



Talbot Mackenzie & Associates

Consulting Arborists

2832 and 2838 Shakespeare St, Victoria

Construction Impact Assessment & Tree Preservation Plan

PREPARED FOR:

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PREPARED BY:

Talbot, Mackenzie & Associates
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TRAQ – Qualified

DATE OF ISSUANCE:

November 2, 2018
(revised November 26th to correct Latin name of species and
add municipal Tree ID numbers)

November 26, 2018: Exploratory excavation
letter

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Jobsite Property: 2832 and 2838 Shakespeare St, Victoria

Date of Site Visit: October 17, 2018

Site Conditions: Municipal boulevard fronting residential lot. No ongoing construction activity.

Summary: The subdivision proposal includes constructing a sidewalk on the Morley Street municipal frontage. If the five municipal trees are to be retained, the sidewalk will have to be raised above the root systems of the trees. The excavation for the services could have a health impact on Red Horse Chestnut NT #2, but we anticipate the tree will recover.

Scope of Assignment:

- Inventory the municipal boulevard trees along the Morley Street frontage
- Review the proposal to subdivide the two properties (through the existing backyards) to create a separate residential lot resulting in a new driveway and services along with frontage improvements including a new sidewalk on the Morley Street frontage
- Comment on how this specific construction activity may impact existing boulevard trees
- Prepare a tree retention and construction damage mitigation plan for those trees deemed suitable to retain given the proposed impacts

Methodology: We visually examined the trees on the boulevard and prepared an inventory in the attached Tree Resource Spreadsheet. Information such as tree species, DBH (1.4m), crown spread, critical root zone (CRZ), health, structure, and relative tolerance to construction impacts were included in the inventory. The trees with their identification numbers (no trees were tagged) were labelled on the attached Site Plan. The conclusions reached were based on the information provided within the attached plans from Java Designs (dated October 1, 2018).

Limitations: The only trees we were requested to assess in this report were the municipal boulevard trees. The areas within the backyards or neighbouring properties have not been inspected to see if any other trees will be impacted by the subdivision.

No exploratory excavations have been requested and thus the conclusions reached are based solely on critical root zone calculations and our best judgement using our experience and expertise. The location, size and density of roots are often difficult to predict without exploratory excavations and therefore the impacts to the trees may be more or less severe than we anticipate.

Summary of Tree Resource: Five municipal trees are located on the Morley St frontage: four Red Horse Chestnuts (NT 1-4, ranging in size between 37 and 45cm DBH) and one Juniper species (NT 5, 57cm DBH).

Trees to be Removed: We do not anticipate any trees will require removal due to the construction related impacts we assessed, if our recommendations are followed and the grade of the sidewalk is raised.

Potential Impacts on Trees to be Retained and Mitigation Measures

- **Sidewalk:** A 1.5m wide sidewalk is proposed along Morley Street frontage directly adjacent to the private property line and approximately one metre away from all five trees. If these trees are to be retained, the construction of the sidewalk must follow the “floating driveway and sidewalk” specifications attached. Large surface roots were observed south of many of the trees in the area that the sidewalk is proposed. Some of the trees also appear to have been planted on raised mounds of soil, which the sidewalk may have to be raised above to avoid severing these roots.

The objective within the attached specifications is to avoid severing the root systems within the sidewalk’s footprint, which would otherwise occur if excavation to suitable bearing soil was required. Instead, the base layers of the sidewalk will have to be raised and built above the significant roots encountered during excavation. This will result in the final grade of the sidewalk being raised above the existing grade. The extent will depend on the thickness of the base layers and paving material. Municipal engineers and project contractors should be informed that typical bearing soil will not be reached and that large areas of the A horizon soil layer (rich in organic material and roots) will be left intact below the sidewalk.

NT #3 is located within one metre of an existing driveway, which the sidewalk will cross. The sidewalk may require a steeper than normal grade at the west edge of the driveway, if roots are encountered in this area and the original grade of the driveway is maintained.

