIC LIMIT w (%) LIQUID LIMIT 20 40 60 80; Shear strength - Vane Torvane Remolded - Vane PENTEST SPT DCPT/BPT R; Shear (kPa) 30 60 90 120			
0.6		compact, grey, GRAVEL (FILL), angular, moist, cobbles.					Note: Elevation estimated based on contour plan and is included for discussion purposes only.			5.5
5.4		firm, brown, sandy, SILT, trace gravel, intermediate to high plasticity, wet.								
1.2										5.0
4.8		compact, brown, sandy, GRAVEL, some fines, fine to coarse grained, subrounded, wet, cobbles.	SPT1		25	5 7 9 5 N=16				4.5
2.1										4.0
3.9		grey, silty, CLAY, trace sand, intermediate to high plasticity, moist.								3.5
		–firm	SPT2		104	1 2 2 1 N=4	25			3.0
										2.5
			SPT3		104	1 2 2 3 N=4	25			2.0
										1.5
		–below 6.0 m, firm to stiff					61			1.0
										0.5
			S1				–DSS (7.9 m) = 55 kPa			0.0
		–below 8.2 m shells								-0.5
										-1.0
										-1.5
										-2.0
										-2.5
9.0										-3.0

Notes: At approximate elevation of CPT1.

BOREHOLE RECORD: **BH19-01/CPT1**

Prepared by: **LM**
Reviewed by: **DF**

Date (Start): **12/10/2019**
Date (End): **12/11/2019**

Project Name: **Upscheek Tashee Trail**
Site: **Waii Area (Escarpment)**
Sector: **Pacific Rim National Park Reserve**
Client: **Parks Canada**

Project Number: **191-08875-02**
Geographic Coordinates: X = W
Y = N
Surface Elevation: 6 m *(Approximate)*
Plunge / Azimuth:

Drilling Company: Drillwell
Drilling Equipment: Acker Soil Sentry III
Drilling Method: Hollow Stem Auger
Borehole Diameter: 254 mm

WELL DETAILS
COPING Elevation :
SCREEN Bottom Depth :
Length :
Opening :
WATER Elevation:
WATER Date:
Water Level Free phase

SAMPLE TYPE
AS - Auger sample
GS - Grab sample
MA - Manual Auger
SS - Split Spoon
ST - Shelby Tube
TA - Auger
TR - Trowel
TU - DT32 Liner

ANALYSIS
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DCPT - Dynamic Cone Penetration Test
GSA - Grain Size Analysis
PENTEST - Blow Counts/300mm
Sg - Specific Gravity
SPT - N Value (Blow Counts/300mm)
UCS - Uniax. Comp. Strength
w - Moisture Content
wL - Liquidity Limit
wP - Plasticity Limit

SAMPLE STATE
Undisturbed
Remoulded
Lost
Cored

DEPTH ELEVATION (m)	GEOLOGY / LITHOLOGY: STRATIGRAPHY	GEOLOGY / LITHOLOGY: DESCRIPTION	GEOTECHNICAL: TYPE & NO.	STATE	% RECOVERY (RQD)	Blows Counts/300 mm N Value = SPT DCPT= Blows Counts	GEOTECHNICAL	WELL: DIAGRAM	WELL: WATER LEVEL DATE	Elevation (m)
9.5		below, 9.1 m, stiff grey, silty, CLAY, trace sand, intermediate to high plasticity, moist.								-3.5
10.0										-4.0
10.5										-4.5
11.0			SPT4		104	1 2 3 3 N=5				-5.0
11.5										-5.5
12.0										-6.0
12.5			SPT5		104	0 1 3 4 N=4				-6.5
13.0										-7.0
13.5		below 13.5 m, very stiff								-7.5
14.0										-8.0
14.5										-8.5
15.0										-9.0
15.5										-9.5
16.0										-10.0
16.5										-10.5
17.0			S2							-11.0
17.5										-11.5
18.0										-12.0

Notes: At approximate elevation of CPT1.

Project : ESCARPMENT.GPJ Type of report : WSP_EN_WELL-GEOTECHNICAL ONLY Data Template : 20190604_CD.GDT 1/25/2021

BOREHOLE RECORD: **BH19-01/CPT1**

Prepared by: **LM** Date (Start): **12/10/2019**
Reviewed by: **DF** Date (End): **12/11/2019**

Project Name: **Upscheek Tashee Trail**
Site: **Waii Area (Escarpment)**
Sector: **Pacific Rim National Park Reserve**
Client: **Parks Canada**

Project Number: **191-08875-02**
Geographic Coordinates: X = W
Y = N
Surface Elevation: 6 m *(Approximate)*
Plunge / Azimuth:

Drilling Company: Drillwell
Drilling Equipment: Acker Soil Sentry III
Drilling Method: Hollow Stem Auger
Borehole Diameter: 254 mm

WELL DETAILS
COPING Elevation :
SCREEN Bottom Depth :
Length :
Opening :
WATER Elevation:
WATER Date:
Water Level Free phase

SAMPLE TYPE
AS - Auger sample
GS - Grab sample
MA - Manual Auger
SS - Split Spoon
ST - Shelby Tube
TA - Auger
TR - Trowel
TU - DT32 Liner

ANALYSIS
AL - Atterberg Limits
DCPT - Dynamic Cone Penetration Test
GSA - Grain Size Analysis
PENTEST - Blow Counts/300mm
Sg - Specific Gravity
SPT - N Value (Blow Counts/300mm)
UCS - Uniax. Comp. Strength
w - Moisture Content
wL - Liquidity Limit
wP - Plasticity Limit

SAMPLE STATE
Undisturbed
Remoulded
Lost
Cored

DEPTH ELEVATION (m)	STRATIGRAPHY	DESCRIPTION	TYPE & NO.	STATE	% RECOVERY (RQD)	Blows Counts/300 mm N Value = SPT DCPT= Blows Counts	GEOTECHNICAL	DIAGRAM	WATER LEVEL DATE	Elevation (m)
18.5		grey, silty, CLAY, trace sand, intermediate to high plasticity, moist.								12.5
19.0										13.0
19.5										13.5
20.0										14.0
20.5							91			14.5
21.0										15.0
21.5										15.5
22.0							DSS (21.7 m) = 60 kPa			16.0
22.5										16.5
23.0		below 23.0 m, very stiff to hard								17.0
23.5										17.5
24.0										18.0
24.5										18.5
25.0							121			19.0
25.5										19.5
26.0			SPT6		100	3 5 8 9 N=13	150			20.0
26.5		End of borehole at 26.50 m.								20.5
27.0		Notes: At approximate elevation of CPT1.								21.0

26.5
-20.50

Notes: At approximate elevation of CPT1.

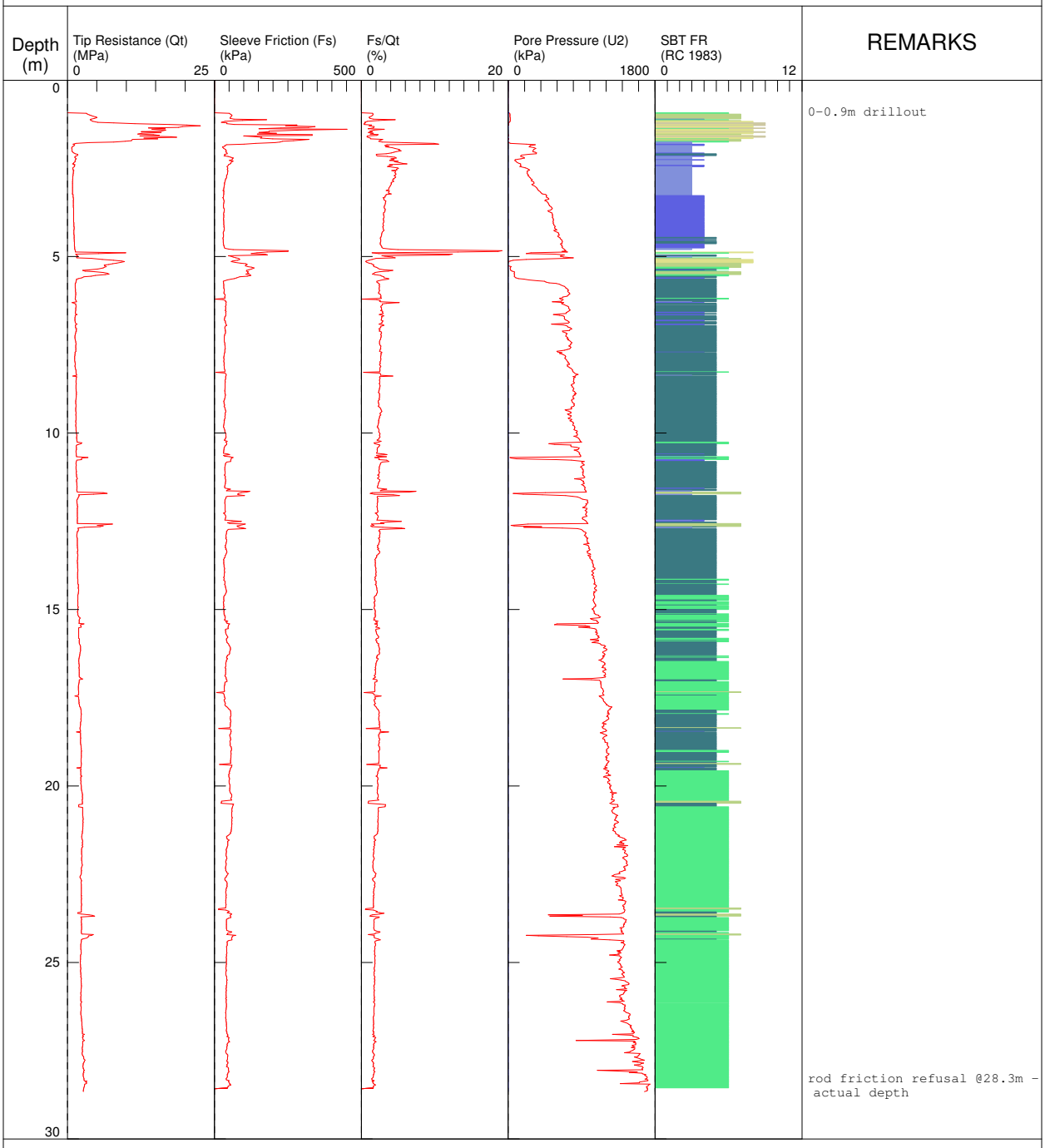
Project : ESCARPMENT.GPJ Type of report : WSP_EN_WELL-GEOTECHNICAL ONLY Data Template : 20190604_CD.GDT 1/25/2021

CPT19-01.cpt

OPERATOR: Steve
CONE ID: DDG1373
TEST DATE: 12/10/2019 9:14:00 AM

PREPARED BY:: Drillwell Enterprises
LOCATION: Tofino
GPS (LAT,LON,ALT): 4911.3000N,12356.9528W,9.4

JOB NUMBER: 191-08875-02
HOLE NUMBER: CPT19-01



REMARKS

0-0.9m drillout

rod friction refusal @28.3m - actual depth

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

APPENDIX 3-2

BH19-02 & CPT19-02

BOREHOLE RECORD: **BH19-02/CPT2**

Prepared by: **LM** Date (Start): **12/12/2019**
Reviewed by: **DF** Date (End): **12/13/2019**

Project Name: **Upscheek Tashee Trail**
Site: **Waii Area (Escarpment)**
Sector: **Pacific Rim National Park Reserve**
Client: **Parks Canada**

Project Number: **191-08875-02**
Geographic Coordinates: X = W
Y = N
Surface Elevation: 16 m *(Approximate)*
Plunge / Azimuth:

Drilling Company: Drillwell
Drilling Equipment: Acker Soil Sentry III
Drilling Method: Hollow Stem Auger
Borehole Diameter: 254 mm

WELL DETAILS
COPING Elevation :
SCREEN Bottom Depth :
Length :
Opening :
WATER Elevation:
WATER Date:
Water Level Free phase

SAMPLE TYPE
AS - Auger sample
GS - Grab sample
MA - Manual Auger
SS - Split Spoon
ST - Shelby Tube
TA - Auger
TR - Trowel
TU - DT32 Liner

ANALYSIS
AL - Atterberg Limits
DCPT - Dynamic Cone Penetration Test
GSA - Grain Size Analysis
PENTEST - Blow Counts/300mm
Sg - Specific Gravity
SPT - N Value (Blow Counts/300mm)
UCS - Uniax. Comp. Strength
w - Moisture Content
wL - Liquidity Limit
wP - Plasticity Limit

SAMPLE STATE
Undisturbed
Remoulded
Lost
Cored

DEPTH ELEVATION (m)	STRATIGRAPHY	DESCRIPTION	TYPE & NO.	STATE	% RECOVERY (RQD)	Blows Counts/300 mm N Value = SPT DCPT= Blows Counts	GEOTECHNICAL	DIAGRAM	WATER LEVEL DATE	Elevation (m)
16.0		Ground surface.								16.0
0.5		compact, brown, silty, SAND, some gravel, fine to coarse grained, wet.					Note: Elevation estimated based on contour plan and is included for discussion purpposes only.			15.5
1.0										15.0
1.4										
14.6		firm to stiff, brown, silty, CLAY, trace sand, intermediate to high plasticity, moist.	SPT1		92	1 2 2 3 N=4				14.5
1.5										
2.0		–below 2.1 m grey								14.0
2.5										13.5
3.0			SPT2		75	2 2 2 6 N=4				13.0
3.4										
12.6		compact, grey, gravelly, SAND, some fines, fine to coarse grained, wet.								12.5
3.5										
3.7										
12.3										12.0
4.0		grey, silty, CLAY, trace sand, intermediate to high plasticity, moist.								
4.5		–firm								11.5
5.0										11.0
5.5										10.5
6.0										10.0
6.5										9.5
7.0										9.0
7.5		–from 7.5 m to 9.3 m, sandy, trace gravel	SPT3		83	2 2 2 2 N=4				8.5
8.0										8.0
8.5										7.5
9.0										7.0

Notes: Approximately 0.2 m lower than CPT2. Slope inclinometer installed.

BOREHOLE RECORD: **BH19-02/CPT2**

Prepared by: **LM**
Reviewed by: **DF**

Date (Start): **12/12/2019**
Date (End): **12/13/2019**

Project Name: **Upscheek Tashee Trail**
Site: **Waii Area (Escarpment)**
Sector: **Pacific Rim National Park Reserve**
Client: **Parks Canada**

Project Number: **191-08875-02**
Geographic Coordinates: X = W, Y = N
Surface Elevation: 16 m *(Approximate)*
Plunge / Azimuth:

Drilling Company: Drillwell
Drilling Equipment: Acker Soil Sentry III
Drilling Method: Hollow Stem Auger
Borehole Diameter: 254 mm

WELL DETAILS
COPING Elevation :
SCREEN Bottom Depth :
Length :
Opening :
WATER Elevation:
WATER Date:
Water Level Free phase

SAMPLE TYPE
AS - Auger sample
GS - Grab sample
MA - Manual Auger
SS - Split Spoon
ST - Shelby Tube
TA - Auger
TR - Trowel
TU - DT32 Liner

ANALYSIS
AL - Atterberg Limits
DCPT - Dynamic Cone Penetration Test
GSA - Grain Size Analysis
PENTEST - Blow Counts/300mm
Sg - Specific Gravity
SPT - N Value (Blow Counts/300mm)
UCS - Uniax. Comp. Strength
w - Moisture Content
wL - Liquidity Limit
wP - Plasticity Limit

SAMPLE STATE
Undisturbed
Remoulded
Lost
Cored

DEPTH ELEVATION (m)	STRATIGRAPHY	DESCRIPTION	TYPE & NO.	STATE	% RECOVERY (RQD)	Blows Counts/300 mm N Value = SPT DCPT= Blows Counts	GEOTECHNICAL	DIAGRAM	WATER LEVEL DATE	Elevation (m)
9.5		grey, silty, CLAY, trace sand, intermediate to high plasticity, moist.	S1							6.5
		–firm					–DSS (9.5 m) = 40 kPa			
10.0										6.0
10.5										5.5
11.0										5.0
11.5										4.5
12.0		–below 12 m stiff, trace gravel								4.0
12.5							61			3.5
13.0										3.0
13.5										2.5
14.0			SPT4		104	1 2 3 N=4	40			2.0
14.5										1.5
15.0										1.0
15.5										0.5
16.0										0.0
16.5										-0.5
17.0										-1.0
17.5										-1.5
18.0										-2.0

Notes: Approximately 0.2 m lower than CPT2. Slope inclinometer installed.

BOREHOLE RECORD: **BH19-02/CPT2**

Prepared by: **LM**
Reviewed by: **DF**

Date (Start): **12/12/2019**
Date (End): **12/13/2019**

Project Name: **Upscheek Tashee Trail**
Site: **Waii Area (Escarpment)**
Sector: **Pacific Rim National Park Reserve**
Client: **Parks Canada**

Project Number: **191-08875-02**
Geographic Coordinates: X = W
Y = N
Surface Elevation: 16 m *(Approximate)*
Plunge / Azimuth:

Drilling Company: Drillwell
Drilling Equipment: Acker Soil Sentry III
Drilling Method: Hollow Stem Auger
Borehole Diameter: 254 mm

WELL DETAILS
COPING Elevation :
SCREEN Bottom Depth :
Length :
Opening :
WATER Elevation:
WATER Date:
Water Level Free phase

SAMPLE TYPE
AS - Auger sample
GS - Grab sample
MA - Manual Auger
SS - Split Spoon
ST - Shelby Tube
TA - Auger
TR - Trowel
TU - DT32 Liner

ANALYSIS
AL - Atterberg Limits
DCPT - Dynamic Cone Penetration Test
GSA - Grain Size Analysis
PENTEST - Blow Counts/300mm
Sg - Specific Gravity
SPT - N Value (Blow Counts/300mm)
UCS - Uniax. Comp. Strength
w - Moisture Content
wL - Liquidity Limit
wP - Plasticity Limit

SAMPLE STATE
Undisturbed
Remoulded
Lost
Cored

DEPTH ELEVATION (m)	STRATIGRAPHY	DESCRIPTION	TYPE & NO.	STATE	% RECOVERY (RQD)	Blows Counts/300 mm N Value = SPT DCPT= Blows Counts	GEOTECHNICAL	DIAGRAM	WATER LEVEL DATE	Elevation (m)
18.5		grey, silty, CLAY, trace sand, intermediate to high plasticity, moist.					RQD (%) PLASTIC LIMIT w (%) LIQUID LIMIT 20 40 60 80 Shear strength - Vane Torvane Remolded - Vane PENTEST SPT DCPT/BPT R Shear (kPa) 30 60 90 120			-2.5
		–stiff					101 82			
19.0										-3.0
19.5										-3.5
20.0										-4.0
20.5										-4.5
21.0										-5.0
21.5			S2							-5.5
							–DSS (21.7 m) = 74 kPa			
22.0										-6.0
22.5										-6.5
23.0										-7.0
23.5										-7.5
24.0										-8.0
24.5										-8.5
25.0										-9.0
25.5		–below 25.6 m, very stiff								-9.5
26.0										-10.0
26.5							121 72			-10.5
27.0										-11.0

Notes: Approximately 0.2 m lower than CPT2. Slope inclinometer installed.

BOREHOLE RECORD: **BH19-02/CPT2**

Prepared by: **LM** Date (Start): **12/12/2019**
Reviewed by: **DF** Date (End): **12/13/2019**

Project Name: **Upscheek Tashee Trail**
Site: **Waii Area (Escarpment)**
Sector: **Pacific Rim National Park Reserve**
Client: **Parks Canada**

Project Number: **191-08875-02**
Geographic Coordinates: X = W
Y = N
Surface Elevation: 16 m *(Approximate)*
Plunge / Azimuth:

Drilling Company: Drillwell
Drilling Equipment: Acker Soil Sentry III
Drilling Method: Hollow Stem Auger
Borehole Diameter: 254 mm

WELL DETAILS
COPING Elevation :
SCREEN Bottom Depth :
Length :
Opening :
WATER Elevation:
WATER Date:
Water Level Free phase

SAMPLE TYPE
AS - Auger sample
GS - Grab sample
MA - Manual Auger
SS - Split Spoon
ST - Shelby Tube
TA - Auger
TR - Trowel
TU - DT32 Liner

ANALYSIS
AL - Atterberg Limits
DCPT - Dynamic Cone Penetration Test
GSA - Grain Size Analysis
PENTEST - Blow Counts/300mm
Sg - Specific Gravity
SPT - N Value (Blow Counts/300mm)
UCS - Uniax. Comp. Strength
w - Moisture Content
wL - Liquidity Limit
wP - Plasticity Limit

SAMPLE STATE
Undisturbed
Remoulded
Lost
Cored

DEPTH ELEVATION (m)	STRATIGRAPHY	DESCRIPTION	TYPE & NO.	STATE	% RECOVERY (RQD)	Blows Counts/300 mm N Value = SPT DCPT= Blows Counts	GEOTECHNICAL	DIAGRAM	WATER LEVEL DATE	Elevation (m)
27.5		grey, silty, CLAY, trace sand, intermediate to high plasticity, moist.					RQD (%) PLASTIC LIMIT w (%) LIQUID LIMIT 20 40 60 80; Shear strength - Vane Torvane Remolded - Vane PENTEST SPT DCPT/BPT; Shear (kPa) 30 60 90 120			11.5
28.0		–very stiff	SPT5		104	0 4 5 7 N=9				12.0
28.0 *-12.04*		End of borehole at 28.04 m. Notes: Approximately 0.2 m lower than CPT2. Slope inclinometer installed.								
28.5										12.5
29.0										13.0
29.5										13.5
30.0										14.0
30.5										14.5
31.0										15.0
31.5										15.5
32.0										16.0
32.5										16.5
33.0										17.0
33.5										17.5
34.0										18.0
34.5										18.5
35.0										19.0
35.5										19.5
36.0										20.0

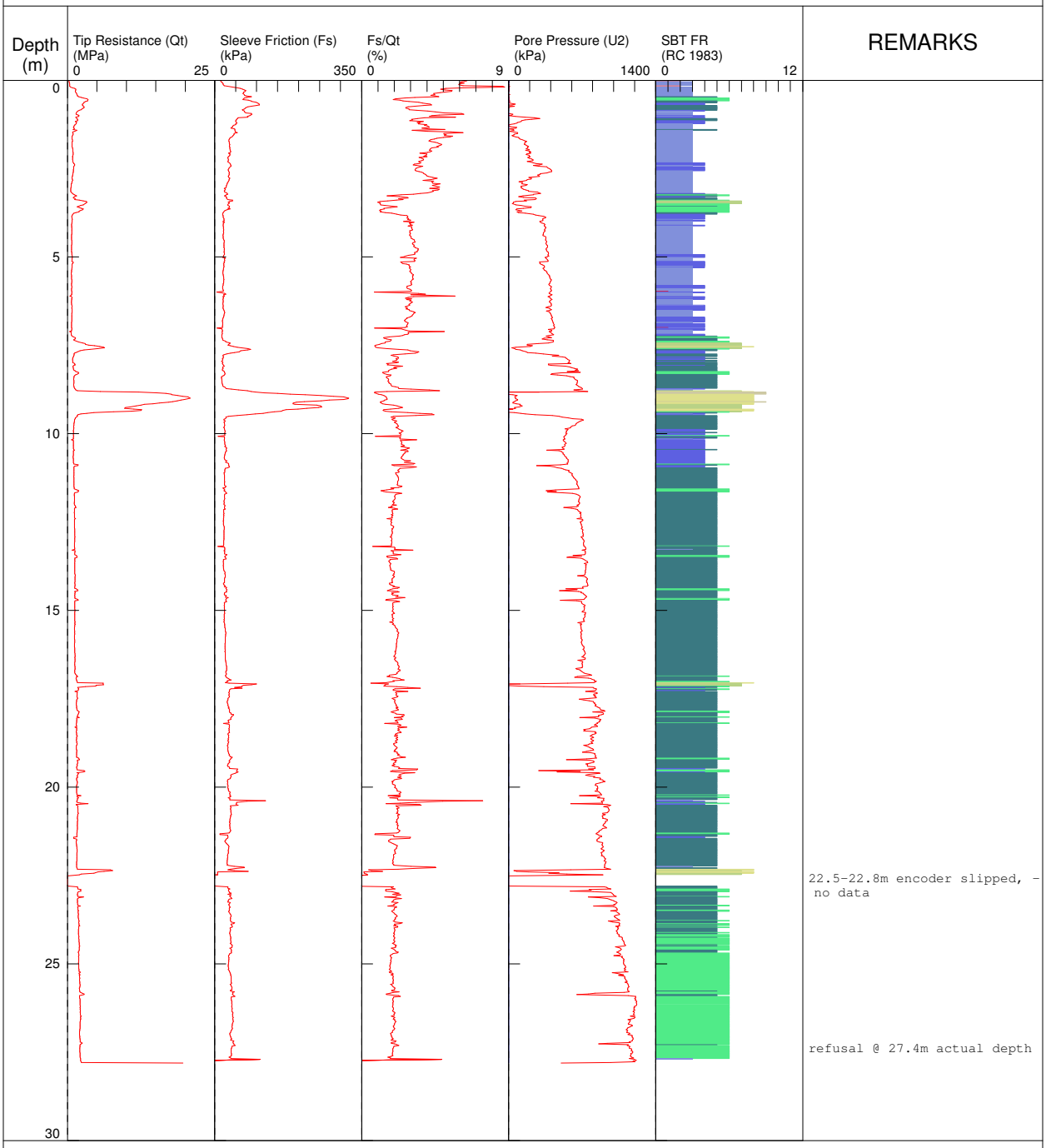
Notes: Approximately 0.2 m lower than CPT2. Slope inclinometer installed.

