

BRITANNIA BEACH SOUTH
SITE DEVELOPMENT AND SERVICING
VOL 5 OF 5 - REFERENCES

Reference: 20.05
Date: 2020-05-05
DRAFT FOR REVIEW

Distribution:
Client – pdf

Britannia Beach South

Site Development and Servicing

Vol 5 of 5 – References

Submitted to Client:

Tiger Bay Development Corporation

Physical address:

27154 Sea-To-Sky Highway 99, Britannia Beach, BC, V0N 1J0

office: 604-896-2339, fax: 604-896-2336

Mailing and delivery address:

General Delivery, Box Number 195 27154 Sea-to-sky Highway 99 Britannia Beach, BC, V0N 1J0

Attn: Long Cheng, Cell: 604-354-5908, long@southbritannia.com

Attn: Tony Petricevic, vcel: 778-708-9111, office@southbritannia.com

Prepared by Consultant:

P.S.Turje & Associates Ltd.

1333 Inglewood Avenue, West Vancouver, BC, V7T 1Y8

Attn: Paul Turje, P.Eng., paul@turje.ca, 604-619-1407

Submitted by:

Paul Turje, P.Eng.

Submission Date:

2020-05-31

Study Limitations:

P.S.Turje & Associates Ltd. (Consultant) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made. This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by psturje for the sole benefit of the Client. It represents Consultant's professional judgement based on the knowledge and information available at the time of completion. Consultant is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk. The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Consultant by Client, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.



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INTRODUCTION

This document is a site development master plan for a new community referred to as Britannia Beach South, located in the Squamish Lillooet Regional District (SLRD) beside Howe Sound and flanking Highway 99 (the Sea-to-Sky highway). The owner and proponent of the development concept is Tiger Bay Development Corporation.

The Master Plan consists of the following five documents:

Volume 1 of 5: Summary – This volume extracts the summaries and phasing plan from the Details volume. The reader should reference the Drawings volume when reading this summary.

Volume 2 of 5: Master Servicing Plan – This volume extracts only the phasing plan from Volume 3 together with the drawings *Site Plan – Interim* and *Site Plan-Final*.

Volume 3 of 5: Engineering – This volume contains the full text of the master plan together with many figures that will aid the reader's understanding. The reader intrepid enough to wade into this volume should also refer to the Drawings and Reference volumes.

Volume 4 of 5: Drawings – This volume includes full-sized drawings.

Volume 5 of 5: Reference (this document) – This volume contains consultant reference reports.
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1 CONTACT LIST

This list contains the names of the current team members and their contact information.

Britannia Beach South Development
Contact Sheet

BRITANNIA BEACH SOUTH DEVELOPMENT
TAICHENG DEVELOPMENT CORPORATION
CONTACT SHEET

(please report errors to paul@turje.ca)

Owner	Tiger Bay Development Corporation Britannia Address 27154 Sea-To-Sky Highway 99 Britannia Beach, BC, V0N 1J0 office: 604-896-2339, fax: 604-896-2336 Downtown office address: Tiger Bay Development Corp #820-510 West Hastings St, Vancouver, BC Mailing and delivery address: General Delivery, Box Number 195 27154 Sea-to-sky Highway 99 Britannia Beach, BC, V0N 1J0 Long Cheng Cell: 604-354-5908, long@taichengcorp.ca ; trotkcheng@hotmail.com; Alex Tony Petricevic cel: 778-708-9111,
Regional Government	Squamish-Lillooet Regional District Box 219, 1350 Aster St, Pemberton, BC, V0N 2L0 604-894-6371 F 604-894-6526 Kimberly Needham, Direct of Planning & Development, kneedham@slrd.bc.ca Kristina Salin, Planner ksalin@slrd.bc.ca Ian Holl, Planner, iholl@slrd.bc.ca Edward Witwicki, engineering technologist ewitwicki@slrd.bc.ca Brooke Carere, Environmental & Utilities Services Technician barere@slrd.bc.ca  Steven Olmstead Senior Planner SOlmstead@slrd.bc.ca P: 604-894-6371 x248 F: 604-894-6526 1-800-298-7753 www.slrd.bc.ca

Britannia Beach South Development
Contact Sheet

Planning & Lead Consultant	MVH Urban Planning & Design Inc. 12601 19A Avenue, Surrey, B.C. CANADA V4A 7M1 T (604) 536-3990 C (604) 789-9325 F (604) 536-3995 Michael A. von Hausen MCIP, RPP, CSLA, MLAUD, LEED AP (project planning coordinator) President, Adjunct Professor, Simon Fraser University vhausen@telus.net Paul Turje, P.Eng. (project engineering coordinator) 1333 Inglewood Avenue, W Vancouver, B7T 1Y8 604-619-1407 paul@turje.ca
Province of BC - Ministry of Transportation and Infrastructure	Graeme Schimpf, Operations Manager – North Shore, Howe Sound & Sunshine Coast Graeme.Schimpf@gov.bc.ca Ministry of Transportation and Infrastructure Lower Mainland District Michael Braun, MPA, Senior District Development Technician North Shore - Sea to Sky - Sunshine Coast Ministry of Transportation and Infrastructure Lower Mainland District t: 604.527.2244 e: Michael.Braun@gov.bc.ca Rupinder Prihar, Area Development and Operations Technician, Ministry of Transportation and Infrastructure, South Coast Region, Lower Mainland District, 310-1500 Woolridge Street, Coquitlam, BC, V3K 0B8 T: 604-527-2246 E: Rupinder.Prihar@gov.bc.ca
Surf Park Supplier	Wave Garden Eneko Elosegui, Business Development, enekoe@wavegarden.com, 34-943-04-10-18 Sean Young, Business Development, sean@wavegarden.com, 34 943 01 10 18 M 34 661 49 73 07 Imanol Sorazu, Architect, imanol@wavegarden.com, 34 943 32 25 38
Highways Consultant	Hatch Mott MacDonald 1010-1066 West Hastings Street, Vancouver, B.C., V6E 3X2 F 604.639.1191 ftp site : https://www.hmmftp.com/ ; Username=st5407; Password=CTEYeZ07 Steve Tarr, MBA, P.Eng., Senior Project Engineer, 604.639.1037 steve.tarr@hatchmott.com Frank Liu, PMP, T 604.629.1736 Contracts Department, T 604.629.1736, frank.liu@hatchmott.com

Britannia Beach South Development
Contact Sheet

Sustainability	Whistler Centre for Sustainability 4325 Blackcomb Way, Whistler, BC, V0N 1B4 (604) 935-8209 Cheeying Ho, Executive Director, (604) 388-8421 (cell), cho@whistlercentre.ca
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Civil Engineers (water supply & sewage treatment)	Kerr Wood Leidal 200-4185 Still Creek Drive, Burnaby, BC, V5C 6G9 T 604-294-2088 Colin Kristiansen, P.Eng. (Project Manager), D (604) 293-3259, ckristiansen@kwl.ca Ken Ferraby, P.Eng., (Review Engineer), D (604) 293-3258 C (604) 240-4574, kferraby@kwl.ca Michelle Revesz, P.Eng. (Project Engineer), D 604-293-3253, mrevesz@kwl.ca Mike Nolan, P.Eng. (Water resources specialist), D 604-293-3289, mnolan@kwl.ca Jack Lau, GIS/CAD Specialist, D 604-293-3233, jlau@kwl.ca
Architect	EKISTICS 1925 Main Street, Vancouver BC , V5T 3C1 Canada Theo Finseth, Project Manager Theo Finseth <finseth@ekistics.ca> C +1.604.365.7574 T +1.604.739.7526 F +1.604.739.7532
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Environmental consultant	Cascade Environmental Resource Group Ltd. 203-38026 2nd Avenue, Squamish, BC, V8B 0C3 Tel: 604-815-0901; fax: 604-805-0904 Dave Williamson, Whistler Office t: 604-938-1949 c: 604 932-0797, dwilliamson@cerg.ca Mike Nelson, c: 604-815-9973, mnelson@cerg.ca

Britannia Beach South Development
Contact Sheet

Hydrogeologist Contamination	Piteau Associates Engineering Ltd. 300 – 788 Copping St, N.Vancouver, BC, V7M 3G6 T 604-986-8551 F 604-985-7286 David Tiplady, P.Eng., dtiplady@piteau.com x249 or direct 604-998-3414
Transportation consultant	Bunt & Associates Engineering (BC) Ltd. 1550 – 1050 W Pender St, Vancouver, BC, V6E 3S7 p 604-685-6427 f 604-687-7234 Daniel Fung, 604-685-6427 x227, dfung@bunteng.com Peter Joyce, 604-685-6427 x 225, pjoyce@bunteng.com
Property Lawyer	Miller Thomson LLP Robson Court, 1000-840 Howe Street, Vancouver, BC V6Z 2M1 Fax: 604.643.1200 Lynn Ramsay, Q.C., direct: 604-643-1208, lramsay@millerthomson.com
Surveyor	Bunbury & Associates, Land Surveyors 207 – 38026 Second Avenue, PO Box 1512, Squamish, BC, V8B 0B1 T:604-892-3090 F:604-892-5427 Martin Jones, BCLS, Principal, M:604-815-7879, mjones@bunbury-surveys.com
CN Crossing Coordinator	Daniel Suh, 604-589-6522, daniel.suh@cn.ca Crossing Coordinator - CN Engineering Services Thornton Operations Building 1st Floor, 11717 138th Street, Surrey, BC, V3R 6T5 Ph: (604)589-6522 Fax: (604)589-6525
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Britannia Beach South Development
Contact Sheet

Britannia Mine Museum	Britannia Mine Society PO Box 188, Britannia Beach, BC, V0N 1T0 Kirstin Clausen, Executive Director, P: 604-896-2233 #224, kclausen@bcmmm.ca
Geotechnical Debris Hazard (see BGC)	Thurber Engineering Ltd. 900 - 1281 West Georgia Street, Vancouver, BC V6E 3J7 Ph: 604-684-4384, Fax: 604-684-5124 Dave Smith, P.Eng., dsmith@thurber.ca Ben Singleton-Polster, P.Eng., bsingleton-polster@thurber.ca (moved to Golder Terrace) Dave Golder Associates Terrace Ben Singleton-Polster, P.Eng. 250-635-3444
Site Development Engineer (civil, grading, utilities)	R.F.BINNIE & ASSOCIATES LTD. 205-4946 Canada Way, Burnaby, BC, V5G 4H7, tel: 604-420-1721, fax: 604-420-4743 R.F.Binnie & Associates Ltd. 201-40147 Glenalder Place, Squamish, BC, V8B 0G2 reception: 604-892-8222, fax: 604-892-8225; direct: 778-945-6110; Robert Dos Santos, ASCT, x31, cel:778-266-0029, rdossantos@binnie.com Tom Rabey, cel:778-945-6040, trabey@binnie.com
Real Estate Development	REDM GROUP 250-669 Howe Street Vancouver, BC, V6C 0B4 604-678-1219 Steve Elias , cel: 778-327-8250, steve.elias@redmgroup.ca
Utility Operator	EPCOR Edmonton Rick Dowell, rdowell@epcor.com
Utility Operator	CORIX Vancouver 604-697-6700

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Geotech (superceded by SFA Engineering)	GEOPACIFIC CONSULTANTS LTD. 215 - 1200 West 73 Avenue, Vancouver, BC, V6P 6G5 O: 604-439-0922 Ext. 227, F: 604-439-9189 Steven Fofonoff, M.Eng., P.Eng., Senior Geotechnical Engineer (Squamish Adventure Centre), , C: 604-78957, fofonoff@geopacific.ca
Province of BC- contaminated sites	Greg Stewart 250-387-9659
Province of BC - Tunnel Dam gravel removal N Britannia	Bruce O'Neil, P.Eng. bruce.oneill@gov.bc.ca Project Director - Provincial Dam Interests Ministry of Forests, Lands and Natural Resource Operations Resource Stewardship Division (Victoria) Phone: (250) 387-3263 Cell: (778) 676-0980
Highway 99 Transportation Study	Parsons Engineering Andrew Kwiatkowski P.Eng. Andrew Kwiatkowski Andrew.Kwiatkowski@parsons.com Transportation Engineer  Suite 2300, Metrotower 1 4710 Kingsway, Burnaby, BC V5H 4M2 P: 604-438-5300 F: 604-438-5350 http://www.parsons.com
BC Hydro	BC Hydro 8475-128 th St, Surrey, BC, V3W 0G1 Chris Nunn , RPF , Project Manager LM/VI, Transmission, Vegetation & Access Management, tel: 604-54137, cel: 604-329-7207, chris.nunn@bchydro.com BC Hydro 39020 Discovery Way, Squamish, BC, V8B 0E5 Tel: 604-892-6575; fax: 604-892-6543 Lori Grant , Design Specialist cel: 604-848-5547 lori.grant@bchydro.com BC Hydro 6911 Southpoint Drive, 12 th floor, Burnaby, BC, V3N 4X8 Tel: 604-528-2135 Mike Murray , Interconnection Manager, cel: 778-241-6404, mike.murray@bchycro.com Lincol Bashualdo , Planner

Britannia Beach South Development
Contact Sheet

Stream Hydraulics (see BGC)	Northwest Hydraulics Consulting 30 Gostick Place, N.Vancouver, V7M 3G3 Tel: 604-980-6011 Barry Chilibeck , bchilibeck@nhcweb.com
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Province of BC - habitat	Ministry of Forests Lands and Natural Resource Operations Scott Barrett, Director, Resource Management (Ecosystems), scott.barrett@gov.bc.ca , 604-586-2889 (applications through Front Counter BC)
Province of BC – water Authorizations	Ministry of Forests, Lands and Natural Resource Operations 200-10428 153 Street, Surrey, BC, V3R 1E1 Remko Rosenboom, Section Head Water Authorizations and Allocations, South Coast Region, Remko.Rosenboom@gov.bc.ca , T 604-586-5629, M 604-992-1762 Jim Davies, Assistant Regional Manager, Regional Hydrologist, Water Allocation, James.Davies@gov.bc.ca 604-586-5637 (applications through Front Counter BC)
Fisheries & Oceans Canada	Fisheries and Oceans Canada Mike Engelsjord, Team Leader, Fisheries Protection Program, Ecosystem Management Branch, 200-401 Burrard Street, Vancouver, BC, V6C 3S4, EngelsjordM@pac.dfo-mpo.gc.ca , 604-367-6628 Teri Ridley, Fisheries Protection Biologist, Teri.Ridley@dfo-mpo.gc.ca , 250-320-9811 Karen Billard, Fisheries Protection Program, Ecosystem Management Branch, Fisheries Protection Biologist, karen.billard@dfo-mpo.gc.ca , T 604-666-0126, M 604-619-8529 (applications to “Triag and Planning Unit at email address ReferralsPacific@dfo-mpo.gc.ca)

Britannia Beach South Development
Contact Sheet

Vancouver Coastal Health	Cindy Watson, Cindy.Watson@vch.ca
Development Consultant	Elevate Property Advisors Moe Freitag, Vice President c: 604-849-0178 e: moe@elevatebc.com John Jervis, Director c: 604-892-4192 e: john@elevatebc.com
Camp Operator	Mike Coyne <i>President</i>  7-38921 Progress Way, Squamish, BC. V8B 0K6 T: <u>604 815 4500</u> F: <u>604 815 4509</u> M: <u>778-899-4342</u> www.landseacamps.com
Power Engineers	Primary Engineering and Construction 209-8327 Eastlake Drive, Burnaby, BC, V5A 4W2 Joseph Kylo, Partner o: 604-558-0401 x11 m: 604-358-6807 jkyllo@primaryeng.com ZE Power Engineering Ltd. 160-5920 No.2 Rd, Richmond, BC, V7C 4R9 Jovan jovan@ze.com

Britannia Beach South Development
Contact Sheet

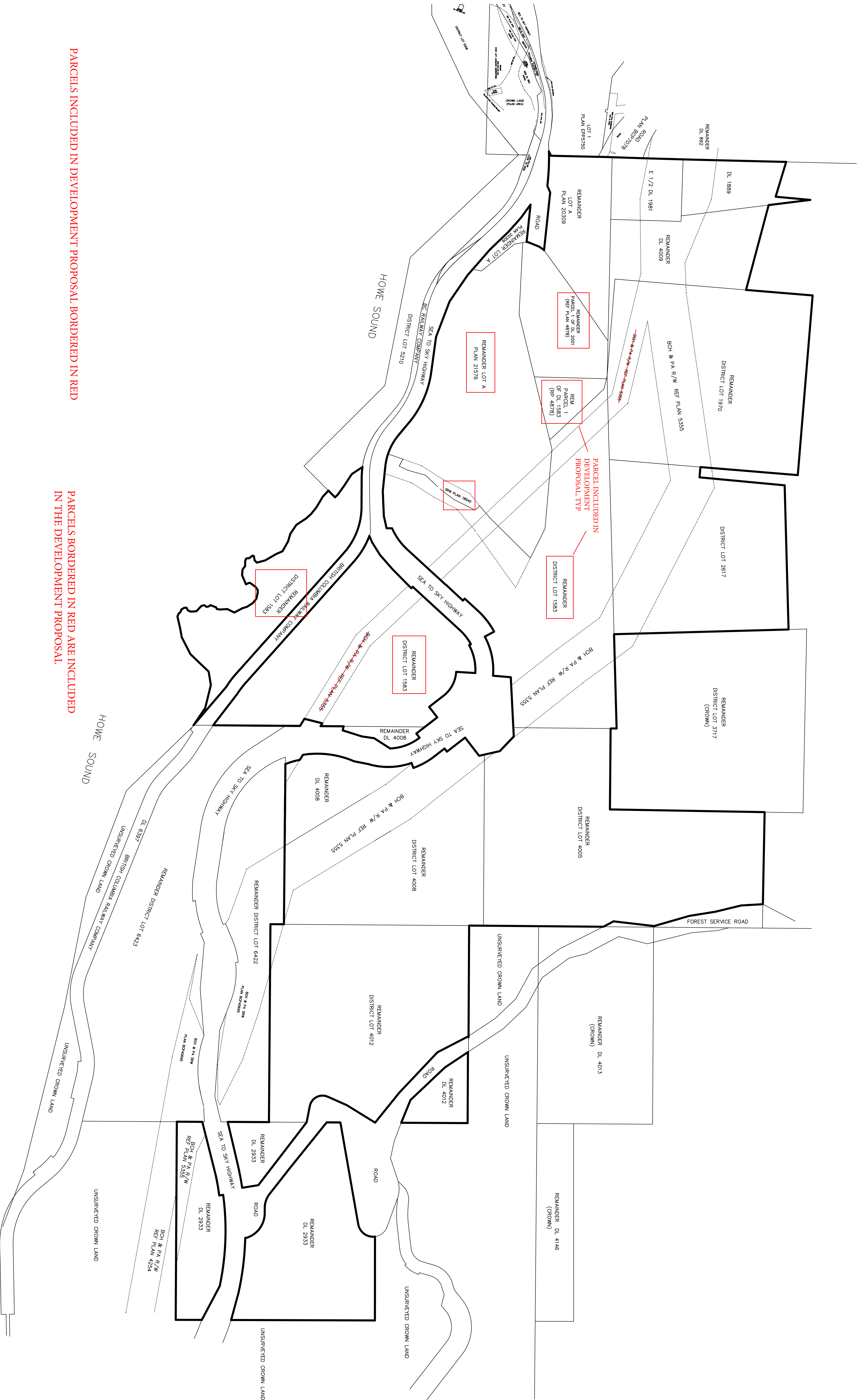
Debris Hazard and Stream Hydraulics	BGC ENGINEERING INC. Suite 500 - 980 Howe Street Vancouver, BC, Canada, V6Z 0C8 Telephone: (604) 684-5900 ext. 41112 Matthias Jakob, Ph.D., P.Geo. (BC/AB), L.G.,Principal Geoscientist MJakob@bgcengineering.ca Direct: (604) 629-3842 Cellular: (604) 367-5795 Lauren Hutchinson, M.Sc., P.Eng. , Geotechnical Engineer Direct line: (604) 330-8097 LHutchinson@bgcengineering.ca
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2 LEGAL PLANS AND TITLES

This section contains the legal plans and titles to the properties included in the submission.

Note the following issues:

1. The BC Hydro R/W that cuts diagonally across the main gravel pit was extinguished in 2014.
2. A small remnant triangle of land measuring only a few square meters of area was inadvertently not conveyed to Taicheng as its existence was only identified during legal survey of the BC Hydro R/W (item 1 above). The intention is to transfer ownership of this property to Taicheng once the means of doing so are identified. The property triangle is located outside of the proposed development area to avoid impediments to the current subdivision proposal.



PARCELS INCLUDED IN DEVELOPMENT PROPOSAL BORDERED IN RED

PARCELS BORDERED IN RED ARE INCLUDED IN THE DEVELOPMENT PROPOSAL.

TITLE SEARCH PRINT

2020-03-25, 15:09:28

File Reference:

Requestor: Piteau user

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

VANCOUVER

VANCOUVER

Title Number

From Title Number

CA6795362

BB1341966

Application Received

2018-05-11

Application Entered

2018-05-24

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

TIGER BAY DEVELOPMENT CORPORATION, INC.NO. BC0864299
PO BOX 195, 27154 HIGHWAY 99
BRITANNIA BEACH, BC
V0N 1J0

Taxation Authority

North Shore - Squamish Valley Assessment Area

Description of Land

Parcel Identifier:

010-025-952

Legal Description:

PARCEL 1 (REFERENCE PLAN 4878) OF DISTRICT LOT 1583 GROUP 1 NEW WESTMINSTER
DISTRICT EXCEPT PART ON PLAN 21576

Legal Notations

NONE

TITLE SEARCH PRINT

File Reference:

2020-03-25, 15:09:28

Requestor: Piteau user

Charges, Liens and Interests

Nature:	UNDERSURFACE RIGHTS
Registration Number:	N46371
Registration Date and Time:	1985-06-14 11:49
Registered Owner:	VALE INVESTMENTS LTD. INCORPORATION NO. C1021365 CHANGE OF ADDRESS FILED, SEE CA4184609
Transfer Number:	CA4144782
Remarks:	INTER ALIA ALL GOLD AND SILVER WHICH MAY BE FOUND IN VEINS LODES OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PARCEL 1; "MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN TRANSFER OF G85006 RECEIVED 29/10/1984 @ 12:58 TRANSFERRED TO R133949 23/12/1987
Nature:	COVENANT
Registration Number:	R133930
Registration Date and Time:	1987-12-23 14:46
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133932
Registration Date and Time:	1987-12-23 14:47
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133933
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA

TITLE SEARCH PRINT

2020-03-25, 15:09:28

File Reference:

Requestor: Piteau user

Nature: COVENANT
Registration Number: R133934
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks: INTER ALIA
SEC 215 LTA

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: TAICHENG DEVELOPMENT CORP.
INCORPORATION NO. BC0864299
Transfer Number: CA4223660
Remarks: INTER ALIA
TRANSFER OF N46371, SEE G85006
ALL GOLD AND SILVER WHICH MAY BE FOUND IN VEINS,
LODES, OR ROCK IN PLACE UNDER THOSE PORTIONS OF
LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL
CLAIM AND LOT 4022, KNOWN AS "NO. 74 FRACTIONAL"
MINERAL CLAIM LYING WITHIN THE LIMITS OF PARCEL 1
"MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN

Nature: MORTGAGE
Registration Number: CA7018476
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

TITLE SEARCH PRINT

2020-03-25, 15:09:28

File Reference:

Requestor: Piteau user

Nature: ASSIGNMENT OF RENTS
Registration Number: CA7018477
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

DRAFT

TITLE SEARCH PRINT

2020-03-25, 15:08:35

File Reference:

Requestor: Piteau user

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

VANCOUVER

VANCOUVER

Title Number

From Title Number

CA6795363

BB2019685

Application Received

2018-05-11

Application Entered

2018-05-24

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

TIGER BAY DEVELOPMENT CORPORATION, INC.NO. BC0864299
PO BOX 195, 27154 HIGHWAY 99
BRITANNIA BEACH, BC
V0N 1J0

Taxation Authority

North Shore - Squamish Valley Assessment Area

Description of Land

Parcel Identifier:

010-025-901

Legal Description:

PARCEL 1 (REFERENCE PLAN 4878) OF DISTRICT LOT 2001 GROUP 1 NEW WESTMINSTER
DISTRICT EXCEPT PART ON PLAN 21576

Legal Notations

THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL
GOVERNMENT ACT, SEE BB1514137

TITLE SEARCH PRINT

File Reference:

2020-03-25, 15:08:35

Requestor: Piteau user

Charges, Liens and Interests

Nature:	UNDERSURFACE RIGHTS
Registration Number:	N46371
Registration Date and Time:	1985-06-14 11:49
Registered Owner:	VALE INVESTMENTS LTD. INCORPORATION NO. C1021365 CHANGE OF ADDRESS FILED, SEE CA4184609
Transfer Number:	CA4144782
Remarks:	INTER ALIA ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES OR ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND SEPARATELY OR IN COMBINATION WITH EACH OTHER UNDER THAT PART OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL MINERAL CLAIM" AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PARCEL 1; TRANSFER OF G85006 RECEIVED 29/10/1984 @ 12:58 TRANSFERRED TO R133949 23/12/1987
Nature:	COVENANT
Registration Number:	R133930
Registration Date and Time:	1987-12-23 14:46
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133932
Registration Date and Time:	1987-12-23 14:47
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133933
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA

TITLE SEARCH PRINT

2020-03-25, 15:08:35

File Reference:

Requestor: Piteau user

Nature: COVENANT
Registration Number: R133934
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks: INTER ALIA
SEC 215 LTA

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: TAICHENG DEVELOPMENT CORP.
INCORPORATION NO. BC0864299
Transfer Number: CA4223660
Remarks: INTER ALIA
TRANSFER OF N46371, SEE G85006
ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES, OR ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND SEPARATELY OR IN COMBINATION WITH EACH OTHER UNDER THAT PART OF LOT 4009 KNOW AS "MAPLE FRACTIONAL MINERAL CLAIM" AND LOT 4022 KNOWN AS "NO. 74 MINERAL FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PARCEL 1

Nature: MORTGAGE
Registration Number: CA7018476
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

TITLE SEARCH PRINT

2020-03-25, 15:08:35

File Reference:

Requestor: Piteau user

Nature: ASSIGNMENT OF RENTS
Registration Number: CA7018477
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

DRAFT

TITLE SEARCH PRINT

2020-03-25, 15:10:29

File Reference:

Requestor: Piteau user

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

VANCOUVER

VANCOUVER

Title Number

From Title Number

CA6795371

BB2019686

Application Received

2018-05-11

Application Entered

2018-05-24

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

TIGER BAY DEVELOPMENT CORPORATION, INC.NO. BC0864299
PO BOX 195, 27154 HIGHWAY 99
BRITANNIA BEACH, BC
V0N 1J0

Taxation Authority

North Shore - Squamish Valley Assessment Area

Description of Land

Parcel Identifier:

010-026-151

Legal Description:

DISTRICT LOT 1583 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT: FIRSTLY; PART IN REFERENCE PLAN 4390, SECONDLY; PART IN REFERENCE PLAN 4878, THIRDLY; PART ON PLAN 21576, FOURTHLY; PART SHOWN AS 8.31 ACRES ON HIGHWAY PLAN 76 FIFTHLY; PART SHOWN AS 0.08 ACRES ON HIGHWAY PLAN 76, SIXTHLY: PPORTION ON PLAN BCP29232

Legal Notations

THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL GOVERNMENT ACT, SEE BB1514137

HERETO IS ANNEXED RESTRICTIVE COVENANT H4828 OVER:

(A) DISTRICT LOTS 1296 AND 1632 EXCEPT PORTIONS IN REFERENCE PLAN 4335

(B) DISTRICT LOTS 1661 AND 1666

(C) DISTRICT LOT 2018, EXCEPT PORTIONS IN REFERENCE PLANS 4335 AND 6684

(D) DISTRICT LOTS 1626, 1659 AND 1898 EXCEPT PORTIONS IN REFERENCE PLAN 4335

(E) DISTRICT LOT 1660

(F) DISTRICT LOT 4145, EXCEPT PORTIONS IN DISTRICT LOTS 1661 AND 1666

TITLE SEARCH PRINT

2020-03-25, 15:10:29

File Reference:

Requestor: Piteau user

(G) DISTRICT LOT 4149

(H) DISTRICT LOTS 2922, 2924, 4007 AND 4144

Charges, Liens and Interests

Nature:	RIGHT OF WAY
Registration Number:	324477M
Registration Date and Time:	1961-03-08 15:36
Registered Owner:	BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
Remarks:	INTER ALIA PART IN REFERENCE PLAN 5355, WITH ANCILLARY RIGHTS OVER THE REMAINDER PARTIALLY CANCELLED BY CA3839444 (2014-07-15 @ 10:14) AS TO THAT PART SHOWN ON PLAN EPP41027
Nature:	COVENANT
Registration Number:	R133930
Registration Date and Time:	1987-12-23 14:46
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133932
Registration Date and Time:	1987-12-23 14:47
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133933
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133934
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA

TITLE SEARCH PRINT

2020-03-25, 15:10:29

File Reference:

Requestor: Piteau user

Nature: STATUTORY RIGHT OF WAY
Registration Number: R133935
Registration Date and Time: 1987-12-23 14:48
Registered Owner: SQUAMISH - LILLOOET REGIONAL DISTRICT
Remarks: INTER ALIA
PART PLAN 18940
ANCILLARY RIGHTS

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: TAICHENG DEVELOPMENT CORP.
INCORPORATION NO. BC0864299
Transfer Number: CA4223660
Remarks: INTER ALIA
TRANSFER OF G85006 RC'D.29.10.84 @12:58 SEE N46371
FIRST: ALL GOLD AND SILVER WHICH MAY BE FOUND IN
VEINS, LODES, OR ROCK IN PLACE UNDER THOSE
PORTIONS OF LOT 2925 KNOWN AS "NO. 71" MINERAL
CLAIM, LOT 2926 KNOWN AS "NO. 72" MINERAL CLAIM
LOT 3717 KNOWN AS "NO. 48" MINERAL CLAIM;
LOT 3942 KNOWN AS "NO. 73" MINERAL CLAIM; LOT 4009
KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM;
LOT 4022 KNOWN AS "NO. 74 FRACTIONAL MINERAL
CLAIM" ALL LYING WITHIN THE LIMITS OF DISTRICT
LOT 1583;

Nature: MORTGAGE
Registration Number: CA7018476
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

TITLE SEARCH PRINT

2020-03-25, 15:10:29

File Reference:

Requestor: Piteau user

Nature: ASSIGNMENT OF RENTS
Registration Number: CA7018477
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

DRAFT

TITLE SEARCH PRINT

2020-03-25, 15:10:04

File Reference:

Requestor: Piteau user

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

VANCOUVER

VANCOUVER

Title Number

From Title Number

CA6795372

BB2019684

Application Received

2018-05-11

Application Entered

2018-05-24

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

TIGER BAY DEVELOPMENT CORPORATION, INC.NO. BC0864299
PO BOX 195, 27154 HIGHWAY 99
BRITANNIA BEACH, BC
V0N 1J0

Taxation Authority

North Shore - Squamish Valley Assessment Area

Description of Land

Parcel Identifier:

010-077-227

Legal Description:

LOT A, EXCEPT PART DEDICATED ROAD ON PLAN BCP28651, DISTRICT LOTS 1583,
2001 AND 7034 PLAN 21576

Legal Notations

THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL
GOVERNMENT ACT, SEE BB1514137

THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL
GOVERNMENT ACT, SEE CA5963142 EXPIRES 2020-04-19

PART DERIVED FROM DISTRICT LOTS 1583 AND 2001 IS ANNEXED
RESTRICTIVE COVENANT H4828 OVER:

(A) DISTRICT LOTS 1296 AND 1632, EXCEPT PORTIONS IN REFERENCE
PLAN 4390

(B) DISTRICT LOTS 1661 AND 1666

(C) DISTRICT LOT 2018, EXCEPT PORTIONS IN REFERENCE PLANS 4335 AND
6684

(D) DISTRICT LOTS 1626, 1659 AND 1898, EXCEPT PORTIONS IN REFERENCE
PLAN 4335

(E) DISTRICT LOT 1660

TITLE SEARCH PRINT

File Reference:

2020-03-25, 15:10:04

Requestor: Piteau user

Charges, Liens and Interests

Nature: RIGHT OF WAY
Registration Number: 324477M
Registration Date and Time: 1961-03-08 15:36
Registered Owner: BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
Remarks: INTER ALIA
PART DERIVED FROM PART FORMER D.L. 1583
PART IN REFERENCE PLAN 5355, WITH ANCILLARY
RIGHTS OVER THE REMAINDER
PARTIALLY CANCELLED BY CA3839444 (2014-07-15 @
10:14) AS TO THAT PART SHOWN ON PLAN EPP41027

Nature: UNDERSURFACE RIGHTS
Registration Number: N46371
Registration Date and Time: 1985-06-14 11:49
Registered Owner: VALE INVESTMENTS LTD.
INCORPORATION NO. C1021365
CHANGE OF ADDRESS FILED, SEE CA4184609
Transfer Number: CA4144782
Remarks: INTER ALIA
(A) ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND
PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODS OR
ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND
SEPARATELY OR IN COMBINATION WITH EACH OTHER
UNDER THAT PART OF LOT 4009 KNOWN AS
"MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN
THE LIMITS OF PART FORMER D.L. 2001 AND PART
FORMER PARCELL 1 (RP4878) OF D.L. 2001;
LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL
CLAIM LYING WITHIN THE LIMITS OF PART FORMER
PARCEL 1 (RP4878) OF D.L. 2001, PART FORMER D.L.
2001 AND PART FORMER D.L. 7034;
(B) ALL GOLD AND SILVER WHICH MAY BE FOUND IN
VEINS LODS OR ROCK IN PLACE UNDER THOSE PORTIONS
OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL
CLAIM AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL"
MINERAL CLAIM LYING WITHIN THE LIMITS OF PART
FORMER PARCEL 1 (RP 4878) OF D.L. 1583
(C) ALL GOLDE AND SILVER WHICH MAY BE FOUND IN
VEINS LODS OR ROCK IN PLACE UNDER THOSE PORTIONS
OF LOT 2925 KNOWN AS "NO. 71" MINERAL CLAIM, LOT
2926 KNOWN AS "NO 72" MINERAL CLAIM; LOT 3717
KNOWN AS "NO 48" MINERAL CLAIM; LOT 3942 KNOWN
AS "NO 73" MINERAL CLAIM; LOT 4009 KNOWN AS
"MAPLE FRACTIONAL" MINERAL CLAIM; LOT 4022 KNOWN
AS "NO 74" FRACTIONAL MINERAL CLAIM; ALL LYING
WITHIN THE LIMITS OF PART FORMER D.L. 1583
TRANSFER OF G85006
REC'D 29/10/1984 @ 12:58
ASSIGNED TO CA4223659

TITLE SEARCH PRINT

2020-03-25, 15:10:04

File Reference:

Requestor: Piteau user

Nature: STATUTORY RIGHT OF WAY
Registration Number: R133935
Registration Date and Time: 1987-12-23 14:48
Registered Owner: SQUAMISH - LILLOOET REGIONAL DISTRICT
Remarks: INTER ALIA
PART PLAN 18940
ANCILLARY RIGHTS

Nature: UNDERSURFACE RIGHTS
Registration Number: CA4223659
Registration Date and Time: 2015-02-06 16:24
Registered Owner: TAICHENG DEVELOPMENT CORP.
INCORPORATION NO. BC0864299
Remarks: INTER ALIA
ASSIGNMENT OF N43671
(A) ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES OR ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND SEPARATELY OR IN COMBINATION WITH EACH OTHER UNDER THAT PART OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN THE LIMITS OF PART FORMER D.L. 2001 AND PART FORMER PARCELL 1 (RP4878) OF D.L. 2001; LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PART FORMER PARCEL 1 (RP4878) OF D.L. 2001, PART FORMER D.L. 2001 AND PART FORMER D.L. 7034;
(B) ALL GOLD AND SILVER WHICH MAY BE FOUND IN VEINS LODES OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PART FORMER PARCEL 1 (RP 4878) OF D.L. 1583
(C) ALL GOLDE AND SILVER WHICH MAY BE FOUND IN VEINS LODES OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 2925 KNOWN AS "NO. 71" MINERAL CLAIM, LOT 2926 KNOWN AS "NO 72" MINERAL CLAIM; LOT 3717 KNOWN AS "NO 48" MINERAL CLAIM; LOT 3942 KNOWN AS "NO 73" MINERAL CLAIM; LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM; LOT 4022 KNOWN AS "NO 74" FRACTIONAL MINERAL CLAIM; ALL LYING WITHIN THE LIMITS OF PART FORMER D.L. 1583

TITLE SEARCH PRINT

2020-03-25, 15:10:04

File Reference:

Requestor: Piteau user

Nature: MORTGAGE
Registration Number: CA7018476
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Nature: ASSIGNMENT OF RENTS
Registration Number: CA7018477
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Duplicate Indefeasible Title NONE OUTSTANDING

Transfers NONE

Pending Applications NONE

July 28, 2014

Delivered Via Mail

Taicheng Development Corporation
Suite 710 - 100 Park Royal South
West Vancouver, BC V7T 1A2

Attention: Long Cheng

Dear Sir/Madam:

**Re: South Britannia Development
BC Hydro – Partial Release of Statutory Right of Way 324477M**

Lynn I. Ramsay, Q.C.
Direct Line: 604.643.1208
Direct Fax: 604.643.1200
lramsay@millerthomson.com

File: 178831.0001

Further to the above matter, enclosed are copies of the following for your files:

1. Application to Deposit Plan EPP41027, together with a filed copy of Plan EPP41027;
2. Form C Release of Statutory Right of Way 324477M which was submitted for registration on July 15, 2014 under registration number CA3839444, together with an executed copy; and
3. Title Searches confirming that the Statutory Right of Way has been released as to that part shown on Plan EPP41027.

