

Arboricultural Inventory and Report

For:
UBCPT

Site Location:
TEF4
6190 Agronomy Road, UBC

To be submitted with Tree Management Plan
dated February 4, 2020.



Submitted to:
Attn: Diona Fong
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Date: February 4, 2020

Submitted by:



The following Diamond Head Consulting staff conducted the on-site tree inventory and prepared or reviewed the report.

All general and professional liability insurance and staff accreditations are provided below for reference.

Reviewed by:



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Please contact us if there are any questions or concerns about the contents of this report.

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General Liability: Northbridge General Insurance Corporation - Policy #CBC1935506, \$10,000,000
Errors and Omissions: Lloyds Underwriters – Policy #1010615D, \$1,000,000

Scope of Assignment:

Diamond Head Consulting Ltd. (DHC) was retained to complete an arboricultural assessment to supplement the proposed project for TEF4. This report contains an inventory of protected trees and summarizes management recommendations with respect to future development plans and construction activities. This report is produced with the following primary limitations, detailed limitations specified in Appendix 7:

- 1) Our investigation is based solely on visual inspection of the trees during our last site visit. This inspection is conducted from ground level. We do not conduct aerial inspections, soil tests or below grade root examinations to assess the condition of tree root systems unless specifically contracted to do so.
- 2) Unless otherwise stated, tree risk assessments in this report are limited to trees with a *high* or *extreme* risk rating in their current condition, and in context of their surrounding land use at the time of assessment.
- 3) The scope of work is primarily determined by site boundaries and local tree-related bylaws. Only trees specified in the scope of work were assessed.
- 4) Beyond six months from the date of this report, the client must contact DHC to confirm its validity because site base plans and tree conditions may change beyond the original report's scope. Additional site visits and report revisions may be required after this point to ensure report accuracy for the municipality's development permit application process. Site visits and reporting required after the first submission are not included within the original proposal fee and will be charged to the client at an additional cost.

The client is responsible for:

- Reviewing this report to understand and implement all tree **risk**, removal and protection requirements related to the project.
- Understanding that we did not assess trees off the subject property and therefore cannot be held liable for actions you or your contractors may undertake in developing this property which may affect the trees on neighboring properties.
- Obtaining a tree removal permit from the relevant municipal authority prior to any tree cutting.
- Obtaining relevant permission from adjacent property owners before removing off-site trees and vegetation.
- Obtaining a timber mark if logs are being transported offsite.
- Ensuring the project is compliant with the tree permit conditions.
- Constructing and maintaining tree protection fencing.
- Ensuring an arborist is present onsite to supervise any works in or near tree protection zones.

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1.0 Introduction

1.1 Site Overview

The subject site consists of the current TEF3 building located at UBC. There is a large amount of surface parking found on-site. The inventoried trees were mostly located along the perimeter of the subject site. The main species found included Red Maples (*Acer rubrum*), Horsechestnuts (*Aesculus hippocastanum*) and European Beeches (*Fagus sylvatica*).

1.2 Proposed Land Use Changes

The proposed project consists of a new TEF4 building. In preparing this report, we reviewed the following information:

1. Base Survey by Murray & Associates dated December 15, 2018.
2. Landscape Plan provided by P+A.

1.3 Report Objective

The objective of this report is to ensure the proposed project follows the development permit application rules for tree inventories at the University of British Columbia (UBC). Trees over 15cm in diameter at breast height were assessed, including: species, diameter at breast height (DBH) measured to the nearest 1 cm at 1.4 m above natural grade (tree's base), estimated height and general health and defects. Critical root zones were calculated for each of the trees with the potential for development impacts. Tree hazards were assessed according to International Society of Arboriculture and WCB standards for the time of assessment. Suitability for tree retention was evaluated based on the health of the trees and their location in relation to the proposed building envelopes and infrastructure. Trees on adjacent properties with a tree protection zone that extends into the subject site have also been captured in the arborist report. This report outlines the existing condition of the trees on and adjacent to the property, summarizes the proposed tree removals and retention trees as well as suggested guidelines for protecting the remaining trees during the construction process.

2.0 Process and Methods

Ian MacLachlan of DHC visited the site on December 7, 2018. The following methods and standards are used throughout this report.