CPT19-02.cpt

OPERATOR: Steve
CONE ID: DDG1373
TEST DATE: 12/12/2019 8:57:47 AM

PREPARED BY:: Drillwell Enterprises
LOCATION: Tofino
GPS (LAT,LON,ALT): 4903.8505N,12544.3524W,10.1

JOB NUMBER: 191-08875-02
HOLE NUMBER: CPT19-02



REMARKS

22.5-22.8m encoder slipped, - no data

refusal @ 27.4m actual depth

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

APPENDIX

4. LABORATORY TEST RESULTS

- Atterberg Limits
- Direct Simple Shear
- Constant Rate of Strain (CRS) Consolidation

APPENDIX 4-1

BH19-01 ST1 (7.9 m)

- Atterberg Limit Determination
- Direct Simple Shear Test
- Constant Rate of Strain (CRS) Consolidation Test

TETRA TECH CANADA INC.

Form Nº TT104

Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	January 13, 2020
Borehole:	BH19-01	Sample No.: ST-1	Depth (m): 7.9

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

LIQUID LIMIT								PLASTIC LIMIT						
TIN No.	Tare + Weight of Wet Soil (g)	Tare + Weight of Dry Soil (g)	Weight of Tin (g)	Weight of Water (g)	Weight of Dry Soil (g)	Water Content (%)	No. of Blows	TIN No.	Tare + Weight of Wet Soil (g)	Tare + Weight of Dry Soil (g)	Weight of Tin (g)	Weight of Water (g)	Weight of Dry Soil (g)	Water Content (%)
83	28.43	26.41	21.92	2.02	4.49	45.0	35	62	32.24	31.10	24.97	1.14	6.13	18.6
52A	30.23	28.06	23.33	2.17	4.73	45.9	29	14A	31.75	30.66	24.88	1.09	5.78	18.9
85	42.29	39.41	33.32	2.88	6.09	47.3	25							
9	33.49	30.61	24.85	2.88	5.76	50.0	17							

Classification of the material : CL

\- % with respect to the total of the material smaller than sieve No. 40

Observations:

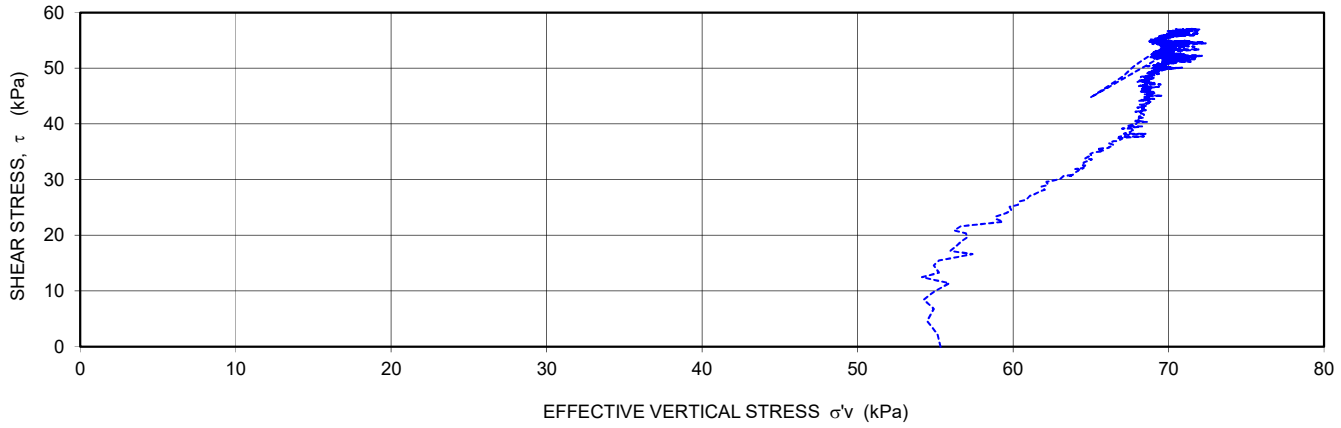
Prepared by:	PC	Checked by:	PS	Approved by:	PS
Date:	January 13, 2020	Date:	January 13, 2020	Date:	January 13, 2020

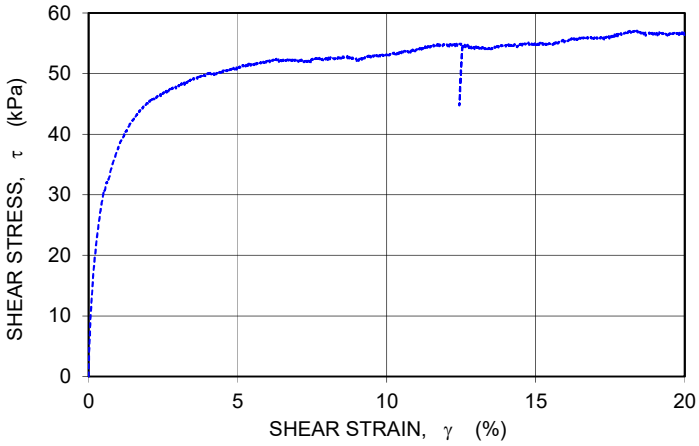
TETRA TECH CANADA INC.

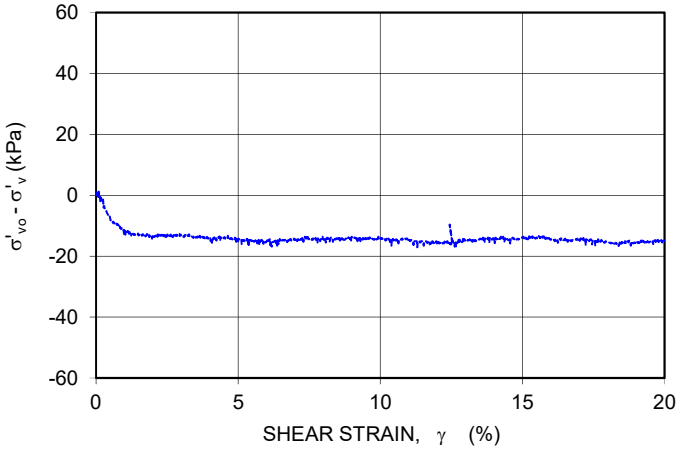
Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	January 10, 2020
Borehole:	BH19-01	Depth (m):	7.9
Sample No.:	ST1		

Direct Simple Shear (ASTM D6528)

Initial Height (mm):	23.5	**Weight of Specimen (g):**	195.37	**Initial Void Ratio, e_o:**	0.76
Diameter of Ring (mm):	73.5	**Total Unit Weight (kN/m^3):**	19.19	**Initial Degree of Saturation, Sr (%):**	97.3
Specific Gravity, Gs:	2.70	**Dry Unit Weight (kN/m^3):**	15.08	**Natural Water Content (%):**	27.2
Consolidation Δh (mm):	0.42	**Final Water Content (%):**	26.9	**Final Total Unit Weight (kN/m^3):**	19.49
Final Height (mm):	23.11	**Final Void Ratio, e_f:**	0.73	**Final Dry Unit Weight (kN/m^3):**	15.35







Type of Test: Constant Volume					
Sample No.	Depth (m)	Total Unit Weight (kN/m^3)	Effective Vertical Stress, σ'v (kPa)	Strain Rate (%/hour)	Test OCR
ST1	7.85	19.2	55	5	2.7

Comments: Sample consolidated to 150 kPa and unloaded to 55kPa

Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	January 10, 2020	Date:	January 10, 2020	Date:	January 23, 2020

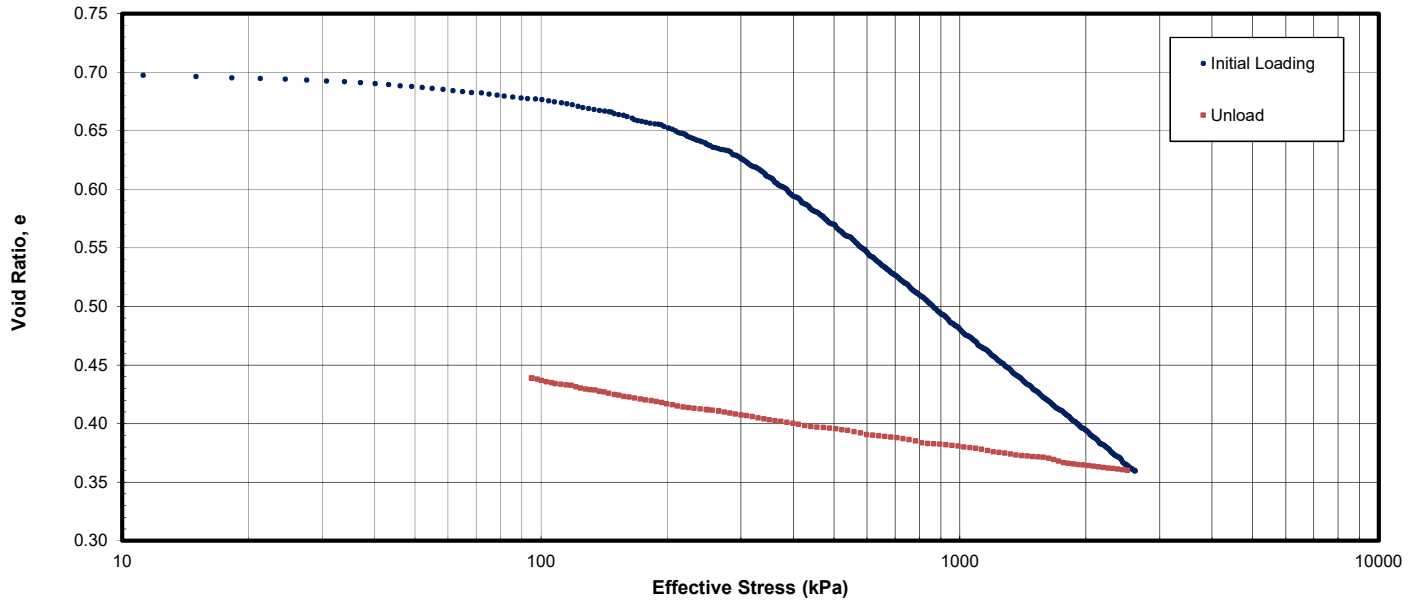
TETRA TECH CANADA INC.

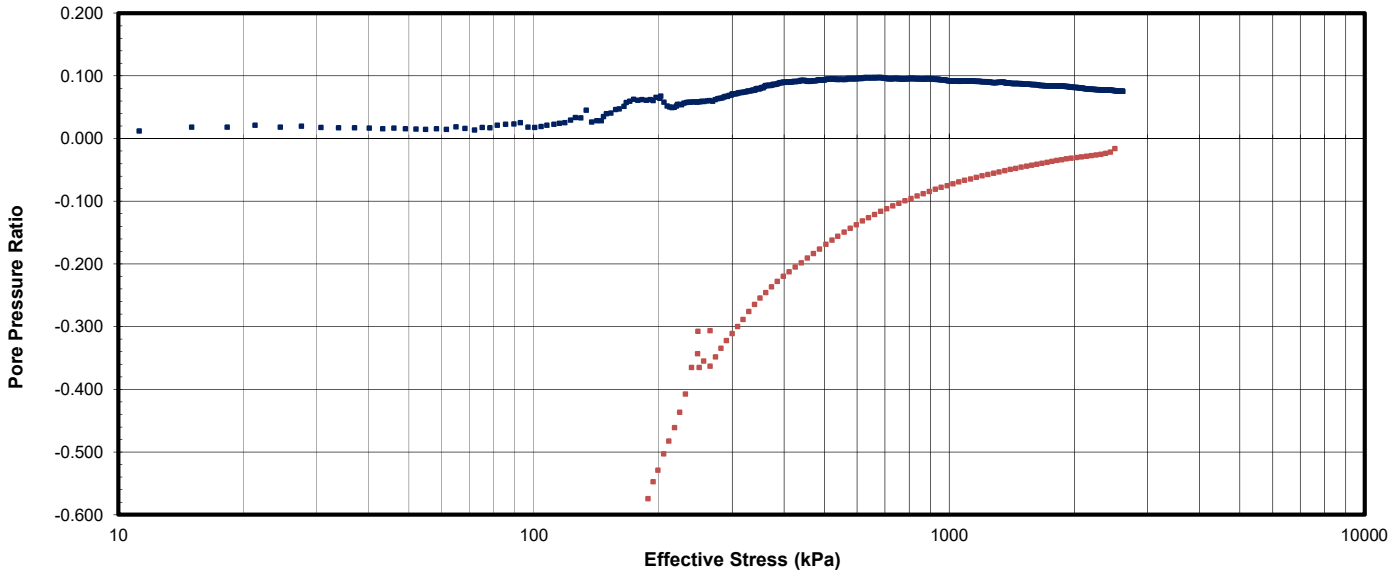
Form Nº TT117b-1

Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	December 30, 2019
Borehole:	BH19-01	Station:	CRS
Sample No.:	ST1	Depth (m):	7.9

Constant Rate of Strain Consolidation (ASTM D4186)

Weight of Ring (g):	216.59	**Ring + Wet Weight (g):**	375.45	**Initial Void Ratio, e:**	0.70
Initial Height (mm):	25.31	**Ring + Dry Weight (g):**	344.08	**Height of Soil, Hs (mm):**	14.91
Diameter of Ring (mm):	63.50	**Water Content (%):**	24.6	**Height of Void, Hv (mm):**	10.40
Unit Weight (kN/m^3)	19.37	**Specific Gravity, Gs:**	2.70		
Loading Strain Rate (%/hr):	0.8	**Max Stress (kPa):**	2616	**Backpressure (kPa):**	414
Unloading Strain Rate (%/hr):	0.1	**Max Strain (%):**	19.9		





Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	December 30, 2019	Date:	December 30, 2019	Date:	January 6, 2020

TETRA TECH CANADA INC.

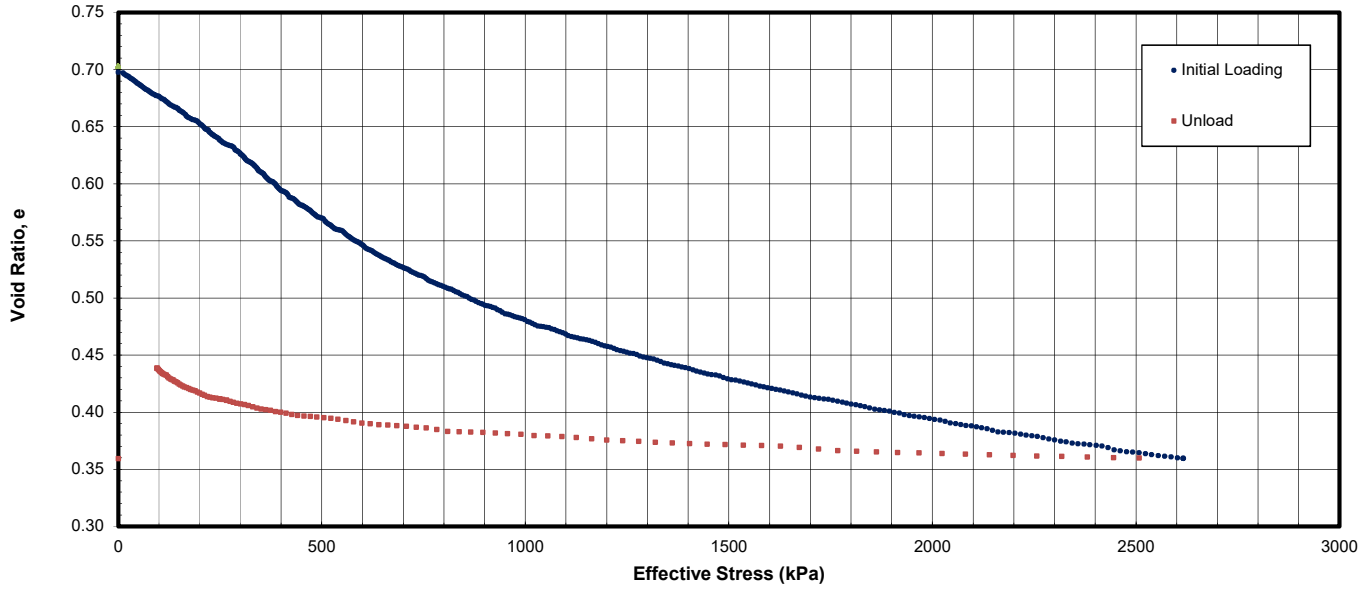
Form Nº TT117b-1

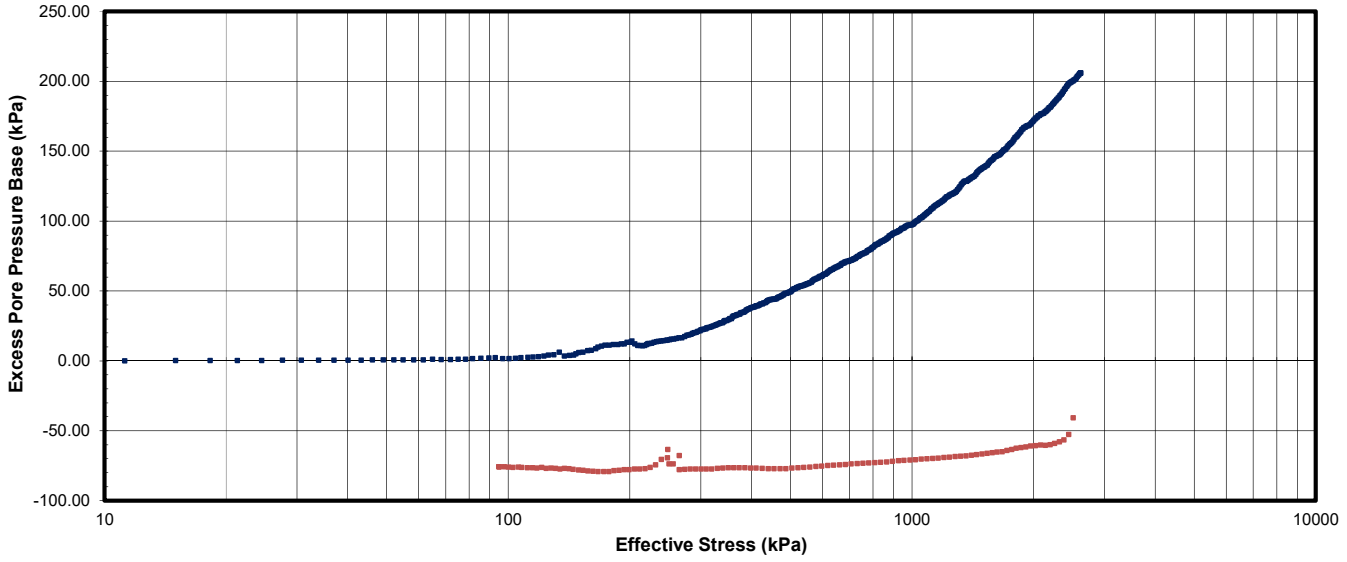
Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	December 30, 2019
Borehole:	BH19-01	Station:	CRS
Sample No.:	ST1	Depth (m):	7.9

Constant Rate of Strain Consolidation (ASTM D4186)

Weight of Ring (g):	216.59	**Ring + Wet Weight (g):**	375.45	**Initial Void Ratio, e:**	0.70
Initial Height (mm):	25.31	**Ring + Dry Weight (g):**	344.08	**Height of Soil, Hs (mm):**	14.91
Diameter of Ring (mm):	63.50	**Water Content (%):**	24.6	**Height of Void, Hv (mm):**	10.40
Unit Weight (kN/m^3)	19.37	**Specific Gravity, Gs:**	2.70		

Loading Strain Rate (%/hr):	0.8	**Max Stress (kPa):**	2616	**Backpressure (kPa):**	414
Unloading Strain Rate (%/hr):	0.1	**Max Strain (%):**	19.9		





Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	December 30, 2019	Date:	December 30, 2019	Date:	January 6, 2020

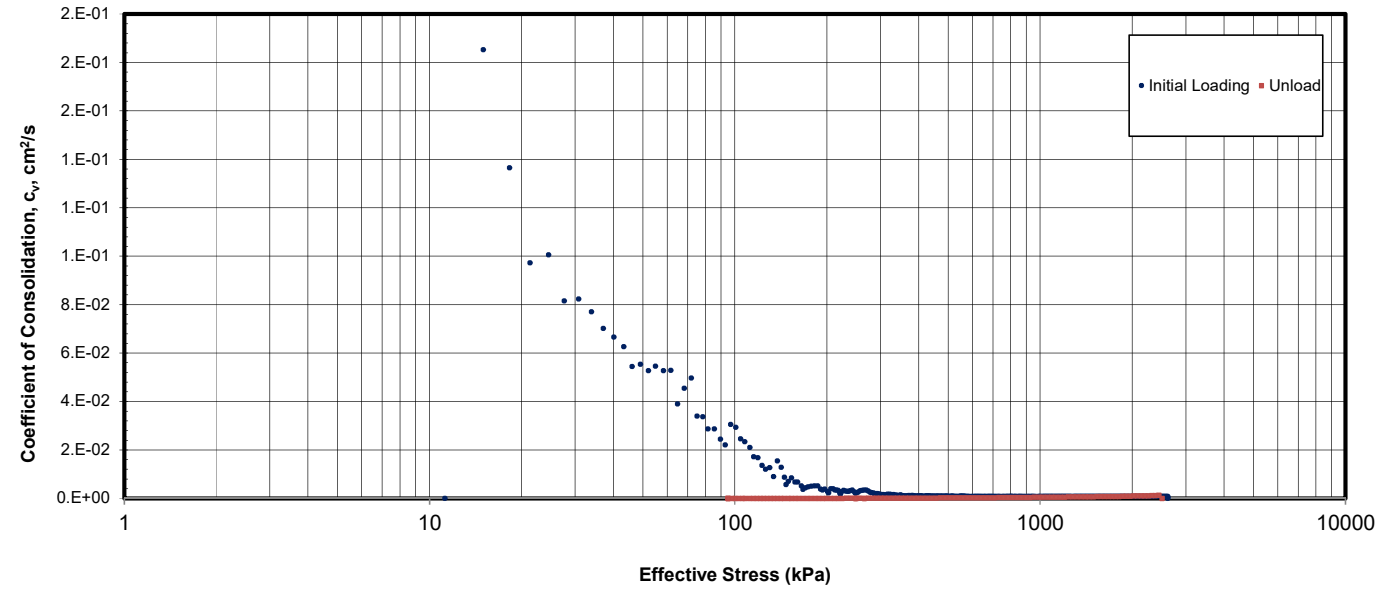
TETRA TECH CANADA INC.

