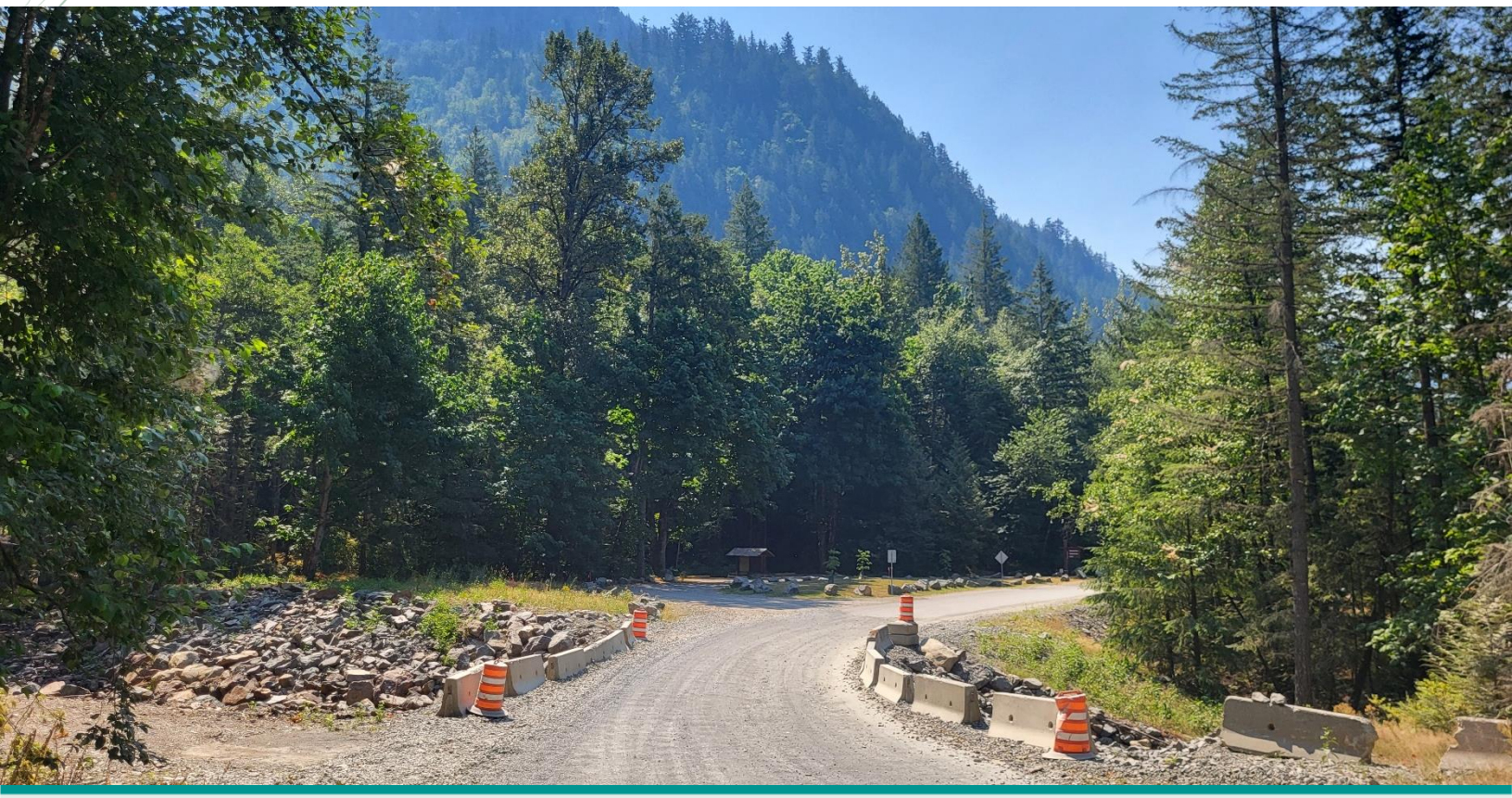
McElhanney

BEST MANAGED COMPANIES CANADA



Timber Evaluation and Tree Risk Assessment: Rockwell Drive Flood Recovery Project DF#4/ Agassiz, Harrison Hot Springs, B.C.

2023-07-28 | Original

Submitted to:
Ministry of Transportation and Infrastructure
Prepared by: McElhanney Ltd.

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Your Challenge.
Our Passion.