2.1 Tree Inventory

Trees on site and trees shared with adjacent properties were marked with a numbered tag and assessed for attributes including: species; height measured to the nearest meter; and, diameter at breast height (DBH) measured to the nearest centimeter at 1.4 m above grade. The general health and structural integrity of each tree was assessed visually and assigned to one of five categories: *excellent*; *good*; *moderate*; *poor*; or *dying/dead*. Descriptions of the health and structure rating criteria are given in Appendix 3.

Tree retention value, categorized as *high*, *medium*, *low*, or *nil*, was assigned to each tree or group of trees based on their health and structure rating, and potential longevity in a developed environment. Descriptions of the retention value ratings are given in Appendix 4.

2.2 Tree Risk Assessment

Tree risk assessments were completed following methods of the ISA Tree Risk Assessment Manual¹ published in 2013 by the International Society of Arboriculture, which is the current industry standard for assessing tree risk. This methodology assigns risk based on the likelihood of failure, the likelihood of impact and the severity of consequence if a failure occurs. Only on-site trees that had *high* or *extreme* risk ratings in their current condition and in context of their surrounding land use were identified and reported in section 3.2. Appendix 5 gives the likelihood and risk rating matrices used to categorize tree risk. DHC recommends that on-site trees be re-assessed for risk after the site conditions change (e.g. after damaging weather events, site disturbance from construction, creation of new targets during construction or in the final developed landscape).

¹ Dunster, J.A., Smiley, E.T., Matheny, N. and Lilly, S. (2013). Tree Risk Assessment Manual. *International Society of Arboriculture*. Champaign, Illinois.

3.0 Findings: Tree Inventory and Risk Assessment

3.1 Tree Inventory

45 protected trees were identified. Of these trees, 28 had good, 14 had moderate and 3 had poor health and structure. Please refer to Appendix 1 for the complete tree inventory.

3.2 Tree Risk Assessment

There were no trees on this site that posed a *high* or *extreme* risk at the time of assessment.

4.0 Discussion and Summary

The new building location and surrounding landscaping significantly conflicts with the root zones of trees 678, 679, 680, 681, 3536, 5213, 5215, 5219 and five (5) undersized trees. The proposed location of the parking lot exit and entry ramp (per 'Trees marked up Drawing Jan[2]' PDF file received from client on February 3, 2020) significantly conflicts with the root zone of trees 676 and 8215. All these trees require removal as a result. It is worth noting that the undersized trees, tree 676 and tree 678 are suitable candidates for transplanting.

The remaining trees inventoried can be protected and retained because the proposed does not significantly conflict with their root zones. Please refer to the Complete Tree Inventory Table in Appendix 1 and the attached Tree Management Plan for further retention details.