We trust you will find the enclosed to be in order, and remain,

Yours truly,

MILLER THOMSON LLP

Per:



Lynn I. Ramsay, Q.C.
LIR/bnp

Enclosure
12011353.1 July 21, 2014 - 4:09 PM

NEW WESTMINSTER LAND TITLE OFFICE

APPLICATION TO DEPOSIT PLAN
AT LAND TITLE OFFICE
PROVINCE OF BRITISH COLUMBIA

Jul-15-2014 10:14:08.001

CA3839443

PAGE 1 OF 3 PAGES

Your electronic signature is a representation that you are a subscriber as defined by the Land Title Act, RSBC 1996 c.250, and that you have applied your electronic signature in accordance with Section 168.732, and a true copy, or a copy of that true copy, is in your possession.

Lynn Isabel
Ramsay V9L5S1

Digitally signed by Lynn Isabel Ramsay
V9L5S1
DN: c=CA, cn=Lynn Isabel Ramsay
V9L5S1, o=Lawyer, ou=Verify ID at
www.juricert.com/LKUP.cfm?id=V9L5S1
Date: 2014.07.14 16:33:45 -07'00'

1. APPLICATION: (Name, address, phone number of applicant, applicant's solicitor or agent)

Lynn Ramsay, Q.C., Miller Thomson LLP
1000, 840 Howe Street

604.687.2242

Client No: 010437 File No: 178831.0001

Taicheng / 11971737

Vancouver

BC V6Z 2M1

Document Fees: \$63.15

Deduct LTSA Fees? Yes ☒

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

SEE SCHEDULE

3. APPLICATION FOR DEPOSIT OF:

PLAN TYPE

PLAN NUMBER

CONTROL NUMBER

NUMBER OF NEW
LOTS CREATED

Reference or Explanatory

EPP41027

140-181-4874

4. OWNER(S): (updated owner(s) name(s), occupation(s), postal address and postal code)

TAICHENG DEVELOPMENT CORP.

710, 100 PARK ROYAL SOUTH

WEST VANCOUVER

V7T 1A2

BRITISH COLUMBIA

CANADA

Incorporation No

BC0864299

5. ADDITIONAL INFORMATION:

ADDITIONAL PARCEL INFORMATIONPAGE 2 OF 3 PAGES

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

010-025-634 ALL THAT PORTION COLOURED RED ON PLAN ANNEXED TO CROWN GRANT DEPOSITED WITH 231087L OF DISTRICT LOT 4009 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT THOSE PORTIONS LYING WITHIN THE LIMITS OF DISTRICT LOTS 1583 AND 2001

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

010-025-863 DISTRICT LOT 1970 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT THOSE PORTIONS LYING WITHIN THE BOUNDARIES OF DISTRICT LOTS 1583 AND 2001

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

010-026-151 DISTRICT LOT 1583 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT: FIRSTLY; PART IN REFERENCE PLAN 4390 SECONDLY; PART IN REFERENCE PLAN 4878 THIRDLY; PART ON PLAN 21576 FOURTHLY; PART SHOWN AS 8.31 ACRES ON HIGHWAY PLAN 76 FIFTHLY PART SHOWN AS 0.08 ACRES ON HIGHWAY PLAN 76 SIXTHLY; PORTION ON PLAN BCP29232

ADDITIONAL PARCEL INFORMATIONPAGE 3 OF 3 PAGES

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

**010-077-227 LOT A EXCEPT PART DEDICATED ROAD ON PLAN BCP28651 DISTRICT
LOTS 1583, 2001 AND 7034 PLAN 21576**

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

**010-025-766 DISTRICT LOT 4008 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT:
FIRSTLY: PART ON HIGHWAY PLAN 76 SECONDLY: PART ON PLAN
BCP29235**

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

NEW WESTMINSTER LAND TITLE OFFICE

Jul-15-2014 10:14:08.002

EPP41027

SURVEY PLAN CERTIFICATION
PROVINCE OF BRITISH COLUMBIA

0762

PAGE 1 OF 2 PAGES

By incorporating your electronic signature into this form you are also incorporating your electronic signature into the attached plan and you

(a) represent that you are a subscriber and that you have incorporated your electronic signature to the attached electronic plan in accordance with section 168.73 (3) of the Land Title Act, RSBC 1996 c.250; and

(b) certify the matters set out in section 168.73 (4) of the Land Title Act, Each term used in this representation and certification is to be given the meaning ascribed to it in part 10.1 of the Land Title Act.

Martin Jones
W73AF9

Digitally signed by Martin Jones
W73AF9
DN: c=CA, cn=Martin Jones W73AF9,
o=BC Land Surveyor, ou=Verify ID at
www.juricent.com/LKUP.cfm?
id=W73AF9
Date: 2014.06.03 10:01:14 -07'00'

1. BC LAND SURVEYOR: (Name, address, phone number)

Martin R. Jones

PO Box 1512

207-38026 Second Avenue

Squamish

BC V8B 0B1

604-892-3090

mjones@bunbury-surveys.com

☐ Surveyor General Certification [For Surveyor General Use Only]

2. PLAN IDENTIFICATION:

Control Number: 140-181-4874

Plan Number: EPP41027

This original plan number assignment was done under Commission #: 762

LTO Document Reference: CA3839443

3. CERTIFICATION:

☒ Form 9☐ Explanatory Plan☐ Form 9A

I am a British Columbia land surveyor and certify that I was present at and personally superintended this survey and that the survey and plan are correct.

The field survey was completed on: 2014 May 27 (YYYY/Month/DD)

The checklist was filed under ECR#:

The plan was completed and checked on: 2014 June 03 (YYYY/Month/DD)

161808

☒ None ☐ Strata Form S☒ None☐ Strata Form U1☐ Strata Form U1/U2Arterial Highway ☐4. ALTERATION: ☐

TITLE SEARCH PRINT

2014-07-25, 17:54:53

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

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

Land Title District	VANCOUVER
Land Title Office	VANCOUVER
Title Number	BB2019682
From Title Number	BB1341968
Application Received	2012-08-10
Application Entered	2012-08-18
Registered Owner in Fee Simple	
Registered Owner/Mailing Address:	TAICHENG DEVELOPMENT CORP., INC.NO. 0864299 710 - 100 PARK ROYAL SOUTH WEST VANCOUVER, BC V7T 1A2
Taxation Authority	NORTH SHORE - SQUAMISH VALLEY ASSESSMENT AREA
Description of Land	
Parcel Identifier:	010-025-863
Legal Description:	DISTRICT LOT 1970 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT THOSE PORTIONS LYING WITHIN THE BOUNDARIES OF DISTRICT LOTS 1583 AND 2001
Legal Notations	
	THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL GOVERNMENT ACT, SEE BB1514137
Charges, Liens and Interests	
Nature:	RIGHT OF WAY
Registration Number:	324477M
Registration Date and Time:	1961-03-08 15:36
Registered Owner:	BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
Remarks:	PART IN REFERENCE PLAN 5355, WITH ANCILLARY RIGHTS OVER THE REMAINDER INTER ALIA PARTIALLY CANCELLED BY CA3839444 (2014-07-15 @ 10:14) AS TO THAT PART SHOWN ON PLAN EPP41027

TITLE SEARCH PRINT

2014-07-25, 17:54:53

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Nature: COVENANT
Registration Number: R133930
Registration Date and Time: 1987-12-23 14:46
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: COVENANT
Registration Number: R133932
Registration Date and Time: 1987-12-23 14:47
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: COVENANT
Registration Number: R133933
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: COVENANT
Registration Number: R133934
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: BRITANNIA BEACH HOLDINGS LTD.
INCORPORATION NO. 301803
Remarks: TRANSFER OF N79348G, SEE G85009G
SEE A.F.B. VOL. 65 FOLIO 331
ALL MINERALS PRECIOUS AND BASE (SAVE COAL AND
PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES, OR
ROCK IN PLACE WHETHER SUCH MINERALS ARE FOUND
SEPARATELY OR IN COMBINATION WITH EACH OTHER UNDER
LOT 1970 KNOWN AS "THISTLE" MINERAL CLAIM
INTER ALIA

TITLE SEARCH PRINT

2014-07-25, 17:54:53

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Nature: MORTGAGE
Registration Number: CA2171157
Registration Date and Time: 2011-08-31 12:55
Registered Owner: YI LUEN DEVELOPMENTS AND HOLDINGS LTD.
INCORPORATION NO. BC0771108
Remarks: INTER ALIA

Nature: JUDGMENT
Registration Number: CA2663816
Registration Date and Time: 2012-07-18 11:23
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
OF R133949
RENEWED BY CA3839941

Nature: JUDGMENT
Registration Number: CA3839941
Registration Date and Time: 2014-07-15 11:21
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
RENEWAL OF CA2663816

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

NEW WESTMINSTER LAND TITLE OFFICE

LAND TITLE ACT
 FORM C (Section 233) RELEASE
 GENERAL INSTRUMENT - PART 1 Province of British Columbia

Jul-15-2014 10:14:08.003

CA3839444

PAGE 1 OF 4 PAGES

Your electronic signature is a representation that you are a subscriber as defined by the Land Title Act, RSBC 1996 c.250, and that you have applied your electronic signature in accordance with Section 168.3, and a true copy, or a copy of that true copy, is in your possession.

Lynn Isabel
 Ramsay V9L5S1

Digitally signed by Lynn Isabel Ramsay
 V9L5S1
 DN: c=CA, cn=Lynn Isabel Ramsay
 V9L5S1, o=Lawyer, ou=Verify ID at
 www.juricert.com/LKUP.cfm?id=V9L5S1
 Date: 2014.07.14 16:31:59 -07'00'

1. APPLICATION: (Name, address, phone number of applicant, applicant's solicitor or agent)

Lynn Ramsay, Q.C., Miller Thomson LLP
 1000, 840 Howe Street

604.687.2242

Client No: 010437 File No: 178831.0001

Taicheng / 11358903

Vancouver

BC V6Z 2M1

Document Fees: \$29.10

Deduct LTSA Fees? Yes ☒

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
 [PID] [LEGAL DESCRIPTION]

SEE SCHEDULESTC? YES ☐

3. NATURE OF INTEREST BEING RELEASED CHARGE NO. ADDITIONAL INFORMATION
SEE SCHEDULE

4. TERMS
 The charge described in item 3 is released or discharged as a charge on the land described in item 2.

5. TRANSFEROR(S):
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

6. TRANSFEREE(S): (including postal address(es) and postal code(s))
 Registered owner

7. ADDITIONAL OR MODIFIED TERMS:
 N/A

8. EXECUTION(S): This instrument creates, assigns, modifies, enlarges, discharges or governs the priority of the interest(s) described in Item 3 and the Transferor(s) and every other signatory agree to be bound by this instrument, and acknowledge(s) receipt of a true copy of the filed standard charge terms, if any.

Officer Signature(s)

C.M. Blake Ferris

Barrister & Solicitor

British Columbia Hydro and Power
 Authority
 12th Floor - 333 Dunsmuir Street
 Vancouver, BC V6B 5R3

Execution Date		
Y	M	D
14	06	23

Transferor(s) Signature(s)

BRITISH COLUMBIA HYDRO AND
 POWER AUTHORITY, by its
 authorized signatory(ies):

Name: Tina Winter

Name:

OFFICER CERTIFICATION:

Your signature constitutes a representation that you are a solicitor, notary public or other person authorized by the *Evidence Act*, R.S.B.C. 1996, c.124, to take affidavits for use in British Columbia and certifies the matters set out in Part 5 of the *Land Title Act* as they pertain to the execution of this instrument.

LAND TITLE ACT
FORM E

SCHEDULE

PAGE 2 OF 4 PAGES

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]

[LEGAL DESCRIPTION]

010-025-634**ALL THAT PORTION COLOURED RED ON PLAN ANNEXED TO CROWN
GRANT DEPOSITED WITH 231087L OF DISTRICT LOT 4009 GROUP 1 NEW
WESTMINSTER DISTRICT EXCEPT THOSE PORTIONS LYING WITHIN THE
LIMITS OF DISTRICT LOTS 1583 AND 2001**

STC?

YES ☐

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]

[LEGAL DESCRIPTION]

010-025-863**DISTRICT LOT 1970 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT
THOSE PORTIONS LYING WITHIN THE BOUNDARIES OF DISTRICT LOTS
1583 AND 2001**

STC?

YES ☐

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]

[LEGAL DESCRIPTION]

010-026-151**DISTRICT LOT 1583 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT:
FIRSTLY; PART IN REFERENCE PLAN 4390 SECONDLY; PART IN
REFERENCE PLAN 4878 THIRDLY; PART ON PLAN 21576 FOURTHLY; PART
SHOWN AS 8.31 ACRES ON HIGHWAY PLAN 76 FIFTHLY PART SHOWN AS
0.08 ACRES ON HIGHWAY PLAN 76 SIXTHLY; PORTION ON PLAN BCP29232**

STC?

YES ☐

LAND TITLE ACT
FORM E

SCHEDULE

PAGE 3 OF 4 PAGES

-
2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

**010-077-227 LOT A EXCEPT PART DEDICATED ROAD ON PLAN BCP28651 DISTRICT
LOTS 1583, 2001 AND 7034 PLAN 21576**

STC? YES ☐

-
2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

**010-025-766 DISTRICT LOT 4008 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT:
FIRSTLY: PART ON HIGHWAY PLAN 76 SECONDLY: PART ON PLAN
BCP29235**

STC? YES ☐

-
2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

STC? YES ☐

**LAND TITLE ACT
FORM E****SCHEDULE**

PAGE 4 OF 4 PAGES

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

Right Of Way

324477M

Partial Release as to area shown outlined on Plan
EPP41027

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

LAND TITLE ACT
FORM C (Section 233) RELEASE
GENERAL INSTRUMENT - PART 1 Province of British Columbia

PAGE 1 OF 5 PAGES

Your electronic signature is a representation that you are a subscriber as defined by the Land Title Act, RSBC 1996 c.250, and that you have applied your electronic signature in accordance with Section 168.3, and a true copy, or a copy of that true copy, is in your possession.

1. APPLICATION: (Name, address, phone number of applicant, applicant's solicitor or agent)

Lynn Ramsay, Q.C., Miller Thomson LLP
 1000, 840 Howe Street

604.687.2242

Client No: 010437 File No: 178831.0001

Taicheng / 11358903

Vancouver

BC V6Z 2M1

Deduct LTSA Fees? Yes ☒

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
 [PID] [LEGAL DESCRIPTION]

SEE SCHEDULESTC? YES ☐

3. NATURE OF INTEREST BEING RELEASED CHARGE NO. ADDITIONAL INFORMATION
SEE SCHEDULE

4. TERMS
 The charge described in item 3 is released or discharged as a charge on the land described in item 2.

5. TRANSFEROR(S):
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

6. TRANSFEREE(S): (including postal address(es) and postal code(s))
 Registered owner

7. ADDITIONAL OR MODIFIED TERMS:
 N/A

8. EXECUTION(S): This instrument creates, assigns, modifies, enlarges, discharges or governs the priority of the interest(s) described in Item 3 and the Transferor(s) and every other signatory agree to be bound by this instrument, and acknowledge(s) receipt of a true copy of the filed standard charge terms, if any.

Officer Signature(s)

C. M. Blake Ferris
 Barrister & Solicitor
 British Columbia Hydro and Power
 Authority
 12th Floor - 333 Dunsmuir Street
 Vancouver, BC V6B 5R3

Execution Date

Y	M	D
14	06	23

Transferor(s) Signature(s)

BRITISH COLUMBIA HYDRO AND
 POWER AUTHORITY, by its
 authorized signatory(ies):

Name: Tina Winter

Name:

OFFICER CERTIFICATION:

Your signature constitutes a representation that you are a solicitor, notary public or other person authorized by the *Evidence Act*, R.S.B.C. 1996, c.124, to take affidavits for use in British Columbia and certifies the matters set out in Part 5 of the *Land Title Act* as they pertain to the execution of this instrument.

LAND TITLE ACT
FORM E

SCHEDULE

PAGE 2 OF 5 PAGES

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]

[LEGAL DESCRIPTION]

010-025-634**ALL THAT PORTION COLOURED RED ON PLAN ANNEXED TO CROWN GRANT DEPOSITED WITH 231087L OF DISTRICT LOT 4009 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT THOSE PORTIONS LYING WITHIN THE LIMITS OF DISTRICT LOTS 1583 AND 2001**

STC?

YES ☐

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]

[LEGAL DESCRIPTION]

010-025-863**DISTRICT LOT 1970 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT THOSE PORTIONS LYING WITHIN THE BOUNDARIES OF DISTRICT LOTS 1583 AND 2001**

STC?

YES ☐

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]

[LEGAL DESCRIPTION]

010-026-151**DISTRICT LOT 1583 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT: FIRSTLY; PART IN REFERENCE PLAN 4390 SECONDLY; PART IN REFERENCE PLAN 4878 THIRDLY; PART ON PLAN 21576 FOURTHLY; PART SHOWN AS 8.31 ACRES ON HIGHWAY PLAN 76 FIFTHLY PART SHOWN AS 0.08 ACRES ON HIGHWAY PLAN 76 SIXTHLY; PORTION ON PLAN BCP29232**

STC?

YES ☐

LAND TITLE ACT
FORM E

SCHEDULE

PAGE 3 OF 8 PAGES

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]

[LEGAL DESCRIPTION]

010-077-227**LOT A EXCEPT PART DEDICATED ROAD ON PLAN BCP28651 DISTRICT
LOTS 1583, 2001 AND 7034 PLAN 21576**

STC?

YES ☐

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]

[LEGAL DESCRIPTION]

010-025-766**DISTRICT LOT 4008 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT:
FIRSTLY: PART ON HIGHWAY PLAN 76 SECONDLY: PART ON PLAN
BCP29235**

STC?

YES ☐

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]

[LEGAL DESCRIPTION]

STC?

YES ☐

LAND TITLE ACT
FORM E

SCHEDULE

PAGE 4 OF ⁴~~5~~ PAGES

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

Right Of Way

324477M

Partial Release as to area shown outlined on Plan
EPP41027

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

NATURE OF INTEREST BEING RELEASED

CHARGE NO.

ADDITIONAL INFORMATION

TITLE SEARCH PRINT

2014-07-25, 17:57:05

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

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

Land Title District	VANCOUVER
Land Title Office	VANCOUVER
Title Number	BB2019687
From Title Number	BB1332899
Application Received	2012-08-10
Application Entered	2012-08-18
Registered Owner in Fee Simple	
Registered Owner/Mailing Address:	TAICHENG DEVELOPMENT CORP., INC.NO. 0864299 710 - 100 PARK ROYAL SOUTH WEST VANCOUVER, BC V7T 1A2
Taxation Authority	NORTH SHORE - SQUAMISH VALLEY ASSESSMENT AREA
Description of Land	
Parcel Identifier:	010-025-766
Legal Description:	DISTRICT LOT 4008 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT: FIRSTLY: PART ON HIGHWAY PLAN 76, SECONDLY: PART ON PLAN BCP29235
Legal Notations	NONE
Charges, Liens and Interests	
Nature:	RIGHT OF WAY
Registration Number:	324477M
Registration Date and Time:	1961-03-08 15:36
Registered Owner:	BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
Remarks:	PART IN REFERENCE PLAN 5355, WITH ANCILLARY RIGHTS OVER THE REMAINDER INTER ALIA PARTIALLY CANCELLED BY CA3839444 (2014-07-15 @ 10:14) AS TO THAT PART SHOWN ON PLAN EPP41027

TITLE SEARCH PRINT

2014-07-25, 17:57:05

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Nature: COVENANT
Registration Number: R133930
Registration Date and Time: 1987-12-23 14:46
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: COVENANT
Registration Number: R133932
Registration Date and Time: 1987-12-23 14:47
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: COVENANT
Registration Number: R133933
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: COVENANT
Registration Number: R133934
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: BRITANNIA BEACH HOLDINGS LTD.
INCORPORATION NO. 301803
Remarks: TRANSFER OF N46371, SEE G85006
ALL MINERALS PRECIOUS AND BASE (SAVE COAL AND
PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES OR
ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND
SEPARATELY OR IN COMBINATION WITH EACH OTHER
UNDER THAT PART OF LOT 4008 KNOWN AS
"NO. 53 MINERAL CLAIM"
INTER ALIA

TITLE SEARCH PRINT

2014-07-25, 17:57:05

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Nature: MORTGAGE
Registration Number: CA2171157
Registration Date and Time: 2011-08-31 12:55
Registered Owner: YI LUEN DEVELOPMENTS AND HOLDINGS LTD.
INCORPORATION NO. BC0771108
Remarks: INTER ALIA

Nature: JUDGMENT
Registration Number: CA2663816
Registration Date and Time: 2012-07-18 11:23
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
OF R133949
RENEWED BY CA3839941

Nature: JUDGMENT
Registration Number: CA3839941
Registration Date and Time: 2014-07-15 11:21
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
RENEWAL OF CA2663816

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

TITLE SEARCH PRINT

2014-07-25, 17:56:27

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

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

Land Title District	VANCOUVER
Land Title Office	VANCOUVER
Title Number	BB2019684
From Title Number	BB1341964
Application Received	2012-08-10
Application Entered	2012-08-18
Registered Owner in Fee Simple	
Registered Owner/Mailing Address:	TAICHENG DEVELOPMENT CORP., INC.NO. 0864299 710 - 100 PARK ROYAL SOUTH WEST VANCOUVER, BC V7T 1A2
Taxation Authority	NORTH SHORE - SQUAMISH VALLEY ASSESSMENT AREA
Description of Land	
Parcel Identifier:	010-077-227
Legal Description:	LOT A, EXCEPT PART DEDICATED ROAD ON PLAN BCP28651, DISTRICT LOTS 1583, 2001 AND 7034 PLAN 21576
Legal Notations	
THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL GOVERNMENT ACT, SEE BB1514137	
PART DERIVED FROM DISTRICT LOTS 1583 AND 2001 IS ANNEXED RESTRICTIVE COVENANT H4828 OVER: (A) DISTRICT LOTS 1296 AND 1632, EXCEPT PORTIONS IN REFERENCE PLAN 4390 (B) DISTRICT LOTS 1661 AND 1666 (C) DISTRICT LOT 2018, EXCEPT PORTIONS IN REFERENCE PLANS 4335 AND 6684 (D) DISTRICT LOTS 1626, 1659 AND 1898, EXCEPT PORTIONS IN REFERENCE PLAN 4335 (E) DISTRICT LOT 1660	

TITLE SEARCH PRINT

2014-07-25, 17:56:27

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Charges, Liens and Interests

Nature:	RIGHT OF WAY
Registration Number:	324477M
Registration Date and Time:	1961-03-08 15:36
Registered Owner:	BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
Remarks:	PART DERIVED FROM PART FORMER D.L. 1583 PART IN REFERENCE PLAN 5355, WITH ANCILLARY RIGHTS OVER THE REMAINDER INTER ALIA PARTIALLY CANCELLED BY CA3839444 (2014-07-15 @ 10:14) AS TO THAT PART SHOWN ON PLAN EPP41027
Nature:	UNDERSURFACE RIGHTS
Registration Number:	N46371
Registration Date and Time:	1985-06-14 11:49
Registered Owner:	MAKIN LANDS LTD. INCORPORATION NO. A22386
Transfer Number:	BA157853
Remarks:	(A) ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODS OR ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND SEPARATELY OR IN COMBINATION WITH EACH OTHER UNDER THAT PART OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN THE LIMITS OF PART FORMER D.L. 2001 AND PART FORMER PARCELL 1 (RP4878) OF D.L. 2001; LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PART FORMER PARCEL 1 (RP4878) OF D.L. 2001, PART FORMER D.L. 2001 AND PART FORMER D.L. 7034; (B) ALL GOLD AND SILVER WHICH MAY BE FOUND IN VEINS LODS OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PART FORMER PARCEL 1 (RP 4878) OF D.L. 1583 (C) ALL GOLDE AND SILVER WHICH MAY BE FOUND IN VEINS LODS OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 2925 KNOWN AS "NO. 71" MINERAL CLAIM, LOT 2926 KNOWN AS "NO 72" MINERAL CLAIM; LOT 3717 KNOWN AS "NO 48" MINERAL CLAIM; LOT 3942 KNOWN AS "NO 73" MINERAL CLAIM; LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM; LOT 4022 KNOWN AS "NO 74" FRACTIONAL MINERAL CLAIM; ALL LYING WITHIN THE LIMITS OF PART FORMER D.L. 1583 INTER ALIA TRANSFER OF G85006 REC'D 29/10/1984 @ 12:58

TITLE SEARCH PRINT

2014-07-25, 17:56:27

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Nature: STATUTORY RIGHT OF WAY
Registration Number: R133935
Registration Date and Time: 1987-12-23 14:48
Registered Owner: SQUAMISH - LILLOOET REGIONAL DISTRICT
Remarks: INTER ALIA
PART PLAN 18940
ANCILLARY RIGHTS

Nature: MORTGAGE
Registration Number: CA2171157
Registration Date and Time: 2011-08-31 12:55
Registered Owner: YI LUEN DEVELOPMENTS AND HOLDINGS LTD.
INCORPORATION NO. BC0771108
Remarks: INTER ALIA

Nature: JUDGMENT
Registration Number: CA2663817
Registration Date and Time: 2012-07-18 11:23
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
OF N46371
RENEWED BY CA3839940

Nature: JUDGMENT
Registration Number: CA3839940
Registration Date and Time: 2014-07-15 11:21
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
RENEWAL OF CA2663817

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

TITLE SEARCH PRINT

2014-07-25, 17:54:09

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

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

Land Title District	VANCOUVER
Land Title Office	VANCOUVER
Title Number	BB2019689
From Title Number	BB1341971
Application Received	2012-08-10
Application Entered	2012-08-18
Registered Owner in Fee Simple	
Registered Owner/Mailing Address:	TAICHENG DEVELOPMENT CORP., INC.NO. 0864299 710 - 100 PARK ROYAL SOUTH WEST VANCOUVER, BC V7T 1A2
Taxation Authority	NORTH SHORE - SQUAMISH VALLEY ASSESSMENT AREA
Description of Land	
Parcel Identifier:	010-025-634
Legal Description:	ALL THAT PORTION COLOURED RED ON PLAN ANNEXED TO CROWN GRANT DEPOSITED WITH 231087L OF DISTRICT LOT 4009 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT THOSE PORTIONS LYING WITHIN THE LIMITS OF DISTRICT LOTS 1583 AND 2001
Legal Notations	NONE
Charges, Liens and Interests	
Nature:	RIGHT OF WAY
Registration Number:	324477M
Registration Date and Time:	1961-03-08 15:36
Registered Owner:	BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
Remarks:	PART IN REFERENCE PLAN 5355, WITH ANCILLARY RIGHTS OVER THE REMAINDER INTER ALIA PARTIALLY CANCELLED BY CA3839444 (2014-07-15 @ 10:14) AS TO THAT PART SHOWN ON PLAN EPP41027

TITLE SEARCH PRINT

2014-07-25, 17:54:09

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Nature: COVENANT
Registration Number: R133930
Registration Date and Time: 1987-12-23 14:46
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: COVENANT
Registration Number: R133932
Registration Date and Time: 1987-12-23 14:47
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: COVENANT
Registration Number: R133933
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: COVENANT
Registration Number: R133934
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: SEC 215 LTA
INTER ALIA

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: BRITANNIA BEACH HOLDINGS LTD.
INCORPORATION NO. 301803
Remarks: TRANSFER OF N46371, SEE G85006
ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND
PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES OR
ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND
SEPARTELY OR IN COMBINATION WITH EACH OTHER
UNDER THAT PART OF LOT 4009 KNOWN AS
"MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN
THE LIMITS OF DISTRICT LOT 4009; INTER ALIA

TITLE SEARCH PRINT

2014-07-25, 17:54:09

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Nature: MORTGAGE
Registration Number: CA2171157
Registration Date and Time: 2011-08-31 12:55
Registered Owner: YI LUEN DEVELOPMENTS AND HOLDINGS LTD.
INCORPORATION NO. BC0771108
Remarks: INTER ALIA

Nature: JUDGMENT
Registration Number: CA2663816
Registration Date and Time: 2012-07-18 11:23
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
OF R133949
RENEWED BY CA3839941

Nature: JUDGMENT
Registration Number: CA3839941
Registration Date and Time: 2014-07-15 11:21
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
RENEWAL OF CA2663816

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

TITLE SEARCH PRINT

2014-07-25, 17:55:33

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

VANCOUVER

VANCOUVER

Title Number

From Title Number

BB2019686

BB1341972

Application Received

2012-08-10

Application Entered

2012-08-18

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

TAICHENG DEVELOPMENT CORP., INC.NO. 0864299
710 - 100 PARK ROYAL SOUTH
WEST VANCOUVER, BC
V7T 1A2

Taxation Authority

NORTH SHORE - SQUAMISH VALLEY ASSESSMENT AREA

Description of Land

Parcel Identifier:

010-026-151

Legal Description:

DISTRICT LOT 1583 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT: FIRSTLY; PART IN REFERENCE PLAN 4390, SECONDLY; PART IN REFERENCE PLAN 4878, THIRDLY; PART ON PLAN 21576, FOURTHLY; PART SHOWN AS 8.31 ACRES ON HIGHWAY PLAN 76 FIFTHLY; PART SHOWN AS 0.08 ACRES ON HIGHWAY PLAN 76, SIXTHLY: PPORTION ON PLAN BCP29232

Legal Notations

THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL GOVERNMENT ACT, SEE BB1514137

HERETO IS ANNEXED RESTRICTIVE COVENANT H4828 OVER:

(A) DISTRICT LOTS 1296 AND 1632 EXCEPT PORTIONS IN REFERENCE PLAN 4335

(B) DISTRICT LOTS 1661 AND 1666

(C) DISTRICT LOT 2018, EXCEPT PORTIONS IN REFERENCE PLANS 4335 AND 6684

(D) DISTRICT LOTS 1626, 1659 AND 1898 EXCEPT PORTIONS IN REFERENCE PLAN 4335

(E) DISTRICT LOT 1660

(F) DISTRICT LOT 4145, EXCEPT PORTIONS IN DISTRICT LOTS 1661 AND 1666

TITLE SEARCH PRINT

2014-07-25, 17:55:33

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

(G) DISTRICT LOT 4149

(H) DISTRICT LOTS 2922, 2924, 4007 AND 4144

Charges, Liens and Interests

Nature:	RIGHT OF WAY
Registration Number:	324477M
Registration Date and Time:	1961-03-08 15:36
Registered Owner:	BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
Remarks:	PART IN REFERENCE PLAN 5355, WITH ANCILLARY RIGHTS OVER THE REMAINDER INTER ALIA PARTIALLY CANCELLED BY CA3839444 (2014-07-15 @ 10:14) AS TO THAT PART SHOWN ON PLAN EPP41027
Nature:	COVENANT
Registration Number:	R133930
Registration Date and Time:	1987-12-23 14:46
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	SEC 215 LTA INTER ALIA
Nature:	COVENANT
Registration Number:	R133932
Registration Date and Time:	1987-12-23 14:47
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	SEC 215 LTA INTER ALIA
Nature:	COVENANT
Registration Number:	R133933
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	SEC 215 LTA INTER ALIA
Nature:	COVENANT
Registration Number:	R133934
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	SEC 215 LTA INTER ALIA

TITLE SEARCH PRINT

2014-07-25, 17:55:33

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Nature: STATUTORY RIGHT OF WAY
Registration Number: R133935
Registration Date and Time: 1987-12-23 14:48
Registered Owner: SQUAMISH - LILLOOET REGIONAL DISTRICT
Remarks: INTER ALIA
PART PLAN 18940
ANCILLARY RIGHTS

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: BRITANNIA BEACH HOLDINGS LTD.
INCORPORATION NO. 301803
Remarks: TRANSFER OF G85006 RC'D.29.10.84 @12:58 SEE N46371
FIRST: ALL GOLD AND SILVER WHICH MAY BE FOUND IN
VEINS, LODES, OR ROCK IN PLACE UNDER THOSE
PORTIONS OF LOT 2925 KNOWN AS "NO. 71" MINERAL
CLAIM, LOT 2926 KNOWN AS "NO. 72" MINERAL CLAIM
LOT 3717 KNOWN AS "NO. 48" MINERAL CLAIM;
LOT 3942 KNOWN AS "NO. 73" MINERAL CLAIM; LOT 4009
KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM;
LOT 4022 KNOWN AS "NO. 74 FRACTIONAL MINERAL
CLAIM" ALL LYING WITHIN THE LIMITS OF DISTRICT
LOT 1583; INTER ALIA

Nature: MORTGAGE
Registration Number: CA2171157
Registration Date and Time: 2011-08-31 12:55
Registered Owner: YI LUEN DEVELOPMENTS AND HOLDINGS LTD.
INCORPORATION NO. BC0771108
Remarks: INTER ALIA

Nature: JUDGMENT
Registration Number: CA2663816
Registration Date and Time: 2012-07-18 11:23
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
OF R133949
RENEWED BY CA3839941

Nature: JUDGMENT
Registration Number: CA3839941
Registration Date and Time: 2014-07-15 11:21
Registered Owner: LAWSON LUNDELL LLP
Remarks: INTER ALIA
RENEWAL OF CA2663816

TITLE SEARCH PRINT

2014-07-25, 17:55:33

Requestor: bpatton@millerthomson.com

Folio/File Reference: 178831.1

Duplicate Indefeasible Title	NONE OUTSTANDING
Transfers	NONE
Pending Applications	NONE

3 PRELIMINARY SITE INVESTIGATION

This section contains the Stage 1 and Stage 2 Preliminary Site Investigation prepared by Piteau Associates Engineering Ltd..



**PITEAU
ASSOCIATES**

Geotechnical & Water
Management Consultants

**COMBINED STAGE 1 AND STAGE 2
PRELIMINARY SITE INVESTIGATION
FOR BRITANNIA BEACH SOUTH PROJECT
NEAR BRITANNIA BEACH
BRITISH COLUMBIA**



Prepared for

TIGER BAY DEVELOPMENT CORPORATION

April 2020

Project 3160-R3

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RECORD OF AMENDMENTS

This report has been issued and amended as follows:

Issue	Description	Date	Prepared by	Approved by
1	First draft	2020-04-14	David J. Tiplady, P.Eng. Principal Hydrogeologist Contaminated Site Approved Professional	David J. Tiplady, P.Eng. Principal Hydrogeologist Contaminated Site Approved Professional

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1. INTRODUCTION

1.1 PROJECT BACKGROUND AND OBJECTIVES

Tiger Bay Development Corporation (“Tiger Bay”) has retained Piteau Associates Engineering Ltd. (Piteau) to complete a combined Stage 1 and Stage 2 Preliminary Site Investigation (PSI) for four contiguous properties located on the east shore of Howe Sound south of Britannia Beach townsite. These lands encompassed by these parcels straddle Highway 99, and include a former gravel pit and the former Minaty Bay village. Collectively, this study area is referred to as “the Site”.

This combined stage 1 and stage 2 PSI is required in support of a proposed new development that may ultimately comprise residential units, along with varying commercial, and recreational activities. The Stage 1 component has involved review of historical maps and aerial photographs, land title records, government databases, previous consulting reports, and an on-Site interview and site inspections to identify areas of potential environmental concern (APECs). The Stage 2 component involved investigation of soil and groundwater conditions within the APECs to determine if contamination is present.

1.2 DESCRIPTION OF THE SITE AND SETTING

The Site is located on the eastern shoreline of Howe Sound, approximately 45 km north of Vancouver. It comprises four lots south of the Britannia Beach townsite (Figure 1). It is bordered on the west to the north, south, and east by undeveloped parcels owned by TIGER BAY, and which are in turn bordering on Crown Land. Highway 99 crosses through the southern part of the Site. Located about 6 km away, the Furry Creek Golf Course is the nearest neighbour to the south.

The lots which comprise the Site are identified by the following legal descriptions and Parcel Identifiers (PIDs):

Lots	Property Identification (PID)	Owner on Title
PARCEL 1 DL 2001	010-025-901	TIGER BAY
PARCEL 1 DL 1583	010-025-952	TIGER BAY
LOT A DL 1583, 2001 & 7034	010-077-227	TIGER BAY
DL 1583	010-026-151	TIGER BAY

Current title information for each of these parcels is included with Appendix A.

The Site is approximately 88.6 ha in size and is presently vacant. It includes bridges crossing local creeks, and a tunnel beneath Highway 99. The approximate latitude and longitude for the centre of the area shown on Figure 1 determined from Google Earth are as follows:

Latitude: 49° 36' 56"

Longitude: 123° 12' 22"

Photographs taken within the study area are reproduced in the Photos section of this report.

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2. STAGE 1 PRELIMINARY SITE INVESTIGATION

2.1 OBJECTIVES, SCOPE, AND METHODOLOGY

2.1.1 Objectives

The objective of this environmental site assessment was to identify potential environmental liabilities at the Site that may have resulted from previous land uses and activities, and to identify past or present conditions or practices that may represent an environmental liability. This phase of the assessment did not include testing of any Site media.

2.1.2 Scope

The scope of work for the Stage 1 PSI included research into past use of the land adjacent properties to evaluate possible historical sources of contamination. Information sources included maps, government records, property titles, aerial photographs, and results of previous investigations. Piteau also contacted the Squamish Lillooet Regional District (SLRD) planning department for land use information and a Site inspection was carried out. No sampling or analysis of media from the Site was done during this component of the investigation.

2.1.3 Methodology

Piteau conducted the environmental assessment according to standard environmental assessment procedures. This involved review of relevant records pertaining to the Site, inspection, interviewing a person with knowledge of the Site, and preparing this report. Land title information, aerial photographs, and previous reports were used to assess historical aspects of the Site.

Mr. Robert Bulger, Contaminated Sites Specialist, completed an initial Site inspections on June 22, 2011. He was accompanied by Mr. Tony Mahood, the Site manager and owner/president of MBD Construction Services Ltd., who operated a small aggregate extraction operation on the north of the Site. Mr. Mahood is familiar with the Site, as these lands were owned by a family member between 1985 and 2011. He was interviewed for information regarding on-Site activities prior to 2011.

Since 2011 the site has been mostly vacant, and has been used occasionally as a filming location, and for temporary off-site parking for music festivals in Squamish.

Between 2011 and the present, Mr. Bulger, and other Piteau staff, have been on-Site to conduct environmental and groundwater supply investigations. Mr. Bulger inspected the Site on March 23, 2020 and note no changes in land use, accumulations of waste, or ground staining that could be indicative of recent impacts.

