



DEVELOPMENT PERMIT

NO. DP- 2018-11 (Aquifer)

TO: **Trulli Developments Ltd.
c/o Bradbury Architecture**

ADDRESS: **350-440 W Hastings St
Vancouver, BC, V6B 1L1
(Permittee)**

1) This Development Permit is issued subject to compliance with all of the Bylaws of the Town of Gibsons applicable thereto, except those specifically varied or supplemented by this Permit.

2) The Development Permit applies to those "lands" within the Town of Gibsons described below:

Parcel Identifier: 009-777-482

Legal Description: Lot 20, Block C, District Lot 686, Plan 6125

**Civic Address: Lot 20 South Fletcher Road
(Lands)**

3) These lands are within Development Permit Area No. 9 for the purpose of the protection of the Gibsons Aquifer.

4) The "lands" described herein shall be developed strictly in accordance with the terms and conditions and provisions of this Permit, and any plans, reports, and specifications attached to and forming part of this Permit; specifically:

- Letter completed by Waterline, dated March 5, 2019, *RE: Drilling Permit Application Review for 20 South Fletcher Road, Gibsons, BC*, signed by Simon Wing, B.Sc., P.Geo., Hydrologist and Scott Green, P. Eng., Senior Hydrologist.
- Report Completed by Geopacific, dated February 19, 2019, titled *Groundwater Investigation: Multifamily Development: Lot 20 South Fletcher Road, Gibsons BC* stamped by Matt Kokan, M. Sc, P. Eng., Principal on February 19, 2019.
- Report completed by Waterline, dated June 29, 2016, titled *Phase 1 Aquifer Assessment for South Fletcher Road Lot 20*, stamped by Dalton Pajak, B. Sc., P. Geo, Hydrogeologist on June 29, 2017.
- Letter completed by Geopacific, titled *Geotechnical Confirmation – Proposed Residential Development Lot 20 South Fletcher Road, Gibsons, BC*, stamped by Marian Letavay, M.Sc., P.Eng, Senior Project Engineer on November 14, 2018.
- Report Completed by Geopacific, dated December 1, 2017, titled *Geotechnical Investigation Report – Proposed Residential Development, Lot 20 South Fletcher Road, Gibsons BC* stamped by John Carter, M. Eng, P. Eng., Principal on December 5, 2017.

- 5) A minimum of 48-hours' notice prior to commencing excavation or drilling is to be provided to the Director of Infrastructure Services.
- 6) This permit and the attached letters and reports shall be forwarded to all members of the project team.
- 7) Prior to and while undertaking any drilling and/or excavation activities, the following mitigative measures for controlling artesian conditions must be undertaken:
 - (a) Regardless of whether artesian conditions are intersected at the proposed boreholes, the Applicant shall install larger diameter surface casing prior to proceeding with the Sonic drilling. Rationale for the surface casing is to provide means for controlling flowing conditions, if the flowing aquifer is intersected by the Sonic borehole; Drilling to the depth of the pressurized aquifer followed by removal of the Sonic core barrel without any surface casing in place will exacerbate erosion potential, and severely limit options for controlling flow;
 - (b) Ensure that artesian flow (expected range of 45 to 203 m³/day) can be diverted to the nearest stormwater outfall system if required. This requires that equipment necessary to do so, be on-hand if artesian flows are encountered. Groundwater pressures in the Lower Gibsons Aquifer have been recorded to be as high as 7 psi;
 - (c) If flowing conditions are encountered, in addition to having Barite on-site as suggested by the Applicants, the driller shall also have a mechanical packer on-site in order to seal off any upward flow and allow grout to set following intersection of artesian conditions;
 - (d) The applicant shall confirm that the contracted driller on-site is a BC Qualified Well Driller having experience at closing flowing artesian wells;
 - (e) Confirm that construction of the proposed development does not exceed the deepest test hole depth elevation; and
 - (f) Update the JHA to include mitigative measures for potential spills associated with the activities being proposed.
- 8) Monitoring wells, boreholes, test pits, or other excavations shall not extend into the Gibsons Aquitard or the Gibsons Aquifer. If the aquitard is encountered, the driller is to notify the Director of Infrastructure Services before proceeding further. Additional requirements may be imposed.
- 9) All requirements of the program are to be followed. On-site monitoring by a qualified professional during all excavations and foundation preparation is required.
- 10) Construction of the proposed development shall not exceed the deepest test hole depth.
- 11) Minor changes to the aforesaid program that do not affect the intent of this Development Permit are permitted only with the approval of the Town of Gibsons and a qualified professional.

- 12) If the Permittee does not commence the development permitted by this Permit within twenty-four months of the date of this Permit, this Permit shall lapse.
- 13) Upon completion of the works, a letter from a qualified professional is required to provide all drill well logs and to ensure all conditions of this permit were met.
- 14) This Permit is NOT a Building Permit.

ISSUED THIS 21 DAY OF March, 2019.



Dave Newman, AScT
Director of Infrastructure Services

for

Lesley-Ann Staats, MCIP, RPP
Director of Planning

Copy of permit to owner.



2430 Jingle Pot Rd
Nanaimo, British Columbia
Canada V9R 6W2
Tel: 250.585.0800
Toll Free: 1.888.585.0802
www.waterlineresources.com

March 05, 2019
1578-19-001

Town of Gibsons
474 South Fletcher Rd
Box 340, Gibsons, BC

Attention: Lesley-Ann Staats (Director of Planning)

Dear Ms. Staats,

RE: Drilling Permit Application Review for 20 South Fletcher Road, Gibsons BC

1.0 INTRODUCTION

The Town of Gibsons (the Town) has requested that Waterline review a drilling permit application (the Application) submitted to the Town by Geopacific Consultants Ltd. (Geopacific) on behalf of Trulli Developments. (Trulli; the Applicants). The Application is for geotechnical drilling at 20 South Fletcher Road (Land Parcel Identification No. 009777482; the Site [Figure 1]) in accordance with the guidelines in Section 16.10 of the Town's Official Community Plan (OCP; Town of Gibsons 2015). The purpose of the geotechnical drilling is to delineate the subsurface sediments prior to excavation and construction of a residential development complex. The drilling program indicates that two test holes (MW19-01 to MW19-02) will be completed in 2019.

2.0 BACKGROUND

The sustainability of the Gibsons Aquifer (provincially mapped aquifer 554; MOE 2017) is important for the Town and the local ecosystem, as stated in the OCP (Town of Gibsons 2015). The Gibsons Aquifer is outlined in the development permit area No.9 (DPA9) included as Schedule F of the OCP (Town of Gibsons 2015). Within this area, Lower Gibsons overlies a pressurized flowing artesian aquifer having the capacity to cause significant erosion if appropriate precautions are not taken when drilling in this area. As such the permit application process for all construction activities (including multi-family housing, industrial, commercial and institutional construction) within the Lower Gibsons subarea requires that applicants identify all hazards and propose mitigative measures for potential environmental impacts related to intercepting the aquifer and controlling flow at the surface.



The Application indicated that drilling of test holes will be completed using a Sonic drill rig. The subsurface geotechnical work will take place at both the western and eastern ends of the Site (Appendix A). The following provides a summary of the main considerations relevant to DPA9:

- The Site Plan (Appendix A) shows that both test holes (MW19-01 and MW19-02) are within the Lower Gibsons Aquifer subarea;
- The deepest depth of investigation for the test holes is 5 metres below ground level (mbgl). Details of the test hole depths and ground elevations are provided in Table 1;
- The Applicants have indicated they believe the potential for breaching the Gibsons Aquifer and encountering flowing conditions is low but are proposing to install casing for each test hole;
- No previous drilling or geotechnical investigations have been completed below 1.5 m depth at the Site, therefore, the Applicants have inferred ground conditions based on surrounding wells within the Gibsons Aquifer that were discussed in a Phase 1 desktop review (Waterline 2016; available literature);
- The Applicants have put forward a series of procedures and mitigative measures to deal with the potential for flowing artesian conditions; and
- The Applicants have outlined the roles and responsibilities for all parties involved, including a job hazard analysis (JHA) for completing the Sonic drilling in a safe manor.

Table1: Depth of Investigation for Proposed Test Hole Locations

Test Hole / Test Pit ID	Proposed Depth of Investigation (mbgl)*	Approximate Ground Elevation* (masl)	Elevation at Depth of Investigation (masl)
MW19-01	5	28	23
MW19-02	5	29	24

Notes: **mbgl** refers to as metres below ground level; **masl** refers to as metres above sea level; * indicates that all depths have been estimated based on available public data

3.0 REVIEW

Waterline has reviewed all the data provided by the Applicants and compared the findings with the requirements of the Town's OCP, the aquifer mapping study completed in 2013 (Waterline 2013) and the Phase 1 study (Waterline 2016). Based on the review:

- The Vashon Till (aquitard) overlies the Pre-Vashon (Gibsons Aquifer) at the Site;
- The elevation of the Site ranges from 34 to 25 metres above sea level (masl);
- The well records for Town Well #4 (Well Tag Number 33950; Figure 1), the closest water well, indicate that the aquitard thickness could be 8 m. This equates to a top of aquifer elevation of 5 masl;
- The inferred piezometric surface for the Gibsons Aquifer (level to which groundwater in a confined aquifer would rise if pierced by subsurface exploration activities), indicates that the groundwater level at the Site (Figure 1) could range from 17 to 19 masl (Waterline 2013);



- As such, the depth of investigation for the deepest proposed test hole (23 masl for MW19-01) would be 18 m higher than the top of the Gibsons Aquifer (based on the logs from the closest town well) and 4 m higher than the top of the mapped piezometric surface;
- The deepest construction depth for the proposed development was noted to be 3.3 mbgl but was not referenced in the any Site plan to indicate where this potential excavation would take place (highest ground elevation or lowest ground elevation); and
- The Applicant's letter suggests that they would install surface casing after flowing artesian conditions are encountered by the Sonic borehole.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The findings from the Application review for geotechnical drilling suggest that the Applicants have considered the hazards associated with the Gibsons Aquifer DPA9 and, more specifically, the potential hazards of the Lower Gibsons subarea. Despite all indications that the Gibsons Aquifer will not be intersected by geotechnical activities, Waterline suggests that the following mitigative measures for controlling artesian conditions be added or discussed with the Applicants prior to undertaking any drilling or excavation activities:

1. Regardless of whether artesian conditions are intersected at the proposed boreholes, the Applicant should install larger diameter surface casing prior to proceeding with the Sonic drilling. Rationale for the surface casing is to provide means for controlling flowing conditions, if the flowing aquifer is intersected by the Sonic borehole; Drilling to the depth of the pressurized aquifer followed by removal of the Sonic core barrel without any surface casing in place will exacerbate erosion potential, and severely limit options for controlling flow.;
2. Ensure that artesian flow (expected range of 45 to 203 m³/day) can be diverted to the nearest stormwater outfall system if required. This requires that equipment necessary to do so, be on-hand if artesian flows are encountered. Groundwater pressures in the Lower Gibsons Aquifer have been recorded to be as high as 7 psi;
3. If flowing conditions are encountered, in addition to having Barite on-site as suggested by the Applicants, the driller should also have a mechanical packer on-site in order to seal off any upward flow and allow grout to set following intersection of artesian conditions;
4. The applicant should confirm that the contracted driller on-site is a BC Qualified Well Driller having experience at closing flowing artesian wells;
5. Confirm that construction of the proposed development does not exceed the deepest test hole depth elevation; and
6. Update the JHA to include mitigative measures for potential spills associated with the activities being proposed.

5.0 CERTIFICATION

This document was prepared under the direction of a professional geologist, geoscientist or engineer registered in the Province of British Columbia.

Waterline Resources Inc. trusts that the information provided in this document is sufficient for your requirements. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Respectfully submitted,

Waterline Resources Inc.

Reviewed By:



Simon Wing, B.Sc., P.Geo.
Hydrogeologist



Scott Green, P.Eng.
Senior Hydrogeologist

6.0 REFERENCES

Government of BC Ministry of Environment - Water Protection and Sustainability, 2017, (MOE 2017). Ground Water Aquifers. <https://catalogue.data.gov.bc.ca/dataset/ground-water-aquifers>. Accessed January 2018.

Town of Gibsons, 2015. SMART PLAN – Gibsons Official Community Plan (Schedule A:” Town of Gibsons Official Community Plan Bylaw No. 985, 2005”). Published for the Town of Gibsons March 2015.

Waterline, 2013. Technical Assessment: Aquifer Mapping Study, Town of Gibsons, British Columbia. Submitted to the Town of Gibsons May 13, 2013.

Waterline, 2016. Phase 1 Aquifer Assessment for 20 South Fletcher Road Lot 20 Gibsons, British Columbia. Submitted to Mirabeau Holdings Ltd., June 29, 2016.

7.0 LIMITATION AND USE

The information presented in this document was compiled exclusively for the Town of Gibsons (the Client) by Waterline Resources Inc. (Waterline). This work was completed in accordance with the scope of work for this project that was agreed between Waterline and the Client. Waterline exercised reasonable skill, care and diligence to assess the information acquired during the preparation of this document but makes no guarantees or warranties as to the accuracy or completeness of this information. The information contained in this document is based upon, and limited by, the circumstances and conditions acknowledged herein, and upon information available at the time of the preparation of this document. Any information provided by others is believed to be accurate but cannot be guaranteed. No other warranty, expressed or implied, is made as to the professional services provided to the Client.

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FIGURES

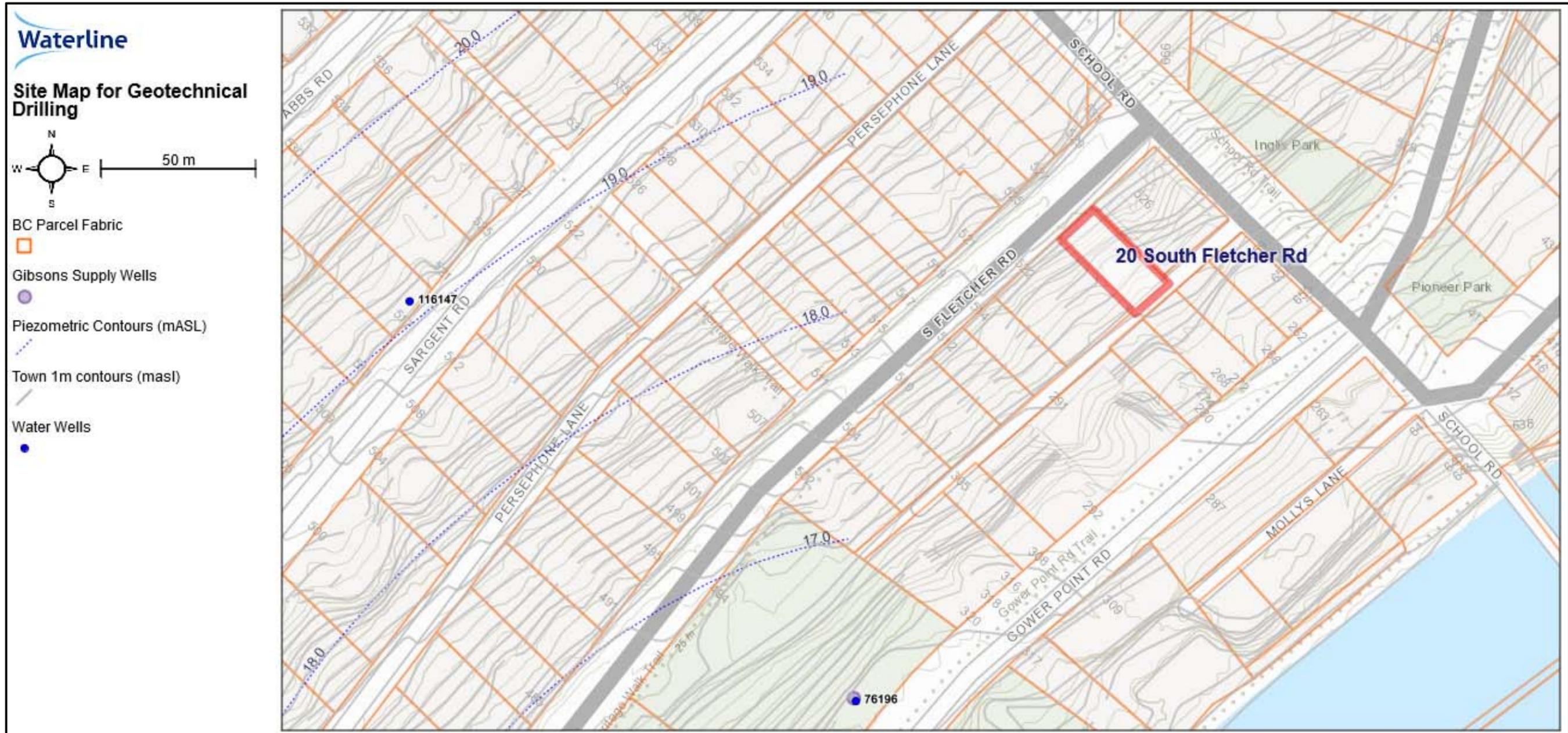


Figure 1: Site Location Map for 20 South Fletcher Road Gibsons, BC

APPENDIX A

Geopacific Consultants Ltd. Site Map – Proposed Test Hole Locations





SITE PLAN

SCALE = 1:800

LEGEND:

◇ MW19-# - MONITORING WELL (MW) LOCATION

LOCATIONS ARE APPROXIMATE

REFERENCE:

GOOGLE EARTH PRO



GEOPACIFIC
VANCOUVER KAMLOOBS CALGARY

1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9187

DATE: JANUARY 29TH, 2019

DRAWN BY: N.S	APPROVED BY: N.S	REVIEWED BY: N.S
------------------	---------------------	---------------------

SCALE: AS SHOWN

GEOTECHNICAL INVESTIGATION
LOT 20 SOUTH FLETCHER RD, GIBSONS, BC
TEST HOLE LOCATION PLAN

FILE NO.: **15620-GW**

DWG. NO.: **15620-GW-01**

REVISIONS:

A.
B.
C.

Town of Gibsons

February 19th, 2019
File 15620_GW

Attention: Lesley-Ann Staats, MCIP, RPP
Director of Planning

**Groundwater Investigation: Multifamily Development
Lot 20 South Fletcher Road, Gibsons, BC.**

Trulli Developments Ltd. is planning to re-development the above-mentioned site within the Town of Gibsons. Based on architectural drawings provided by Bradbury Architecture, dated November 2018, the underground parking of the proposed development will extend to a maximum depth of approximately 3.3 m below ground surface.