Appendix 1 Complete Tree Inventory Table

Tag #	Location	Species	DBH (cm)	Height (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/Remove	Retention/TPZ Comments	TPZ (m)
654	On-Site	Maple (A. rubrum)	32	11	Good	In 6 m wide mown grass boulevard, 2 m from road. Stem has no defects. Structural unions good. Crown rounded, symmetrical. Dripline radius 5 m. No UBC tag, would be number 3779.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
655	On-Site	Maple (A. rubrum)	27	11	Moderate	In 6 m wide grass boulevard, 2 m from road. Stem has no defects. Structural unions good. 15 cm diameter scaffold branch over road with wound and advanced decay, partly occluded. Crown rounded. Dripline radius 5 m. No UBC tag, would be number 3777.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
656	On-Site	Beech (F. sylvatica)	15	8	Moderate	In planted bed. 0.75 m from foundations to north and east. Surface roots at base. Columnar form. Dripline radius 2 m.	Low	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
657	On-Site	Beech (F. sylvatica)	10	6	Moderate	0.75 m from retaining wall to east. In planted bed. Surface roots at base. Columnar form. Dripline radius 1.5 m. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Low	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
658	On-Site	Beech (F. sylvatica)	10	4	Moderate	Between retaining wall and sidewalk, 1 m north and south. In planted bed. Top broken with decayed stub at 1 m. Columnar form. Dripline radius 1 m. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Low	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
659	On-Site	Beech (F. sylvatica)	13	7	Moderate	No tag, tree inaccessible. In concrete planter, walls 1 m from base on all sides. Fastigate form. Dripline radius 1.5 m. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Low	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
660	On-Site	Beech (F. sylvatica)	10	4	Moderate	1 m south of concrete sidewalk. In grass. Columnar form. Dripline radius 1 m. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Low	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
661	On-Site	Beech (F. sylvatica)	10	7	Moderate	1 m south of concrete sidewalk. In grass. Columnar form. Dripline radius 1 m. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Low	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
662	On-Site	Maple (A. rubrum)	19	8	Moderate	In 6 m wide mown grass boulevard, 2 m from road. Stem has no defects. Structural union at 1.5 m is poor with included bark. Crown rounded, symmetrical. Dripline radius 3 m.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
663	On-Site	Maple (A. rubrum)	16	8	Moderate	In 6 m wide mown grass boulevard, 2 m from road. Stem has no defects. Structural union acute, but minor included bark. Crown rounded, symmetrical. Dripline radius 2.5 m.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
664	On-Site	Maple (A. rubrum)	16	8	Moderate	In 5 m wide mown grass boulevard, 2.5 m from road. Stem has no defects. Structural unions acute but minor included bark. Crown rounded, symmetrical. Dripline radius 3 m.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0

Tag #	Location	Species	DBH (cm)	Height (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/Remove	Retention/TPZ Comments	TPZ (m)
665	On-Site	Ash (F. ornus)	16	8	Moderate	Memorial tree. In grass, moderate compaction in root zone. Minor stem and scaffold defects. Rounded crown.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
666	On-Site	Locust (G. triacanthos)	15	7	Moderate	Memorial tree. In grass. No structural defects. Crown asymmetrical to west.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
667	On-Site	Katsura (C. japonicum))	20	6	Poor	Memorial tree. In grass. Four similar stems from base, one with 50 cm long wound from grade.	Low	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
668	On-Site	Sorbus (S. aucuparia)	31	10	Moderate	In grass. Moderate compaction in root zone. Scaffold branch unions acute with moderate included bark. Crown rounded.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
669	On-Site	Linden (Tilia sp.)	14	7	Moderate	In grass. Moderate compaction in root zone. Single stem. Several poorly pruned or broken branches in crown. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
670	On-Site	Linden (Tilia sp.)	13	7	Good	In grass. Significant compaction in root zone. Single stem free from defects. Good symmetrical crown structure. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
671	On-Site	Linden (Tilia sp.)	13	7	Good	In grass. Significant compaction in root zone. Single stem free from defects. Good symmetrical crown structure. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
672	On-Site	Pine (P. nigra)	64	17	Good	In grass. 5 m from sidewalk. Single stem to top, free from defects. Wide crown. Foliage healthy.	High	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	3.8
673	On-Site	Pine (P. nigra)	54	17	Moderate	In grass. 4 m from sidewalk. Single stem to acute fork at 12 m. Minor basal sweep. Wide crown. Foliage healthy.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	3.2
674	On-Site	Pine (P. nigra)	70	10	Moderate	In grass. 4 m from sidewalk. 8 large laterals from good union at 1.5 m. Foliage healthy. Dripline radius 6 m.	High	Retain	Protect as per attached Tree Management Plan.	4.2
675	On-Site	Cypress (C. nootkatensis)	50	10	Poor	Two equal stems from base. 50 % of crown is dead.	Low	Retain	Protect as per attached Tree Management Plan.	3.0
676	On-Site	Maple (A. rubrum)	16	9	Good	In 1.5 m wide grass boulevard.	Medium	Remove	Tree conflicts with proposed location of parking lot exit and entry ramp (as per 'Trees marked up Drawing Jan[2]' PDF file received from client on February 3, 2020). Tree is a suitable candidate for transplanting.	2.0
677	On-Site	Oak (Q. rubra)	10	8	Good	In 4 m wide grass boulevard. Vigorous, single-stemmed young tree. Dripline radius 1.5 m. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	High	Retain	Tree outside project scope. TPZ fencing not required.	2.0