2.2 INFORMATION REVIEW

2.2.1 Topography and Drainage

The elevation of the ground surface at the Site ranges from mean sea level to about 150 m-asl (metres above mean sea level) at its southeast corner. Approximately 450 m from the shoreline the grade increases from about 5% to 30%, where the bedrock walls of Howe Sound rise to an elevation of 1,370 m-asl. The central portion of the Site, located east of Highway 99, is relatively flat with elevations ranging between about 5 and 10 m-asl.

Thistle and Daisy creeks originate in the uplands east of the Site and flow northwest across the Fan to Howe Sound. These are sustained by rainfall runoff and snowmelt during the fall, winter, and spring months, and are reported to go dry during the summer months. The Site is unpaved except in limited areas in the area of the former Minaty Bay townsite. Hence, most precipitation infiltrates ground surface.

2.2.2 Geology

Much of the Site is situated on top of a fan comprised of alluvial and glaciomarine sands and gravels that extend about 700 m inland from the shoreline, and top out at about 95 m-asl. East of the fan at higher elevations bedrock is exposed or is blanketed by a thin veneer of colluvium (weathered rock and/or re-worked unconsolidated deposits) or till. According to Lynch (1990), the bedrock consists of meta-sedimentary rocks (shale), massive to fragmented volcanic rocks, and younger plutonic rocks (granodiorite and quartz diorite).

2.2.3 Groundwater Conditions

The former gravel pit area is underlain by sand and gravel hosting an unconfined aquifer capable of being used for water supply purposes. A shallow dug well supplied water to the caretaker's residence, but is no longer in use. More recently, test drilling to evaluate the groundwater supply potential within the central portion of Site has been conducted by Piteau. The locations of groundwater test wells and associated monitoring wells (MW1, MW2, and MW3) are shown on Figure 2.

The soils hosting the unconfined aquifer (sands and gravels) were encountered near surface and extend to bedrock at a depth of about 18 m. The inferred groundwater flow direction within the central portion of the Site is to the northwest, and the water table ranges between about 3 and 12 m below ground level (m-bgl), depending on location. Results of analysis of groundwater samples

collected during Piteau's groundwater supply investigation indicated concentrations of all constituents tested (including metals) were below standards for protection of drinking water and aquatic water from the Contaminated Sites Regulation (CSR).

Other water wells in the region include a series of water supply wells on the north bank of Britannia Creek (0.5 km north) that are the source of water to the Britannia Village, and wells near Furry Creek (3.5 km south), which supply the golf course and nearby residences.

2.2.4 Historical Land Use

The primary activity within the Site was gravel extraction between the late 1950s or early 1960s and the 1980s. Power for this operation was provided by BC Hydro. A large conveyor belt was utilized to load aggregate onto barges for shipment off-Site. A townsite comprising approximately 40 homes and located in Minaty Bay housed workers for the Britannia Mine. This was demolished in the early 1980s.

The results of the historical land title search for two of the four lots that comprise the Site are included with Appendix A and are summarized in Table I. The Anaconda Company (Canada) Ltd. (or Anaconda American Brass Ltd.) owned lands in the south-central portion of the Site between 1963 and 1978 that constituted an amalgamation of ten previous titles. Ownership of all or part of this Southern Portion was subsequently held by 85818 Ltd. (1978-1979), Dome Petroleum Ltd. (1979-1985), Makin Pulp and Paper Ltd. (1985-1987), and Britannia Beach Holdings Ltd. (1987-2011) before being transferred to Taicheng Development Corporation in 2011, and then Tiger Bay Development Corporation in 2018.

The Makin Pulp and Paper Company acquired the site to construct a pulp mill, but this did not go ahead. Dome Petroleum had intended to build a liquid natural gas storage facility at the Site, but this also did not occur.¹

2.2.5 Municipal Directories & Fire Insurance Maps

There are no municipal directories or fire insurance maps available for the study area.

¹ Interview with Mr. Mahood, June 22, 2012.

2.2.6 Aerial Photographs

Aerial photographs from 1983, 1957, 1969, 1982, 1990, 1994, and 2004, 2009, and 2019 are included with Appendix B. A summary of observations based on these photos follows:

Year/Photo Numbers	Comments
1953 (BC 1634:54,55)	Subdivision and clearing of lands occupied by former Minaty Bay townsite, small cleared and possible Pier on north end of Site. Remaining areas mostly vegetated with exception of two linear clearings and roadways. Low resolution photo.
1957 (BC 2349:6,7)	Minaty Bay townsite, Highway, and Pier clearly visible. Active aggregate extraction has commenced on north end of Site (Lot A, Parcel 1 DL 2001).
1969 (BC 5342 036,037; BC 7202 137,138)	Expansion of aggregate extraction operation to the south to occupy nearly all of the Northern Portion of Primary Area (DL 2001, DL 1583). Conveyor belt transferring material to Pier clearly visible. Linear clearings for BC Hydro Right-of-Way faintly visible. Aggradation of land area in vicinity of Pier (DL 5210).
1982 (BC 82058 Nos. 061,062)	Apparent cessation / slowing of aggregate extraction in Northern Portion indicated by patchy revegetation. BC Hydro Right-of-Way clearly visible, transacted by small logging roads.
1990 (30BC890020 Nos. 41,42)	Aggregate extraction resumes in parts of Northern (Lot A, DL 2001) and Southern Portions (DL 1583). Minaty Bay townsite appears fully revegetated, with exception of a few small roadways. Railway clearly visible. Pier decommissioned and revegetated.
1994 (30BC94156 Nos. 079,080)	Slowing of aggregate extraction activities and revegetation in Northern and Southern Portions. Site relatively unchanged.
2004 (SRS 6935 – 80,81)	Minor additional clearing for aggregate extraction in Northern Portion. Site relatively unchanged.
2009 (Google Earth)	Site unchanged
2019 (Google Earth)	Site Unchanged

2.2.7 Zoning

Zoning information (Appendix C) indicate that Site is zoned AC1, which corresponds to “Resource Use.” In accordance with the SLRD Zoning bylaw No. 540 (1994), this allows for a variety of land uses, including daycare, bed & breakfast, home industry, single family dwelling, park, public, open land recreation, silviculture, wood harvesting, and temporary commercial and industrial use.

2.2.8 Previous Investigations

Preliminary environmental and geotechnical assessments were carried out at the Site by Thurber Environmental Consultants (Thurber) in 1996, 1997 and 1999. Excerpts from these reports are included with Appendix D. These involved a historical review of land use activities, site reconnaissance, and collection and analysis of soil, surface water and groundwater samples. Findings that pertain to this investigation are addressed in subsequent sections of this report.

2.2.9 Nearby Contaminated Sites

The BC Site Registry includes three separate entries within a 5 x 5 km box centred on the Site (Appendix E). It should be noted that inclusion of property information in the Site Registry does not indicate that a property is contaminated. Similarly, the absence of a record associated with a particular property does not indicate that it is free of contamination.

The search identified seven properties within 5 km of the Site. These include the Site (No. 3444), the former Britannia Mine (No. 436), the former Britannia Village (Nos. 8881, 8976, & 8977), a site at Furry Creek (No. 5529), and a site in at Watts Point (No. 16505).

The Furry Creek and Watts Point sites are not of interest to this investigation owing to their distances from the Site. The Britannia Village sites are of no relevance to conditions at the Site.

Little information is available on the Site Registry for the former Britannia Mine. Underground workings and waste dumps associated with the mine are known to be a source of Acid Rock Drainage (ARD) due to the oxidation of naturally occurring sulphide minerals to produce sulphuric acid, and to mobilize dissolved metals. Currently, flow in the underground workings is directed to the 4100 Level adit and water treatment plant. Drainage from exiting portals at higher elevations will report to either the Furry Creek or Britannia Creek basins. Therefore, surface and groundwater at the Site is not expected to be impacted by ARD. This is supported by near neutral pH's and relatively low metals concentrations measured in groundwater samples collected from pre-existing monitoring wells 96-1, 96-2, and 96-3 and from both creeks by Thurber in 1996.

Limited environmental investigations in lands adjacent to the eastern and northeastern Site boundary (Appendix D) indicated elevated concentrations of various metals in soil. The cause can be attributed to activities at the adjacent Britannia Mine, such as dumping of debris and mine slag, and possibly elevated background levels. The soil data indicate that the impacted areas do not extend to the eastern boundary of the Site, except near the northeastern border of Parcel 1 DL 2001, where there was insufficient data to delineate the extent of contamination.

It is noteworthy that although the concentrations of several metals in soils in the lands to the east of the site exceed the standards for residential land and commercial land, this is due only to exceedance of standards that are protective of ecological health. None of the concentrations exceed standards that are protective of human health.

2.3 SITE APPEARANCE AND OCCUPANCY

Photos taken during the site walkovers are included with this report. The Site is largely vacant, with the exception of the abandoned caretaker's residence on the north end, and minor piles of refuse and debris. Large areas of the former gravel pit are overgrown, and remnants of the foundations of the former aggregate conveyor are visible near the entrance off Highway 99, and on the opposite side of the highway on DL 5210.

No obvious signs of contamination, such as staining or stressed vegetation, and no evidence of past commercial or industrial activities has been observed by Piteau during site inspections in 2011 and 2020, and during visits to the Site during the intervening years.

2.4 ENVIRONMENTAL ISSUES

2.4.1 Air Emissions

There are no air emission issues associated with activities in the Site.

2.4.2 Asbestos

It is possible that structures belonging to the former Minaty Bay townsite may have utilized asbestos containing materials (ACM's), as use of these materials was not discontinued until 1978. These were likely removed from site during demolition of the townsite, as no ACM's were observed during the Site inspection (i.e., floor tiles, sprayed ceiling texture, drywall filler or roofing material).

2.4.3 Chemical Use Activities and Chemical Spills

Small quantities of fuel were stored at a former helicopter pad and refuelling area operated by Britannia Beach Heli-Tours on the north end of the Site (Figure 2). Inspection of this area by Thurber in 1996 indicated two empty and one partially full 220 L drums of Jet B aviation fuel with minor surficial staining in the vicinity (0.1 m deep over 2 m²). No staining was noted in Piteau's site inspection in June 2012.

Dangerous goods that are transported on the section of CN Rail line that crosses the Site include but are not limited to fuel oil, methyl alcohol, butane, propane, sulphur dioxide, hydrochloric acid, sulphuric acid, sodium hydroxide, sodium chlorate, sodium hydrosulphate, and hydrogen peroxide. Interviews with Mr. John Brodie of BC Rail (former operator of rail line) by Thurber (1997) indicated that there have been no spills in the vicinity of the Site. BC Rail ceased operations in 2005 and Mr. Brodie became an employee of the parent company British Columbia Railway Company. He was re-interviewed in 2012 by Piteau as part of this investigation. Mr. Brodie indicated that although CN Rail operates the railway, British Columbia Railway Company remains the owner of the land, and would have been advised if any release of contaminants had occurred since 2005.

Since then, there have been no reported rail-related accidents or spills along in the vicinity of the Site resulting in release of potential soil or groundwater contaminants.

2.4.4 Dumping and Landfilling Activities

Dumping of litter and miscellaneous refuse materials have been noted at several locations across the Site at the time of the walk-through inspection. These are indicated on Figure 2, and include two apparently empty steel tanks (Photo 2), a demolished creosote-treated timber structure (Photo 3), a trailer (Photo 4), concrete foundation blocks (Photo 5,) and rock from a construction site in West Vancouver.

Approximately 3,000 m³ of wash-out debris from a 1993 flood event in the Britannia Beach Village area were temporarily stored in the north-central portion of the Site under the direction of the Ministry of Transportation and Highways (Figure 2)^{2,3}. This material comprised of sand to boulder-sized clasts with occasional silt and asphaltic concrete. According to Mr. Mahood, this material was

² Interview with Mr. Mahood, June 22, 2012.

³ Thurber (1996) indicate this volume to be 7,000 to 12,000 m³

found to contain metals concentrations exceeding CSR for industrial land use and was removed from the Site in 2006. It is not known whether confirmatory sampling of underlying soil was conducted at this time, however, groundwater samples collected from a nearby monitoring well was free of metals contamination (Thurber, 1996).

Stockpiling of soil and sediment is evident on the east side of Highway 99, just north of the main entrance gate (Photo 6). The origin of this material has not been confirmed. It is possible that these may be the same six stockpiles sampled by Thurber in 1997, which were suspected to have been relocated from the Britannia Mine. Copper concentrations in six grab samples collected from the piles exceeded the CSR commercial land use standard of 250 mg/kg, and lead concentrations in two samples exceeded the standard of 1,000 mg/kg. Thurber's 1997 report states that this material would eventually be removed during Site development.

There was no historical or recent evidence to suggest that landfill materials or structural fill was imported to the Site. However, it is likely that overburden and/or aggregate from some portions of the Site were used as backfill in other portions of the Site. No further action on dumping of local source materials is warranted at this time.

2.4.5 Hazardous Wastes

Based on the historic use of the Site, and based on inspections completed 2011 and 2020, and observations during intervening years, there is no reason to believe that hazardous wastes have been generated or stored on-Site.

2.4.6 Liquid Effluents and Site Run-off

Sewage from the caretaker's residence and former buildings at the Minaty Bay townsite are/were likely disposed to on-Site septic drainfields. However, this is not considered to be a potential source of contamination within the Site.

2.4.7 Ozone-Depleting Substances

At the time of the Site visits, no potential ozone-depleting substances were identified on the Site.

2.4.8 Polychlorinated Biphenyls

Polychlorinated Biphenyls (PCBs) are generally associated with electrical equipment, such as transformers and capacitors that were installed before 1978. It is possible that PCB containing materials were present in structures belonging to the former Minaty Bay townsite. However, it is likely that these were removed during demolition.

2.4.9 Solid Waste

The Site has never been used for landfilling of solid waste and is mostly free of waste on the surface.

2.4.10 Underground and Above-Ground Storage Tanks

The two steel tanks mentioned previously in Section 2.4.4 are of unknown origin, but were likely used as underground storage tanks (USTs). Each holds approximately 7,500 L (2,000 gallons) and appeared to be empty at the time of the Site inspection.

There is a possibility of residential heating oil USTs remaining in the old Minaty Bay townsite area. However, as residential heating oil tanks do not trigger filing of a site profile under the CSR, these are not considered as an area of potential environmental concern (APEC). If present, these should be removed during the construction phase of the development project, along with any associated contamination.

2.4.11 Potential Impacts of Off-Site Activities

Ore produced by the former Britannia Mine between 1904 and 1974 was processed at the Britannia Beach concentrator mill located adjacent to the Site to the north. Considerable volumes of waste rock and tailings were dumped along the shoreline to provide a foundation for the mine's wharf and dock facilities. This material generated a plume of metal-contaminated groundwater beneath the Britannia fan, which is currently captured by extraction wells and treated by an on-Site water treatment plant. As the Britannia Beach fan completely pinches out to the North of the Site, this contamination is unlikely to extend onto the Site.

The soil data for investigations by Piteau in adjacent properties to the east of the Site (Appendix D) show that metals impacts to soils do not extend onto the Site, except possibly along its north-eastern border, where available data are insufficient to delineate the extent.

2.4.12 Schedule 2 Activities

Schedule 2 of the CSR lists industrial and commercial purposes and activities with the potential to cause contamination.

No Schedule 2 activities are known to have occurred at the Site.

2.5 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

Based on the results of the Stage 1 PSI has identified 8 APECs within the Site. These are summarized in the table below. The relative potential for contamination is indicated in parentheses, and corresponding locations are shown on Figure 2.

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

APEC No.	Description	Media	Potential Contaminants of Concern (PCOCs)
1	Existing and former soil stockpiles at north end of Site (MODERATE)	Soil & groundwater	Metals
2	Historic fuel storage at former helipad (LOW)	Soil, groundwater, and vapour (as appropriate)	LEPH, VPH, BTEX, PAH, lead
3	Former location of stockpiles of 1997 creek washout debris (MODERATE)	Soil and groundwater (as appropriate)	Metals
4	Debris from West Vancouver construction site (LOW)	Soil and groundwater (as appropriate)	Metals
5	Misc. refuse at trailer (LOW)	Soil, groundwater, and vapour (as appropriate)	LEPH, HEPH, VPH, BTEX, PAH, metals
6	Steel ASTs and creosoted timbers (LOW)	Soil, groundwater, and vapour (as appropriate)	LEPH, HEPH, VPH, BTEX, PAH, lead
7	Misc. refuse (LOW)	Soil and groundwater (as appropriate)	LEPH, HEPH, VPH, BTEX, PAH, metals
8	Impact from neighbouring lands along northeast Site boundary (LOW)	Soil and groundwater	metals

LEPH=Light extractable petroleum hydrocarbons; HEPH=Heavy extractable petroleum hydrocarbons; VPH = volatile petroleum hydrocarbons; BTEX = benzene, toluene, ethylbenzene, and xylenes; PAH = polycyclic aromatic hydrocarbons

3. STAGE 2 PRELIMINARY SITE INVESTIGATION

3.1 SCOPE AND OBJECTIVES

The objectives of the Stage 2 PSI described in this report have been to investigate soil and groundwater within the APECs described in the preceding section, and to determine if concentrations of potential contaminants of concern (PCOCs) exceed applicable standards from the Contaminated Sites Regulation (CSR).

Work conducted during this Stage 2 PSI included collection and analysis of soil and groundwater samples. The samples were analyzed for PCOCs and the results were compared to relevant standards from the CSR to determine if contamination is present.

Although also regulated under the CSR, concentrations of PCOCs in vapour were not evaluated during the investigations described in this report. As a vapour assessment must target areas where concentrations are highest, they are more appropriately completed after the extent of contamination in soil and groundwater has been fully delineated. In most cases, where volatile organics that may give rise to vapour contamination are not present in soil and groundwater, investigation of soil vapour is not necessary.

3.2 SUMMARY OF FIELD INVESTIGATION

3.2.1 Collection and Analysis of Soil Samples

Test pits were excavated in the vicinity of the APECs identified in Section 2.6 to facilitate collection of soil samples. All work was completed under the direction of Mr. Robert Bulger, Contaminated Sites Specialist. Methodologies for collection of soil samples from test pits are described in Appendix F. The test pit locations are shown on Figure 3.

Test pits TP13-1 through TP13-14 were excavated on February 4 and 5, 2013 using a hydraulic excavator operated by MBD Construction. These test pits ranged between 0.6 m and 2.6 m deep and targeted APECs 1 through 7.

Test pits TP20-1 and TP20-2 were excavated on March 23, 2020 to collect soil samples within APEC #8.

Soil samples were collected from the walls of the test pits and transferred to clean glass jars provided by the project laboratory (ALS Environmental, Burnaby). For samples located in areas

where the PCOCs included hydrocarbons, a subset of each sample was also placed in a clean Zip-loc bag for field measurement of headspace vapour concentrations using the method described in Appendix F. Combustible vapour concentrations noted throughout the sediment profile, as well as observations of sediment type, colour, moisture content, staining, and odour, and monitoring well construction details are presented on logs provided in Appendix G.

Soil samples S36 through S39 were collected from the stockpiles associated with APECs 1 and 4. As described in Appendix F, each sample was comprised of five aliquots of approximately equal volume.

A total of 31 soil samples collected from test pits and stockpiles were analyzed for PCOCs corresponding to the APECs from which the samples were collected. This includes three field duplicate samples collected and analyzed for quality control and quality assurance purposes. The analytical results are discussed in Section 3.3.3.

3.2.2 Monitoring Well Installation and Analysis of Groundwater Samples

Monitoring wells MW15-01 and MW15-02 (Figure 3) were installed at the Site to facilitate collection of groundwater samples from near the water table. While the objective for MW15-01, located in the northern portion of the Site was to evaluate the potential for impacts on Site groundwater APEC #8, MW15-02 was to confirm that soils with elevated metals concentrations situated to the east of the Site, but not considered as an APEC, had not affected site groundwater conditions.

The monitoring wells were installed on May 19, 2015 using a sonic drill rig operated by Omega Environmental Drilling Ltd. Construction methods are described in Appendix F, and borehole logs with installation details are included with Appendix G.

The screen in MW15-01 extends between 1.2 and 4.5 m-bgl in sand, and spans the water table, which was 3.0 m-bgl on May 25, 2015. MW15-02 is screened between 5.1 and 8.5 m-bgl in gravelly sand and sand and also straddles the water table, which was 8.2 m-bgl.

Groundwater samples were collected from MW15-01 and MW15-02 on May 25, 2015 using the method described in Appendix F. The samples were submitted to Caro Analytical Services for analysis for dissolved metals.

3.3 INVESTIGATION RESULTS

3.3.1 Hydrostratigraphy

Soils encountered in the test pits at the Site (Appendix G) included sand, gravely sand, and minor silt, and are consistent with the site geology described in Section 2.2.2. These sediments host a productive unconfined aquifer with a water table ranging between about 3 and 12 m-bgl.

3.3.2 Applicable Standards

For a given substance in soil, the CSR includes either a generic or matrix numerical standard. Generic standards are listed in Parts 1 and 2 of Schedule 3.1 of the regulation, and consist of concentrations that apply regardless of site-specific factors.

As the proposed future use of the Site is a combination of residential and commercial, the appropriate soil standards from the CSR are the most conservative (lowest) of Low Density Residential land use (RL_{LD}), High Density Residential land use (RL_{HD}), and Commercial Land (CL) standards.

Matrix soil standards are listed in Part 1 of Schedule 3.1 take into account site-specific factors. The applicable standard for a substance is determined by using the lowest of the applicable concentrations accounting for possible exposure scenarios. The site-specific standards account for human exposure by intake of contaminated soil, and, if applicable, groundwater used for drinking water. Other factors include whether there is exposure to other environmental receptors such as soil invertebrates, livestock, and/or aquatic life, and whether the groundwater will be used for irrigation. In accordance with the protocols developed by the MOECCS, soil standards protective of aquatic life apply to sites situated within 0.5 km of a surface water body used by aquatic life.

Soil standards that are applicable to the Site must be protective of both drinking water, marine aquatic water, and the lowest of the matrix standards for the intake of contaminated soil, toxicity to soil invertebrates and plants.

The groundwater standards applicable to the Site include drinking water (DW) and marine aquatic life (AW_m) standards from Schedule 3.2 of the CSR. Standards protective of irrigation water (IW) and livestock watering (LW) do not apply, as these activities do not occur at the Site. Although there is fresh water in Daisy and Thistle Creeks, since these are losing watercourses (i.e., creek flow infiltrates to recharge groundwater), standards that are protective of freshwater aquatic life do not apply at the Site.

3.3.3 Soil Analyses

Analysis of soil samples was completed by ALS Environmental at their Burnaby laboratory and were analyzed for PCOCs identified in Section 2.5. A summary of all soil analyses performed is as follows:

- Polycyclic Aromatic Hydrocarbons (PAHs) – 4 samples
- Total metals – 31 samples (including 3 duplicates)
- Light and heavy extractable petroleum hydrocarbons (LEPH/HEPH) – 11 samples (including 1 duplicate)
- Benzene, ethylbenzene, toluene, xylenes (BTEX), and volatile petroleum hydrocarbons (VPH) – 5 samples

The soil analytical results are included with the laboratory certificates in Appendix H. The results are summarized in Tables II and III, and are summarized graphically on Figure 4. Concentrations of all PCOCs in soil in all samples analyzed were below applicable RL_{LD} , RL_{HD} , and CL standards. Accordingly, the Site is considered uncontaminated with respect to soil. As no volatile hydrocarbons were detected in any of the APECs, vapour assessments are not required.

The precision (i.e., repeatability) of analytical results for the soil has been evaluated by comparing analysis results for duplicates. Precision is assessed through calculation of a relative percent difference (RPD) between the sample and the duplicate, in accordance with the expression:

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \times 100\%$$

where:

RPD is relative percent difference;

C_1 is the larger of the two observed values; and

C_2 is the smaller of the two observed values.

RPD values below about 35% are generally desirable, and values of up to about 65% are considered acceptable.

Calculated RPD values for duplicate soil samples are listed in Tables I and II. For total metals in soil (Table I) the RPD values were below 35%, thus indicating relatively good analytical precision.

No RPD values were calculated for the duplicate sample analyzed for LEPH and HEPH for duplicate sample S12 (Table II) due to non-detectable concentrations.

3.3.4 Groundwater Analyses

Analysis of groundwater samples from MW15-01 and MW15-02 for dissolved metals was completed by ALS Environmental. The results of analysis are included in the laboratory certificate included with Appendix H, and are summarized on Tables IV along with the applicable AW_m and DW standards from the CSR. These show that the concentrations of all metals analyzed in groundwater were below applicable AW_m and DW standards. Accordingly, the Site can be considered uncontaminated with respect to groundwater.

As only two samples of groundwater were analyzed, no field-duplicate samples were analyzed during this program of investigation.

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4. SUMMARY OF FINDINGS

Piteau was retained by Tiger Bay Development Corporation to conduct a combined Stage 1 and Stage 2 Preliminary Site Investigation on four contiguous properties located on the east shore of Howe Sound and immediately south of the Britannia Beach townsite.

The Stage 1 PSI component of this study identified eight Areas of Potential Environmental Concern (APECs) at the Site. As described in Section 2.5, most of the APECs were judged to post a low risk of contamination within the Site. The only APEC judged to post a moderate risk was existing and former stockpiles of soil at the north end of the Site.

The Stage 2 PSI component of this study involved collecting soil samples from shallow hand-dug pits and from deeper machine-dug test pits within the APECs. Soil analysis results indicated concentrations of all PCOCs were below soil standards appropriate for the anticipated future use of the Site, which includes low density residential and commercial use. Groundwater samples from monitoring wells installed at the Site indicated concentrations of groundwater PCOCs were below the standards for protection of marine aquatic life (AWm) and drinking water (DW), which are applicable at the Site.

Based on these analytic results, it can be concluded that the Site is uncontaminated for its future use.

5. LIMITATIONS

This report was prepared by Piteau Associated Engineering Ltd. for Tiger Bay Development Corporation. This report reflects Piteau's best judgement, based on the information available at the time of preparation. Any use that a third party makes of this report, or any reliance on or decisions to be made based upon it, are the responsibility of such third parties. Piteau accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

In evaluating the Site, Piteau has relied in good faith on information provided by the organizations noted in this report. No responsibility is accepted for inaccuracies, deficiencies, or misstatements contained in this report as a result of inaccuracies, deficiencies, or misstatements in the information obtained from these sources.

The findings, conclusions and recommendations in this report have been developed in a manner consistent with the level of skill normally exercised by environmental professionals currently practicing under similar conditions in British Columbia. No warranty is expressed or implied.

No environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions in connection with a site. Performance of standardized environmental site assessment methods is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions in connection with the site, given reasonable limits of time and cost.

Respectfully submitted,

PITEAU ASSOCIATES ENGINEERING LTD.

David J. Tiplady, P.Eng.
Principal Hydrogeologist
Contaminated Site Approved Professional

6. REFERENCES

Lynch, J.V.G., 1990. Geology of Gambier Group Rocks in the Howe Sound Area, British Columbia. Geological Survey of Canada, Open File 2307.

Squamish Lillooet Regional District, 1994. Electoral Area D Zoning By-Law No. 540, Adopted June 27, 1974.

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TABLES

**TABLE I
HISTORICAL OWNERSHIP**

OWNER	LEGAL	YEARS	CHARGE INFORMATION / COMMENTS
P.I.D. 010-077-227			
Tiger Bay Development Corporation	Lot A, Except Part Dedicated Road on Plan BCP 28651, District Lot 1583, 2001 & 7034 Plan 21576	May 2018 to present	
Taicheng Development Corp.	Lot A, Except Part Dedicated Road on Plan BCP 28651, District Lot 1583, 2001 & 7034 Plan 21576	Aug 2011 to May 2018	British Columbia Hydro and Power Authority Right-of-Way, Undersurface Rights to Makin Lands Ltd.; Squamish-Lillooet Regional District Statutory Right-of-Way; Mortgage
Makin Lands Ltd.	Lot A, Except Part Dedicated Road on Plan BCP 28651, District Lot 1583, 2001 & 7034 Plan 21576	2006 to Aug 2011	
Makin Pulp and Paper Ltd.	Lot A, Except Part Dedicated Road on Plan BCP 28651, District Lot 1583, 2001 & 7034 Plan 21576	1987 to 2006	Comes from 5 prior titles
Makin Pulp and Paper Ltd.	DL 7034	Jun 1985 to 1987	
Dome Petroleum Ltd.	DL 7034	Oct 1979 to Jun 1985	
Copper Beach Estates Ltd.	DL 7034	Oct 1979 to Oct 1979	
Makin Pulp and Paper Ltd.	Parcel 1 (Ref Plan 4878) DL 2001	Jun 1985 to 1987	
Dome Petroleum Ltd.	Parcel 1 (Ref Plan 4878) DL 2001 & Parcel 1 (Ref Plan 4878) DL 1583	Oct 1979 to Jun 1985	
Copper Beach Estates Ltd.	Parcel 1 (Ref Plan 4878) DL 2001 & Parcel 1 (Ref Plan 4878) DL 1583	Oct 1979 to Oct 1979	
Makin Pulp and Paper Ltd.	Parcel 1 (Ref Plan 4878) DL 1583	Jun 1985 to 1987	
Makin Pulp and Paper Ltd.	DL 2001 except portions in Ref Plan 4390 & 4878 & Plan 20309	Jun 1985 to 1987	
Dome Petroleum Ltd.	DL 2001 except portions in Ref Plan 4390 & 4878 & Plan 20309	Jan 1985 to Jun 1985	
Dome Petroleum Ltd.	See title	Oct 1979 to Jan 1985	
Makin Pulp and Paper Ltd.	DL 1583 except portions in Ref Plans 4390 & 4878	Jun 1985 to 1987	
P.I.D. 010-026-151			
Tiger Bay Development Corporation	District Lot 1583 Group 1 NWD Except: Firstly, Part in Reference Plan 4390, Secondly, Part in Reference Plan 4878, Thirdly, Part on Reference Plan 21576, Fourthly, Part Shown as 8.31 Acres on Highway Plan 76, Fifthly, Part shown as 0.08 Acres on Highway Plan 76, Sixthly, Portion on Plan BCP29232	May 2018 to present	British Columbia Hydro and Power Authority Right-of-Way, Undersurface Rights to Britannia Beach Holdings Ltd.; Covenants to Her Majesty the Queen in Right of the Province of British Columbia; Squamish-Lillooet Regional District Statutory Right-of-Way; Mortgage
Taicheng Development Corp.	District Lot 1583 Group 1 NWD Except: Firstly, Part in Reference Plan 4390, Secondly, Part in Reference Plan 4878, Thirdly, Part on Reference Plan 21576, Fourthly, Part Shown as 8.31 Acres on Highway Plan 76, Fifthly, Part shown as 0.08 Acres on Highway Plan 76, Sixthly, Portion on Plan BCP29232	Aug 2011 to May 2018	
Britannia Beach Holdings Ltd.	District Lot 1583 Group 1 NWD Except: Firstly, Part in Reference Plan 4390, Secondly, Part in Reference Plan 4878, Thirdly, Part on Reference Plan 21576, Fourthly, Part Shown as 8.31 Acres on Highway Plan 76, Fifthly, Part shown as 0.08 Acres on Highway Plan 76, Sixthly, Portion on Plan BCP29232	1987 to Aug 2011	
Makin Pulp and Paper Ltd.	District Lot 1583 Group 1 NWD Except: Firstly, Part in Reference Plan 4390, Secondly, Part in Reference Plan 4878, Thirdly, Part on Reference Plan 21576, Fourthly, Part Shown as 8.31 Acres on Highway Plan 76, Fifthly, Part shown as 0.08 Acres on Highway Plan 76, Sixthly, Portion on Plan BCP29232	1985 to 1987	
Makin Pulp and Paper Ltd.	DL 1583 except portions in Ref Plans 4390 & 4878	Jun 1985	
Dome Petroleum Ltd.	DL 1583 except portions in Ref Plans 4390 & 4878	Jan 1985 to Jun 1985	
Dome Petroleum Ltd.	DL 1583 & 2001 except portions of each DL included in Ref Plan 4390 and Parcel 1 (Ref Plan 4878) and DL 2617	Oct 1979 to Jan 1985	
Copper Beach Estates Ltd.	DL 1583 & 2001 except portions of each DL included in Ref Plan 4390 and Parcel 1 (Ref Plan 4878) and DL 2617	Oct 1979 to Oct 1979	
85818 Canada Ltd.	DL 1583 & 2001 except portions of each DL included in Ref Plan 4390 and Parcel 1 (Ref Plan 4878) and DL 2617	Jul 1978 to Oct 1979	
Anaconda American Brass Ltd.	DL 1583 & 2001 except portions of each DL included in Ref Plan 4390 and Parcel 1 (Ref Plan 4878) and DL 2617	Nov 1970 to Jul 1978	
The Anaconda Company (Canada) Ltd.	DL 891 except portions in Ref Plan 4390; DL 892 except portions in Ref Plan 7313; DL 1583 except portions in Ref Plan 4390 & in Parcel 1 (Ref Plan 4878); DL 1897 & 3623 except portions of each DL included in Ref Plan 4390; DL 2001 except portions included in Ref Plan 4390 & in Parcel 1 (Ref Plan 4878); DL 2617	May 1963 to Nov 1970	
The Anaconda Company (Canada) Ltd.	See title	Jan 1963 to May 1963	Comes from 10 prior titles

Notes:

1. See Appendix A for full listing of historical title search.
2. Indented entries indicate 5 prior titles to current title

TABLE II

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP13-01 S1 0-0.3 04-Feb-13 L1266292-1	TP13-01 S2 0.8-1.2 04-Feb-13 L1266292-2	TP13-01 S3 1.8-2.1 04-Feb-13 L1266292-3	TP13-02 S5 0-0.3 04-Feb-13 L1266292-5	TP13-04 S9 0-0.3 04-Feb-13 L1266292-9	TP13-05 S11 0-0.3 04-Feb-13 L1266292-11	dup. S11 S12 04-Feb-13 L1266292-12	RPD	TP13-06 S14 0-0.3 04-Feb-13 L1266292-14	TP13-06 S15 0.6-0.9 04-Feb-13 L1266292-15	TP13-07 S16 0-0.3 04-Feb-13 L1266292-16	TP13-07 S17 0.8-1.1 04-Feb-13 L1266292-17	TP13-08 S18 0-0.3 04-Feb-13 L1266292-18
Physical Tests																
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾	13.8	14.2	13.8	15.8	13.8	21.3	20.7		8.43	-	9.23	-	-
pH	NS	NS	NS	6.71	5.95	5.63	4.97	5.29	5.76	5.63	2%	5.79	5.89	6.63	5.43	6.49
Total Metals																
Antimony T-Sb mg/kg	20	40	40	0.72	0.55	0.15	<0.10	0.16	0.19	0.16	17%	<0.10	<0.10	<0.10	0.27	<0.10
Arsenic T-As mg/kg	10	10	10	5.32	1.99	1.47	1.19	2.42	3.77	3.56	6%	1.49	2.15	0.992	1.49	1.34
Barium T-Ba mg/kg	350	350	350	43.6	42.4	43.9	42.6	27.6	38.8	37.5	3%	38.3	37.5	36	53.5	38.9
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 350 (pH > 8)	<0.20	<0.20	<0.20	<0.20	<0.20	0.36	0.34	6%	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.065	0.141	0.079	<0.050	0.065	0.151	0.134	12%	0.233	0.107	<0.050	0.168	<0.050
Chromium T-Cr mg/kg	60	60	60	9.68	9	8.63	8.63	12	19.5	17.1	13%	8.1	9.91	7.88	9.79	8.41
Cobalt T-Co mg/kg	25	25	25	5.54	5.12	5.03	4.99	4.51	5.96	5.41	10%	4.98	5.55	4.99	5.89	4.78
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	39.2	79.8	32.2	21.9	17.7	19.3	15.4	22%	18.2	28.7	16.2	31.4	21.6
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	6.32	14.5	6.93	4.21	8.97	8.03	7.44	8%	2.14	2.9	1.46	27.2	2.06
Manganese mg/kg	2000	2000	2000													
Mercury T-Hg mg/kg	10	25	75	0.161	<0.050	<0.050	<0.050	<0.050	0.06	0.06	0%	<0.050	<0.050	<0.050	<0.050	<0.050
Molybdenum T-Mo mg/kg	15	15	15	<0.50	0.67	0.73	<0.50	0.69	1.28	1.04	21%	<0.50	<0.50	<0.50	<0.50	<0.50
Nickel T-Ni mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	8.65	8.07	7.84	8.43	9.48	9.95	9.35	6%	8.03	10.2	8.12	9.25	7.94
Selenium T-Se mg/kg	1	1	1	<0.20	0.39	<0.20	<0.20	0.21	0.44	0.37	17%	<0.20	<0.20	<0.20	<0.20	<0.20
Silver T-Ag mg/kg	20	40	40	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10
Tin T-Sn mg/kg	50	300	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium T-U mg/kg	30	30	30													
Vanadium T-V mg/kg	100	100	100	34.8	34.3	33.7	36.3	37.4	49.8	48.5	3%	34.7	37.2	30.7	39	33.7
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	101	53.2	86.7	32.1	41.4	53	53.7	1%	46.1	55.3	29.8	67.7	30.9

Notes:

(1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.

(2) "NS" denotes no standard.

(3) "-" denotes not analyzed.

