R.F. BINNIE & ASSOCIATES LTD.
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Burnaby, BC V5G 4H7
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Memorandum

To:	Gordon Easton	**From:**	Russell Warren, P.Eng.
Cc:	Jason Wegman	**Date:**	May 25, 2016
Project Title:	Block F	**File No.:**	12-125
Re:	Tree Survey Methodology		

As requested, the following is a general description of the methodology used in establishing the heights of the existing trees at Block F. The survey was completed by our survey crews in January, 2015. In order to determine the heights of the existing trees the survey crews used two different strategies: Reflectorless Total Station and Total Station Transit. In the Reflectorless Total Station methodology a specific piece of equipment called a reflectorless total station uses a laser beam to measure the distance to the object (in this case the top of the tree). In the Total Station Transit methodology a standard total station is used to measure the angle between the top and the bottom of the tree and the height of the object is calculated. Both methodologies provide a high level of accuracy and are commonly used in the surveying industry.

If you have any questions please feel free to contact us for more information.

TREES		
TAG #	DESC.	DIA. (M.)
TAG0187	Cedar - T.plicata	0.7
TAG0188	Hemlock - T.heterophylla	0.7
TAG0189	Douglas-fir	1.2
TAG0190	Douglas-fir	1.1
TAG0191	Cedar - T.plicata	0.4
TAG0192	Hemlock - T.heterophylla	0.8
TAG0193	Douglas-fir	1.0
TAG0194	Douglas-fir	0.7
TAG0195	Cedar - T.plicata	0.9
TAG0196	Douglas-fir	1.0
TAG0197	Cedar - T.plicata	0.8
TAG0198	Cedar - T.plicata	0.4
TAG0199	Douglas-fir	1.1
TAG0200	Douglas-fir	1.0
TAG0201	Cedar - T.plicata	0.9
TAG0202	Douglas-fir	0.4
TAG0203	Cedar - T.plicata	0.3
TAG0204	Douglas-fir	0.9
TAG0205	Cedar - T.plicata	0.3
TAG0206	Cedar - T.plicata	0.5
TAG0207	Cedar - T.plicata	0.7
TAG0208	Cedar - T.plicata	0.5
TAG0209	Cedar - T.plicata	0.4
TAG0210	Cedar - T.plicata	0.4
TAG0211	Cedar - T.plicata	0.4
TAG0212	Cedar - T.plicata	0.6
TAG0213	Douglas-fir	1.2
TAG0214	Cedar - T.plicata	0.8
TAG0215	Cedar - T.plicata	0.5
TAG0216	Douglas-fir	1.0
TAG0217	Douglas-fir	0.8
TAG0218	Douglas-fir	1.0

TAG #	DESC	DIA. (M.)
TAG0219	Hemlock - T.heterophylla	0.7
TAG0220	Douglas-fir	0.6
TAG0221	Douglas-fir	1.1
TAG0222	Douglas-fir	0.8
TAG0223	Cedar - T.plicata	0.8
TAG0224	Cedar - T.plicata	0.8
TAG0225	Cedar - T.plicata	1.0
TAG0226	Douglas-fir	0.8
TAG0227	Douglas-fir	0.6
TAG0228	Douglas-fir	0.8
TAG0229	Douglas-fir	0.9
TAG0230	Douglas-fir	0.7
TAG0231	Douglas-fir	1.0
TAG0232	Douglas-fir	1.2
TAG0233	No Data	0.6
TAG0234	Cedar - T.plicata	0.8
TAG0235	Douglas-fir	0.8
TAG0236	Cedar - T.plicata	0.8
TAG0237	Cedar - T.plicata	0.7
TAG0238	Douglas-fir	0.9
TAG0239	Cedar - T.plicata	0.5
TAG0240	Douglas-fir	0.8
TAG0241	Cedar - T.plicata	0.8
TAG0242	Hemlock - T.heterophylla	0.4
TAG0243	Cedar - T.plicata	0.4
TAG0244	Cedar - T.plicata	0.6
TAG0245	Douglas-fir	0.9
TAG0246	Douglas-fir	1.2
TAG0247	Douglas-fir	1.1
TAG0248	Douglas-fir	0.8
TAG0249	Cedar - T.plicata	0.5

TAG #	DESC.	DIA. (M.)
TAG0250	Cedar - T.plicata	0.6
TAG0251	Cedar - T.plicata	0.9
TAG0252	Cedar - T.plicata	1.0
TAG0253	Cedar - T.plicata	0.6
TAG0254	Cedar - T.plicata	1.2
TAG1001	Cedar - T.plicata	1.1
TAG1002	Douglas-fir	0.6
TAG1003	Cedar - T.plicata	0.6
TAG1004	Cedar - T.plicata	0.5
TAG1005	Cedar - T.plicata	0.5
TAG1006	Douglas-fir	0.5
TAG1007	Cedar - T.plicata	0.7
TAG1008	Hemlock - T.heterophylla	1.1
TAG1009	Cedar - T.plicata	0.7
TAG1010	Cedar - T.plicata	0.6
TAG1011	Cedar - T.plicata	0.9
TAG1012	Cedar - T.plicata	0.5
TAG1013	Cedar - T.plicata	0.8
TAG1014	Cedar - T.plicata	1.1
TAG1015	Cedar - T.plicata	0.7
TAG1016	Cedar - T.plicata	1.2

TREES PICKED UP JAN 8, 2015		
Tag	Species	DBH (m)
490	Douglas-fir	1.0
489	Douglas-fir	1.0
247	Douglas-fir	1.4
1016	Douglas-fir	1.3
465	Douglas-fir	1.3
464	Douglas-fir	0.8
8449	Douglas-fir	0.8
8450	Douglas-fir	0.8
8451	Douglas-fir	0.8
8452	Douglas-fir	0.9
8453	Douglas-fir	0.9
8454	Douglas-fir	0.7
8455	Douglas-fir	0.9
8456	Douglas-fir	1.0
8457	Douglas-fir	0.8
8458	Douglas-fir	0.7
8459	Douglas-fir	0.1
8460	Douglas-fir	-
8461	Douglas-fir	0.8
8462	Douglas-fir	0.8
8463	Douglas-fir	0.8
8464	Douglas-fir	0.6
8465	Douglas-fir	1.0
8466	Douglas-fir	0.1
8467	Douglas-fir	0.8
8468	Douglas-fir	1.0
8469	Douglas-fir	1.0
8470	Douglas-fir	0.7
231	Douglas-fir	-
8471	Douglas-fir	-
473	Douglas-fir	0.9
8472	Douglas-fir	0.9
482	Douglas-fir	0.8
484	Douglas-fir	-
483	Douglas-fir	-
235	Douglas-fir	-
8473	Douglas-fir	1.0
8474	Douglas-fir	1.0
8475	Douglas-fir	1.0

LEGEND

EXISTING	DESCRIPTION
	IRON PROPERTY PIN
	PAVEMENT EDGE
	CURB
SP	SANITARY PUMP STATION
SFM	SANITARY FORCEMAIN
S	SANITARY SEWER
	STORM SEWER
	CATCH BASIN
LD	LAWN DRAIN
W	WATERMAIN
	WATER VALVE
FH	HYDRANT
	CAPPED END
WM	WATER METER
	BLOW--OFF
T	UNDERGROUND TELEPHONE
E	UNDERGROUND ELECTRICAL
G	GASMAIN
	GASMAIN VALVE
L	STREET LIGHT U/G DUCTS
	STREET LIGHT
	UTILITY POLE WITH LIGHT
	UTILITY POLE
	ANCHOR
	JUNCTION BOX
	ELECTRICAL BOX
	SIGN