Tag #	Location	Species	DBH (cm)	Height (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/Remove	Retention/TPZ Comments	TPZ (m)
678	On-Site	Alder (A. rubra)	19	8	Good	In 4 m wide planting strip. Significant compaction throughout exposed root zone. Structure good.	Medium	Remove	Tree conflicts with proposed landscape design. Tree is a suitable candidate for transplanting.	2.0
679	On-Site	Maple (A. pseudoplatanus)	15	8	Moderate	In 1 m wide planting bed between parking lot and sidewalk. Dripline 2.5 m.	Low	Remove	Tree conflicts with proposed landscape design.	2.0
680	On-Site	Alder (A. rubra)	16	8	Good	In 4 m wide planting strip. Significant compaction throughout exposed root zone. Old wound with probably decay mostly occluded at 1.5 m. Single stem. Crown asymmetrical to north west.	Medium	Remove	Tree conflicts with proposed landscape design.	2.0
681	On-Site	Maple (A. macrophyllum)	21	10	Good	In 4 m wide planting strip. Drain grate 0.5 m from base. Significant compaction in exposed root zone. Structure good, branches a little congested.	Medium	Remove	Tree conflicts with proposed landscape design.	2.0
3345	On-Site	Oak (Q. rubra)	41	14	Good	In 5 m wide grass boulevard. 2 m from curb and sidewalk to north and east. Significant compaction in root zone. Tree structure and form is good. Dripline radius 7.	High	Retain	Protect as per attached Tree Management Plan.	2.5
3526	On-Site	Oak (Q. rubra)	46	14	Good	In 5 m wide grass boulevard. Severe compaction and exposed surface roots 2 m from base to south. Tree structure and form is good. Dripline radius 7.	High	Retain	Protect as per attached Tree Management Plan.	2.8
3527	On-Site	Oak (Q. rubra)	57	18	Good	In 5 m wide grass boulevard, 2 m from high curb to west. Tree structure and form is good. Minor dead wood in crown. Dripline radius 7 m.	High	Retain	Protect as per attached Tree Management Plan.	3.4
3528	On-Site	Oak (Q. rubra)	57	18	Good	In 5 m wide grass boulevard, 2 m from high curb to west. Tree structure and form is good. Minor dead wood in crown. Dripline radius 7 m.	High	Retain	Protect as per attached Tree Management Plan.	3.4
3536	On-Site	Oak (Q. rubra)	56	16	Good	In 5 m wide grass boulevard. 2 m from high curb to west. Tree structure and form is good. Minor dead wood in crown. Dripline radius 7.	High	Remove	Tree conflicts with proposed landscape design.	3.4
3774	On-Site	Maple (A. rubrum)	21	10	Good	In 6 m wide mown grass boulevard, 0.5 m from road. Stem has no defects. Structural unions good. Crown rounded, symmetrical. Dripline radius 5 m.	High	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
3775	On-Site	Maple (A. rubrum)	27	11	Poor	In 6 m wide grass boulevard, 1 m from road. Stem wound at base from impact, advanced decay, 1/3 circumference. Structural unions good. Scaffold with occluding pruning wound and advanced decay. Crown asymmetrical to west. Dripline radius 5.5 m.	Low	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
3776	On-Site	Maple (A. rubrum)	27	11	Good	In 6 m wide mown grass boulevard, 1 m from road. Stem has no defects. Structural unions good. Crown rounded, symmetrical. Dripline radius 5.5 m.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
3778	On-Site	Maple (A. rubrum)	24	11	Good	In 6 m wide mown grass boulevard, 2 m from road. Stem has no defects. Structural unions good. Crown rounded, symmetrical. Dripline radius 5 m.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
3780	On-Site	Maple (A. rubrum)	18	10	Good	In middle of 6 m wide mown grass boulevard. Stem has no defects. Structural unions good. Crown slightly asymmetrical to west away from building.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
3781	On-Site	Maple (A. rubrum)	31	11	Good	Concrete sidewalk to base on east side. Single stem to good scaffold unions at 2.5 m. Branch structure upright, crown slightly asymmetrical to west. Dripline radius 4.5 m.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
3782	On-Site	Horsechestnut (A. hippocastanum)	59	11	Moderate	In raised bed at intersection, 0.5 m above sidewalk, 1.5 m from retaining wall. Minor stem defects. Scaffold branch unions good. Branch structure reasonable, codominant laterals. Driplines radius 7 m.	High	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	3.5
3813	On-Site	Maple (A. platanooides)	36	8	Good	2 m from sidewalk, in grass. Good crown structure. Dripline radius 6 m.	High	Retain	Protect as per attached Tree Management Plan.	2.2
3817	On-Site	Cedar (T. plicata)	26	7	Good	In grass. Short tree wide crown, dripline radius 3 m. Variegated foliage.	Medium	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0