TABLE II

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:			Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP13-09 S20 0-0.3 04-Feb-13 L1266292-20	dup. S20 S21 04-Feb-13 L1266292-21	RPD	TP13-09 S22 0.3-0.6 04-Feb-13 L1266292-22	TP13-10 S23 0-0.2 04-Feb-13 L1266292-23	TP13-11 S25 0-0.2 04-Feb-13 L1266292-25	TP13-11 S26 0.6-0.6 04-Feb-13 L1266292-26	TP13-12 S27 0-0.3 04-Feb-13 L1266292-27	TP13-13 S30 0-0.3 04-Feb-13 L1266292-30	TP13-13 S31 0.3-0.7 04-Feb-13 L1266292-31	TP13-13 S32 0.7-1.0 04-Feb-13 L1266292-32	TP13-14 S33 0-0.1 04-Feb-13 L1266292-33	dup. S33 S34 04-Feb-13 L1266292-34
Physical Tests																		
Moisture %			NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾	-	-		-	-	-	-	-	-	-	-	-	-
pH			NS	NS	NS	6.9	6.83	1%	7.34	6.18	8.14	7.53	6.91	7.94	7.1	6.8	6.2	6.16
Total Metals																		
Antimony T-Sb	mg/kg	20	40	40	0.9	0.64	34%	<0.10	0.27	0.17	0.22	0.13	0.16	<0.10	<0.10	<0.10	<0.10	
Arsenic T-As	mg/kg	10	10	10	3.14	3.24	3%	1.23	2.93	2.03	4.73	2.41	1.95	1.16	0.6	1.06	0.743	
Barium T-Ba	mg/kg	350	350	350	61.4	62.5	2%	42	79	59.9	52.7	43.5	47.6	47.4	34.7	39.7	35.1	
Beryllium T-Be	mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH>8)	0.23	0.22	4%	<0.20	0.23	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium T-Cd	mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.124	0.134	8%	<0.050	0.101	0.077	0.096	0.103	0.057	<0.050	<0.050	0.067	0.069	
Chromium T-Cr	mg/kg	60	60	60	14.4	15.5	7%	7.82	13.3	11.1	15	8.16	7.98	8.41	6.4	8.2	6.92	
Cobalt T-Co	mg/kg	25	25	25	5.93	6.14	3%	5.23	6.13	6.54	8.7	6.04	5.86	5.74	4.7	5.73	4.94	
Copper T-Cu	mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	31.3	29.7	5%	29.7	36.2	18.9	37.9	17.9	16.8	22.8	17.8	48.1	45	
Lead	mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	10.2	10.3	1%	3.51	8.08	4.32	5.34	7.09	5.36	2.29	1.14	1.34	1.29	
Manganese	mg/kg	2000	2000	2000														
Mercury T-Hg	mg/kg	10	25	75	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Molybdenum T-Mo	mg/kg	15	15	15	1.77	1.77	0%	<0.50	2.88	<0.50	0.98	<0.50	1	<0.50	<0.50	<0.50	<0.50	<0.50
Nickel T-Ni	mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	7.36	7.82	6%	7.75	6.53	7.88	12.4	8.48	5.46	8.04	7.05	9.53	7.97	
Selenium T-Se	mg/kg	1	1	1	0.23	0.24	4%	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver T-Ag	mg/kg	20	40	40	0.11	0.11	0%	<0.10	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Tin T-Sn	mg/kg	50	300	300	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium T-U	mg/kg	30	30	30														
Vanadium T-V	mg/kg	100	100	100	59.4	63.3	6%	33.7	56.7	46	50.7	39.2	41.2	37.1	24.9	40.5	33.1	
Zinc T-Zn	mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	43.2	46.5	7%	33.4	35	38.6	47.9	48.3	28.7	31.1	25.5	28.7	25.4	

Notes:

(1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.

(2) "NS" denotes no standard.

(3) "-" denotes not analyzed.

TABLE II

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	RPD	TP13-14 S35 0.3-0.6 04-Feb-13 L1266292-35	TP20-1 RB1 0.15-0.3m 23-Mar-2020 VA20A3817-001	TP20-2 RB2 0-0.3m 23-Mar-2020 VA20A3817-002	Stockpile S36 (APEC 1) 04-Feb-13 L1266292-36	Stockpile S37 (APEC 5) 04-Feb-13 L1266292-37	Stockpile S38 (APEC 5) 04-Feb-13 L1266292-38	Stockpile S39 (APEC 5) 04-Feb-13 L1266292-39
Physical Tests											
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾		-			-	-	-	-
pH	NS	NS	NS	1%	6.03	7.37	5.49	7.11	6.25	6.43	5.47
Total Metals											
Antimony T-Sb mg/kg	20	40	40	-	<0.10	0.58	<0.10	0.27	0.1	0.27	0.12
Arsenic T-As mg/kg	10	10	10	35%	1.48	3.22	1.04	3.13	1.84	2.35	2.05
Barium T-Ba mg/kg	350	350	350	12%	30.2	74.5	36.0	71.3	95.2	46.9	38.4
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 350 (pH > 8)	-	<0.20	0.18	0.10	<0.20	0.21	<0.20	<0.20
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	3%	0.081	0.175	0.043	0.121	<0.050	0.107	0.069
Chromium T-Cr mg/kg	60	60	60	17%	6.62	13.0	7.41	18.8	12.8	16.8	11.6
Cobalt T-Co mg/kg	25	25	25	15%	5.53	6.50	5.43	7.15	11.2	5.12	6.15
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	7%	29.1	25.4	25.9	25.5	82.6	18.4	24.4
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	4%	1.04	16.2	3.01	8.15	2.21	12.2	4.74
Manganese mg/kg	2000	2000	2000			322	276				
Mercury T-Hg mg/kg	10	25	75	-	<0.050	<0.0500	<0.0500	<0.050	<0.050	<0.050	<0.050
Molybdenum T-Mo mg/kg	15	15	15	-	<0.50	0.51	0.30	0.56	5.81	<0.50	1.81
Nickel T-Ni mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	18%	7.75	8.30	8.13	11.7	5.89	6.25	8.16
Selenium T-Se mg/kg	1	1	1	-	<0.20	<0.20	<0.20	<0.20	0.31	0.21	0.26
Silver T-Ag mg/kg	20	40	40	-	<0.10	0.30	<0.10	<0.10	<0.10	<0.10	<0.10
Tin T-Sn mg/kg	50	300	300	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium T-U mg/kg	30	30	30			0.552	0.316				
Vanadium T-V mg/kg	100	100	100	20%	27.8	46.3	33.4	55.9	78	64.1	47.2
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	12%	31.3	70.6	28.6	57.1	29.9	41.1	32.5

Notes:

(1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.

(2) "NS" denotes no standard.

(3) "-" denotes not analyzed.

TABLE III

SUMMARY OF HYDROCARBON ANALYSES FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:		Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP13-01 S1 0-0.3 04-Feb-13 L1266292-1	TP13-01 S2 0.8-1.2 04-Feb-13 L1266292-2	TP13-01 S3 1.8-2.1 04-Feb-13 L1266292-3	TP13-02 S5 0-0.3 04-Feb-13 L1266292-5
Physical Tests								
Moisture		NS	NS	NS	13.8	14.2	13.8	15.8
pH		NS	NS	NS	6.71	5.95	5.63	4.97
Polycyclic Aromatic Hydrocarbons								
Acenaphthene	mg/kg	950	2,000	15,000	<0.050	-	-	<0.050
Acenaphthylene	mg/kg	NS	NS	NS	<0.050	-	-	<0.050
Anthracene	mg/kg	2.5	30	30	<0.050	-	-	<0.050
Benz(a)anthracene	mg/kg	1	1	10	<0.050	-	-	<0.050
Benzo(a)pyrene	mg/kg	5	10	30	<0.050	-	-	<0.050
Benzo(b)fluoranthene	mg/kg	1	1	10	<0.050	-	-	<0.050
Benzo(g,h,i)perylene	mg/kg	NS	NS	NS	<0.050	-	-	<0.050
Benzo(k)fluoranthene	mg/kg	1	10	10	<0.050	-	-	<0.050
Chrysene	mg/kg	200	400	4,500	<0.050	-	-	<0.050
Dibenz(a,h)anthracene	mg/kg	1	10	10	<0.050	-	-	<0.050
Fluoranthene	mg/kg	50	200	200	<0.050	-	-	<0.050
Fluorene	mg/kg	600	1,000	9,500	<0.050	-	-	<0.050
Indeno(1,2,3-c,d)pyrene	mg/kg	1	10	10	<0.050	-	-	<0.050
2-Methylnaphthalene	mg/kg	60	100	950	<0.050	-	-	<0.050
Naphthalene	mg/kg	0.6	20	20	<0.050	-	-	<0.050
Phenanthrene	mg/kg	5	50	50	<0.050	-	-	<0.050
Pyrene	mg/kg	10	100	100	<0.050	-	-	<0.050
Extractable Hydrocarbons								
EPH10-19	mg/kg	NS	NS	NS	<200	<200	<200	<200
EPH19-32	mg/kg	NS	NS	NS	<200	<200	<200	<200
LEPH	mg/kg	1,000	200	2,000	<200	<200	<200	<200
HEPH	mg/kg	1,000	5,000	5,000	<200	<200	<200	<200
Non-Halogenated Volatiles								
Benzene	mg/kg	0.035	0.035	0.035	<0.040	-	-	<0.040
Ethylbenzene	mg/kg	15	15	15	<0.050	-	-	<0.050
Styrene	mg/kg	5	50	50	<0.050	-	-	<0.050
Toluene	mg/kg	6	6	6	<0.050	-	-	<0.050
meta- & para-Xylene	mg/kg	NS	NS	NS	<0.050	-	-	<0.050
ortho-Xylene	mg/kg	NS	NS	NS	<0.050	-	-	<0.050
Total Xylenes	mg/kg	6.5	6.5	6.5	<0.075	-	-	<0.075
Volatile Hydrocarbons (VH6-10)	mg/kg	NS	NS	NS	<100	-	-	<100
VPH	mg/kg	200	200	200	<100	-	-	<100
Methyl t-butyl ether (MTBE)	mg/kg	4,000	8,000	20,000	<0.20	-	-	<0.20

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) *Italics* denotes equivalency between LEPH and EPH10-19, or HEPH and EPH19-32 assumed.

TABLE III

SUMMARY OF HYDROCARBON ANALYSES FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP13-03	TP13-04	TP13-05	dup. S11	
				S7	S9	S11	S12	
				0-0.3	0-0.3	0-0.3		
				04-Feb-13 L1266292-7	04-Feb-13 L1266292-9	04-Feb-13 L1266292-11	04-Feb-13 L1266292-12	
Physical Tests								
Moisture	NS	NS	NS	14.0	13.8	21.3	20.7	
pH	NS	NS	NS	-	5.29	5.76	5.63	
Polycyclic Aromatic Hydrocarbons								
Acenaphthene	mg/kg	950	2,000	15,000	<0.050	<0.050	-	-
Acenaphthylene	mg/kg	NS	NS	NS	<0.050	<0.050	-	-
Anthracene	mg/kg	2.5	30	30	<0.050	<0.050	-	-
Benz(a)anthracene	mg/kg	1	1	10	<0.050	<0.050	-	-
Benzo(a)pyrene	mg/kg	5	10	30	<0.050	<0.050	-	-
Benzo(b)fluoranthene	mg/kg	1	1	10	<0.050	0.063	-	-
Benzo(g,h,i)perylene	mg/kg	NS	NS	NS	<0.050	<0.050	-	-
Benzo(k)fluoranthene	mg/kg	1	10	10	<0.050	<0.050	-	-
Chrysene	mg/kg	200	400	4,500	<0.050	<0.050	-	-
Dibenz(a,h)anthracene	mg/kg	1	10	10	<0.050	<0.050	-	-
Fluoranthene	mg/kg	50	200	200	<0.050	<0.050	-	-
Fluorene	mg/kg	600	1,000	9,500	<0.050	<0.050	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg	1	10	10	<0.050	<0.050	-	-
2-Methylnaphthalene	mg/kg	60	100	950	<0.050	<0.050	-	-
Naphthalene	mg/kg	0.6	20	20	<0.050	<0.050	-	-
Phenanthrene	mg/kg	5	50	50	<0.050	<0.050	-	-
Pyrene	mg/kg	10	100	100	<0.050	<0.050	-	-
Extractable Hydrocarbons								
EPH10-19	mg/kg	NS	NS	NS	<200	<200	<200	<200
EPH19-32	mg/kg	NS	NS	NS	<200	<200	<200	<200
LEPH	mg/kg	1,000	200	2,000	<200	<200	<200	<200
HEPH	mg/kg	1,000	5,000	5,000	<200	<200	<200	<200
Non-Halogenated Volatiles								
Benzene	mg/kg	0.035	0.035	0.035	-	<0.040	-	-
Ethylbenzene	mg/kg	15	15	15	-	<0.050	-	-
Styrene	mg/kg	5	50	50	-	<0.050	-	-
Toluene	mg/kg	6	6	6	-	<0.050	-	-
meta- & para-Xylene	mg/kg	NS	NS	NS	-	<0.050	-	-
ortho-Xylene	mg/kg	NS	NS	NS	-	<0.050	-	-
Total Xylenes	mg/kg	6.5	6.5	6.5	-	<0.075	-	-
Volatile Hydrocarbons (VH6-10)	mg/kg	NS	NS	NS	-	<100	-	-
VPH	mg/kg	200	200	200	-	<100	-	-
Methyl t-butyl ether (MTBE)	mg/kg	4,000	8,000	20,000	-	<0.20	-	-

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
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TABLE III

SUMMARY OF HYDROCARBON ANALYSES FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	RPD	TP13-06	TP13-07	TP13-12
					S14	S16	S28
					0-0.3	0-0.3	0.3-0.6
					04-Feb-13	04-Feb-13	04-Feb-13
					L1266292-14	L1266292-16	L1266292-28
Physical Tests							
Moisture	NS	NS	NS		8.4	9.2	7.9
pH	NS	NS	NS		5.79	6.63	-
Polycyclic Aromatic Hydrocarbons							
Acenaphthene mg/kg	950	2,000	15,000	-	-	-	-
Acenaphthylene mg/kg	NS	NS	NS	-	-	-	-
Anthracene mg/kg	2.5	30	30	-	-	-	-
Benz(a)anthracene mg/kg	1	1	10	-	-	-	-
Benzo(a)pyrene mg/kg	5	10	30	-	-	-	-
Benzo(b)fluoranthene mg/kg	1	1	10	-	-	-	-
Benzo(g,h,i)perylene mg/kg	NS	NS	NS	-	-	-	-
Benzo(k)fluoranthene mg/kg	1	10	10	-	-	-	-
Chrysene mg/kg	200	400	4,500	-	-	-	-
Dibenz(a,h)anthracene mg/kg	1	10	10	-	-	-	-
Fluoranthene mg/kg	50	200	200	-	-	-	-
Fluorene mg/kg	600	1,000	9,500	-	-	-	-
Indeno(1,2,3-c,d)pyrene mg/kg	1	10	10	-	-	-	-
2-Methylnaphthalene mg/kg	60	100	950	-	-	-	-
Naphthalene mg/kg	0.6	20	20	-	-	-	-
Phenanthrene mg/kg	5	50	50	-	-	-	-
Pyrene mg/kg	10	100	100	-	-	-	-
Extractable Hydrocarbons							
EPH10-19 mg/kg	NS	NS	NS	-	<200	<200	<200
EPH19-32 mg/kg	NS	NS	NS	-	<200	<200	<200
LEPH mg/kg	1,000	200	2,000	-	<200	<200	<200
HEPH mg/kg	1,000	5,000	5,000	-	<200	<200	<200
Non-Halogenated Volatiles							
Benzene mg/kg	0.035	0.035	0.035	-	<0.040	-	<0.040
Ethylbenzene mg/kg	15	15	15	-	<0.050	-	<0.050
Styrene mg/kg	5	50	50	-	<0.050	-	<0.050
Toluene mg/kg	6	6	6	-	<0.050	-	<0.050
meta- & para-Xylene mg/kg	NS	NS	NS	-	<0.050	-	<0.050
ortho-Xylene mg/kg	NS	NS	NS	-	<0.050	-	<0.050
Total Xylenes mg/kg	6.5	6.5	6.5	-	<0.075	-	<0.075
Volatile Hydrocarbons (VH6-10) mg/kg	NS	NS	NS	-	<100	-	<100
VPH mg/kg	200	200	200	-	<100	-	<100
Methyl t-butyl ether (MTBE) mg/kg	4,000	8,000	20,000	-	<0.20	-	<0.20

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) *Italics* denotes equivalency between LEPH and EPH10-19, or HEPH and EPH19-32 assumed.

TABLE IV
SUMMARY OF GROUNDWATER ANALYSIS RESULTS

Analyte	Units	CSR Stds.		MW15-01	MW15-02
		DW	AWm	25-May-15	25-May-15
Hardness, Total (Diss. as CaCO ₃)	mg/L	-	-	47.1	56.3
Aluminum, dissolved	mg/L	9.5	NS	<0.05	<0.05
Antimony, dissolved	mg/L	0.006	2.5	0.003	0.002
Arsenic, dissolved	mg/L	0.01	0.125	<0.005	<0.005
Barium, dissolved	mg/L	1	5	<0.05	<0.05
Beryllium, dissolved	mg/L	0.008	1	<0.001	<0.001
Boron, dissolved	mg/L	5	12	<0.04	<0.04
Cadmium, dissolved	mg/L	0.005	0.015	<0.0001	<0.0001
Calcium, dissolved	mg/L	NS	NS	14.4	17.8
Chromium, dissolved	mg/L	6	0.56	<0.005	<0.005
Cobalt, dissolved	mg/L	0.001	0.04	<0.0005	<0.0005
Copper, dissolved	mg/L	1.5	0.02	<0.002	<0.002
Iron, dissolved	mg/L	6.5	NS	<0.10	<0.10
Lead, dissolved	mg/L	0.01	0.02	<0.001	<0.001
Lithium, dissolved	mg/L	0.08	NS	<0.001	<0.001
Magnesium, dissolved	mg/L	NS	NS	2.7	2.9
Manganese, dissolved	mg/L	1.5	NS	0.042	0.058
Mercury, dissolved	mg/L	0.001	0.00025	<0.00002	<0.00002
Molybdenum, dissolved	mg/L	0.25	10	0.001	0.003
Nickel, dissolved	mg/L	0.08	0.083	<0.002	<0.002
Selenium, dissolved	mg/L	0.01	0.02	<0.005	<0.005
Silver, dissolved	mg/L	0.02	0.015	<0.0005	<0.0005
Sodium, dissolved	mg/L	200	NS	2.2	4.3
Strontium, dissolved	mg/L	2.5	NS	0.09	0.08
Thallium, dissolved	mg/L	NS	0.003	<0.0002	<0.0002
Titanium, dissolved	mg/L	NS	1	<0.05	<0.05
Uranium, dissolved	mg/L	0.02	0.085	<0.0002	<0.0002
Vanadium, dissolved	mg/L	0.02	NS	<0.01	<0.01
Zinc, dissolved	mg/L	3	0.1	<0.04	<0.04

NS denotes no standard

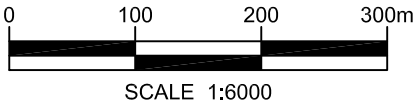
DRAFT

FIGURES



LEGEND

-  SITE OUTLINE
-  LOT OUTLINE
- ① PID 010 025 901
- ② PID 010 025 952
- ③ PID 010 077 227
- ④ PID 010 026 151



TIGER BAY DEVELOPMENT CORPORATION
COMBINED STAGE 1 AND 2 PRELIMINARY SITE
INVESTIGATION
BRITANNIA BEACH SOUTH PROJECT

LOCATION PLAN

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

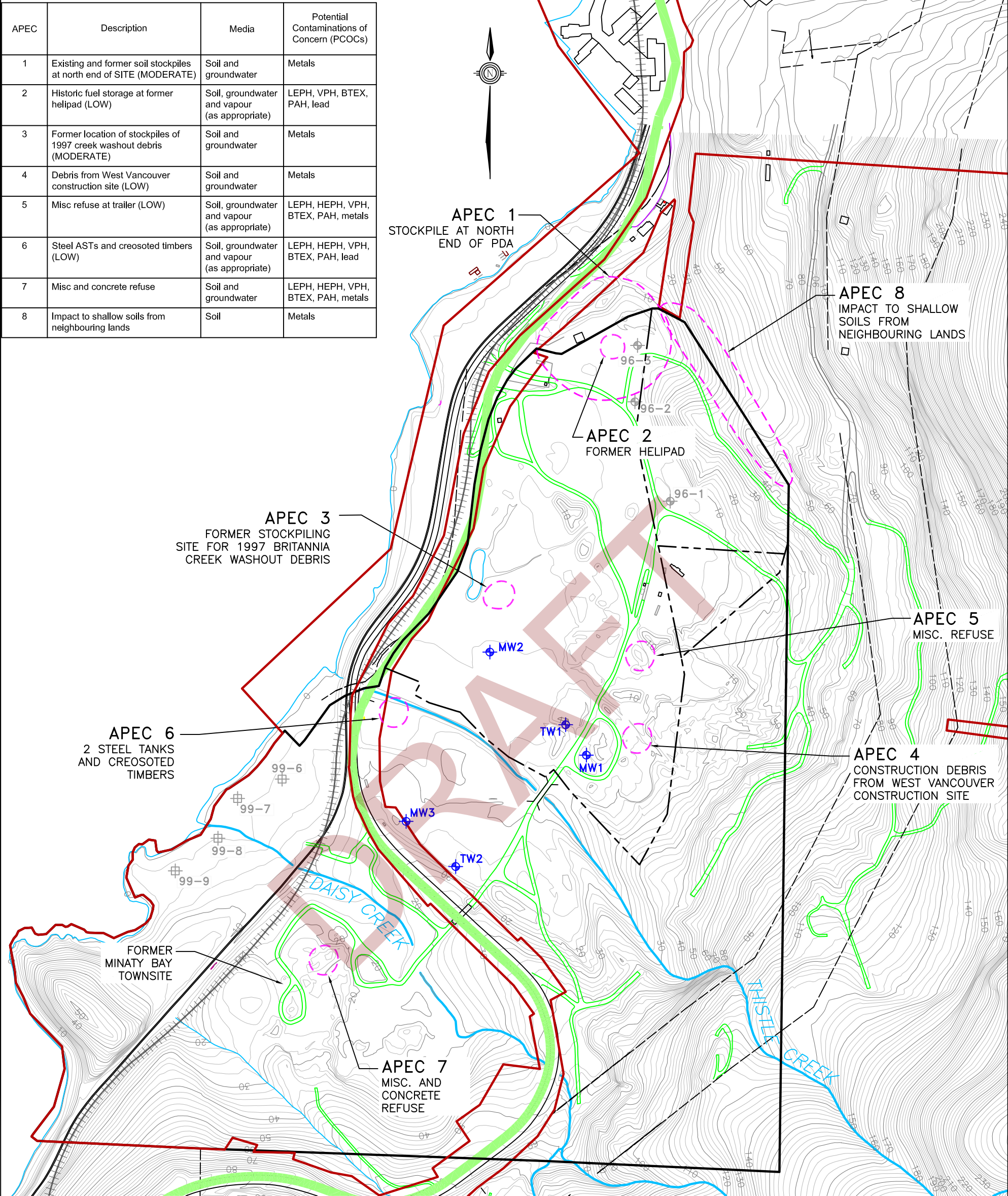


PITEAU ASSOCIATES

GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

BY:	DJT/si	DATE:	APR 20
APPROVED:		FIGURE:	1

APEC	Description	Media	Potential Contaminations of Concern (PCOCs)
1	Existing and former soil stockpiles at north end of SITE (MODERATE)	Soil and groundwater	Metals
2	Historic fuel storage at former helipad (LOW)	Soil, groundwater and vapour (as appropriate)	LEPH, VPH, BTEX, PAH, lead
3	Former location of stockpiles of 1997 creek washout debris (MODERATE)	Soil and groundwater	Metals
4	Debris from West Vancouver construction site (LOW)	Soil and groundwater	Metals
5	Misc refuse at trailer (LOW)	Soil, groundwater and vapour (as appropriate)	LEPH, HEPH, VPH, BTEX, PAH, metals
6	Steel ASTs and creosoted timbers (LOW)	Soil, groundwater and vapour (as appropriate)	LEPH, HEPH, VPH, BTEX, PAH, lead
7	Misc and concrete refuse	Soil and groundwater	LEPH, HEPH, VPH, BTEX, PAH, metals
8	Impact to shallow soils from neighbouring lands	Soil	Metals



LEGEND

- SITE BOUNDARY
- HIGHWAY 99
- BC HYDRO TRANSMISSION CORRIDOR
- RAILWAY
- BRIDGE
- TUNNEL
- MONITORING WELL (THURBER, 1996)

- TESTPIT (THURBER, 1999)
- GROUNDWATER SUPPLY TEST WELL OR MONITORING WELL
- AREA OF POTENTIAL ENVIRONMENTAL CONCERN (APEC) – SEE TABLE

- NOTES:
- TOPOGRAPHIC CONTOURS ARE IN METRES ABOVE MEAN SEA LEVEL.
 - ALL LOCATIONS APPROXIMATE.

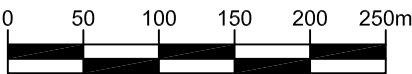
PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD, HAS NOT ENTERED INTO A CONTRACT.

TIGER BAY DEVELOPMENT CORPORATION
COMBINED STAGE 1 AND 2 PRELIMINARY SITE
INVESTIGATION
BRITANNIA BEACH SOUTH PROJECT



PITEAU ASSOCIATES

GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS



SCALE 1:5000

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

BY:	DATE:
DJT/sI	APR 20
APPROVED:	FIGURE:
	2



APEC 1
STOCKPILE AT NORTH
END OF PDA

APEC 8
IMPACT TO SHALLOW
SOILS FROM
NEIGHBOURING LANDS

APEC 2
FORMER HELIPAD

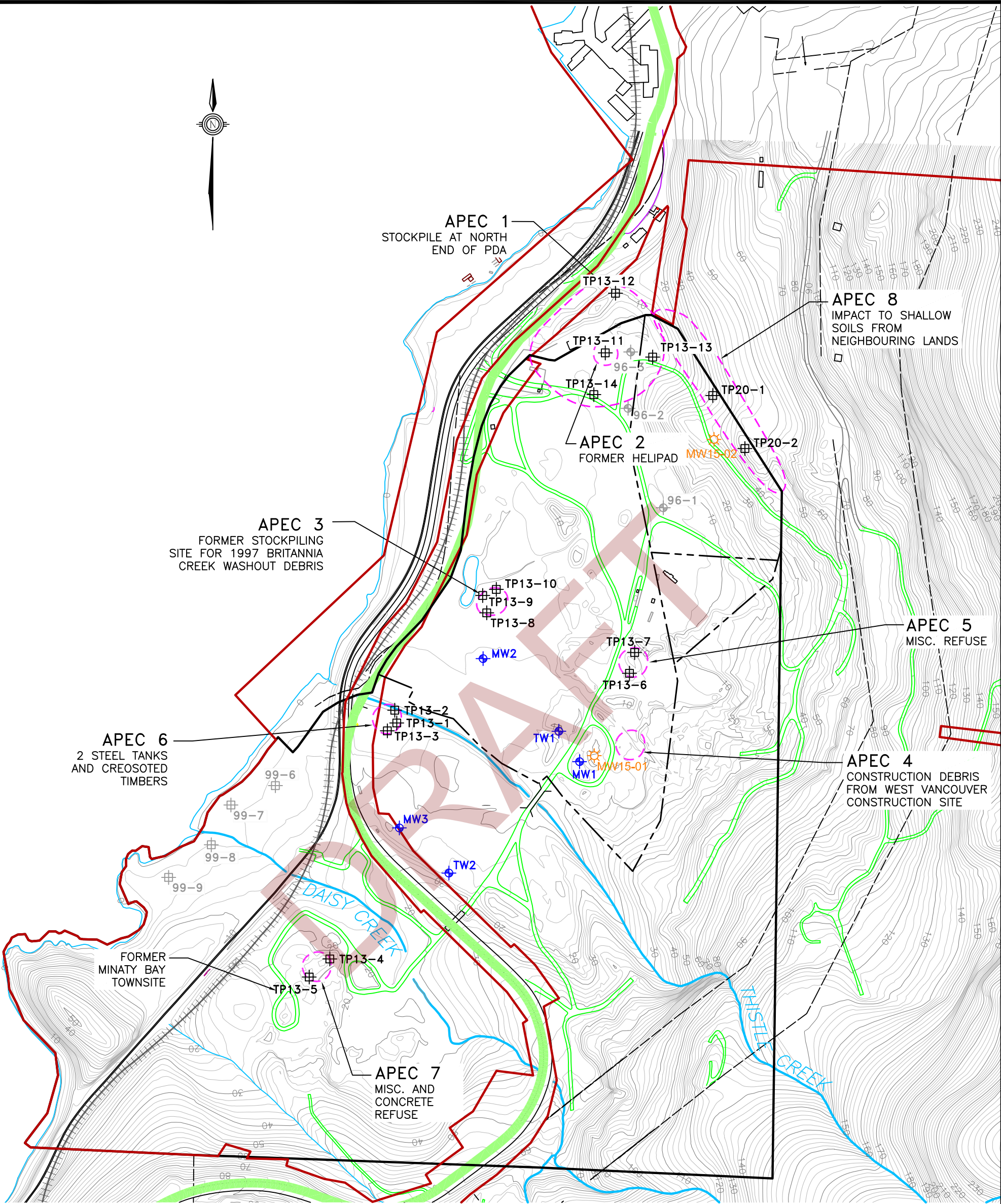
APEC 3
FORMER STOCKPILING
SITE FOR 1997 BRITANNIA
CREEK WASHOUT DEBRIS

APEC 5
MISC. REFUSE

APEC 6
2 STEEL TANKS
AND CREOSOTED
TIMBERS

APEC 4
CONSTRUCTION DEBRIS
FROM WEST VANCOUVER
CONSTRUCTION SITE

APEC 7
MISC. AND
CONCRETE
REFUSE



LEGEND

— SITE BOUNDARY

— HIGHWAY 99

--- BC HYDRO TRANSMISSION CORRIDOR

++++ RAILWAY

— BRIDGE

— TUNNEL

⊕ MONITORING WELL
(THURBER, 1996)

⊕ TESTPIT (THURBER, 1999)

⊕ TESTPIT (THIS INVESTIGATION)

⊕ GROUNDWATER SUPPLY TEST WELL OR
MONITORING WELL (PREVIOUS INVESTIGATIONS)

⊕ MONITORING WELL (THIS INVESTIGATION)

⊕ AREA OF POTENTIAL ENVIRONMENTAL
CONCERN (APEC)

NOTES:

1. TOPOGRAPHIC CONTOURS ARE IN METRES ABOVE MEAN SEA LEVEL.
2. ALL LOCATIONS APPROXIMATE.

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

TIGER BAY DEVELOPMENT CORPORATION
COMBINED STAGE 1 AND 2 PRELIMINARY SITE
INVESTIGATION
BRITANNIA BEACH SOUTH PROJECT



PITEAU ASSOCIATES

GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SITE PLAN WITH TEST PIT AND MONITORING WELL LOCATIONS

BY:

DJT/sl

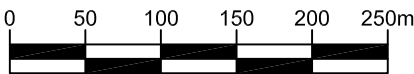
DATE:

APR 20

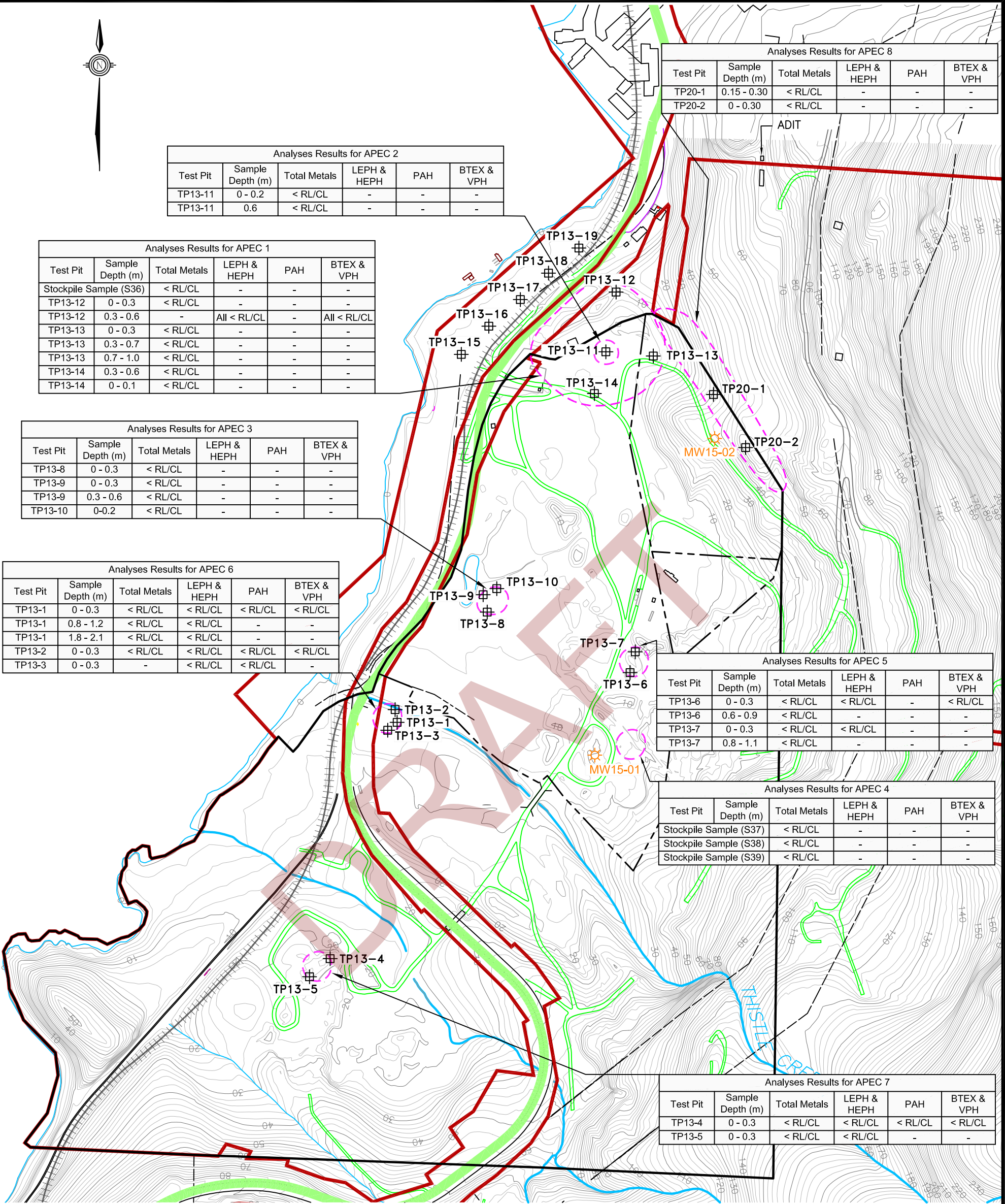
APPROVED:

FIGURE:

3



SCALE 1:5000



LEGEND

- SITE BOUNDARY
- HIGHWAY 99
- BC HYDRO TRANSMISSION CORRIDOR
- RAILWAY
- BRIDGE
- TUNNEL
- TESTPIT (THIS INVESTIGATION)



MONITORING WELL
(THIS INVESTIGATION)



AREA OF POTENTIAL ENVIRONMENTAL
CONCERN (APEC) - SEE TABLE

- NOTES:
- TOPOGRAPHIC CONTOURS ARE IN METRES ABOVE MEAN SEA LEVEL.
 - ALL LOCATIONS APPROXIMATE.

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

TIGER BAY DEVELOPMENT CORPORATION
COMBINED STAGE 1 AND 2 PRELIMINARY SITE
INVESTIGATION
BRITANNIA BEACH SOUTH PROJECT

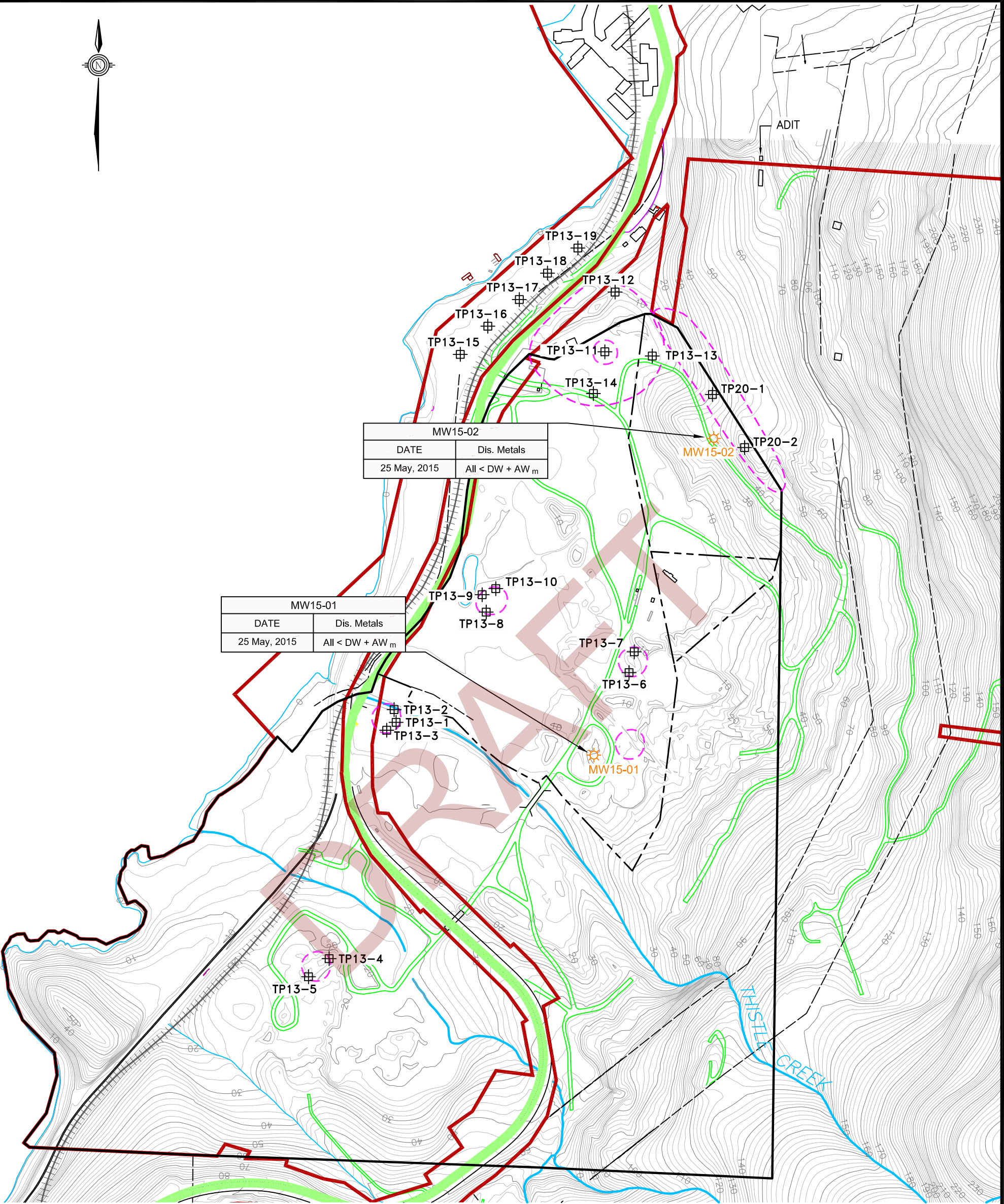


PITEAU ASSOCIATES

GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SITE INVESTIGATION SUMMARY - SOILS

BY: DJT/si
APPROVED: DATE: APR 20
FIGURE:



MW15-02	
DATE	Dis. Metals
25 May, 2015	All < DW + AW _m

MW15-01	
DATE	Dis. Metals
25 May, 2015	All < DW + AW _m

LEGEND

- SITE BOUNDARY
- HIGHWAY 99
- BC HYDRO TRANSMISSION CORRIDOR
- RAILWAY
- BRIDGE
- TUNNEL
- TESTPIT (THIS INVESTIGATION)

- MONITORING WELL (THIS INVESTIGATION)
- AREA OF POTENTIAL ENVIRONMENTAL CONCERN (APEC) – SEE TABLE

- NOTES:
- TOPOGRAPHIC CONTOURS ARE IN METRES ABOVE MEAN SEA LEVEL.
 - ALL LOCATIONS APPROXIMATE.