- **Proposed Services: Storm, Sewer and Water Line**

All three services are proposed to be located through the CRZ of Red Horse Chestnut NT #2 (43cm DBH) with the storm drain located the closest (3m from the tree). We anticipate the trench edge will be approximately 2.5m from the trunk of the tree. A significant amount of roots will likely be encountered. A structural impact is unlikely, but this may result in a health impact to the tree with evidence of reduced growth and potentially twig dieback in the years following construction. However, Horse Chestnuts are very tolerant to root loss and construction-related impacts, and therefore we anticipate the tree will survive and likely recover in the long-term. We recommend the services be shifted further west if possible.

An arborist should supervise the excavations for the services and may recommend less invasive digging methods (air-spade, hydro-excavation, hand-digging) if significant roots are encountered that can be retained across the trenches. If conventional excavation is first attempted, we recommend using as narrow a bucket as the installation will allow and that it be equipped with a flat edge.

- **Proposed Driveway:** Red Horse Chestnut NT #1 will be 3 – 3.5m from the edge of the proposed driveway. If significant roots are encountered during excavation, we will recommend the driveway also follow the “floating driveway and sidewalk” specifications attached. Some surface roots will not be able to be retained regardless due to the driveway requiring a slope down to the street. However, we do not anticipate a significant root loss to the tree or that its health or stability will be significantly impacted, especially if other deeper roots are able to be retained below the driveway surface.

To allow water to drain into the root systems below, we may also recommend that the surface be made of a permeable material (instead of conventional asphalt or concrete) such as permeable asphalt, paving stones, or other porous paving materials and designs such as those utilized by Grasspave, Gravelpave, Grasscrete and open-grid systems.

- **Arborist Supervision:** All excavation occurring within the critical root zones of protected trees should be completed under supervision by the project arborist. Any roots encountered must be pruned back to sound tissue to reduce wound surface area and encourage rapid compartmentalization of the wound. In particular, the following activities should be completed under the direction of the project arborist:
 - Sidewalk excavation within the CRZ of all five trees
 - New driveway excavation within the CRZ of NT #1
 - Installation of underground services that cross the CRZ of NT #2
- **Barrier fencing:** The areas surrounding the trees to be retained should be isolated from the construction activity by erecting protective barrier fencing. Where possible, the fencing should be erected at the perimeter of the critical root zones. The barrier fencing must be a minimum of 4 feet in height, of solid frame construction that is attached to wooden or metal posts. A solid board or rail must run between the posts at the top and the bottom of the fencing. This solid frame can then be covered with plywood, or flexible snow fencing. The fencing must be erected prior to the start of any construction activity on site (i.e. demolition, excavation, construction), and remain in place through completion of the project. Signs should be posted around the protection zone to declare it off limits to all construction related activity. The project arborist must be consulted before this fencing is removed or moved for any purpose.
- **Minimizing Soil Compaction:** In areas where construction traffic must encroach into the critical root zones of trees to be retained, efforts must be made to reduce soil compaction where possible by displacing the weight of machinery and foot traffic. This can be achieved by one of the following methods:
 - Installing a layer of hog fuel or coarse wood chips at least 20 cm in depth and maintaining it in good condition until construction is complete.
 - Placing medium weight geotextile cloth over the area to be used and installing a layer of crushed rock to a depth of 15 cm over top.
 - Placing two layers of 19mm plywood.
 - Placing steel plates.

- **Mulching:** Mulching can be an important proactive step in maintaining the health of trees and mitigating construction related impacts and overall stress. Mulch should be made from a natural material such as wood chips or bark pieces and be 5-8cm deep. No mulch should be touching the trunk of the tree. See “methods to avoid soil compaction” if the area is to have heavy traffic.
- **Blasting:** Care must be taken to ensure that the area of blasting does not extend beyond the necessary footprints and into the critical root zones of surrounding trees. The use of small low-concussion charges and multiple small charges designed to pre-shear the rock face will reduce fracturing, ground vibration, and overall impact on the surrounding environment. Only explosives of low phytotoxicity and techniques that minimize tree damage should be used. Provisions must be made to ensure that blasted rock and debris are stored away from the critical root zones of trees.
- **Landscaping and Irrigation Systems:** The planting of new trees and shrubs should not damage the roots of retained trees. The installation of any in-ground irrigation system must take into account the critical root zones of the trees to be retained. Prior to installation, we recommend the irrigation technician consult with the project arborist about the most suitable locations for the irrigation lines and how best to mitigate the impacts on the trees to be retained. This may require the project arborist supervise the excavations associated with installing the irrigation system. Excessive frequent irrigation and irrigation which wets the trunks of trees can have a detrimental impact on tree health and can lead to root and trunk decay.
- **Arborist Role:** It is the responsibility of the client or his/her representative to contact the project arborist for the purpose of:
 - Locating the barrier fencing
 - Reviewing the report with the project foreman or site supervisor
 - Locating work zones, where required
 - Supervising any excavation within the critical root zones of trees to be retained
 - Reviewing and advising of any pruning requirements for machine clearances
- **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 site clearing, tree removal, demolition, or other construction activity occurs and to confirm the locations of the tree protection barrier fencing.