Tag #	Location	Species	DBH (cm)	Height (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/Remove	Retention/TPZ Comments	TPZ (m)
3818	On-Site	Sorbus (<i>S. aucuparia</i>)	23	10	Good	In grass. Moderate compaction in root zone. Branch structure good. Crown rounded upright.	High	Retain	Tree outside project scope. Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
5211	On-Site	Oak (<i>Q. rubra</i>)	68	22	Good	In 4 m wide grass boulevard, 0.5 m from sidewalk to east; sidewalk is heaving. Tree structure and form is good. Minor dead wood in crown. Dripline radius 8 m.	High	Retain	Tree outside project scope. TPZ fencing not required.	4.1
5212	On-Site	Oak (<i>Q. rubra</i>)	48	22	Good	In 4 m wide grass boulevard, 0.5 m from sidewalk to east; sidewalk is heaving. Crown asymmetrical to north. Minor dead wood in crown. Dripline radius 7 m.	High	Retain	Tree outside project scope. TPZ fencing not required.	2.9
5213	On-Site	Oak (<i>Q. rubra</i>)	56	16	Good	In 5 m wide grass boulevard. 2 m from high curb to west. Tree structure and form is moderate, crown from upswept lateral branches. Minor dead wood in crown. Dripline radius 7 m.	High	Remove	Tree conflicts with proposed landscape design.	3.4
5214	On-Site	Oak (<i>Q. rubra</i>)	37	14	Good	In 4 m wide grass boulevard. Tree structure and structure is good. Dripline radius 7 m.	High	Retain	Tree outside project scope. TPZ fencing not required.	2.2
5215	On-Site	Oak (<i>Q. rubra</i>)	48	16	Good	In 5 m wide grass boulevard. 2 m from high curb to west. Tree structure and form is moderate, large lateral forms half of crown. Minor dead wood in crown. Dripline radius 7 m.	High	Remove	Tree conflicts with proposed landscape design.	2.9
5216	On-Site	Oak (<i>Q. rubra</i>)	40	16	Good	In 4 m wide grass boulevard. Tree structure and form is good, two codominant stems from good unions. Minor dead wood in crown. Dripline radius 6 m.	High	Retain	Tree outside project scope. TPZ fencing not required.	2.4
5217	On-Site	Oak (<i>Q. robur</i>)	40	16	Good	In 4 m wide grass boulevard. Tree structure and form is moderate, three codominant stems from good unions form crown. Minor dead wood in crown. Dripline radius 6 m.	High	Retain	Tree outside project scope. TPZ fencing not required.	2.4
5218	On-Site	Oak (<i>Q. rubra</i>)	43	16	Moderate	In 5 m wide grass boulevard, 0.5 m from curb. Tree structure and form is moderate, top moribund, crown from large laterals. Minor dead wood in crown. Dripline radius 7 m.	High	Retain	Tree outside project scope. TPZ fencing not required.	2.6
5219	On-Site	Oak (<i>Q. rubra</i>)	41	16	Moderate	In 5 m wide grass boulevard. Significant compaction in approx. 10% of root zone. Tree structure and form is moderate, top moribund, crown from large laterals. Minor dead wood in crown. Dripline radius 7 m.	High	Remove	Tree conflicts with proposed landscape design.	2.5
8215	On-Site	Maple (<i>A. rubrum</i>)	14	9	Good	In 1.5 m wide grass boulevard. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Medium	Remove	Tree conflicts with proposed location of parking lot exit and entry ramp (as per 'Trees marked up Drawing Jan[2]' PDF file received from client on February 3, 2020).	2.0
8217	On-Site	Maple (<i>A. rubrum</i>)	16	9	Good	In 1.5 m wide grass boulevard.	Medium	Retain	Protect as per attached Tree Management Plan.	2.0
8218	On-Site	Maple (<i>A. rubrum</i>)	16	9	Good	In 1.5 m wide grass boulevard. Crown asymmetrical to south.	Medium	Retain	Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0
8219	On-Site	Maple (<i>A. rubrum</i>)	14	7	Good	In 1.5 m wide grass boulevard. Irrigation cover 0.5 m from base. Note that tree is undersized (less than 15cm DBH) and therefore not included as part of our summary counts.	Medium	Retain	Hoarding as shown on 'Preliminary General Site Plan' dated 2019-11-04 by Syncra Construction will also provide protection for tree. TPZ fencing not required.	2.0