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

TIGER BAY DEVELOPMENT CORPORATION
COMBINED STAGE 1 AND 2 PRELIMINARY SITE
INVESTIGATION
BRITANNIA BEACH SOUTH PROJECT



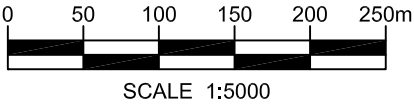
PITEAU ASSOCIATES

GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS

SITE INVESTIGATION SUMMARY - GROUNDWATER

BY: DJT/si
DATE: APR 20
APPROVED: FIGURE:

5



DRAFT

PHOTOS

FILE: P:\Photos\3160\January-2014\Report_Photos\Report1



Photo 1.
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Photo 2.
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Photo 3.
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Photo 4.
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Photo 5.
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Photo 6.
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APPENDIX A
HISTORIC TITLE SEARCH FOR
CENTRAL PORTION OF SITE (PIDs 010-077-227 & 010-026-151)
AND CURRENT TITLES

TITLE SEARCH PRINT

2020-03-25, 15:09:28

File Reference:

Requestor: Piteau user

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

VANCOUVER

VANCOUVER

Title Number

From Title Number

CA6795362

BB1341966

Application Received

2018-05-11

Application Entered

2018-05-24

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

TIGER BAY DEVELOPMENT CORPORATION, INC.NO. BC0864299
PO BOX 195, 27154 HIGHWAY 99
BRITANNIA BEACH, BC
V0N 1J0

Taxation Authority

North Shore - Squamish Valley Assessment Area

Description of Land

Parcel Identifier:

010-025-952

Legal Description:

PARCEL 1 (REFERENCE PLAN 4878) OF DISTRICT LOT 1583 GROUP 1 NEW WESTMINSTER
DISTRICT EXCEPT PART ON PLAN 21576

Legal Notations

NONE

TITLE SEARCH PRINT

File Reference:

2020-03-25, 15:09:28

Requestor: Piteau user

Charges, Liens and Interests

Nature:	UNDERSURFACE RIGHTS
Registration Number:	N46371
Registration Date and Time:	1985-06-14 11:49
Registered Owner:	VALE INVESTMENTS LTD. INCORPORATION NO. C1021365 CHANGE OF ADDRESS FILED, SEE CA4184609
Transfer Number:	CA4144782
Remarks:	INTER ALIA ALL GOLD AND SILVER WHICH MAY BE FOUND IN VEINS LODES OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PARCEL 1; "MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN TRANSFER OF G85006 RECEIVED 29/10/1984 @ 12:58 TRANSFERRED TO R133949 23/12/1987
Nature:	COVENANT
Registration Number:	R133930
Registration Date and Time:	1987-12-23 14:46
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133932
Registration Date and Time:	1987-12-23 14:47
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133933
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA

TITLE SEARCH PRINT

2020-03-25, 15:09:28

File Reference:

Requestor: Piteau user

Nature: COVENANT
Registration Number: R133934
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks: INTER ALIA
SEC 215 LTA

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: TAICHENG DEVELOPMENT CORP.
INCORPORATION NO. BC0864299
Transfer Number: CA4223660
Remarks: INTER ALIA
TRANSFER OF N46371, SEE G85006
ALL GOLD AND SILVER WHICH MAY BE FOUND IN VEINS,
LODES, OR ROCK IN PLACE UNDER THOSE PORTIONS OF
LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL
CLAIM AND LOT 4022, KNOWN AS "NO. 74 FRACTIONAL"
MINERAL CLAIM LYING WITHIN THE LIMITS OF PARCEL 1
"MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN

Nature: MORTGAGE
Registration Number: CA7018476
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

TITLE SEARCH PRINT

2020-03-25, 15:09:28

File Reference:

Requestor: Piteau user

Nature: ASSIGNMENT OF RENTS
Registration Number: CA7018477
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

DRAFT

TITLE SEARCH PRINT

2020-03-25, 15:08:35

File Reference:

Requestor: Piteau user

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

VANCOUVER

VANCOUVER

Title Number

From Title Number

CA6795363

BB2019685

Application Received

2018-05-11

Application Entered

2018-05-24

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

TIGER BAY DEVELOPMENT CORPORATION, INC.NO. BC0864299
PO BOX 195, 27154 HIGHWAY 99
BRITANNIA BEACH, BC
V0N 1J0

Taxation Authority

North Shore - Squamish Valley Assessment Area

Description of Land

Parcel Identifier:

010-025-901

Legal Description:

PARCEL 1 (REFERENCE PLAN 4878) OF DISTRICT LOT 2001 GROUP 1 NEW WESTMINSTER
DISTRICT EXCEPT PART ON PLAN 21576

Legal Notations

THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL
GOVERNMENT ACT, SEE BB1514137

TITLE SEARCH PRINT

File Reference:

2020-03-25, 15:08:35

Requestor: Piteau user

Charges, Liens and Interests

Nature:	UNDERSURFACE RIGHTS
Registration Number:	N46371
Registration Date and Time:	1985-06-14 11:49
Registered Owner:	VALE INVESTMENTS LTD. INCORPORATION NO. C1021365 CHANGE OF ADDRESS FILED, SEE CA4184609
Transfer Number:	CA4144782
Remarks:	INTER ALIA ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES OR ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND SEPARATELY OR IN COMBINATION WITH EACH OTHER UNDER THAT PART OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL MINERAL CLAIM" AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PARCEL 1; TRANSFER OF G85006 RECEIVED 29/10/1984 @ 12:58 TRANSFERRED TO R133949 23/12/1987
Nature:	COVENANT
Registration Number:	R133930
Registration Date and Time:	1987-12-23 14:46
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133932
Registration Date and Time:	1987-12-23 14:47
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133933
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA

TITLE SEARCH PRINT

2020-03-25, 15:08:35

File Reference:

Requestor: Piteau user

Nature: COVENANT
Registration Number: R133934
Registration Date and Time: 1987-12-23 14:48
Registered Owner: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA
Remarks: INTER ALIA
SEC 215 LTA

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: TAICHENG DEVELOPMENT CORP.
INCORPORATION NO. BC0864299
Transfer Number: CA4223660
Remarks: INTER ALIA
TRANSFER OF N46371, SEE G85006
ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND
PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES, OR
ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND
SEPARATELY OR IN COMBINATION WITH EACH OTHER
UNDER THAT PART OF LOT 4009 KNOWN AS
"MAPLE FRACTIONAL MINERAL CLAIM" AND LOT 4022
KNOWN AS "NO. 74 MINERAL FRACTIONAL" MINERAL CLAIM
LYING WITHIN THE LIMITS OF PARCEL 1

Nature: MORTGAGE
Registration Number: CA7018476
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

TITLE SEARCH PRINT

2020-03-25, 15:08:35

File Reference:

Requestor: Piteau user

Nature: ASSIGNMENT OF RENTS
Registration Number: CA7018477
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

DRAFT

TITLE SEARCH PRINT

2020-03-25, 15:10:29

File Reference:

Requestor: Piteau user

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

VANCOUVER

VANCOUVER

Title Number

From Title Number

CA6795371

BB2019686

Application Received

2018-05-11

Application Entered

2018-05-24

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

TIGER BAY DEVELOPMENT CORPORATION, INC.NO. BC0864299
PO BOX 195, 27154 HIGHWAY 99
BRITANNIA BEACH, BC
V0N 1J0

Taxation Authority

North Shore - Squamish Valley Assessment Area

Description of Land

Parcel Identifier:

010-026-151

Legal Description:

DISTRICT LOT 1583 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT: FIRSTLY; PART IN REFERENCE PLAN 4390, SECONDLY; PART IN REFERENCE PLAN 4878, THIRDLY; PART ON PLAN 21576, FOURTHLY; PART SHOWN AS 8.31 ACRES ON HIGHWAY PLAN 76 FIFTHLY; PART SHOWN AS 0.08 ACRES ON HIGHWAY PLAN 76, SIXTHLY: PPORTION ON PLAN BCP29232

Legal Notations

THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL GOVERNMENT ACT, SEE BB1514137

HERETO IS ANNEXED RESTRICTIVE COVENANT H4828 OVER:

(A) DISTRICT LOTS 1296 AND 1632 EXCEPT PORTIONS IN REFERENCE PLAN 4335

(B) DISTRICT LOTS 1661 AND 1666

(C) DISTRICT LOT 2018, EXCEPT PORTIONS IN REFERENCE PLANS 4335 AND 6684

(D) DISTRICT LOTS 1626, 1659 AND 1898 EXCEPT PORTIONS IN REFERENCE PLAN 4335

(E) DISTRICT LOT 1660

(F) DISTRICT LOT 4145, EXCEPT PORTIONS IN DISTRICT LOTS 1661 AND 1666

TITLE SEARCH PRINT

File Reference:

2020-03-25, 15:10:29

Requestor: Piteau user

(G) DISTRICT LOT 4149
(H) DISTRICT LOTS 2922, 2924, 4007 AND 4144

Charges, Liens and Interests

Nature:	RIGHT OF WAY
Registration Number:	324477M
Registration Date and Time:	1961-03-08 15:36
Registered Owner:	BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
Remarks:	INTER ALIA PART IN REFERENCE PLAN 5355, WITH ANCILLARY RIGHTS OVER THE REMAINDER PARTIALLY CANCELLED BY CA3839444 (2014-07-15 @ 10:14) AS TO THAT PART SHOWN ON PLAN EPP41027
Nature:	COVENANT
Registration Number:	R133930
Registration Date and Time:	1987-12-23 14:46
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133932
Registration Date and Time:	1987-12-23 14:47
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133933
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA
Nature:	COVENANT
Registration Number:	R133934
Registration Date and Time:	1987-12-23 14:48
Registered Owner:	HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
Remarks:	INTER ALIA SEC 215 LTA

TITLE SEARCH PRINT

2020-03-25, 15:10:29

File Reference:

Requestor: Piteau user

Nature: STATUTORY RIGHT OF WAY
Registration Number: R133935
Registration Date and Time: 1987-12-23 14:48
Registered Owner: SQUAMISH - LILLOOET REGIONAL DISTRICT
Remarks: INTER ALIA
PART PLAN 18940
ANCILLARY RIGHTS

Nature: UNDERSURFACE RIGHTS
Registration Number: R133949
Registration Date and Time: 1987-12-23 14:50
Registered Owner: TAICHENG DEVELOPMENT CORP.
INCORPORATION NO. BC0864299
Transfer Number: CA4223660
Remarks: INTER ALIA
TRANSFER OF G85006 RC'D.29.10.84 @12:58 SEE N46371
FIRST: ALL GOLD AND SILVER WHICH MAY BE FOUND IN
VEINS, LODES, OR ROCK IN PLACE UNDER THOSE
PORTIONS OF LOT 2925 KNOWN AS "NO. 71" MINERAL
CLAIM, LOT 2926 KNOWN AS "NO. 72" MINERAL CLAIM
LOT 3717 KNOWN AS "NO. 48" MINERAL CLAIM;
LOT 3942 KNOWN AS "NO. 73" MINERAL CLAIM; LOT 4009
KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM;
LOT 4022 KNOWN AS "NO. 74 FRACTIONAL MINERAL
CLAIM" ALL LYING WITHIN THE LIMITS OF DISTRICT
LOT 1583;

Nature: MORTGAGE
Registration Number: CA7018476
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

TITLE SEARCH PRINT

2020-03-25, 15:10:29

File Reference:

Requestor: Piteau user

Nature: ASSIGNMENT OF RENTS
Registration Number: CA7018477
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Duplicate Indefeasible Title

NONE OUTSTANDING

Transfers

NONE

Pending Applications

NONE

DRAFT

TITLE SEARCH PRINT

2020-03-25, 15:10:04

File Reference:

Requestor: Piteau user

****CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

VANCOUVER

VANCOUVER

Title Number

From Title Number

CA6795372

BB2019684

Application Received

2018-05-11

Application Entered

2018-05-24

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

TIGER BAY DEVELOPMENT CORPORATION, INC.NO. BC0864299
PO BOX 195, 27154 HIGHWAY 99
BRITANNIA BEACH, BC
V0N 1J0

Taxation Authority

North Shore - Squamish Valley Assessment Area

Description of Land

Parcel Identifier:

010-077-227

Legal Description:

LOT A, EXCEPT PART DEDICATED ROAD ON PLAN BCP28651, DISTRICT LOTS 1583,
2001 AND 7034 PLAN 21576

Legal Notations

THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL
GOVERNMENT ACT, SEE BB1514137

THIS TITLE MAY BE AFFECTED BY A PERMIT UNDER PART 26 OF THE LOCAL
GOVERNMENT ACT, SEE CA5963142 EXPIRES 2020-04-19

PART DERIVED FROM DISTRICT LOTS 1583 AND 2001 IS ANNEXED
RESTRICTIVE COVENANT H4828 OVER:

(A) DISTRICT LOTS 1296 AND 1632, EXCEPT PORTIONS IN REFERENCE
PLAN 4390

(B) DISTRICT LOTS 1661 AND 1666

(C) DISTRICT LOT 2018, EXCEPT PORTIONS IN REFERENCE PLANS 4335 AND
6684

(D) DISTRICT LOTS 1626, 1659 AND 1898, EXCEPT PORTIONS IN REFERENCE
PLAN 4335

(E) DISTRICT LOT 1660

TITLE SEARCH PRINT

File Reference:

2020-03-25, 15:10:04

Requestor: Piteau user

Charges, Liens and Interests

Nature: RIGHT OF WAY
Registration Number: 324477M
Registration Date and Time: 1961-03-08 15:36
Registered Owner: BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
Remarks: INTER ALIA
PART DERIVED FROM PART FORMER D.L. 1583
PART IN REFERENCE PLAN 5355, WITH ANCILLARY
RIGHTS OVER THE REMAINDER
PARTIALLY CANCELLED BY CA3839444 (2014-07-15 @
10:14) AS TO THAT PART SHOWN ON PLAN EPP41027

Nature: UNDERSURFACE RIGHTS
Registration Number: N46371
Registration Date and Time: 1985-06-14 11:49
Registered Owner: VALE INVESTMENTS LTD.
INCORPORATION NO. C1021365
CHANGE OF ADDRESS FILED, SEE CA4184609
Transfer Number: CA4144782
Remarks: INTER ALIA
(A) ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND
PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODS OR
ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND
SEPARATELY OR IN COMBINATION WITH EACH OTHER
UNDER THAT PART OF LOT 4009 KNOWN AS
"MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN
THE LIMITS OF PART FORMER D.L. 2001 AND PART
FORMER PARCELL 1 (RP4878) OF D.L. 2001;
LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL
CLAIM LYING WITHIN THE LIMITS OF PART FORMER
PARCEL 1 (RP4878) OF D.L. 2001, PART FORMER D.L.
2001 AND PART FORMER D.L. 7034;
(B) ALL GOLD AND SILVER WHICH MAY BE FOUND IN
VEINS LODS OR ROCK IN PLACE UNDER THOSE PORTIONS
OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL
CLAIM AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL"
MINERAL CLAIM LYING WITHIN THE LIMITS OF PART
FORMER PARCEL 1 (RP 4878) OF D.L. 1583
(C) ALL GOLDE AND SILVER WHICH MAY BE FOUND IN
VEINS LODS OR ROCK IN PLACE UNDER THOSE PORTIONS
OF LOT 2925 KNOWN AS "NO. 71" MINERAL CLAIM, LOT
2926 KNOWN AS "NO 72" MINERAL CLAIM; LOT 3717
KNOWN AS "NO 48" MINERAL CLAIM; LOT 3942 KNOWN
AS "NO 73" MINERAL CLAIM; LOT 4009 KNOWN AS
"MAPLE FRACTIONAL" MINERAL CLAIM; LOT 4022 KNOWN
AS "NO 74" FRACTIONAL MINERAL CLAIM; ALL LYING
WITHIN THE LIMITS OF PART FORMER D.L. 1583
TRANSFER OF G85006
REC'D 29/10/1984 @ 12:58
ASSIGNED TO CA4223659

TITLE SEARCH PRINT

2020-03-25, 15:10:04

File Reference:

Requestor: Piteau user

Nature: STATUTORY RIGHT OF WAY
Registration Number: R133935
Registration Date and Time: 1987-12-23 14:48
Registered Owner: SQUAMISH - LILLOOET REGIONAL DISTRICT
Remarks: INTER ALIA
PART PLAN 18940
ANCILLARY RIGHTS

Nature: UNDERSURFACE RIGHTS
Registration Number: CA4223659
Registration Date and Time: 2015-02-06 16:24
Registered Owner: TAICHENG DEVELOPMENT CORP.
INCORPORATION NO. BC0864299
Remarks: INTER ALIA
ASSIGNMENT OF N43671
(A) ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES OR ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND SEPARATELY OR IN COMBINATION WITH EACH OTHER UNDER THAT PART OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN THE LIMITS OF PART FORMER D.L. 2001 AND PART FORMER PARCELL 1 (RP4878) OF D.L. 2001; LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PART FORMER PARCEL 1 (RP4878) OF D.L. 2001, PART FORMER D.L. 2001 AND PART FORMER D.L. 7034;
(B) ALL GOLD AND SILVER WHICH MAY BE FOUND IN VEINS LODES OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PART FORMER PARCEL 1 (RP 4878) OF D.L. 1583
(C) ALL GOLDE AND SILVER WHICH MAY BE FOUND IN VEINS LODES OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 2925 KNOWN AS "NO. 71" MINERAL CLAIM, LOT 2926 KNOWN AS "NO 72" MINERAL CLAIM; LOT 3717 KNOWN AS "NO 48" MINERAL CLAIM; LOT 3942 KNOWN AS "NO 73" MINERAL CLAIM; LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM; LOT 4022 KNOWN AS "NO 74" FRACTIONAL MINERAL CLAIM; ALL LYING WITHIN THE LIMITS OF PART FORMER D.L. 1583

TITLE SEARCH PRINT

2020-03-25, 15:10:04

File Reference:

Requestor: Piteau user

Nature: MORTGAGE
Registration Number: CA7018476
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Nature: ASSIGNMENT OF RENTS
Registration Number: CA7018477
Registration Date and Time: 2018-08-23 12:37
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA6893410
AS TO AN UNDIVIDED 3/8 INTEREST
Registered Owner: CANADIAN WESTERN TRUST COMPANY
INCORPORATION NO. A46845
IN TRUST, SEE CA4243630
AS TO AN UNDIVIDED 4/8 INTEREST
Registered Owner: BENCHMARK ESTATE (2009) LTD
INCORPORATION NO. 1128015
AS TO AN UNDIVIDED 1/8 INTEREST
Remarks: INTER ALIA

Duplicate Indefeasible Title NONE OUTSTANDING

Transfers NONE

Pending Applications NONE

ENVIRONMENTAL SEARCH FORM

CURRENT LEGAL: DISTRICT LOT 1583 GROUP 1 NWD EXCEPT: FIRSTLY; PART IN REFERENCE
 PLAN 4390, SECONDLY; PART IN REFERENCE PLAN 4878, THIRDLY; PART ON
 PLAN 21576, FOURTHLY; PART SHOWN AS 8.31 ACRES ON HIGHWAY PLAN 76,
 FIFTHLY; PART SHOWN AS 0.08 ACRES ON HIGHWAY PLAN 76,
 SIXTHLY; PORTION ON PLAN BCP29232

Client: PITEAU ASSOCIATES ENGINEERING

Invoice #: 37-77320

PID: 010-026-151

File Ref.: BRITANNIA BEACH

Title No.	Registered Owner	Title Registered	Title Cancelled	Prior Legal(s)	Charge Information
BB1341972	TAICHENG DEVELOPMENT CORP.	31 AUG 2011	CURRENT		TITLE ATTACHED
BB81817	BRITANNIA BEACH HOLDINGS LTD.	Title not viewed Date not known	31-8-2011		Online title not viewed
BM38529	BRITANNIA BEACH HOLDINGS LTD.	1998	Not known		Online title not viewed
BL391930	BRITANNIA BEACH HOLDINGS LTD.	1997	1998		Online title not viewed
BF40706	BRITANNIA BEACH HOLDINGS LTD.	1992	1997		Online title not viewed
BE359893	BRITANNIA BEACH HOLDINGS LTD.	1991	1992		Online title not viewed
R133947	BRITANNIA BEACH HOLDINGS LTD.	1987	1991		Online title not viewed
GB17812	MAKIN PULP AND PAPER LTD.	1988	1987		Online title not viewed
N46369	MAKIN PULP AND PAPER LTD.	1985	1988		Online title not viewed
Manual N46369	MAKIN PULP AND PAPER LTD.	14 JUNE 1985	Converted to online title	DL 1583 except portions in Ref Plans 4390 & 4878	See attached title

IMPORTANT: As all computer titles may not have been checked, charges appearing on them that could affect the property, such as leases, are not noted. Information must be checked against LTO records to verify. **Please request document copies or titles if required.** If you have any questions concerning how to read this form, please contact **West Coast Title Search Ltd.** in New Westminster at 604-659-8600 or 1-800-553-1936 and in Victoria at 250-405-6000 or 1-800-667-7767.

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ENVIRONMENTAL SEARCH FORM

PID: 010-026-151

File Ref.: BRITANNIA BEACH

Title No.	Registered Owner	Title Registered	Title Cancelled	Prior Legal(s)	Charge Information
N302 L	DOME PETROLEUM LIMITED	2 JAN 1985	14-6-1985	DL 1583 except portions in Ref Plans 4390 & 4878	See attached title (issued under Sec 188 LTA)
G85003 L	DOME PETROLEUM LIMITED	29 OCT 1979	2-1-1985	DL 1583 & 2001 except those portions of each DL included in Ref Plan 4390 and Parcel 1 (Ref Plan 4878) and DL 2617	See attached title
G79921 L	COPPER BEACH ESTATES LTD.	29 OCT 1979	29-10-1979	As above	See attached title
F45622 L	85818 CANADA LTD.	5 JULY 1978	29-10-1979	As above	See attached title
615552 L	ANACONDA AMERICAN BRASS LIMITED	4 NOV 1970	6-7-1978	As above	See attached title
471404 L	THE ANACONDA COMPANY (CANADA) LTD.	10 MAY 1963	4-11-1970	1. DL 891 except portions in Ref Plan 4390 2. DL 892 except portions in Ref Plan 7313 3. DL 1583 except portions in Ref Plan 4390 & in Parcel 1 (Ref Plan 4878) 4. DL 1897 & 3623 except portions of each DL included in Ref Plan 4390 5. DL 2001 except portions included in Ref Plan 4390 & in Parcel 1 (Ref Plan 4878) 6. DL 2617	See attached title
465684 L	THE ANACONDA COMPANY (CANADA) LTD.	18 JAN 1963	10-5-1963	SEE TITLE FOR LEGALS	See attached title
	465684 L comes from 10 prior titles				

IMPORTANT: As all computer titles may not have been checked, charges appearing on them that could affect the property, such as leases, are not noted. Information must be checked against LTO records to verify. **Please request document copies or titles if required.** If you have any questions concerning how to read this form, please contact **West Coast Title Search Ltd.** in New Westminster at 604-659-8600 or 1-800-553-1936 and in Victoria at 250-405-6000 or 1-800-667-7767.

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ENVIRONMENTAL SEARCH FORM

CURRENT LEGAL: LOT A, EXCEPT PART DEDICATED ROAD ON PLAN BCP 28651,
DISTRICT LOT 1583, 2001 & 7034 PLAN 21576

Client: PITEAU ASSOCIATES ENGINEERING

Invoice 37-77320

#:

PID: 010-077-227

File Ref.: BRITANNIA BEACH

Title No.	Registered Owner	Title Registered	Title Cancelled	Prior Legal(s)	Charge Information
BB1341964	TAICHENG DEVELOPMENT CORP.	31 AUG 2011	CURRENT		TITLE ATTACHED
BB65030	MAKIN LANDS LTD.	Title not viewed Date unknown	31-8-2011		Online title not viewed
BA154366	MAKIN LANDS LTD.	2006	Date unknown		Online title not viewed
R133931	MAKIN PULP AND PAPER LTD.	1987	2006		Online title not viewed
	R133931 comes from 5 prior titles	1) N46357 DL 7034	2) N46366 Parcel 1 (RP4878)	3) N46367 Parcel 1 (RP 4878) DL 1583 4) N46368 Remainder of DL 2001	5) N46369 Remainder of DL 1583
1) N46357	MAKIN PULP AND PAPER LTD.	14 JUNE 1985	1987	DL 7034	See attached title
G80000 L	DOME PETROLEUM LIMITED	29 OCT 1979	14-6-1985		See attached title
G79909 L	COPPER BEACH ESTATES LTD.	29 OCT 1979	29-10-1979		See attached title
2) N46366 L	MAKIN PULP AND PAPER LTD.	14 JUNE 1985	1987	Parcel 1 (Ref Plan 4878) DL 2001	See attached title

IMPORTANT: As all computer titles may not have been checked, charges appearing on them that could affect the property, such as leases, are not noted. Information must be checked against LTO records to verify. **Please request document copies or titles if required.** If you have any questions concerning how to read this form, please contact **West Coast Title Search Ltd.** in New Westminster at 604-659-8600 or 1-800-553-1936 and in Victoria at 250-405-6000 or 1-800-667-7767.

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ENVIRONMENTAL SEARCH FORM

PID: 010-077-227

File Ref.: BRITANNIA BEACH

Title No.	Registered Owner	Title Registered	Title Cancelled	Prior Legal(s)	Charge Information
G85004 L	DOME PETROLEUM LIMITED	29 OCT 1979	14-6-1985	Parcel 1 (RP 4878) DL 2001 & Parcel 1 (RP4878) DL 1583	See attached title
G79922 L	COPPER BEACH ESTATES LTD.	29 OCT 1979	29-10-1979	As above	See attached title
3) N46367 L	MAKIN PULP AND PAPER LTD.	14 JUNE 1985	1987	Parcel 1 (Ref Plan 4878) DL 1583	See attached title
G 85004 L	Joins above				
4) N46368 L	MAKIN PULP AND PAPER LTD.	14 JUNE 1985	1987	DL 2001 except portions in RP 4390 & 4878 & Plan 20309	See attached title
N301 L	DOME PETROLEUM LIMITED	2 JAN 1985	14-6-1985	As above	See attached title
G85003 L	DOME PETROLEUM LIMITED	29 OCT 1979	2-1-1985	See title for legal	See attached title
G79921 L	See report for PID 010-026-151				
5) N46369 L	MAKIN PULP AND PAPER LTD.	14 JUNE 1985	1987	DL 1583 except portions in Ref Plans 4390 & 4878	See attached title
N302 L	See report with PID 010-026-151				

IMPORTANT: As all computer titles may not have been checked, charges appearing on them that could affect the property, such as leases, are not noted. Information must be checked against LTO records to verify. **Please request document copies or titles if required.** If you have any questions concerning how to read this form, please contact **West Coast Title Search Ltd.** in New Westminster at 604-659-8600 or 1-800-553-1936 and in Victoria at 250-405-6000 or 1-800-667-7767.

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Date: 18-Jun-2012 TITLE SEARCH PRINT Time: 16:54:42
 Requestor: (PD45881) WEST COAST TITLE SEARCH LTD. Page 001 of 003
 Folio: TITLE - BB1341964

VANCOUVER LAND TITLE OFFICE TITLE NO: BB1341964
 FROM TITLE NO: BB65030

APPLICATION FOR REGISTRATION RECEIVED ON: 31 AUGUST, 2011
 ENTERED: 08 SEPTEMBER, 2011

REGISTERED OWNER IN FEE SIMPLE:
 TAICHENG DEVELOPMENT CORP., INC.NO. 0864299
 1182 EYREMOUNT DRIVE
 WEST VANCOUVER, BC
 V7S 2C5

TAXATION AUTHORITY:
 NORTH SHORE - SQUAMISH VALLEY ASSESSMENT AREA

DESCRIPTION OF LAND:
 PARCEL IDENTIFIER: 010-077-227
 LOT A, EXCEPT PART DEDICATED ROAD ON PLAN BCP28651, DISTRICT LOTS 1583,
 2001 AND 7034 PLAN 21576

LEGAL NOTATIONS:

PART DERIVED FROM DISTRICT LOTS 1583 AND 2001 IS ANNEXED
 RESTRICTIVE COVENANT H4828 OVER:
 (A) DISTRICT LOTS 1296 AND 1632, EXCEPT PORTIONS IN REFERENCE
 PLAN 4390
 (B) DISTRICT LOTS 1661 AND 1666
 (C) DISTRICT LOT 2018, EXCEPT PORTIONS IN REFERENCE PLANS 4335 AND
 6684
 (D) DISTRICT LOTS 1626, 1659 AND 1898, EXCEPT PORTIONS IN REFERENCE
 PLAN 4335
 (E) DISTRICT LOT 1660

CHARGES, LIENS AND INTERESTS:

NATURE OF CHARGE
 CHARGE NUMBER DATE TIME

RIGHT OF WAY

324477M 1961-03-08 15:36

REGISTERED OWNER OF CHARGE:

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
 324477M

REMARKS: PART DERIVED FROM PART FORMER D.L. 1583
 PART IN REFERENCE PLAN 5355, WITH ANCILLARY
 RIGHTS OVER THE REMAINDER
 INTER ALIA

UNDERSURFACE RIGHTS

N46371 1985-06-14 11:49

REGISTERED OWNER OF CHARGE:

MAKIN PULP AND PAPER LTD.
 (REGISTRATION NO. A22386)

N46371 TRANSFERRED TO BA157853

MAKIN LANDS LTD.

INCORPORATION NO. A22386

Date: 18-Jun-2012 TITLE SEARCH PRINT Time: 16:54:42

Requestor: (PD45881) WEST COAST TITLE SEARCH LTD.
 Folio: TITLE - BB1341964

Page 002 of 003

BA157853

REMARKS: (A) ALL MINERALS, PRECIOUS AND BASE (SAVE COAL AND PETROLEUM) WHICH MAY BE FOUND IN VEINS, LODES OR ROCK IN PLACE, WHETHER SUCH MINERALS ARE FOUND SEPARATELY OR IN COMBINATION WITH EACH OTHER UNDER THAT PART OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL MINERAL CLAIM" LYING WITHIN THE LIMITS OF PART FORMER D.L. 2001 AND PART FORMER PARCELL 1 (RP4878) OF D.L. 2001; LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PART FORMER PARCEL 1 (RP4878) OF D.L. 2001, PART FORMER D.L. 2001 AND PART FORMER D.L. 7034;
 (B) ALL GOLD AND SILVER WHICH MAY BE FOUND IN VEINS LODES OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM AND LOT 4022 KNOWN AS "NO. 74 FRACTIONAL" MINERAL CLAIM LYING WITHIN THE LIMITS OF PART FORMER PARCEL 1 (RP 4878) OF D.L. 1583
 (C) ALL GOLDE AND SILVER WHICH MAY BE FOUND IN VEINS LODES OR ROCK IN PLACE UNDER THOSE PORTIONS OF LOT 2925 KNOWN AS "NO. 71" MINERAL CLAIM, LOT 2926 KNOWN AS "NO 72" MINERAL CLAIM; LOT 3717 KNOWN AS "NO 48" MINERAL CLAIM; LOT 3942 KNOWN AS "NO 73" MINERAL CLAIM; LOT 4009 KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM; LOT 4022 KNOWN AS "NO 74" FRACTIONAL MINERAL CLAIM; ALL LYING WITHIN THE LIMITS OF PART FORMER D.L. 1583
 INTER ALIA
 TRANSFER OF G85006
 REC'D 29/10/1984 @ 12:58

STATUTORY RIGHT OF WAY

R133935 1987-12-23 14:48
 REGISTERED OWNER OF CHARGE:
 SQUAMISH - LILLOOET REGIONAL DISTRICT
 R133935
 REMARKS: INTER ALIA
 PART PLAN 18940
 ANCILLARY RIGHTS

MORTGAGE

CA2171157 2011-08-31 12:55
 REGISTERED OWNER OF CHARGE:
 YI LUEN DEVELOPMENTS AND HOLDINGS LTD.
 INCORPORATION NO. BC0771108
 CA2171157
 REMARKS: INTER ALIA

"CAUTION - CHARGES MAY NOT APPEAR IN ORDER OF PRIORITY. SEE SECTION 28, L.T.A."

DUPLICATE INDEFEASIBLE TITLE: NONE OUTSTANDING

TRANSFERS: NONE

PENDING APPLICATIONS: NONE

Date: 18-Jun-2012 TITLE SEARCH PRINT
 Requestor: (PD45881) WEST COAST TITLE SEARCH LTD.
 Folio: TITLE - BB1341964

Time: 16:54:42
 Page 003 of 003

CORRECTIONS: NONE

DRAFT



Title No. N 46357-L
From Title No. G 80000-L

LAND TITLE ACT
(FORM 21, Section 173(1))

CERTIFICATE OF INDEFEASIBLE TITLE

Land Title Office, VANCOUVER, British Columbia

The undermentioned owner in fee-simple is indefeasibly entitled to an estate in fee-simple, subject to such charges, liens, and interests as are notified by endorsement on this certificate and subject to the conditions, exceptions, and reservations set out on the back hereof, to the land in British Columbia described below.

Registered owner in fee-simple: (Application for registration received on 14/6/85).

MAKIN PULP AND PAPER LTD.
(Registration No. A22386)
103 - 133 West 15th Street
North Vancouver, B.C.
V7M 1R8

Description of land:
Vancouver Assessment District
District Lot 7034

CONVERTED
SECTION 172(3)

CHARGES, LIENS, AND INTERESTS*

Nature of Charge, Number, Date and Time of Application	Registered Owner of Charge	Remarks
U N 46371 14/6/85 11:49	Makin Pulp and Paper Ltd. (Registration No. A22386)	All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes or rock in place, whether such minerals are found separately or in combination with each other under that part of Lot 4022 known as "No. 74 Fractional" Mineral Claim lying within the limits of District Lot 7034, transferred from G 85006 inter alia

Signed and sealed by me, this 21st day of June 1985.

JB/idp/MM

Registrar

DUPLICATE CERTIFICATE OF TITLE

Date Issued	Name and Address of Person to Whom Delivered	Filing Reference of Request for Duplicate Certificate of Title	Date of Cancellation of Duplicate Certificate of Title
Title Cancelled and Interest Disposed of as Follows		Date	Signature of Registrar



LAND REGISTRY ACT
(FORM F, SECTION 143)

Title No. G 80000-L

Register Vol. _____

From Title No. G 79909-L

CERTIFICATE OF INDEFEASIBLE TITLE

Land Registry Office, VANCOUVER, British Columbia.

This is to certify that the undermentioned registered owner in fee-simple is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon, and subject to the conditions, exceptions, and reservations set out hereon, to the land situated in the Province of British Columbia, and more particularly described below.

Registered owner in fee-simple: Application for registration received 29/10/79

DOME PETROLEUM LIMITED
(Registration No. 3788A)
540 - 645 Fort Street
Victoria, B.C.

Description of land: (See back hereof for transfers (if any) of the land or a part thereof).

Vancouver Assessment District
District Lot 7034

Cancelled
12/6/85
N 46357L

CHARGES, LIENS, AND INTERESTS*

Nature of Charge, Number, Date and Time of Application	Registered Owner of Charge	Remarks
U G 85006 29/10/79 @ 12:58	Dome Petroleum Limited (Registration No. 3788A)	All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in combination with each other, under that part of Lot 4022 known as No. 74 Fractional Mineral Claim lying within the limits of District Lot 7034, transferred from G 79924, inter alia Certificate of Charge 36570 issued 29/10/79 TRANSFERRED TO N 46371 <i>12/6/85</i>

In witness whereof I have hereunto set my hand and the seal of my office aforesaid, this 31st day of January, 1980.

D.H. Stunk

Registrar.

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column. See back hereof for abbreviations, etc.



LAND REGISTRY ACT
(FORM F, SECTION 143)

Title No. G 79909-L

Register Vol. _____

From Title No. F 45610-L

CERTIFICATE OF INDEFEASIBLE TITLE

Land Registry Office, VANCOUVER, British Columbia.

This is to certify that the undermentioned registered owner in fee-simple is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon, and subject to the conditions, exceptions, and reservations set out hereon, to the land situated in the Province of British Columbia, and more particularly described below.

Registered owner in fee-simple: Application for registration received 29/10/79

COPPER BEACH ESTATES LTD.
(Incorporation No. 188389)
1600 - 595 Burrard Street

CANCELLED 29/10/79, G 80000-L

Description of land: (See back hereof for transfers (if any) of the land or a part thereof).

Vancouver Assessment District
District Lot 7034

CHARGES, LIENS, AND INTERESTS*

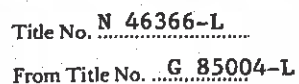
Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
U G 79924 29/10/79 @ 12:38	Copper Beach Estates Ltd. (Incorporation No. 188389)	All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in combination with each other, under that part of Lot 4022 known as No. 74 Fractional Mineral Claim lying within the limits of District Lot 7034, transferred from F 45882 see G 79906-L; inter alia Certificate of Charge 36569 issued 29/10/79

In witness whereof I have hereunto set my hand and the seal of my office aforesaid, this 31st day of January, 1980

[Signature]

Registrar.