The Gibsons Aquifer underlies the site and is protected under the Development Permit Area 9 guideline (DPA 9). A Phase 1 Aquifer Assessment was previously completed by Waterline Resources Inc (Waterline). The assessment recommends further site investigation if ground disturbance exceeds 1.5m depth in order to confirm the hydrogeological conditions on site. GeoPacific proposes the following Hydrogeological Investigation in response.

We will mobilize a sonic drill rig to complete the investigation. We will drill 2 boreholes on site to depths of 5 m to confirm soil conditions on site and to confirm that the Gibsons aquifer will not be breached during excavation. We will install data loggers to monitor groundwater levels. A siteplan of the proposed test hole locations has been provided following this covering letter as Drawing No 15620-GW-01.

We believe that the potential for breaching the Gibsons Aquifer and encountering flowing conditions during our investigation is low, considering the proposed depth of investigation is shallower than the mapped Gibsons Aquifer. As such, we are still proposing to install casing for the test hole drilling to mitigate any risks.

No previous drilling or geotechnical investigations have been completed at the Site, therefore, we have inferred ground conditions based on available literature.

Perceived risks are as follows:

- Uncontrolled artesian flow if aquitard confining the Gibson's Aquifer is breached
- Possible sink hole development if artesian flow is left unattended/flow is not mitigated
- Possible impact on water wells in Town of Gibsons if aquifer is breached
- Potential loss of aquifer pressures if aquifer is breached and not sealed properly

If the aquifer soil (coarse grained sand or gravel) and /or artesian pressures or fresh water are encountered – the borehole will be abandoned immediately according to the following procedures:

Borehole Abandonment Program (Artesian Flowing Well Bore)

- Discontinue drilling with core barrel and place surface casing (**and telescoped casing, if required**) down to the level where flowing conditions were encountered. Continue drilling with core barrel.
- Measure hydraulic head and determine the grout weight required to withstand the hydraulic pressure.
- 5% bentonite to be used in grout mixture.
- Barite can be used in grout mixture, such that minimum grout weight of 12 lbs/gal is achieved.**
- Grout to be poured with tremie.
- Confirm that cement/grout has set and sealed before moving off of location.

Borehole Abandonment Program (Non-artesian Flowing Well Bore)

- Discontinue drilling with core barrel and place surface casing down to the level where flowing conditions were encountered. Continue drilling with core barrel.
- 5% bentonite to be used in grout mixture.
- Grout to be poured with tremie.
- Confirm that cement/grout has set and sealed before moving off of location.

Should the aquifer be encountered Geopacific will contact the Director of Infrastructure Services immediately.

Should you have any further questions, please don't hesitate to contact the undersigned.

Yours truly,
GeoPacific Consultants Ltd.

Nathalie Sahakyan, B.Sc., GIT
Hydrogeology Department

Reviewed By:



Matt Kokan, M.Sc., P.Eng.
Principal



SITE PLAN
SCALE = 1:800

LEGEND:

◇ MW19-# - MONITORING WELL (MW) LOCATION

LOCATIONS ARE APPROXIMATE

REFERENCE:

GOOGLE EARTH PRO

REVISIONS:

- A.
- B.
- C.

FILE NO.: **15620-GW**

DWG. NO.: **15620-GW-01**



GEOTECHNICAL INVESTIGATION
LOT 20 SOUTH FLETCHER RD, GIBSONS, BC
TEST HOLE LOCATION PLAN

DATE: JANUARY 29TH, 2019

DRAWN BY: N.S. APPROVED BY: N.S. REVIEWED BY: N.S.

SCALE: AS SHOWN

3779 W. 7201 Avenue
Vancouver, B.C. V6P 4P8
P: 604-459-0922
F: 604-459-0949

GEOPACIFIC
VANCOUVER CALGARY



Bylaw 1192-02 – Schedule E

Proposed Drilling Program
for Lot 20 South Fletcher Road, Gibsons
File #: 3220-S. Fletcher Road-Lot 20 ; In support of DP# 2018-10
Submitted to: The Town of Gibsons
Date Issued: _____

PREPARED BY: Geo Pacific Consultants for Trulli Developments.

- CC: Town of Gibsons representative _____
Town's hydrogeology consultant _____
Drilling contractor _____
Barge Contractor (if applicable) _____
Other personnel on site (if applicable) _____

CONTACT LIST

EMERGENCY NUMBERS

Town of Gibsons Representative: [Name, work phone number, cell phone number]
Drilling Contractor Owner/Principal: [Name, work phone number, cell phone number]
Ambulance/Hospital 911

Prime Consultant in Charge
Matt kokan (604) 341-6360
Nathalie Sahakyan (604) 771-3059

Town Hydrogeology Consultant

Principal Hydrogeologist: [Name, work phone number, cell phone number]
Field Hydrogeologist: [Name, work phone number, cell phone number]

SERVICE COMPANIES

Drilling Contractors: Blue Max Drilling (778) 237-2583
Grouting/Cement Contractor: [Name, work phone number, cell phone number]
Vacuum Truck: [Name, work phone number, cell phone number]
Waste Removal Contractor: [Name, work phone number, cell phone number]
Barge Operator: [Name, work phone number, cell phone number]
Other: [Name, work phone number, cell phone number]

TO BE POSTED ON SITE

Bylaw 1192-02 – Schedule E

1 OVERVIEW

1.1 The purpose of subject the drilling program is to:

To determine underlying stratigraphy upto 5m depth and confirm the Gibson Aquifer will not be breached during construction.

1.2 As outlined in the Town of Gibsons Development Permit Area Guidelines, the proposed drilling area is underlain by a known artesian aquifer (the Gibson Aquifer) and therefore an increased standard of care is needed to protect the aquifer.

The site is within The Lower Gibson's subArea, Gibson's Well Head Protection Area and Development Permit Area. According to the BC Water Resources Atlas, Water Well # 76196 is closest to the site.

1.3 [Primary Contractor] envisage that the following risks would be involved in the proposed drilling program:

- Uncontrolled artesian flow if aquitard is breached.
- Development of a sink hole if artesian flow is left unattended or site worker are unprepared to mitigate the flow.
- Impact on the Town of Gibsons' water wells if the aquifer is breached and left unsealed.
- Potential loss of aquifer pressure if the aquifer is breached and not sealed properly.

1.4 Table 1 summarizes the proposed drilling program with anticipated depth, location, and decommissioning plan. The proposed borehole locations are shown on [e.g. Figure 1].

Table 1: Example table of proposed borehole details

Borehole Name	Location	Planned Depth	Decommission Plan
MW19-01	Refer to attached	5m below	Decommission as per attached

MW19-02 siteplan grade cover letter.

Bylaw 1192-02 – Schedule E

2 PRE-DRILLING REQUIREMENTS

2.1 The following must be established prior to drilling commencement:

- Knowledge and understanding of British Columbia's Groundwater Protection Regulation

- (http://www.bclaws.ca/Recon/document/ID/freeside/11_299_2004) Yes.

- WorkSafe BC program

Hard Hat, Safety Vest, Steel Toe Boots, Safety Glasses if required

- Permit Requirements:

- e.g. Town of Gibsons Development Permit,

- Driller certification:

Please see attached Certificate.

- All rig lifting equipment, and overhead equipment must be certified to the Original Equipment Manufacturers Specifications (OEM).

All equipment is certified.

- Casing handling and running procedures:

See Job Hazard Analysis attached.

- Certificate of Insurance and WorkSafe BC letter are attached

Please see attached from GeoPacific + BlueMax Drilling.

- Drill rig specifications are attached

Please see attached Spec Sheet.

- Additional pre-drilling requirements:

Bylaw 1192-02 – Schedule E

3 RIG MOVE, RIG UP AND SITE SAFETY

3.1 The following procedures site safety provisions must be followed in mobilizing, set up and operation of the drilling rig:

- Provide procedures, e.g.: *Please see attached Job Hazard Analysis.*
 - *Drilling contractor to contact prime consultant in change the day before mobilization to site to confirm site and drill is ready.*
 - *Move in and rig up drilling rig and auxiliary equipment on site (or onto the barge if applicable). Prior to initiating drilling, carry out detailed rig inspection and report any unsafe conditions to prime consultant.*
 - *Hold a pre-drilling safety meeting with the rig crew and all consultants on site to discuss the Hazardous Operations and drilling program.*
 - *Certified driller to be onsite at all times during drilling.*

4 GENERAL DRILLING PROCEDURES

4.1 Roles and responsibilities:

- *Utility Locator, Driller + 2x driller helpers, Field Consultant.*

4.2 Methodology of data and sample collection:

- *Describe roles and responsibilities of all personnel on site. For example:*
 - *Prime field consultant to be onsite to collect soil samples every 0.5m or as stratigraphy changes.*
 - *Utility Locator will clear utilities before drilling and BC one call.*
 - *Drilling Contractor will operate drill rig, install groundwater monitoring wells and complete wells.*

4.3 Drilling Details

4.3.1 Borehole *MW19-01 and MW19-02*

- *Provide details on each proposed borehole, e.g.:*

2" boreholes to 5m depth.

Bylaw 1192-02 – Schedule E

- screens located according to BC Water Sustainability Act + Water Regulations.
- Refer to siteplan for locations.

4.3.2 Monitoring Well / Piezometer Installation Details (If Required)

- 10 slot screen with 10/20 sand pack. (PVC screen)
- bentonite seal to ground surface around solid PVC pipe
- Well cap and stick up cover at surface.
- Pressure Gauge if necessary.

4.3.3 Borehole Abandonment Program (Artesian Flowing Well Bore)

- As per the Water Sustainability Act, Section 53, a flowing artesian well must be controlled.
- During drilling: Fill the casing with a cement grout seal. Retract casing as it is filled and ensure no pathway for water to migrate to the surface.
 - can use Barite in difficult conditions.
- After drilling: Install packer to control flow.
Please refer to covering letter for full details.

Bylaw 1192-02 – Schedule E

4.3.4 Borehole Abandonment Program (Non-artesian Flowing Well Bore)

- As per BC provincial regulations, a borehole can be abandoned with bentonite to ground surface.
Refer to covering letter for details.

5 FIELD PACKAGE

- The following documents are attached:
 - *Proposed borehole/well location plan*
 - *Site specific Health and Safety Plan*
 - *Drilling Contractor Materials (procedures, rig equipment and operation)*
 - *Permits*
 - *Utility clearances*
 - *BC MoE Flowing Artesian Well Document*
 - *Any other relative documentation.*
 - *Other relative documentation.*



SITE PLAN
SCALE = 1:800

LEGEND:

◇ MW19-# - MONITORING WELL (MW) LOCATION

LOCATIONS ARE APPROXIMATE

REFERENCE:

GOOGLE EARTH PRO

REVISIONS:

A. B. C.

FILE NO.: 15620-GW

DWG. NO.: 15620-GW-01



GEOTECHNICAL INVESTIGATION
LOT 20 SOUTH FLETCHER RD, GIBSONS, BC
TEST HOLE LOCATION PLAN

DATE: JANUARY 29TH, 2019

DRAWN BY: N/S

APPROVED BY: N/S

REVIEWED BY: N/S

SCALE: AS SHOWN

1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P. 604.459.0922
F. 604.459.0928

GEO PACIFIC
VANCOUVER & MONTREAL OFFICES



1-800-663-3333
www.ita.bc.ca
1000-1000-1000

YOUR TICKET.

June 26, 2018

David Jonathan Rooker
13727 111 Ave
Surrey BC V3R 5C1

Dear David,

This letter is to confirm your recent successful completion of the geotechnical examination. An
enrolled Certificate of Qualification and wallet card are included.

Geotechnical Environmental Driller
00003-GN-18
2018-JUN-20

In this regard, we are certain that the effort and time spent in achieving and designating your MBE and
knowledge will ensure recognition throughout the trade.

We are very pleased to extend our congratulations to you on your achievement in achieving this
certification and wish your every success in your future endeavours.

Yours truly,

Guy Herman

Guy Herman, CEO



Ref: 106295660

www.itabc.ca

Connect with us   



CERTIFICATE OF QUALIFICATION

This is to certify that
David Jonathan Rooker
has met the certification requirements in the occupation of
Geotechnical/Environmental Driller
in accordance with the Statutes of the province of British Columbia.
Given at Victoria, British Columbia, this 20th day of June, 2018



Guy Herman
CEO



Blue Max Drilling
 Job Hazard Analysis (JHA)
Sonic Drilling

Site Training Requirements:	Tools/Equipment Required	Material Required	PPE Required
<ul style="list-style-type: none"> Sonic Rig Orientation Ground Disturbance First Aid Lvl 1 WHMIS Incident Investigation 	Track Drill Rig (Sonic) Various Hand Tools; Wrenches, Hammers, Shovel, Barrel Grounding Cable (if in substation)	Bentonite Sand Concrete (for well covers or grouting)	Hard Hat Safety Glasses Hearing Protection His Vis FR Clothing Work Gloves
Safe Job Procedure	Potential Hazards	Risk Assessment	Safe Work Practices
1. Site Orientation/ rig inspection	1. Parking rig for inspection	1. Moderate	<ul style="list-style-type: none"> Ensure rig is parked in designated area free of traffic for inspection to take place safely Workers must be in proper PPE at all time while in substation All workers must complete Site Specific Orientation at start of job and Sign off on Tailgate Meeting
2. Drill set-up	1. Moving Drill 2. Raising tower 3. Overhead and underground utilities locating 4. High Voltage Lines	1. Moderate 2. High 3. Moderate 4. Critical	<ul style="list-style-type: none"> Pay attention to visitors approaching work area. If necessary, setup barriers to keep vehicles and visitors out of the work area and use caution tape, cone delineation or traffic control if available. Underground utilities must be marked out before drilling begins. Observe overhead lines, utility line locates and other objects before raising the mast of the drill rig. Anticipate the radius of sweep going up and coming down, and plan appropriately. Position the drill rig no closer than 10 feet (3m) from overhead power lines Spotter must be used when moving vehicle into place or raising tower Beware of pinch points while raising mast, setting up supports and unstrapping augers
3. Drilling – General Activates	5. Pinch Points 1. Loud Noise 2. Rotating Equipment 3. Auto Hammer 4. Suspended Loads 5. Dust due to climate 6. Slip/trips/falls 7. Pinch points 8. Non Blue Max Workers 9. Heavy Lifting	5. Moderate 1. Moderate 2. Moderate 3. Moderate 4. High 5. Moderate 6. Moderate 7. Moderate 8. Moderate 9. High	<ul style="list-style-type: none"> Wear approved safety ear plugs when noise level about 85 dBA (e.g. smoke alarm or blender) Hearing Protection must be worn when Auto Hammer in use. When necessary, wear appropriate PPE to protect from dust for inhalation hazard. At minimum an N95 dust mask Make sure helpers are clear whenever rotation begins. Use eye contact and verbal communication for all steps in drilling process. A minimum distance of 2ft is required, as well as a “show me your hands” rule for the driller helpers before any rotation can begin Use proper lifting techniques, use legs not back, do not twist while lifting Keep body parts clear of pinch points. Drill rig should be shut down if non-Blue Max Driller approaches the rig for soil inspection or staff communication

Blue Max Drilling
Job Hazard Analysis (JHA)
Sonic Drilling

Safe Job Procedure	Potential Hazards	Risk Assessment	Safe Work Practices
4. Drilling – Advancing Pipe	<ol style="list-style-type: none"> Physical injury from moving parts of machinery, including changing of augers or rod Physical Injury from cables under tension that suddenly release 	<ol style="list-style-type: none"> High High 	<ul style="list-style-type: none"> Drill Cage MUST be closed while drilling Avoid moving parts of machinery. Keep fingers, hands, and arms away from rotating drill head near the top (connection to drive) or near the bottom (hole entrance). Wear gloves when handling objects, and steel-toed boots and hard hat at all times. Keep hands away from hydraulic clamps when activated. Keep fingers away from pinch points when screwing pipe joints together. Keep all drill bits secured when not in use, to prevent rolling off the rig or other movement. Do not come near cables under tension, such as those lifting drill pipe, as they tend to twist rapidly until the tension is equalized. Inspect cable and hooks frequently for signs of damage and wear. Do not stand directly underneath a load suspended by cable. Suspended loads are not to be left unattended.
5. Drilling – Adding/removing pipe	<ol style="list-style-type: none"> Work area can become messy with dirt from hole Suspended rod Pinch points from adding rods Pipe Arm 	<ol style="list-style-type: none"> Moderate High Moderate High 	<ul style="list-style-type: none"> Keep work area tidy, dirt should be piled nicely off to the side or drummed All Hanging equipment (e.g. drill rod, casing) must be held in secure place with a clip or strap away from drill teams work zone. Keep hands away from the bottom of the bit assembly when removing it from, or inserting it into, the casing or boring. Set the assembly on the ground and remove it from the overshot. Suspended loads are not to be left unattended. Helpers must remain 2m clear of pipe arm with in operation. Hands must be kept clear of pipe clamp when in operation. Pipe and rod lengths are to be added/removed from head by pipe arm. Short section (2'lengths) that need to be added by hand should never be handled while drill head is rotating. Watch hand placement when adding pipe. Hold onto pipe away from attachment points. Use jaws to remove from head. Then manually lift from jaws. Drillers hands must be off controls while cage is open except when helper needs to stabilize short sections as head's threads are lowered into pipe. Helper MUST be clear and cage closed before head threads onto pipe
6. Filling hole after work done or installation	<ol style="list-style-type: none"> Heavy Lifting Silica Dust Slip/trips falls Mixing Concrete or grout. 	<ol style="list-style-type: none"> Moderate Moderate Moderate Moderate 	<ul style="list-style-type: none"> Lift with legs not back, avoid twisting motion while lifting. Use 2 men for heavy loads. Use of dust mask n95 if need to stand right over hole if filling with sand or bentonite when dust clouds are created and there is no air-flow. Beware of ground conditions. Ground might be slick and mud covered depending on ground condition. Try to keep work area as clean as possible. Excess clean soil should be drummed or spread evenly around site with EM permission only. . Grout to be mixed slowly, avoid pouring in full bag into drums as this can cause dust clouds and clumping in the mixture.