Appendix 2 Site Photographs



Photo 1. Overview of tree 3782.



Photo 2. Overview of tree 3526.



Photo 3. View looking north from the eastern parking lot entrance off Health Science Mall.

Appendix 3 Tree Health and Structure Rating Criteria

The tree health and structure ratings used by Diamond Head Consulting summarize each tree based on both positive and negative attributes using five stratified categories. These ratings indicate health and structural conditions that influence a tree's ability to withstand local site disturbance during the construction process (assuming appropriate tree protection) and benefit a future urban landscape.

Excellent: Tree of possible specimen quality, unique species or size with no discernible defects.

Good: Tree has no significant structural defects or health concerns, considering its growing environment and species.

Moderate: Tree has noted health and/or minor to moderate structural defects. This tree can be retained, but may need mitigation (e.g., pruning or bracing) and monitoring post-development. A moderate tree may be suitable for retention within a stand or group, but not suitable on its own.

Poor: Tree is in serious decline from previous growth habit or stature, has multiple defined health or structural weaknesses. It is unlikely to acclimate to future site use change. This tree is not suitable for retention within striking distance of most targets.

Dying/Dead: Tree is in severe decline, has severe defects or was found to be dead.

Appendix 4 Tree Retention Value Rating Criteria

The tree retention value ratings used by Diamond Head Consulting provide guidance for tree retention planning. Each tree in an inventory is assigned to one of four stratified categories that reflect its value as a future amenity and environmental asset in a developed landscape. Tree retention value ratings take in to account the health and structure rating, species profile*, growing conditions and potential longevity assuming a tree's growing environment is not compromised from its current state.

High: Tree suitable for retention. Has a good or excellent health and structure rating. Tree is open grown, an anchor tree on the edge of a stand or dominant within a stand or group. Species of *Populus*, *Alnus* and *Betula* are excluded from this category.

Medium: Tree suitable for retention with some caveats or suitable within a group**. Tree has moderate health and structure rating, but is likely to require remedial work to mitigate minor health or structural defects. Includes trees that are recently exposed, but wind firm, and trees grown on sites with poor rooting environments that may be ameliorated.

Low: Tree has marginal suitability for retention. Health and structure rating is moderate or poor; remedial work is unlikely to be viable. Trees within striking distance of a future site developments should be removed.

Nil: Tree is unsuitable for retention. It has a dying/dead or poor health and structure rating. It is likely that the tree will not survive, or it poses an unacceptable hazard in the context of future site developments.

* The species profile is based upon mature age and height/spread of the species, adaptability to land use changes and tree species susceptibility to diseases, pathogen and insect infestation.

** Trees that are 'suitable as a group' have grown in groups or stands that have a single, closed canopy. They have not developed the necessary trunk taper, branch and root structure that would allow them to be retained individually. These trees should only be retained in groups.

Appendix 5 Risk Rating Matrices

Trees with a *probable* or *imminent* likelihood of failure, a *medium* or *high* likelihood of impacting a specified target, and a *significant* or *severe* consequence of failure have been assessed for risk and included in this report (Section 3.2). These two risk rating matrices showing the categories used to assign risk are taken without modification to their content from the International Society of Arboriculture Tree Risk Assessment Qualification Manual.