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column. See back hereof for abbreviations, etc.



CERTIFICATE OF INDEFEASIBLE TITLE

Land Title Office, VANCOUVER, British Columbia

The undermentioned owner in fee-simple is indefeasibly entitled to an estate in fee-simple, subject to such charges, liens, and interests as are notified by endorsement on this certificate and subject to the conditions, exceptions, and reservations set out on the back hereof, to the land in British Columbia described below.

Registered owner in fee-simple: (Application for registration received on 14/6/85).

MAKIN PULP AND PAPER LTD.
(Registration No. A22386)
103 - 133 West 15th Street
North Vancouver, B.C.
V7M 1R8

CONVERTED
SECTION 172(3)

Description of land:
Vancouver Assessment District
Parcel 1 (Reference Plan 4878) of
District Lot 2001

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
U N 46371 14/6/85 11:49	Makin Pulp and Paper Ltd. (Registration No. 22386)	All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes or rock in place, whether such minerals are found separately or in combination with each other under those portions of Lot 4009 known as "Maple Fractional" Mineral Claim and Lot 4022 known as "No. 74 Fractional" Mineral Claim lying within the limits of Parcel 1 inter alia transferred from G 85006

Signed and sealed by me, this 21st day of June, 1985
JB/idp/MM

Assistant Deputy Registrar

DUPLICATE CERTIFICATE OF TITLE

Date Issued	Name and Address of Person to Whom Delivered	Filing Reference of Request for Duplicate Certificate of Title	Date of Cancellation of Duplicate Certificate of Title

Title Cancelled and Interests Disposed of as Follows	Date	Signature of Registrar



LAND REGISTRY ACT
(FORM F, SECTION 143)

Title No. G 85004-L

Register Vol. _____

From Title No. G 79922-L

CERTIFICATE OF INDEFEASIBLE TITLE

Land Registry Office, VANCOUVER, British Columbia.

This is to certify that the undermentioned registered owner in fee-simple is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon, and subject to the conditions, exceptions, and reservations set out hereon, to the land situated in the Province of British Columbia, and more particularly described below.

Registered owner in fee-simple: Application for registration received 29/10/79

DOME PETROLEUM LIMITED
(Registration No. 3788A)
540 - 645 Fort Street
Victoria, B.C.

Description of land: (See back hereof for transfers (if any) of the land or a part thereof).

Vancouver Assessment District

<u>FIRST:</u>	Parcel	1 (Reference Plan 4878) of
	District Lot	2001
<u>SECONDLY:</u>	Parcel	1 (Reference Plan 4878) of
	District Lot	1583

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
U G 85006 29/10/79 @ 12:58	Dome Petroleum Limited (Registration No. 3788A)	All gold and silver which may be found in veins, or lodes, or rock in place under those parts of Lot 4009 known as Maple Fractional Mineral Claim and Lot 4022 known as No. 74 Fractional Mineral Claim lying within the limits of Lot 1 (Reference Plan 4878) of District Lot 1583 (Continued on Page 2)

In witness whereof I have hereunto set my hand and the seal of my office aforesaid, this 31st day of January, 1980

Registrar.

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column. See back hereof for abbreviations, etc.

This certificate of indefeasible title is void as against the title of any person adversely in actual possession of and rightly entitled to the land included in same at the time of the application upon which this certificate was granted, and who continues in possession, and is subject to

- (a) the subsisting exceptions or reservations contained in the original grant from the Crown;
- (b) any Dominion or Provincial tax, rate, or assessment at the date of the application for registration imposed or made a lien or which may thereafter be imposed or made a lien on the land;
- (c) any municipal charge, rate, or assessment at the date of the application for registration imposed or which may thereafter be imposed on the land, or which had theretofore been imposed for local improvements or otherwise and which was not then due and payable, including any charge, rate, or assessment imposed by any public corporate body having taxing powers over an area in which the land is situate;
- (d) any lease, or agreement for lease, for a period not exceeding three years, where there is actual occupation under the same;
- (e) any public highway or right-of-way, watercourse or right of water, or other public easement;
- (f) any right of expropriation by Statute;
- (g) any *lis pendens* or mechanics' lien, judgment, caveat, or other charge, or any assignment for the benefit of creditors or receiving order or assignment under the *Bankruptcy Act*, registered since the date of the application for registration;
- (h) any condition, exception, reservation, charge, lien, or interest noted or endorsed hereon;
- (i) the right of any person to show that the whole or any portion of the land is by wrong description of boundaries or parcels improperly included in this certificate;
- (j) the right of any person to show fraud, wherein the registered owner or wherein the person from or through whom the registered owner derived his right or title otherwise than bona fide for value has participated in any degree;
- (k) any restrictive condition, right of reverter, or obligation imposed on the land by the *Forest Act* when noted and endorsed hereon.

THIS CERTIFICATE MAY BE AFFECTED BY THE LAND ACT AMENDMENT ACT, 1961 (see S.B.C. 1970, Chapter 17).

The following parcels have been transferred:—

Land	To Certificate No.
PCL 1, D.C. 2001	N 46366L

ABBREVIATIONS:

CML=Claim of mechanics' lien.

CVT=Caveat.

E =Easement.

J =Judgment.

L =Lease.

LP =Lis pendens.

M =Mortgage.

OP =Option to purchase.

RC =Restrictive covenant.

RFR=Right of first refusal.

RP =Right to purchase.

RW =Right-of-way.

SRP=Sub-right to purchase.

TSN=Tax Sale Notice.

U =Undersurface rights.

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
		Secondly: All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in combination with each other, under those parts of Lot 4009 known as Maple Fractional Mineral Claim and Lot 4022 known as No. 74 Fractional Mineral Claim lying within the limits of Lot 1 (Reference Plan 4878) of District Lot 2001 inter alia Certificate of Charge 36570 issued 29/10/79 transferred from G 79924 TRANSFERRED TO N46371 14/6/85

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column.



LAND REGISTRY ACT
(FORM F, SECTION 143)

Title No. G 79922-L

Register Vol. _____

From Title No. F 45623-L

CERTIFICATE OF INDEFEASIBLE TITLE

Land Registry Office, VANCOUVER, British Columbia.

~~This is to certify~~ that the undermentioned registered owner in fee-simple is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon, and subject to the conditions, exceptions, and reservations set out hereon, to the land situated in the Province of British Columbia, and more particularly described below.

Registered owner in fee-simple: Application for registration received 29/10/79

COPPER BEACH ESTATES LTD.
(Incorporation No. 188389)
1600 - 595 Burrard Street

CANCELLED 29/10/79, G 85004-L

Description of land: (See back hereof for transfers (if any) of the land or a part thereof).

Vancouver Assessment District

FIRST: Parcel 1 (Reference Plan 4878) of
District Lot 2001
SECONDLY: Parcel 1 (Reference Plan 4878) of
District Lot 1583

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
U G 79924 29/10/79 e 12:38	Copper Beach Estates Ltd. (Incorporation No. 188389)	All gold and silver which may be found in veins, or lodes, or rock in place under those parts of Lot 4009 known as Maple Fractional Mineral Claim and Lot 4022 known as No. 74 Fractional Mineral Claim lying within the limits of Lot 1 (Reference Plan 4878) of District Lot 1583 (Continued on Page 2)

In witness whereof I have hereunto set my hand and the seal of my office aforesaid, this 31st day of January, 1980

Registrar.

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column. See back hereof for abbreviations, etc.

CHARGES, LIENS, AND INTERESTS*

Nature of Charge: Number: Date and Time of Application	Registered Owner of Charge	Remarks
		Secondly:
		All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in combination with each other, under
		those parts of Lot
		4009 known as
		Maple Fractional
		Mineral Claim and
		Lot 4022 known as
		No. 74 Fractional
		Mineral Claim lying
		within the limits
		of Lot 1
		(Reference Plan 4878)
		of District Lot 2001
		inter alia
		Certificate of Charge
		36569 issued 29/10/79
		transferred from
		F 45882 see G 79906-L

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column.



Title No. N 46367-L

From Title No. G 85004-L

LAND TITLE ACT
(FORM 21, Section 173(1))

CERTIFICATE OF INDEFEASIBLE TITLE

Land Title Office, VANCOUVER, British Columbia

The undermentioned owner in fee-simple is indefeasibly entitled to an estate in fee-simple, subject to such charges, liens, and interests as are notified by endorsement on this certificate and subject to the conditions, exceptions, and reservations set out on the back hereof, to the land in British Columbia described below.

Registered owner in fee-simple: (Application for registration received on 14/6/85).

MAKIN PULP AND PAPER LTD.
(Registration No. A22386)
103 - 133 West 15th Street
North Vancouver, B.C.
V7M 1R8

CONVERTED
SECTION 172(3)

Description of land:
Vancouver Assessment District
Parcel 1 (Reference Plan 4878) of
District Lot 1583

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
U N 46371 14/6/85 11:49	Makin Pulp and Paper Ltd. (Registration No. A22386)	all gold and silver which may be found in veins, or lodes, or rock in place under those portions of Lot 4009 known as "Maple Fractional" Mineral Claim and Lot 4022 known as "No. 74 Fractional" Mineral Claim lying within the limits of Parcel 1; inter alia transferred from G 85006

Signed and sealed by me, this 21st day of June 1985.

JB/ldp/MM

Registrar

DUPLICATE CERTIFICATE OF TITLE

Date Issued	Name and Address of Person to Whom Delivered	Filing Reference of Request for Duplicate Certificate of Title	Date of Cancellation of Duplicate Certificate of Title
Title Cancelled and Interests Disposed of as Follows		Date	Signature of Registrar

2



Title No. H 301-1
From Title No. G 85003-1

LAND TITLE ACT
(FORM 21, Section 173(1))
(Section 193)
CERTIFICATE OF INDEFEASIBLE TITLE

Land Title Office, VANCOUVER, British Columbia

The undermentioned owner in fee-simple is indefeasibly entitled to an estate in fee-simple, subject to such charges, liens, and interests as are notified by endorsement on this certificate and subject to the conditions, exceptions, and reservations set out on the back hereof, to the land in British Columbia described below.

Registered owner in fee-simple: (Application for registration received on 2/1/85)

DOME PETROLEUM LIMITED
(Registration No. 5788A)
540 - 643 Fort Street
Victoria, B.C.

Description of land:
Vancouver Assessment District
District Lot 2001, except portions in Reference Plans 4390 and 4878 and Plan 20309

- Hereto is annexed Restrictive Covenant H 4823 over:
- a) District Lots 1296 and 1632, except portions in Reference Plan 4335
 - b) District Lots 1661 and 1666
 - c) District Lot 2010, except portions in Reference Plans 4335 and 6684
 - d) District Lots 1626, 1659 and 1698, except portions in Reference Plan 4335
 - e) District Lot 1660
 - f) District Lot 4145, except portions in District Lots 1661 and 1666
 - g) District Lot 4149
 - h) District Lots 2922, 2924, 3727, 4007 and 4144

CHARGES, LIENS, AND INTERESTS

Nature of Charge, Number of Charge, and Date of Application	Amount of Charge	Remarks
(Continued on Page 2)		

Signed and sealed by me, this 7th day of January, 1985.

JB/ab/MW

DUPLICATE CERTIFICATE OF TITLE

[Signature]
Assistant Deputy Registrar

Date Issued	Name and Address of Person to Whom Issued	Being Duplicate of Request for Duplicate Certificate of Title	Date of Cancellation of Duplicate Certificate
Title Cancelled and Interest Expired		Date	Signature of Registrar
<i>[Signature]</i>		<i>[Signature]</i>	<i>[Signature]</i>

CHARGES, LINES, AND INTERESTS¹

DRAFT

6-112 (2001)



LAND REGISTRY ACT
(FORM F, SECTION 143)

Title No. G 85003-L

Register Vol. _____

From Title No. G 79921-L

CERTIFICATE OF INDEFEASIBLE TITLE

Land Registry Office, VANCOUVER, British Columbia.

This is to certify that the undermentioned registered owner in fee-simple is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon, and subject to the conditions, exceptions, and reservations set out hereon, to the land situated in the Province of British Columbia, and more particularly described below.

Registered owner in fee-simple: Application for registration received 29/10/79

DOMESTIC PETROLEUM LIMITED
(Registration No. 3788A)
540 - 645 Fort Street
Victoria, B.C.

Description of land: (See back hereof for transfers (if any) of the land or a part thereof).

Vancouver Assessment District

FIRST: District Lots

1583 and 2001, except those portions of each District Lot included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878)

SECONDLY: District Lot 2617

To First is annexed Restrictive Covenant H 4828 see schedule annexed hereto

RE PARAGRAPHS (e) & (f) OF
SECTION 23(1) LAND TITLES

ACT SEE DF. N4547 DATE 22/1/85

AS TO DL. 2001 ONLY

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
RW 324477-M 8/3/61 @ 3:36	British Columbia Hydro and Power Authority	over all (but see Reference Plan 5355) inter alia, District Lot 1583 except those portions included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878) and District Lot 2617
(Continued on Page 3)		

In witness whereof I have hereunto set my hand and the seal of my office aforesaid, this 31st day of January, 1980.

Registrar.

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column. See back hereof for abbreviations, etc.

This certificate of indefeasible title is void as against the title of any person adversely in actual possession of and rightly entitled to the land included in same at the time of the application upon which this certificate was granted, and who continues in possession, and is subject to

- (a) the subsisting exceptions or reservations contained in the original grant from the Crown;
- (b) any Dominion or Provincial tax, rate, or assessment at the date of the application for registration imposed or made a lien or which may thereafter be imposed or made a lien on the land;
- (c) any municipal charge, rate, or assessment at the date of the application for registration imposed or which may thereafter be imposed on the land, or which had theretofore been imposed for local improvements or otherwise and which was not then due and payable, including any charge, rate, or assessment imposed by any public corporate body having taxing powers over an area in which the land is situate;
- (d) any lease, or agreement for lease, for a period not exceeding three years, where there is actual occupation under the same;
- (e) any public highway or right-of-way, watercourse or right of water, or other public easement;
- (f) any right of expropriation by Statute;
- (g) any *lis pendens* or mechanics' lien, judgment, caveat, or other charge, or any assignment for the benefit of creditors or receiving order or assignment under the *Bankruptcy Act*, registered since the date of the application for registration;
- (h) any condition, exception, reservation, charge, lien, or interest noted or endorsed hereon;
- (i) the right of any person to show that the whole or any portion of the land is by wrong description of boundaries or parcels improperly included in this certificate;
- (j) the right of any person to show fraud, wherein the registered owner or wherein the person from or through whom the registered owner derived his right or title otherwise than bona fide for value has participated in any degree;
- (k) any restrictive condition, right of reverter, or obligation imposed on the land by the *Forest Act* when noted and endorsed hereon.

THIS CERTIFICATE MAY BE AFFECTED BY THE LAND ACT AMENDMENT ACT, 1961 (see S.B.C. 1970, Chapter 17).

The following parcels have been transferred:—

Land	To Certificate No.
PART OF DL 2001 IN PLAN 20309	M 94304L
REM DL 2001	N 301-L
DL 1583	N 302L

ABBREVIATIONS:

CML=Claim of mechanics' lien.
CVT=Caveat.
E =Easement.
J =Judgment.
L =Lease.

LP =Lis pendens.
M =Mortgage.
OP =Option to purchase.
RC =Restrictive covenant.
RFR=Right of first refusal.

RP =Right to purchase.
RW =Right-of-way.
SRP=Sub-right to purchase.
TSN=Tax Sale Notice.
U =Undersurface rights.

- | | | |
|-----|---------------|--|
| (a) | District Lots | 1296 and 1632, except those portions included in Reference Plan 4335 |
| (b) | District Lots | 1661 and 1666 |
| (c) | District Lot | 2018, except those portions included in Reference Plans 4335 and 6684 |
| (d) | District Lots | 1626, 1659 and 1898, except those portions included in Reference Plan 4335 |
| (e) | District Lot | 1660 |
| (f) | District Lot | 4145, except portions included in District Lots 1661 and 1666 |
| (g) | District Lot | 4149 |
| (h) | District Lots | 2922, 2924, 3727, 4007 and 4144 |

DRAFT

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
U G 85006 29/10/79 @ 12:58	Dome Petroleum Limited (Registration No. 3788A)	First: All gold and silver which may be found in veins, or lodes, or rock in place under those portions of Lot 2925 known as No. 71 Mineral Claim Lot 2926 known as No. 72 Mineral Claim Lot 3717 known as No. 48 Mineral Claim Lot 3942 known as No. 73 Mineral Claim Lot 4009 known as Maple Fractional Mineral Claim Lot 4022 known as No. 74 Fractional Mineral Claim, all lying within the limits of District Lot 1583. and Secondly: All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in combination with each other, under those portions of Lot 3942 known as No. 73 Mineral Claim lying within the limits of District Lot 2617, Lot 4009 known as Maple Fractional Mineral Claim and Lot 4022 known as No. 74 Fractional Mineral Claim lying within the limits of District Lot 2001; inter alia Certificate of Charge 36570 issued 29/10/79 transferred from G 79924

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column.



Title No. N 46369-L

From Title No. N 302-L

LAND TITLE ACT
(FORM 21, Section 173(1))

CERTIFICATE OF INDEFEASIBLE TITLE

Land Title Office, VANCOUVER, British Columbia

The undermentioned owner in fee-simple is indefeasibly entitled to an estate in fee-simple, subject to such charges, liens, and interests as are notified by endorsement on this certificate and subject to the conditions, exceptions, and reservations set out on the back hereof, to the land in British Columbia described below.

Registered owner in fee-simple: (Application for registration received on 14/6/85).

MAKIN PULP AND PAPER LTD.
(Registration No. A22386)
103 - 133 West 15th Street
North Vancouver, B.C.
V7M 1R8

CONVERTED
SECTION 172(3)

Description of land:

Vancouver Assessment District

District Lot 1583, except portions in Reference Plans 4390 and 4878

Hereto is annexed Restrictive Covenant H 4828 over:

- (a) District Lots 1296 and 1632 except portions in Reference Plan 4335
- (b) District Lots 1661 and 1666
- (c) District Lot 2018, except portions in Reference Plans 4335 and 6684
- (d) District Lots 1626, 1659 and 1898, except portions in Reference Plan 4335
- (e) District Lot 1660
- (f) District Lot 4145, except portions in District Lots 1661 and 1666
- (g) District Lot 4149
- (h) District Lots 2922, 2924, 3727, 4007 and 4144

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
SW 324477-M 8/3/61 3:36	British Columbia Hydro and Power Authority	part in Reference Plan 5355, with ancillary rights over the remainder inter alia
(Continued on Page 2)		

Signed and sealed by me, this 21st day of June 19 85

JB/idp/MM

Registrar

DUPLICATE CERTIFICATE OF TITLE

Date Issued	Name and Address of Person to Whom Delivered	Filing Reference of Duplicate Certificate of Title	Date of Cancellation of Duplicate Certificate of Title
Title Cancelled and Interest Disposed of as Follows		Date	Signature of Registrar

CHARGES, LIENS, AND INTERESTS*[illegible]

*Each endorsement affects all the land described, unless otherwise indicated in "Remarks" column.

Date: 18-Jun-2012 TITLE SEARCH PRINT Time: 16:54:03
Requestor: (PD45881) WEST COAST TITLE SEARCH LTD. Page 001 of 003
Folio: TITLE - BB1341972

VANCOUVER LAND TITLE OFFICE TITLE NO: BB1341972
FROM TITLE NO: BB81817

APPLICATION FOR REGISTRATION RECEIVED ON: 31 AUGUST, 2011
ENTERED: 08 SEPTEMBER, 2011

REGISTERED OWNER IN FEE SIMPLE:
TAICHENG DEVELOPMENT CORP., INC.NO. 0864299
1182 EYREMOUNT DRIVE
WEST VANCOUVER, BC
V7S 2C5

TAXATION AUTHORITY:
NORTH SHORE - SQUAMISH VALLEY ASSESSMENT AREA

DESCRIPTION OF LAND:
PARCEL IDENTIFIER: 010-026-151
DISTRICT LOT 1583 GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT: FIRSTLY; PART
IN REFERENCE PLAN 4390, SECONDLY; PART IN REFERENCE PLAN 4878, THIRDLY;
PART ON PLAN 21576, FOURTHLY; PART SHOWN AS 8.31 ACRES ON HIGHWAY PLAN 76
FIFTHLY; PART SHOWN AS 0.08 ACRES ON HIGHWAY PLAN 76, SIXTHLY: PPORTION ON
PLAN BCP29232

LEGAL NOTATIONS:

HERETO IS ANNEXED RESTRICTIVE COVENANT H4828 OVER:
(A) DISTRICT LOTS 1296 AND 1632 EXCEPT PORTIONS IN REFERENCE PLAN 4335
(B) DISTRICT LOTS 1661 AND 1666
(C) DISTRICT LOT 2018, EXCEPT PORTIONS IN REFERENCE PLANS 4335 AND 6684
(D) DISTRICT LOTS 1626, 1659 AND 1898 EXCEPT PORTIONS IN REFERENCE PLAN 4335
(E) DISTRICT LOT 1660
(F) DISTRICT LOT 4145, EXCEPT PORTIONS IN DISTRICT LOTS 1661 AND 1666
(G) DISTRICT LOT 4149
(H) DISTRICT LOTS 2922, 2924, 4007 AND 4144

CHARGES, LIENS AND INTERESTS:

NATURE OF CHARGE			
CHARGE NUMBER	DATE	TIME	

RIGHT OF WAY
324477M 1961-03-08 15:36

REGISTERED OWNER OF CHARGE:
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
324477M

REMARKS: PART IN REFERENCE PLAN 5355, WITH ANCILLARY
RIGHTS OVER THE REMAINDER
INTER ALIA

COVENANT
R133930 1987-12-23 14:46

REGISTERED OWNER OF CHARGE:
Date: 18-Jun-2012 TITLE SEARCH PRINT Time: 16:54:03

Requestor: (PD45881) WEST COAST TITLE SEARCH LTD. Page 002 of 003
Folio: TITLE - BB1341972

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
R133930
REMARKS: SEC 215 LTA
INTER ALIA

COVENANT

R133932 1987-12-23 14:47
REGISTERED OWNER OF CHARGE:
HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
R133932
REMARKS: SEC 215 LTA
INTER ALIA

COVENANT

R133933 1987-12-23 14:48
REGISTERED OWNER OF CHARGE:
HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
R133933
REMARKS: SEC 215 LTA
INTER ALIA

COVENANT

R133934 1987-12-23 14:48
REGISTERED OWNER OF CHARGE:
HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA
R133934
REMARKS: SEC 215 LTA
INTER ALIA

STATUTORY RIGHT OF WAY

R133935 1987-12-23 14:48
REGISTERED OWNER OF CHARGE:
SQUANISH - LILLOOET REGIONAL DISTRICT
R133935
REMARKS: INTER ALIA
PART PLAN 18940
ANCILLARY RIGHTS

UNDERSURFACE RIGHTS

R133949 1987-12-23 14:50
REGISTERED OWNER OF CHARGE:
BRITANNIA BEACH HOLDINGS LTD.
(INC NO 301803)
R133949
REMARKS: TRANSFER OF G85006 RC'D.29.10.84 @12:58 SEE N46371
FIRST: ALL GOLD AND SILVER WHICH MAY BE FOUND IN
VEINS, LODES, OR ROCK IN PLACE UNDER THOSE
PORTIONS OF LOT 2925 KNOWN AS "NO. 71" MINERAL
CLAIM, LOT 2926 KNOWN AS "NO. 72" MINERAL CLAIM
LOT 3717 KNOWN AS "NO. 48" MINERAL CLAIM;
LOT 3942 KNOWN AS "NO. 73" MINERAL CLAIM; LOT 4009
KNOWN AS "MAPLE FRACTIONAL" MINERAL CLAIM;
LOT 4022 KNOWN AS "NO. 74 FRACTIONAL MINERAL
CLAIM" ALL LYING WITHIN THE LIMITS OF DISTRICT
LOT 1583; INTER ALIA

Date: 18-Jun-2012 TITLE SEARCH PRINT Time: 16:54:03
Requestor: (PD45881) WEST COAST TITLE SEARCH LTD. Page 003 of 003
Folio: TITLE - BB1341972

MORTGAGE

CA2171157 2011-08-31 12:55

REGISTERED OWNER OF CHARGE:

YI LUEN DEVELOPMENTS AND HOLDINGS LTD.

INCORPORATION NO. BC0771108

CA2171157

REMARKS: INTER ALIA

"CAUTION - CHARGES MAY NOT APPEAR IN ORDER OF PRIORITY. SEE SECTION 28, L.T.A."

DUPLICATE INDEFEASIBLE TITLE: NONE OUTSTANDING

TRANSFERS: NONE

PENDING APPLICATIONS: NONE

CORRECTIONS: NONE

DRAFT



Title No. N 46369-L

From Title No. N 302-L

LAND TITLE ACT
(FORM 21, Section 173(1))

CERTIFICATE OF INDEFEASIBLE TITLE

Land Title Office, VANCOUVER, British Columbia

The undermentioned owner in fee-simple is indefeasibly entitled to an estate in fee-simple, subject to such charges, liens, and interests as are notified by endorsement on this certificate and subject to the conditions, exceptions, and reservations set out on the back hereof, to the land in British Columbia described below.

Registered owner in fee-simple: (Application for registration received on 14/6/85).

MAKIN PULP AND PAPER LTD.
Registration No. A22386)
103 - 133 West 15th Street
North Vancouver, B.C.
V7M 1R8

CONVERTE
SECTION 172(3)

Description of land:

Vancouver Assessment District

District Lot 1583, except portions in Reference Plans 4390 and 4878

Hereto is annexed Restrictive Covenant H 4828 over:

- (a) District Lots 1296 and 1632 except portions in Reference Plan 4335
- (b) District Lots 1661 and 1666
- (c) District Lot 2018, except portions in Reference Plans 4335 and 6684
- (d) District Lots 1626, 1659 and 1898, except portions in Reference Plan 4335
- (e) District Lot 1660
- (f) District Lot 4145, except portions in District Lots 1661 and 1666
- (g) District Lot 4149
- (h) District Lots 2922, 2924, 3727, 4007 and 4144

CHARGES, LIENS, AND INTERESTS*

Nature of Charge: Number: Date and Time of Application	Registered Owner of Charge	Remarks
RW 324477-M 8/3/61 3:36	British Columbia Hydro and Power Authority	part in Reference Plan 5355, with ancillary rights over the remainder inter alia
(Continued on Page 2)		

Signed and sealed by me, this 21st day of June 1985

JB/ldp/MM

Registrar

DUPLICATE CERTIFICATE OF TITLE

Date Issued	Name and Address of Person to Whom Delivered	Filing Reference of Request for Duplicate Certificate of Title	Date of Cancellation of Duplicate Certificate of Title
Title Cancelled and Interest Disposed of as Follows		Date	Signature of Registrar

CHARGES, LIENS, AND INTERESTS*

*Each endorsement affects all the land described, unless otherwise indicated in "Remarks" column.

② fee =

FILM
SECTION 188



Title No. N 302-L-301
From Title No. G 85003-L

LAND TITLE ACT
(FORM 21, Section 173(1))

CERTIFICATE OF INDEFEASIBLE TITLE

Land Title Office, _____, British Columbia

The undermentioned owner in fee-simple is indefeasibly entitled to an estate in fee-simple, subject to such charges, liens, and interests as are notified by endorsement on this certificate and subject to the conditions, exceptions, and reservations set out on the back hereof, to the land in British Columbia described below.

Registered owner in fee-simple: (Application for registration received on 2/1/85).

DOMO PETROLEUM LIMITED
(Registration No. 3788A)
540-645 Fort Street
Victoria, B.C.

Description of land:
Vancouver Assessment District

District Lot 1583700, except portions in Reference Plans 4390 and 4878 ~~and Plan 20289~~

Hereto is annexed Restrictive Covenant H 4828 over:

- a) District Lots 1296 and 1632, except portions in Reference Plan 4335
- b) District Lots 1661 and 1666
- c) District Lot 2018, except portions in Reference Plans 4335 and 6684
- d) District Lots 1626, 1659 and 1898, except portions in Reference Plan 4335
- e) District Lot 1660
- f) District Lot 4145, except portions in District Lots 1661 and 1666
- g) District Lot 4149
- h) District Lots 2922, 2924, 3727, 4007 and 4144

CHARGES, LIENS, AND INTERESTS

Nature of Charge: Number, Date and Time of Application	Registered Owner of Charge	Remarks
① RW 324477-M 8/3/61 3:36	British Columbia Hydro and Power Authority	part in Reference Plan 5355 with ancillary rights over the remainder; inter alia
② <u>TIPIST</u> COPY OFF OF PAGE 2 →		

Signed and sealed by me, this _____ day of _____ 19_____

Registrar

DUPLICATE CERTIFICATE OF TITLE

Date Issued	Name and Address of Person to Whom Delivered	Filing Reference of Request for Duplicate Certificate of Title	Date of Cancellation of Duplicate Certificate of Title
Title Cancelled and Interest Disposed of as Follows		Date	Signature of Registrar

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
② U G 85006 29/10/79 @ 12:58	Dome Petroleum Limited (Registration No. 3788A)	First: All gold and silver which may be found in veins, or lodes, or rock in place under those portions of Lot 2925 known as No. 71 Mineral Claim Lot 2926 known as No. 72 Mineral Claim Lot 3717 known as No. 48 Mineral Claim Lot 3942 known as No. 73 Mineral Claim Lot 4009 known as Maple Fractional Mineral Claim Lot 4022 known as No. 74 Fractional Mineral Claim, all lying within the limits of District Lot 1583; and Secondly: All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in combination with each other, under those portions of Lot 3942 known as No. 73 Mineral Claim lying within the limits of District Lot 2617, Lot 4009 known as Maple Fractional Mineral Claim and Lot 4022 known as No. 74 Fractional Mineral Claim lying within the limits of District Lot 1583, inter alia Certificate of Charge 36570 issued 29/10/79 transferred from G. 79924

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column.



LAND REGISTRY ACT
(FORM F, SECTION 143)

Title No. G 85003-L

Register Vol. _____

From Title No. G 79921-L

CERTIFICATE OF INDEFEASIBLE TITLE

Land Registry Office, VANCOUVER, British Columbia.

This is to certify that the undermentioned registered owner in fee-simple is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon, and subject to the conditions, exceptions, and reservations set out hereon, to the land situated in the Province of British Columbia, and more particularly described below.

Registered owner in fee-simple: Application for registration received 29/10/79

DOME PETROLEUM LIMITED
(Registration No. 3788A)
540 - 645 Fort Street
Victoria, B.C.

Description of land: (See back hereof for transfers (if any) of the land or a part thereof).

Vancouver Assessment District
FIRST: District Lots

1583 and 2001, except those portions of each District Lot included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878) 2617

SECONDLY: District Lot
To First is annexed Restrictive Covenant H 4828 see schedule annexed hereto

RE PARAGRAPHS (a) & (f) OF
SECTION 23(1) LAND TITLES

ACT SEE OF N4547 DATE 20/1/85
AS TO D.L. 2001 ONLY

CHARGES, LIENS, AND INTERESTS*

Nature of Charge, Number, Date and Time of Application	Registered Owner of Charge	Remarks
RW 324477-M 8/3/61 @ 3:36	British Columbia Hydro and Power Authority	over all (but see Reference Plan 5355) inter alia, District Lot 1583 except those portions included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878) and District Lot 2617
(Continued on Page 3)		

In witness whereof I have hereunto set my hand and the seal of my office aforesaid, this 31st day of January, 1980.

[Signature]

Registrar.

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column. See back hereof for abbreviations, etc.

This certificate of indefeasible title is void as against the title of any person adversely in actual possession of and rightly entitled to the land included in same at the time of the application upon which this certificate was granted, and who continues in possession, and is subject to

- (a) the subsisting exceptions or reservations contained in the original grant from the Crown;
- (b) any Dominion or Provincial tax, rate, or assessment at the date of the application for registration imposed or made a lien or which may thereafter be imposed or made a lien on the land;
- (c) any municipal charge, rate, or assessment at the date of the application for registration imposed or which may thereafter be imposed on the land, or which had theretofore been imposed for local improvements or otherwise and which was not then due and payable, including any charge, rate, or assessment imposed by any public corporate body having taxing powers over an area in which the land is situate;
- (d) any lease, or agreement for lease, for a period not exceeding three years, where there is actual occupation under the same;
- (e) any public highway or right-of-way, watercourse or right of water, or other public easement;
- (f) any right of expropriation by Statute;
- (g) any *lis pendens* or mechanics' lien, judgment, caveat, or other charge, or any assignment for the benefit of creditors or receiving order or assignment under the *Bankruptcy Act*, registered since the date of the application for registration;
- (h) any condition, exception, reservation, charge, lien, or interest noted or endorsed hereon;
- (i) the right of any person to show that the whole or any portion of the land is by wrong description of boundaries or parcels improperly included in this certificate;
- (j) the right of any person to show fraud, wherein the registered owner or wherein the person from or through whom the registered owner derived his right or title otherwise than bona fide for value has participated in any degree;
- (k) any restrictive condition, right of reverter, or obligation imposed on the land by the *Forest Act* when noted and endorsed hereon.

THIS CERTIFICATE MAY BE AFFECTED BY THE LAND ACT AMENDMENT ACT, 1961 (see S.B.C. 1970, Chapter 17).

The following parcels have been transferred:—

Land	To Certificate No.
PART OF DL 2001 IN PLAN 20309	M 94304L
REM DL 2001	N 301-L
DL 1583	N 302L

ABBREVIATIONS:

CML=Claim of mechanics' lien.
CVT=Caveat.
E =Easement.
J =Judgment.
L =Lease.

LP =Lis pendens.
M =Mortgage.
OP =Option to purchase.
RC =Restrictive covenant.
RFR=Right of first refusal.

RP =Right to purchase.
RW =Right-of-way.
SRP=Sub-right to purchase.
TSN=Tax Sale Notice.
U =Undersurface rights.

Page (2) of
Indefeasible Fees
No. G 85003-L
(Continued from Page 1)

(a)	District Lots	1296 and 1632, except those portions included in Reference Plan 4335
(b)	District Lots	1661 and 1666
(c)	District Lot	2018, except those portions included in Reference Plans 4335 and 6684
(d)	District Lots	1626, 1659 and 1898, except those portions included in Reference Plan 4335
(e)	District Lot	1660
(f)	District Lot	4145, except portions included in District Lots 1661 and 1666
(g)	District Lot	4149
(h)	District Lots	2922, 2924, 3727, 4007 and 4144

DRAFT



LAND REGISTRY ACT
(FORM F, SECTION 143)

Title No. G 79921-L

Register Vol. _____

From Title No. F 45622-L

CERTIFICATE OF INDEFEASIBLE TITLE

Land Registry Office, VANCOUVER, British Columbia.

This is to certify that the undermentioned registered owner in fee-simple is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon, and subject to the conditions, exceptions, and reservations set out hereon, to the land situated in the Province of British Columbia, and more particularly described below.

Registered owner in fee-simple: Application for registration received 29/10/79

COPPER BEACH ESTATES LTD.
(Incorporation No. 188389)
1600 - 595 Burrard Street

CANCELLED 29/10/79, G 85003-L

Description of land: (See back hereof for transfers (if any) of the land or a part thereof).

Vancouver Assessment District

FIRST: District Lots 1583 and 2001, except those portions of each District Lot included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878

SECONDLY: District Lot 2617

CHARGES, LIENS, AND INTERESTS*

Nature of Charge, Number, Date and Time of Application	Registered Owner of Charge	Remarks
RW 324477-M 8/3/61 @ 3:36	British Columbia Hydro and Power Authority	over all (but see Reference Plan 5355) inter alia, District Lot 1583 except those portions included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878) and District Lot 2617
(Continued on Page 2)		

In witness whereof I have hereunto set my hand and the seal of my office aforesaid, this 31st day of January, 19 80

[Signature]
Registrar.

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column. See back hereof for abbreviations, etc.

This certificate of indefeasible title is void as against the title of any person adversely in actual possession of and rightly entitled to the land included in same at the time of the application upon which this certificate was granted, and who continues in possession, and is subject to

- (a) the subsisting exceptions or reservations contained in the original grant from the Crown;
- (b) any Dominion or Provincial tax, rate, or assessment at the date of the application for registration imposed or made a lien or which may thereafter be imposed or made a lien on the land;
- (c) any municipal charge, rate, or assessment at the date of the application for registration imposed or which may thereafter be imposed on the land, or which had theretofore been imposed for local improvements or otherwise and which was not then due and payable, including any charge, rate, or assessment imposed by any public corporate body having taxing powers over an area in which the land is situate;
- (d) any lease, or agreement for lease, for a period not exceeding three years, where there is actual occupation under the same;
- (e) any public highway or right-of-way, watercourse or right of water, or other public easement;
- (f) any right of expropriation by Statute;
- (g) any *lis pendens* or mechanics' lien, judgment, caveat, or other charge, or any assignment for the benefit of creditors or receiving order or assignment under the *Bankruptcy Act*, registered since the date of the application for registration;
- (h) any condition, exception, reservation, charge, lien, or interest noted or endorsed hereon;
- (i) the right of any person to show that the whole or any portion of the land is by wrong description of boundaries or parcels improperly included in this certificate;
- (j) the right of any person to show fraud, wherein the registered owner or wherein the person from or through whom the registered owner derived his right or title otherwise than bona fide for value has participated in any degree;
- (k) any restrictive condition, right of reverter, or obligation imposed on the land by the *Forest Act* when noted and endorsed hereon.

THIS CERTIFICATE MAY BE AFFECTED BY THE LAND ACT AMENDMENT ACT, 1961 (see S.B.C. 1970, Chapter 17).

The following parcels have been transferred:—

Land	To Certificate No.

ABBREVIATIONS:

CML=Claim of mechanics' lien.

CVT=Caveat

E =Easement.

J =Judgment.

L =Lease.

LP =Lis pendens.

M =Mortgage.

OP =Option to purchase.

RC =Restrictive covenant.

RFR=Right of first refusal.

RP =Right to purchase.