REVISION	DESCRIPTION	DATE (YYYY-MM-DD)	ISSUED BY	REVIEWED BY
0	ORIGINAL	2023-08-08	LS	RP

Contents

Appendices

A: Tree Management Plans
B: Site photographs

1. Introduction & Project Understanding

McElhanney Ltd. was asked to complete an initial Timber Evaluation and Tree Risk Assessment for an approximate 0.4 hectares of a natural forested area located upslope and downslope of the slide on Hick's Lake Road, of the Rockwell Drive, Agassiz/Harrison Hot Springs, BC. This site is identified as DF#4 is the focus of this report (*Figure 1*).

During our July 20th, 2023 site visit, and in conjunction with the inventory, trees on and in the striking distance of the subject sites were assessed for risk, on a limited visual assessment basis. This initial Tree Risk Assessment was completed using the International Society of Arboriculture (ISA) TRAQ standards. Trees proposed for removal due to their conflicting location with the proposed construction were evaluated for volume.

The proposed construction works will include forest cover removal, possibly rock basting, excavations, soil grading and construction of the new section of the slope stability and water management structures of these sections of the Hick's Lake Road. Detailed images and construction specification are provided in the engineering documentation and drawings and are not part of this report. This assignment is designed to support the Rockwell Drive flood recovery project due to landslides.

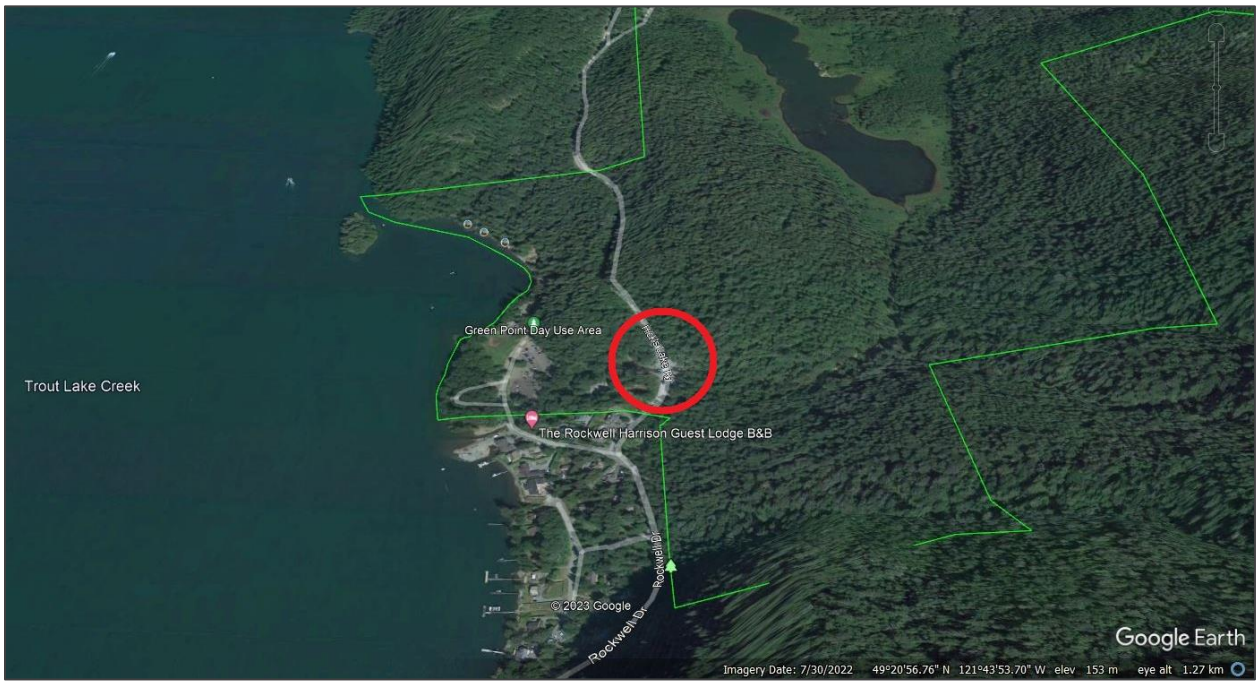


Figure 1. Rockwell Drive (Hick's lake Road) flood recovery project DF#4 / Agassiz, Harrison Hot Springs with area of interest outlined in red and BC Parks boundaries in green (Google Earth Pro Image - North oriented, not to scale).