BENCHMARK:
MONUMENT UEL #28 EL.91.709m CVD28GVRD DATUM

SITE SCALE FACTOR = 0.9996

SURVEYED BY:
R. F. BINNIE & ASSOCIATES LTD

CIVIC ADDRESS:

LEGAL DESCRIPTION:
LOT 'A'
PLAN 22191
DL 140
NEW WESTMINSTER DISTRICT

SCALE:
0 1:500 25m

ISS/REV	DESCRIPTION
JAN 8/15	8 ADDED 39 TREES W/ GROUND SHOT AT BASE
SEPT 4/13	7 RAISED TOPO 105mm TO CVD28GVRD DATUM
APRIL 19/13	6 ADDED MORE TREES
MAR 22/13	5 ADDED TOP OF TREE SURVEY
FEB 27/13	4 ADD 0.5m CONTOURS
DEC 5/12	3 ADDED TREES AND ITS DETAILS FROM ARBORIST
NOV 1/12	2 ADDED MH INVERTS
OCT 25/12	1 ADDED UNDERGROUND & ADDITIONAL SURVEY

PROJECT:
MUSQUEAM DEVELOPMENT

CLIENT:
COLLIERS INTERNATIONAL CONSULTANTS

CONSULTANT:
BINNIE
Engineering • Project Management • Geomatics

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DATE: 10/5/12
DRAWN: SJ
DESIGN:
CHECKED:
SCALE: 1:500m
SEAL:

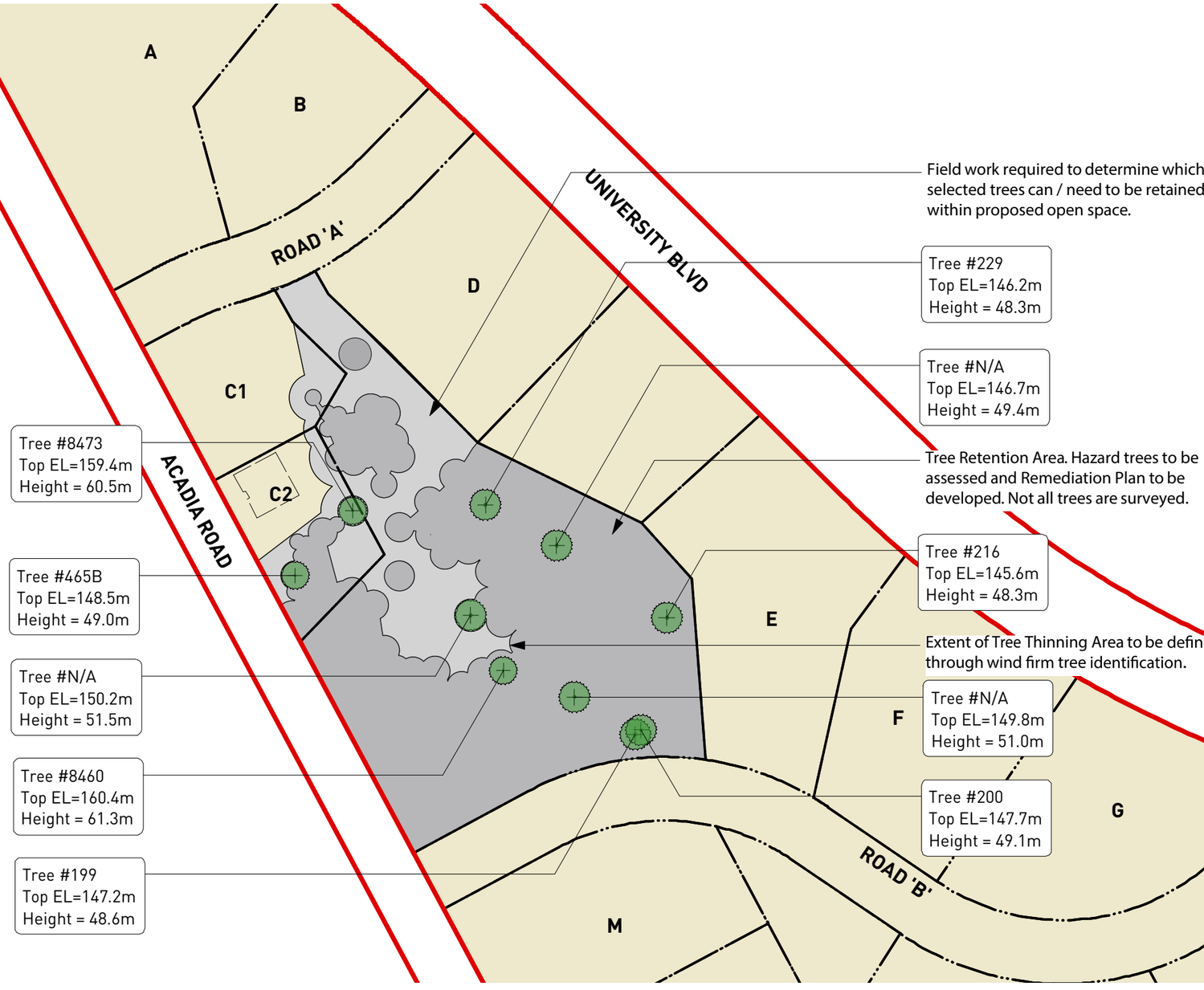
SHEET TITLE:
TOPOGRAPHIC PLAN

DRAWING NO.: TP-1
REV.: 6
RFB JOB No. 12–125
SHEET 1 OF 1

NOTE:
CONTOUR INTERVAL = 0.5m

NOTE:
UNDERGROUND UTILITIES SHOWN ON THIS DRAWING HAVE BEEN INTERPRETED FROM RECORDS OBTAINED FROM THE UNIVERSITY ENDOWMENT LANDS AS WELL AS OTHER UTILITY COMPANIES AND ARE APPROXIMATE ONLY.

NOTE:
THIS DRAWING IS IN GROUND LEVEL COORDINATE SYSTEM. ELEVATIONS SHOWN ARE METRIC GEODETIC. LEGAL BOUNDARIES SHOWN ARE APPROXIMATE ONLY AND SHOULD BE CONFIRMED BY A PROFESSIONAL B.C. LAND SURVEYOR.



LEGEND

- Existing Evergreen Trees to Remain (Surveyed)
- Tree Retention Area
- Tree Thinning Area
- Tree Removal Area
- Parcel Boundary

TREE HEIGHT TABLE

	TREE TAGS	HEIGHT (M)	HEIGHT (FT)
1	8460	61.30	201.11
2	8473	60.50	198.49
3	N/A	51.50	168.96
4	N/A	51.00	167.32
5	N/A	49.40	162.07
6	200	49.10	161.09
7	465B	49.00	160.76
8	199	48.60	159.45
9	216	48.30	158.46
10	229	48.30	158.46

NOTE: INFORMATION AS PER BINNIE SURVEY DATED JAN 8, 2015.