Matrix 1: Likelihood

Likelihood of Failure	Likelihood of Impacting Target			
	Very Low	Low	Medium	High
Imminent	Unlikely	Somewhat Likely	Likely	Very Likely
Probable	Unlikely	Unlikely	Somewhat Likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat Likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2: Risk Rating

Likelihood of Failure and Impact	Consequences of Failure			
	Negligible	Minor	Significant	Severe
Very Likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat Likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Appendix 6 Construction Guidelines

Tree management recommendations in this report are made under the expectation that the following guidelines for risk mitigation and proper tree protection will be adhered to during construction.

Respecting these guidelines will prevent changes to the soil and rooting conditions, contamination due to spills and waste, or physical wounding of the trees. Any plans for construction work and activities that deviate from or contradict these guidelines should be discussed with the project arborist so that mitigation measures can be implemented.

Tree Protection Zones

A Tree protection zone (TPZ) is determined using either dripline or a DBH multiplier to define a radius measured in all directions from the outside of a tree's trunk. It is typically determined according to local municipal bylaw specifications and may be modified based on professional judgement of the project arborist to accommodate species specific tolerances and site specific growing conditions. For retained trees, the TPZ and fencing indicated in this report are proposed as suitable in relation to the level of disturbance proposed on the site plan provided to the project arborist. Arborist consultation is required if any additional work beyond the scope of the plans provided is proposed near the tree. Work done in addition to the proposed impacts discussed in this report may cause the tree to decline and die.

Tree Protection Fencing: Tree protection zones (TPZs) will be protected by Tree Protection Fencing except where site features constrict roots (e.g., retaining walls or roads), where continual access is required (e.g., sidewalks), or when an acceptable encroachment into the TPZ is proposed, in which case the fencing will be modified. Tree Protection Fencing is shown on the Tree Protection Plan and, where it varies from the TPZ, the rationale is described in the inventory table in Section 3.1.

Within a TPZ, no construction activity, including materials storage, grading or landscaping, may occur without project arborist approval. Within the TPZ, the following are tree preservation guidelines based on industry standards for best practice and local municipal requirements:

- No soil disturbance or stripping.
- Maintain the natural grade.
- No storage, dumping of materials, parking, underground utilities or fires within TPZs or tree driplines.
- Any planned construction and landscaping activities affecting trees should be reviewed and approved by a consulting arborist.
- Install specially designed foundations and paving when these structures are required within TPZs.
- Route utilities around TPZs.
- Excavation within the TPZs should be supervised by a consultant arborist.
- Surface drainage should not be altered in such a way that water is directed in or out of the TPZ.

- Site drainage improvements should be designed to maintain the natural water table levels within the TPZ.

Prior to any construction activity, Tree Protection Fencing must be constructed as shown on the Tree Protection Plan. The protection barrier or temporary fencing must be at least 1.2 m in height and constructed of 2" by 4" lumber with orange plastic mesh screening. Tree Protection Fencing must be constructed prior to tree removal, excavation or construction and remain intact for the entire duration of construction.

Tree Crown Protection and Pruning

All heavy machinery (excavators, cranes, dump trucks, etc.) working within five meters of a tree's crown should be made aware of their proximity to the tree. If there is to be a sustained period of machinery working within five meters of a tree's crown, a line of colored flags should be suspended at eye-level of the machinery operator for the length of the protected tree area. Any concerns regarding the clearance required for machinery and workers within or immediately outside tree protection zones should be referred to the project arborist so that a zone surrounding the crowns can be established or pruning measures undertaken. Any wounds incurred to protected trees during construction should be reported to the project arborist immediately.

Unsurveyed Trees

Unsurveyed trees identified by DHC in the Tree Retention Plan have been hand plotted for approximate location only using GPS coordinates and field observations. The location and ownership of unsurveyed trees cannot be confirmed without a legal survey. The property owner or project developer must ensure that all relevant on- and off-site trees are surveyed by a legally registered surveyor, whether they are identified by DHC or not.