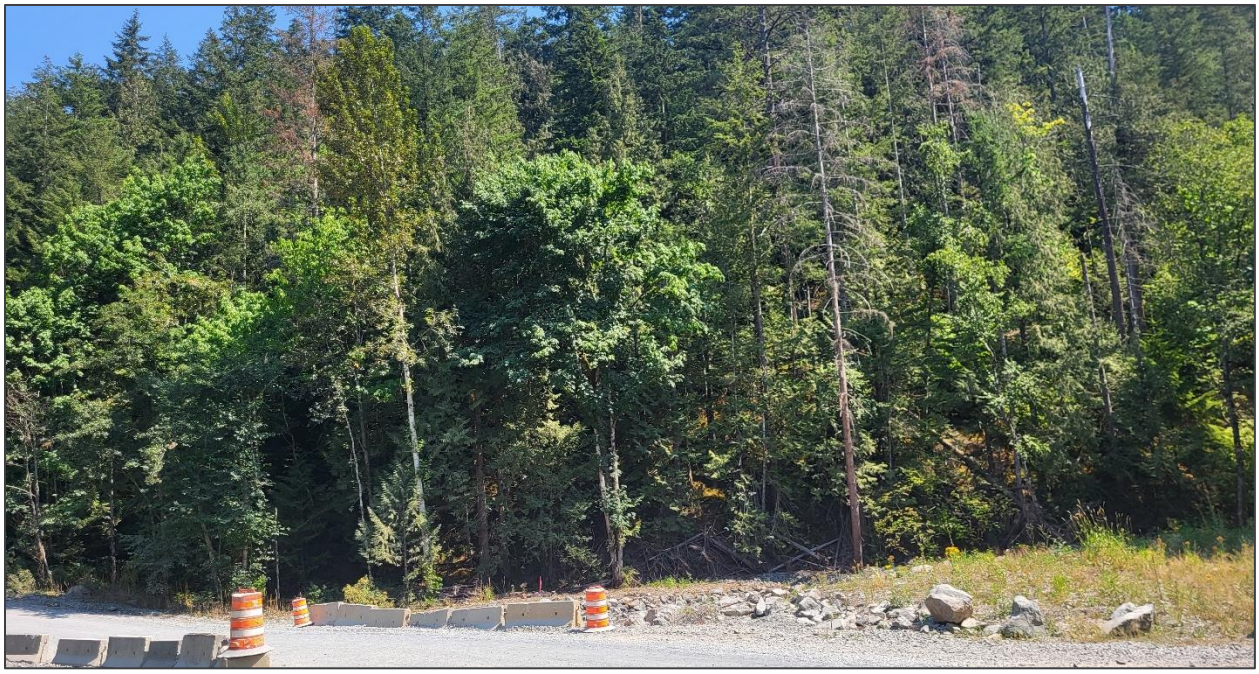


Figure 2. DF#4 - sample image of the soil erosion and steep terrain above the Hick's Lake Road (view from the West to the East).

2. Definitions

- **DBH** – diameter at breast height. The diameter of trunk measured to the nearest centimetre at 1.4 metres above ground level.
- **Dripline** – Indicates the radius of the crown spread, measured in metres, from the centre of the tree to the dripline of the longest limbs.
- **Dangerous tree** – "means a tree that is a hazard to a worker due to its location or lean, its physical, damage, overhead conditions, deterioration of its limbs, stem or root system, or any combination of these conditions."
- **Suspect trees –** "are any live or dead tree with a visible defect which could cause failure of the tree, either whole or in part, for the applicable level of disturbance."
- **Common tree species names and codes:**
    - Douglas fir – Fd
    - Western red cedar – Cw
    - Western hemlock – Hw
    - Bigleaf maple – Mb
    - Red alder – Dr
    - Black cottonwood – Ac
    - Paper birch - Ep

Descriptive information for each ownership polygon with identified timber stands is recorded in the tree inventory tables (*Table 1, 2 and 3*). The proposed clearing areas and the locations of the assessed trees are represented on the attached Tree Management Plan in *Appendix A*.

Tree Inventory Table 1. Detailed timber evaluation table

Detailed timber evaluation table - Rockwell Drive / Hick's Lake Road - Harrison Hot Springs DF#4

July 28, 2023

ID polygon	Ownership	Overall stand composition (%)	Height class (m)	Median HtC (m)	Estimated # of trees		DBH (cm)	Estimated Volume (m3)	
					Species	#		Gross	Merch
MoTI RoW	MoTI	Fd40%Mb30%Cw20%Hw5%Dr5% (Ep,Ac)	10-20	15	Hw	1	22	0.2	0.0
MoTI RoW	MoTI		10-20	15	Dr	1	34	0.4	0.0
MoTI RoW	MoTI		20-30	25	Cw	2	40	1.7	1.0
MoTI RoW	MoTI		20-30	25	Ep	2	26	0.8	0.5
MoTI RoW	MoTI		20-30	25	Mb	3	40	2.6	1.8
MoTI RoW	MoTI		10-20	15	Fd	2	24	0.4	0.0
MoTI RoW	MoTI		20-30	25	Fd	5	40	4.4	3.5
MoTI RoW	MoTI		30-40	35	Fd	5	50	9.4	7.5
MoTI RoW	MoTI		20-30	25	Ac	1	60	1.8	1.3
Notes:	Totals	n/a	n/a	n/a	n/a	22	n/a	21.7	15.6