Blue Max Drilling
Job Hazard Analysis (JHA)
Sonic Drilling

Safe Job Procedure	Potential Hazards	Risk Assessment	Safe Work Practices
7. Unsafe Conditions	<ol style="list-style-type: none"> 1. Unknown Hazards identified in the field 2. Changing/ Abnormal conditions 3. Long Days 	<ol style="list-style-type: none"> 1. Moderate 2. Moderate 3. Moderate 	<ul style="list-style-type: none"> • Where a situation presents a hazardous condition, the exposed employee will be removed from the hazardous area until all necessary precautions have been taken to eliminate the hazard and ensure their safety • Stop work authority will be used when unsafe conditions arise Use Field Level Risk Assessment to identify risks, update as conditions change. • Use the rule, every 20mins – look away at 20’ – for 20 sec to give yourself a visual and mental break
Developed By: Shane Williamson Dec 2017		Signature: 	
Reviewed By: Cole Bertsch			



BFL CANADA Insurance Services Inc.
 1177 West Hastings Street, Suite 200
 Vancouver BC V6E 2K3
 Tel: 604-669-9600
 Toll Free: 1-866-669-9602
 Fax: 604-683-9316

Certificate of Insurance

Certificate No: 2019-00002

This is to certify to: **To Whom It May Concern**

that the following described policy(ies) or cover note(s) in force at this date have been affected to cover as shown below:

Named Insured: **Geopacific Consultants Ltd.**
 Address: **1779 West 75th Avenue, Vancouver, BC V6P 6P2**

Description of operations and/or activities and/or locations to which this certificate applies: **Engineering and Surveying**

Type	Insurer / Policy No.	Policy Period from (mm/dd/yyyy) to (mm/dd/yyyy)	Limits
General Liability	Intact Insurance Company of Canada Policy No: 5A1197902	01/24/2019 to 01/24/2020	
Bodily Injury and Property Damage Per Occurrence			\$ 5,000,000
Personal & Advertising Injury			\$ 5,000,000
Non Owned Automobile Liability			\$ 5,000,000
Products/Completed Operations Aggregate			\$ 5,000,000
Tenants Legal Liability			\$ 500,000
PARTICULARS OF INSURANCE - General Liability			
Premises Property and Operations, Products and Completed Operations, Cross Liability, Blanket Contractual (all written agreements), Occurrence Bodily Injury and Property Damage, Broad Form Property Damage, Contingent Employers Liability, Cross Liability and Separation of Insureds, Advertising and Personal Injury, Limited Pollution Liability Coverage Endorsement			
Professional Liability (Claims Made)	Encon Group Inc. Policy No: ENG523599	01/24/2019 to 01/24/2020	
Each Claim			\$ 2,000,000
Aggregate			\$ 2,000,000

Additional Information

This certificate is issued as a matter of information only and is subject to all the limitations, exclusions and conditions of the above-listed policies as they now exist or may hereafter be endorsed. We accept no responsibility whatsoever for any inadvertent or negligent act, error or omission on our part in preparing these statements or for any loss, damage or expense thereby occasioned to any recipient of this certificate.

Limits shown above may be reduced by Claims or Expenses paid. This Policy contains a Clause(s) which may limit the amount payable.

BFL CANADA Insurance Services Inc.



 Authorized Representative
 Jeff McLellan

Signed in Vancouver this January 23, 2019



WORKING TO MAKE A DIFFERENCE

Assessment Department

Mailing Address

PO Box 5350
Station Terminal
Vancouver BC V6B 5L5

Location

6951 Westminster Highway
Richmond BC
V7C 1C6
www.worksafebc.com

Clearance Section

Telephone 604 244 6380
Toll Free within Canada
1 888 922 2768
Fax 604 244 6390

TOWN OF GIBSONS
474 South Fletcher Road
Box 340
TOWN OF GIBSONS, BC V0N 1V0

February 14, 2019

Person/Business : GEOPACIFIC CONSULTANTS LTD
Account number : 374728

This letter provides clearance information for the purposes of Section 51 of the *Workers Compensation Act*.

We confirm that the above-referenced firm is active, in good standing, and has met WorkSafeBC's criteria for advance clearance. Accordingly, if the addressee on this letter is the prime contractor, the addressee will not be held liable for the amount of any assessment payable for work undertaken by the above-referenced firm to **April 01, 2019**.

This firm has had continuous coverage with us since June 22, 1987.

Employer Service Centre
Assessment Department

Clearance Reference # : C130747012
CLRAAA

For more information about Section 51 and clearance letters visit WorkSafeBC.com

Please refer to your account number in your correspondence or when contacting the Assessment Department.

To alter this document constitutes fraud.

CERTIFICATE OF LIABILITY INSURANCE

This certificate is issued as a matter of information only and confers no rights upon the certificate holder and imposes no liability on the insurer.
This certificate does not amend, extend or alter the coverage afforded by the policies below.

1. CERTIFICATE HOLDER - NAME AND MAILING ADDRESS	2. INSURED'S FULL NAME AND MAILING ADDRESS
To Whom it May Concern	Blue Max Drilling Inc.
	12247 103A Ave
POSTAL CODE	Surrey British Columbia
	POSTAL CODE V3V 3G7

3. DESCRIPTION OF OPERATIONS/LOCATIONS/AUTOMOBILES/SPECIAL ITEMS TO WHICH THIS CERTIFICATE APPLIES (but only with respect to the operations of the Named Insured)

Environmental Drilling Contractor

4. COVERAGES

This is to certify that the policies of insurance listed below have been issued to the insured named above for the policy period indicated notwithstanding any requirements, terms or conditions of any contract or other document with respect to which this certificate may be issued or may pertain. The insurance afforded by the policies described herein is subject to all terms, exclusions and conditions of such policies.

LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS

TYPE OF INSURANCE	INSURANCE COMPANY AND POLICY NUMBER	EFFECTIVE DATE YYYY/MM/DD	EXPIRY DATE YYYY/MM/DD	LIMITS OF LIABILITY (Canadian dollars unless indicated otherwise)		
				COVERAGE	DED.	AMOUNT OF INSURANCE
COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE OR <input checked="" type="checkbox"/> OCCURRENCE <input checked="" type="checkbox"/> PRODUCTS AND / OR COMPLETED OPERATIONS <input type="checkbox"/> EMPLOYER'S LIABILITY <input checked="" type="checkbox"/> CROSS LIABILITY <input checked="" type="checkbox"/> TENANTS LEGAL LIABILITY <input type="checkbox"/> POLLUTION LIABILITY EXTENSION	Intact Insurance Company - 5A1198359	2018/04/13	2019/04/13	COMMERCIAL GENERAL LIABILITY BODILY INJURY AND PROPERTY DAMAGE LIABILITY - GENERAL AGGREGATE	\$2,500	
				- EACH OCCURRENCE		\$10,000,000
				PRODUCTS AND COMPLETED OPERATIONS AGGREGATE		\$10,000,000
				<input checked="" type="checkbox"/> PERSONAL INJURY LIABILITY OR <input type="checkbox"/> PERSONAL AND ADVERTISING INJURY LIABILITY		\$10,000,000
				MEDICAL PAYMENTS		\$10,000
				TENANTS LEGAL LIABILITY		\$500,000
				POLLUTION LIABILITY EXTENSION		
<input checked="" type="checkbox"/> NON-OWNED AUTOMOBILES <input type="checkbox"/> HIRED AUTOMOBILES	Intact Insurance Company - 5A1198359	2018/04/13	2019/04/13	NON OWNED AUTOMOBILE		\$10,000,000
AUTOMOBILE LIABILITY <input type="checkbox"/> DESCRIBED AUTOMOBILES <input type="checkbox"/> ALL OWNED AUTOMOBILES <input type="checkbox"/> LEASED AUTOMOBILES ** <small>** ALL AUTOMOBILES LEASED IN EXCESS OF 30 DAYS WHERE THE INSURED IS REQUIRED TO PROVIDE INSURANCE</small>				BODILY INJURY AND PROPERTY DAMAGE COMBINED		
				BODILY INJURY (PER PERSON)		
				BODILY INJURY (PER ACCIDENT)		
				PROPERTY DAMAGE		
EXCESS LIABILITY <input type="checkbox"/> UMBRELLA FORM <input type="checkbox"/>				EACH OCCURRENCE		
				AGGREGATE		
OTHER LIABILITY (SPECIFY) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>						

5. CANCELLATION

6. BROKERAGE/AGENCY FULL NAME AND MAILING ADDRESS

Metrix Professional Insurance Brokers Inc.

400 - 555 Burrard Street, Box 275

Vancouver BC POSTAL CODE V7X 1M8

BROKER CLIENT ID: BLUEM-2

POSTAL CODE

7. ADDITIONAL INSURED NAME AND MAILING ADDRESS
(but only with respect to the operations of the Named Insured)

8. CERTIFICATE AUTHORIZATION

ISSUER Metrix Professional Insurance Brokers Inc.	CONTACT NUMBER(S) TYPE Main NO. (604) 683-5583 TYPE Fax NO. (604) 683-8032
AUTHORIZED REPRESENTATIVE Phil Webb	TYPE NO. TYPE NO.
SIGNATURE OF AUTHORIZED REPRESENTATIVE	DATE April 18, 2018 EMAIL ADDRESS pwebb@mpib.com



WORKING TO MAKE A DIFFERENCE

Assessment Department

Mailing Address

PO Box 5350
Station Terminal
Vancouver BC V6B 5L5

Location

6951 Westminster Highway
Richmond BC
V7C 1C6
www.worksafebc.com

Clearance Section

Telephone 604 244 6380
Toll Free within Canada
1 888 922 2768
Fax 604 244 6390

Blue Max Drilling Inc.
12247 103A Avenue
SURREY, BC V3V 3G7

January 10, 2019

Person/Business : BLUE MAX DRILLING INC.
Account number : 835234

We confirm that the above-mentioned account is currently **active** and **in good standing**.

This firm has had continuous coverage with us since October 01, 2009 and has satisfied assessment remittance requirements to **January 01, 2019**.

The next payment that will affect this firm's clearance status is due on January 20, 2019.

This information is only provided for the purposes of Section 51 of the *Workers Compensation Act*, which indicates that a person using a contractor or subcontractor to perform work may be responsible for unpaid assessments of the contractor or subcontractor.

Employer Service Centre
Assessment Department

Clearance Reference # : C130659689
CLRA1A

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Please refer to your account number in your correspondence or when contacting the Assessment Department.

To alter this document constitutes fraud.

Heli/Mini Sonic Drill Rig

Environmental | Geotechnical | Exploration

BLUE MAX DRILLING

This is a full service sonic drill rig as a helicopter portable unit, used on major projects since summer 2016. This light weight helicopter portable drill rig has each module at less than 1,900 lbs, allowing for small helicopter transport in remote access areas. This is a multi-functional unit that can sonic drill and conventional diamond drill (rock drill) for geotechnical, hydrogeological, environmental or exploration purposes. The rig is a fully functioning sonic drill, capable of 4x6 sonic drilling and BQ, NQ and HQ diamond drilling.

Note: The rig can also sit on a **TRACK** platform for a truly versatile sonic drill!



HELI Rig Specs	Imperial	Metric
Weight, per Lift	<1,900 lbs	<860 kg

HELI Drill Depths	Imperial	Metric
Sonic, (Overburden)	200'	60m
Coring, HQ (Rock)	1,500'+	460m+

TRACK Rig Specs	Imperial	Metric
Height, Mast Up	12.5'	3.81m
Height, Mast Down	9'	2.7m
Length, Mast Up	15'	4.6m
Length, Mast Down	15'	4.6m
Width	8'	2.4m
Weight	17,000 lbs	7,700 kg

TRACK Drill Depths	Imperial	Metric
Sonic, (Overburden)	200'	60m
Coring, HQ (Rock)	300'+	100m+

TRACK Additional Features

- Automatic Rod Loader
- Engineered Safety Drill Cage
- Remote controlled
- Rock coring head attachment (NQ, HQ)
- Angle drilling capable
- 4" x 6" rod/casing system
- SPT & DCPT testing capable with Auto Hammer
- CPT capable



Locations

- Surrey, BC (Head Office)
- Vancouver Island, BC
- Terrace, BC

www.bluemaxdrilling.com
(778) 237-BLUE (2583)





2301 McCullough Road, Unit D
Nanaimo, British Columbia
Canada V9S 4M9
Tel: 250.585.0800
Toll Free: 1.844.585.0800
www.waterlineresources.com

June 29, 2016
2875-17-001

Mirabeau Holdings Ltd.
1605-1005 Beach Ave.
Vancouver, B.C.

Attention: Enrico Di Napoli

Dear Mr. Di Napoli,

RE: Phase 1 Aquifer Assessment for South Fletcher Road Lot 20

1.0 INTRODUCTION

1.1 Background

Mirabeau Holdings Ltd. (Mirabeau) is in the process of acquiring a property on South Fletcher Road (the Property) within the Town of Gibsons (the Town). The Property is identified as Lot 20 and located adjacent to 522 South Fletcher Road, as shown on Figures 1 and 2. The Gibsons Aquifer underlies much of the Town and requires protection under the Development Permit Area 9 guideline (DPA9; Attachment A). Mirabeau is aware that the Gibsons Aquifer is under artesian pressure and may be vulnerable to breaching and blow out if proper geologic controls are not implemented during site construction and development. DPA9 requires that an aquifer assessment be completed to determine the site conditions if ground disturbance/excavations of greater than 1.5 m depth are being contemplated. The aquifer assessment guidelines¹ provided in DPA9 require the developer to:

- Review and evaluate available hydrogeological information regarding the Gibsons Aquifer location, depth, pressure and geometry at the subject property. Also, identify the overlying aquitard's location and depth;
- Reference new hydrogeological data to a common geodetic datum with an elevation survey. The new data (test pits, boreholes, water chemistry, etc.) should be provided to the Town in an electronic format and integrated with the existing aquifer information; and
- Review and evaluate how the proposed development may impact the Gibsons Aquifer; including the potential for excavating through the Gibsons Aquitard and/or Aquifer.

Mirabeau retained Waterline Resources Inc. (Waterline) to conduct a Phase 1 Aquifer Assessment to address the potential impacts to the Gibsons Aquifer from the proposed

¹ Gibsons Official Community Plan. March 2015. Section 16.10, page 145.

development. A preliminary sketch of the proposed development was provided to Waterline by Mirabeau and is attached in Attachment B. It should be noted that the sketch provided is only conceptual to illustrate a possible example of what could be developed at the site, the final proposed development could vary significantly depending on actual ground conditions.

1.2 Scope of Work

Waterline's scope of work included:

- Review the preliminary development plan for the Property;
- Compile available hydrogeological information: water well records, geotechnical boreholes, geophysical surveys, surficial geology mapping, and topography contours to assess the shallow groundwater flow conditions at the site;
- Prepare a letter that summarizes Waterline's key findings related to the Gibsons Aquifer; and
- Provide recommendations and control measures to protect the aquifer during investigation, design, and construction stages of development.

2.0 METHODOLOGY

2.1 Desktop Review

Although an abundance of regional geology and hydrogeology related information exists in the Gibsons area, no subsurface soil/geology data exists at the Property. Waterline therefore relied on data previously compiled for the Gibsons Aquifer Mapping study² as well as data collected from nearby properties as part of various geotechnical and environmental studies³.

2.2 EWS Geodatabase and Conceptual Hydrogeological Model

The information compiled by Waterline was input into the Environmental Web Services (EWS™) database system and used to develop a conceptual understanding of hydrogeological conditions near the Property. The intent was to assess the presence and depth of Gibsons Aquifer/Aquitard beneath the Property in the context of the preliminary development plan to meet the requirements of DPA9. The enclosed report provides Waterline's preliminary assessment to assist Mirabeau with the property purchase and possible development.

² Waterline Resources Inc., 2013. Gibsons Aquifer Mapping Study.

³ Core6 Environmental, 2015. Supplementary Preliminary and Detailed Site Investigation. 263 Gower Point Rd. and 1157 School Rd, Gibsons, BC.

3.0 RESULTS AND DISCUSSION

3.1 Study Area and Land Use

The Property is located in an area of mixed land use with mainly residential, strata, and commercial buildings, as shown on Figure 1. The following relevant features exist near the Property:

- Properties located northwest are primarily single family residential built into the steep hillside. Data from multi-level monitoring wells (MW06-1A/B) that form part of the Gibsons Aquifer groundwater monitoring system was used in this study. The multi-level wells are located approximately 450 m upslope and some 70 m higher elevation above the Property and completed in both the shallow Capilano Aquifer and the deeper Gibsons Aquifer.
- Properties located Southeast of the Property and downslope include the Gibsons Landing and the commercial waterfront development. Several drilling investigations were completed on properties along Gower Point Road and School Road and were also considered as part of our study.
- Gibsons Town Well 4 is located approximately 170 m southwest of the Property. Town Well 4 is completed in the Gibsons Aquifer and exhibits flowing artesian pressure. Town Well 1 located further west is also flowing artesian when not being pumped. The artesian flows vary with well use, with flows measured in the 100 gallons per minute range when the well pumps are turned off. Although the aquifer pressure cannot be measured due to the wellhead configurations at Town Wells 1 and 4, it is estimated to be several metres above ground surface (~3-6 m) based on regional monitoring data.

3.2 Topography and Drainage

Topography at the Property slopes steeply towards the waterfront, with the elevation ranging from 34 m above sea level (asl) to 25 masl along the Lower Periwinkle Lane (Figure 2; and preliminary site development plan, Attachment B). Topography in the region strongly influences and controls overland drainage and groundwater flow through the shallow water table aquifer and the deeper Gibsons Aquifer described below.