0 50 100 m

Revised:

PWL partnership
www.pwlpartnership.com
T 604.688.6111
F 604.688.6112

This LSK to be read in conjunction with the following drawings:

Project: 1266
UEL Block F

Drawing Title:
TREE MANAGEMENT PLAN -TEN TALLEST TREES OUTLINED

Scale: 1:1500

North:

Date: May 25, 2016
File: 1266 Tree Management.vwx
Drawn: MW/KC Reviewed:
Drawing:

LSK-35

Diamond Head Consulting Ltd. Tree Management Recommendations for 1266 UEL Block 6

April 8 2015

Table 1 updated May 25, 2016

Submitted to:

Musqueam Indian Band
c/o Gordon Easton at Colliers International
200 Granville Street, 19th Floor
Vancouver, BC
V6C 2R6

Submitted by:

DIAMOND HEAD CONSULTING LTD.

342 West 8th Avenue
Vancouver, BC
V5Y 3X2

The following Diamond Head Consulting staff performed the site visit and prepared the report. All general and professional liability insurance and individual accreditations have been provided below for reference.

Supervisor:

Mike Coulthard, R.P.Bio., R.P.F.
Senior Forester, Biologist
Certified Tree Risk Assessor (46)
BC Parks Wildlife and Danger Tree Assessor

Contact Information

Phone: 604-733-4886
Fax: 604-733-4879
Email: mike@diamondheadconsulting.com
Website: www.diamondheadconsulting.com

Insurance Information

WCB:	# 657906 AQ (003)
General Liability:	Northbridge General Insurance Corporation - Policy #CBC1935506, $5,000,000 (Mar 2016 to Mar 2017)
Errors & Omissions:	Lloyds Underwriters – Policy #1010615D, $1,000,000 (June 2015 to June 2017)

Table of Contents

Introduction

Diamond Head Consulting Ltd. (DHC) was asked to complete an assessment of the trees on and adjacent to the following proposed development:

Civic address:	1266 UEL Block F
Project No.:	N/A
Client name:	Colliers International
Date of site visits:	Nov 21, Dec 6 2012/March 14,April 5 2013/August 10 2014/April 3 2015

The following report outlines tree management assessment, impacts and strategies related to the proposed development at 1266 UEL Block F. This report follows up on a number of previous assessments. In 2012 an assessment was completed to identify opportunities for tree retention on site. This helped to direct site planning to accommodate safe tree retention. Subsequent more detailed assessments were completed in 2013 and 2014 to inventory trees to be retained adjacent to the development and proposed park space. This report outlines the existing condition of the stands of trees on the property, summarizes the proposed tree removals and trees that are planned for retention.

1.1 Limits of Assignment

- Our investigation is based solely on our visual inspection of the trees. Our inspection was conducted from ground level. We did not conduct soil tests or root examination to assess the condition of the root system of the trees.
- This report does not provide any estimates to implement the proposed recommendations provided in this report.
- This report is valid for six months from the date of submission. Additional site visits and report revisions are required after this point to ensure accuracy of the report.

1.2 Purpose and Use of Report

- Provide documentation pertaining to on site trees to supplement the proposed development planning process.

Tree Retention Opportunities

The proposed development area is roughly 21.4 acres or 8.66 hectares in size and is all forested. The topography of the site is generally flat. There is a significant amount of standing water along the eastern edge of the property adjacent to University Boulevard.

Figure 1. Location of site -1266 UEL Block F

The site has been divided into five distinct stands. These are described in detail in Appendix A. In the middle of the site along the western edge, adjacent to Acadia Road, there is a mature conifer stand (Stand 1) that provides the best opportunity for safe tree retention. This stand also has a well-developed looped trail system throughout that provides an area of high recreational value. The remainder of the site consists of mostly young to intermediate aged deciduous trees growing on sites with high moisture regimes. With the exception of a number of scattered conifer trees, these other stands provide poor opportunities for safe tree retention.

The five stands of trees on this site were placed into the following categories for tree retention opportunities. Figure 2 illustrates the locations of these tree retention areas.

Poor: These stands include trees that could not be retained safely adjacent to any development. The trees in these stands have structural characteristics that if exposed on their own would make them prone to windthrow in high wind events. The failure potential of these trees once exposed is likely during wind events that reach speeds of greater than 40km/hr.

Moderate: These stands include individual or small groups of trees that could be exposed on their own. Some of these trees would require feathering prescriptions to make them more windfirm. The failure potential of some of these trees is possible during wind events that reach speeds of greater than 40 km/hr.

Good: These stands provide individual and groups of trees that could be safely retained. After windfirming treatments it is expected that they will be stable. There is a low risk of windthrow during unusually high wind events. The failure potential of some of the exposed trees is unlikely during wind events that reach speeds of greater than 40 km/hr.

Figure 2. Stand level tree retention potential

Following the initial stand assessment, a more detailed tree survey was completed which focused on the identification of a windfirm boundary around Stand 1. This tree survey was carried out with the intention of preserving the windfirm edge trees that have established around its perimeter. In addition to these edge trees, significant trees outside of this core retention zone were also identified for possible retention.

Trees were assigned a retention potential value (Good, Moderate, Poor) based on the health and structural stability of the tree, and its ability to adapt to changes in growing conditions such as hydrology and removal of neighboring trees.