Please do not hesitate to call us at (250) 479-8733 should you have any further questions. Thank you.

Yours truly,



Michael Marcucci
ISA Certified # ON-1943A
TRAQ – Qualified

Talbot Mackenzie & Associates
ISA Certified Consulting Arborists

Encl. 1-page tree resource spreadsheet, 1-page site plan with trees and fencing, 1-page floating driveway and sidewalk specifications, 1-page fencing specifications, 2-page tree resource spreadsheet methodology and definitions

Disclosure Statement

Arborists are professionals who examine trees and use their training, knowledge and experience to recommend techniques and procedures that will improve their 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. It is not possible for an Arborist to identify every flaw or condition that could result in failure or can he/she guarantee that the tree will remain healthy and free of risk.

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.

Tree ID (municipal ID# in brackets)	Common Name	Latin Name	DBH (cm) ~ approximate	Crown Spread (m)	CRZ (m)	Relative Tolerance	Health	Structure	Remarks and Recommendations	Retention Status
NT 1 (23056)	Red Horse Chestnut	<i>Aesculus x carnea</i>	45.0	13.0	4.5	Good	Fair	Fair/poor	Municipal. Large burl at base. Cavity in decayed pruning wound in trunk. Significantly V-pruned for utility line clearance. 2.3m west of fence line (roughly in line with other trees)	Retain
NT 2 (23198)	Red Horse Chestnut	<i>Aesculus x carnea</i>	43.0	13.0	4.5	Good	Fair	Fair/poor	Municipal. V-pruned for utility line clearance. Some small decayed pruning wounds.	Retain
NT 3 (23055)	Red Horse Chestnut	<i>Aesculus x carnea</i>	37.0	13.0	4.0	Good	Fair	Fair/poor	Municipal. Significantly V-pruned for utility line clearance.	Retain
NT 4 (23054)	Red Horse Chestnut	<i>Aesculus x carnea</i>	41.0	13.0	4.0	Good	Fair	Fair/poor	Municipal. V-pruned for utility line clearance. Exposed and damaged surface roots south of tree with potential bedrock visible in same area indicating potentially limited soil volume.	Retain
NT 5	Juniper	<i>Juniperus spp</i>	57.0	9.0	7.0	Fair	Fair	Fair	Municipal. Some pruning for utility line clearance.	Retain

Prepared by:

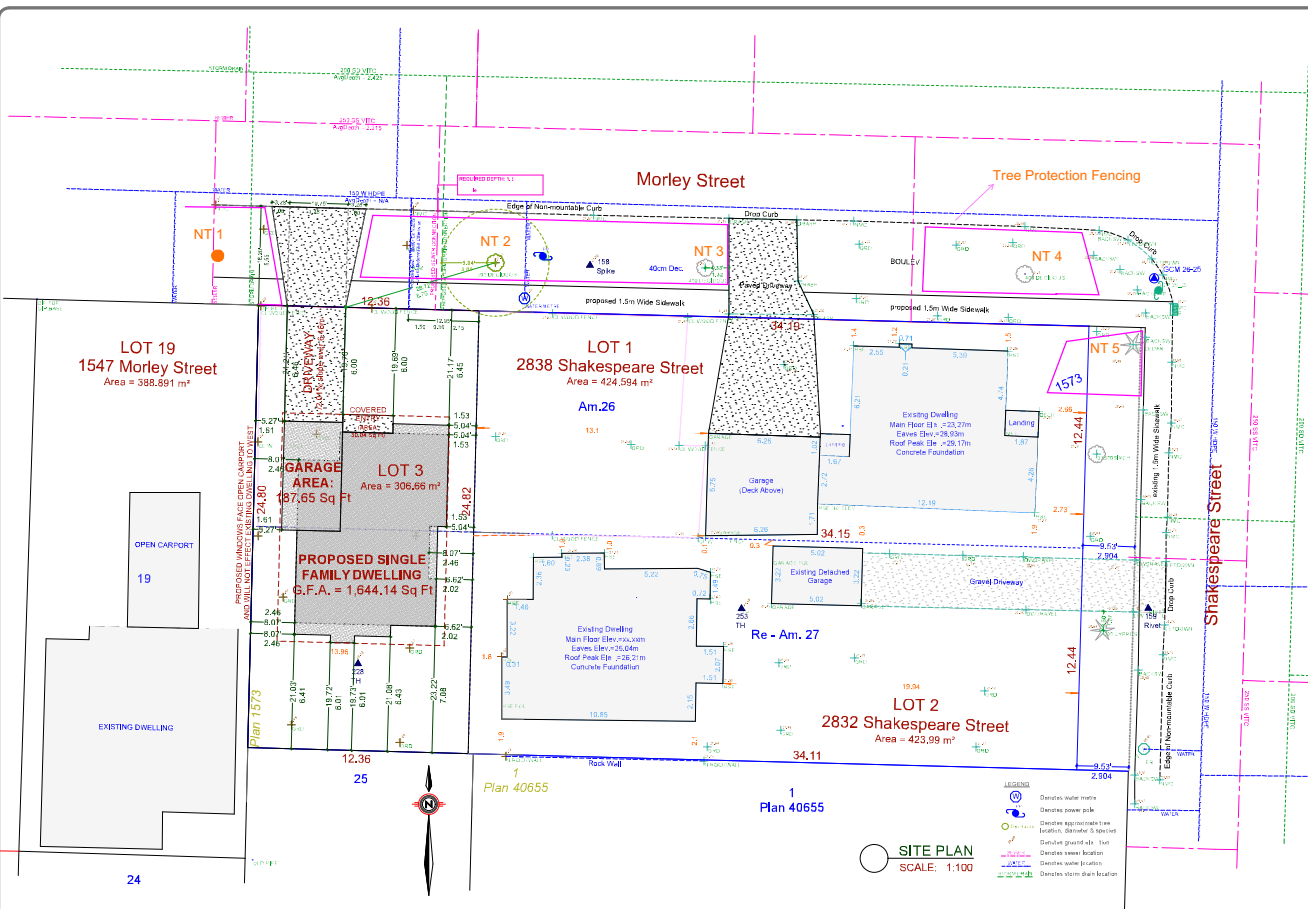
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Market Data for the Top 10 Stocks in the S&P 500			
Stock	Current Price	52-Week High	52-Week Low
Apple	\$175.00	\$180.00	\$160.00
Microsoft	\$340.00	\$350.00	\$320.00
Amazon	\$3,200.00	\$3,300.00	\$3,000.00
Google	\$2,800.00	\$2,900.00	\$2,700.00
Facebook	\$250.00	\$260.00	\$240.00
Twitter	\$55.00	\$60.00	\$50.00
Netflix	\$450.00	\$460.00	\$440.00
Alphabet	\$2,900.00	\$3,000.00	\$2,800.00
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IBM	\$160.00	\$170.00	\$150.00
Oracle	\$70.00	\$75.00	\$65.00
LinkedIn	\$280.00	\$290.00	\$270.00
Slack	\$120.00	\$130.00	\$110.00
Zoom	\$180.00	\$190.00	\$170.00
Dropbox	\$90.00	\$100.00	\$80.00
Twitter	\$55.00	\$60.00	\$50.00
Netflix	\$450.00	\$460.00	\$440.00
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Dropbox	\$90.00	\$100.00	\$80.00
Twitter	\$55.00	\$60.00	\$50.00
Netflix	\$450.00		