RW =Right-of-way.

SRP=Sub-right to purchase.

TSN=Tax Sale Notice.

U =Undersurface rights.

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
U G 79924 29/10/79 @ 12:38	Copper Beach Estates Ltd. (Incorporation No. 188389)	First: All gold and silver which may be found in veins, or lodes, or rock in place under those portions of Lot 2925 known as No. 71 Mineral Claim Lot 2926 known as No. 72 Mineral Claim Lot 3717 known as No. 48 Mineral Claim Lot 3942 known as No. 73 Mineral Claim Lot 4009 known as Maple Fractional Mineral Claim Lot 4022 known as No. 74 Fractional Mineral Claim, all lying within the limits of District Lot 1583. and Secondly: All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in com- bination with each other, under those portions of Lot 3942 known as No. 73 Mineral Claim lying within the limits of District Lot 2617, Lot 4009 known as Maple Fractional Mineral Claim and Lot 4022 known as No. 74 Fractional Mineral Claim lying within the limits of District Lot 2001; inter alia Certificate of Charge 36569 issued 29/10/79 transferred from F 45882 see G 79906-L

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column.



LAND REGISTRY ACT
(FORM F, SECTION 143)

Title No. F 45622-L
Register Vol. _____
From Title No. 615552-L

CERTIFICATE OF INDEFEASIBLE TITLE

Land Registry Office, VANCOUVER, British Columbia.

~~This is to certify~~ that the undermentioned registered owner in fee-simple is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon, and subject to the conditions, exceptions, and reservations set out hereon, to the land situated in the Province of British Columbia, and more particularly described below.

Registered owner in fee-simple: Application for registration received 5/7/78
85818 CANADA LTD.
(Registration No. 14076A)
2100 - 700 West Georgia Street

conceded
29/10/79
679921 L

Description of land: (See back hereof for transfers (if any) of the land or a part thereof).

Vancouver Assessment District
FIRST: District Lots

1583 and 2001, except those portions of each District Lot included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878)

SECONDLY: District Lot

2617

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
RW 324477-M 8/3/61 @ 3:36	British Columbia Hydro and Power Authority	over all (but see Reference Plan 5355) inter alia District Lot 1583 except those portions included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878) and District Lot 2617
(Continued on Page (2))		

In witness whereof I have hereunto set my hand and the seal of my office aforesaid, this 12th day of October, 19 78

D.H. Smith

Registrar.

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column. See back hereof for abbreviations, etc.

This certificate of indefeasible title is void as against the title of any person adversely in actual possession of and rightly entitled to the land included in same at the time of the application upon which this certificate was granted, and who continues in possession, and is subject to

- (a) the subsisting exceptions or reservations contained in the original grant from the Crown;
- (b) any Dominion or Provincial tax, rate, or assessment at the date of the application for registration imposed or made a lien or which may thereafter be imposed or made a lien on the land;
- (c) any municipal charge, rate, or assessment at the date of the application for registration imposed or which may thereafter be imposed on the land, or which had theretofore been imposed for local improvements or otherwise and which was not then due and payable, including any charge, rate, or assessment imposed by any public corporate body having taxing powers over an area in which the land is situated;
- (d) any lease, or agreement for lease, for a period not exceeding three years, where there is actual occupation under the same;
- (e) any public highway or right-of-way, watercourse or right of water, or other public easement;
- (f) any right of expropriation by Statute;
- (g) any *lis pendens* or mechanics' lien, judgment, caveat, or other charge, or any assignment for the benefit of creditors or receiving order or assignment under the *Bankruptcy Act*, registered since the date of the application for registration;
- (h) any condition, exception, reservation, charge, lien, or interest noted or endorsed hereon;
- (i) the right of any person to show that the whole or any portion of the land is by wrong description of boundaries or parcels improperly included in this certificate;
- (j) the right of any person to show fraud, wherein the registered owner or wherein the person from or through whom the registered owner derived his right or title otherwise than bona fide for value has participated in any degree;
- (k) any restrictive condition, right of reverter, or obligation imposed on the land by the *Forest Act* when noted and endorsed hereon.

THIS CERTIFICATE MAY BE AFFECTED BY THE LAND ACT AMENDMENT ACT, 1961 (see S.B.C. 1970, Chapter 17).

The following parcels have been transferred:—

Land	To Certificate No.

ABBREVIATIONS:

CML=Claim of mechanics' lien.

CVT=Caveat.

E=Easement.

J=Judgment.

L=Lease.

LP=Lis pendens.

M=Mortgage.

OP=Option to purchase.

RC=Restrictive covenant.

RFR=Right of first refusal.

RP=Right to purchase.

RW=Right-of-way.

SRP=Sub-right to purchase.

TSN=Tax Sale Notice.

U=Undersurface rights.

CHARGES, LIENS, AND INTERESTS*

Nature of Charge; Number; Date and Time of Application	Registered Owner of Charge	Remarks
U F 45882 5/7/78 @ 9:20	85818 Canada Ltd. (Registration No. 14076A)	First: All gold and silver which may be found in veins, or lodes, or rock in place under Those portions of Lot 2925 known as No. 71 Mineral Claim Lot 2926 known as No. 72 Mineral Claim Lot 3717 known as No. 48 Mineral Claim Lot 3942 known as No. 73 Mineral Claim Lot 4009 known as Maple Fractional Mineral Claim Lot 4022 known as No. 74 Fractional Mineral Claim, all lying within the limits of District Lot 1583 and Secondly: All minerals, precious and base (save coal and petroleum); which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in combination with each other, under those portions of Lot 3942 known as No. 73 Mineral Claim lying within the limits of District Lot 2617, Lot 4009 known as Maple Fractional Mineral Claim and Lot 4022 known as No. 74 Fractional Mineral Claim lying within the limits of District Lot 2001; inter alia Certificate of Charge 35902 issued 5/7/78 Transferred from 518140-M see F 45624-G

* Each endorsement affects all the land described herein, unless otherwise indicated in "Remarks" column.

No. 61555-2-L

Register, Vol. 3227

LAND REGISTRY ACT
FORM F (Section 143)

Certificate of Indefeasible Title

Date of application for registration, the 4th day of November, 1970.

This is to certify that

ANACONDA AMERICAN BRASS LIMITED

(Registration No. 4542A)

Britannia Beach, B. C.

is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon, and subject to the conditions, exceptions, and reservations set out hereon, to those

piece^s of land situate in the VANCOUVER ASSESSMENT DISTRICT

and Province of British Columbia, and more particularly known and described as:—

FIRST: District Lots 1583 and 2001, except those portions of each

District Lot included in Reference Plan 4390 and

Parcel 1 (Reference Plan 4878)

SECONDLY: District Lot 2617

All of: Group 1, NEW WESTMINSTER DISTRICT

THE FOLLOWING PIECES OF LAND HAVE BEEN TRANSFERRED						CERT. No.
LAND						
						

In witness whereof I have hereunto set my hand and seal of office

at 0 VANCOUVER, British Columbia,

this 15th day of DECEMBER

19 70

DEPUTY Registrar

FOR OTHER ABBREVIATIONS
SEE INDEX

RW - Right of Way

U - Undersurface rights

CHARGES, LIENS, AND INTERESTS

LAND	Nature of Charge	No.	Date of Application	Time	OWNER OF CHARGE	Value or Amount	PARTICULARS, TERM, RATE, ETC.	RELEASED No.	Date	Reg. trar's Signature to Releasee
District Lot 1583 except those portions included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878) and District Lot 2617 (inter alia)	RW	324477-M	8/3/61	3:36	British Columbia Hydro and Power Authority		Reference Plan 5355			
All gold and silver which may be found in veins, or lodes, or rock in place under those portions of Lot 2925 known as No. 71, Mineral Claim, Lot 2926 known as No. 72 Mineral Claim, Lot 3942 known as No. 73 Fractional Mineral Claim, Lot 4022 known as No. 74 Fractional Mineral Claim, Lot 4009 known as Maple Fractional Mineral Claim, and Lot 3717 known as No. 48 Mineral Claim, All lying within the limits of District Lot 1583 except those portions included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878 and	U	518140-M	4/11/70	8:53	Anaconda American Brass Limited (Registration No. 4542A)		Transfer of Undersurface rights 358180-M <i>Transferred to K45882 5/1/78</i>			

DRAFT

All minerals, precious and base (save coal and petroleum), which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in combination with each other, under those portions of Lot 3942 known as No. 73 Fractional Mineral Claim lying within the limits of District Lot 2617, Lot 4022 known as No. 74 Fractional Mineral Claim and Lot 4009 known as Maple Fractional Mineral Claim lying within the limits of District Lot 2001, except those portions included in Reference Plan 4390 and Parcel 1 (Reference Plan 4878) (inter alia) Certificate of Charge 34758

Continued on page 2

A.M. = Mortgage in fee.
 R.P. = Right to purchase.
 R.P. = Right to purchase.
 L.P. = Life purchase.
 L.L. = Lease.
 R.C. = Reversionary interest.

FOR OTHER ADDRESS ATIONS
CALL IN HERE

R.W. - Right of Way
O.L. - Option to Lease
M.C. - Mineral Claim

[illegible]

CHARGES, LIENS, AND INTERESTS (CONTINUED)

FOR OTHER ABBREVIATIONS
FILL IN HERE:

M.C. - Mineral Claim

2M-557-8064

LAND	Name of Charge	No.	Date of Application	Time	OWNER OF CHARGE	Value or Amount	PARTICULARS, TERM, RATE, ETC.	RELEASES No. Date	Registrar's Signature to Release
All minerals, petroleum and base metals and other petroleum, which may be found in veins, lodes, or rock in place, whether such minerals are found separately or in combination with each other, under	M.C. 358181N	18-1-63	10/15		The Anaconda Company (Canada) Ltd.		Transfer of Mineral Claim 283674N		
	(inter alia)								
	(Certificate of Charge 33288)								

Those portions of

- (a) Lot 2894 known as Vananda Copper Mineral Claim lying within the limits of First and District Lot 1897
- (b) Lot 4034 known as Sound Mineral Claim and Lot 4018 known as Sound Fraction Mineral Claim lying within the limits of First and Secondly

part of secondly indicated, 2 48953-4, 3.6.69, 11.02 British Columbia
included in reference Hydro and Power Authority
also 10110

for 40 years from
1/6/68

Hereto is annexed case report
48760-11 appointment to
post of District Lot 892 in district
in reference above 4886

part of records included in reference file 5786 E 489760-4, 3.6.69, 11.04 British Columbia Hydro and Power Authority

appartenant à
Case 489759-14

This Certificate of Indefeasible Title is void as against the title of any person adversely in actual possession of and rightly entitled to the land included in some of the items of the application upon which this Certificate was granted, and who continues in possession, and is subject to:-

- (a) The subsisting exceptions or reservations contained in the original grant from the Crown;
- (b) Any Dominion or Provincial tax, rate, or assessment at the date of the application for registration imposed or made a lien or which may thereafter be imposed or made a lien on the land;
- (c) Any municipal charge, rate, or assessment at the date of the application for registration imposed or which may thereafter be imposed on the land, or which had theretofore been imposed for local improvements or otherwise and which was not then due and payable, including any charge, rate, or assessment imposed by any public corporate body having taxing powers over an area in which the land is situated;
- (d) Any lease, or agreement for lease, for a period not exceeding three years, where there is actual occupation under the same;
- (e) Any public highway or right-of-way, watercourse, or right of water, or other public easement;
- (f) Any right of expropriation by Statute;
- (g) Any lien pendens or mechanics' lien, judgment, caveat, or other charge, or any assignment for the benefit of creditors, or receiving order or authorized assignment under the "Bankruptcy Act," registered since the date of the application for registration;
- (h) Any condition, exception, reservation, charge, lien, or interest noted or endorsed hereon;
- (i) The right of any person to show that the whole or any portion of the land is by wrong description of boundaries or parcels improperly included in this certificate;
- (j) The right of any person to show fraud, wherein the registered owner or wherein the person from or through whom the registered owner derived his right or title otherwise than bona fide for value has participated in any degree;
- (k) Any restrictive condition, right of reverter, or obligation imposed on the land by the "Forest Act" when noted and endorsed thereon.

From Certificate No. 27748-I

28286-I
34196-I
397017-L
27748-I
397022-L
51909-I
34197-I
25470-I
397023-L
231087-L



No. 465684-L

Certificate of Indefeasible Title

Date of application for registration, the 18th day of January at 10:07 a.m., 1953

Register, Vol. 2627

This is to certify that

THE ANACONDA COMPANY (CANADA) LTD.

Room 1403 - 1030 West Georgia Street

is absolutely and indefeasibly entitled in fee-simple, subject to such charges, liens, and interests as are notified by endorsement hereon and on the back of page 2, and subject to the conditions, exceptions, and reservations set out hereon, to those

pieces of land situate in the VANCOUVER ASSESSMENT DISTRICT

and Province of British Columbia, and more particularly known and described as:-

FIRST:

District Lots

Eight Hundred and Ninety-one (891) ✓
Eight Hundred and Ninety-two (892) ✓
Eighteen Hundred and Ninety-seven (1897) ✓
Twenty-two Hundred and Sixty-two (2262)
Twenty-two Hundred and Sixty-three (2263)
Twenty-four Hundred and Eighty-eight (2488)
Twenty-six Hundred and Seventeen (2617)
Twenty-seven Hundred and Thirty-four (2734)
Twenty-eight Hundred and Ninety-one (2891)
Twenty-nine Hundred and Thirty-three (2933)
Thirty-six Hundred and Twenty-three (3623) ✓
Four Thousand and Five (4005)
Four Thousand and Eight (4008)
Four Thousand and Twelve (4012)
Four Thousand and Fifteen (4015)
Four Thousand and Seventeen (4017)

SECONDLY:

District Lot

Eighteen Hundred and Eighty-nine (1889) and the East half (1/2) of District Lot 1981 except from said District Lots such minerals as are registered in Absolute Fees Book Volume 65 - Folio 244 - No. 8746-G

THIRDLY:

FOURTHLY:

District Lot

Parcel One (1) (Reference Plan 4878) District Lot Two Thousand and One (2001) except Parcel One (1) (Reference Plan 4878)

FIFTHLY:

SIXTHLY:

District Lot

Parcel One (1) (Reference Plan 4878) District Lot Fifteen Hundred and Eighty-three (1583)
Fifteen Hundred and Eighty-three (1583) except Parcel One (1) (Reference Plan 4878)

SEVENTHLY:

District Lot

Nineteen Hundred and Seventy (1970) known as "Thistle" Mineral Claim except those portions lying within the boundaries of District Lots Fifteen Hundred and Eighty-three (1583) and Two Thousand and One (2001) and except such mineral as are registered in Absolute Fees Book Volume 65 - Folio 244 - No. 8746-G

EIGHTHLY:

All of:

Group

All that portion coloured red on Plan annexed to Crown Grant deposited with 231087-L of District Lot Four Thousand and Nine (4009) except those parts of said District Lot within the limits of District Lots Fifteen Hundred and Eighty-three (1583) and Two Thousand and One (2001)
One (1)
NEW WESTMINSTER DISTRICT

THE FOLLOWING PIECES OF LAND HAVE BEEN TRANSFERRED:		
LAND	CERT. NO.	
Parcel 1 (Reference Plan 4878)		
OF DISTRICT LOT 1583 AND		
Parcel 1 (Reference Plan 4878)		
LE DISTRICT LOT 2001		
T. THOSE PORTIONS OF D.L.'S		
891, 1583, 1897, 2001 AND		
3623 INCLUDED IN REF. 467002		
PLAN 4390 AND		
P. THAT PART OF D.L. 892		
INCLUDED IN REF. PLAN		
7313		
DISTRICT LOTS 2933, 4005, 4008, 4214 & 5		
AND 4012		
DISTRICT LOT 1889 AND EAST HALF OF		
D.L. 1981 EXCEPT THAT PORTION		
THE S.W. 1/4 THEREOF AS HEREIN		
IN REF. 467002, D.L. 1583 & 4009		
EXCEPT THAT PORTION COLOURED RED		
ON PLAN ANNEXED TO CROWN GRANT		
DEPOSITED WITH 231087-L OF		
DISTRICT LOT 4009 EXCEPT THOSE		
PORTIONS LYING WITHIN THE		
BOUNDARIES OF DISTRICT LOTS		
1583 AND 2001 AND EXCEPT SUCH		
MINERAL AS ARE REGISTERED IN		
ABSOLUTE FEES BOOK VOLUME 65 -		
FOLIO 244 - NO. 8746-G		
ALL THAT PORTION COLOURED RED ON		
PLAN ANNEXED TO CROWN GRANT		
DEPOSITED WITH 231087-L OF		
DISTRICT LOT 4009 EXCEPT THOSE		
PARTS OF SAID DISTRICT LOT		
WITHIN THE LIMITS OF DISTRICT		
LOTS 1583 AND 2001		
ONE (1)		
NEW WESTMINSTER DISTRICT		

THE FOLLOWING PIECES OF LAND
HAVE BEEN TRANSFERRED: CONT'D

OF D.L. 4609 EXCEPT THOSE PORTIONS
LYING WITHIN THE LIMITS OF D.L.'S 1583
AND 2001 2488 471406
DISTRICT LOTS 2262, 2263, 2264, 2265,
4015 AND 4017 471407
DISTRICT LOT 891 EXCEPT THOSE PORTIONS
INCLUDED IN REFERENCE PLAN 4210
DISTRICT LOT 892 EXCEPT THOSE PORTIONS
INCLUDED IN REFERENCE PLAN 1312
DISTRICT LOT 1583 EXCEPT THOSE PORTIONS
INCLUDED IN REFERENCE PLAN 4290 AND IN
PARCEL 1 (REFERENCE PLAN 4519) 471404
DISTRICT LOTS 1891 AND 1892 EXCEPT THOSE
PORTIONS OF EACH OF SAID D.L.'S INCLUDED
IN REFERENCE PLAN 4390
DISTRICT LOT 2001 EXCEPT THOSE PORTIONS
INCLUDED IN REFERENCE PLAN 4340
AND IN PARCEL 1 (REFERENCE PLAN 4815) AND
D.L. 2617

DRAFT

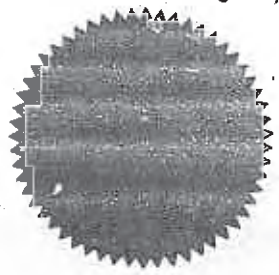
CANCELLED
BY 471407

10
5
63

In witness whereof I have hereunto set my hand and seal of office
at VANCOUVER, British Columbia,
this 18th day of FEBRUARY
19 63

(OVER)

DEPUTY Registrar.



ABBREVIATIONS:
M. = Mortgage in fee.
R.P. = Right to purchase.
S.R.P. = Sub-right to purchase.
L.P. = Lease.
L. = Lease.
R.C. = Restrictive covenant.

CHARGES, LIENS, AND INTERESTS

FOR OTHER ABBREVIATIONS
FILL IN HERE.
R.W. - Right of Way
O.P. - Option to Purchase
O.L. - Option to Lease
1M-537-6064

LAND	Nature of Charge	No.	Date of Application	Time	OWNER OF CHARGE	Value or Amount	PARTICULARS, TERM, RATE, ETC.	RELEASES	Registrar's Signature to Release
District Lots 891, 892, 1897 and 3623	R.W.	140004M	12-6-51	12:24	British Columbia Telephone Company	Rep.	Over 10 foot strip, Plan 3522, with appurtenant rights over the balance	No. Date	
Parcel 1 (Reference Plan 4878) of District Lot 1583, and Parcel 1 (Reference Plan 4878) of District Lot 2001	R.P.	247153M	29-3-57	12:18	Construction Aggregates Ltd.				
Parcel 1 (Reference Plan 4878) of District Lot 1583, and Parcel 1 (Reference Plan 4878) of District Lot 2001 (Assigned to 358179M 18-1-63)	O.P.	247154M	29-3-57	12:22	Britannia Mining and Smelting Co. Limited				
Parcel 1 (Reference Plan 4878) of District Lot 1583, and Parcel 1 (Reference Plan 4878) of District Lot 2001	M.	248685M	28-4-57	11:28	Industrial Development Bank		Mortgage of Right to Purchase 247153M for \$300,000 Interest 6 1/2%		
All except District Lots 2001, 2262, 2263, 2488, 2734, 2891, 4015, and 4017 Parcel 1 (Reference Plan 4878) of District Lot 1583 (inter alia)	R.W.	324477M	8-3-61	3:36	British Columbia Electric Company Limited		Over those parts of District Lots 1889, 2933, 4005, 4008, 4012, 3623, 1897, 2617, 891, 892, East 1/2 of 1981		
							(b) All that part coloured red on Plan annexed to Crown Grant deposited with 231087-L of District Lot 4009 except those parts of said District Lot within the limits of District Lots 1583 and 2001,		
							(c) District Lot 1583 except Parcel 1 (Reference Plan 4878) and District Lot 1970 known as "Thistle" Mineral Claim except those lying within the boundaries of District Lots 1583		
							included in Reference Plan 5535; over those parts of District Lots 1897 and 3623 included in Reference Plan 5486, with subordinate rights over balance of said District Lots		
							As set out in 324477M		
That part of District Lot 891 included in Reference Plan 6628	O.L.	324478M	8-3-61	3:37	British Columbia Electric Company Limited				

DK.
CORRECTED 3/5/63

ALL OF SAID PORTIONS

included in Reference Plan 5535; over those parts of District Lots 1897 and 3623 included in Reference Plan 5486, with subordinate rights over balance of said District Lots

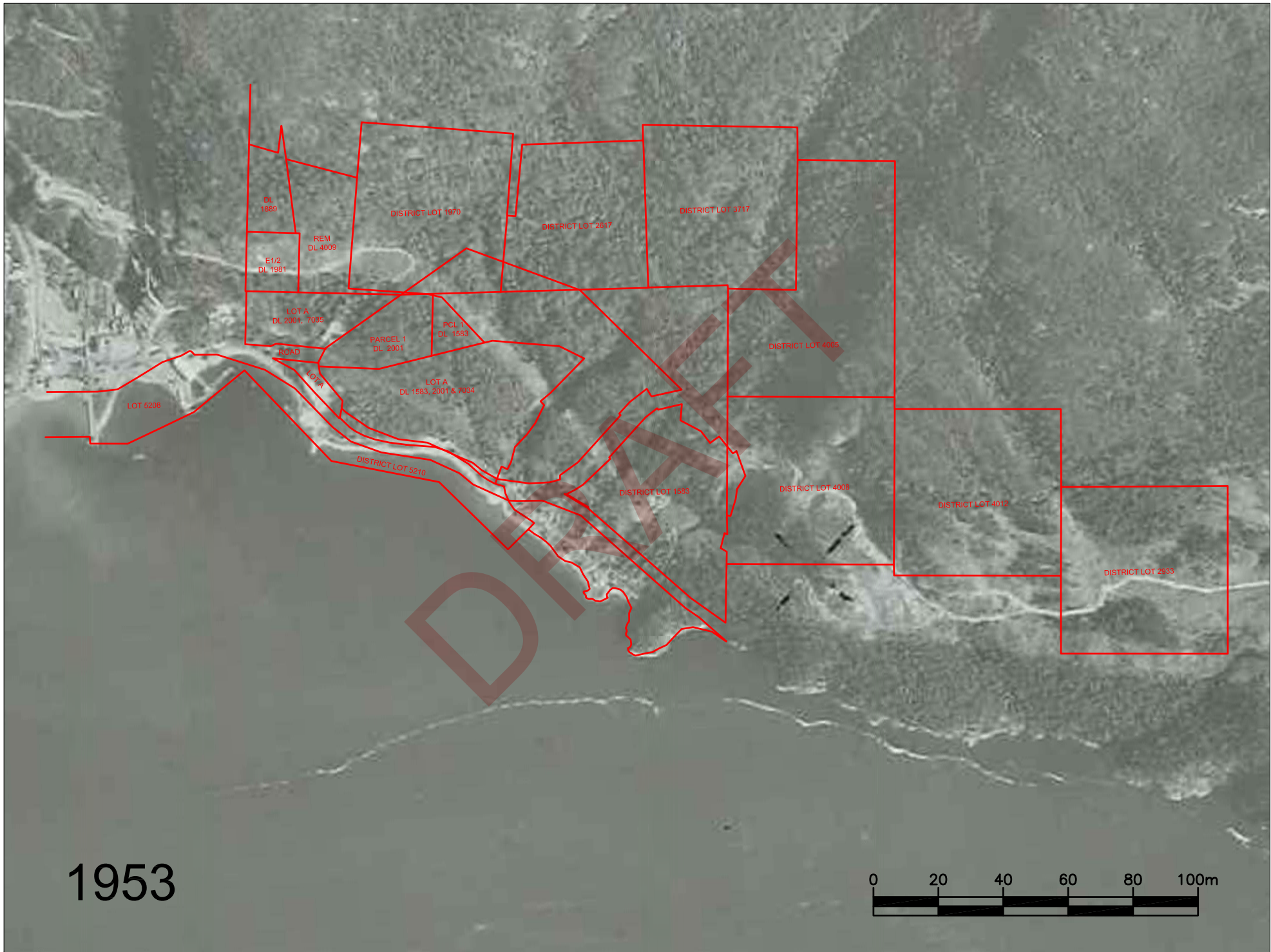
As set out in 324477M

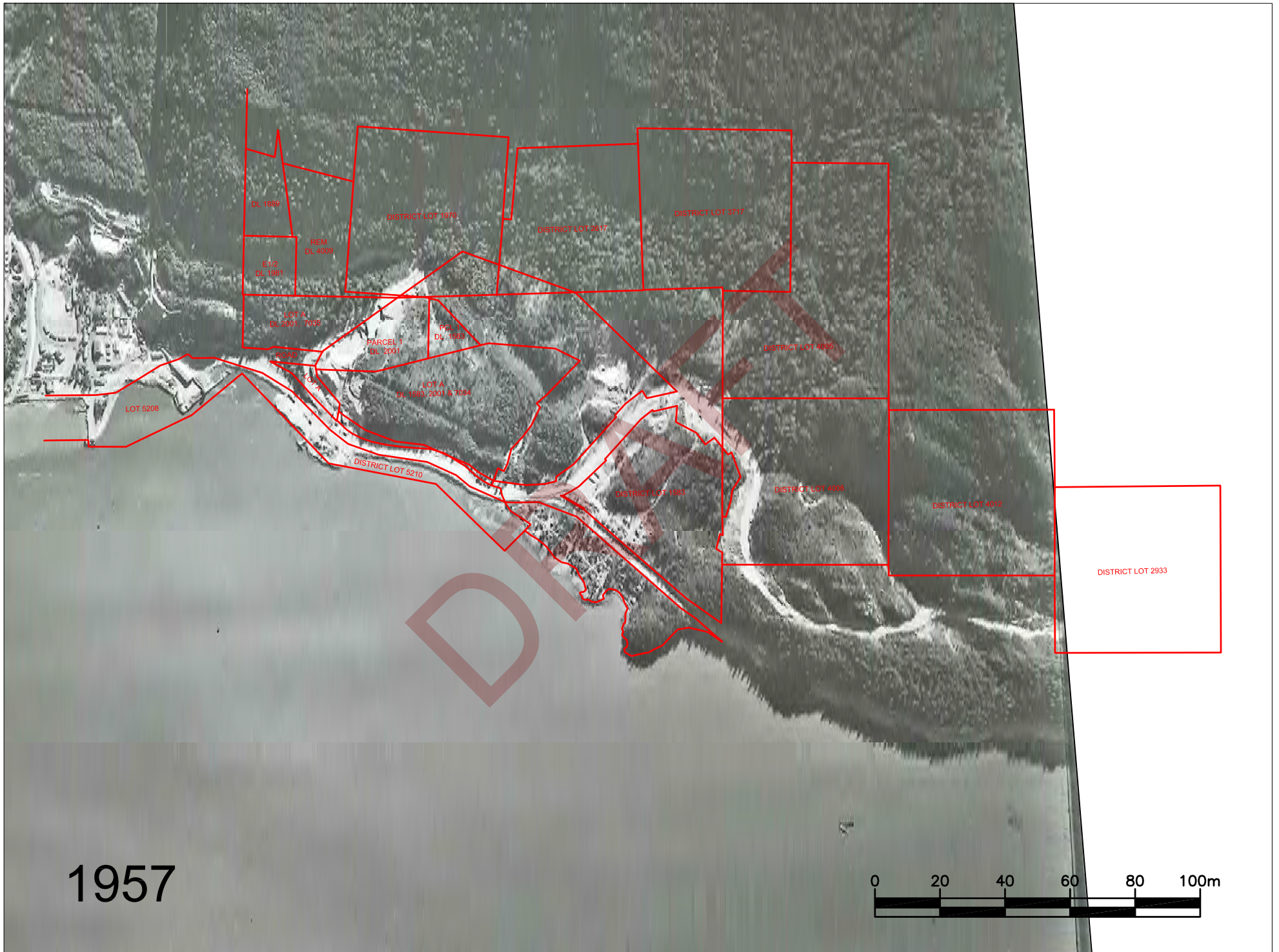
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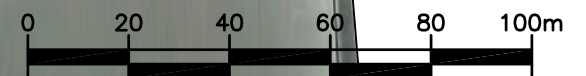
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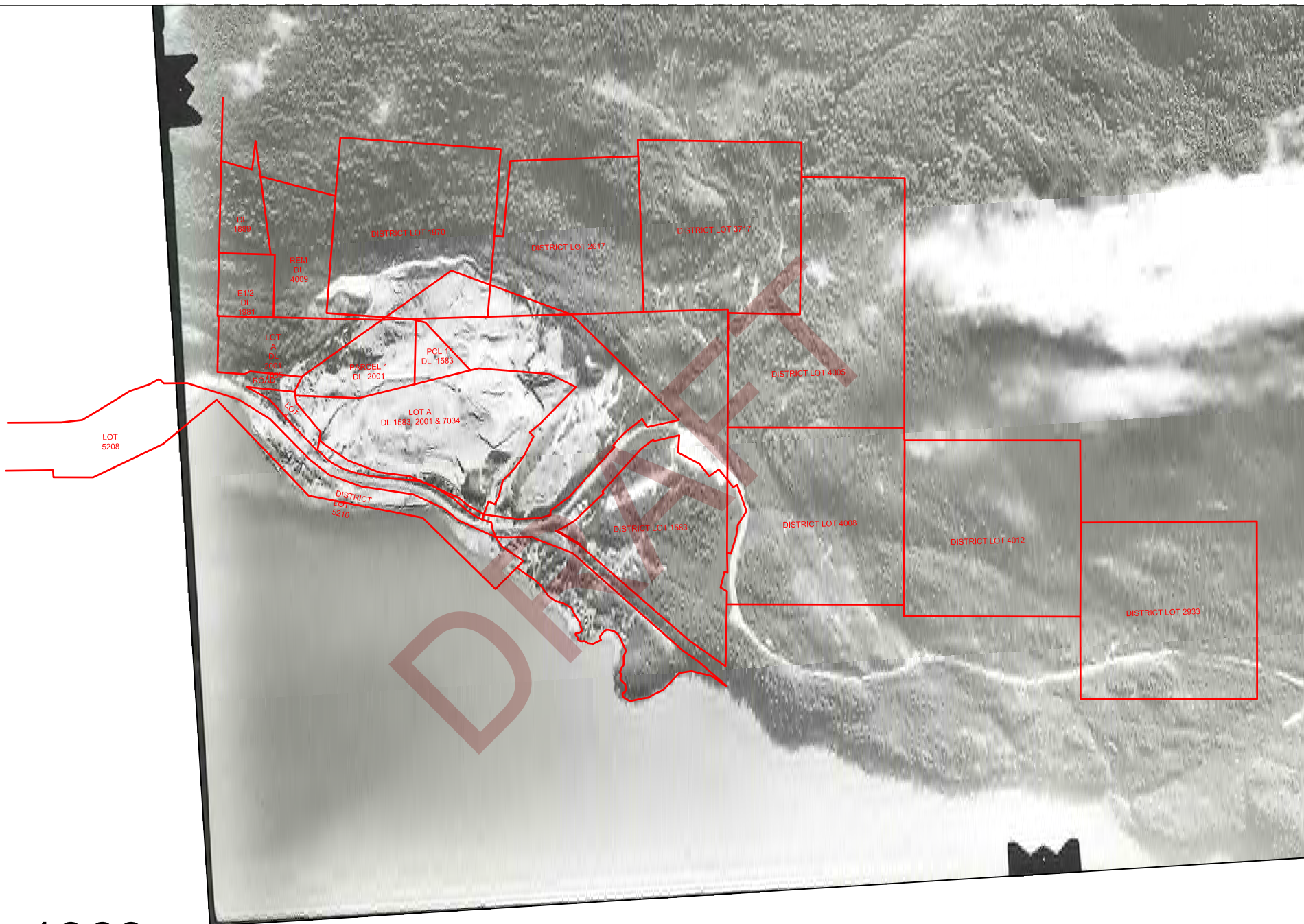
APPENDIX B
HISTORICAL AERIAL PHOTOGRAPHS





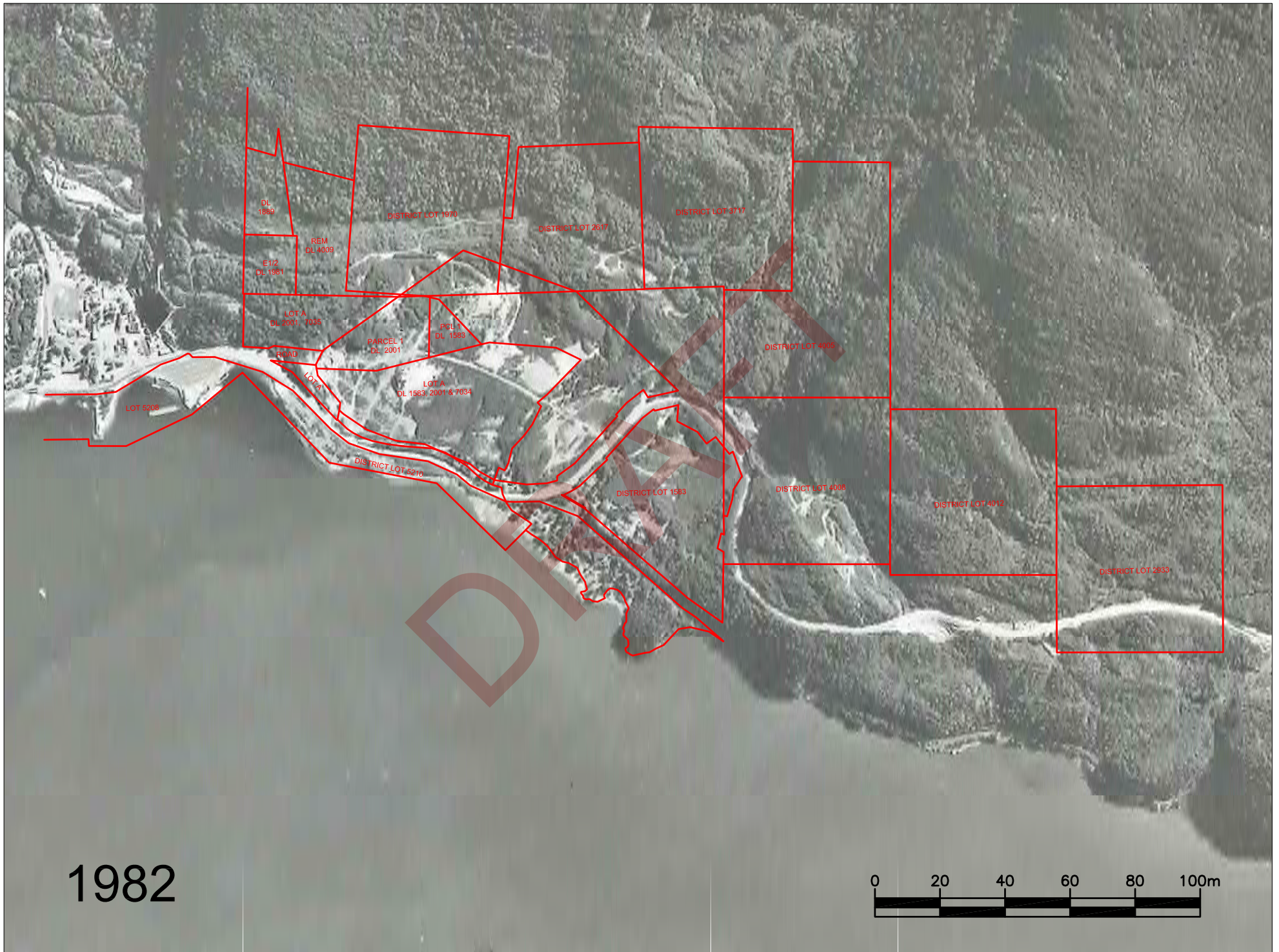
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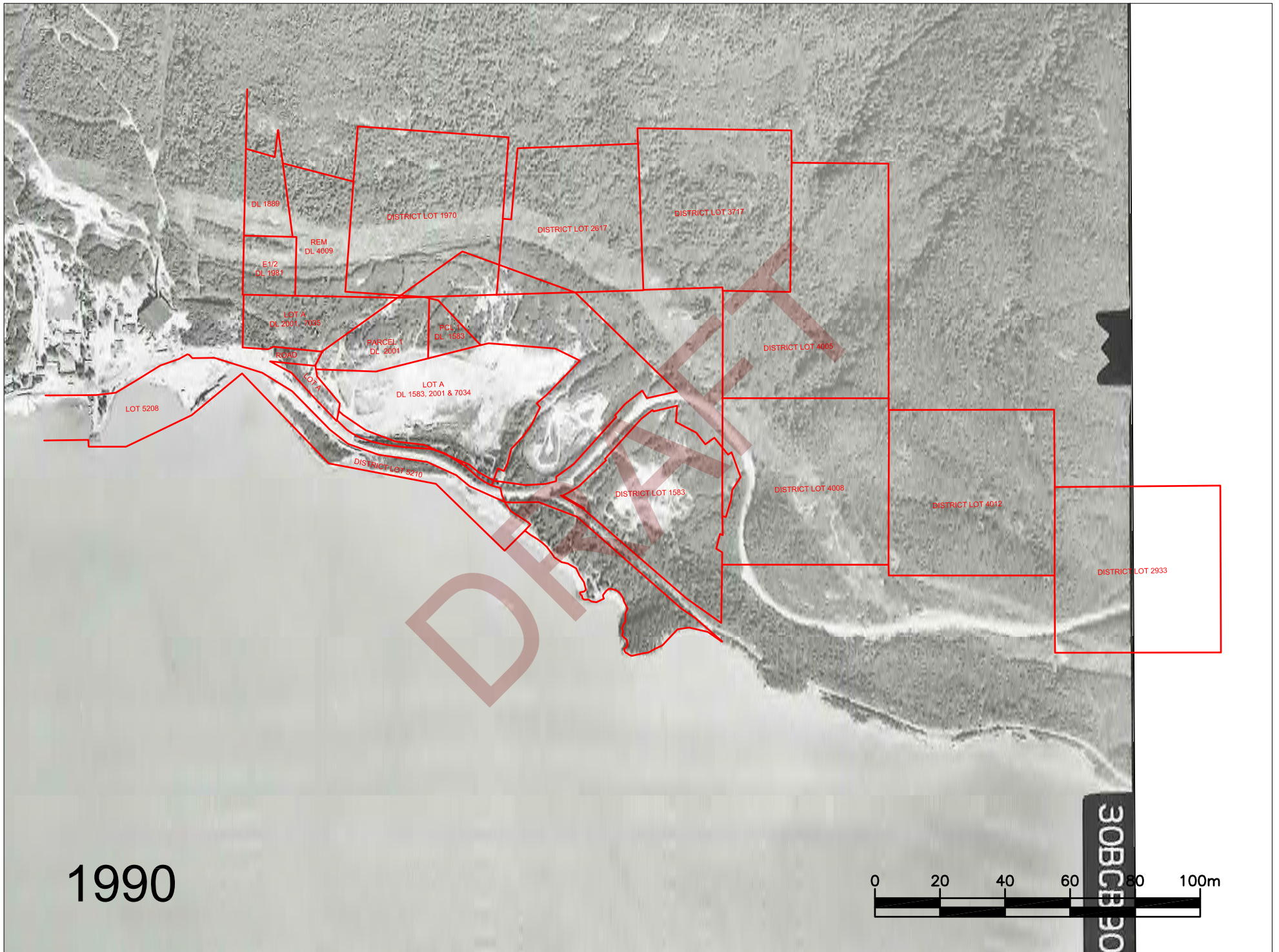




1969







April 2009

Google Earth

Image © 2020 Province of British Columbia



May 15, 2019

Google Earth

Image © 2020 Maxar Technologies
Image © 2020 CNES / Airbus



DRAFT

APPENDIX C
SLRD ZONING INFORMATION

SCHEDULE B

SQUAMISH-LILLOOET REGIONAL DISTRICT

HOWE SOUND EAST SUB-AREA 3 PLAN

DRAFT

(Plan Amendment By-law 714)

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1.0 Context

The Electoral Area D OCP, originally adopted in September 1994 as the Whistler South Official Community Plan Bylaw No. 495, provides guiding principles and general policies for all of the lands within Electoral Area D. The plan establishes Sub-Areas, of which Howe Sound East is Sub-Area 3. One of the four primary implementation measures of Bylaw 495 is preparation of a “Sub Area Plan” for Howe Sound East.