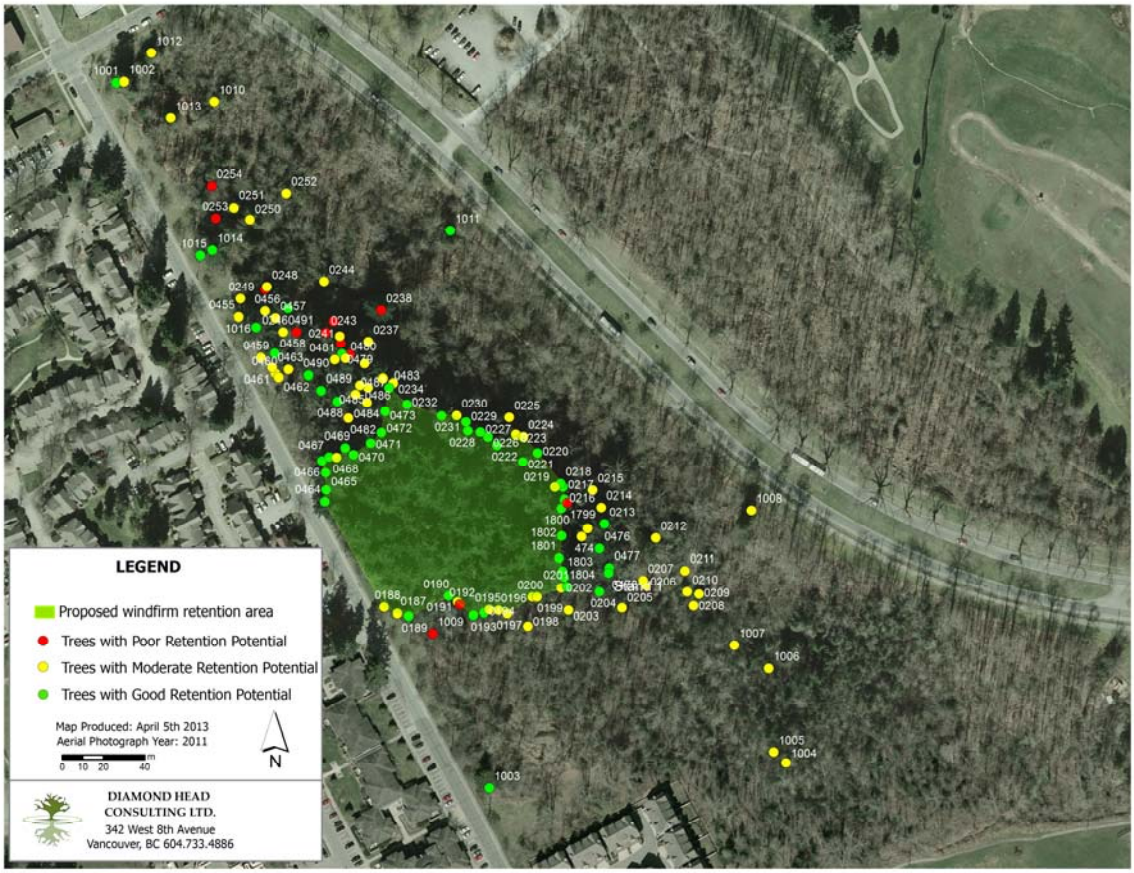


Figure 3. Tree retention potential overview map

Forest Management Zones

In 2014 land use planning proceeded with the intention of retaining the majority of Stand 1 as an intact stand of mature conifer trees. DHC completed a detailed assessment of this stand to identify options for the installation of an open passive meadow area. It was found that this could be established as long as the opening is limited in size and protects the most windfirm trees in the area. A suitable treed boundary was identified and subsequently surveyed. This opening extends south-east from Acadia Road. It is critical that a natural edge (4-6m) be established around the perimeter of this meadow area to ensure that the rooting zones of the edge trees remains undisturbed.

To the north of this meadow area, a clearing is proposed which would support scattered large trees. Individual dominant trees have been identified for retention in this area. These include the largest Douglas-fir trees. Lower crowns of these trees can be raised to about 30m to allow for light to reach the clearing area. A no disturbance zone is required around these individual trees to keep them healthy and windfirm.

To the southeast of the meadow zone, a view corridor will be established. In this area, all mature trees will be retained, however shrubs and understory trees will be pruned down to allow for visual sight lines. With the exception of trails, no ground disturbance is allowed to protect the roots of mature trees in this area.

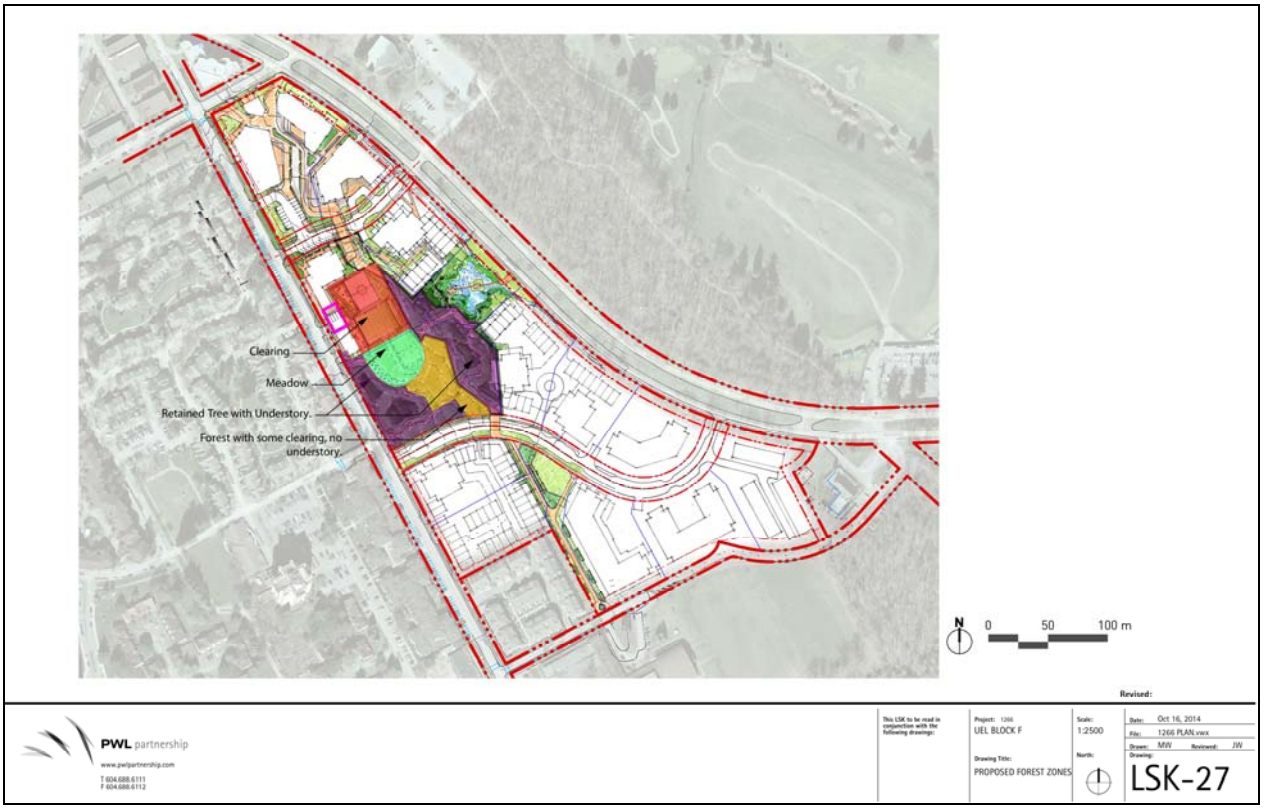


Figure 4 – Forest management zone concept (PWL, 2014)

Tree Retention Inventory

A completed inventory of trees that will form the outer edge of Stand 1 as well as the inner edge of the meadow area are summarized in Table 1. This table also includes the individual trees that are proposed for retention in the clearing area north of the meadow. Tree locations are illustrated in Figure 5.

Table 1 – Tree inventory of windfirm edge trees and individual trees to be retained in the clearing area

Tag	Species	DBH (cm)	Height (m)	Overall Condition	Comments	Root Protection Zone (m)
0187	*Tsuga heterophylla*	50	37	Good	Branches primarily found on east side	4.5
0188	*Thuja plicata*	60	28	Good	Slightly leaning towards road, branches primarily found on east side of tree	5.4
0189	*Pseudotsuga menziesii*	90	41*	Good	Healthy dominant well tapered tree on edge on mature stand	8.1
0190	*Pseudotsuga menziesii*	80	44*	Good	Healthy tree on edge of stand, small secondary dead stem at base	7.2
0191	*Thuja plicata*	30	20	Good	Healthy young tree	3.0
0193	*Pseudotsuga menziesii*	90	46*	Good	Healthy dominant tree, branches primarily found on south side	8.1
0194	*Pseudotsuga menziesii*	55	35	Good	Healthy tree, slight lean towards potential development site	4.9
0195	*Thuja plicata*	60	28	Good	Healthy well tapered tree, could be retained as single tree	5.4
0196	*Pseudotsuga menziesii*	70	42	Good	Healthy tree	6.3
0197	*Thuja plicata*	70	23	Good	Branches to base but only on one side, healthy tree	6.3
0199	*Pseudotsuga menziesii*	95	49*	Good	Healthy tree growing adjacent 200	8.5
0200	*Pseudotsuga menziesii*	95	49*	Good	Healthy tree growing adjacent 199	8.5
0201	*Pseudotsuga menziesii*	75	44*	Good	Slight lean towards stand	6.7
0202	*Thuja plicata*	40	22	Good	Healthy young tree	3.6
0216	*Pseudotsuga menziesii*	90	48*	Good	Healthy tree on path with slight sweep. Good edge tree	8.1