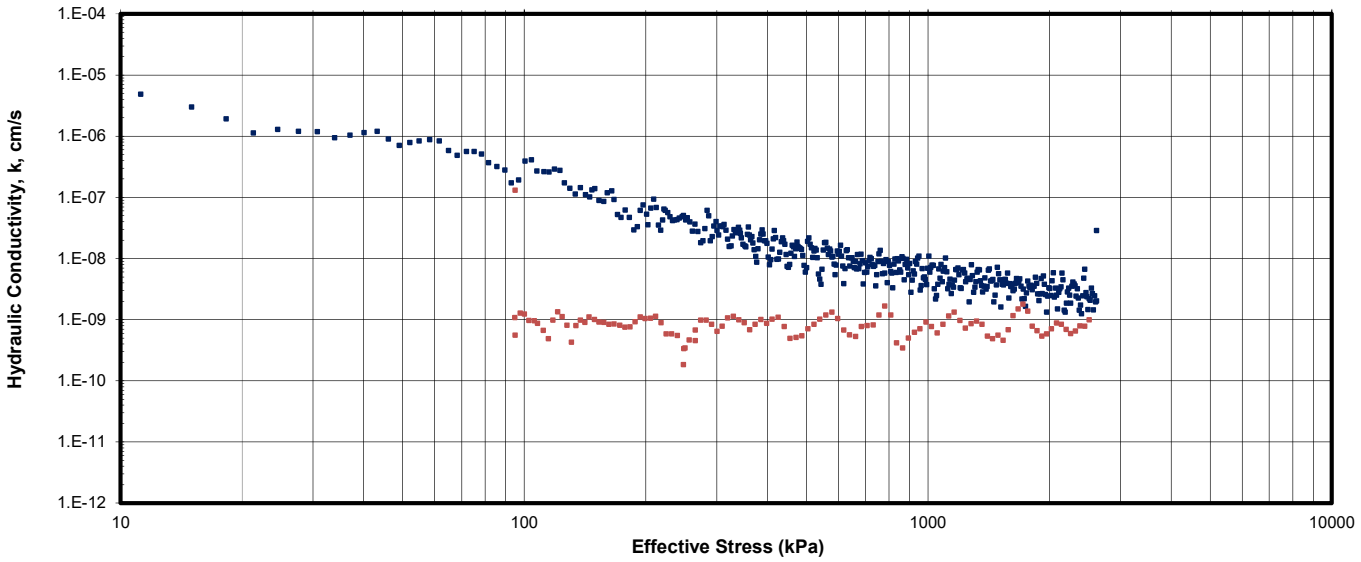
Form Nº TT117b-1

Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	December 30, 2019
Borehole:	BH19-01	Station:	CRS
Sample No.:	ST1	Depth (m):	7.9

Constant Rate of Strain Consolidation (ASTM D4186)

Weight of Ring (g):	216.59	**Ring + Wet Weight (g):**	375.45	**Initial Void Ratio, e:**	0.70
Initial Height (mm):	25.31	**Ring + Dry Weight (g):**	344.08	**Height of Soil, Hs (mm):**	14.91
Diameter of Ring (mm):	63.50	**Water Content (%):**	24.6	**Height of Void, Hv (mm):**	10.40
Unit Weight (kN/m^3)	19.37	**Specific Gravity, Gs:**	2.70		
Loading Strain Rate (%/hr):	0.8	**Max Stress (kPa):**	2616	**Backpressure (kPa):**	414
Unloading Strain Rate (%/hr):	0.1	**Max Strain (%):**	19.9		





Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	December 30, 2019	Date:	December 30, 2019	Date:	January 6, 2020

APPENDIX 4-2

BH19-01 ST2 (17.19 m)

- Atterberg Limit Determination
- Direct Simple Shear Test

TETRA TECH CANADA INC.

Form Nº TT104

Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	January 22, 2020
Borehole:	BH19-01	Sample No.: ST-2	Depth (m): 17.1

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

LIQUID LIMIT								PLASTIC LIMIT						
TIN No.	Tare + Weight of Wet Soil (g)	Tare + Weight of Dry Soil (g)	Weight of Tin (g)	Weight of Water (g)	Weight of Dry Soil (g)	Water Content (%)	No. of Blows	TIN No.	Tare + Weight of Wet Soil (g)	Tare + Weight of Dry Soil (g)	Weight of Tin (g)	Weight of Water (g)	Weight of Dry Soil (g)	Water Content (%)
95	31.23	28.09	22.04	3.14	6.05	51.9	35	80	29.94	28.79	23.63	1.15	5.16	22.3
84	43.85	40.62	34.49	3.23	6.13	52.7	30	66	30.40	29.23	23.99	1.17	5.24	22.3
60	41.29	38.25	32.57	3.04	5.68	53.5	24							
58	37.23	33.05	25.44	4.18	7.61	54.9	18							

Classification of the material : CL

\- % with respect to the total of the material smaller than sieve No. 40

Observations:

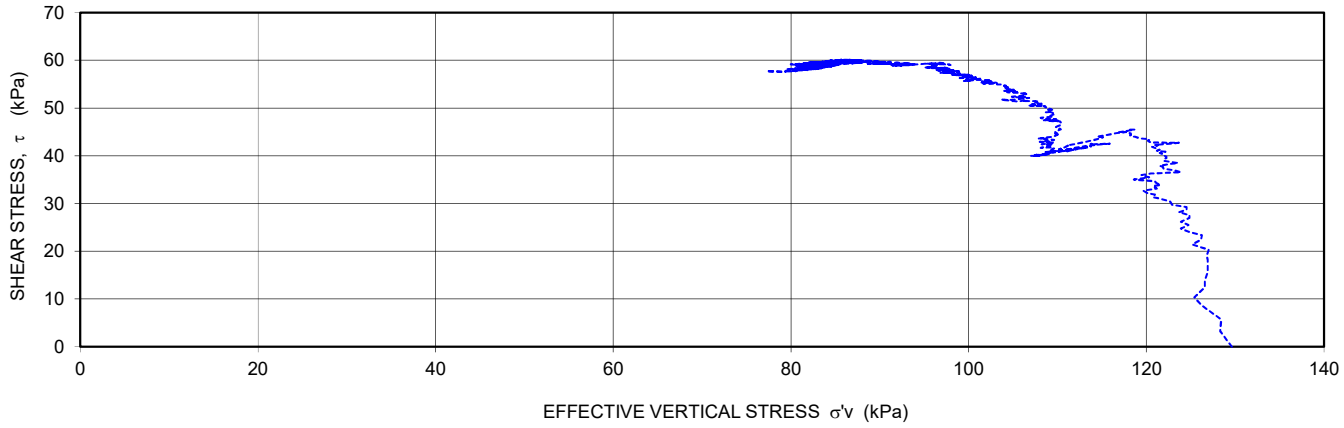
Prepared by:	PC	Checked by:	PS	Approved by:	PS
Date:	January 22, 2020	Date:	January 22, 2020	Date:	January 22, 2020

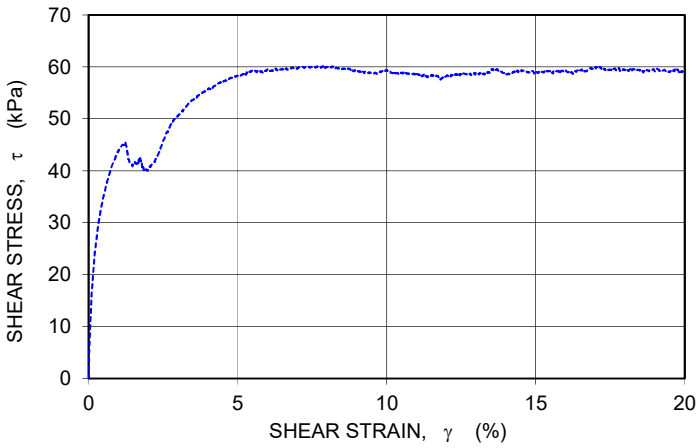
TETRA TECH CANADA INC.

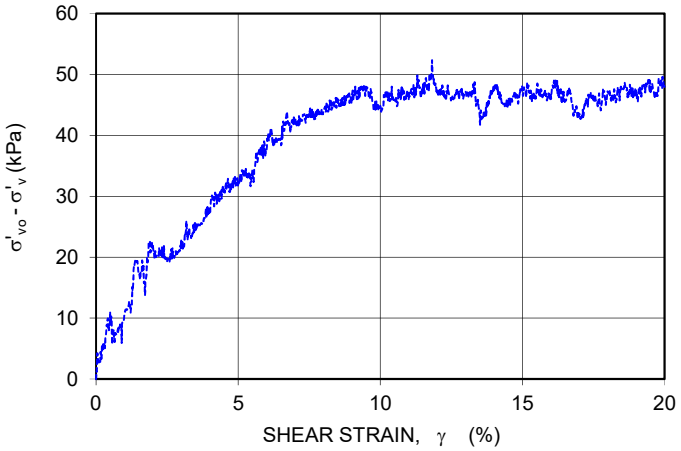
Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	January 22, 2020
Borehole:	BH19-01	Depth (m):	17.1
Sample No.:	ST2		

Direct Simple Shear (ASTM D6528)

Initial Height (mm):	23.5	**Weight of Specimen (g):**	183.40	**Initial Void Ratio, e_o:**	1.00
Diameter of Ring (mm):	73.5	**Total Unit Weight (kN/m^3):**	18.04	**Initial Degree of Saturation, Sr (%):**	98.0
Specific Gravity, Gs:	2.70	**Dry Unit Weight (kN/m^3):**	13.23	**Natural Water Content (%):**	36.4
Consolidation Δh (mm):	0.68	**Final Water Content (%):**	37.3	**Final Total Unit Weight (kN/m^3):**	18.71
Final Height (mm):	22.81	**Final Void Ratio, e_f:**	0.94	**Final Dry Unit Weight (kN/m^3):**	13.63







Type of Test: Constant Volume					
Sample No.	Depth (m)	Total Unit Weight (kN/m^3)	Effective Vertical Stress, σ'v (kPa)	Strain Rate (%/hour)	Test OCR
ST2	17.08	18.0	130	5	1.35

Comments: Sample consolidated to 175kPa and unloaded to 130kPa

Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	January 22, 2020	Date:	January 22, 2020	Date:	January 23, 2020

APPENDIX 4-3

BH19-02 ST1 (9.5 m)

- Atterberg Limit Determination
- Direct Simple Shear Test

TETRA TECH CANADA INC.

Form Nº TT104

Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	January 15, 2020
Borehole:	BH19-02	Sample No.: ST1	Depth (m): 9.5

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

LIQUID LIMIT								PLASTIC LIMIT						
TIN No.	Tare + Weight of Wet Soil (g)	Tare + Weight of Dry Soil (g)	Weight of Tin (g)	Weight of Water (g)	Weight of Dry Soil (g)	Water Content (%)	No. of Blows	TIN No.	Tare + Weight of Wet Soil (g)	Tare + Weight of Dry Soil (g)	Weight of Tin (g)	Weight of Water (g)	Weight of Dry Soil (g)	Water Content (%)
91	43.44	41.03	33.38	2.41	7.65	31.5	32	82	32.39	31.34	25.09	1.05	6.25	16.8
12	46.12	43.38	34.74	2.74	8.64	31.7	24	54	30.80	29.72	23.47	1.08	6.25	17.3
27	33.84	31.35	23.55	2.49	7.80	31.9	19							
75	42.14	39.69	32.08	2.45	7.61	32.2	14							

Classification of the material : CL

\- % with respect to the total of the material smaller than sieve No. 40

Observations:

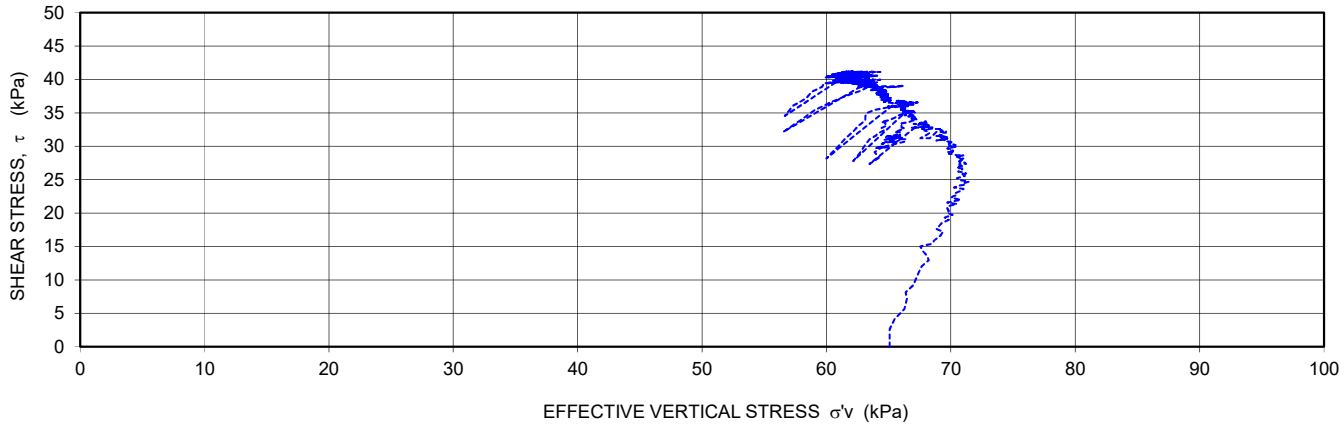
Prepared by:	PC	Checked by:	PS	Approved by:	PS
Date:	January 15, 2020	Date:	January 15, 2020	Date:	January 15, 2020

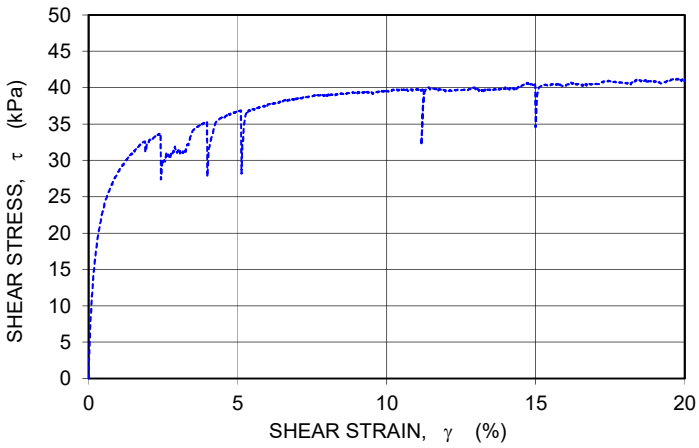
TETRA TECH CANADA INC.

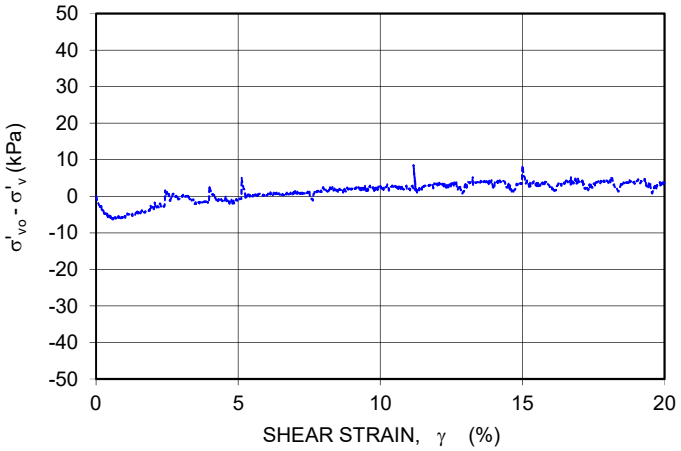
Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	January 15, 2020
Borehole:	BH-2	Depth (m):	9.5
Sample No.:	ST1		

Direct Simple Shear (ASTM D6528)

Initial Height (mm):	23.5	**Weight of Specimen (g):**	194.95	**Initial Void Ratio, e_o:**	0.75
Diameter of Ring (mm):	73.5	**Total Unit Weight (kN/m^3):**	19.17	**Initial Degree of Saturation, Sr (%):**	95.7
Specific Gravity, Gs:	2.70	**Dry Unit Weight (kN/m^3):**	15.14	**Natural Water Content (%):**	26.6
Consolidation Δh (mm):	1.05	**Final Water Content (%):**	25.5	**Final Total Unit Weight (kN/m^3):**	19.89
Final Height (mm):	22.46	**Final Void Ratio, e_f:**	0.67	**Final Dry Unit Weight (kN/m^3):**	15.85







Type of Test: Constant Volume					
Sample No.	Depth (m)	Total Unit Weight (kN/m^3)	Effective Vertical Stress, σ'v (kPa)	Strain Rate (%/hour)	Test OCR
ST1	9.50	19.2	65	5	2.15

Comments: Sample consolidated to 140kPa and unloaded to 65kPa

Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	January 15, 2020	Date:	January 15, 2020	Date:	January 23, 2020

OQM CERTIFIED

APPENDIX 4-4

BH19-02 ST2 (21.7 m)

- Atterberg Limit Determination
- Direct Simple Shear Test
- Constant Rate of Strain (CRS) Consolidation Test

TETRA TECH CANADA INC.

Form Nº TT104

Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	January 13, 2020
Borehole:	BH19-02	Sample No.: ST2	Depth (m): 21.7

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

LIQUID LIMIT								PLASTIC LIMIT						
TIN No.	Tare + Weight of Wet Soil (g)	Tare + Weight of Dry Soil (g)	Weight of Tin (g)	Weight of Water (g)	Weight of Dry Soil (g)	Water Content (%)	No. of Blows	TIN No.	Tare + Weight of Wet Soil (g)	Tare + Weight of Dry Soil (g)	Weight of Tin (g)	Weight of Water (g)	Weight of Dry Soil (g)	Water Content (%)
94	42.40	39.65	32.46	2.75	7.19	38.2	35	63	40.82	39.82	34.18	1.00	5.64	17.7
43	33.01	30.51	24.04	2.50	6.47	38.6	29	38	41.06	40.05	34.60	1.01	5.45	18.5
13	34.30	31.59	24.80	2.71	6.79	39.9	24							
6	44.18	41.47	34.91	2.71	6.56	41.3	15							

Classification of the material : CL

\- % with respect to the total of the material smaller than sieve No. 40

Observations:

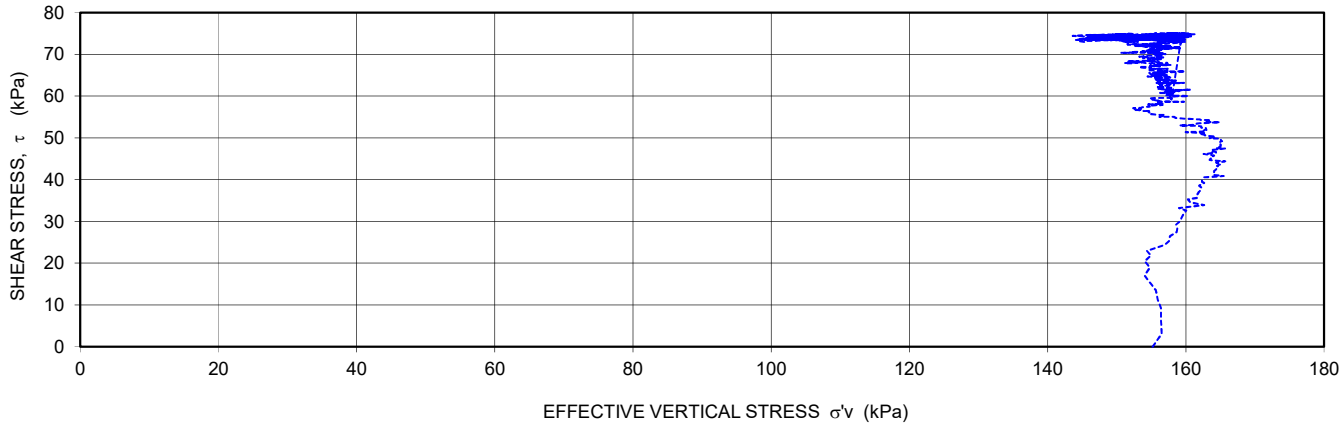
Prepared by:	PC	Checked by:	PS	Approved by:	PS
Date:	January 13, 2020	Date:	January 13, 2020	Date:	January 13, 2020

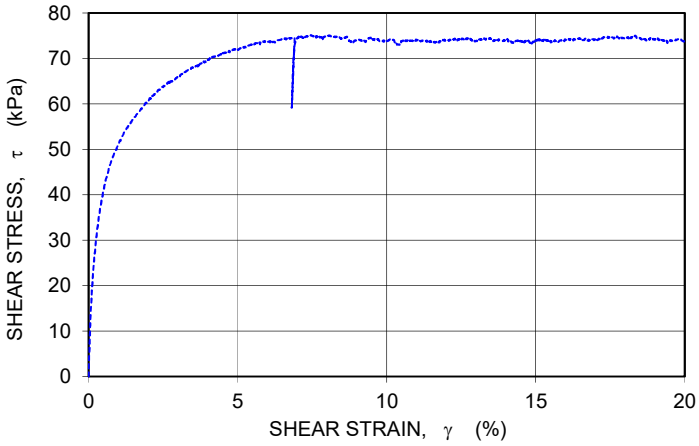
TETRA TECH CANADA INC.