3.3 Geology

The landscape and landforms observed in Gibsons, and across the Sunshine Coast primarily resulted from glacial and interglacial processes occurring over the last 50,000 years. Overburden sediments beneath the Town of Gibsons can range up to 150 m thick and include the following mapped geologic units (top down):

- **Salish Sediments:** Gravel, sand, clay and peat deposits mapped on surface along the Gibsons waterfront and at lower elevations. These sediments do not appear to extend to the South Fletcher Road area.

- **Capilano Sediments: Shallow Unconfined Aquifer** - Coarse grained, sand and gravel deposits that form a perched, unconfined aquifer in most areas beneath the Town including the South Fletcher Road area. This unit is referred to as the unconfined Capilano Aquifer and likely occurs beneath the Property. This unit is loosely consolidated and can exhibit variable permeability and convey significant amounts of groundwater. Many of the seasonal springs observed in Lower Gibsons originate from the Capilano unit.
- **Vashon Till: Gibson Aquitard** - Hard packed silt, clay, sand, gravel and stones up to 30 m thickness. Includes glacial till, glacial fluvial (river deposits) and glacial lacustrine (lake deposits) sediments. The till is brown when weathered, and a blue-grey colour when unweathered. Forms the cap over the underlying Gibsons Aquifer. This unit can be easily recognized in Upper Gibsons during drilling or excavation and often referred to as hardpan. The unit thins significantly in Lower Gibsons and has been observed to be 1.5-3 m thick. Care and caution must be taken during ground disturbance as this unit forms the protective cap over the Gibsons Aquifer.
- **Pre-Vashon or Quadra Sediments: Gibsons Aquifer** - Glacio-fluvial deposits consisting of silt, sand and gravel. The Quadra Sediments are generally moderately consolidated and of high permeability. The thickness varies considerably across the Town and the deposit extends to the top of the granite or metasedimentary bedrock that is present beneath the Town. This unit forms the Gibsons Aquifer which is protected from surface activities by the overlying Vashon Till Aquitard. The primary concern in Lower Gibsons (including the South Fletcher Road area) is with the possible thinning of the Gibsons Aquitard, the shallow depth of the Gibsons Aquifer, and possible geotechnical issues that may be caused by uncontrolled artesian groundwater flow if the Gibsons Aquitard is disturbed.

Figure 3 shows the mapped extent of the Gibsons Aquifer. As can be seen, the Subject Property is within the “High Confidence” aquifer mapping area and therefore the Gibsons Aquifer almost certainly exists at some depth beneath the site.

Figure 4 shows a northwest to southeast geological cross-section (schematic) extending from Upper/Middle Gibsons to Lower Gibsons to illustrate the subsurface environment relative to the Property. The cross-section trace is shown on Figures 1 and 3. As seen on the cross-section, the precise depth to the Vashon Till (Gibsons Aquitard) and to the top of the Quadra Sediments (Gibsons Aquifer) at the site is not known with certainty but most likely occurs between 2-5 m below ground level (mbgl), and 5 to 20 m mbgl, respectively.

3.4 Hydrogeology and Groundwater Flow

As shown on Figure 4, the Gibsons Aquifer is partially saturated (i.e., the water level is below the top of the aquifer) in Upper/Middle Gibsons at the MW06-1A location, and becomes fully saturated and confined in Lower Gibsons with flowing artesian conditions at Town Well 4 (170 m southwest). Groundwater flow in the Gibsons Aquifer essentially follows local topography moving from northwest to southeast and discharging in the vicinity of Gibsons Harbour. Historical groundwater levels in the Gibsons Aquifer show a delayed hydraulic response to seasonal

precipitation/recharge and exhibit a slight increasing trend since 2011⁴. This suggests that pressure in the aquifer is increasing and is likely due to a reduction in groundwater use as a direct result of meter installation and leak repairs to the distribution piping by the Town.

The shallow, unconfined, Capilano Aquifer is also likely to be present immediately beneath the Property. The Capilano Aquifer is not under artesian pressure but is known to discharge to surface as springs in some areas of Lower Gibsons. Groundwater levels in the shallow Capilano aquifer correlate strongly to seasonal precipitation and snow melt, indicating the aquifer is in direct hydraulic communication with the surface. The Capilano Aquifer can be penetrated and may require engineer drainage (weeping tile) if proposed foundation structures extend below the groundwater level. A geotechnical assessment would be required to determine design requirements.

4.0 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Due to the lack of subsurface data at the Property, the exact depth to the top of the Gibsons Aquitard and Aquifer is not known with certainty. However, the regional data compiled by Waterline suggests that the Gibsons Aquitard could be 2 to 5 m deep and the Gibsons Aquifer between 5 to 20 m beneath the Property.

Based on the preliminary development plan provided to Waterline by Mirabeau and personal communication with Enrique Di Napoli, Waterline understand that the developer is planning to complete minimal excavation during site development. The current plan provided in Attachment B shows a possible excavation that extends approximately 3 m below natural grade and exceeds the DPA9 excavation depth of 1.5 m. Therefore, if the proposed development requires deep foundations then further geotechnical and hydrogeological studies will be required.

It should also be cautioned that any planned subsurface investigations, including test pitting or drilling, to support foundation design will require proper planning and control measures. This includes a drilling/excavation plan and protocols to ensure groundwater control. Drilling procedures developed for the Town are provided for reference in Attachment C. Waterline understands Geopacific Consultants and PGL Environmental Consultants may be retained to conduct any needed geotechnical and environmental studies. All members of the project team, should be informed of the possible aquifer conditions prior to investigation and project design to ensure protection of the Gibsons Aquifer in compliance with the requirements of DPA9.

Waterline has the following recommendations for Mirabeau Holdings Ltd. with respect to the aquifer assessment and site development:

- This letter should be forwarded to all members of the project team prior to architectural and engineering design;

⁴ Waterline Resources Inc., 2016. Gibsons Annual Groundwater Monitoring.

- Further hydrogeological site investigations should be completed if ground disturbance at the site exceeds 1.5 m depth. The site investigation should include a minimum of three boreholes to confirm site geology and groundwater flow in the shallow sediments. If deeper foundation structures are required, then deeper drilling and testing will be needed to confirm the depth and integrity of the Vashon Till Aquitard. Monitoring wells, boreholes, test pits, or other excavations should not extend into the Gibsons Aquitard or the Gibsons Aquifer without proper groundwater control procedures in place as provided in Attachment C.

5.0 CERTIFICATION

This document was prepared under the direction of a professional geoscientist registered in the Province of British Columbia. The enclosed letter report is provided for exclusive use by Mirabeau for planning and assessment of Lot 20 on South Fletcher Road, Gibsons British Columbia. The information provided is preliminary and should not be used for engineering design purposes. Any use, reliance on, or decision made, by a third party based on this document is the sole responsibility of said third party. Waterline makes no representation or warranty to any third party with regard to this document and, or the work referred to in this document, and accepts no duty of care to any third party or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties, or other harm that may be suffered or incurred as a result of the use of, reliance on, any decision made, or any action taken based on, this document or the work referred to in this document.

Waterline Resources Inc. trusts that the information provided in this document is sufficient for your requirements. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Respectfully submitted,

Waterline Resources Inc.



Dalton Pajak, B.Sc., P.Geo.
Hydrogeologist

Reviewed By:

A handwritten signature in black ink, appearing to read "Darren David", written over a horizontal line.

Darren David, M.Sc., P.Geo.
Principal Hydrogeologist

FIGURES

Figure 1: Location Plan with Cross Section Trace

Figure 2: Site Plan with Topography

Figure 3: Gibsons Aquifer Extent

Figure 4: Conceptual Cross-Section A-A'

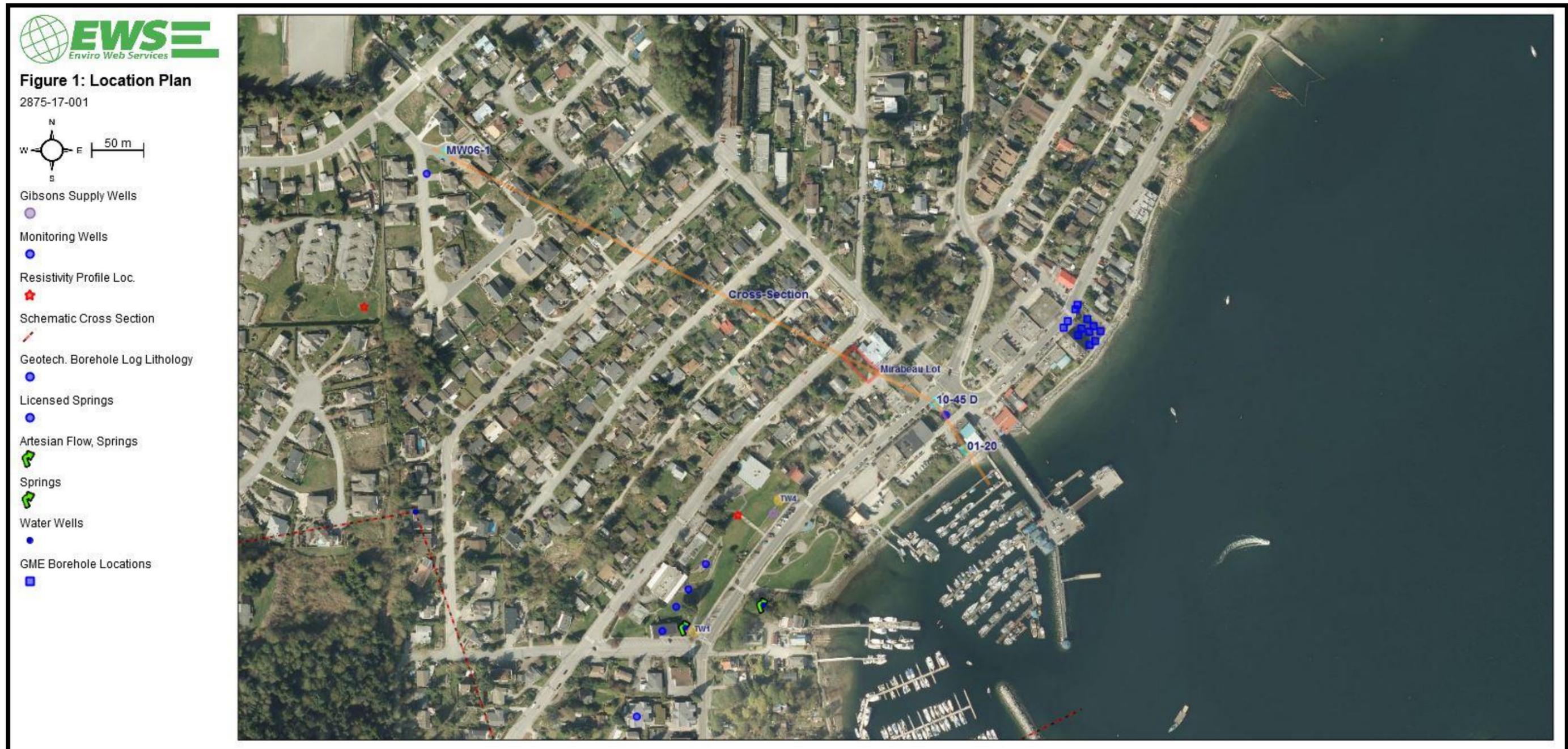


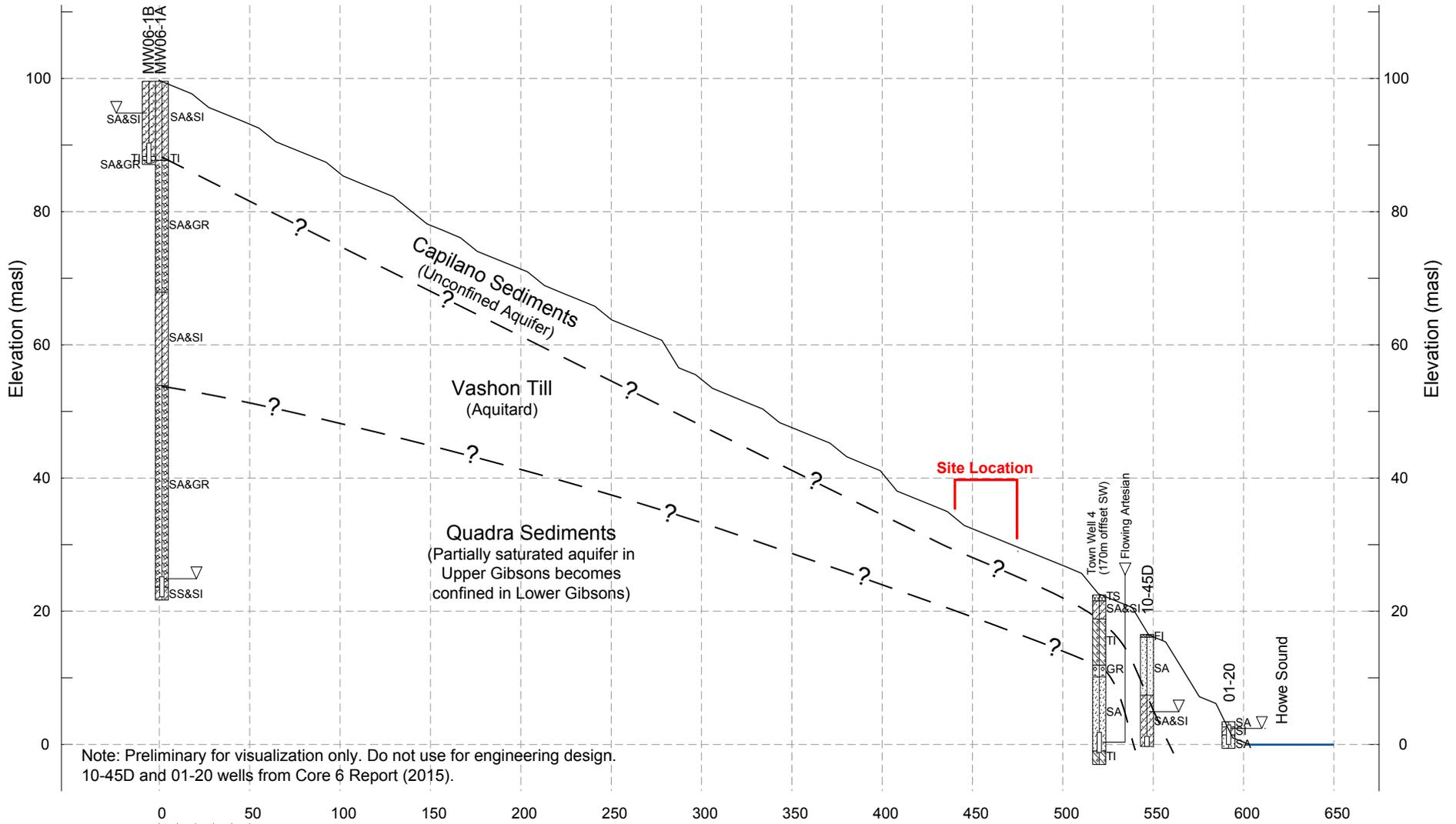
Figure 1: Location Plan with Cross Section Trace



Figure 2: Site Plan and Topography

A
(Northwest)

A'
(Southeast)



Note: Preliminary for visualization only. Do not use for engineering design.
10-45D and 01-20 wells from Core 6 Report (2015).

0 10 20 30 40 50
Horizontal Scale (m)
Vertical Exaggeration: 3:1

LEGEND:

- ▽ Static Water Level at the Time of Completion
- ▭ Screen Interval
- Interpreted Ground Surface

- Topsoil (TS)
- Fill (FI)
- Till (TI)
- Silt (SI)
- Sand (SA)
- Gravel (GR)
- Sand & Silt (SA&SI)
- Sand & Gravel (SA&GR)

PROJECT		Mirabeau Holdings Ltd.	
		Phase 1 Aquifer Assessment For South Fletcher Road Lot 20 Gibsons, British Columbia	
TITLE			
CONCEPTUAL CROSS-SECTION A-A'			
PREPARED BY: Waterline Resources Inc.		FIGURE 4	
PROJECT: 2875-17-001			
COMPILED BY: CGD			
DATE ISSUED: June 2017			
REVISD: --			



ATTACHMENT A

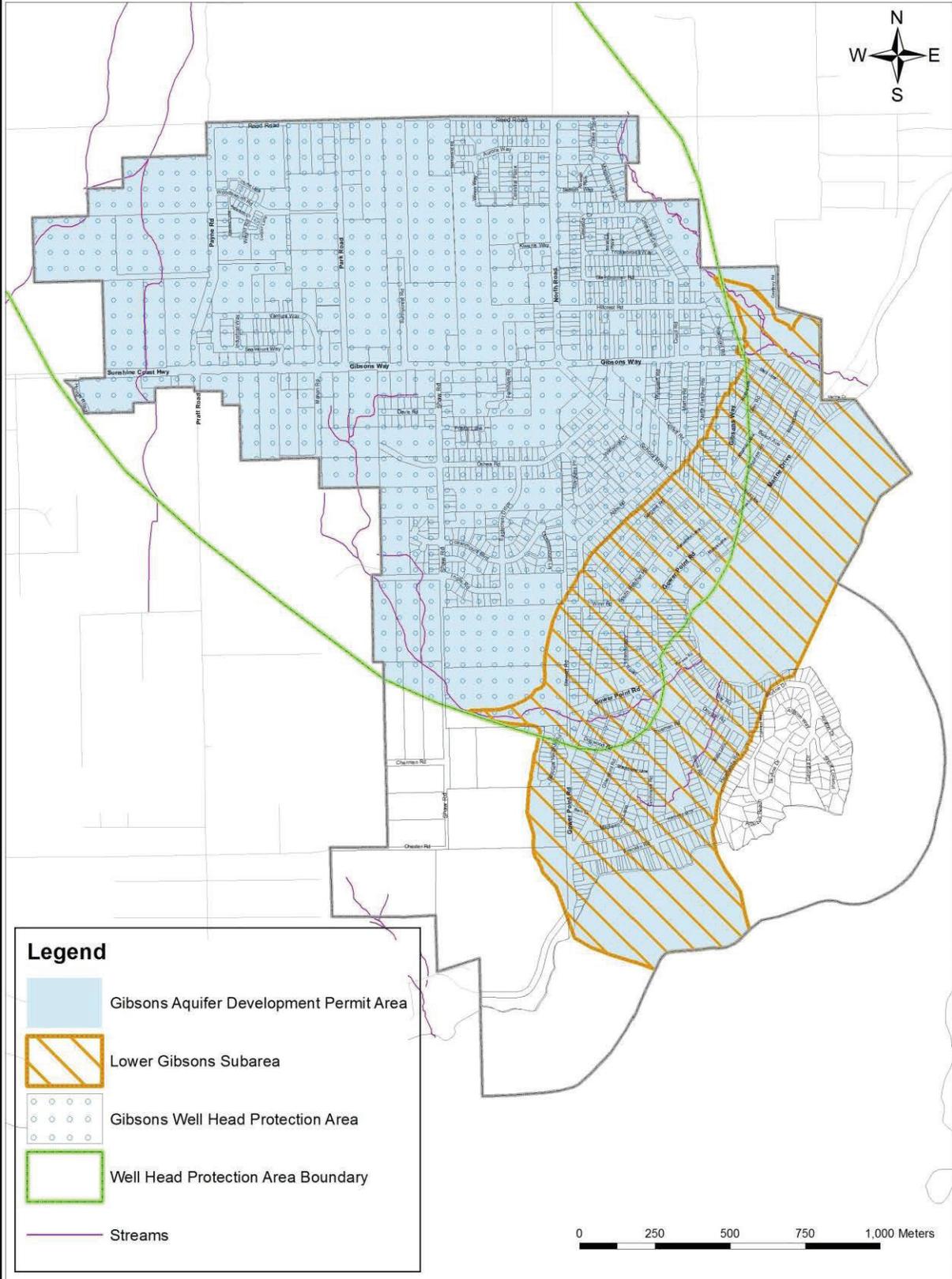
Gibsons Aquifer Development Permit Area 9





Schedule F - Gibsons Aquifer Development Permit Area No.9

Std00030
March 2015



ATTACHMENT B

Survey of Lot 20 South Fletcher Road, Gibsons



April 17th, 2017

Re: Lot 20 South Fletcher Road
Gibsons B.C.