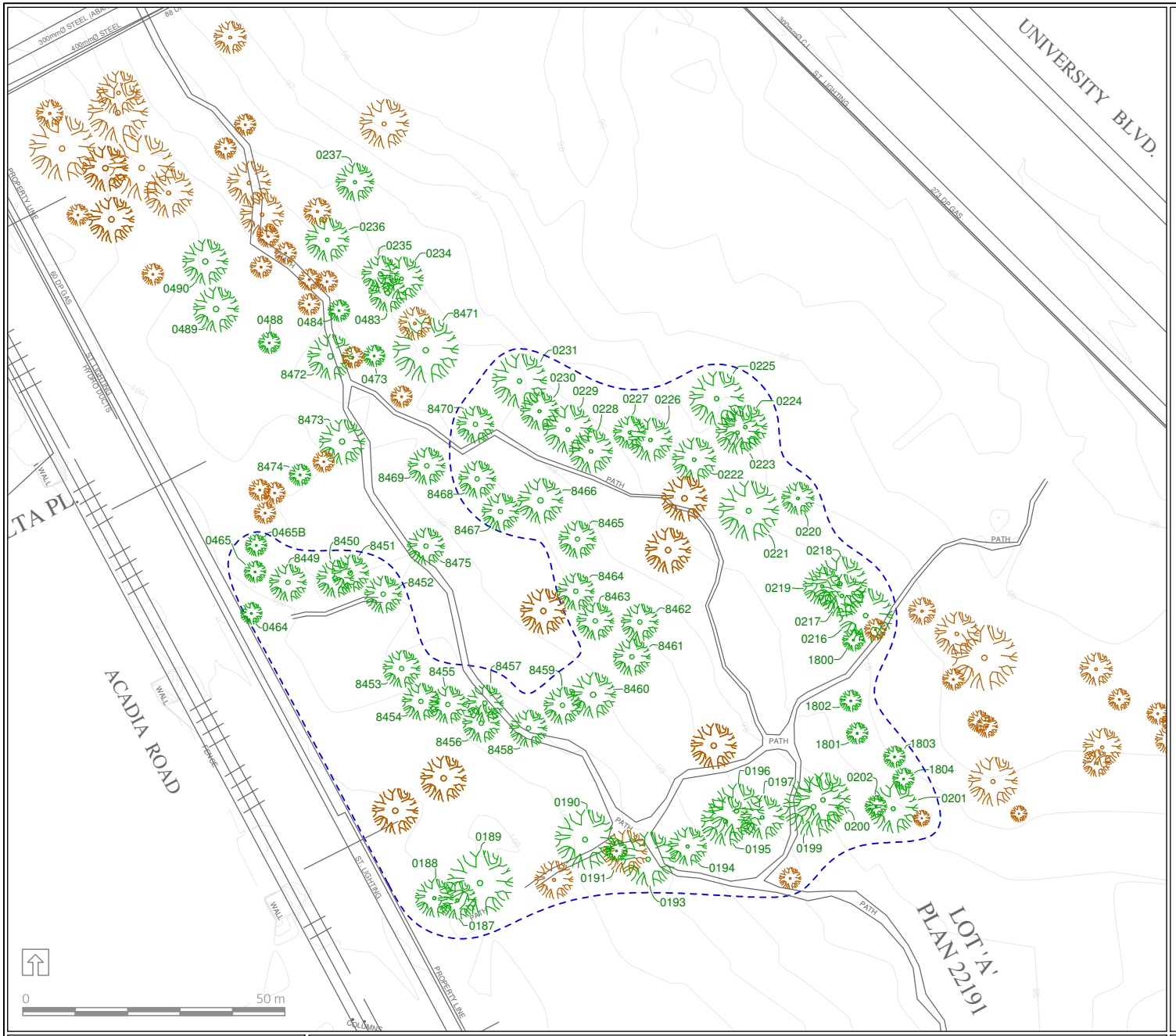
Tag	Species	DBH (cm)	Height (m)	Overall Condition	Comments	Root Protection Zone (m)
0217	*Pseudotsuga menziesii*	65	45*	Good	Dominant healthy tree	5.8
0218	*Pseudotsuga menziesii*	90	37	Good	Dominant healthy tree	8.1
0219	*Tsuga heterophylla*	55	34	Good	Dominant healthy tree, branches primarily found on one side	4.9
0220	*Pseudotsuga menziesii*	45	42	Good	Dominant healthy tree	4.0
0221	*Pseudotsuga menziesii*	95	41	Good	Dominant healthy tree	8.5
0222	*Pseudotsuga menziesii*	75	37	Good	Dominant healthy tree	6.7
0223	*Thuja plicata*	90	28	Fair	Healthy tree with small secondary stem at base, slightly away from main stand	8.1
0224	*Thuja plicata*	65	25	Good	Healthy tree, slightly away from main stand	5.8
0225	*Thuja plicata*	95	27	Good	Healthy well tapered tree, could be retained on its own	8.5
0226	*Pseudotsuga menziesii*	65	32	Good	Healthy tree with a slight stem crook halfway up trunk	5.8
0227	*Pseudotsuga menziesii*	55	33	Good	Healthy tree	4.9
0228	*Pseudotsuga menziesii*	65	46*	Good	Healthy tree leaning into stand	5.8
0229	*Pseudotsuga menziesii*	95	48*	Good	Pronounced sweep in trunk	8.5
0230	*Pseudotsuga menziesii*	75	34	Good	Healthy tree with branches primarily found on one side	6.7
0231	*Pseudotsuga menziesii*	105	43	Excellent	Healthy dominant tree with well-proportioned stem and branches	9.0
8471 (232)	*Pseudotsuga menziesii*	100	47*	Good	Healthy tree with sweep in stem	9.0
0234	*Thuja plicata*	95	35	Good	Healthy tree	8.5
0235	*Pseudotsuga menziesii*	70	40	Good	Healthy tree with sweep in stem	6.3
0236	*Thuja plicata*	65	25	Good	Healthy tree	5.8