NAFS REQUIREMENTS:
Performance Grade of 30
Water Test Pressure of 260 P

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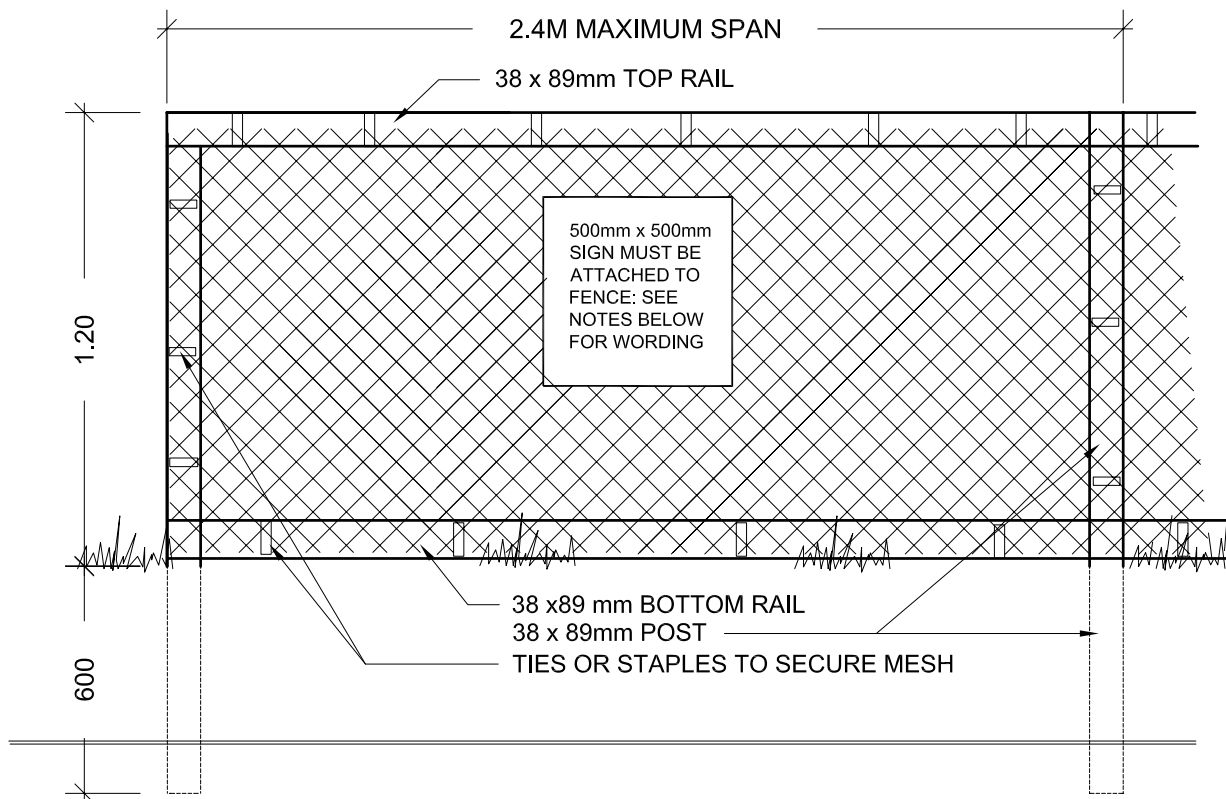
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1. 在下列各题中, 指出下列命题的真假, 并说明理由: (1) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x + y = 0$ (2) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x + y = 0$ (3) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x + y = 0$ (4) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x + y = 0$ (5) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x - y = 0$ (6) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x - y = 0$ (7) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x - y = 0$ (8) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x - y = 0$ (9) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x \cdot y = 0$ (10) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x \cdot y = 0$ (11) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x \cdot y = 0$ (12) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x \cdot y = 0$ (13) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x / y = 0$ (14) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x / y = 0$ (15) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x / y = 0$ (16) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x / y = 0$	2. 在下列各题中, 指出下列命题的真假, 并说明理由: (1) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 + y^2 = 0$ (2) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 + y^2 = 0$ (3) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 + y^2 = 0$ (4) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 + y^2 = 0$ (5) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 - y^2 = 0$ (6) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 - y^2 = 0$ (7) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 - y^2 = 0$ (8) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 - y^2 = 0$ (9) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 \cdot y = 0$ (10) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 \cdot y = 0$ (11) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 \cdot y = 0$ (12) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 \cdot y = 0$ (13) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 / y = 0$ (14) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 / y = 0$ (15) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 / y = 0$ (16) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 / y = 0$	3. 在下列各题中, 指出下列命题的真假, 并说明理由: (1) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 + y^2 = 1$ (2) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 + y^2 = 1$ (3) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 + y^2 = 1$ (4) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 + y^2 = 1$ (5) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 - y^2 = 1$ (6) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 - y^2 = 1$ (7) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 - y^2 = 1$ (8) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 - y^2 = 1$ (9) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 \cdot y = 1$ (10) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 \cdot y = 1$ (11) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 \cdot y = 1$ (12) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 \cdot y = 1$ (13) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 / y = 1$ (14) $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 / y = 1$ (15) $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x^2 / y = 1$ (16) $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x^2 / y = 1$
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TREE PROTECTION FENCING