PID : 009-777-482
Legal: Lot 20 Plan VAP6125 Block C DL 686

Owner: Kenco Enterprises (1982) Ltd.

To whom it may concern,

We, the owners of the above mentioned property, grant permission to Mirabeau Holdings Ltd to obtain any information on file regarding the subject property.

Thank you

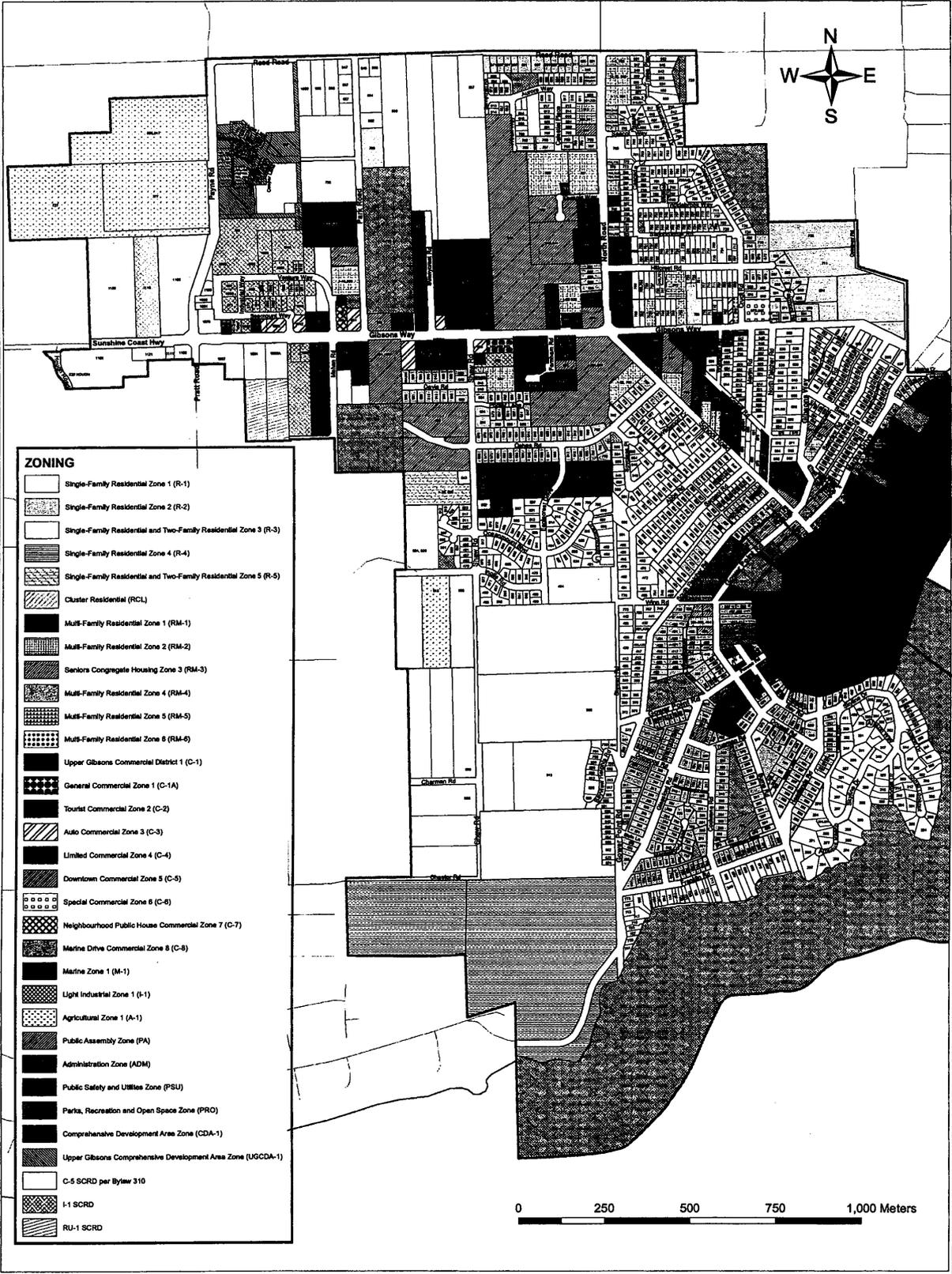


Kenco Enterprises (1982) Ltd.



Zoning Bylaw Number 1065, 2007 Schedule A

File No.: Sst00004
Date : Nov 2014



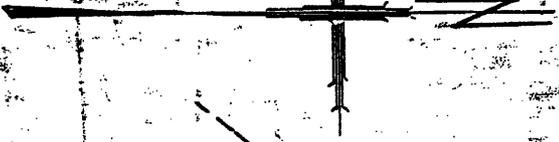
~~WILLIAMS~~

SUBDIVISION OF NORTH BAY

Block C of Lot 686 Group One

Next to Farming District

Gibsons Landing



Scale 1:1000

Approved under the provisions of the Land Regulations of 1928

Q. P. Phillips

Minister of Lands and Survey

Witness

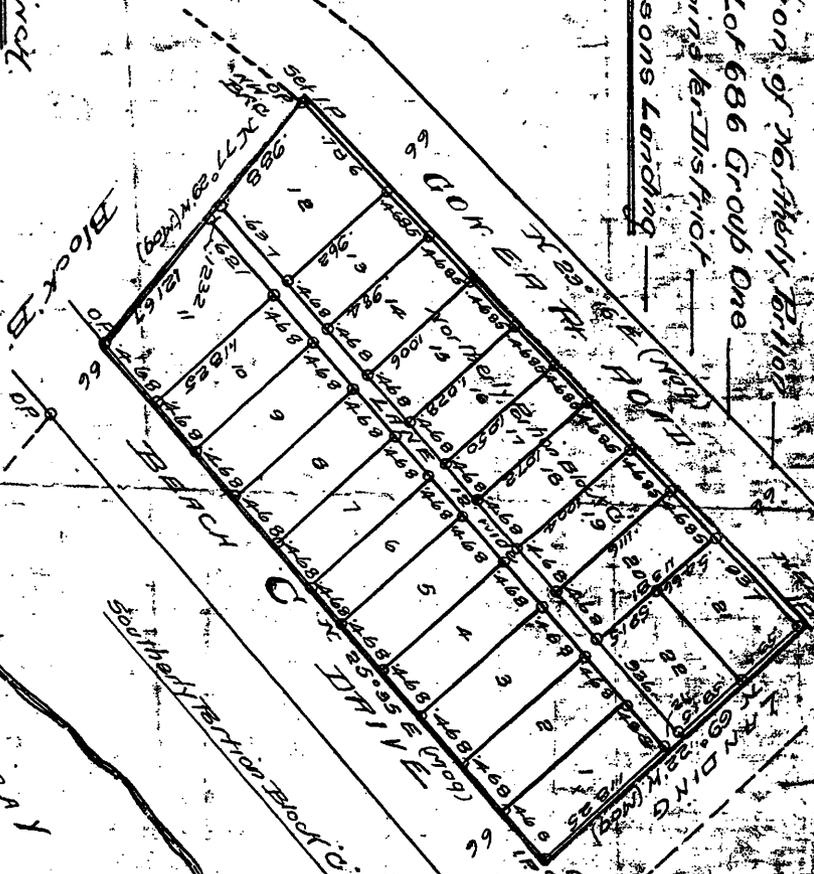
Witness

Witness

Witness

Approved by the Municipal Council

Witness



Legend
1/2" denotes 100 FT
OP denotes 0 FT
313' denotes 313 FT

Approved under the provisions of the Land Regulations of 1928

Witness

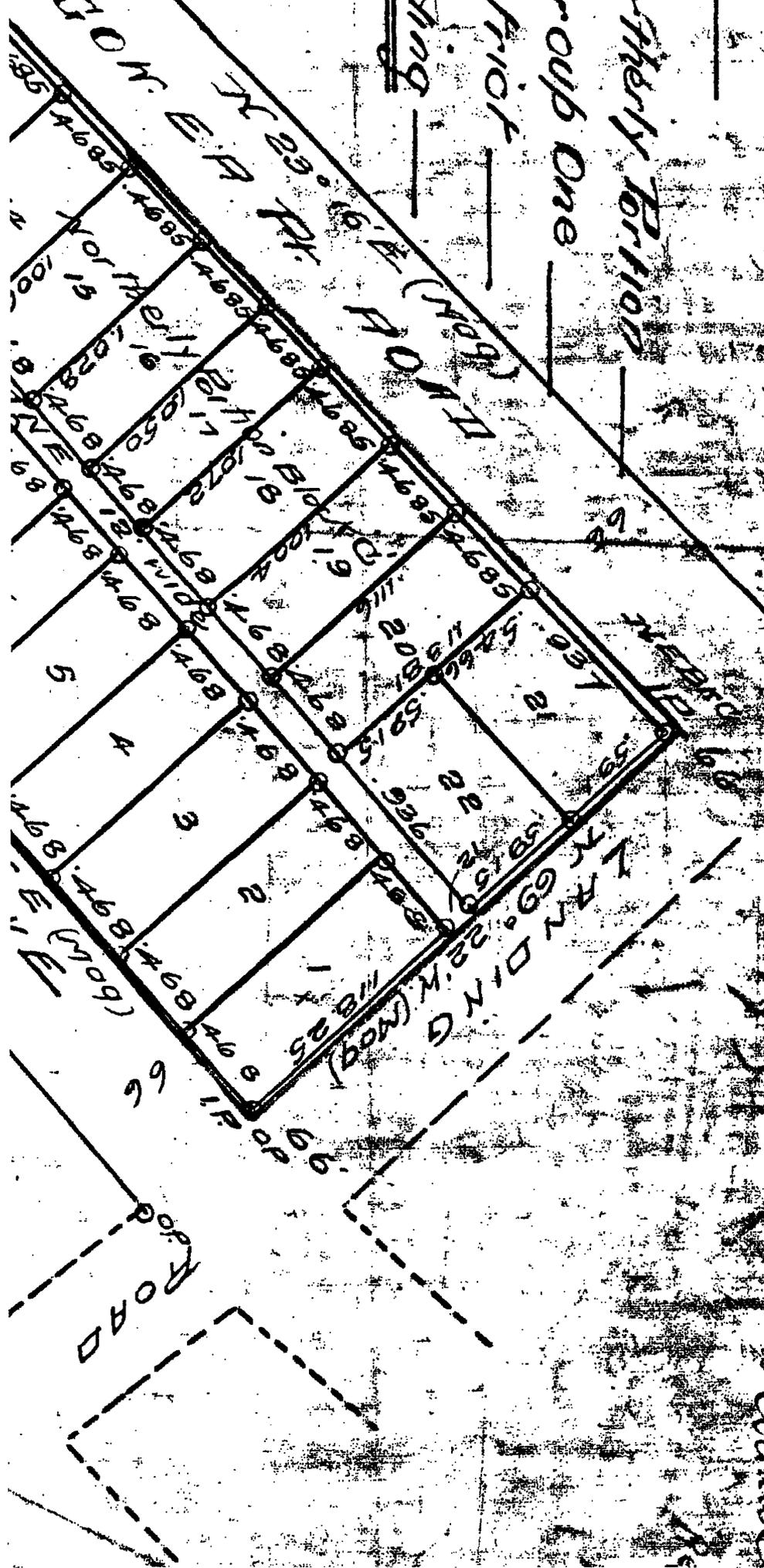
Witness

Thirty Pillion

Group One

Tricot

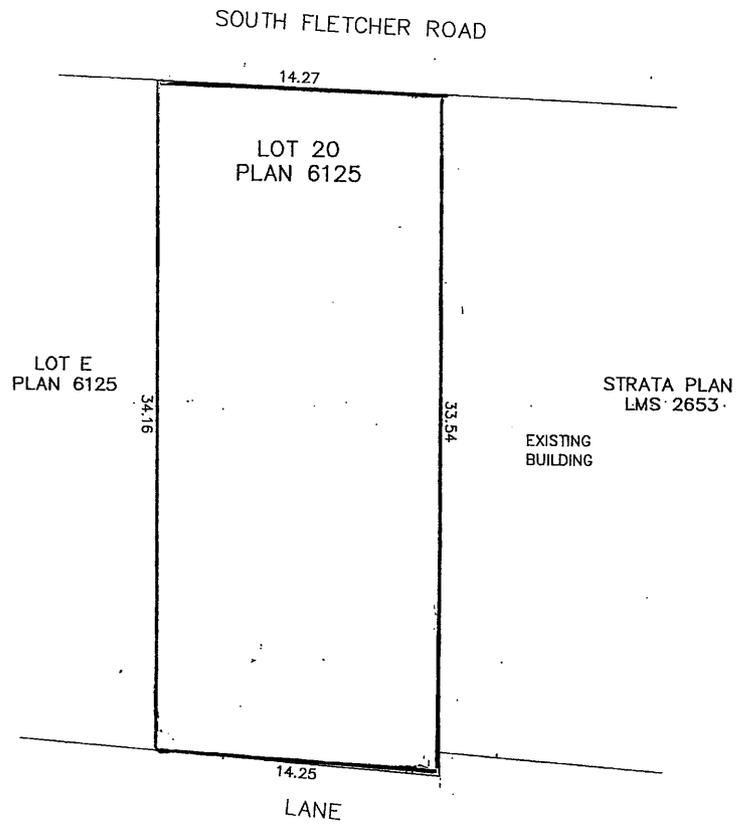
Ang



SKETCH OF PROPOSED BUILDING LOCATION ON
LOT 20, BLOCK C, DL 686, PLAN 6125.

SCALE 1 : 250

SOUTH FLETCHER ROAD, GIBSONS, B.C.



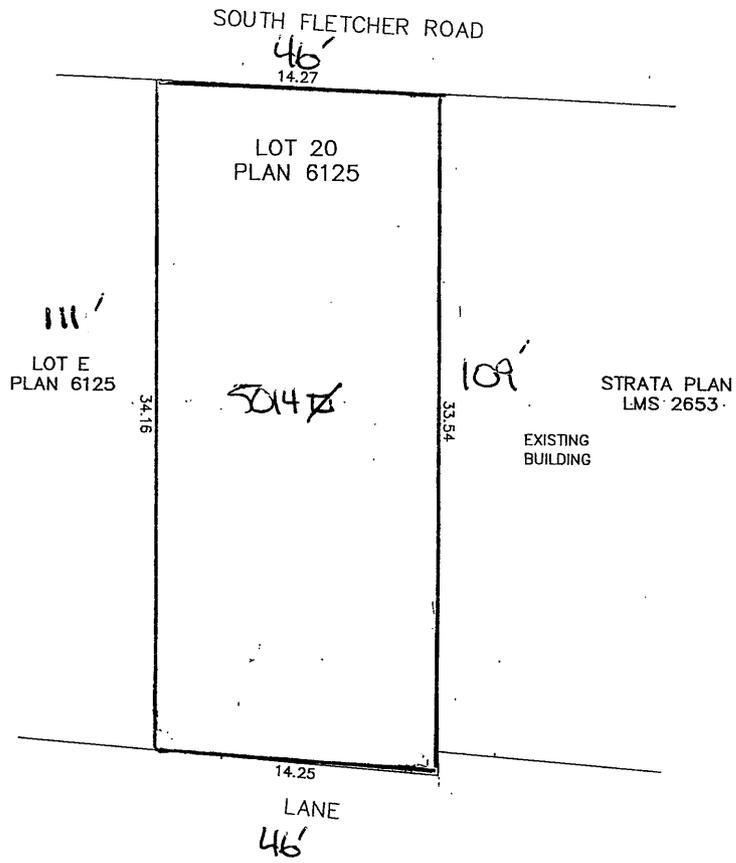
Penonzek Land Surveying Ltd.
B.C. Land Surveyors
Box 505 Gibsons, B.C.
VON 1V0 FAX 886-2553
PHONE: 604-886-2531
© 2008

Date : September 30, 2008
File : 10908 - 1504

SKETCH OF PROPOSED BUILDING LOCATION ON
LOT 20, BLOCK C, DL 686, PLAN 6125.