Tag	Species	DBH (cm)	Height (m)	Overall Condition	Comments	Root Protection Zone (m)
0237	*Thuja plicata*	50	25	Good	Healthy tree growing away from main stand	4.5
0464	*Pseudotsuga menziesii*	98	39*	Good	Dominant healthy potential new edge tree	5.9
0465	*Pseudotsuga menziesii*	75	34	Good	Dominant healthy potential new edge tree. Slight kink at base	4.5
0465b	*Pseudotsuga menziesii*	133	49*	Excellent	Dominant healthy potential new edge tree	8.0
8474 (469)	*Pseudotsuga menziesii*	101	48*	Good	Dominant healthy tree	6.1
8473 (471)	*Pseudotsuga menziesii*	97	61*	Good	Dominant healthy tree	5.8
0473	*Pseudotsuga menziesii*	97	45	Good	Dominant healthy tree	5.8
8472 (482)	*Pseudotsuga menziesii*	87	47*	Good	Co dominant tree in stand, can be retained alone if spiral pruned	5.2
0483	*Pseudotsuga menziesii*	101	45	Good	Dominant healthy tree	6.1
0484	*Pseudotsuga menziesii*	78	43	Good	Co dominant tree in stand, can be retained alone if spiral pruned	4.7
0488	*Pseudotsuga menziesii*	84	47*	Good	Co dominant well balanced tree, can be retained on its own	5.0
0489	*Pseudotsuga menziesii*	97	46*	Good	Healthy dominant tree with branches evenly disrupted around stem	5.8
0490	*Pseudotsuga menziesii*	98	46*	Good	Healthy dominant tree with branches evenly disrupted around stem	5.9
1800	*Pseudotsuga menziesii*	77	48*	Good	Healthy dominant tree	4.6
1801	*Pseudotsuga menziesii*	91	45	Good	Healthy dominant tree	5.5
1802	*Pseudotsuga menziesii*	106	45	Good	Healthy dominant tree	6.4
1803	*Thuja plicata*	68	32	Good	Intermediate tree in the stand, not a critical windfirm tree but can be incorporated into the new stand edge	4.1
1804	*Pseudotsuga menziesii*	100	45	Good	Healthy dominant tree, may need spiral pruning.	6.0

Tag	Species	DBH (cm)	Height (m)	Overall Condition	Comments	Root Protection Zone (m)
8449	*Pseudotsuga menziesii*	79	32	Good	Three co dominant stems at 10m. Prune off 2 smaller stems	7.1
8450	*Pseudotsuga menziesii*	79	45	Good	Best edge tree in this area	7.1
8451	*Pseudotsuga menziesii*	82	45	Good	Slight sweep in crown in top 20m. Best edge tree in this area	7.4
8452	*Pseudotsuga menziesii*	90	45	Good	Dominant healthy tree	8.1
8453	*Pseudotsuga menziesii*	86	45	Good	Dominant healthy tree	7.7
8454	*Pseudotsuga menziesii*	72	45	Good	Dominant healthy tree	6.5
8455	*Pseudotsuga menziesii*	85	45	Good	Dominant healthy tree	7.6
8456	*Pseudotsuga menziesii*	97	45	Good	Dominant healthy tree	8.7
8457	*Pseudotsuga menziesii*	80	45	Good	On edge of trail	7.2
8458	*Pseudotsuga menziesii*	74	45	Good	On edge of trail	6.7
8459	*Pseudotsuga menziesii*	90	45	Good	Dominant healthy tree	8.1
8460	*Pseudotsuga menziesii*	80	61*	Good	Dominant healthy tree	7.0
8461	*Pseudotsuga menziesii*	82	45	Good	Dominant healthy tree	7.4
8462	*Pseudotsuga menziesii*	84	45	Good	Dominant healthy tree	7.6
8463	*Pseudotsuga menziesii*	80	45	Good	Dominant healthy tree	7.2
8464	*Pseudotsuga menziesii*	62	45	Good	Dominant healthy tree	5.6
8465	*Pseudotsuga menziesii*	102	50	Good	Specimen quality tree	9.2

Tag	Species	DBH (cm)	Height (m)	Overall Condition	Comments	Root Protection Zone (m)
8466	*Pseudotsuga menziesii*	80	46*	Good	Dominant healthy tree	7.2
8467	*Pseudotsuga menziesii*	83	50	Good	Growing as an individual in clearing	7.5
8468	*Pseudotsuga menziesii*	101	50	Good	Specimen quality tree	9.1
8469	*Pseudotsuga menziesii*	97	50	Good	Dominant healthy tree	8.7
8470	*Pseudotsuga menziesii*	70	45	Good	Dominant healthy tree	6.3
8475	*Pseudotsuga menziesii*	103	50	Good	Dominant healthy tree	9.3

*Tree heights measured by R.F. Binnie and Associates Ltd.



LEGEND

- TREE PROTECTION ZONE
- TREE TO BE RETAINED
- TREE TO BE REMOVED

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Drawn by: SH
Page size: 8.5" x 11"

Tree removal and retention summary

The site has been divided into 5 stands based on tree characteristics and the proposed tree retention on site. Stand 1 will retain all mature trees. Stand 2 will retain selected dominant and healthy trees within a cleared park area. Stands 3, 4 and 5 have poor tree retention potential and will be cleared of all trees.

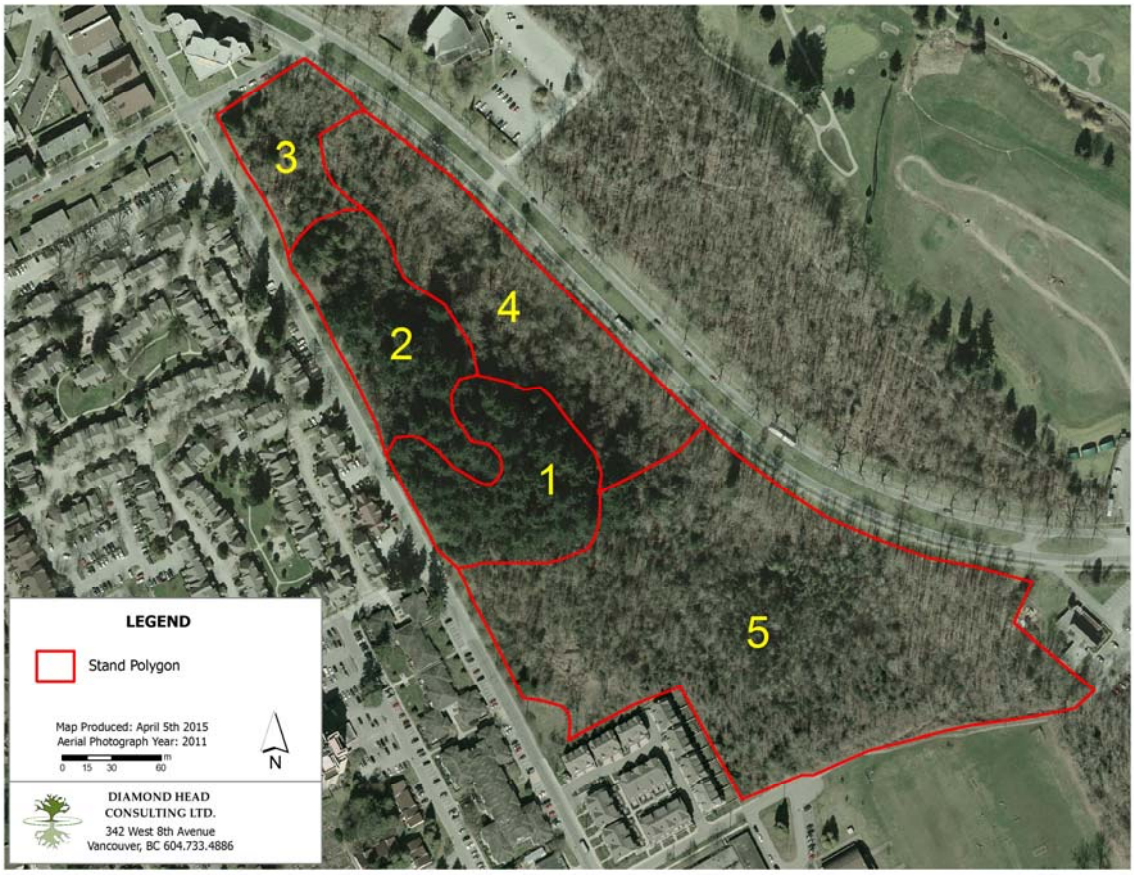

Figure 6. Stand Polygons

Trees greater than 20cm in diameter were visually inventoried across the entire site. A total inventory of trees by species and diameter classes are summarized in table 2. A summary of tree removal and retention is provided in table 3.