ID polygon	Ownership	Overall stand composition (%)	Height class (m)	Median HtC (m)	Estimated # of trees		DBH (cm)	Estimated Volume (m3)	
					Sp	#		Gross	Merch
BC Parks	BC Parks	Mb50%Dr30%Fd15%Ac5% (Cw)	10-20	15	Mb	6	30	1.8	0.7
			20-30	25	Mb	2	44	2.1	1.7
			10-20	15	Dr	6	30	1.8	0.9
			20-30	25	Ac	1	24	0.4	0.2
			20-30	25	Fd	1	42	1.0	0.8
Notes:	Totals	n/a	n/a	n/a	n/a	16	n/a	7.1	4.3

Species codes: Fd = Douglas fir / Cw = Western redcedar / Yc = Yellow cedar / Hw = Western hemlock / Bg = Grand fir / Mb Bigleaf maple / Dr = Red alder / Se = Engelman spruce / Sw = White spruce / Ss = Sitka spruce / Pl = Lodgepole pine / Py Yellow pine (Ponderosa pine) / Pw = Western white pine / At = Trembling aspen / Ac = Black cottonwood / Paper birch = Ep.

3. Site Information

The subject site DF#4 that is approximate 0.4 ha consists of a second growth natural regenerated forest stand in the Coastal Western Hemlock zone (CWH), dry maritime (dm) subzone with a combination of 01, and 04 variants (Land Management Handbook 28, 1994). The terrain is variable sloping 10 to 160% west towards Harrison Lake, with some areas appearing to be unstable. The soil is generally shallow on the steeper sections and deeper at the base of slope near the road.

The overall multi-layer forest stand characteristics, and all inventoried trees with their biophysical characteristics grouped by height classes, are presented in *Table 1* above. The estimated age of the stand is a range from newly regenerated trees to 60 years. Sample images of the site conditions and trees were also included in this report (Appendix B).

4. Timber Evaluation

The trees located in the clearing and grubbing areas within the MoTI right-of-way or BC Parks ownership areas are presented on the project maps and the Tree Management Plans (Appendix A).

As stated above all trees proposed for removal were separated into two (2) polygons: clearing and grubbing DF#4 MoTI and DF$4 BC Parks.