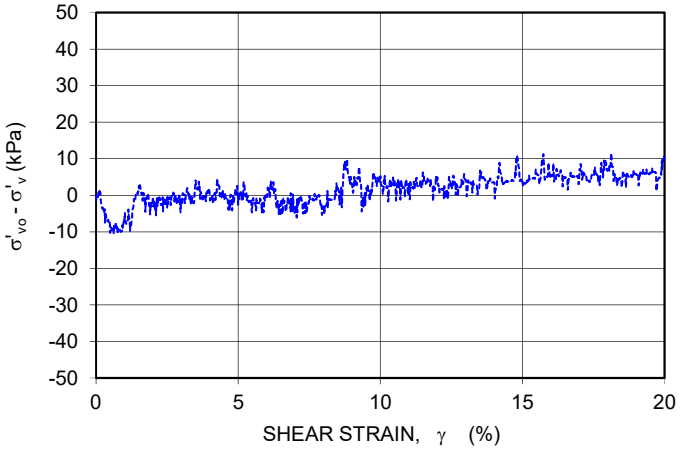
Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	January 13, 2020
Borehole:	BH19-02	Depth (m):	21.6
Sample No.:	ST2		

Direct Simple Shear (ASTM D6528)

Initial Height (mm):	23.6	**Weight of Specimen (g):**	190.72	**Initial Void Ratio, e_o:**	0.75
Diameter of Ring (mm):	73.5	**Total Unit Weight (kN/m^3):**	18.68	**Initial Degree of Saturation, Sr (%):**	83.8
Specific Gravity, Gs:	2.70	**Dry Unit Weight (kN/m^3):**	15.17	**Natural Water Content (%):**	23.2
Consolidation Δh (mm):	1.83	**Final Water Content (%):**	22.9	**Final Total Unit Weight (kN/m^3):**	20.21
Final Height (mm):	21.76	**Final Void Ratio, e_f:**	0.61	**Final Dry Unit Weight (kN/m^3):**	16.45







Type of Test: Constant Volume					
Sample No.	Depth (m)	Total Unit Weight (kN/m^3)	Effective Vertical Stress, σ'v (kPa)	Strain Rate (%/hour)	Test OCR
ST2	21.60	18.7	155	5	1.94

Comments: Sample consolidated to 300kPa and unloaded to 155kPa

Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	January 13, 2020	Date:	January 13, 2020	Date:	January 23, 2020

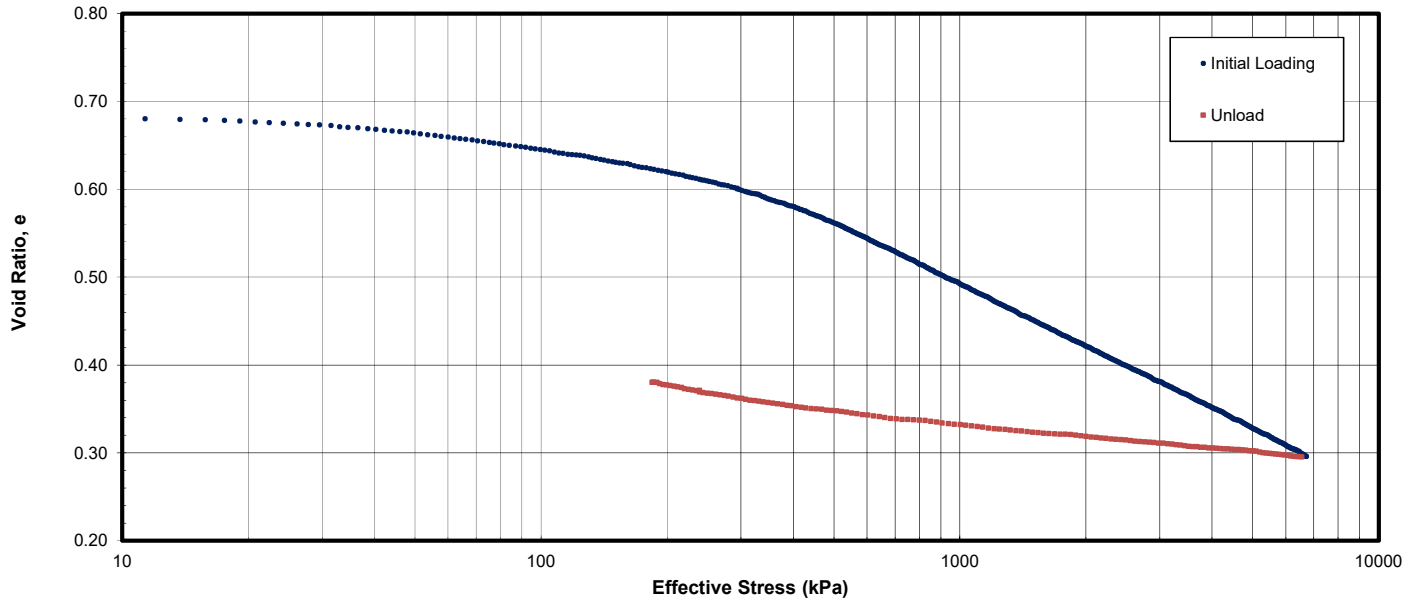
TETRA TECH CANADA INC.

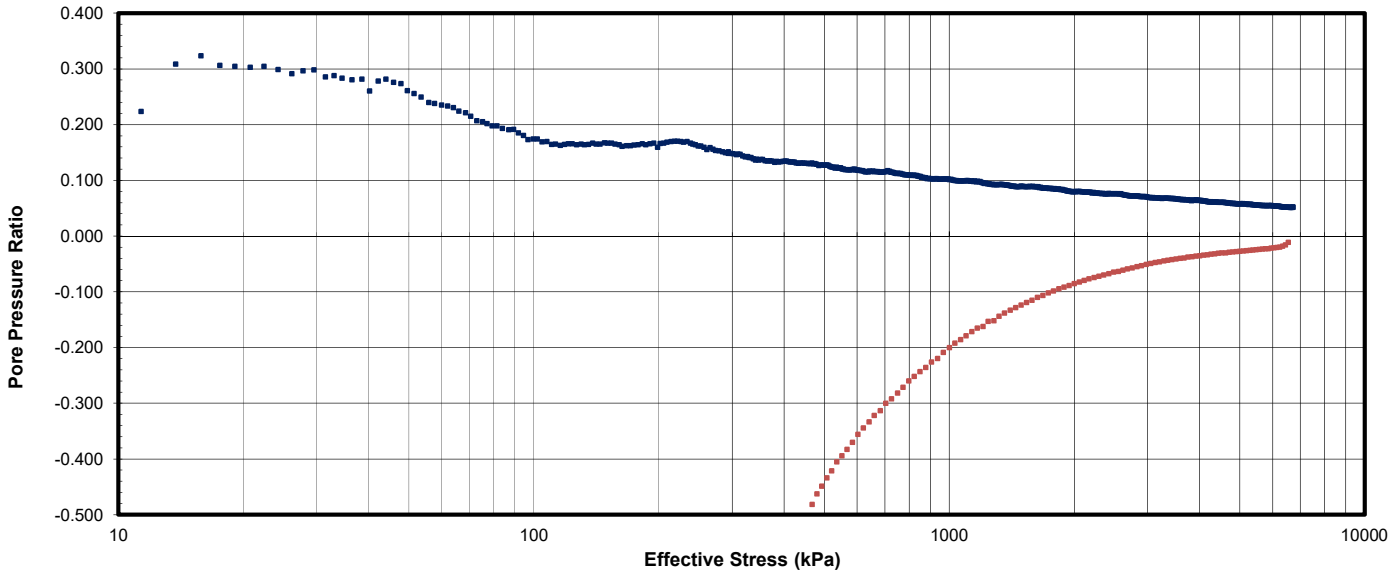
Form Nº TT117b-1

Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	December 31, 2019
Borehole:	BH19-02	Station:	CRS
Sample No.:	ST2	Depth (m):	21.7

Constant Rate of Strain Consolidation (ASTM D4186)

Weight of Ring (g):	211.92	**Ring + Wet Weight (g):**	370.42	**Initial Void Ratio, e:**	0.68
Initial Height (mm):	25.06	**Ring + Dry Weight (g):**	339.41	**Height of Soil, Hs (mm):**	14.91
Diameter of Ring (mm):	63.50	**Water Content (%):**	24.3	**Height of Void, Hv (mm):**	10.15
Unit Weight (kN/m^3)	19.33	**Specific Gravity, Gs:**	2.70		
Loading Strain Rate (%/hr):	0.8	**Max Stress (kPa):**	6712	**Backpressure (kPa):**	414
Unloading Strain Rate (%/hr):	0.1	**Max Strain (%):**	22.9		





Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	January 10, 2020	Date:	January 10, 2020	Date:	January 15, 2020

TETRA TECH CANADA INC.

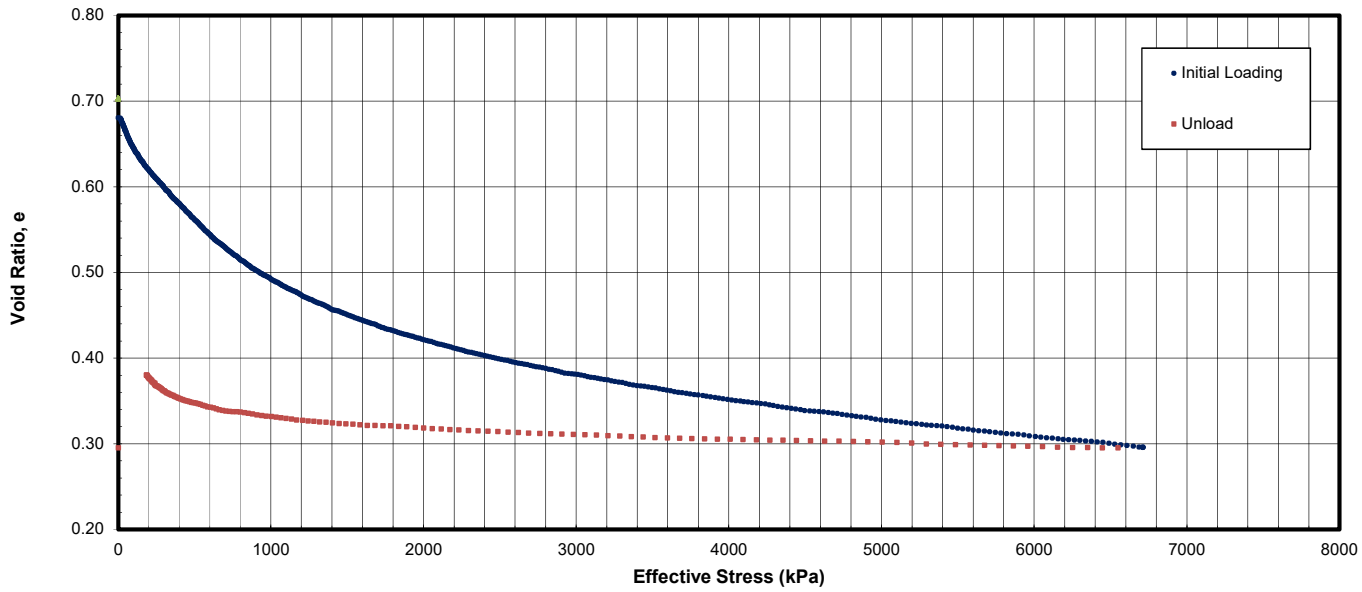
Form Nº TT117b-1

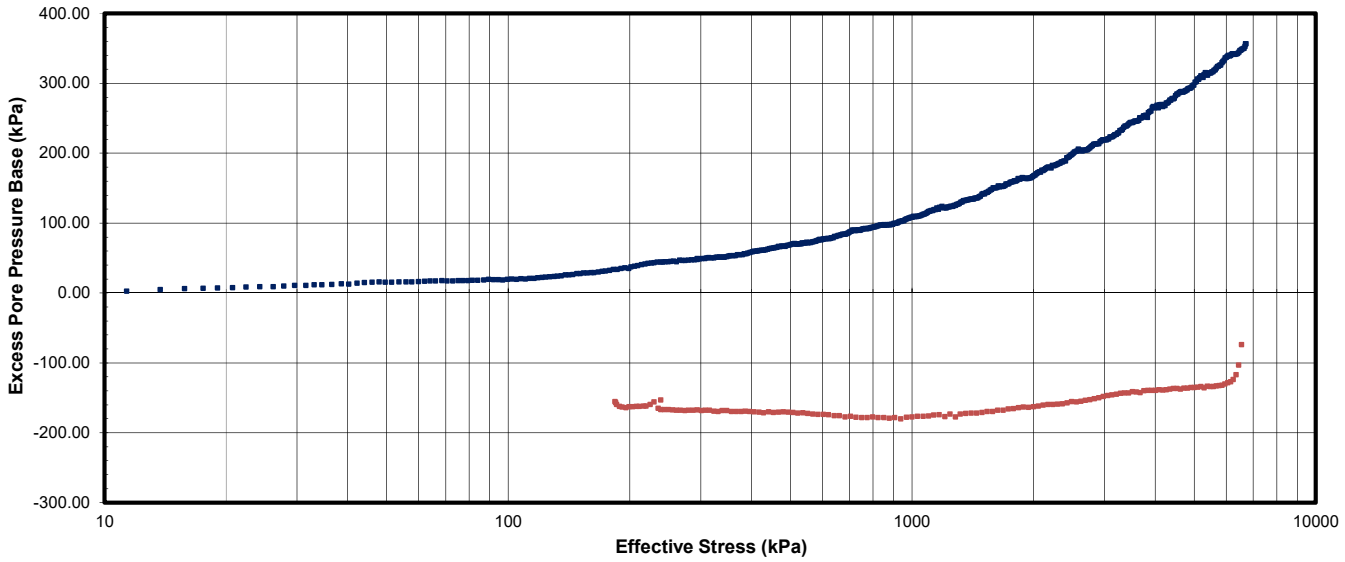
Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	December 31, 2019
Borehole:	BH19-02	Station:	CRS
Sample No.:	ST2	Depth (m):	21.7

Constant Rate of Strain Consolidation (ASTM D4186)

Weight of Ring (g):	211.92	**Ring + Wet Weight (g):**	370.42	**Initial Void Ratio, e:**	0.68
Initial Height (mm):	25.06	**Ring + Dry Weight (g):**	339.41	**Height of Soil, Hs (mm):**	14.91
Diameter of Ring (mm):	63.50	**Water Content (%):**	24.3	**Height of Void, Hv (mm):**	10.15
Unit Weight (kN/m^3)	19.33	**Specific Gravity, Gs:**	2.70		

Loading Strain Rate (%/hr):	0.8	**Max Stress (kPa):**	6712	**Backpressure (kPa):**	414
Unloading Strain Rate (%/hr):	0.1	**Max Strain (%):**	22.9		





Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	January 10, 2020	Date:	January 10, 2020	Date:	January 15, 2020

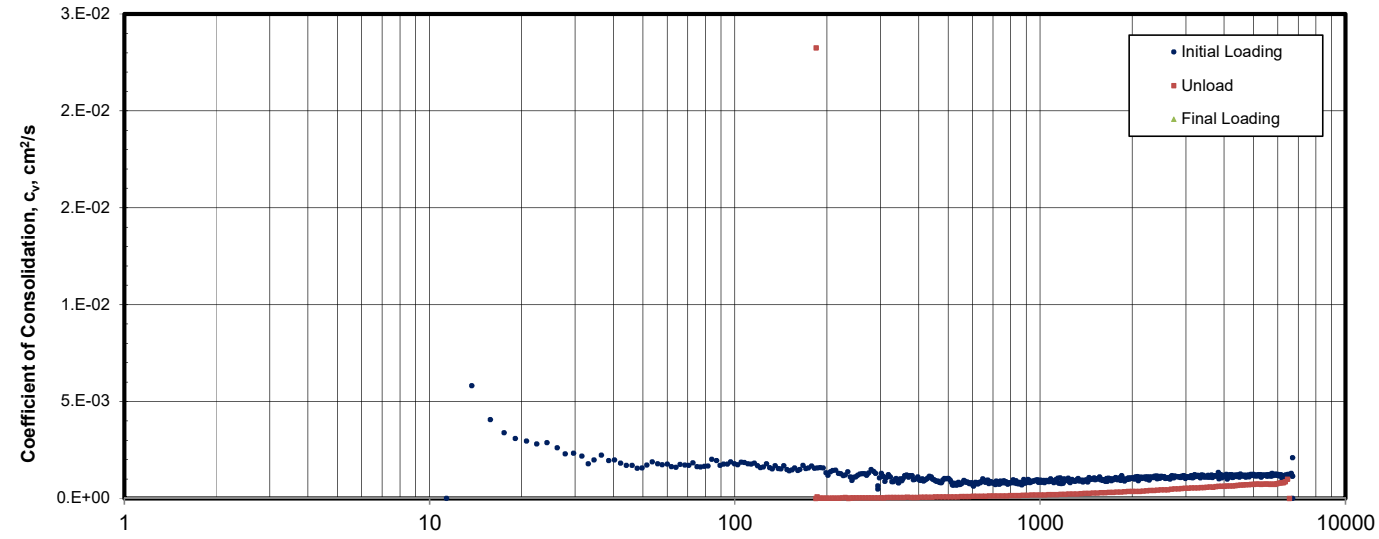
TETRA TECH CANADA INC.

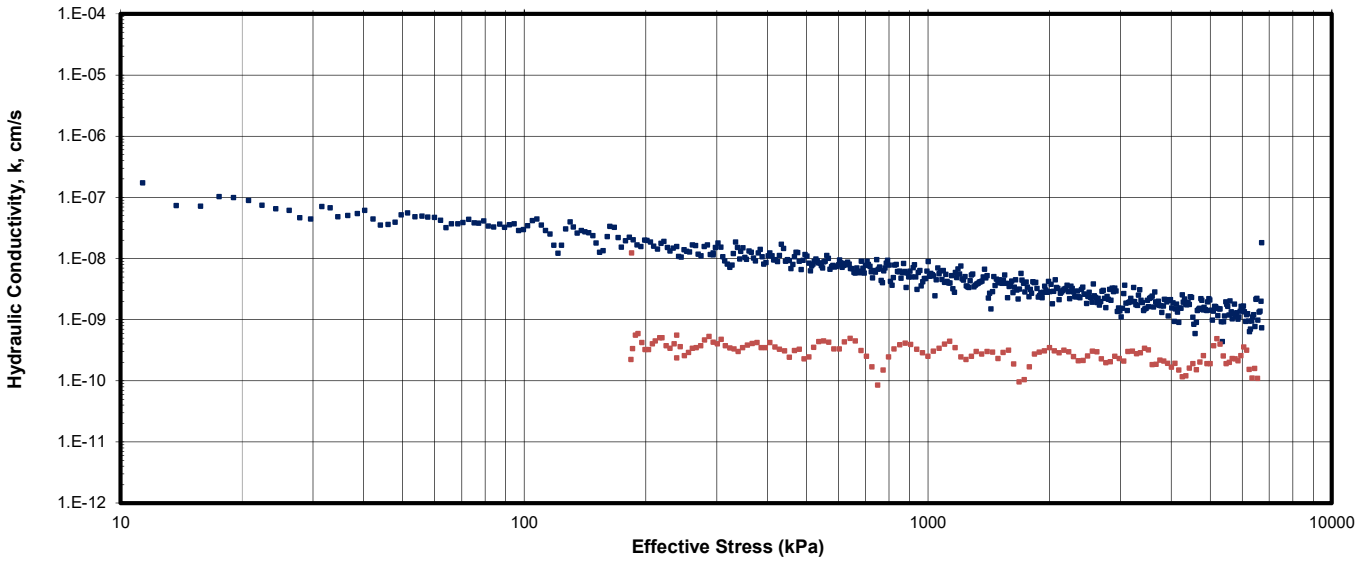
Form Nº TT117b-1

Project:	WSP - Upscheek Tashee Pathway	Project No.:	704-ENG.VGEO03755-01
Location:	Pacific Rim National Park Reserve, Tofino, BC	Date:	December 31, 2019
Borehole:	BH19-02	Station:	CRS
Sample No.:	ST2	Depth (m):	21.7

Constant Rate of Strain Consolidation (ASTM D4186)

Weight of Ring (g):	211.92	**Ring + Wet Weight (g):**	370.42	**Initial Void Ratio, e:**	0.68
Initial Height (mm):	25.06	**Ring + Dry Weight (g):**	339.41	**Height of Soil, Hs (mm):**	14.91
Diameter of Ring (mm):	63.50	**Water Content (%):**	24.3	**Height of Void, Hv (mm):**	10.15
Unit Weight (kN/m^3)	19.33	**Specific Gravity, Gs:**	2.70		
Loading Strain Rate (%/hr):	0.8	**Max Stress (kPa):**	6712	**Backpressure (kPa):**	414
Unloading Strain Rate (%/hr):	0.1	**Max Strain (%):**	22.9		





Prepared By:	PC	Checked By:	PS	Approved By:	PS
Date:	January 10, 2020	Date:	January 10, 2020	Date:	January 15, 2020

APPENDIX

5. INCLINOMETER READINGS (BH19-02)

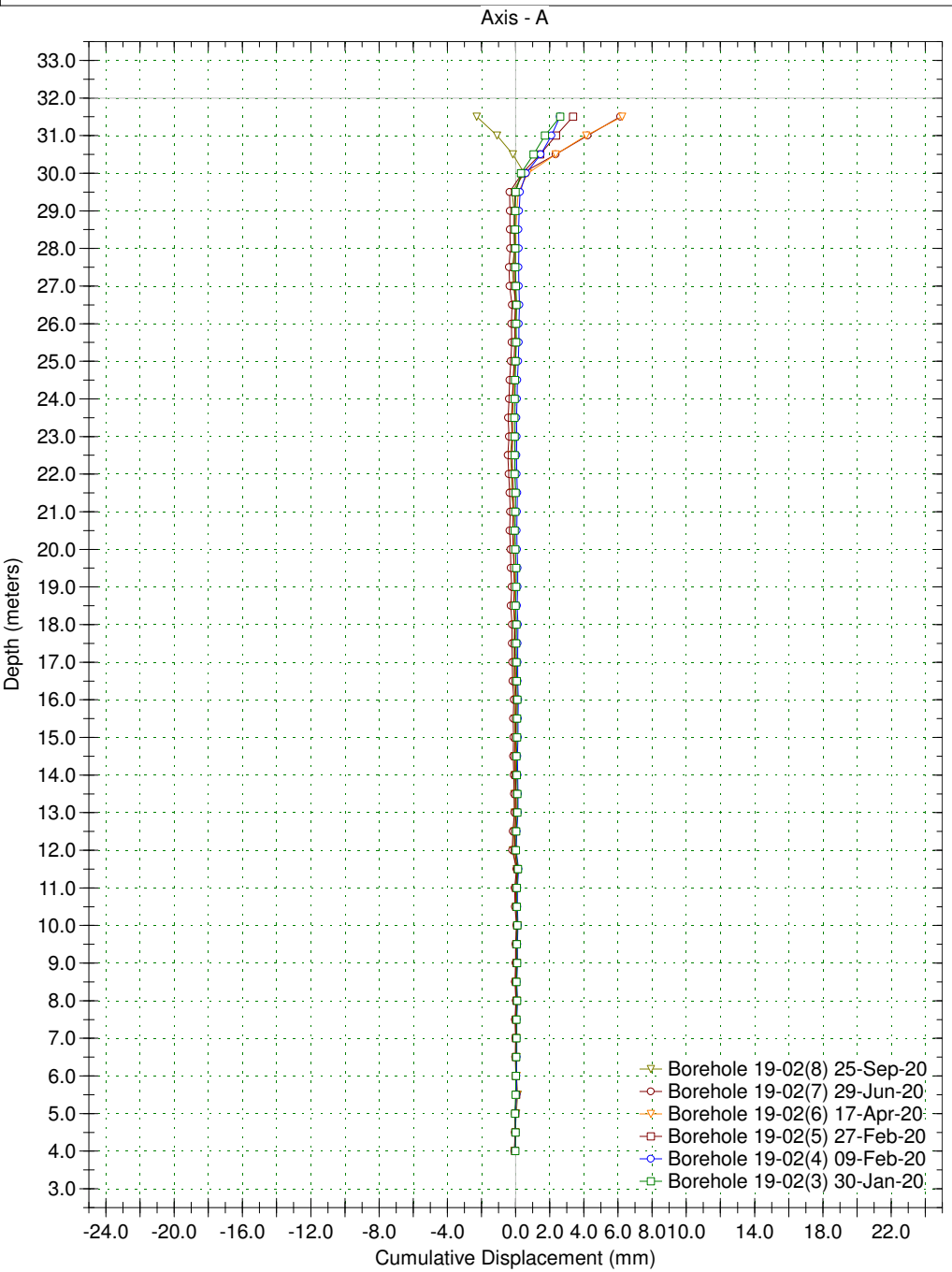
RST Instruments Ltd.