Table 2 Summary of trees by species and diameter class for each stand

Tree Species	Diameter range (cm)	Stand 1	Stand 2	Stand 3	Stand 4	Stand 5	Total
Douglas-fir	20-50	23	12				**35**
	50-100	67	48				**115**
	>100	35	8				**43**
Western redcedar	20-50	13	10	4	1	16	**44**
	50-100	14	14	3	1	4	**36**
	>100						**0**
Western hemlock	20-50	5	4	1		3	**13**
	50-100	7	4				**11**
	>100						**0**
Red alder	20-50		19	22	75	470	**586**
	50-100		10	8	6	14	**38**
	>100						**0**
Black cottonwood	20-50				1	45	**46**
	50-100				3	45	**48**
	>100						**0**
Bigleaf maple	20-50			15		3	**18**
	50-100		1	1		1	**3**
	>100						**0**
Cherry	20-50	2		2		20	**24**
	50-100						**0**
	>100						**0**
Total		**166**	**130**	**56**	**87**	**621**	**1060**

Table 3 Summary of trees retention and removal by species and diameter class

Tree Species	Diameter range (cm)	Retain	Remove
Douglas-fir	20-50	23	12
	50-100	79	36
	>100	38	5
Western redcedar	20-50	13	31
	50-100	14	22
	>100		
Western hemlock	20-50	5	8
	50-100	7	4
	>100		
Red alder	20-50		586
	50-100		38
	>100		
Black cottonwood	20-50		46
	50-100		48
	>100		
Bigleaf maple	20-50		18
	50-100		3
	>100		
Cherry	20-50	2	22
	50-100		
	>100		
Total		**181**	**879**

Summary of Recommendations

The most significant stand on the site and the most stable group of trees is the distinct mature conifer stand (#1). This stand includes large healthy and structurally sound Douglas-fir trees that are considered trees of significance in the region. A proposed windfirm boundary has been laid out to retain most of this stand. All trees on the perimeter of this stand have been inventoried as well as an interior edge of trees to allow for a central meadow area. The required root protection zones for all edge trees have been recommended to retain them safely and in good health.

Significant and healthy individual trees have been identified for retention in the clearing area north-west of stand 1. These trees as well as some of the new edge trees along the north-westn edge of stand 1 will require some windfirming treatments. These treatments include thinning and spiral pruning to reduce the risk of them failing in high wind storms. It is recommended that following tree clearing, that the new edges be assessed for hazard trees and to prescribe pruning.

This report summarizes recommendations for tree retention potential on the site. If there are any questions or concerns about any of the material presented in this report, please feel free to contact us at any time.

Sincerely,

Mike Coulthard, R.P.Bio., R.P.F.
Senior Forester, Biologist
Certified Tree Risk Assessor (46)
BC Parks Wildlife and Danger Tree Assessor

Appendix A – Stand Descriptions

The proposed development area has been divided into five distinct stands. In the middle of the site along the western edge, adjacent to Acadia Road, there is a mature conifer stand that provides the best opportunity for safe tree retention. The remainder of the site consists of mostly young to intermediate aged deciduous trees growing on sites with high moisture regimes. With the exception of a number of scattered conifer trees, these other stands provide poor opportunities for safe tree retention. The following is a description of each of the five stands types. Their locations are illustrated in Figure 7.

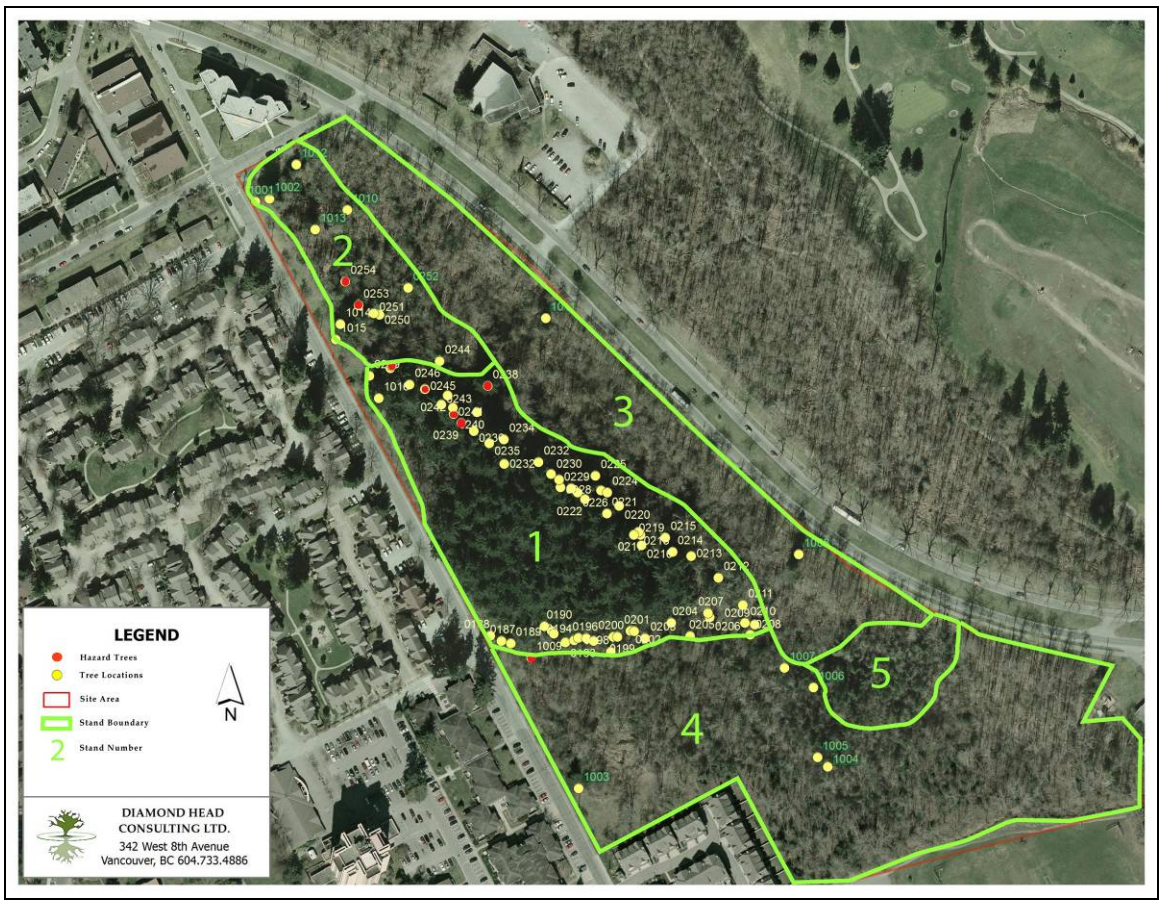

Figure 7. Stand and Tree Inventory

Stand 1

This area supports a mature conifer stand that is much older than the rest of the stands on this property. The dominant tree species includes Douglas-fir (*Pseudotsuga menziesii*), with mixed components of western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*). Many of these trees are of significance in terms of their size. The largest trees include the Douglas-fir which reach diameters of up to 100cm and heights of up to 60m. These dominant trees are growing on a slightly drier site and have reached a height that is well above the trees on the rest of the property. The trees around the perimeter, although still reliant on the stand for support, are considerably more windfirm than the trees found in the middle of the stand. Trees in the middle of this stand have higher height to diameter ratios and rely upon the stand as a whole to withstand oncoming winds. This stand has grown and adapted together and disturbing or removing trees on its parameter will expose less stable trees making tree retention more difficult. This stand provides the best opportunity for tree retention on the site. The trees area healthy and windfirm as a group. If this entire stand cannot be retained in its entirety, the southern portion should be prioritized for retention. This area supports the greatest number of large windfirm trees.