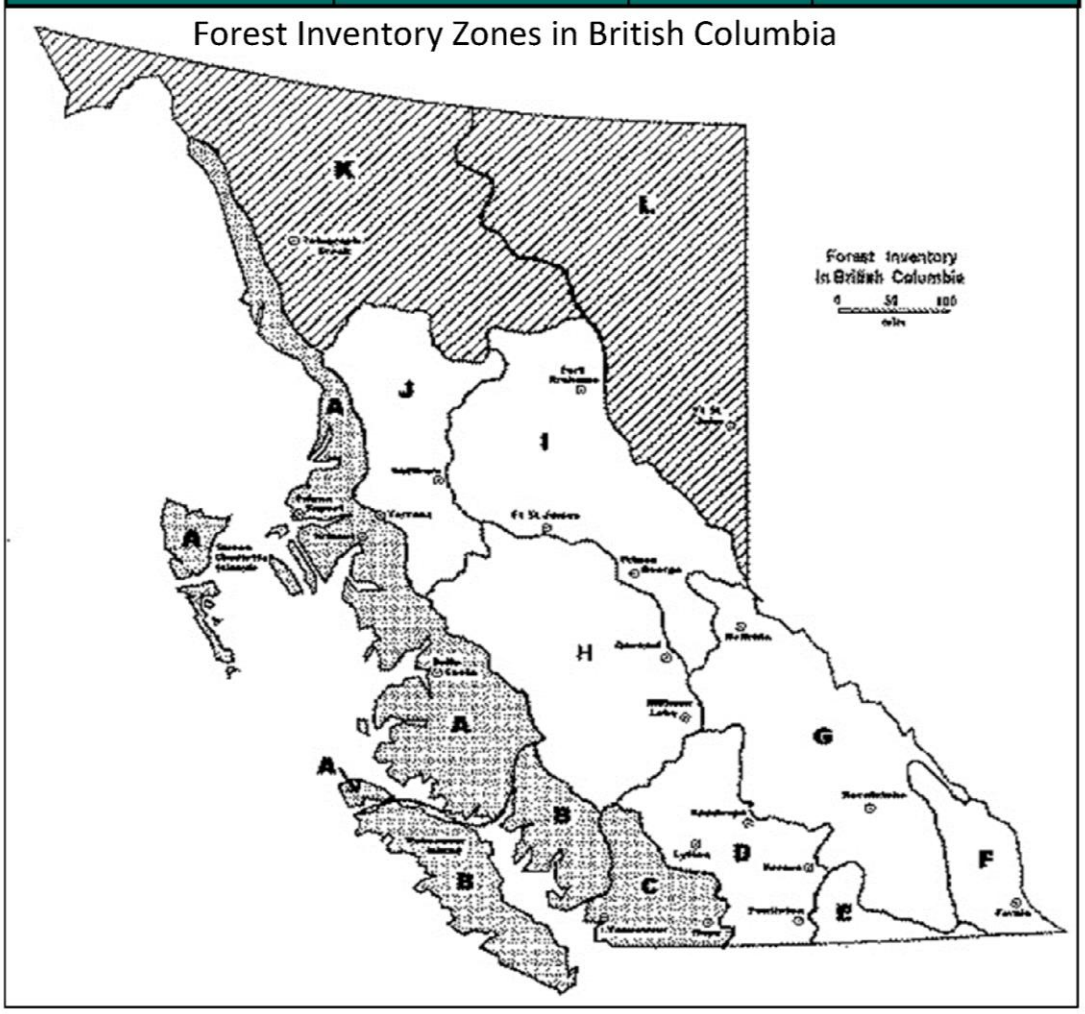
A preliminary LIDAR analysis was used to determine the approximate number of trees for different height classes from 10 – 20, 20 – 30, 30 – 40, 40 – 50, and 50+ metres, then a field proofing count was completed per species (*Table 1*). Timber evaluation summary and totals split by property are presented below (*Table 2 and 3*). These timber removals are necessary to provide construction clearance for flood recovery project.

Table 2. Tree Removal Volume Summary

Specifications	Total Estimated Number of Remove Trees	Total Estimated Gross Volume (m3) Remove Trees	Merchantable Volume (m3)
Deciduous DF#4 MoTI	7	5.6	3.6
Conifer DF#4 MoTI	15	16.1	12.0
Total DF#4 MoTI	22	21.7	15.6
Deciduous DF#4 BC Parks	15	6.1	3.5
Conifer DF#4 BC Parks	1	1.0	0.8
Total DF#4 BC Parks	16	7.1	4.3
TOTAL GENERAL	38	28.8	19.9

Table 3. Tree Removal Volume per species and ownership

Trees Proposed for Removal - Volume Analysis / Rockwell Drive - Harrison Hot Springs DF#4			
Forest Inventory Zone (FIZ) A to L	**Stand Age Type (M-mature) (I-immature)**	**Stump Height (m)**	**Top Diameter (cm)**
"C"	**M**	**0.3**	**10**
Remove trees from MoTI RoW			
Species	**Estimated number of trees**	**Est. Gross Volume (m3)**	**Merch. Volume m3**
Douglas fir (Fd)	12	14.2	11.0
Western red cedar (Cw)	2	1.7	1.0
Western hemlock (Hw)	1	0.2	0.0
Bigleaf maple (Mb)	3	2.6	1.8
Red alder (Dr)	1	1.8	1.3
Black cottonwood (Ac)	1	0.4	0.0
Paper birch (Ep)	2	0.8	0.5
Totals	**22**	**21.7**	**15.6**
Remove trees from BC Parks			
Species	**Estimated number of trees**	**Est. Gross Volume (m3)**	**Merch. Volume m3**
Douglas fir (Fd)	1	1.0	0.8
Bigleaf maple (Mb)	8	3.9	2.4
Red alder (Dr)	6	1.8	0.9
Black cottonwood (Ac)	1	0.4	0.2
Totals	**16**	**7.1**	**4.3**
Totals	**38**	**28.8**	**19.9**



5. Tree Risk Assessment and Recommendations

During our July 20th, 2023 site visit, and in conjunction with the tree inventory, trees were assessed for risk, on a limited visual assessment basis, and in the context of the current and proposed land uses. We did not observe any trees that were deemed to be moderate, high, or extreme risk that would require hazard abatement to eliminate present and/or future risks (within a 1-year timeframe of the tree inventory).