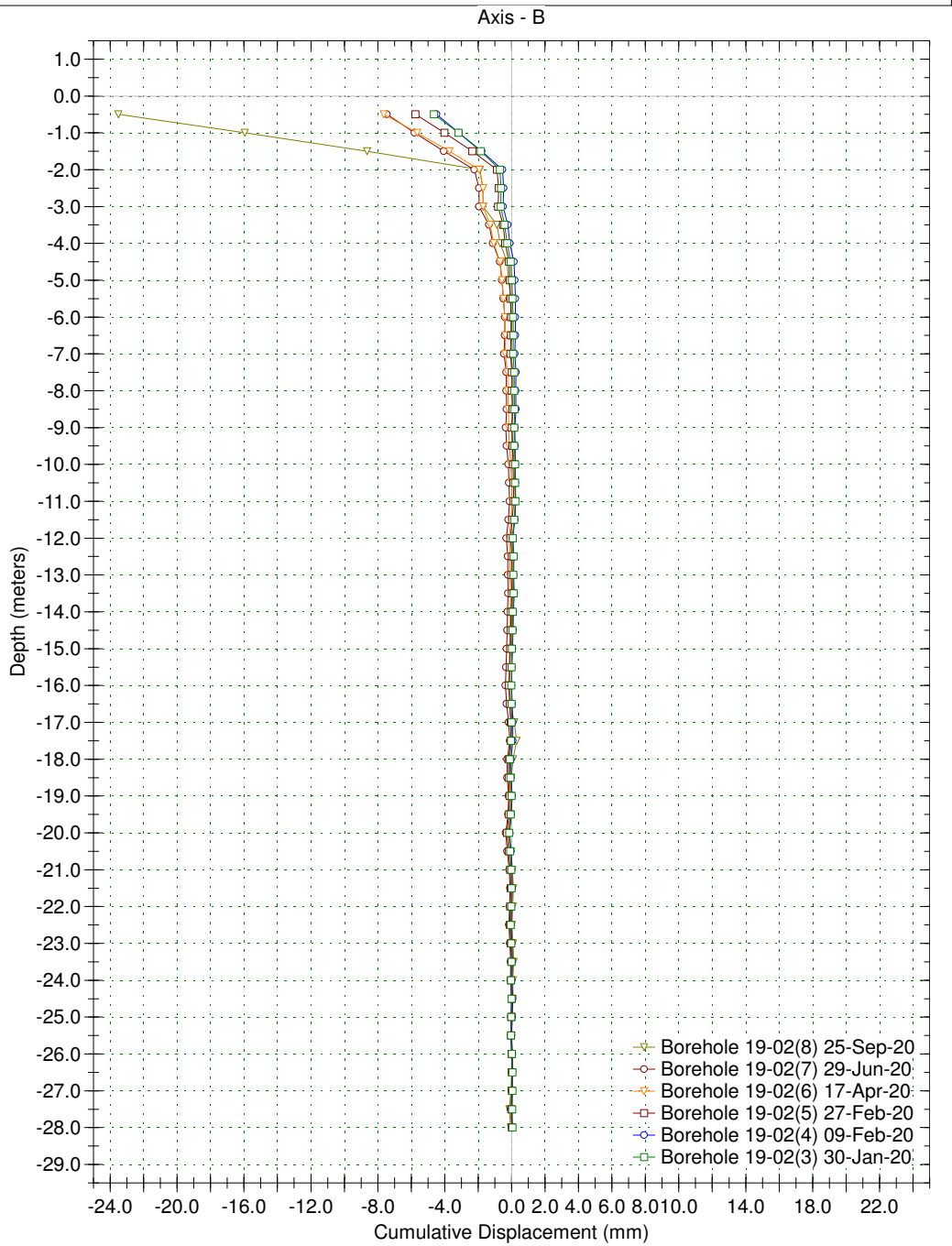
CUMULATIVE DISPLACEMENT

Inclinalysis v.2.40

Borehole : Borehole 19-02
Project : Upscheek Tashee, Escarpment
Location :
Northing :
Easting :
Collar : elevation approximate

Spiral Correction : N/A
Collar Elevation : 16.0 meters
Borehole Total Depth : 28.0 meters
North Groove Azimuth :
Base Reading : 2019 Dec 20 12:09
Axis A Azimuth : 0.0 degrees





APPENDIX

6. WOOD TEST HOLE LOGS (2016-2017)

- Boreholes - BH17-04, 09
- Cone Penetration Test - CPT 17-09
- Portable Hammer Drill - PH17-04, 05, 06, 07, 08
- Hand Auger - HA16-14

BOREHOLE BH17-04

STARTED: 26/02/2017 **FINISHED:** 26/02/2017

METHOD: Hollow Stem Auger

LOCATION: Pacific Rim National Park, BC ELEV. 22.0M

COORDINATES (m): N 5438236 **E** 299975 **ELEV:** 22 m

DESCRIPTION OF MATERIALS

DEPTH (m)	BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS
0					0.2 Asphalt - two layers - 100 mm (upper) and 50 mm (lower) thick. 21.8
					0.3 Road base - silt, sand, gravel, brown, compact, moist 21.7
					CLAY, trace silt, trace gravel, grey/brown, stiff, moist, medium plastic
1			G1		
	1/2/3/2		SS1		- @ 1.5 m below, firm, grey
2					
3			SS2		- @ 3.0 m below, very soft
	0/0/1/1				
4					
	0/0/1/0		SS3		
5					
6			SS4		
	0/0/0/0				
7					
8	0/0/0/0		SS5		
9					
	0/1/0/1		SS6		
10					

WELL INSTALLATION DETAILS

UNDRAINED SHEAR Su (kPa)

20 60 100 140 180

FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN⊙ TORVANE ◬

■ SPT N ◆ DCPT N Blows/0.3 m

W_P% W% W_L%

10 30 50 70 90

38, 5, 30, 1, 33, 152, >>▲, 1, 40, 0, 34, >>▲, 3, 36, 1, 28

N-GEO-CONVERT-2017 KA21151 PACIFIL TRAVERSE TRAIL (BH17-01 AND BH17-07).GPJ ALL-1.GDT 3/11/17

amec foster wheeler

AMEC FOSTER WHEELER
Environment & Infrastructure
18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151.5

PROJECT: Pacific Traverse Trail Project

LOCATION: Pacific Rim National Park, BC

LOGGED BY: bc **REVIEWED BY:** bf

SHEET 1 OF 2 **BOREHOLE No. BH17-04**

BOREHOLE BH17-04

STARTED: 26/02/2017 **FINISHED:** 26/02/2017

METHOD: Hollow Stem Auger

LOCATION: Pacific Rim National Park, BC ELEV. 22.0M

COORDINATES (m): **N** 5438236 **E** 299975 **ELEV:** 22 m

UNDRAINED SHEAR Su (kPa)
20 60 100 140 180
FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN⊙ TORVANE ◬
■ SPT N ◆ DCPT N Blows/0.3 m
W_P% W% W_L%
10 30 50 70 90

DEPTH (m)	BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS	WELL INSTALLATION DETAILS
11	0/0/0/1		SS7		CLAY, trace silt, trace gravel, grey/brown, stiff, moist, medium plastic *(continued)*	
12	0/0/0/1		SS8			
13					13.7 8.3	
14	3/9/14/11	70.2	SS9		SILT, sandy, grey, stiff/compact, moist	
					14.3 7.7	
15	0/0/2/5		SS10		CLAY, trace silt, trace gravel, grey, soft, moist, medium plastic	
16					15.8 6.2	
					End of borehole - Monitoring well was installed, bottom of MW at a depth of 15.2 m with a screen of 3.0 m long and backfilled with filter sand.	
17						
18						
19						
20						

N-GEO-CONVERT-2017 KA21151 PACIFIL TRAVERSE TRAIL (BH17-01 AND BH17-07).GPJ ALL-1.GDT 3/11/17

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Environment & Infrastructure
18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151.5

PROJECT: Pacific Traverse Trail Project

LOCATION: Pacific Rim National Park, BC

LOGGED BY: bc **REVIEWED BY:** bf

SHEET 2 OF 2 **BOREHOLE No. BH17-04**

BOREHOLE BH17-09

STARTED: 11/21/2017 **FINISHED:** 11/21/2017

METHOD: Solid Stem Auger/CPT

LOCATION: Pacific Rim Hwy, Road STA 12+950±. Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): N 5438225 **E** 300046 **ELEV:** 22 m

DESCRIPTION OF MATERIALS

DEPTH (m)	DESCRIPTION
0.1	**ASPHALT**, 130mm thick
21.9	**GRANULAR FILL**, sand & gravel, 19mm to 75mm minus, compact, moist, brown
1.1	**CLAY**, medium plasticity, stiff to firm, brown
20.9	
	- grey/brown from 2m
2.7	**CLAY**, medium plasticity, grey - soft from 2.7m±
19.3	
	- some to trace gravel from 6 to 6.5m, fine grain - trace gravel from 6.5m, fine grain

BLOWS PER 152mm | % Fines < No. 200 | SAMPLE TYPE AND NUMBER | SYMBOL | WELL INSTALLATION DETAILS

UNDRAINED SHEAR Su (kPa)
20 60 100 140 180
FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN ⊙ TORVANE ◬
■ SPT N ◆ DCPT N Blows/0.3 m
W_P% W% W_L%
10 30 50 70 90

12 27 40 19 29 30 29

N-GEO-CONVERT-2017 KA21151 PACIFIC TRAVERSE TRAIL (BH17-8 TO BH17-12).GPJ ALL-1.GDT 12/7/17

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Environment & Infrastructure
18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151.5
PROJECT: Pacific Traverse Trail Project
LOCATION: Pacific Rim National Park, BC
LOGGED BY: EDS **REVIEWED BY:** AA
SHEET 1 OF 4 **BOREHOLE No. BH17-09**

BOREHOLE BH17-09

STARTED: 11/21/2017 **FINISHED:** 11/21/2017

METHOD: Solid Stem Auger/CPT

LOCATION: Pacific Rim Hwy, Road STA 12+950±. Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): **N** 5438225 **E** 300046 **ELEV:** 22 m

DESCRIPTION OF MATERIALS

UNDRAINED SHEAR Su (kPa)
20 60 100 140 180
FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN⊙ TORVANE ◬

■ SPT N ◆ DCPT N Blows/0.3 m

W_P% W% W_L%
10 30 50 70 90

DEPTH (m)	BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS	WELL INSTALLATION DETAILS	UNDRAINED SHEAR Su (kPa) / SPT N / DCPT N / W_P% W% W_L%
10			G8		**CLAY**, medium plasticity, grey *(continued)* - soft/firm from 10m±		23
11							
12			G9				29
13							
13			G10				23
14							
15			G11		- occasional thin silty/sandy lensing from 15m		27
16							
16			G12		- occasional shell fragment from 16.5m		19
17							
18							
18			G13		- firm/stiff from 18m±		21
19							
20			G14				21

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Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151.5
PROJECT: Pacific Traverse Trail Project
LOCATION: Pacific Rim National Park, BC
LOGGED BY: EDS **REVIEWED BY:** AA
SHEET 2 OF 4 **BOREHOLE No. BH17-09**

BOREHOLE BH17-09

STARTED: 11/21/2017 **FINISHED:** 11/21/2017

METHOD: Solid Stem Auger/CPT

LOCATION: Pacific Rim Hwy, Road STA 12+950±. Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): **N** 5438225 **E** 300046 **ELEV:** 22 m

DESCRIPTION OF MATERIALS

CLAY, medium plasticity, grey *(continued)*

UNDRAINED SHEAR Su (kPa)
20 60 100 140 180
FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN⊙ TORVANE ◬
■ SPT N ◆ DCPT N Blows/0.3 m
W_P% W% W_L%
10 30 50 70 90

DEPTH (m)	BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	WELL INSTALLATION DETAILS
21			G15		
22					
23			G16		
24					
25			G17		
26			G18		
27			G19		
28					
29			G20		
30					

29.9 -7.9

27 28 22 30 27 22

N-GEO-CONVERT-2017 KA21151 PACIFIC TRAVERSE TRAIL (BH17-8 TO BH17-12).GPJ ALL-1.GDT 12/7/17

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Environment & Infrastructure
18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151.5
PROJECT: Pacific Traverse Trail Project
LOCATION: Pacific Rim National Park, BC
LOGGED BY: EDS **REVIEWED BY:** AA
SHEET 3 OF 4 **BOREHOLE No. BH17-09**

BOREHOLE BH17-09

STARTED: 11/21/2017 **FINISHED:** 11/21/2017

METHOD: Solid Stem Auger/CPT

LOCATION: Pacific Rim Hwy, Road STA 12+950±. Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): N 5438225 **E** 300046 **ELEV:** 22 m

DEPTH (m)	BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS	WELL INSTALLATION DETAILS
31					End of Borehole - stand pipe piezometers installed - piezometer reading Nov 25, 2017, shallow piezometer @ 1.8m, perched water and/or not stabilized, deep piezometer @ 26.8m, not stabilized, pressurized air escaped when opened.	
32						
33						
34						
35						
36						
37						
38						
39						
40						

UNDRAINED SHEAR Su (kPa)
20 60 100 140 180
FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN⊙ TORVANE ◬

■ SPT N ◆ DCPT N Blows/0.3 m

W_P% W% W_L%
10 30 50 70 90

N-GEO-CONVERT-2017 KA21151 PACIFIC TRAVERSE TRAIL (BH17-8 TO BH17-12).GPJ ALL-1.GDT 12/7/17

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Environment & Infrastructure
18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

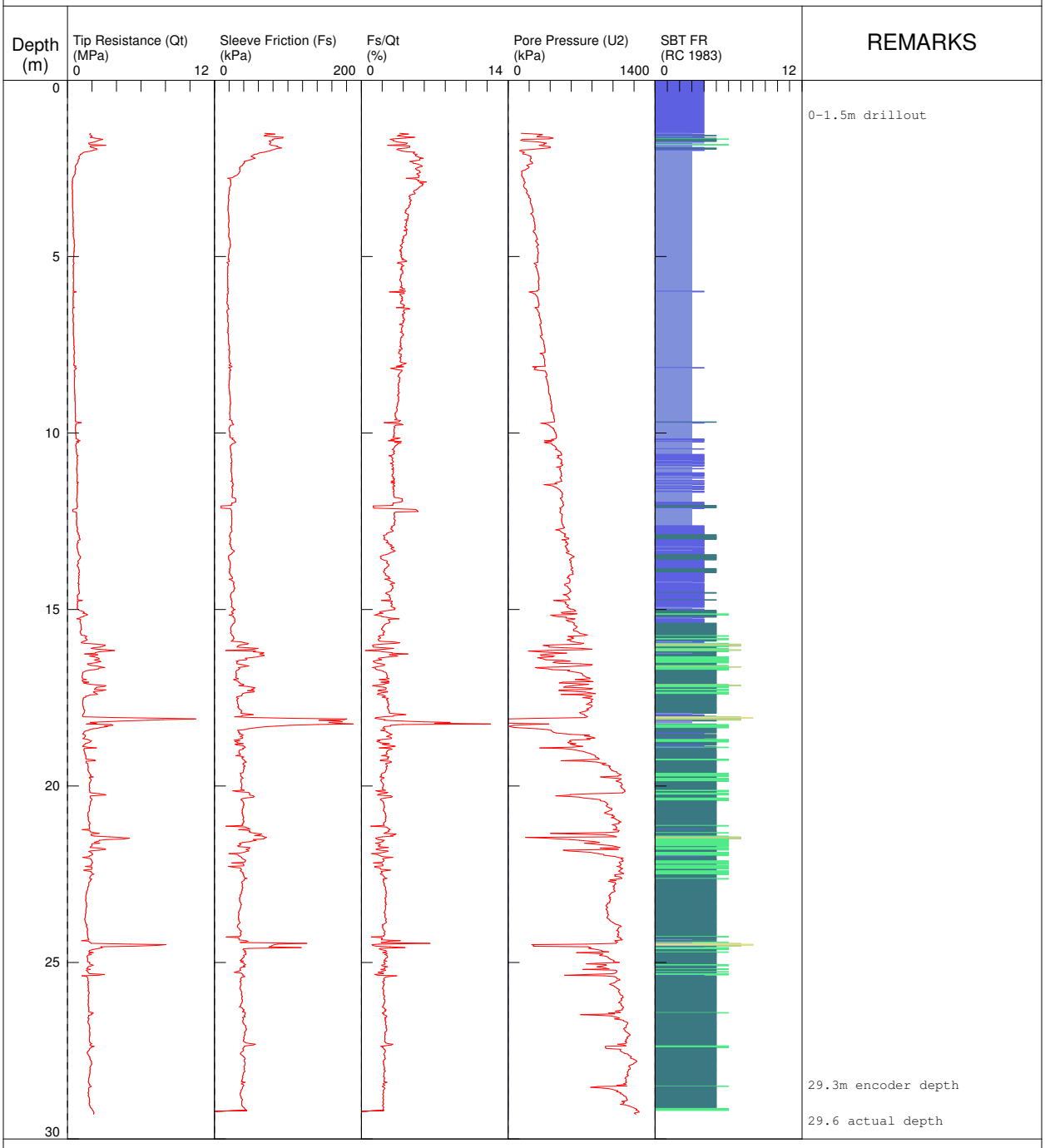
PROJECT NO.: KA21151.5
PROJECT: Pacific Traverse Trail Project
LOCATION: Pacific Rim National Park, BC
LOGGED BY: EDS **REVIEWED BY:** AA
SHEET 4 OF 4 **BOREHOLE No. BH17-09**

KA21151CPT17-09.cpt

OPERATOR: Colin
CONE ID: DDG1374
TEST DATE: 11/21/2017 8:08:21 AM

PREPARED BY:: Drillwell Enterprises
LOCATION: Tofino
GPS (LAT,LON,ALT): 4901.0420N,12538.4922W,15.9

JOB NUMBER: KA21151
HOLE NUMBER: CPT17-09



REMARKS

0-1.5m drillout

29.3m encoder depth

29.6 actual depth

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

BOREHOLE PH17-04

STARTED: 11/7/2017 **FINISHED:** 11/7/2017

METHOD: Pionjar/BQ

LOCATION: Pacific Rim Hwy, Road STA 12+960±. Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): N 5438211 **E** 300038 **ELEV:** 20 m

DESCRIPTION OF MATERIALS

DEPTH (m)	BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS	WELL INSTALLTION DETAILS
0					**FOREST LITTER/TOPSOIL,** soft, moist to wet	
1.0					19.1	
1					**CLAY,** medium plasticity, very stiff to stiff, brown - fissured to 1.2m± - grey/brown from 1.5m - grey from 2m	
3					- firm from 3m± - stone encountered, partial BQ casing blockage, recovery highly disturbed - occasional thin clayey sand lense from 3 to 4m	
4					- infer firm/soft below 4.5m	
6.1					13.9	
6					End of Borehole - piezometer installed - FV; Geonor field vane on undisturbed soil - TV; Torvane at bottom of BQ casing, disturbed - Hole backfilled with cuttings and sealed with bentonite.	
7						
8						
9						
10						

UNDRAINED SHEAR Su (kPa)

20 60 100 140 180

FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN⊙ TORVANE ◬

■ SPT N ◆ DCPT N Blows/0.3 m

W_P% W% W_L%

10 30 50 70 90

63 188 31 90 29 33 29

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18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151.6

PROJECT: Pacific Traverse Trail Project

LOCATION: Pacific Rim National Park, BC

LOGGED BY: EDS **REVIEWED BY:** AA

SHEET 1 OF 1 **BOREHOLE No. PH17-04**

BOREHOLE PH17-05

STARTED: 11/7/2017 **FINISHED:** 11/7/2017

METHOD: Pionjar/BQ

LOCATION: Pacific Rim Hwy, Road STA 12+985±. Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): N 5438219 **E** 300016 **ELEV:** 16 m

DESCRIPTION OF MATERIALS

FOREST LITTER/TOPSOIL, soft, moist to wet

1.0

15.1

CLAY, medium plasticity, very stiff to stiff, brown
- fissured to 1.5m±, minor perched water seepage
- grey/brown from 2.5m
- grey from 3m

- firm from 3m±

- infer firm/soft below 4.5m

6.1

9.9

End of Borehole
- piezometer installed
- FV; Geonor field vane on undisturbed soil
- TV; Torvane at bottom of BQ casing, disturbed
- Hole backfilled with cuttings and sealed with bentonite.

UNDRAINED SHEAR Su (kPa)
20 60 100 140 180
FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN⊙ TORVANE ◬
■ SPT N ◆ DCPT N Blows/0.3 m
W_P% W% W_L%
10 30 50 70 90

170 180 36 90 26 23 27 22 24

PROJECT NO.: KA21151.6	
PROJECT: Pacific Traverse Trail Project	
LOCATION: Pacific Rim National Park, BC	
LOGGED BY: EDS	**REVIEWED BY:** AA
SHEET 1 OF 1	**BOREHOLE No. PH17-05**

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Surrey, B.C. V4N 3P9

BOREHOLE PH17-06

STARTED: 11/7/2017 **FINISHED:** 11/8/2017

METHOD: Pionjar/BQ

LOCATION: Pacific Rim Hwy, Road STA 12+960±. Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): N 5438188 **E** 300032 **ELEV:** 14 m

DESCRIPTION OF MATERIALS

DEPTH (m)	BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS	WELL INSTALLTION DETAILS
0					**FOREST LITTER/TOPSOIL,** soft, moist to wet	
0.3						
					CLAY, medium plasticity, very stiff to stiff, brown - grey/brown from 0.5m - grey from 1.6m	
1						
2					- trace sand & fine gravel from 2.5m	
3					- stone encountered at 3m, no FV - firm to stiff below 3m	
4						
5						
5.5						
5.6					**SAND,** fine grained, silty to some silt, infer compact, moist, grey	
6						
8.4					End of Borehole - effective refusal @5.6m - piezometer installed - FV; Geonor field vane on undisturbed soil - TV; Torvane at bottom of BQ casing, disturbed - standpipe piezometer installed - water level reading Nov 25, 2017, 0.62m (likely perched water)	
8.5						
10						

UNDRAINED SHEAR Su (kPa)

20 60 100 140 180

FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN ⊙ TORVANE ◬

■ SPT N ◆ DCPT N Blows/0.3 m

W_P% W% W_L%

10 30 50 70 90

26 110 29 140 30 18 70 36 29

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18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151.6

PROJECT: Pacific Traverse Trail Project

LOCATION: Pacific Rim National Park, BC

LOGGED BY: EDS **REVIEWED BY:** AA

SHEET 1 OF 1 **BOREHOLE No. PH17-06**

BOREHOLE PH17-07

STARTED: 11/8/2017 **FINISHED:** 11/8/2017

METHOD: Pionjar/BQ

LOCATION: Pacific Rim Hwy, Road STA 12+985±. Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): **N** 5438169 **E** 300013 **ELEV:** 6 m

DESCRIPTION OF MATERIALS

DEPTH (m)	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS
0			**FOREST LITTER/TOPSOIL,** soft, moist to wet
0.4 / 5.7			
0.6 / 5.5	GS1		**FILL,** sand & gravel, compact, wet, brown, - possible road base at abandoned road
1	GS2		**CLAY, sandy/SAND clayey,** lensed, medium to non-platic, infer firm/compact, moist, grey/brown
2			- grey from 2.5m
2.8 / 3.2			
3.0 / 3.0	GS3		**SAND,** fine grained, trace silt, infer compact, moist, grey
	GS4		**CLAY,** medium plasticity, firm, grey
3.4 / 2.6	GS5		
4			End of Borehole - effective refusal @5.6m - piezometer installed - FV; Geonor field vane on undisturbed soil - TV; Torvane at bottom of BQ casing, disturbed - standpipe piezometer installed - piezometer reading Nov 25, 2017 @ 0.10m (likely perched water)
5			
6			
7			
8			
9			
10			

WELL INSTALLTION DETAILS

UNDRAINED SHEAR Su (kPa)
20 60 100 140 180
FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN ⊙ TORVANE ◬

■ SPT N ◆ DCPT N Blows/0.3 m

W_P% W% W_L%
10 30 50 70 90

36
14
15
14
40
20

N-GEO-CONVERT-2017 KA21151 PH (PH17-1 TO PH17-45, HA17-18).GPJ ALL-1.GDT 12/7/17

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Environment & Infrastructure
18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151.6

PROJECT: Pacific Traverse Trail Project

LOCATION: Pacific Rim National Park, BC

LOGGED BY: EDS **REVIEWED BY:** AA

SHEET 1 OF 1 **BOREHOLE No. PH17-07**

BOREHOLE PH17-08

STARTED: 11/8/2017 **FINISHED:** 11/8/2017

METHOD: Pionjar/BQ

LOCATION: Pacific Rim Hwy, Road STA 13+005±. Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): N 5438202 **E** 299983 **ELEV:** 6 m

DESCRIPTION OF MATERIALS

DEPTH (m)	BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS	WELL INSTALLTION DETAILS
0					**FOREST LITTER/TOPSOIL,** soft, moist to wet	
0.5						
					CLAY, medium plasticity, stiff to firm, brown/grey	
1						
			SS1			
2					- grey from 1.8m	
2.2						
			SS2			
3.8					End of Borehole - effective refusal @5.6m - piezometer installed - FV; Geonor field vane on undisturbed soil - TV; Torvane at bottom of BQ casing, disturbed - hole backfilled with cuttings & bentonite seal	
5.5						
10						

UNDRAINED SHEAR Su (kPa)

20 60 100 140 180

FIELD VANE PEAK ▲ RESIDUAL △ POCKET PEN⊙ TORVANE ◬

■ SPT N ◆ DCPT N Blows/0.3 m

W_P% W% W_L%

10 30 50 70 90

22 75 40 31

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Environment & Infrastructure
18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151.6

PROJECT: Pacific Traverse Trail Project

LOCATION: Pacific Rim National Park, BC

LOGGED BY: EDS **REVIEWED BY:** AA

SHEET 1 OF 1 **BOREHOLE No. PH17-08**

N-GEO-CONVERT-2017 KA21151 PH (PH17-1 TO PH17-45, HA17-18).GPJ ALL-1.GDT 12/7/17

BOREHOLE HA16-14

STARTED: 12/14/2016 **FINISHED:** 12/14/2016

METHOD: Hand Auger

LOCATION: Bridge ID.11, Coord's from GPS, indicated accuracy of ±3m. Elev's from Parson's dwg R.081570.001 Rev_2.