Table 4: Stand #1 characteristics

STAND CHARACTERISTICS					
	Dominant Trees	**Co-Dominant Trees**	**Intermediate Trees**	**Suppressed Trees**	**Regeneration**
Species[1] (% by volume)	-	Fd80% Cw10% Hw10% S+	Fd50% Hw30% Cw20%	Hw60% Cw40%	Cw60% Hw40%
Density (stems/ha)	-	300	150	40	20
Tree Diameter at Breast Height (cm)	-	70	30	10	
Tree Height (m)	-	47	25	6	
Crown closure (%)	45				

[1] Species codes: Act (black cottonwood), Cw (western redcedar), Fd (Douglas-fir), Dr (red alder), Mb (bigleaf maple), Pr (bitter cherry), Ep (paper birch) S(spruce)

Photos 1 and 2 - Stand 1

Stand 2

The stand is growing in the north west portion of the site adjacent to Acadia Road. It consists of a mix of mostly mature Bigleaf Maples (*Acer macrophyllum*) and western redcedar trees. This site is slightly drier than the areqs further to the east. This is a relatively open stand with canopy gaps. There are a number of mature western redcedars growing along the perimeter of the property that are windfirm and provide good opportunity for tree retention. The bigleaf maples generally have structural defects including multiple stems and decay that make them unsuitable for individual tree retention.

This stand provides some opportunity for individual tree retention. Efforts should focus on retaining the mature western redcedars that have been identified around the north and west edges of the stand.

Table 5: Stand #2 characteristics

STAND CHARACTERISTICS					
	Dominant Trees	**Co-Dominant Trees**	**Intermediate Trees**	**Suppressed Trees**	**Regeneration**
Species[1] (% by volume)	-	Mb70% Cw20% Dr10%	Mb50% Cw20% Dr30%	Cw20% Mb80% Bg+	-
Density (stems/ha)	-	100	50	200	-
Tree Diameter at Breast Height (cm)	-	50	25	7	
Tree Height (m)	-	25	17	3	
Crown closure (%)	30				

[1] Species codes: Act (black cottonwood), Cw (western redcedar), Fd (Douglas-fir), Dr (red alder), Mb (bigleaf maple), Pr (bitter cherry), Ep (paper birch)

Photos 3 and 4 - Stand 2

Stand 3

This stand consists of mainly of young to intermediate aged Red Alder (*Alnus rubra*) that are growing in an area with a high water table. There are pools of standing water and wetland plant species that indicate that this area remains wet throughout the year. This stand is open with numerous canopy gaps. Many of the trees are showing signs of stress likely related to the high water table. Many have dead or broken tops. There are very few trees that are suitable for tree retention. The possibility for small group or individual tree retention is further complicated by the changes that the new development will have to the water table.

The trees in this area provide poor opportunities for safe retention.

Table 6: Stand #3 characteristics

STAND CHARACTERISTICS					
	Dominant Trees	**Co-Dominant Trees**	**Intermediate Trees**	**Suppressed Trees**	**Regeneration**
Species[1] (% by volume)	Act100%	Dr100% Act+ Cw+	Dr90% Ep10%	Dr80% Pr10% Ep10%	-
Density (stems/ha)	10	200	100	300	-
Tree Diameter at Breast Height (cm)	80	35	10	8	
Tree Height (m)	35	17	9	3	
Crown closure (%)	20				

[1] Species codes: Act (black cottonwood), Cw (western redcedar), Fd (Douglas-fir), Dr (red alder), Mb (bigleaf maple), Pr (bitter cherry), Ep (paper birch)

Photos 5 and 6 - Stand 3

Stand 4

This stand consists of mainly intermediate aged Black Cottonwood (*Populus trichocarpa*) and Red Alder (*Alnus rubra*). There are scattered mature western redcedar and western hemlock in the main canopy and in the suppressed layer. The stand is moderately dense and many of the trees have high height to diameter ratios. Most of these trees are healthy, however they have grown together as a group relying on each other for structural support. It would be challenging to ensure the stability of these interior trees if they were exposed on their own.

The majority of the trees in this area provide poor opportunities for safe retention. There are however scattered western redcedar trees in this stand that are growing on slightly drier sites and could potentially be retained on their own.

Table 7: Stand #4 characteristics

STAND CHARACTERISTICS					
	Dominant Trees	**Co-Dominant Trees**	**Intermediate Trees**	**Suppressed Trees**	**Regeneration**
Species[1] (% by volume)	-	Act70% Dr30%Hw+ Cw+	Act60%Dr40% Ep+	Dr50% Act30% Cw20% Ep+	Cw100%
Density (stems/ha)	-	400	200	40	10
Tree Diameter at Breast Height (cm)	-	50	25	15	
Tree Height (m)	-	35	25	8	
Crown closure (%)	45				

[1] Species codes: Act (black cottonwood), Cw (western redcedar), Fd (Douglas-fir), Dr (red alder), Mb (bigleaf maple), Pr (bitter cherry), Ep (paper birch)

Photos 7 and 8 - Stand 4

Stand 5

This stand consists of mostly western redcedar that are growing on a wet and nutrient poor site. This stand supports smaller trees that are growing at a higher density compared to adjacent areas. There were large standing pools at the time of assessment. Most cedar trees are healthy however, they have adapted to growing on this wet site and have grown shallow rooting systems. It is expected that this groups may go into decline if the water table were altered by the proposed development. There are not trees of significance in terms of their size and species in this area.

The majority of the trees in this area provide poor opportunities for safe retention.

Table 8: Stand #5 characteristics

STAND CHARACTERISTICS					
	Dominant Trees	**Co-Dominant Trees**	**Intermediate Trees**	**Suppressed Trees**	**Regeneration**
Species[1] (% by volume)	-	Cwt70% Dr10% Act10% Ep10%	Cw70%Ep30%	Cw100%	Cw100%
Density (stems/ha)	-	1200	700	800	10
Tree Diameter at Breast Height (cm)	-	20	10	8	
Tree Height (m)	-	16	9	4	
Crown closure (%)	65				

[1] Species codes: Act (black cottonwood), Cw (western redcedar), Fd (Douglas-fir), Dr (red alder), Mb (bigleaf maple), Pr (bitter cherry), Ep (paper birch)

Photos 9 and 10 - Stand 5

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