Existing targets considered during this TRAQ (L1) assessment include the existing buildings, main access driveways, lane, road, (frequent use), vehicles, occupants, and users (frequent use). The time frame used for the purpose of our assessment is one year (from the date of the tree inventory). Unless otherwise noted herein, we did not conduct a basic (level 2) or advanced (level 3) assessment, such as resistograph.

The newly created forest edge along the cut boundaries shall be assessed for safety before the rock blasting, excarnation and soil grading activities begin. This new created forest edge shall be also wind proofed to ensure trees retained along this new section of the road will be stable with a reduced risk of them being up rooted or bent over the road.

6. Impact Mitigation

Excavation: We recommend that no excavation occur within tree protection zones of trees that are to be retained. Any excavation that is necessary, within the working space setback of trees to be retained must be completed under the direction of the project arborist. If it is found, at the time of excavation, that the excavation cannot be completed without severing roots that are critical to the trees health or stability it may be necessary to remove additional trees.

Material storage: Areas must be designated for material storage and staging during the construction process. Ideally these areas will be located outside of the tree protection areas that will be isolated by barrier fencing. Should it be necessary to store material temporarily within any of the tree protection areas, the project arborist must be consulted.

Crown and root pruning: We recommend that any pruning of the retain trees along the newly created forest edge be conducted to ANSI A300 Standards and Best Management Practices.

Stump removal: We recommend that, all stumps require removal, within the dripline of the retained trees to be completed under arborist supervision or using a stump grinder to avoid disturbing root systems of near retained trees.

Windthrow: Where forest edge trees are proposed to be removed, we recommend that trees that may experience an increase in wind exposure be re-examined, once tree clearing has taken place, to ensure that they are structurally stable, and suitable for retention as leading-edge trees.

Blasting and rock removal: If it is necessary to blast areas of bedrock near critical root zones of trees to be retained, the blasting to level these rock areas should be sensitive to the root zones located at the edge

of the rock. Care must be taken to assure that the area of blasting does not extend into the critical root zones beyond the building and road footprints. The use of small low-concussion charges, and multiple small charges designed to pre-shear the rock face, will reduce fracturing, ground vibration, and reduce the impact on the surrounding environment. Only explosives of low phytotoxicity, and techniques that minimize tree damage, are to be used. Provisions must be made to store blast rock, and other construction materials and debris, away from critical tree root zones.

Washout area: It may be necessary to designate any area on the property for washing out cement and masonry tools and equipment. This area should be located away from the critical root zones of any trees to be retained.

Paved areas over critical root zones of trees to be retained: Where paved areas cannot avoid encroachment within critical root zones of trees to be retained, construction techniques, such as floating permeable paving, may be required. (specifications can be provided by the project arborist, in consultation with the design consultant).

Landscaping: Any proposed landscaping within the critical root zones of trees to be retained must be reviewed with the project arborist.

Review and site meeting: Once the project receives approval, it is important that the project arborist meet with the principals involved in the project to review the information contained herein. It is also important that the arborist meet with the site foreman or supervisor before any demolition, site clearing, or other construction activity occurs.

7. Conclusion and Recommendations

Some construction activities probably requiring blasting, excavation, or grade changes within the Critical Root Zone (CRZ) of retained trees shall be supervised by the project forester/arborist, and any root pruning required shall be performed by the project forester/arborist. The construction impact of the tree's overall health and/or structural condition for each subject tree will be based on the professional opinion of the project forester/arborist.

Timber Evaluation

An estimated total 28.8 m^3 of gross volume with an estimated 19.9 m^3 merchantable timber will be produced from tree clearing for this project. The quality of the assessed timber is estimated to be split between chip-n-saw, pulp, and firewood, and due to the relatively small amount, not feasible for commercial harvesting. I recommend this volume to be disposed of as per the owners' directions. For further details, data, ownership, and species breakdown, please see Tables 1, 2 and 3 above.

Tree Risk Assessment

No danger trees were identified during the field visit for a timeframe of one (1) year from the date of tree assessment.

For the active construction phase and for the newly created forest edge along both sides of Rockwell Drive shall be re-assessed for safety before the rock blasting, excavation and soil grading activities begin. This newly created forest edge shall be also wind-proofed to ensure trees retained along this new section of the road will be stable with a reduced risk of them being up-rooted or bent over the road.

Culturally Modified Trees

During our site visits, no CMTs were identified in the proposed project area or vicinity.