NOTES:

1. FENCE WILL BE CONTRUCTED USING 38 X 89 mm (2"X4") WOOD FRAME: TOP, BOTTOM AND POSTS. *
USE ORANGE SNOW-FENCING MESH AND SECURE TO THE WOOD FRAME WITH "ZIP" TIES OR GALVANZIED STAPLES.
2. ATTACH A 500mm x 500mm SIGN WITH THE FOLLOWING WORDING:
WARNING-HABITAT PROTECTION AREA. THIS SIGN MUST BE AFFIXED ON EVERY FENCE FACE OR AT LEAST EVERY 10 LINEAR METRES.

* IN ROCKY AREAS, METAL POSTS (T-BAR OR REBAR) DRILLED INTO ROCK WILL BE ACCEPTED

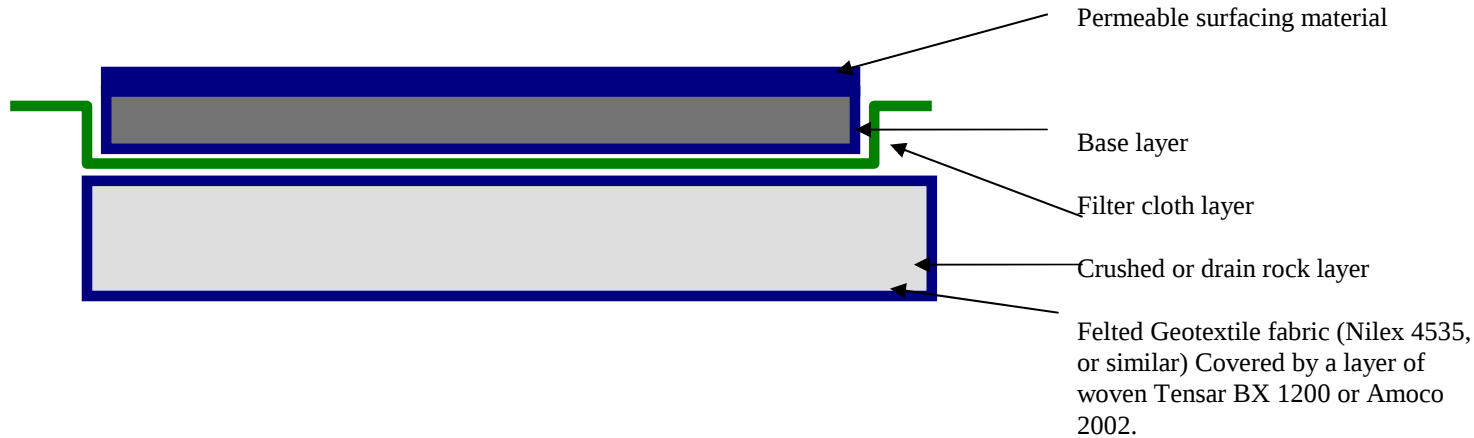


DETAIL NAME: **TREE PROTECTION FENCING**

H:\shared\parks\Tree Protection Fencing.pdf

DATE: March/08
DRAWN: DM
APP'D. RR
SCALE: N.T.S.