COORDINATES (m): N 5438193 **E** 300010 **ELEV:** 14 m

DESCRIPTION OF MATERIALS

DEPTH (m)	BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS	WELL INSTALLATION DETAILS
0			G		FOREST LITTER/TOPSOIL/PEAT, very soft	
0.3						
			G		CLAY, trace sand, hard to very stiff, reddish brown to grey/brown, mottled - field vane refusal to 0.8m depth, >280 kPa	
1			G			
			G			
2			G			
2.1						
11.9					End of Hole - no groundwater seepage observed	
13.7						

UNDRAINED SHEAR Su (kPa)
20 60 100 140 180
FIELD VANE PEAK ▲ RESIDUAL △
POCKET PEN ⊙ TORVANE ◬
■ SPT N ◆ DCPT N Blows/0.3 m
W_P% W% W_L%
10 30 50 70 90
164
>>
158

N-GEO-CONVERT-2017 KA21151 PACIFIC TRAVERSE TRAIL (HA TEST HOLES DEC 2016).DRAFT.V00.GPJ ALL-1.GDT 12/8/17

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Environment & Infrastructure
18568 - 96 Avenue, Unit 110
Surrey, B.C. V4N 3P9

PROJECT NO.: KA21151
PROJECT: PACIFIC TRAVERSE TRAIL
LOCATION: PACIFIC RIM NATIONAL PARK, BC
LOGGED BY: EDS **REVIEWED BY:** JL
SHEET 1 OF 1 **BOREHOLE No. HA16-14**

APPENDIX

7. LEVELTON TEST HOLE LOGS (2014, 2010)

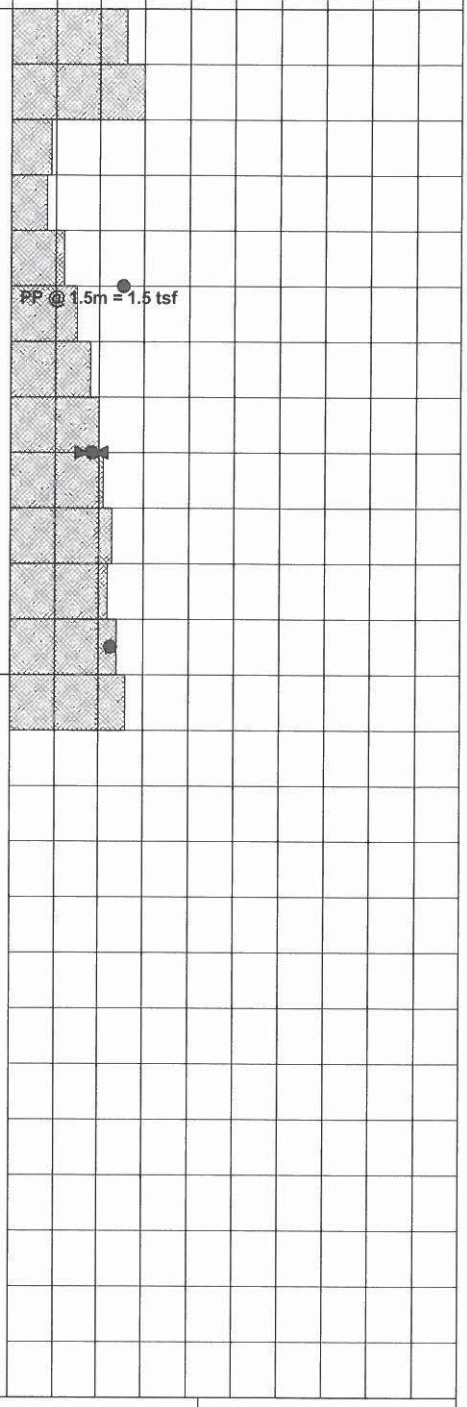
LEVELTON

Sewer and Lift Stations
Tofino, BC
Geotechnical Assessment

BH10-20

Project No: VI10-1223-00

Depth (m)	Depth (ft)	Description	C	N	Type	Water Level
		Compact, **SAND AND GRAVEL (VARIOUS FILL),** road base and subbase, trace to some silt, moist.				
	2	Soft to firm, mottled orange brown, **SILT,** trace gravel, moist.				
	4	Firm, orange brown, silty, **CLAY,** trace sand and gravel.			G	
2	6					
	8	- firm, blue grey, trace to some gravel, moist at 2.5m			G	
	10	- increased plasticity content below 3.0m - trace to some sand below 3.0m depth.				
	12				G	
		Bottom of hole at 3.7 metres				
4	14					
	16					
	18					
6	20					
	22					
	24					



C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
S : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type: Trip Hammer
DYNAMIC CONE PENETRATION TEST: Blow count no. of blows of a 140 lb (64 kg) hammer dropped 30in. (750mm) to produce 12in (300mm) of a 2in (50mm) diameter cone.

- Moisture Content %
- Plastic Limit
- Liquid Limit
- Ground Water Level
- Shear strength in kPa (Torvane or Penetrometer)
- Shear strength in kPa (Unconfined)
- Shear strength in kPa (field vane)
- Remolded strength in kPa
- Percent Passing # 200 sieve

Drill Method: Solid Stem Auger / DCPT
Date Drilled: 7/22/2010
By: RH

1 LOG PER PAGE VI10-1223-00.GPJ LEVELTON.GDT 8/19/10

LEVELTON

Geotechnical Assessment
Highway 4 - Pacific Rim National Park
WSP Canada Inc.

BH14-04
Pg 1 of 1

Project No: R714-0308-00

Depth (m)	Depth (ft)	Description	C	N	Type	Water Level
		ASPHALT (180mm), ≥ 3 layers.			G	
		Compact, dark grey, **SAND AND GRAVEL (FILL),** crushed, 19mm.			G	
		Compact, brown, **SAND AND GRAVEL (FILL),** pit run, moist. - filter cloth (grey and white) observed at 1.3m.				
2	5	Firm to stiff, grey, silty, **CLAY,** some wood debris sizes to 25mm diameter, some organic, moist. - trace shells observed at 1.6m depth			G	
	10	- blue grey, trace sand and gravel, moist				
4					G	
	15	- yellow brown, trace gravel, moist				
		- blue grey, occasional gravel sizes to 25mm diameter.				
6	20				G	
	25				G	
8		Bottom of hole at 7.6 metres				
	30					
10						
	35					
12	40					
	45					

10 20 30 40 50 60 70 80 90

- Hand excavated

C: Condition of Sample
Good
Disturbed
No Recovery

Type: Type of Sampler
SPT : 2 in. standard
S : Shelby
FP : Fixed Piston
G : Grab
CORE

N: Number of Blows
WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type:

DYNAMIC CONE PENETRATION TEST:
Blow count no. of blows of a 140 lb (64 kg) hammer dropped 30in. (750mm) to produce 12in (300mm) of a 2in (50mm) diameter cone.

- ● Moisture Content %
- ▶ Plastic Limit
- ◀ Liquid Limit
- ▼ Ground Water Level
- ⊠ Shear strength in kPa (Torvane or Penetrometer)
- × Shear strength in kPa (Unconfined)
- ⊗ Shear strength in kPa (field vane)
- ⊠ Remolded strength in kPa
- ■ Percent Passing # 200 sieve

Drill Method: Solid Stem Auger / DCPT
Date Drilled: 23/01/2014
By: RH

Photo 7: View looking west at road condition near BH14-04 (11 February 2014)

Photo 8: View looking east at road condition near BH14-04 (11 February 2014)

LEVELTON

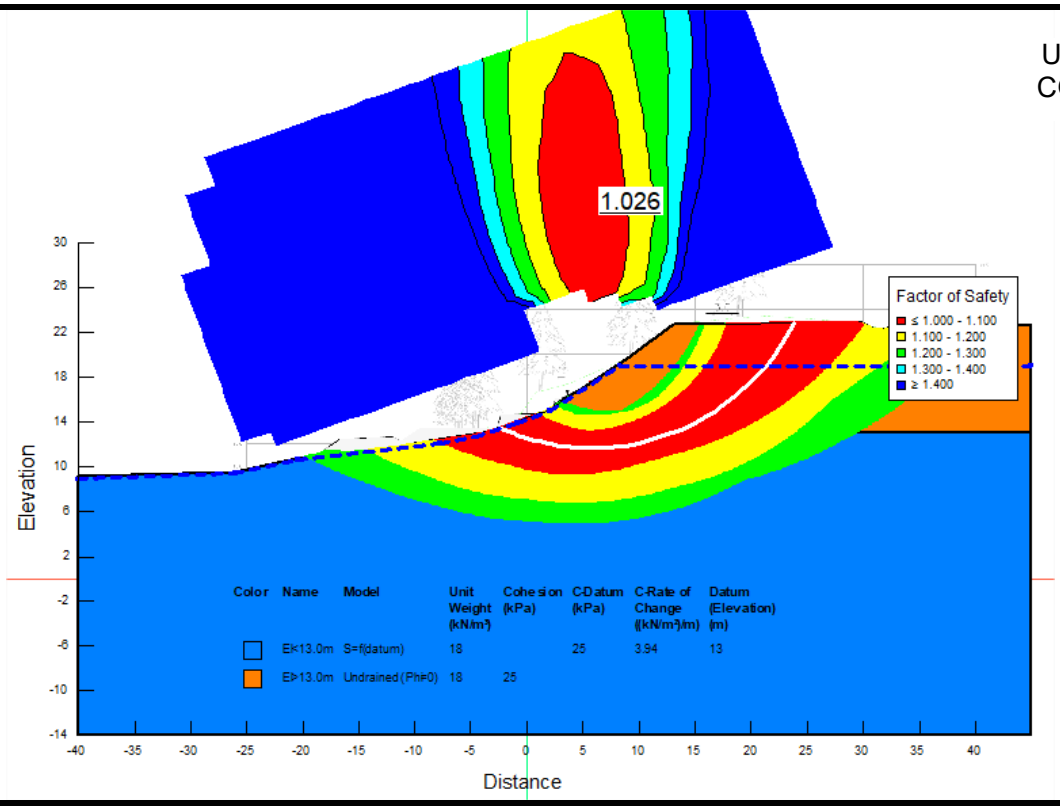
PROJECT:	Geotechnical Assessment Highway No. 4 – Pacific Rim National Park
TITLE:	Site Photographs
CLIENT:	WSP Canada Inc.

PHOTO NOS.:	DATE:	FILE NO.:
7 and 8	MARCH 2014	R714-0308-00

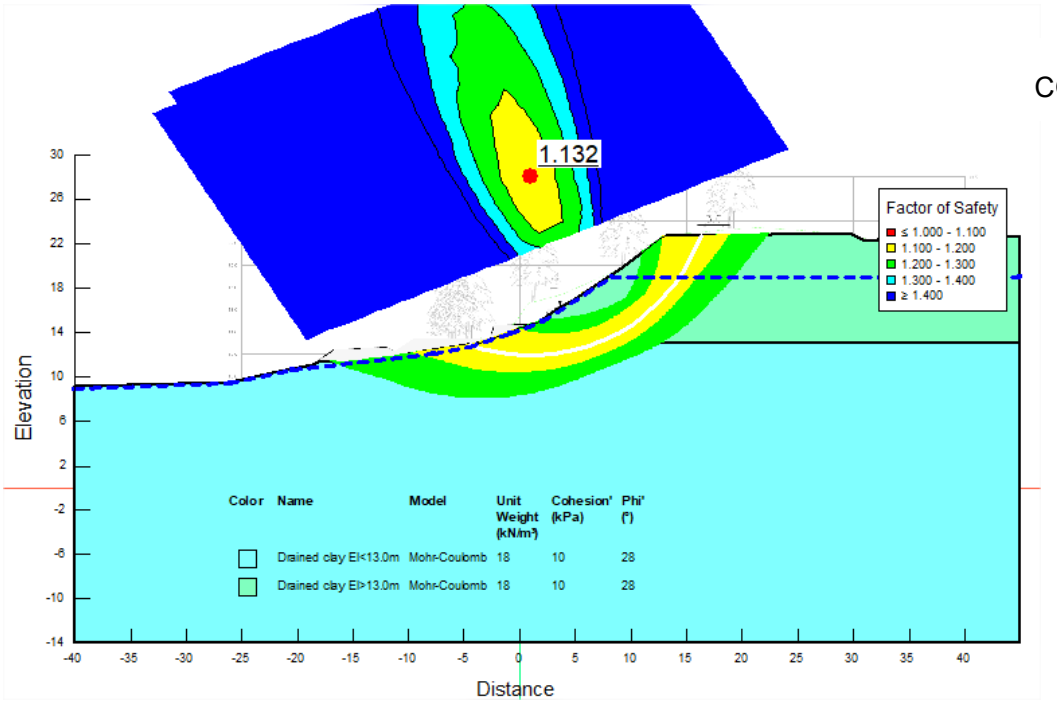
APPENDIX

8. SLOPE STABILITY ANALYSES – 2D

UNDRAINED CONDITIONS



DRAINED CONDITIONS



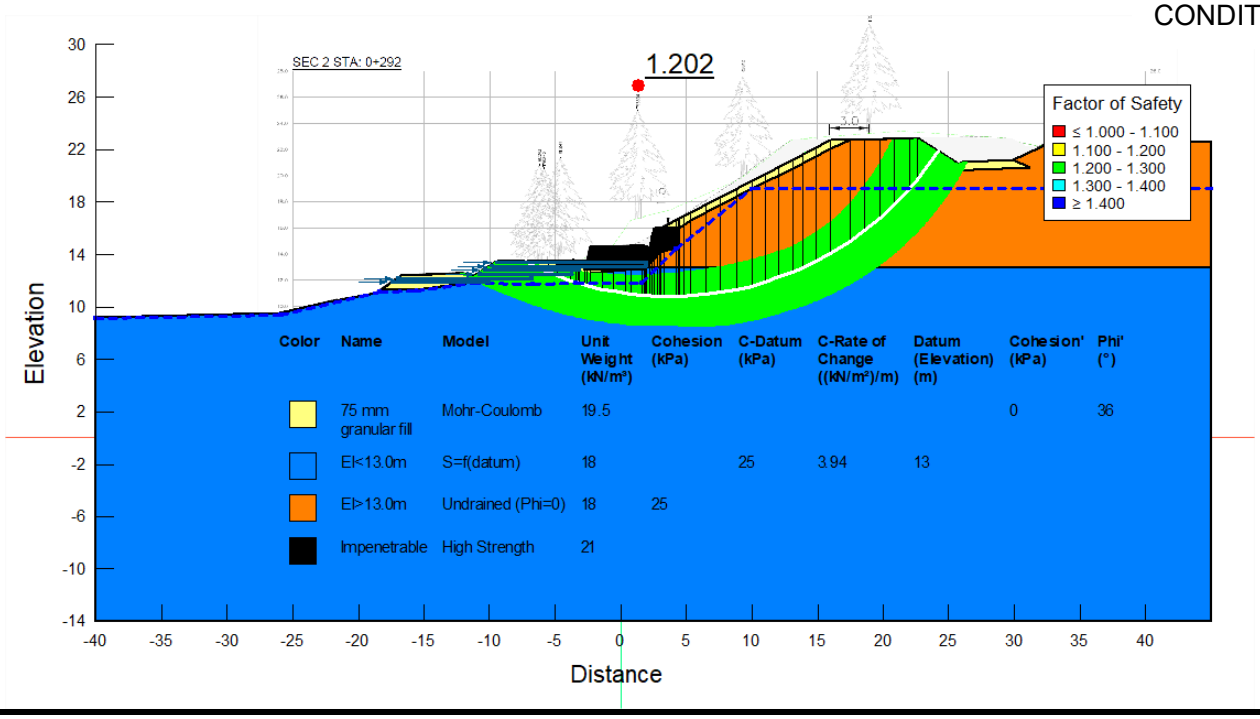
PROJECT:
PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC
UPSCHEEK TASHEE PATHWAY – WAYII AREA
GEOTECHNICAL ASSESSMENT

TITLE:
2D STABILITY ANALYSES AT STA 0+292
EXISTING CONDITIONS

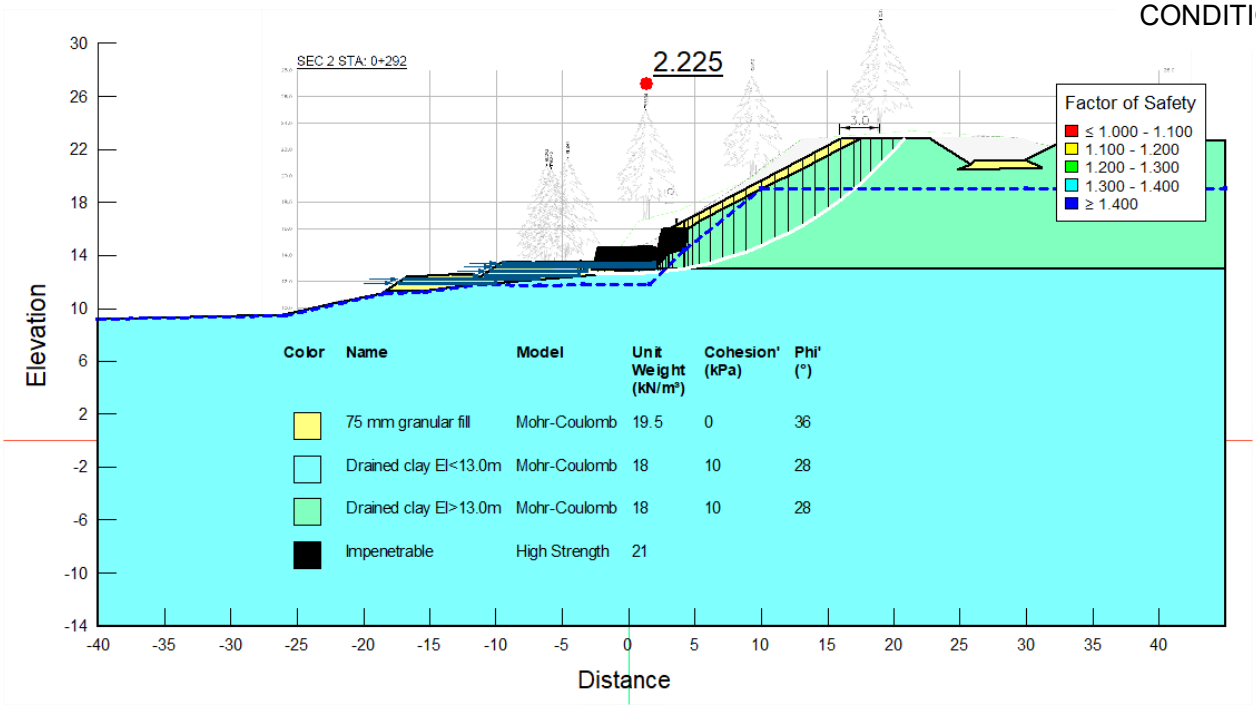
CLIENT:
PARKS CANADA

DRAWING NO.:	DATE:	FILE NO.:	SCALE:	DRAWN BY:	REV NO.:
A8-1	FEBRUARY 2021	191-08875-02	NTS	AP/DF	0

UNDRAINED CONDITIONS



DRAINED CONDITIONS



PROJECT:
PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC
UPSCHEEK TASHEE PATHWAY – WAYII AREA
GEOTECHNICAL ASSESSMENT