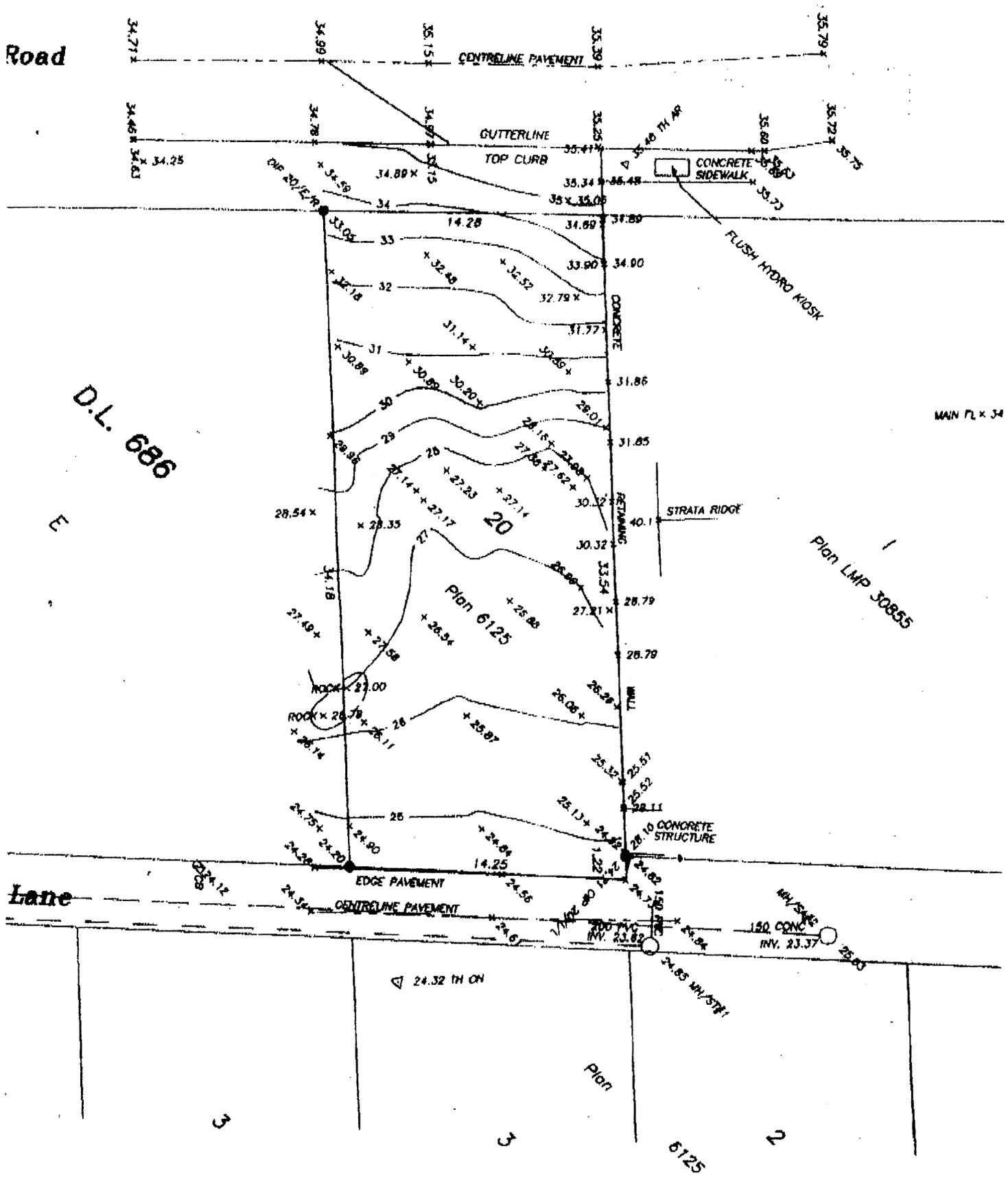
SCALE 1 : 250

SOUTH FLETCHER ROAD, GIBSONS, B.C.



Penonzek Land Surveying Ltd.
B.C. Land Surveyors
Box 505 Gibsons, B.C.
VON 1VQ FAX 886-2553
PHONE: 604-886-2531
© 2008

Date : September 30, 2008
File : 10908 - 1504



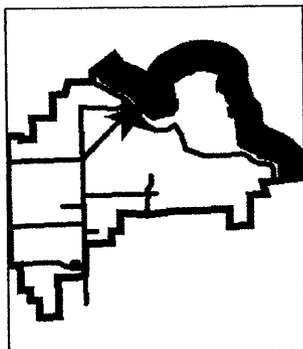
D.L. 686

E

Lane

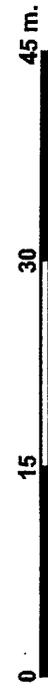
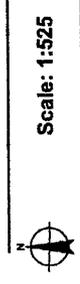
ROOF RIDGE 25.95*
PINK HOUSE 85.2'

Ken Riddell Property



Legend

- lots
- Foreshore
- Gibsons_Bndy
- Streams
- Streets
- addresses
- ortho09



Map center: 463227, 5472283

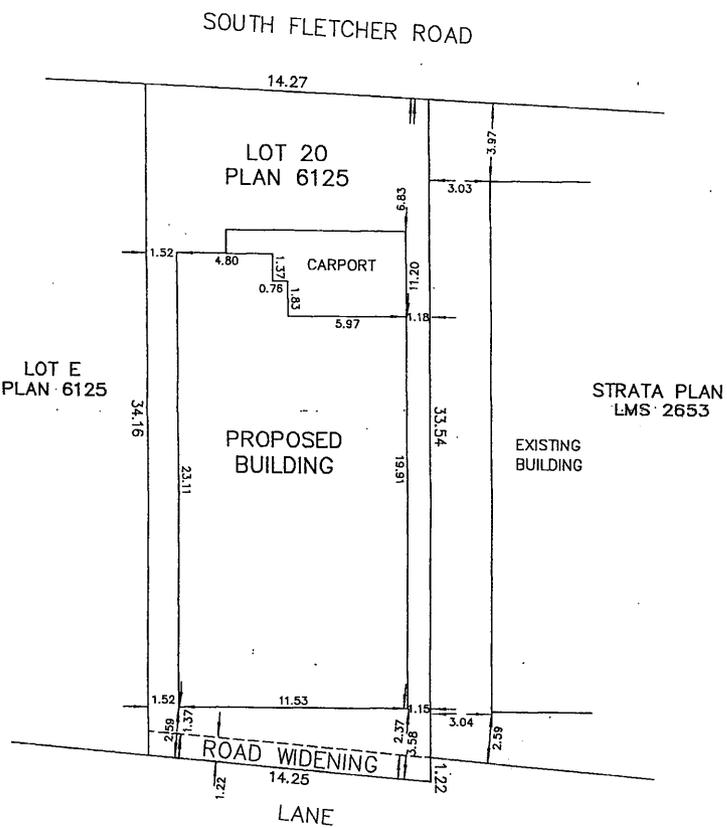
Notes: Aerial produced by Jeff Paleczny

This map is a user generated static output from an Internet mapping site and is for general reference only. MAP IS NOT TO BE USED FOR NAVIGATION.

SKETCH OF PROPOSED BUILDING LOCATION ON
LOT 20, BLOCK C, DL 686, PLAN 6125.

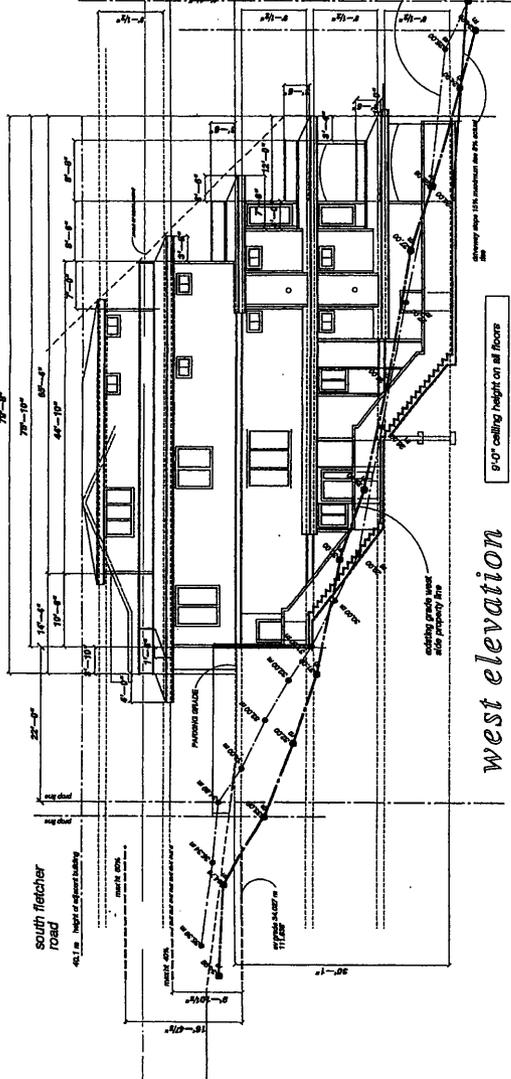
SCALE 1 : 250

SOUTH FLETCHER ROAD, GIBSONS, B.C.

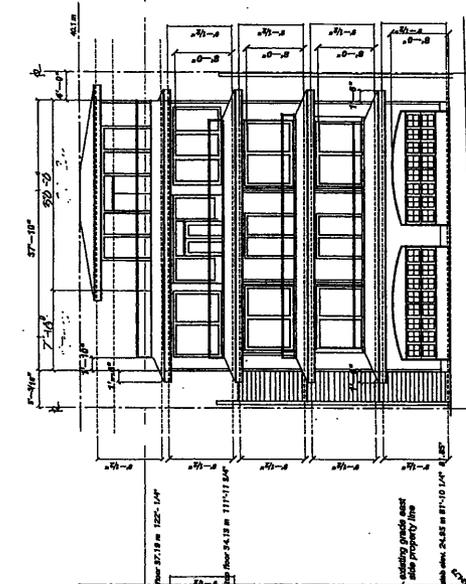


Penonzek Land Surveying Ltd.
B.C. Land Surveyors
Box 505 Gibsons, B.C.
VON 1VO FAX 886-2553
PHONE: 604-886-2531
© 2008

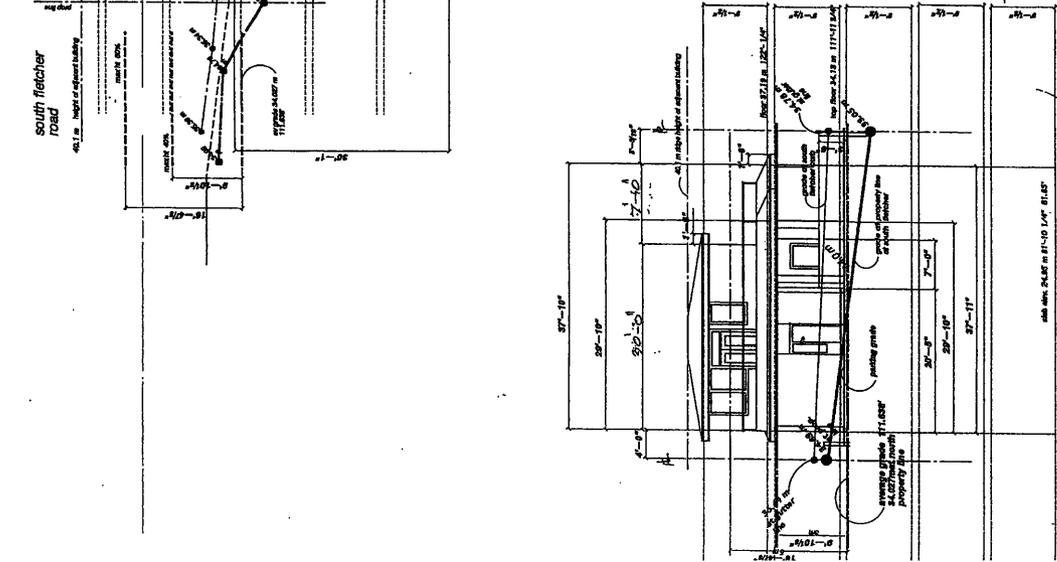
Date : September 30, 2008
File : 10908 - 1504



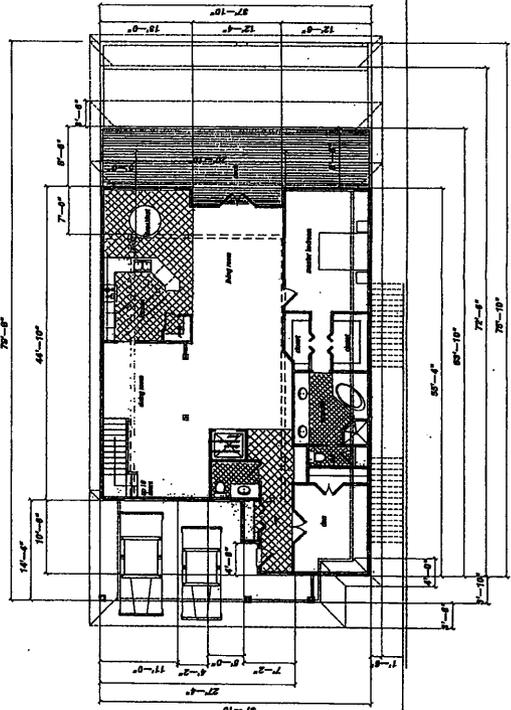
west elevation



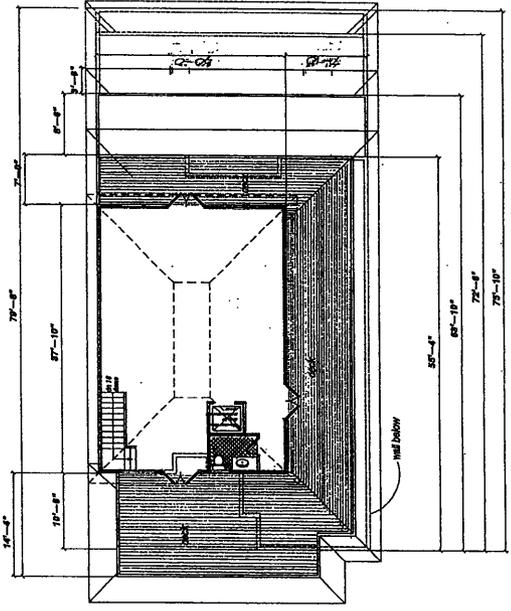
south elevation



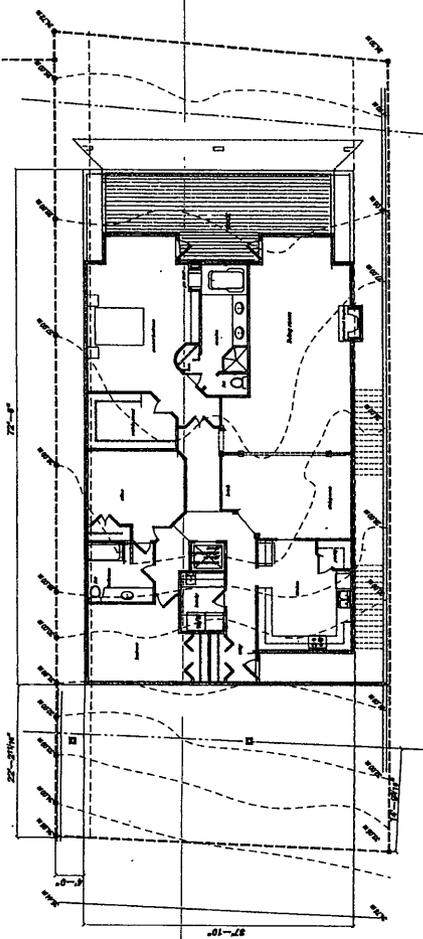
south fletcher



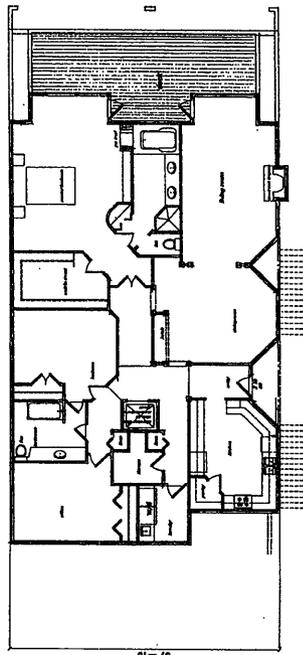
third floor level



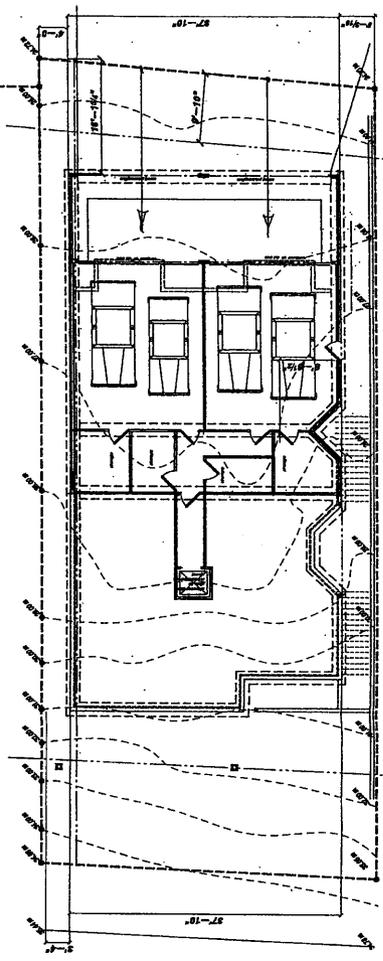
fourth floor level



second floor level



first floor level



garage level

road
south fletcher

none of floors to be apartment

MULTI-FAMILY RESIDENTIAL ZONE 6 (RM-6)

1052. Application and Intent of Zone

The regulations of this zone apply to the use of land, buildings, and structures within the Multi-Family Residential Zone 6, as shown on the maps attached to this Bylaw as Schedule A. The intent of the RM-6 zone is to permit townhouse and apartment use, at low to medium densities, in those areas which the "Land Use Plan" of the Official Community Plan, designates "Low Density Multi-Family Residential 1," and specifically to permit such use on smaller parcels within "Sub-Area I" on the south-east side of South Fletcher Road between School Road and Holland Lands.