Removal of logs from sites

Private timber marks are required to transport logs from privately-owned land in BC. It is property owner's responsibility to apply for a timber mark prior to removing any merchantable timber from the site. Additional information can be found at: <http://www.for.gov.bc.ca/hth/private-timber-marks.htm>

Regulation of Soil Moisture and Drainage

Excavation and construction activities adjacent to TPZs can influence the availability of moisture to protected trees. This is due to a reduction in the total root mass, changes in local drainage conditions, and changes in exposure including reflected heat from adjacent hard surfaces. To mitigate these concerns the following guidelines should be followed:

- Soil moisture conditions within the tree root protection zones should be monitored during hot and dry weather. When soil moisture is inadequate, supplemental irrigation should be provided that penetrates soil to the depth of the root system or a minimum of 30 cm.
- Any planned changes to surface grades within the TPZs, including the placement of mulch, should be designed so that any water will flow away from tree trunks.

- Excavations adjacent to trees can alter local soil hydrology by draining water more rapidly from TPZs more rapidly than it would prior to site changes. It is recommended that when excavating within 6 m of any tree, the site be irrigated more frequently to account for this.

Root Zone Enhancements and Fertilization

Root zone enhancements such as mulch, and fertilizer treatments may be recommended by the project arborist during any phase of the project if they deem it necessary to maintain tree health and future survival.

Paving Within and Adjacent to TPZs

If development plans propose the construction of paved areas and/or retaining walls close to TPZs, measures should be taken to minimize impacts. Construction of these features would raise concerns for proper soil aeration, drainage, irrigation and the available soil volume for adequate root growth. The following design and construction guidelines for paving and retaining walls are recommended to minimize the long-term impacts of construction on protected trees:

- Any excavation activities near or within the TPZ should be monitored by a certified arborist. Structures should be designed, and excavation activities undertaken to remove and disturb as little of the rooting zone as possible. All roots greater than 2 cm in diameter should be hand pruned by a Certified Arborist.
- The natural grade of a TPZ should be maintained. Any retaining walls should be designed at heights that maintain the existing grade within 20 cm of its current level. If the grade is altered, it should be raised not reduced in height.
- Compaction of sub grade materials can cause trees to develop shallow rooting systems. This can contribute to long-term pavement damage as roots grow. Minimizing the compaction of subgrade materials by using structural soils or other engineered solutions and increasing the strength of the pavement reduces reliance on the sub-grade for strength.
- If it is not possible to minimize the compaction of sub-grade materials, subsurface barriers should be considered to help direct roots downward into the soil and prevent them from growing directly under the paved surfaces.

Plantings within TPZs

Any plans to landscape the ground within the TPZ should implement measures to minimize negative impacts on the above or below ground parts of a tree. Existing grass layer in TPZs should not be stripped because this will damage surface tree roots. Grass layer should be covered with mulch at the start of the project, which will gradually kill the grass while moderating soil moisture and temperatures. Topsoil should be mixed with the mulch prior to planting of shrubs, but new topsoil layer should not be greater than 20 cm deep on top of the original grade. Planting should take place within the newly placed topsoil mixture and should not disturb the original rooting zone of the trees. A two-meter radius around the

base of each tree should be left unplanted and covered in mulch; a tree's root collar should remain free from any amendments that raise the surface grade.

Monitoring during construction

Ongoing monitoring by a consultant arborist should occur for the duration of a development project. Site visits should be more frequent during activities that are higher risk, including the first stages of construction when excavation occurs adjacent to the trees. Site visits will ensure contractors are respecting the recommended tree protection measures and will allow the arborist to identify any new concerns that may arise.

During each site visit the following measures will be assessed and reported on by a consulting arborist:

- Health and condition of protected trees, including damage to branches, trunks and roots that may have resulted from construction activities, as will the health of. Recommendations for remediation will follow.
- Integrity of the TPZ and fencing.
- Changes to TPZ conditions including overall maintenance, parking on roots, and storing or dumping of materials within TPZ. If failures to maintain and respect the TPZ are observed, suggestions will be made to ensure tree protection measures are remediated and upheld.
- Review and confirmation of recommended tree maintenance including root pruning, irrigation, mulching and branch pruning.
- Changes to soil moisture levels and drainage patterns; and
- Factors that may be detrimentally impact the trees.

Appendix 7 Report Assumptions and Limiting Conditions

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