8. Limitations of Report

This field review report was prepared by McElhanney for the exclusive use of the Client and may not be reproduced, used, or relied upon, in whole or in part, by a party other than the Client without the prior written consent of McElhanney. Any unauthorized use of this report, or any part hereof, by a third party, or any reliance on or decisions to be made based on it, are at the sole risk of such third parties. McElhanney accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report, in whole or in part.

Foresters/arborists are professionals who examine trees and use their training, knowledge, and experience to recommend techniques and procedures that will improve a tree's health and structure or to mitigate associated risks. Trees are living organisms whose health and structure change and are influenced by age, continued growth, climate, weather conditions, and insect and disease pathogens. Indicators of structural weakness and disease are often hidden within the tree structure or beneath the ground. The arborist's review is limited to a visual examination of tree health and structural condition, without excavation, probing, resistance drilling, increment coring, or aerial examination. There are inherent limitations to this type of investigation, including, without limitation, that some tree conditions will inadvertently go undetected. The arborist's review followed the standard of care expected of arborists undertaking similar work in British Columbia under similar conditions. No warranties, either express or implied, are made as to the services provided and included in this report.

The findings and opinions expressed in this report are based on the conditions that were observed on the noted date of the field review only. The Client recognizes that passage of time, natural occurrences, and direct or indirect human intervention at or near the trees may substantially alter discovered conditions and that McElhanney cannot report on, or accurately predict, events that may change the condition of trees after the described investigation was completed.

It is not possible for a forester/arborist to identify every flaw or condition that could result in failure, nor can he/she guarantee that the tree will remain healthy and free of risk. The only way to eliminate tree risk entirely is to remove the entire tree. All trees retained should be monitored on a regular basis. Remedial care and mitigation measures recommended are based on the visible and detectable indicators present at the time of the examination and cannot be guaranteed to alleviate all symptoms or to mitigate all risk posed.

Immediately following land clearing, grade changes or severe weather events, all trees retained should be reviewed for any evidence of soil heaving, cracking, lifting or other indicators of root plate instability. If new information is discovered in the future during such events or other activities, McElhanney should be requested to re-evaluate the conclusions of this report and to provide amendments as required prior to any reliance upon the information presented herein.

9. Company Information

WorkSafe BC #	200094159
General Liability	ACE INA Insurance Company, Policy No: CGL 524064: $3,000,000
Errors & Omissions	Certain Underwriters at Lloyds as arranged by Lockton Companies LLP, Policy No: GLOPR 1601496: $3,000,000
City of Surrey Inter-Municipal Business License (Metro West)	148615, expires November 26, 2023.

10. In Closing

We trust that this report meets your needs. Should there be any questions regarding the information within this report, please do not hesitate to contact the undersigned.

Yours truly,

McELHANNEY LTD.

Prepared by:

Lucian Serban, RPF
Project Forester / Arborist
ISA Certified Arborist PN 7558AM
Wildlife Dangerous Tree Assessor
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Reviewed by:

Ruben Pineiro, FIT
ISA Certified Arborist PN 8525A
Tree Risk Assessment Qualification
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11. References

Cruise Compilation Manual / Height-Diameter Equations Ministry of Forests, Lands and NRO, July 2014.

Dunster, J.A., E.T. Smiley, N. Matheny, and S. Lily. 2017. Tree Risk Assessment Manual, International Society of Arboriculture (ISA).

Green, R.N., Klinka, K. 1994. A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region. Land Management Handbook Number 28. Province of British Columbia Ministry of Forests.

Site Index Estimates by BEC Site Series (SIBEC) / Site Index Estimates By Site Series: Report by Region Ministry of Forests, Lands and Natural Resource Operations, 2003

APPENDIX A:
TREE MANAGEMENT PLANS

APPENDIX B:
SITE PHOTOGRAPHS

Photos 1 & 2. *Sample images of DF#4 – above the road.*

Photo 3 & 4. *Sample images of DF#4 – below the road.*

Photo 5. *Sample image of the existing drainage DF#4 – above the road.*

Photo 6. *Sample Image of SF#4 – above the road.*

Contact
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lserban@mcelhanney.com