Diagram – Site Specific Floating Driveway, Parking and Sidewalk Areas



Specifications for Floating Driveway and Parking Areas

1. Excavation for driveway or parking area construction must remove the sod layer only, where they encroach on the root zones of the protected trees
2. A layer of medium weight felted Geotextile fabric (Nilex 4535, or similar) is to be installed over the entire area of the critical root zone that is to be covered by the paving. Cover this Geotextile fabric with a layer of woven Amoco 2002 or Tensar BX 1200. Each piece of fabric must overlap the adjoining piece by approximately 30-cm.
3. A 10cm layer of torpedo rock, or 20-mm clean crushed drain rock, is to be used to cover the Geotextile fabric.
4. A layer of felted filter fabric is to be installed over the crushed rock layer to prevent fine particles of sand and soil from infiltrating this layer.
5. The bedding or base layer and permeable surfacing can be installed directly on top of the Geotextile fabric.



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Consulting Arborists

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Ph: (250) 479-8733

Fax: (250) 479-7050

Email: tmtreehelp@gmail.com

Tree Resource Spreadsheet Methodology and Definitions

Tag: Tree identification number on a metal tag attached to tree with nail or wire, generally at eye level. Trees on municipal or neighboring properties are not tagged.

NT: No tag due to inaccessibility or ownership by municipality or neighbour.

DBH: Diameter at breast height – diameter of trunk, measured in centimetres at 1.4m above ground level. For trees on a slope, it is taken at the average point between the high and low side of the slope.

* Measured over ivy

~ Approximate due to inaccessibility or on neighbouring property

Crown Spread: Indicates the diameter of the crown spread measured in metres to the dripline of the longest limbs.

Relative Tolerance Rating: Relative tolerance of the tree species to construction related impacts such as root pruning, crown pruning, soil compaction, hydrology changes, grade changes, and other soil disturbance. This rating does not take into account individual tree characteristics, such as health and vigour. Three ratings are assigned based on our knowledge and experience with the tree species: Poor, Moderate or Good.

Critical Root Zone: A calculated radial measurement in metres from the trunk of the tree. It is the optimal size of tree protection zone and is calculated by multiplying the DBH of the tree by 10, 12 or 15 depending on the tree's Relative Tolerance Rating. This methodology is based on the methodology used by Nelda Matheny and James R. Clark in their book "Trees and Development: A Technical Guide to Preservation of Trees During Land Development."

- 15 x DBH = Poor Tolerance of Construction
- 12 x DBH = Moderate
- 10 x DBH = Good

To calculate the critical root zone, the DBH of multiple stems is considered the sum of 100% of the diameter of the largest stem and 60% of the diameter of the next two largest stems. It should be noted that these measures are solely mathematical calculations that do not consider factors such as soil volume restrictions, age, crown spread, health, or structure (such as a lean).

Health Condition:

- Poor - significant signs of visible stress and/or decline that threaten the long-term survival of the specimen
- Fair - signs of stress
- Good - no visible signs of significant stress and/or only minor aesthetic issues

Structural Condition:

- Poor - Structural defects that have been in place for a long period of time to the point that mitigation measures are limited
- Fair - Structural concerns that are possible to mitigate through pruning
- Good - No visible or only minor structural flaws that require no to very little pruning

Retention Status:

- X - Not possible to retain given proposed construction plans
- Retain - It is possible to retain this tree in the long-term given the proposed plans and information available. This is assuming our **recommended mitigation measures are followed**
- Retain * - See report for more information regarding potential impacts
- TBD (To Be Determined) - The impacts on the tree could be significant. However, in the absence of exploratory excavations and in an effort to retain as many trees as possible, we recommend that the final determination be made by the supervising project arborist at the time of excavation. The tree might be possible to retain depending on the location of roots and the resulting impacts, but concerned parties should be aware that the tree may require removal.
- NS - Not suitable to retain due to health or structural concerns