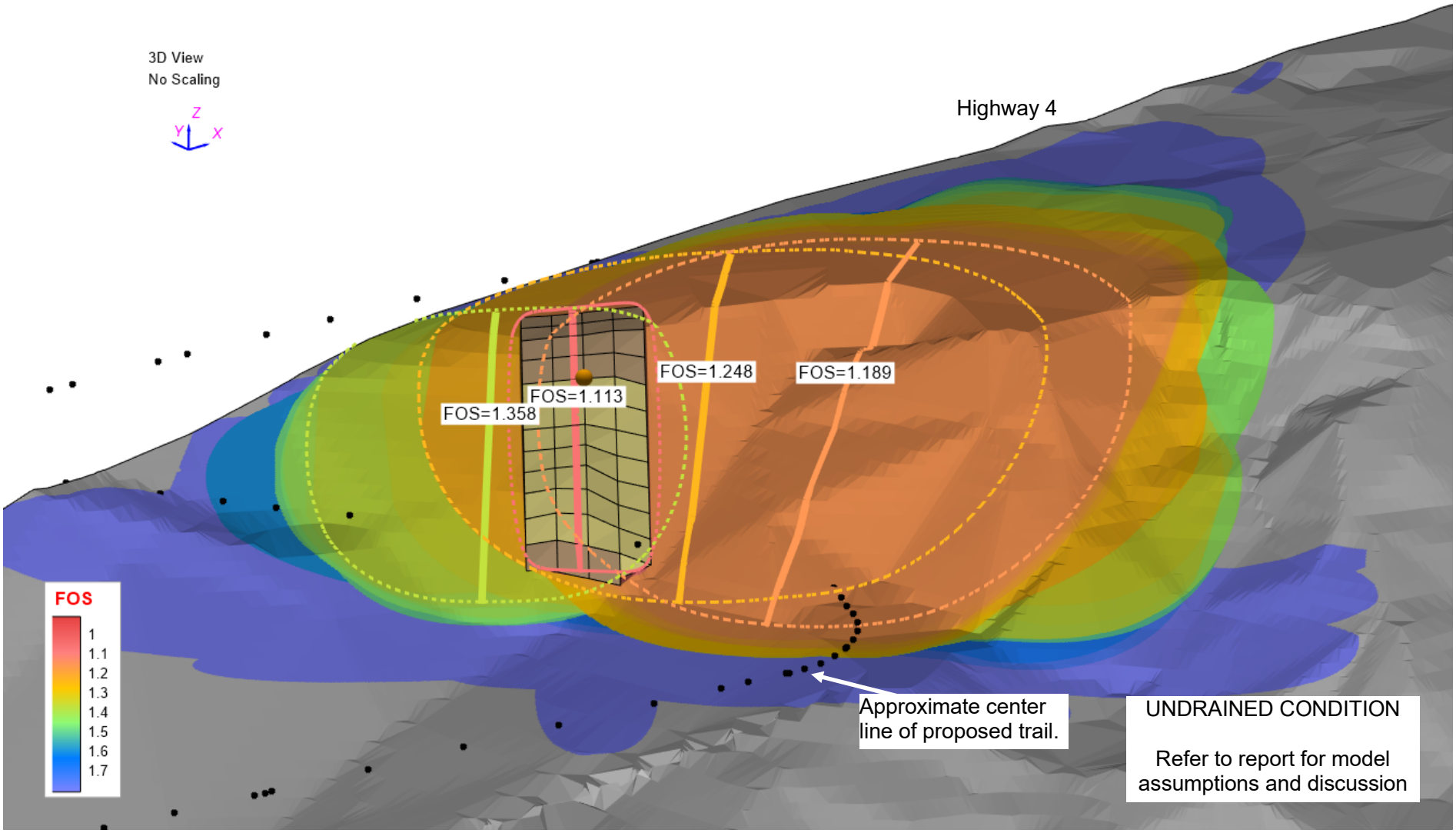
TITLE:
2D STABILITY ANALYSES AT STA 0+292
BUTTRESS WITH GEOGRID

CLIENT:
PARKS CANADA

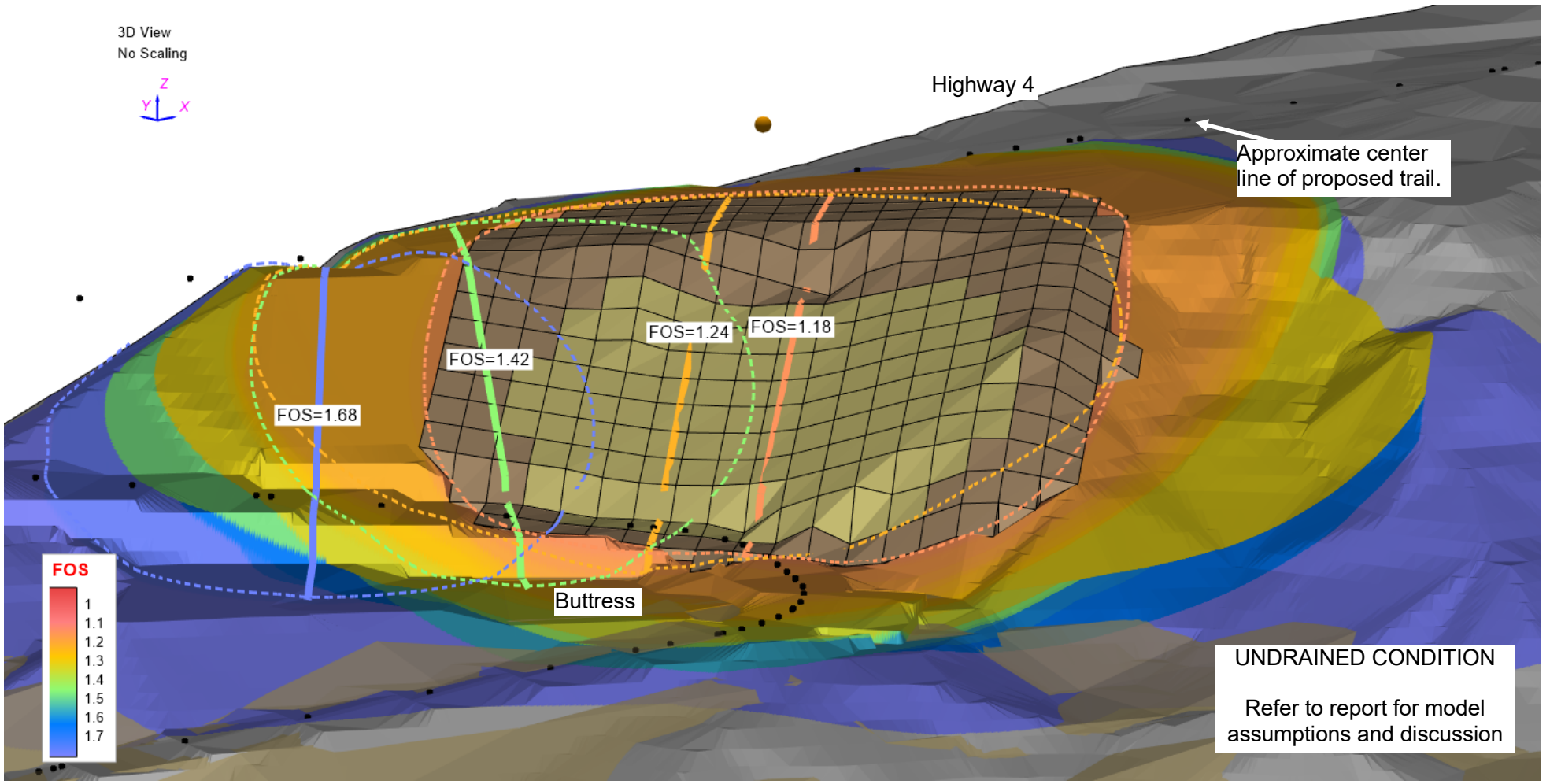
DRAWING NO.:	DATE:	FILE NO.:	SCALE:	DRAWN BY:	REV NO.:
A8-2	FEBRUARY 2021	191-08875-02	NTS	AP/DF	0

APPENDIX

9. SLOPE STABILITY ANALYSES – 3D



	PROJECT: PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC UPSCHEEK TASHEE PATHWAY – WAYII AREA GEOTECHNICAL ASSESSMENT				
	TITLE: 3D ANALYSES SUMMARY - EXISTING TOPOGRAPHY: LOCALIZED STABILITY (SMALL WEDGES)				
	CLIENT: PARKS CANADA				
DRAWING NO.: A9-1	DATE: FEBRUARY 2021	FILE NO.: 191-08875-02	SCALE: NTS	DRAWN BY: AD/DF	REV NO.: 0



PROJECT:
PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC
UPSCHEEK TASHEE PATHWAY – WAYII AREA
GEOTECHNICAL ASSESSMENT

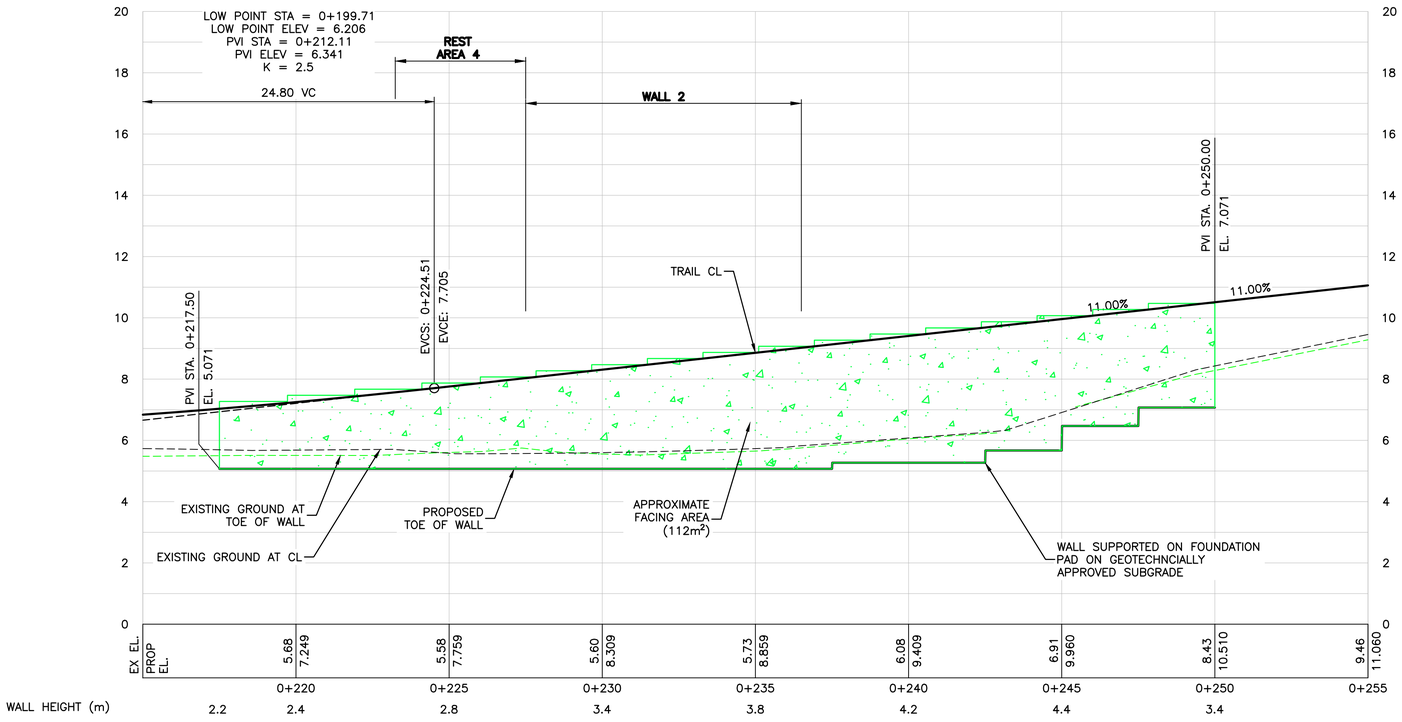
TITLE:
3D ANALYSES SUMMARY - FINAL GRADE: LOCALIZED STABILITY (SMALL WEDGES)

CLIENT:
PARKS CANADA

DRAWING NO.:	DATE:	FILE NO.:	SCALE:	DRAWN BY:	REV NO.:
A9-2	FEBRUARY 2021	191-08875-02	NTS	AD/DF	0

APPENDIX

10. RETAINING WALL & BUTTRESS DESIGN DRAWINGS (IFT FEB 2021)



WALL 1 PROFILE

1:100 HOR – 1:100 VER

Parks Canada Agency / L'Agence Parcs Canada

PARSONS

wsp

Revision/ Revision	Description/Description	Date/Date
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0	ISSUED FOR TENDER	21/02/18

Client/client

Parks Canada Agency / L'Agence Parcs Canada

Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet

TOFINO

PACIFIC RIM NATIONAL PARK RESERVE
ʔapscɨ̓ik t̓asɨ̓i
(Ups-cheek ta-shee)
"Going in the right direction on the trail"

Consultant Signature Only

Designed by/Concept par
DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

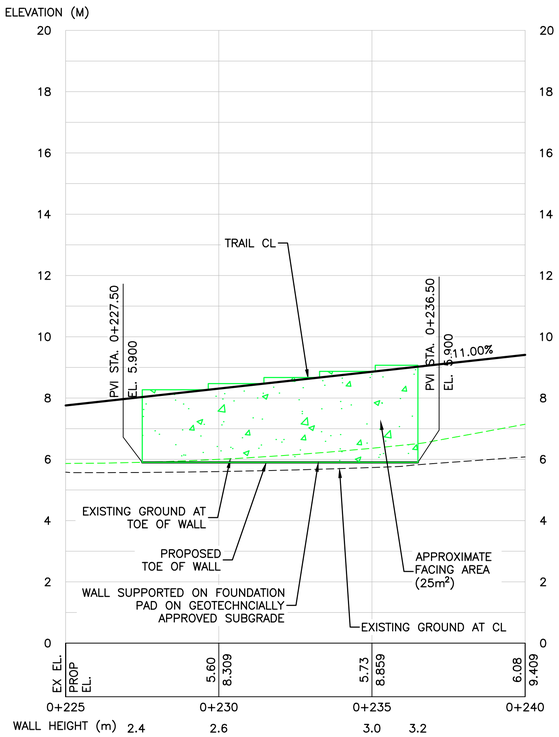
Drawing title/Titre du dessin

WAYII AREA TRAIL DESIGN

WALL 1 PROFILE

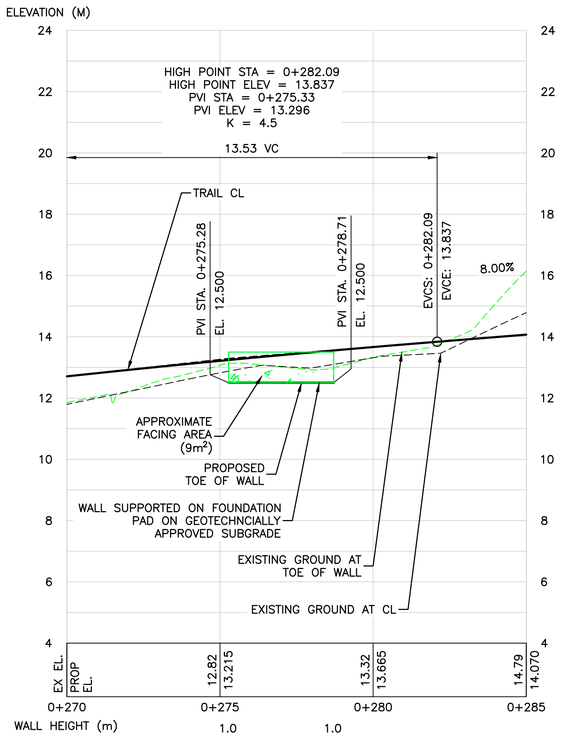
Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	W-01 OF	0

PWGSC – A1 – 841X594



WALL 2 PROFILE

1:100 HOR – 1:100 VER



WALL 3 PROFILE

1:100 HOR – 1:100 VER

PWGSC – A1 – 841X594

Parks Canada Agency | L'Agence Parcs Canada

PARSONS

wsp

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0	ISSUED FOR TENDER	21/02/18
Revision/ Revision	Description/Description	Date/Date

Client/client

Parks Canada Agency | L'Agence Parcs Canada

Western and Northern Region | Ouest et Nord du Canada

Project title/Titre du projet

TOFINO

PACIFIC RIM NATIONAL PARK RESERVE
ʔapscɨik ta̓sɨi
(Ups-cheek ta-shee)
"Going in the right direction on the trail"

Consultant Signature Only

Designed by/Concept par
DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessiné par
MICHAEL GIANG

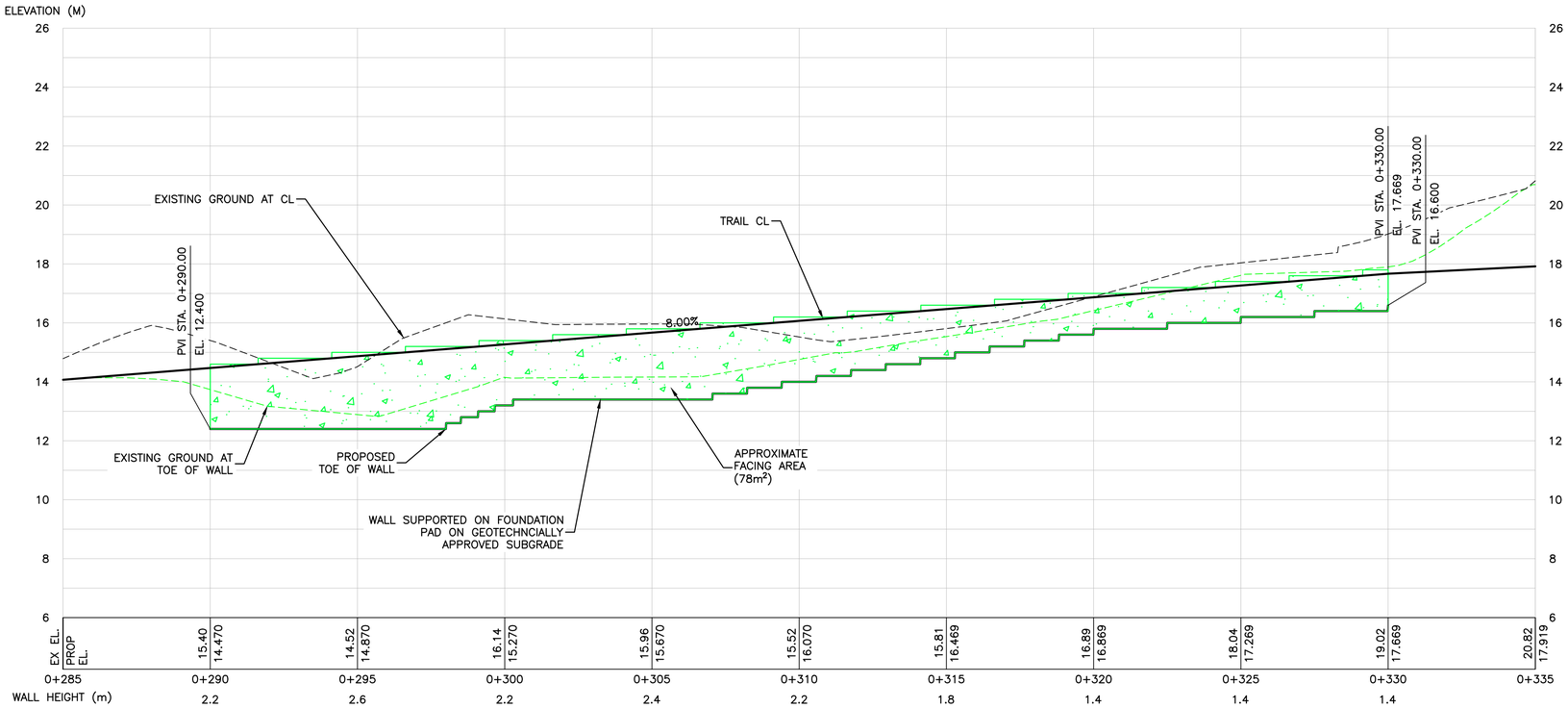
PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin

WAYII AREA TRAIL DESIGN

WALL 2 AND WALL 3 PROFILE

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	W-02 OF	0



WALL 4 PROFILE

1:100 HOR – 1:100 VER

Parks Canada Agency / L'Agence Parcs Canada

PARSONS

wsp

Revision/ Revision	Description/Description	Date/Date
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0	ISSUED FOR TENDER	21/02/18

Client/client

Parks Canada Agency / L'Agence Parcs Canada

Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet

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ʔapscīik ta·sïi

(Ups-cheek ta-shee)

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DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin

WAYII AREA TRAIL DESIGN

WALL 4 PROFILE

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	W-03 OF	0

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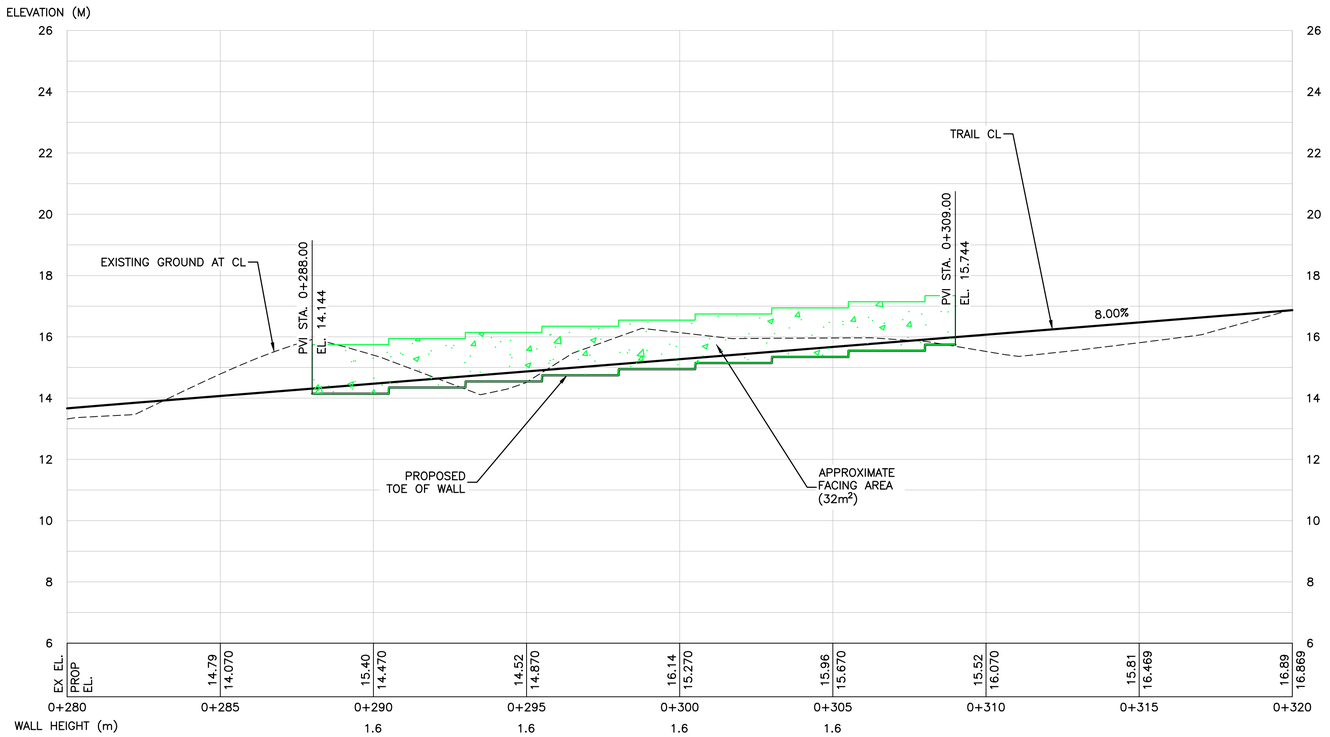
PWGSC – A1 – 841X594



WALL 5 PROFILE

1:100 HOR – 1:100 VER

Parks Canada Agency / L'Agence Parcs Canada

PARSONS

wsp

Revision/ Revision	Description/Description	Date/Date
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0	ISSUED FOR TENDER	21/02/18

Client/client

Parks Canada Agency / L'Agence Parcs Canada

Western and Northern Region / Ouest et Nord du Canada

Project title/Titre du projet

TOFINO

PACIFIC RIM NATIONAL PARK RESERVE
ʔapscīik ta·šii
(Ups-cheek ta-shee)
"Going in the right direction on the trail"

Consultant Signature Only

Designed by/Concept par
DARRYL FUREY / ANDREW KWIATKOWSKI

Drawn by/Dessine par
MICHAEL GIANG

PCA Project Manager/Technical Authority
Administrateur de Projets APC
JACKIE HICKS

Drawing title/Titre du dessin

WAYII AREA TRAIL DESIGN

WALL 5 PROFILE

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
PCA #1522	W-04 OF	0

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PWGSC – A1 – 841X594

FOUNDATION PAD

1. EXCAVATE TO DEEPER OF NON-ORGANIC SUBGRADE OR ELEVATION ON DRAWINGS.
2. NOTE THAT THE LATERAL EXTENT OF THE FOUNDATION PADS MAY NEED TO BE LOCALLY MODIFIED ADJACENT TO TREES. GEOTECHNICAL REVIEW AND APPROVAL IS REQUIRED PRIOR TO IMPLEMENTING MODIFICATIONS. OEM TO BE CONSULTED PRIOR TO EXCAVATION WITHIN 5m OF TREES (LATERALLY).
3. GEOGRID REINFORCED FOUNDATION PAD TO EXTEND MINIMUM 0.5m BEYOND THE FACE OF THE STRUCTURAL PART OF WALL (I.E. TO APPROXIMATE BACK OF FACING CELL THAT IS TO BE FILLED WITH ORGANICS).
4. PLACE COMPOSITE GEOGRID (TE-BXC30 OR APPROVED EQUIVALENT) ON GEOTECHNICALLY APPROVED, NON-ORGANIC SUBGRADE, EXPECTED TO BE COMPACT SAND OR FIRM CLAY. COMPACT SUBGRADE IF REQUESTED BY THE OWNER'S GEOTECHNICAL ENGINEER.
5. FOUNDATION PAD TO BE 75mm CRUSHED GRANULAR SUBBASE PLACED IN MINIMUM 2 LIFTS AND COMPACTED TO A MINIMUM 95% MODIFIED PROCTOR MAXIMUM DRY DENSITY (MPMDD) USING A PROCEDURE APPROVED BY THE OWNER'S GEOTECHNICAL ENGINEER.
6. PLACE BI-AXIAL GEOGRID, TE BX30PP (OR APPROVED EQUIVALENT), AT MID-DEPTH OF FOUNDATION PAD. JOINTS BETWEEN GEOGRID PANELS TO BE OFFSET FROM UNDERLYING COMPOSITE GEOGRID.
7. A VENEER (MAX 50mm THICKNESS) OF GRANULAR BASE MAY BE USED FOR FINE GRADING AT UNDERSIDE OF ENVIROGRID CELLS.
8. ARCHAEOLOGICALLY SENSITIVE SOILS MAY BE PRESENT. ALL EXCAVATION, CLEARING, AND GRUBBING WORK IS TO BE COORDINATED WITH OAM IN ADVANCE OF WORK AS OUTLINED IN THE PROJECT SPECIFICATIONS.
9. CONTRACTOR IS TO LOCATE ALL UTILITIES PRIOR TO EXCAVATION. INFORMATION SHOWN ON DRAWINGS IS APPROXIMATE AND IS BASE ON AVAILABLE BACKGROUND INFORMATION PROVIDED BY OTHERS.
10. FOLLOW WORKSAFE BC GUIDELINES FOR TEMPORARY EXCAVATIONS.
11. IMPLEMENT SEDIMENT AND EROSION CONTROLS IN ACCORDANCE WITH CONTRACT