1053. Permitted Principle Uses

- (1) apartment use;
- (2) townhouses, provided that within a townhouse use a portion of the dwelling unit is permitted to take the form of only two attached townhouse dwelling units per building.

1054. Permitted Accessory Uses

- (1) accessory off-street, parking and loading;
- (2) accessory buildings as permitted by Section 413-420;
- (3) a home occupation use as permitted by Section 905;
- (4) a community care use licensed as a day care for children, not located within a dwelling unit;
- (5) other accessory uses customarily incidental and subordinate to a permitted principle use.

1055. Minimum Lot Area

A lot in the RM-6 zone must have a lot area of not less than 450.0 m² (4,843.7 ft²).

1056. Minimum Lot Width

A lot in the RM-6 zone must have a lot width of not less than 14.0 m (45.9 ft).

1057. Minimum Lot Depth

A lot in the RM-6 zone must have a lot depth of not less than 30.0 m (98.4 ft).

1058. Maximum Density

- (1) For townhouse use, the maximum density must not exceed 250.0 m² (2691.0 ft²) of lot area per townhouse dwelling unit.
- (2) For apartment use, the maximum density must not exceed 110.0 m² (1184.0 ft²) of lot area per apartment dwelling unit.
- (3) Where required accessory off-street parking is located within or under a principle building, the floor area occupied by such parking may be added to the lot area of the lot for purpose of determining density under subsections (1) and (2).

1059. Setbacks

Setbacks are as required or permitted by Section 403, Section 413-420, and Part 5.

1060. Siting Exceptions for Balconies and Canopies

- (1) In addition to the siting exceptions under Section 403, balconies may project beyond the front yard and rear yard setbacks of Section 511 by up to 2.0 m (6.6 ft).
- (2) For apartment buildings, one canopy may project 2.0 m (6.6 ft) further than the front yard and rear yard setbacks specified in Section 511 provided that such canopy was part of the original construction of the building.

1061. Maximum Lot Coverage

A lot in the RM-6 zone must have a total lot coverage not exceeding 75% of the lot area of the lot.

1062. Maximum Height of Buildings

Building heights are as required by Part 5 of this Bylaw.

1063. Required Off-Street Parking

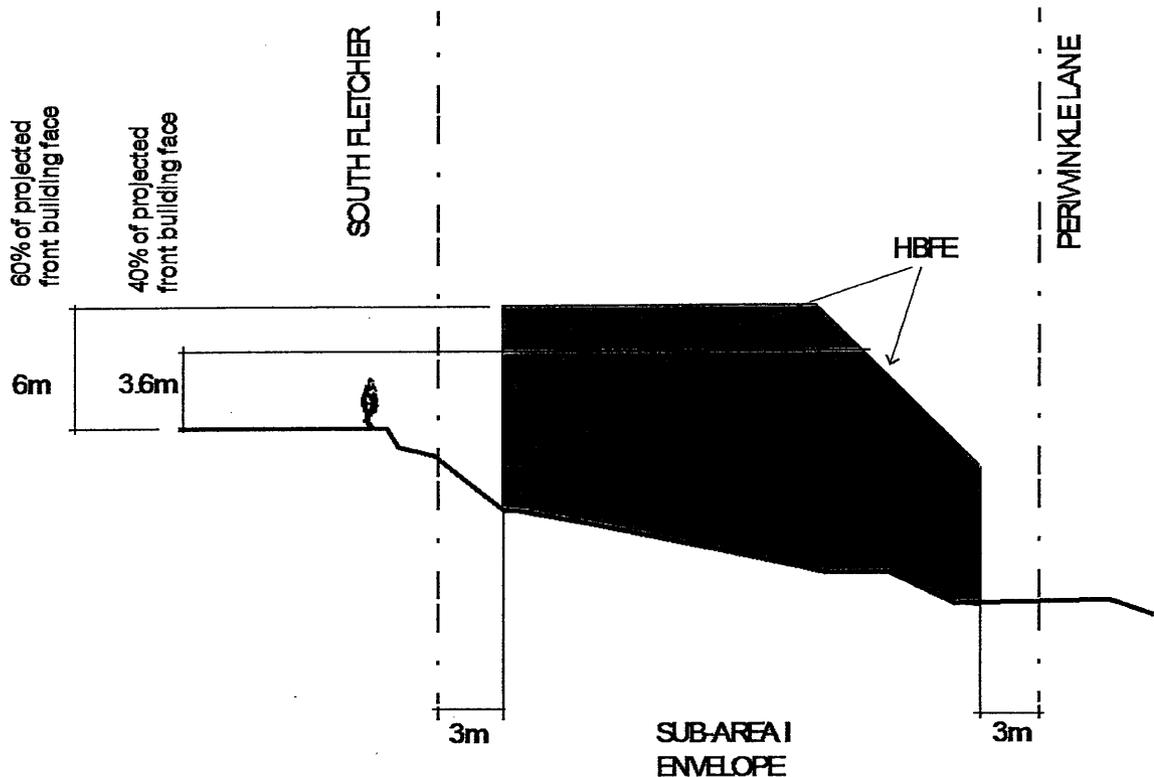
Off-street parking must be provided and maintained in accordance with the requirements of Part 6.

1064. Landscaping

Apartment and townhouse uses in the RM-6 zone must be landscaped and maintained as required by Sections 405 and 614 of this Bylaw.”

511. Regulations for Sub-area I

- (1) The building height must not exceed 6.0 m (19.7 ft) from the average natural grade of the sidewalk on the uphill side of the site for a maximum of 60 percent of the front building face, and must not exceed 3.6 m (11.8 ft) from the average natural grade of the sidewalk on the uphill side for the remainder of the front building face.
- (2) Any gabled roofs higher than the 3.6 m (11.8 ft) maximum must be designed such that roof ridges are perpendicular to South Fletcher Road, except where required between gables.
- (3) Any building must be contained within a Highest Building Face Envelope at a height of 6.5 m (21.3 ft).
- (4) buildings or structures must be sited no closer to a rear lot line than 3.0 m (9.8 ft), nor closer to a front lot line than 3.0 m (9.8 ft).



TITLE SEARCH PRINT

2017-01-31, 09:44:52

File Reference: PATRICK HOBBS

Requestor: DEBORAH SOUTER

Declared Value \$78000

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN****

Land Title District VANCOUVER
Land Title Office VANCOUVER

Title Number BV533466
From Title Number GE24273

Application Received 2003-12-22

Application Entered 2004-01-24

Registered Owner in Fee Simple
Registered Owner/Mailing Address: KENCO ENTERPRISES (1982) LTD., INC.NO. 257775
P.O. BOX 136
GIBSONS, BC
V0N 1V0

Taxation Authority NORTH SHORE - SQUAMISH VALLEY ASSESSMENT AREA
TOWN OF GIBSONS

Description of Land
Parcel Identifier: 009-777-482
Legal Description:
LOT 20 BLOCK C DISTRICT LOT 686 PLAN 6125

Legal Notations
THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL
GOVERNMENT ACT, SEE BB1249038, EXPIRES: N/A

Charges, Liens and Interests

Nature: COVENANT
Registration Number: R95863
Registration Date and Time: 1987-09-16 09:53
Registered Owner: THE VILLAGE OF GIBSONS
Remarks: L.T.A. S.215
INTER ALIA

Nature: MORTGAGE
Registration Number: CA860263
Registration Date and Time: 2008-07-23 14:49
Registered Owner: SUNSHINE COAST CREDIT UNION

TITLE SEARCH PRINT

File Reference: PATRICK HOBBS

Declared Value \$78000

2017-01-31, 09:44:52

Requestor: DEBORAH SOUTER

Duplicate Indefeasible Title NONE OUTSTANDING

Transfers NONE

Pending Applications NONE



12 MAR 2010 13 47

BB1249038

LOCAL GOVERNMENT ACT
(Part 26)

NOTICE OF PERMIT

PERMIT NO.: DP-2008-08

TO: Registrar of Titles
88 – 6th Street
New Westminster, B.C., V3L 5B3

TAKE NOTICE that the land described below is subject to a Permit issued by the Town of Gibsons.

PARTICULARS OF PERMIT

PERMIT DESCRIPTION:

- (a) Type of Permit: **Development Permit**
- (b) Statutory Authority: **Section 919.1(1)(b) of the Local Government Act**
(Specify Section of Local Government Act authorizing Permit)

Legal Description of Land affected:

LOT 20, BLOCK C, DL 686, PLAN 6125 GROUP 1 NEW WESTMINSTER DISTRICT
PID: 009-777-482

Issue Date: **October 6th, 2009**
Expiry Date (if any): **N/A**

(For Temporary Commercial or Industrial Permit ONLY)

ak 3/12/2010 1:47:19 PM 2 2
Doc File 1 \$23.75

FURTHER PARTICULARS OF THE PERMIT
MAY BE OBTAINED FROM THE ISSUING AUTHORITY

USE THIS BOX ONLY FOR AN AMENDMENT TO A LAND USE CONTRACT BY WAY OF PERMIT UNDER S.930 OF THE LOCAL GOVERNMENT ACT:

This Notice relates to the amendment of Land Use Contract No.: _____
(Registration Number)
which is registered as a charge against the above described land.

PARTICULARS OF THE AMENDMENT MAY BE OBTAINED
FROM THE ISSUING AUTHORITY

AND FURTHER TAKE NOTICE that in the case of a Temporary Commercial or Industrial Permit you are hereby authorized to cancel the notation of the filing of this Notice against the title to the land affected by it on or after the expiry date specified above without further application from us and we consent to a cancellation of the notation on the basis of effluxion of time.

TOWN OF GIBSONS

DATED: Feb 12, 2010


Michelle Jansson
Corporate Officer

'87 SEP 16 -9 :53

F 75768-L

THIS AGREEMENT dated this 25th day of March, 1980.
VANCOUVER, B.C.

BETWEEN:

THE VILLAGE OF GIBSONS,
1490 South Fletcher Road,
Post Office Box 340, Gibsons
in the Province of British
Columbia, VON IVO

R 95863

(Called herein the "Village")

OF THE FIRST PART

AND:

FREDERICK DOUGLAS LEE and
MARGARET LEE both of 1919
Lonsdale Avenue, North Vancouver
in the Province of British Columbia
V7M 2K3
(JOINT TENANTS) ✓
(Called herein the "Owners")

OF THE SECOND PART

WHEREAS Section 215 of the Land Titles Act, provides that a covenant, whether of a negative or positive nature, in respect of the use of the land, created in favour of a Municipality may be registered and, upon registration constitutes a charge on the land in favour of the Municipality;

AND WHEREAS the Owners are the registered owners of all and singular those certain parcels or tracts of land and premises situate lying and being in the Village of Gibsons in the Province of British Columbia and being more particularly known and described as:

OVER ALL

Lots 20, 21 and 22, Block C
District Lot 686, Plan 6125

(called herein the "Lands")

- 2 -

AND WHEREAS the Owners in order to meet with the requirements of the Village have agreed and now consent to grant a restrictive covenant in favour of the Village;

NOW THEREFORE in consideration of the premises and of the payment of the sum of One Dollar (1.00) receipt of which by the Owners from the Village is hereby acknowledged THE OWNERS HEREBY:

1. COVENANTS AND AGREES that provision shall always be made for no less than Eight (8) parking spaces on the said lands.

2. IT IS UNDERSTOOD and agreed that this Covenant is given for the purposes of complying with the parking requirements of the Village.

Whenever the singular or masculine is used in this Agreement, the same shall be deemed to include the plural or the feminine or the body politic or corporate as the context so requires; every reference to each party hereto shall be deemed to include the heirs, executors, administrators, successors and assigns of such party whenever the context so requires or the parties so require; this Agreement shall run with the Lands, and this Agreement shall enure to the benefit of and be binding upon the parties hereto.

SIGNED, SEALED AND DELIVERED by the Owners in the City of North Vancouver, in the Province of British Columbia on the *25th* day of *March*, 1980 in the presence of:

W. Bruce Campbell

**W. BRUCE CAMPBELL
RATCLIFF & COMPANY
BARRISTERS & SOLICITORS
103 - 133 WEST 15th ST.
NORTH VANCOUVER, B.C.**

As to both Signatures

Fred Lee

Margaret Lee

IN WITNESS WHEREOF the corporate seal of the Village was hereunto affixed in the Village of Gibsons in the Province of British Columbia on the *15th* day of *September*, 1980 in the presence of: *7 R.L.S.*

G.L. Giddard

ATTACHMENT C

Drilling Procedures Developed for the Town of Gibsons



**Proposed Drilling Program
for [enter project name]**

Submitted to: The Town of Gibsons

Date Issued: _____

PREPARED BY: [*The primary qualified professional consultant*]

CC: Town of Gibsons representative _____
Town's hydrogeology consultant _____
Drilling contractor _____
Barge Contractor (if applicable) _____
Other personal on site (if applicable) _____

CONTACT LIST

EMERGENCY NUMBERS

Town of Gibsons Representative: [*Name, work phone number, cell phone number*]
Drilling Contractor Owner/Principal: [*Name, work phone number, cell phone number*]
Ambulance/Hospital **911**

Prime Consultant in Charge

Principal Consultant: [*Name, work phone number, cell phone number*]
Field Consultant: [*Name, work phone number, cell phone number*]

Town Hydrogeology Consultant

Principal Hydrogeologist: [*Name, work phone number, cell phone number*]
Field Hydrogeologist: [*Name, work phone number, cell phone number*]

SERVICE COMPANIES

Drilling Contractors: [*Name, work phone number, cell phone number*]
Grouting/Cement Contractor: [*Name, work phone number, cell phone number*]
Vacuum Truck: [*Name, work phone number, cell phone number*]
Waste Removal Contractor: [*Name, work phone number, cell phone number*]
Barge Operator: [*Name, work phone number, cell phone number*]
Other: [*Name, work phone number, cell phone number*]

TO BE POSTED ON SITE

1 OVERVIEW

1.1 The purpose of subject the drilling program is to:

- *Provide summary of drilling program objectives*

1.2 As outlined in the Town of Gibsons Development Permit Area Guidelines, the proposed drilling area is underlain by a known artesian aquifer (the Gibson Aquifer) and therefore an increased standard of care is needed to protect the aquifer.

- *Describe location of site relative to the mapped Gibsons Aquifer and or to the Town Wells*

1.3 [Primary Contractor] envisage that the following risks would be involved in the proposed drilling program:

- *Outline the risks related to drilling in artesian conditions. Refer to BC MoE Flowing Artesian Wells document available at:*

http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/flowing_artesian_wells.pdf)

- *Examples:*

- *Uncontrolled artesian flow if aquitard is breached.*
- *Development of a sink hole if artesian flow is left unattended or site worker are unprepared to mitigate the flow.*
- *Impact on the Town of Gibsons' water wells if the aquifer is breached and left unsealed.*
- *Potential loss of aquifer pressure if the aquifer is breached and not sealed properly.*
- *Barge drilling risks (if applicable).*
- *Etc.*

1.4 Table 1 summarizes the proposed drilling program with anticipated depth, location, and decommissioning plan. The proposed borehole locations are shown on [e.g. Figure 1].