McElhanney

CANADA BEST MANAGED COMPANIES

LOT 5
PLAN LMP8249
PID 018-056-741
TO HARRISON HOT SPRINGS
LIMIT OF CONSTRUCTION
P.O.C. 100+57.253
CROWN PIN: 35740021
PART LEGAL SUBDIVISION 5
SW1/4 SEC.32, TP4, R28, W6M
NEW WESTMINSTER DISTRICT
LIMIT OF CONSTRUCTION
P.O.T. 101+91.417
TROUT LAKE CREEK
BC Parks
BC Parks
TO SASQUATCH PROVINCIAL PARK
TROUT LAKE CREEK BRIDGE No. 10505-23
SEE BRIDGE DRAWINGS FOR DETAILS
MoTI RoW
MoTI RoW
HICKS LAKE ROAD
100 LINE
300 LINE
DETOUR ROAD
R=50.000
R=40.000
R=90.000
PARK BOUNDARY
LIMIT OF DETOUR ROAD
P.O.C. 300+10.969
LIMIT OF DETOUR ROAD
P.O.C. 301+58.089
CROWN LAND
PARK SERVICE ROAD
DETOUR TO BE ADJUSTED IF PARK SERVICE ROAD IS USED FOR NORTHBOUND TRAFFIC
BC Parks
SRW PLAN NWP10235
LEGAL SUBDIVISION 3
SW1/4 SEC.32, TP4, R28, W6M
NEW WESTMINSTER DISTRICT
DESIGN SPEED 300 LINE 30 km/h
LEGEND
CONSTRUCTION STAGE 1
CONSTRUCTION STAGE 2
CONSTRUCTION STAGE 3
CONSTRUCTION STAGE 4
GEOGRID REINFORCEMENT EXTENTS
Clearing & Grubbing MoTI RoW
Clearing & Grubbing BC Parks
KEY PLAN
HICKS LAKE ROAD
1101

NOTES TO CONTRACTOR:

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FOR PROFILE
SEE DWG. No. R1-1070-1102

FOR TYPICAL SECTIONS
SEE DWG. No. R1-1070-1103

STAGE 1 ACTIVITIES:

1. IMPLEMENT SINGLE LANE ALTERNATING TRAFFIC (SLAT) ON THE WEST SIDE OF THE EXISTING ROAD.
2. CONSTRUCT TEMPORARY DETOUR (DETOUR BRIDGE, TEMPORARY ABUTMENTS, AND APPROACHES) WITH A MINIMUM LANE WIDTH OF 5.0 m. ALL WORKS TO BE OUTSIDE OF THE TROUT LAKE CREEK CHANNEL.

STAGE 2 ACTIVITIES:

3. SHIFT TRAFFIC TO THE DETOUR WITH SLAT ACROSS THE ONE LANE DETOUR BRIDGE. THE PARK SERVICE ROAD MAY USED AS A QUEUING AREA FOR NORTHBOUND VEHICLES.
4. REMOVE EXISTING CULVERTS.
5. CONSTRUCT THE NEW BRIDGE, REINFORCED SOIL SLOPE AND APPROACHES.

STAGE 3 ACTIVITIES:

6. AFTER THE NEW BRIDGE IS OPERATIONAL, SHIFT SLAT TRAFFIC BACK TO THE WEST SIDE OF HICKS LAKE ROAD AND CONSTRUCT REMAINING APPROACH WORKS ON THE EAST SIDE OF HICKS LAKE ROAD.

STAGE 4 ACTIVITIES:

7. REMOVE TEMPORARY DETOUR (DETOUR BRIDGE, TEMPORARY ABUTMENTS, AND APPROACHES).
8. COMPLETE FINAL GRADING, PAVING, BARRIERS AND RIPRAP. *

* WORKS WITHIN THE TROUT LAKE CREEK CHANNEL WILL NEED TO BE CARRIED OUT WITHIN THE INSTREAM WORK WINDOW.

Associated Engineering

BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY DESIGN AND GEOMATICS ENGINEERING

SCALE 0 2 1:250 12m
CAD FILENAME R1-1070-1101
PLOT DATE 2023-08-08

REV	DATE	REVISIONS	NAME
A	2023-08-08	ISSUED FOR 100% DETAILED DESIGN	MdT

SUGGESTED CONSTRUCTION STAGING

TROUT LAKE CREEK CULVERT REPLACEMENT
HICKS LAKE ROAD
PLAN

M. DU TOIT, P. ENG.
ENGINEER OF RECORD
DATE 2023-08-08

DESIGNED M. DU TOIT DATE 2023-06-29
QUALITY CONTROL M. DU TOIT DATE 2023-06-29
QUALITY ASSURANCE P. STANCOMBE DATE 2023-06-29
DRAWN H. YIN DATE 2023-06-29

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2022-2677-00	14048-0000	1	R1-1070-1101	A

PLOT DATE: 2023/06/29 Q:\2022-2677-00\civil\model\MoTI_Working_Drawings\DrawingProduction\1100_SubDisciplines\ConstructionStaging\R1-1070-1101.dwg