ENVIROGRID RETAINING WALL

1. THE MECHANICALLY STABILIZED EARTH (MSE) WALL SYSTEM IS TO BE ENVIROGRID EGA40
   a. CELL APERTURE: 508 mm X 475 mm
   b. CELL PANELS: 200 mm HIGH x 2.56 m LONG x 0.95 m WIDTH (I.E. EMBEDMENT INTO WALL)
   c. ENVIROGRID CELLS TO SUPPLIED BY PARKS
2. UNIAXIAL GEOGRID IS TO CONSIST OF TITAN ENVIRONMENTAL TE-UX20 PET GEOGRID (SUPPLIED BY PARKS).
   a. ULTIMATE TENSILE STRENGTH (Tult): 50 kN/m LTDS = 24 kN/m (PER MANUFACTURER)
   b. RFcr = 1.46
   c. RFd = 1.1
   d. RFid = 1.3
   e. COEFFICIENTS OF INTERACTION IN DIRECT SLIDING AND PULL-OUT: 0.85
3. REINFORCED & RETAINED SOIL
   a. UNIT WEIGHT 20 kN/m^3
   b. DESIGN VALUE OF INTERNAL FRICTION: 36 DEGREES
4. WALL HEIGHTS: 1.5 to 4.6 m
5. FACING BATTER: 14 DEGREES RELATIVE TO VERTICAL
6. MINIMUM TOE EMBEDMENT: 0.5 m
7. SEISMIC DESIGN
   a. EXCLUDED FOR GLOBAL STABILITY. REFER TO GEOTECHNICAL REPORT FOR INFORMATION
   b. INTERNAL WALL DESIGN BASED ON 0.28g (1:475 YEAR DESIGN EARTHQUAKE)
8. LIVE LOAD: 5 kPa
9. WALL DESIGNED IN GENERAL ACCORDANCE WITH BC MOTI SUPPLEMENT TO CANADIAN HIGHWAY BRIDGE DESIGN CODE (CHBDC) S6-14, CHBDC S6-14 AND AASHTO LRFD METHOD.
10. WATER TABLE ASSUMED AT BASE OF WALL (I.E. FULLY DRAINED).
11. SUBGRADE AT BASE OF FOUNDATION PAD: FIRM CLAY AND/OR COMPACT SAND
12. CONSTRUCT PER MANUFACTURER'S INSTRUCTIONS. A TITAN ENVIRONMENTAL REPRESENTATIVE IS TO BE ON SITE AT THE START OF WALL CONSTRUCTION. CONTRACTOR IS TO COORDINATE.
13. GEOGRID LENGTHS ARE MEASURED RELATIVE TO THE FRONT OF THE STRUCTURAL COMPONENT OF THE WALL (I.E. MIDDLE OF OUTER ENVIROGRID PANEL, ALSO BACK OF ORGANIC FACING CELL). IN GENERAL, UNIAXIAL GEOGRID LAYERS ARE TO BE INSTALLED AT APPROXIMATELY 0.4m VERTICAL SPACING (I.E. EVERY SECOND ROW VERTICALLY)
14. FOR BACK-TO-BACK WALLS (I.E. WALL 1 & WALL 2), WALLS ARE INDEPENDENT. UNIAXIAL GEOGRID IS NOT TO CONNECT FROM WALL TO WALL. GEOGRID IS TO ALTERNATE ON DIFFERENT TIERS. THE FIRST LAYER OF UNIAXIAL GEOGRID ON THE OCEAN SIDE OF WALL 1 IS TO BE DIRECTLY BELOW BELOW FIRST ROW OF CELLS.
15. BACKFILL ENVIROGRID CELLS WITH 19mm CRUSHED GRANULAR BASE, COMPACTED TO MINIMUM 95% MPMDD (NOTE THAT THIS OVERRIDES THE MANUFACTURER'S MINIMUM). RIDE ON COMPACTION EQUIPMENT IS NOT TO BE USED WITHIN 1m OF THE FACE OF THE WALL. A 1000LB PLATE COMPACTOR IS ACCEPTABLE WITHIN 1m OF THE FACE OF THE WALL.
16. FILL THE OUTER CELL THE ENVIROGRID PANELS WITH ORGANICS THAT ARE APPROVED BY PARKS AND OEM. PLANT PER PARKS & OEM. FILL WITH ORGANIC SOIL AT EACH LIFT (I.E. NOT AT END OF WALL CONSTRUCTION). ADD WOODY DEBRIS PER OEM AND GEOTECHNICAL ENGINEER. REFER TO ENVIRONMENTAL DRAWING SET (EN-*) AND SPECIFICATION (01 35 43) FOR DETAILS REGARDING PLANTING AND RESTORATION
17. ENVIROGRID EGA40 PANELS ARE TO BE STEPPED BACK AT EACH LAYER TO CREATE A 75 DEGREE (OR GENTLER) SLOPED FACE.
18. THE HAND RAIL POST FOOTING SLEEVE IS TO BE INSTALLED AT THE TIME OF WALL CONSTRUCTION. THE CONTRACTOR IS TO ENSURE A SMOOTH ALIGNMENT OF SLEEVES. CUTTING OF ENVIROGRID CELLS IS NOT PERMITTED. SLEEVES ARE 150mm DIAMETER RIGID PVC AND EXTEND MINIMUM 1m BELOW TOP OF ENVIROGRID CELLS (WHICH IS ABOUT 0.2m BELOW TRAIL ASPHALT SURFACE).
19. WALL BACKFILL TO BE 75mm PIT RUN THAT IS PLACED AND COMPACTED IN 200mm THICK LIFTS (I.E. HEIGHT OF ENVIROGRID CELL) AND COMPACTED TO A MINIMUM 95% MPMDD. VERIFY DENSITIES WITH IN PLACE DENSITY TESTING.
20. WALL CONSTRUCTION AND FILL PLACEMENT IS TO BE COMPLETED UNDER THE OBSERVATION OF WSP.
21. WALL 3 CONSTRUCTION DETAIL IS TO BE PER THE DETAIL FOR WALL 5 SHOWN ON WD-4

LEGEND:

REV. :	DESCRIPTION:	DATE : (M/D/YR)
0	ISSUED FOR TENDER	02/17/21

PROJECT:
UPSCHEEK TASHEE MULTI-USE PATHWAY
WAYII AREA TRAIL DESIGN (ESCARPMENT)
PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC

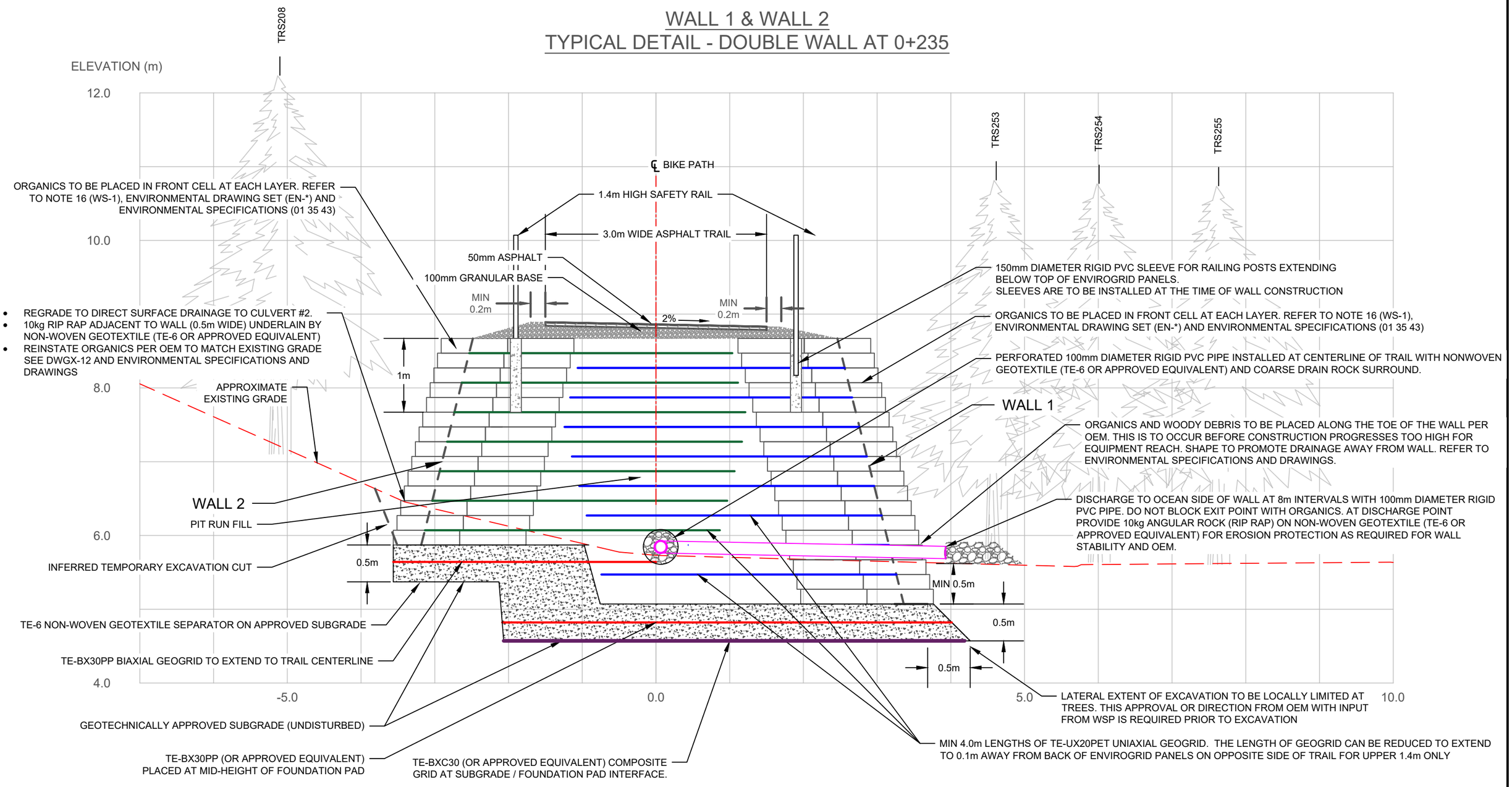
CLIENT:
PARKS CANADA

TITLE:
CONSTRUCTION NOTES - RETAINING WALL

DATE: FEB 2021
DESIGN BY: DF
DRAWN BY: BPK
CHECKED BY: DF
SCALE: AS SHOWN
PROJECT No.: 191-08875-02
FIGURE NO.: WD-1

WSP Canada Inc.
760 Enterprise Cres.,
Victoria, B.C. V8Z 6R4
P: 250.475.1000
www.wsp.com

WALL 1 & WALL 2
TYPICAL DETAIL - DOUBLE WALL AT 0+235



LEGEND:

REV. :	DESCRIPTION:	DATE : (M/D/YR)
0	ISSUED FOR TENDER	02/17/21

PROJECT: UPSCHEEK TASHEE MULTI-USE PATHWAY
WAYII AREA TRAIL DESIGN (ESCARPMENT)
PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC

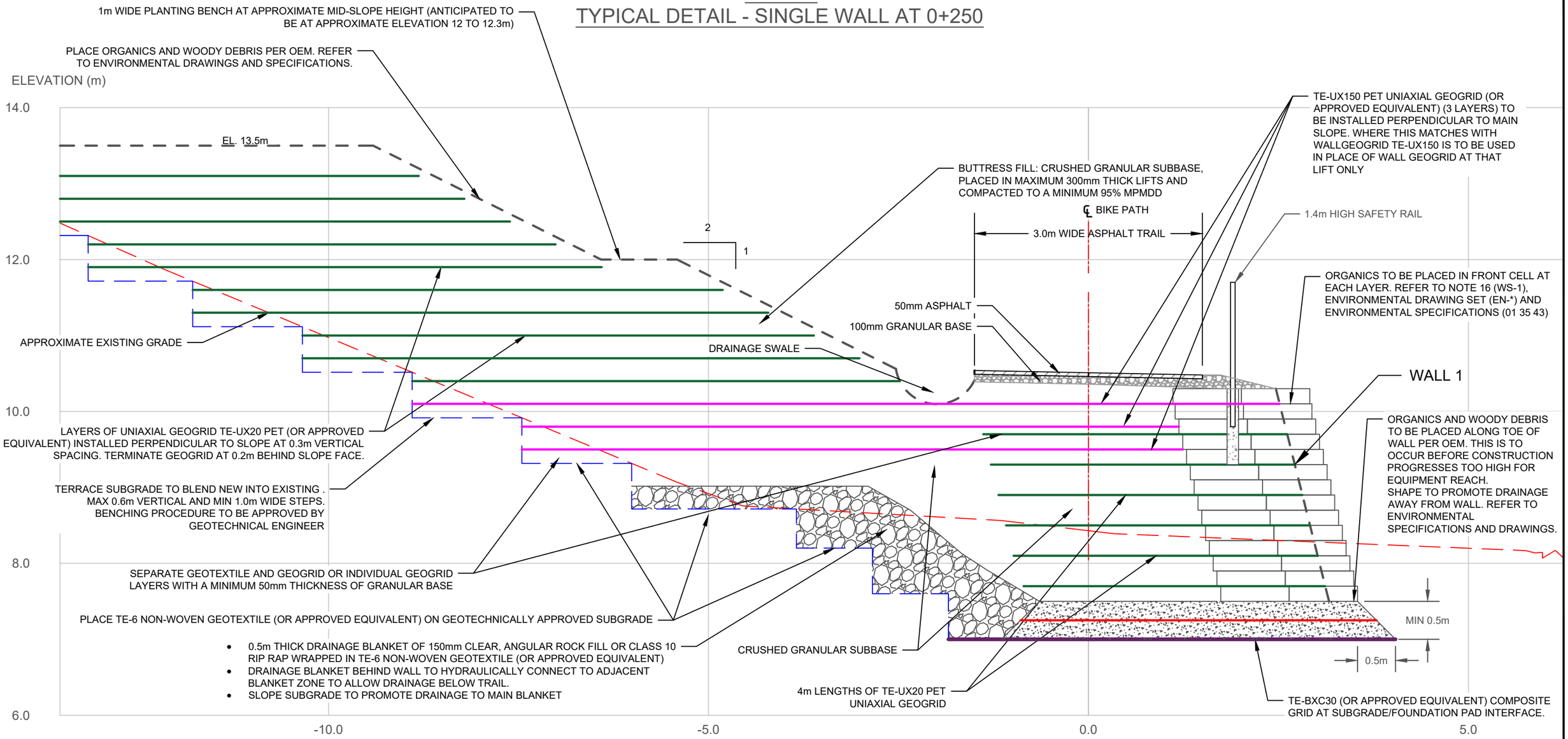
CLIENT: PARKS CANADA

TITLE: WALL 1 & 2 DETAIL (STATION 0+235)

DATE: FEB 2021
DESIGN BY: DF
DRAWN BY: BPK
CHECKED BY: DF
SCALE: AS SHOWN
PROJECT No.: 191-08875-02
FIGURE NO.: WD-2

WSP Canada Inc.
760 Enterprise Cres.,
Victoria, B.C. V8Z 6R4
P: 250.475.1000
www.wsp.com

WALL 1
TYPICAL DETAIL - SINGLE WALL AT 0+250



LEGEND:

REV. :	DESCRIPTION:	DATE : (M/D/YR)
0	ISSUED FOR TENDER	02/17/21

PROJECT:
UPSCHEEK TASHEE MULTI-USE PATHWAY
WAYII AREA TRAIL DESIGN (ESCARPMENT)
PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC

CLIENT:
PARKS CANADA

TITLE:
WALL 1 DETAIL AND BUTTRESS DETAIL (STATION 0+250)

DATE:	FEB 2021
DESIGN BY:	DF
DRAWN BY:	BPK
CHECKED BY:	DF
SCALE:	AS SHOWN
PROJECT No.:	191-08875-02
FIGURE NO.:	WD-3

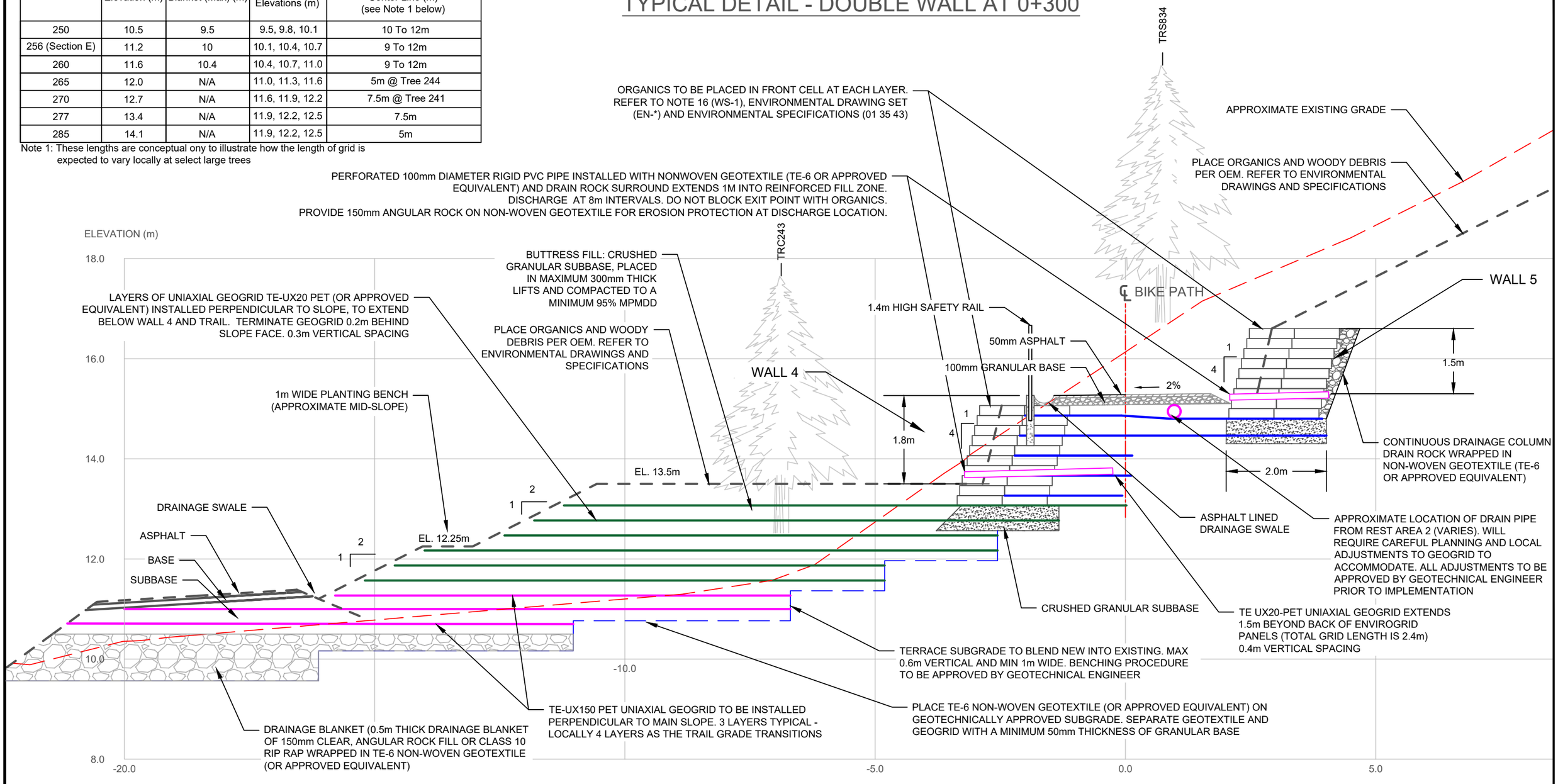
WSP Canada Inc.
760 Enterprise Cres.,
Victoria, B.C. V8Z 6R4
P: 250.475.1000
www.wsp.com

Table - 1: Summary of Elevations of Stronger Uniaxial Geogrid Within Buttress

Station	Approx. Trail Elevation (m)	Top of Drainage Blanket (Max) (m)	Stronger Uniaxial Geogrid Elevations (m)	Approx. Distance Grid Extends into Slope Relative to Lower Trail Center Line (m) (see Note 1 below)
250	10.5	9.5	9.5, 9.8, 10.1	10 To 12m
256 (Section E)	11.2	10	10.1, 10.4, 10.7	9 To 12m
260	11.6	10.4	10.4, 10.7, 11.0	9 To 12m
265	12.0	N/A	11.0, 11.3, 11.6	5m @ Tree 244
270	12.7	N/A	11.6, 11.9, 12.2	7.5m @ Tree 241
277	13.4	N/A	11.9, 12.2, 12.5	7.5m
285	14.1	N/A	11.9, 12.2, 12.5	5m

Note 1: These lengths are conceptual ony to illustrate how the length of grid is expected to vary locally at select large trees

WALL 4 & WALL 5
TYPICAL DETAIL - DOUBLE WALL AT 0+300



LEGEND:

REV. :	DESCRIPTION:	DATE : (M/D/YR)
0	ISSUED FOR TENDER	02/17/21

PROJECT: UPSCHEEK TASHEE MULTI-USE PATHWAY
WAYII AREA TRAIL DESIGN (ESCARPMENT)
PACIFIC RIM NATIONAL PARK RESERVE, TOFINO, BC

CLIENT: PARKS CANADA

TITLE: WALL 4 & 5 AND BUTTRESS DETAIL (STATION 0+300)

DATE: FEB 2021
DESIGN BY: DF
DRAWN BY: BPK
CHECKED BY: DF
SCALE: AS SHOWN
PROJECT No.: 191-08875-02
FIGURE NO.: WD-4

WSP Canada Inc.
760 Enterprise Cres.,
Victoria, B.C. V8Z 6R4
P: 250.475.1000
www.wsp.com

APPENDIX

11. STANDARD LIMITATIONS

Standard Limitations

WSP Canada Inc. ("WSP") prepared this report solely for the use of the intended recipient, Parks Canada, in accordance with the professional services agreement between the parties. In the event a contract has not been executed, the parties agree that the WSP General Terms for Consultant shall govern their business relationship which was provided to you prior to the preparation of this report.

The report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions presented in this report are based on work performed by trained, professional and technical staff, in accordance with their reasonable interpretation of current and accepted engineering and scientific practices at the time the work was performed.

The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this project.

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WSP makes no other representations whatsoever concerning the legal significance of its findings.

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