Table 1: Example table of proposed borehole details

Borehole Name	Location	Planned Depth	Decommission Plan
			<i>[e.g. decommission, install standpipe, etc]</i>

2 PRE-DRILLING REQUIREMENTS

2.1 The following must be established prior to drilling commencement:

- Knowledge and understanding of British Columbia's Groundwater Protection Regulation
 - (http://www.bclaws.ca/Recon/document/ID/freeside/11_299_2004)
- WorkSafe BC program
 - *List site specific H&S requirements, special considerations (e.g., life jackets worn at all times if drilling on barge).*
- Permit Requirements:
 - *e.g. Town of Gibsons Development Permit, Ministry of Environment, Department of Ocean and Fisheries, if applicable*
- Driller certification:
 - *List training courses for the drillers that will be conducting the subject drilling program are attached (include in appendix).*
- All rig lifting equipment, and overhead equipment must be certified to the Original Equipment Manufacturers Specifications (OEM).
 - *Provide statement*
- Casing handling and running procedures:
 - *To be provided by the drilling contractor. May be included in appendix*
- Certificate of Insurance and WorkSafe BC letter are attached
 - *Include in appendix.*
- Drill rig specifications are attached
 - *Include in appendix.*
- Additional pre-drilling requirements:
 - *Refer to BC MoE Flowing Artesian Wells document. May be included in appendix.*

3 RIG MOVE, RIG UP AND SITE SAFETY

3.1 The following procedures site safety provisions must be followed in mobilizing, set up and operation of the drilling rig:

- *Provide procedures, e.g.:*
 - *Drilling contractor to contact prime consultant in change the day before mobilization to site to confirm site and drill is ready. If drilling with a barge, confirm barge location and condition.*
 - *Move in and rig up drilling rig and auxiliary equipment on site (or onto the barge if applicable). Prior to initiating drilling, carry out detailed rig inspection and report any unsafe conditions to prime consultant.*
 - *Hold a pre-drilling safety meeting with the rig crew and all consultants on site to discuss the Hazardous Operations and drilling program.*
 - *Certified driller to be onsite at all times during drilling.*

4 GENERAL DRILLING PROCEDURES

4.1 Roles and responsibilities:

- *Describe roles and responsibilities of all personnel on site*

4.2 Methodology of data and sample collection:

- *Describe roles and responsibilities of all personal on site. For example:*
 - *Prime field consultant and Town's hydrogeology consultant to be onsite to collect formation cutting samples every (XX) m from surface. Formation cuttings samples to be collected and retained every (XX) m in the zone of interest for each well.*
 - *Additional data collection during drilling (e.g. standard penetration tests, electrical conductivity, groundwater levels or pressures, artesian flow rates, airlift rates etc.)*

4.3 Drilling Details

4.3.1 Borehole #####

- *Provide details on each proposed borehole, e.g.:*
 - *Borehole will be drilled vertically to approximately (XX) m and logged by the prime field consultant. The actual total depth of borehole will be finalized in the field based on subsurface conditions, cutting samples and geophysical logs (if applicable).*

- *Drilling contractor to drill and install the (XX)-inch surface casing conductor to the top of the aquitard, approximately (XX) m below ground (based on nearest drilled borehole or well record).*
- *Drilling contractor to drill and install (XX)-inch production casing by telescoping through surface casing.*
- *Fit conductor with annular diverter over surface casing in order to control artesian flow.*
- *Drilling rate should be sufficiently slow to allow for the collection of core samples by prime field consultant.*
- *Prime field consultant to complete geological logging, various geotechnical measurements (pressure, flow, salinity, etc...).*
- *Town's hydrogeology consultant to observe process and assist wherever possible.*
- *Measure water levels and electrical conductivity between drill runs.*
- *If the aquifer soil (which is understood to comprise coarse grained sand and/or gravel) and/or artesian pressures or fresh water are encountered, borehole to be abandoned immediately or completed as a monitoring well (piezometer), as described below.*
- *Refer to BC MoE Flowing Artesian Wells document for guidance.*
- *Must provide details describing control*

4.3.2 Monitoring Well / Piezometer Installation Details (If Required)

- *Refer to BC MoE Flowing Artesian Wells document for guidance.*
- *Explain in detail how the well will be completed and sealed to ensure no leakage through well cap, annular space or surface casing.*
- *Include details including: materials to be provided on site (pvc, screens, pressure gauge, barite, bentonite, cement, etc.), anticipated grout or cement mixtures to be used, well head completion details.*
- *Include how the well will be verified and monitored to ensure it remains sealed.*

4.3.3 Borehole Abandonment Program (Artesian Flowing Well Bore)

- *Describe all planned abandonment details including: maintaining control of artesian flow, grout mixture to be used.*
- *Method of placing grout/cement into borehole (pressure grouting, tremie line system etc.)*
- *Confirm that cement/grout has set and sealed before moving off of location.*
- *If borehole drilled in foreshore, final abandonment to be completed by cutting of the casing at the seabed so as not to create a navigation hazard.*

4.3.4 Borehole Abandonment Program (Non-artesian Flowing Well Bore)

- *Describe all planned abandonment details including grout mixture or bentonite to be used.*
- *Method of placing grout/cement into borehole (pressure grouting, tremie line system etc.)*
- *Confirm that grout or bentonite has set and sealed before moving off of location.*
- *If borehole drilled in foreshore, final abandonment to be completed by cutting of the casing at the seabed so as not to create a navigation hazard.*

5 FIELD PACKAGE

- The following documents are attached:
 - *Proposed borehole/well location plan*
 - *Site specific Health and Safety Plan*
 - *Drilling Contractor Materials (procedures, rig equipment and operation)*
 - *Permits*
 - *Utility clearances*
 - *BC MoE Flowing Artesian Well Document*
 - *Any other relative documentation.*
 - *Other relative documentation.*



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Trulli Developments Ltd.
505 – 633 Kinghorne Mews
Vancouver, B.C.
V6Z 3H4



November 13, 2018

File: 15620

DP-2018-11

Attention: Enrico Gay

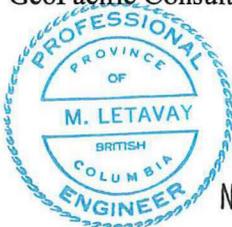
**Re: Geotechnical Confirmation - Proposed Residential Development
Lot 20 South Fletcher Road, Gibsons, B.C.**

This letter is to confirm that the results of our geotechnical investigation as presented in the “Geotechnical Investigation Report – Proposed Residential Development, Lot 20 South Fletcher Road, Gibsons, BC” dated December 1st, 2017 are considered valid and applicable for the proposed development.

We trust the above statements satisfy your requirements at this time. However, do not hesitate to contact us if you should require any clarification or additional details.

For:
GeoPacific Consultants Ltd.

Reviewed by:



NOV 14 2018

Marian Letavay, M.Sc., P.Eng.
Senior Project Engineer

Roberto Avendano, B.Eng., P.Eng.
Project Engineer



Trulli Developments Ltd.
505 – 633 Kinghorne Mews
Vancouver, B.C.
V6Z 3H4

December 1, 2017
File: 15620

**Re: Geotechnical Investigation Report - Proposed Residential Development
Lot 20 South Fletcher Road, Gibsons, B.C.**

1.0 INTRODUCTION

We understand that a new house is proposed for the above referenced property. Based on provided preliminary drawings, the new house is to consist of 5 cascading levels stepped into the slope to a maximum depth of 3 metres. We expect reinforced concrete construction for the below grade development and wood framed construction for the above grade portions. We anticipate relatively light column and wall loads in the range of 300 kN and 40 kN/m, respectively. Floor slab on grade loading is anticipated to be light.

This report presents a review of the soil conditions encountered during our field investigation and presents design and construction recommendations for the proposed development.

This report has been prepared exclusively for our client, for their use and the use of others on their design and construction team for this project and the Town of Gibsons for permitting purposes.

2.0 SITE DESCRIPTION

The site is located on the southeast side of South Fletcher Road in Gibsons, B.C. The site is bounded by Periwinkle Lane to the southeast, South Fletcher to the northwest and residential properties to the northeast and southwest. The site is currently unoccupied with evidence of a previous structure that has since been removed observed on the lower half of the property. The site is rectangular in shape and measures approximately 34 m on its longer perimeter and 14 m on the shorter perimeter. The site slopes down relatively steeply from South Fletcher Road towards Periwinkle with an elevation change of approximately 10 m across the site. The site has some older landscaping improvements and mature trees locally on the property towards South Fletcher Road.

The location of the site is shown on our Drawing No. 15620-01, following the text of this report.

3.0 FIELD INVESTIGATION

On November 20th, 2017 a total of 4 test pits were excavated using a mini excavator supplied and operated by Seagard Construction Ltd. from Halfmoon Bay, BC. The test pits were excavated until effective refusal and were logged and sampled by engineering personnel from our office. All test pits were backfilled after

our investigation was complete. The location of our test pits is shown on Drawing 15620-01, following the text of this report.

4.0 SUBSURFACE CONDITIONS

4.1 Soil Conditions

The general soil profile noted in our test holes consisted of a thin layer of organics overlying dense to very dense brown sand and gravel with cobble overtop of very dense grey sandy silt and gravel that was interpreted to be glacial till. The area on the lower half of the site that was observed to be previously improved generally had little to no cover overtop of the glacial till, whereas the upper half of the property contained up to 1.2 m of brown sand and gravel overlying the glacial till.

Please refer to appendix A for specific details of soils encountered in each test hole.

4.2 Groundwater Conditions

Groundwater was not encountered during our investigation. We do not anticipate groundwater will be encountered during excavation for the relatively shallow foundation elements.

Near surface perched groundwater generated by rainfall should be expected during wetter winter periods.

5.0 DISCUSSION

5.1 General Comments

We expect that the proposed structure will be supported on conventional spread foundations founded on native very dense glacial till. The stepped nature of the proposed structure is expected to result in shallow excavations less than about 3 m to establish sufficient grade for the foundation elements.

5.0 RECOMMENDATIONS

5.1 Site Preparation

We expect that the building would be founded up to 3 m below present site grades. All deleterious material (organics, loose fill, debris etc) should be removed from site prior to construction of the foundation. Exposed glacial till should be blinded immediately with a 100 mm thick layer of clear crush gravel to prevent disturbance of the soil. Generally the depth of foundations will dictate the necessary stripping depths. Where required, grade reinstatement beneath the floor slabs and non-load bearing walls can be done using engineered fill.

“Engineered Fill” is generally defined as clean sand to sand and gravel containing 5 percent fines by weight, compacted in 300 mm loose lifts to a minimum of 95% of the ASTM D1557 (Modified Proctor) maximum dry density at a moisture content that is within 2% of optimum for compaction.

The geotechnical engineer shall be contacted for the review of stripping and engineered fill placement and compaction.

5.2 Foundations and Bearing Capacity

Once the recommended site preparation has been completed, the new house can be founded on conventional strip and pad foundations.

For footings bearing on dense to very dense glaciated soils (Till), we recommend that footings be designed based on an SLS bearing pressure of 450 kPa. Ultimate Limit States (ULS) bearing pressures may be taken at 1.5 x SLS bearing pressures provided.

For footings bearing on engineered fill, we recommend that footings be designed based on an SLS bearing pressure of 120 kPa. Ultimate Limit States (ULS) bearing pressures may be taken at 1.5 x SLS bearing pressures provided.

We expect that the settlement of footings designed as recommended should be within the normally acceptable limits of 25 mm total and up to 2 mm per metre span of differential.

Irrespective of SLS bearing pressures, footings should not be less than 450 mm in width for strip footings and not less than 600 mm in width for square or rectangular footings.

The geotechnical engineer shall be contacted for the review of all foundation subgrades.

5.3 Seismic Design of Foundations

The subgrade conditions underlying the site may be classified as Site Class C as defined in Table 4.1.8.4.A of the 2012 BC Building Code. Peak ground accelerations on firm ground for the approximate site location is 0.434 g (National Resources Canada, Site Coordinates: 49.40 degrees North, 123.51 degrees West).

5.4 Slab-On-Grade Floors Preparation

In order to provide suitable support for slab-on-grade floors we recommend that any fill placed under the slab should be “engineered fill” as described in Section 5.1 above. In addition, this granular fill must be compacted to a minimum of 98 % Standard Proctor maximum dry density (ASTM D698) with water content within 2% of optimum for compaction.

Floor slab should be underlain by a minimum of 150 mm of 20 mm clear crushed gravel fill to inhibit upward migration of moisture beneath the slab. A moisture barrier should underlie the slab directly above the free draining granular material.

The crushed gravel under slab fill should be compacted to a minimum of 95% of the ASTM D1557 (Modified Proctor) maximum dry density at a moisture content that is within 2% of optimum for compaction.

The geotechnical engineer should be contacted for the review of the slab subgrade and underslab materials and compaction.

5.5 Site and Foundation Drainage

A perimeter drainage system will be required for the below grade structure to prevent the development of water pressure on the foundation walls and the basement floor slabs. Groundwater flows are expected to be relatively light and due solely to perched water. This should be confirmed at the time of construction.

5.6 Temporary Excavations

We expect that temporary excavations would be sloped where possible since it is more economical to do so. We would expect that slopes cut to 1V to 1H can be constructed within the existing native soils. All temporary cut slopes should be covered in poly sheeting to prevent erosion of the slope face. Temporary cut slopes in excess of 1.2 metres in height require inspection by a professional engineer in accordance with Work Safe BC guidelines. GeoPacific can provide further advise on slope cuts once the excavation is underway.

To the northeast where an adjacent development is present near the property line, and towards South Fletcher Road to the northwest, shoring may be required to provide adequate working room. We expect that conventional shotcrete and anchor shoring systems would be the most economical provided encroachment agreements can be obtained for anchors installed on neighboring properties. Should this be desired, GeoPacific can work with you to design shoring systems that meet your needs.

Light seepage during the wetter months should be expected due to the formation of perched water tables. We expect that inflows may be handled with conventional sumps and sump pumps.

The geotechnical engineer shall be contacted for the review of temporary excavations.

5.7 Earth Pressures on Foundation Walls

Earth pressures against the foundation walls are dependent on factors such as, available lateral restraint along the wall, surcharge loads, backfill materials, compaction of the backfill and drainage conditions.

The foundation wall is expected to be partially yielding and fully restrained between the basement floor and backfilled with a free draining granular soil. The foundation walls will be backfilled with granular soil and compacted in place to a density suitable for support of patios and other settlement sensitive fixtures constructed at grade beyond the parkade limits. We expect backfill to be compacted to at least 95 percent ASTM D698 (Standard Proctor) maximum dry density.

We recommend that the foundation walls be designed to resist the following lateral earth pressures:

Static: Triangular soil pressure distribution of $5 H$ kPa, where H is equal to the total wall height in metres.

Seismic: Inverted triangular soil pressure distribution of $4.5H$ kPa, where H is equal to the total wall height in metres.

The preceding loading recommendations assume that the basement walls would be backfilled with only free draining backfill materials, ensuring a drained cavity around the perimeter of the parkade. We expect that the perimeter drainage system will be connected to the synthetic drainage material and sufficiently lower the groundwater level such that hydrostatic pressures against the foundation walls are eliminated.

The geotechnical engineer should be contacted for the review of all backfill materials and procedures.

5.8 Slope Stability

The proposed development site consists of slopes as steep as approximately 30 degrees. As such, we completed a slope stability analysis in accordance with the 2012 BCBC which was addressed using the "Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC" (Revised May 2008).

We have considered the effects of the anticipated loading associated with the proposed house in our analysis. A GeoSlope model was created to assess the factor of safety for both static and seismic conditions and returned results of 3.3 and 1.7 respectively. These results exceed typically required levels of stability of 1.5 and 1.0.

6.0 DESIGN REVIEWS AND CONSTRUCTION INSPECTIONS

The preceding sections make recommendations for the design and construction of the proposed new house at Lot 20 South Fletcher Road, Gibsons, BC. We recommend that we be retained to review certain aspects of the design and construction. It is important that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also important that any contractors working on the site review this document prior to commencing their work.

It is the responsibility of the contractors working on-site to inform GeoPacific a minimum of 24 hours in advance that a field review is required. In summary, reviews are required by geotechnical engineer for the following portions of the work.

- | | |
|--------------------|---|
| 1. Stripping | Review of stripping depth. |
| 2. Excavation | Review of temporary cut slopes. |
| 3. Engineered Fill | Review of fill materials and compaction. |
| 4. Foundation | Review of foundation subgrade. |
| 5. Slab on-grade | Review of subgrade and underslab fill materials and compaction. |

7.0 CLOSURE

This report has been prepared exclusively for our client for the purpose of providing geotechnical recommendations for the design and construction of the proposed house development, temporary excavations and related earthworks. The report remains the property of GeoPacific Consultants Ltd. and unauthorized use of, or duplication of, this report is prohibited.

We are pleased to assist you with this project and we trust this information is helpful and sufficient for your purposes at this time. However, please do not hesitate to call if you should require any clarification.

For:

GeoPacific Consultants Ltd.

Reviewed by:



DEC 05 2017

Kyle Doyle, B. Eng., EIT
Geotechnical Engineer in Training

John Carter, M. Eng., P.Eng.
Principal

Appendix A: Test Pit Logs



SITE PLAN
SCALE = 1:500

LEGEND:
[Icon] TP17-# - TEST PIT (TP) LOCATION

REFERENCE:

*TEST LOCATIONS ARE APPROXIMATE

GEO PACIFIC
VANCOUVER GEOTECHNICAL SERVICES

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Vancouver, B.C. V6P 6P2
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F: 604-436-9659

DATE:	NOVEMBER 28, 2017
DRAWN BY:	R.M.
APPROVED BY:	J.G.C.
REVIEWED BY:	K.D.
SCALE:	AS SHOWN

RESIDENTIAL HOME
LOT 20 SOUTH FLETCHER ROAD, GIBBONS, BC
TEST HOLE SITE PLAN

FILE NO.:	15620	REVISIONS:
DWG. NO.:	15620-01	A
		B
		C

Test Hole Log: TP17-01

File: 15620

Project: Residential Development

Client: Trulli Development Ltd.

Site Location: Lot 20 South Fletcher Road, Gibsons, BC



GEOPACIFIC
CONSULTANTS

1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)				
0		Ground Surface	0.0				
0		Organics 6 inch thick layer of forest litter over topsoil.	0.2				
1		Sand and Gravel Dense to very dense, brown, sand and gravel with some cobble.					
4		Glacial Till Very dense, grey, sandy silt with gravel.	1.2				
5		End of Borehole	1.5				

Logged: KGD
Method: Mini Excavator
Date: Nov 20, 2017

Datum: Existing Ground
Figure Number: A.01
Page: 1 of 1

Test Hole Log: TP17-02

File: 15620

Project: Residential Development

Client: Trulli Development Ltd.

Site Location: Lot 20 South Fletcher Road, Gibsons, BC



1779 West 75th Avenue, Vancouver, BC, V6P 6P2
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INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)				
0		Ground Surface	0.0				
0		Fill Loose fill, organics, plastic debris, trash.	0.2				
1		Glacial Till Very dense, grey, sandy silt with gravel.	0.3				
		End of Borehole					
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Logged: KGD
Method: Mini Excavator
Date: Nov 20, 2017

Datum: Existing Ground
Figure Number: A.02
Page: 1 of 1

Test Hole Log: TP17-03

File: 15620

Project: Residential Development

Client: Trulli Development Ltd.

Site Location: Lot 20 South Fletcher Road, Gibsons, BC



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INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)				
0		Ground Surface	0.0				
0		Sand Compact sand with gravel and cobble.	0.2				
1		Glacial Till Very dense, grey, sandy silt with gravel.	0.3				
		End of Borehole					
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Logged: KGD
Method: Mini Excavator
Date: Nov 20, 2017

Datum: Existing Ground
Figure Number: A.03
Page: 1 of 1

Test Hole Log: TP17-04

File: 15620

Project: Residential Development

Client: Trulli Development Ltd.

Site Location: Lot 20 South Fletcher Road, Gibsons, BC



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INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)				
0		Ground Surface	0.0				
0		Fill Organic fill.					
1		Sand Compact sand with gravel and cobble.	0.3				
2		Glacial Till Very dense, grey, sandy silt with gravel.	0.5				
		End of Borehole					
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Logged: KGD
Method: Mini Excavator
Date: Nov 20, 2017

Datum: Existing Ground
Figure Number: A.04
Page: 1 of 1