In the Electoral Area D Official Community Plan (OCP), Furry Creek is designated a Planned Community. Britannia Beach and Porteau Cove are designated Special Planning Areas. Bylaw 495 states that the Special Planning Areas can receive the Planned Community designation upon completion of a Sub Area Plan. This reflects the fact that Bylaw 495 did not contain sufficient detail to provide direction for proposed new communities.

In July, 1996, a draft Master Plan for Howe Sound East was prepared (Arlington Group). That plan was not adopted, however the plan document provides a significant amount of background information that is relevant to the planning of Sub-Area 3. This Bylaw relies on much of that information, but for the purpose of conciseness, does not repeat it.

In 2000, a major amendment to the Electoral Area D OCP was undertaken in the form of Bylaw 692, which outlines principles for the Sub-Area planning process in Howe Sound East. Those principles provide the guidance and framework for this Bylaw.

The Sub-Area 3 study area is 19,000 hectares (47,000 acres) in size. It includes three identifiable waterfront locations, Porteau Cove, Furry Creek, and Britannia Beach, as well as extensive mining and forestry lands to the east of the Howe Sound shoreline.

The study area provides many opportunities with respect to future land use, including:

- a stunning waterfront location offering spectacular views,
- road and rail access up the Sea-to-Sky corridor,
- rolling developable land close to the waterfront,
- mountain valleys with swiftly flowing creeks,
- a historic mine and townsite at Britannia, and
- extensive resource lands.

There are also significant constraints, including:

- acid rock drainage and contaminated deposits resulting from the previous mining activity at Britannia Beach,
- unstable geology that can cause flooding and debris flows along creeks, especially Britannia Creek,
- numerous steep slopes that vary in stability,
- steep land rising to high elevations close to the shoreline,
- riparian areas and other environmentally sensitive resources,
- archaeological sites,
- highway, rail and utility corridors that form barriers to public access, making potentially developable land too expensive to access, and
- ongoing forestry activity.

Refer to Map B1 Constraints for an illustration of the constraints that can be mapped.

The likelihood of land development occurring within the 5 to 10 year horizon of a typical land use plan varies for each of four locations within the plan area. However, as one of the primary development areas within the Sea-to-Sky corridor, it is important to establish the overall approach to planning and the projected total population before substantial additional development occurs. Some comments on the potential sequence of development follow:

- A development agreement with the Squamish-Lillooet Regional District (SLRD) is in place and Furry Creek has an approved Preliminary Layout Approval (PLA) with the Ministry of Transportation for development of 920 residential units consisting of up to 250 units in the “waterfront” lands and up to 670 single family lots in the “uplands”. Development is about 15% complete.
- The Squamish First Nation is has an option to acquire lands owned by BCR Properties Ltd. at Porteau Cove as part of a Comprehensive Agreement with the province, so detailed planning for the future of this area will not occur for some time, if at all from a local government perspective.
- The Britannia minesite will require various forms of remediation before development of lands owned by Copper Beach Estates and the BC Museum of Mining can proceed.
- The Makin property immediately south of the Britannia mine and townsite, part of the Britannia Beach area for the purposes of this bylaw, has been the subject of a rezoning application, and will likely be the next community to be developed.

The primary focus of this plan amendment is therefore Britannia Beach, including the Makin lands.

The planning process and public consultation related to Howe Sound East has been underway for some time through the Master Plan preparation, meetings related to Bylaw 692, and meetings hosted by the developer of the Makin property. The planning process related specifically to this plan amendment included: regular meetings and review by an Advisory Committee composed of agencies, public interest groups and residents, an inter-agency meeting to review a draft plan, and two public sessions; a workshop at the outset of the project and a meeting to review a draft plan.

Policy

- 1.0.1 Based on the land use plan outlined in this Schedule, the land use designation of the Britannia Beach area is hereby changed from Special Planning Area to Planned Community. Refer to Map 4 Amendment for an illustration of the change.

2.0 Britannia Beach

2.1 Vision

The Britannia Beach community is envisioned as including two parts:

- Britannia North refers to the Britannia Beach mine and existing townsite with the surrounding area, and includes land currently owned by Copper Beach Estates, the BC Museum of Mining, and the Crown (waterfront area),
- Britannia South refers to the area surrounding Minaty Bay and the adjacent private property known locally as the Makin Lands.

The overall vision is to develop a community that:

- respects the natural environment and adheres to principles of environmental sustainability,
- respects and promotes the historic aspects of the community,
- promotes a “sense of community” by encouraging social interaction and providing employment opportunities,
- is compatible with the other communities and patterns of growth in the Sea-to-Sky corridor,
- promotes tourism, outdoor recreation potential, and film industry use,
- promotes the waterfront as a destination for residents and tourists, and
- focuses on livability for residents with appropriate parks, local services, and community facilities.

2.2 Residential

Objectives

- Encourage the development of a variety of densities and housing types.
- Reinforce the historic townsite by encouraging retention of the existing affordable residential community at Britannia Beach.
- Plan for residential use only where there are no hazards or environmentally sensitive areas, or where hazards can be adequately mitigated.
- Encourage development that will be visually unobtrusive as viewed from the highway.
- Encourage tree protection in residential areas.

Policies

- 2.2.1 Residential areas will generally be located where shown on Map B2 Britannia Beach Land Use Plan. Residential area boundaries may be modified based on additional site-specific environmental and hazard (geotechnical) information.
- 2.2.2 Residential development shall not occur in areas that are contaminated or geologically unsafe (refer also to sections 2.10 and 2.11). Appropriate phased remediation, mitigation and risk management must occur prior to residential development.
- 2.2.3 Encourage clustering of residential units with public open space around clusters.
- 2.2.4 Housing types may include:

- single family at densities of 10 to 15 units per hectare (4 to 6 units per acre) (including home occupation and secondary suites),
- small lot single family at densities of 15 to 25 units per hectare (6 – 10 units per acre),
- town homes at densities of 20 to 30 units per hectare (8 – 12 units per acre),
- stacked town homes at densities of 30 to 40 units per hectare (12 – 16 units per acre)
- residential/commercial mixed use, and
- live/work units.

Apartments, with the possible exception of senior citizens housing, and high-rise buildings will be discouraged.

- 2.2.5 The total number of future residential units in Britannia Beach will be in the range of 1650 - 2000 at build-out, based generally on the distribution shown on Map B2 Britannia Beach Land Use Plan, with approximately 800 to 1000 units allocated to Britannia North, and approximately 850 to 1000 units allocated to Britannia South.
- 2.2.5 Promote energy conservation in building design, e.g. passive solar, recycled materials, conservation features within buildings.
- 2.2.6 Encourage protection of existing trees and plant new trees in residential areas to provide neighbourhood character and to minimize visual impacts, especially in areas that slope steeply towards Highway 99, the railway, or the ocean.
- 2.2.7 Support and encourage retention of the 10 ha (25 acre) historic community site for affordable housing to accommodate a maximum of 100 units. Support retention of existing homes, and opportunities for existing residents to remain in the community.
- 2.2.8 Development at Britannia Beach is expected to be phased in over a period of at least 20 years, with development of Britannia South lands generally expected to precede development of Britannia North. An infrastructure servicing plan for the entire Britannia Beach area must be done prior to or in conjunction with the first rezoning application for the Britannia North or Britannia South lands.
- 2.2.9 In accordance with section 919.1 of the Local Government Act, all Single Family Residential and Mixed Residential designated lands in the Britannia area (North and South) are designated as development permit areas for the purpose of establishment of objectives and development of guidelines for the form and character of intensive residential development.

Designations

- Single Family Residential – for traditional single family lots up to 15 units per hectare (6 units per acre)
- Mixed Residential – for development clusters incorporating a range of housing types from 15 to 40 units per hectare (6 to 16 units per acre)
- Historic Residential – for retention of the historic single family community of affordable housing

2.3 Parks and Open Space

Objectives

- Encourage provision of public pedestrian access to and along Howe Sound where possible, retaining existing public use areas as such.

- Encourage provision of a variety of recreational parkland to meet community needs.
- Encourage provision of a trail system throughout the community and alongside environmentally sensitive areas where possible.
- Encourage park designs that have a natural BC coastal character.

Policies

- 2.3.1 In accordance with the park dedication provisions in the Local Government Act, require dedication of land for the provision of community and neighbourhood parks in the general locations shown on Map B2 Britannia Beach Land Use Plan. The recommended park sizes are as follows:
- at least 1 to 1.5 hectares (2.2 to 3.5 acres) for the Britannia North community park, noting that this area is subject to flooding. The design of the area will need to address flood management.
 - at least 3.5 to 4 hectares (8.5 to 10 acres) for the Britannia South combined community park/elementary school site.
- 2.3.2 Encourage location of the Britannia South community park adjacent to an elementary school site.
- 2.3.3 In conjunction with future rezoning of the Britannia South lands, encourage provision of an additional waterfront park at Minaty Bay, in the general location shown on the land use plan, to protect the beach, the picnic area, and the peninsula, retaining the natural character of this public use area. The minimum recommended size for the park is 4.9 hectares (12 acres), which includes land in the bluff area on the south side of the bay, as well as the picnic area north-east of the beach, extending east to the railway tracks.
- 2.3.4 Encourage provision of pedestrian access along the shoreline of Howe Sound on the Britannia South frontage and the Britannia North frontage, with a pedestrian link between these two areas.
- 2.3.5 Encourage provision of natural open space in all environmentally sensitive areas, hazard areas, and the upland remainder of Britannia North and South which are not intended for future development. It is anticipated that the open space will be publicly accessible where there are no safety or environmental impact concerns, and that other portions may be inaccessible where safety or environmental resources would be at risk. Encourage retention of existing vegetation in these open space areas, and environmental restoration of land previously disturbed.
- 2.3.6 Encourage provision of a trail system throughout the community and to adjacent communities (e.g., Furry Creek), linking commercial areas, residential areas, and parks and open space. Encourage provision of trail-head facilities (e.g. road access, small parking lot, signage) where possible and appropriate. The trail system should include major trails for walking and bicycle use, as well as hiking trails. Consideration should be given to designation of specific trails that can accommodate mountain biking.

Designations

- Park – for active use areas
- Open Space – for natural open space, environmentally sensitive areas and hazard areas

2.4 Community Amenities

Objectives

- Encourage provision of community facilities to serve the needs of the projected population.

Policies

- 2.4.1 Support provision of one elementary school, and potentially a second school if the proposed population requires it as follows:
- Proposed elementary school central to the proposed Britannia South residential area, on a site not exceeding 15% slope, with no known hazards, generally where indicated with a symbol on Map B2 Britannia Beach Land Use Plan with easy access from the highway and pedestrian routes.
 - Potential elementary school if required central to the proposed Britannia North residential area, on a site not exceeding 15% slope, at least 500 m from the transmission lines, with no known hazards, with easy access from pedestrian routes, and with an adjacent neighbourhood park.
- 2.4.2 Encourage provision of a site for public indoor recreation facilities to serve the community within or near the Britannia South school/park site.
- 2.4.3 Work with other government agencies to determine the needs for sites for other community amenities. A fire hall will be retained at Britannia North. There will be a future need for a police office and ambulance station either at Britannia Beach or Furry Creek.

Designations

- Public Institutional

2.5 Commercial

Objectives

- Promote tourist commercial business, in particular the adaptive reuse of heritage and historic buildings.
- Promote non-polluting commercial and recreational uses of the Britannia waterfront, in particular facilities with a historic focus.
- Encourage building forms and designs which help to promote use of the community as a commercial filming location.
- Encourage provision of local convenience retail and services to accommodate the needs of the local community.
- Support existing business uses and provide for their continued existence within the community.
- Support the development of an inn or small hotel.
- Support the development of an institutional retreat centre.

(Plan Amendment By-law 1050)

Policies

- 2.5.1 Encourage the location of commercial uses generally where shown on Map B2 Britannia Beach Land Use Plan.
- 2.5.2 Focus tourism-related commercial activities within the existing townsite and adjacent waterfront area at Britannia North.
- 2.5.3 Support the ongoing operation of the B.C. Museum of Mining as a tourist commercial site under the designations National Historic Site and Provincial Historic Landmark.
- 2.5.4 In siting commercial buildings, ensure that views of Howe Sound from the highway and from residential areas are protected, although the views may be partially interrupted.
- 2.5.5 Support provision of non-polluting recreational marine commercial services, such as mooring facilities, canoe and kayak rentals, windsurfing shop.
- 2.5.6 Support provision of community-oriented commercial uses, up to a maximum of approximately 1500 square metres (16,000 square feet) of gross leasable floor area, to serve residents. Community commercial development should be located at or near a major road intersection within Britannia South, away from Highway 99 on a site that has convenient pedestrian access from the majority of the residential development.
- 2.5.7 Ensure provision of adequate off-street parking for commercial uses.
- 2.5.8 Support tourist accommodation with a maximum size of 100 bedrooms.
- 2.5.9 All commercially designated lands are designated as development permit areas for the purpose of establishment of objectives and development of guidelines for the form and character of commercial development.

Designations

- Tourist Commercial – for retail services and attractions oriented towards tourists, including land and marine-oriented facilities
 - Community Commercial - for convenience retail and services oriented towards residents
 - Tourist Accommodation – for an inn or small hotel
- Institutional Retreat Centre

(Plan Amendment By-law 1050)

2.6 Industrial

Objectives

- Encourage non-polluting industry in the Britannia North area.

Policies

- 2.6.1 Encourage the location of industrial uses generally where shown on Map B2 Britannia Beach Land Use Plan.
- 2.6.2 Ensure that access to Resource Management lands is maintained to allow for future timber harvesting.

Designations

- Industrial – for non-polluting industrial development

2.7 Transportation

Objectives

- Support improvements to the safety of Highway 99 through Britannia South and opportunities to develop land near the waterfront that is uninterrupted by the highway.
- Support the continued routing of highway traffic through Britannia North for tourism purposes, but with improved safety and access to the waterfront and into the B.C. Museum of Mining.
- Minimize the impacts of new roads through development areas.
- Encourage and support opportunities for public transit, including improved rail and bus service for commuters and tourists.

Policies

- 2.7.1 Encourage the realignment of Highway 99 around Britannia South as generally shown on Map B2 Britannia Beach Land Use Plan with a grade-separated access off the highway.
- 2.7.2 Support the retention of 2-lane Highway 99 through Britannia North, with improved pedestrian crossing of the highway and the railway, and allowance for vehicular access to potential upper residential areas from the highway. If the highway is to be 4-laned, retain the 2-lane highway through Britannia.
- 2.7.3 Encourage and support internal community roads narrower and steeper than typical Ministry of Transportation standards to reduce visual and environmental impacts. This could require private or strata-title development of roads.
- 2.7.4 Encourage provision of transportation demand management facilities, such as park and ride/carpool lot.
- 2.7.5 Encourage and support provisions for a future commuter rail service, such as space for train stations in key locations, such as Britannia North and South.

2.8 Infrastructure

Objectives

- Encourage the development of community-based water supply and sewage treatment systems, in which one water and one sewage system can serve all of Britannia (North and South).
- Prior to development, clarify the administrative system to be used for planning, construction and management of infrastructure, particularly water supply and sewage disposal.
- Work with developers and agencies to develop a system in which the costs of providing services are shared in an equitable manner.
- Encourage the development of infrastructure that minimizes impacts to environmental resources.
- Respect the fact that the existing residents of Britannia Beach have little financial ability to contribute to the cost of improving servicing standards.

Policies

- 2.8.1 Prior to development being authorized, adopt basic servicing standards for community infrastructure, including water supply and sewage disposal.
- 2.8.2 Water and sewer systems must comply with all provincial regulations and those of the Coast Garibaldi Health Services Society.
- 2.8.3 At the development application or rezoning stage, a sewage treatment facility site at Britannia Beach will be secured which meets the following criteria:
- .1 location is capable of serving the entire community (Britannia North and South);
 - .2 site location as close to sea level elevation as possible;
 - .3 site area of approximately 0.8 hectare, with a configuration such that the treatment plant is located no closer than 300 metres from any residential property;
 - .4 minimum visual impacts from other properties;
 - .5 not within a flood hazard or geotechnical constraint area
 - .6 ocean outfall, combined with or as close as possible to Britannia Creek ARD outfall, to minimize additional marine impacts.
- 2.8.4 The SLRD will require developers to adhere to best management practices for sewage treatment plant odour control.
- 2.8.5 Require preparation of a detailed stormwater management plan prior to development, encouraging infiltration of the water to the ground as quickly as possible, and the use of best management practices in stormwater design.

Stormwater Management Guidelines

- Stormwater should be managed to minimize negative impacts on watercourses, riparian areas, and other vegetation. It is critical to recognize that all land alteration and development affects stormwater runoff and that effects are cumulative. Development proposals should use best management practices for stormwater management, aquifer recharge and watershed management to ensure that post-development peak flows do not exceed pre-development peak flows and to maintain recharge of aquifers. One principle of stormwater management is to direct water back to the ground wherever possible to minimize channelling and piping. Some examples of appropriate practices include:
 - incorporate maximum effective impervious cover percentages in the zoning bylaw for single-family, multi-family, commercial and industrial areas.
 - minimize runoff from roads through narrow, permeable surfaces (e.g., granular, and discontinuous grass swales that discharge to open space);
 - minimize impervious surfaces through use of permeable materials for parking areas (e.g. gravel, pavers designed for grass in openings, grass field for overflow parking), and porous materials for paths, patios, and other use areas. If driveway paving is required due to a steep slope, use tire track paving with grass in the middle;
 - drain roof water to cisterns, with the overflow to the surface and disperse it into the ground, using such devices as splash pads and exfiltration galleries;
 - thick organic layer of growing medium throughout cleared/disturbed area to promote growth of vegetation and water retention;
 - direct water to grass slopes, swales and areas with thick vegetation;

- use stormwater detention or infiltration areas where required and where possible as an alternative method for accommodating stormwater;
- use wetlands which can improve quality of stormwater through biofiltration; and
- retain as much existing vegetation as possible, and where clearing has occurred, plant native trees and shrubs to restore the vegetative mass.
- Stormwater detention for the site should meet the minimum requirements of the *Land Development Guidelines for the Protection of Aquatic Habitat* and newer stormwater management guidelines that are being developed.
- Stormwater outflows to a stream or leave strip should have water quality and erosion control features included in accordance with the *Fish Protection Act Streamside Protection Regulation*.
- Any storm drain inlets should be marked in accordance with the DFO storm drain marking program.

2.9 Environmentally Sensitive Areas

Objectives

- Encourage the protection and enhancement of existing environmental resources.

Policies

- 2.9.1 Streamside protection and enhancement areas shall be established in accordance with the Streamside Protection Regulation contained within the *Fish Protection Act*.
- 2.9.2 Require environmental assessments prior to subdivision approval. The assessments shall address wildlife habitat and migration corridors (unique, rare or endangered or essential), fish habitat (unique, rare or endangered or essential), and vegetation (unique, rare or endangered). The assessment shall also identify areas where development should not occur, including required setbacks from watercourses, recommended mitigation measures, and enhancement measures that could improve environmental resources.
- 2.9.3 Encourage the enhancement of environmental resource in environmentally sensitive areas (ESAs) and throughout development areas through community education and stewardship initiatives.

Guidelines for Environmentally Sensitive Areas

- Encourage additional setbacks adjacent to streamside protection and enhancement areas wide enough to accommodate trails in appropriate locations.
- Minimize crossings of streamside protection and enhancement areas. Where crossings are required, bridges should be used where possible. If culverts are used, they should be "bottomless" to ensure that natural substrates are maintained along the creek.
- Where wetlands, watercourses or riparian areas are disturbed, restoration of the disturbance or compensation equal to 100% of the disturbed area should be provided.
- Instream work and stream crossings should meet the requirements of the Land Development Guidelines, the B.C. Water Act, and newer guidelines that are being developed.

- Timing of works in and about a stream should be in accordance with provincial guidelines and regulations, and requires specific written approval by the Ministry of Water, Land and Air Protection, in addition to any development permit, before work begins.
- Effort should be made to retain as much existing vegetation as possible, especially significant vegetation and habitat, using the following guidelines.
 - Minimize the extent of cut and fill required for road construction and instead conform to the natural contours of the landscape. All cut and fill slopes should be treated with growing medium, hydroseeded, and planted with native vegetation.
 - Plan open space areas to incorporate stands of mature forest.
 - Retain existing ground vegetation and trees where possible within development areas.
 - Use buildings with small footprints where possible so that building sites can more readily conform with the existing terrain and allow for protection of existing vegetation.
 - Protect any existing veteran trees.
 - Site habitable structures so that existing trees do not pose a hazard.
 - Protect any trees that contain raptor nests, along with a 50 m setback where existing vegetation is not disturbed.
- Development should be timed to alleviate impacts upon the special conditions of the site including but not limited to:
 - preventing works in and about streams at time of spawning and fish migration.
 - limitations of works that may impact established seasonal habitat of wildlife. e.g., no clearing during the sensitive nesting period for birds and other wildlife.
 - minimizing land disturbance in areas subject to possible erosion during seasonal periods of high rainfall.
- Encourage public education regarding environmental stewardship, including promotion of the use of bird feeders and waterers, amphibian ponds, and nesting boxes.

2.10 Heritage Resources

Objectives

- Encourage the protection and preservation of existing heritage resources, as outlined in section 4.7 of the Electoral Area D Official Community Plan Bylaw No. 495.
- Support the efforts of the Maritime Heritage Society in establishing a maritime heritage precinct at Britannia North, and the efforts of the Britannia Beach Historical Society in maintaining a heritage precinct at Britannia North.

Policies

- 2.10.1 Encourage protection and preservation of the historic Britannia townsite and Museum.
- 2.10.2 Encourage establishment of a Maritime Heritage Society facility within the waterfront location shown as Tourist Commercial on Map B2 Britannia Beach Land Use Plan.
- 2.10.3 Encourage any new structures within the Historic Residential, Tourist Commercial or Floodplain Management areas to be compatible with the character of the existing historic community in terms of siting, form, and exterior design.

2.11 Natural Hazards

Objectives

- Require the identification of areas involving known risk and minimize the risks to public safety and property associated with the hazards prior to development.

Policies

- 2.11.1 Require detailed geotechnical studies prior to development in the general areas identified as steep slopes and hazard areas Map B1 Constraints. These studies should identify potential flooding and debris flow risks, and site stability risks. The studies should also identify areas that are unsuitable for development, and mitigation measures for hazards that can be mitigated. The development plan shall comply with all of the recommendations of the geotechnical studies.
- 2.11.2 Avoid dwelling units in the area designated Flood Management on Map B2, which is within the floodplain and alluvial fan of Britannia Creek. Temporary tourist commercial uses, park space, parking, and historic structures not used for accommodation may be permissible in that area. The potential relocation of the historic structures will be determined through a Heritage Study.
- 2.11.3 Recognize that provincial regulators require local government to maintain flood mitigation works. In the study area, this applies to Britannia, Thistle and Daisy Creeks.

Designations

- Flood Management – for flood protection, with other uses such as temporary tourist commercial uses, park space, parking, and historic structures not used for accommodation, secondary to objectives related to flood management and safety

2.12 Environmental Contamination

Objective

- Encourage the remediation and the environmental risk management of lands and water that have been subject to environmental contamination.

Policies

- 2.12.1 Support and encourage the remediation of acid rock drainage, the removal and containment of contaminated rock, soil or tailings, and the limitation of public access to mining hazards.
- 2.12.2 Recognize that appropriate remediation is a prerequisite to development, and that the requirements of the remediation program take precedence over future land development plans.
- 2.12.3 Where possible, encourage the incorporation of public access and education displays into remediation facilities.

- 2.12.4 Support integration of remediation facilities into the community in a way that is compatible with tourism and heritage objectives.
- 2.12.5 Recognize that future acid rock drainage could occur anywhere in the Britannia Beach area as a result of blasting. Ensure that monitoring and risk management provisions are in place during construction. Appropriate mitigation must occur prior to land development.

3.0 Development Permit Areas

Development Permit Area #1

Area

The area identified on Map B3 Development Permit Area, attached to this bylaw, as DP#1, hereafter referred to as the Howe Sound Sub-Area 3 Development Permit Area #1, is designated as a development permit area for the provision of guidelines respecting the form and character of commercial development, and multi-family and intensive single-family residential development.

Justification and Special Conditions

The special conditions and objectives that justify the designation of the Howe Sound Sub-Area 3 Development Permit Area are described below.

The Electoral Area D Official Community Plan contains policies respecting: the heritage values of Britannia Beach, and the importance of enhancing the visual quality along Highway 99. Public consultation indicated that there is interest in maintaining views of Howe Sound; ensuring public access to the shore; encouraging commercial buildings that are compatible with the heritage theme; and ensuring that buildings blend in with the environment.

Objectives

The objectives of these guidelines are to permit the orderly development of the subject lands while controlling the character of commercial, and multifamily and intensive single family residential development in terms of building siting, form, exterior design, landscaping, lighting and the form and character of parking areas.

Guidelines

The following guidelines outline the approach for ensuring that the form and character of commercial, and multifamily and intensive single family residential development are compatible with surrounding land uses and the natural environment:

- The design of buildings and structures should be consistent with the study area's rural, coastal character, e.g. small footprints, pitched roofs, windows on most walls.
- The design of buildings should minimize the obstruction of views, be of natural materials, blend in well with the existing natural features, give the impression of small scale buildings; and connect with neighbourhood pedestrian and cycling pathways or trails. Site planning should maximize access to open space and minimize paving, e.g. shared driveways, use of gravel.

- In visually sensitive areas, i.e., steep slopes highly visible from highway, buildings and roads should follow existing contours, large cuts and fills should be avoided, buildings should be of colours that blend with the surroundings, large blank facades should be avoided, and existing or planted trees should be used to partially screen views of the buildings and to frame views from the buildings.
- In the Britannia townsite area, tourist commercial buildings should use historic elements consistent with an industrial, small settlement heritage.
- Large surface parking areas should be broken down into smaller parking lots (e.g., maximum 20 cars) where possible. Where not practical, large parking lots should have landscape areas throughout, with tree planting in these areas. Shared accesses and parking areas should be provided where possible, especially for uses that have parking needs at different times. Parking areas should be effectively set back, landscaped and screened from adjacent properties with natural vegetation. Paved areas should be minimized, but where necessary, they should incorporate a variety of materials, patterns, textures and blocks of vegetation.
- Within residential clusters, telephone, power, community sewer and water services, except any required storage tanks, should be provided underground, except where existing telephone and power lines are currently above ground. Above ground storage tanks should be screened.
- Signs should be non-illuminated from within, and in keeping with the heritage Britannia theme. Billboards are not permitted within the SLRD sign bylaw.
- Exterior lighting, including within a parking area, should be low intensity and not cause excessive night-time illumination to be cast onto adjoining properties or the waterfront. Exterior lighting at a pedestrian scale should be provided in commercial areas to encourage evening use and improve safety.

Development Permit Exemptions

1. A development permit shall not be required for alterations that do not affect the exterior appearance of an existing commercial building, including replacement of wood siding with new siding material of the same style and colour; replacement of damaged windows or doors with new windows or doors of the same size, shape, materials and appearance, repainting or re-staining the exterior walls with paint or stains matching the original paints and stains and replacement of building signs with new signs of the same size, shape, materials and appearance.
2. In addition to 1. above, all development in this Development Permit Area is exempted from the requirement to obtain a Development Permit, except:
 - development of land for commercial, or multifamily or intensive single family residential use.
 - development of tourist accommodation units.
 - development of new commercial space greater than 50 square metres in gross floor area that is visible from public areas or other properties.
 - development of a commercial parking lot.
 - development of two or more attached dwelling units.
 - development of single family residences on lots less than 500 square metres.

4.0 Furry Creek

Objective

- Continue to recognize the Planned Community designation, and encourage adequate provision of community facilities and public open space as development proceeds.

Policies

- 4.0.1 Consider establishing zoning regulation of the Uplands area of Furry Creek consistent with the existing development agreement to ensure public consultation occurs in conjunction with any revisions to the development agreement.
- 4.0.2 Encourage collaboration with Britannia Beach regarding potential accommodation of community facilities that will serve both communities, including elementary school, indoor recreation facilities, ambulance station, police station and local commercial services.
- 4.0.3 Encourage provision of as much public access to the waterfront as possible.
- 4.0.4 Encourage provision of a trail system throughout the community (e.g., along but outside creek setbacks), linking commercial areas, residential areas, and parks and open space. Encourage provision of trail head facilities (e.g. road access, small parking lot, signage) where possible and appropriate.

5.0 Porteau Cove

Objective

- Make provision for the development, either by First Nations or non-aboriginal developers, of a livable community compatible with other Howe Sound East developments, and with adequate provision of community facilities and public open space.

Policies

- 5.0.1 Undertake detailed planning for the Porteau Cove area if the Squamish First Nation does not exercise its existing option to purchase.
- 5.0.2 Include public consultation during the development planning process.
- 5.0.3 Encourage the protection of existing environmental resources.
- 5.0.4 Encourage avoidance and/or mitigation of flood, debris flow and stability hazard areas.
- 5.0.5 Encourage the protection of any identified heritage resources.
- 5.0.6 Encourage additional public access to and along Howe Sound and from development areas to Porteau Cove Provincial Park if possible, given topographical, highway and railway constraints.
- 5.0.7 Encourage the provision of a variety of recreational parkland to meet community needs.
- 5.0.8 Encourage the provision of a trail system throughout the community, linking commercial areas, residential areas, and parks and open space. Encourage provision of trail head facilities (e.g. road access, small parking lot, signage) where possible and appropriate.

- 5.0.9 Encourage the provision of community facilities as required to serve the needs of the community.

5.1 **Land Use**

(Plan Amendment Bylaw 946, 2005)

The Regional District supports development of a comprehensively planned community of up to 1400 residences at Porteau Cove accommodating an estimated population of 3,000 – 3,500. The Porteau Cove Planned Community will include mixed residential, commercial use in a Village centre, community uses, parks and recreation, trails and open space generally as shown on the Conceptual Site Plan which is attached as Appendix 1 to this bylaw.

Development will be phased generally in accordance with the Concept Plan, with approximately half of the total development units within each of Phase 1 and Phase 2. Sub phases of development may be approved, provided all amenities are provided as required by the Squamish-Lillooet Regional District.

5.2 **Planning and Sustainability Principles**

The Planned Community at Porteau Cove will be developed in accordance with the design and development principles and Smart Growth approaches in the Sustainability Strategy incorporated in this plan. The overall site design will be planned to minimize impacts on natural site conditions; avoid sensitive environmental areas; provide a range of housing choices; allow for alternative standards for infrastructure; promote transportation choices and a compact, pedestrian Village core to achieve a high standard of livability and environmental responsibility.

Development of the new community at Porteau Cove will be guided by the following planning and sustainability principles:

1. Livable Community: Provide a variety of housing forms, a viable neighbourhood Village Centre and community facilities and amenities to ensure a livable and vital community that reflects the unique landscape character and lifestyle opportunities of the Sea to Sky corridor.
2. Ecological Integrity and Biodiversity: Protect sensitive areas and key natural features within a comprehensive open space system. Focus development in less sensitive areas in a way that minimizes negative impacts on:
 - fish habitat and water quality by avoiding (where possible) development near watercourses, sensitive wetland and their riparian zones;
 - wildlife habitat by retaining areas of undisturbed forest and avoiding impacts and endangered wildlife species habitats;
 - environmentally sensitive old growth forest areas and other areas containing endangered plant species;
 - streams by limiting the number of stream crossings to preserve the natural streambed habitat; and
 - controls or avoids environmental and cultural impacts during construction

3. Greener and Smarter Infrastructure: Use resources more efficiently, shift toward renewable resources, reduce pollution, and use natural processes where possible when providing the following infrastructure: energy, stormwater management, water, wastewater, and solid waste.
4. Greener and Smarter Buildings: Develop to “green” building standards.
5. Transportation Options: Provide a compact, walkable village centre and encourage transportation options. Develop a road network that integrates with the existing topography, while providing necessary access for daily use and emergency purposes.
6. Economic Sustainability: Recognize the importance of the Porteau Cove project as part of the economic development strategy and social goals of the Squamish Nation. Support job creation within Porteau Cove within the Village centre, and by support of home businesses within residential areas.
7. Development Context: Consider visual impacts the Porteau Cove development may create from the Sea To Sky Highway, Howe Sound and Porteau Cove Provincial Parks. Consider noise impacts on development from the Highway and rail line.

5.3 Sustainability Strategy for a Livable Community

The following actions will be taken within the Porteau Cove development to achieve the sustainability principles:

Compact, Mixed Use Centre

Provide a compact and walkable mixed-use village centre adjacent to the highway that includes housing, commercial, social and employment opportunities in close proximity.

Diverse Housing Opportunities

Offer a range of housing types and sizes, including single family homes, apartments, townhomes and live/work spaces, to accommodate and encourage a diversity of residents.

Commercial Opportunities

Provide a range of retail and other commercial spaces within a vibrant local commercial area to meet the basic needs of residents and to create a focal point in the community.

Community Spaces and Services

Provide a system of parks, community spaces, green corridors and trails, educational and public safety services that provide a focus of community and meets the community’s public gathering, activity and security needs.

Pedestrian Friendly Village Centre

Design the village centre to be pedestrian friendly, with wide sidewalks and spaces for interaction, trail connections, and a pedestrian scale.

Minimize Light Pollution

Minimize the impact of outdoor lighting through:

- o Specifying fixtures that only shine down to limit light pollution;
- o Providing minimal street lighting except at intersections; and
- o Designing to strategically limit need for excess lighting.

Residential Policies

- 5.3.1 Residential areas will generally be located within the areas shown on Appendix 1. The exact location of these areas may be modified based on site specific environmental information and housing design submitted in the rezoning or development permit process. The housing mix may be modified somewhat at the time of rezoning, provided the overall development strategy is followed and the total unit count for the site is not exceeded.
- 5.3.2 Site specific mitigation measures shall be required prior to development approval in areas that are environmentally sensitive or subject to natural hazards, as outlined in section 5.4 and the Development Permit Area guidelines of this plan.
- 5.3.3 A base residential density of approximately 140 units is supported for the Porteau Cove community, with provision for a density bonus to allow a maximum of 1400 total residential units as shown conceptually on Appendix 1, subject to provision of community amenities including parks, open space, and community amenity buildings. The developer will also have the option of providing affordable housing as outlined in this plan to achieve the density bonus. The details of the density bonus will be specified in the zoning bylaw, and legal agreements between the owner and the Squamish-Lillooet Regional District will be required to implement the community amenity contributions.
- 5.3.4 A variety of housing types are encouraged to create a diverse neighbourhood and may include:
- Single family at densities of 10 to 15 units per hectare;
 - Small lot single family at densities of 15-25 units per hectare, with parcel sizes in the range of 400-500m²;
 - Two family dwellings and townhomes at densities of 20 to 30 units per hectare;
 - Stacked townhomes at densities of 30-40 units per hectare
 - Apartments at densities of 15-40 units per hectare;
 - Terraced apartments with densities ranging from 45-100 units per hectare;
 - Mixed residential and commercial with up to 20 residential units per hectare;
 - Live/work units
- 5.3.5 Affordable housing is encouraged in Porteau Cove and may be provided in the form of smaller lots, duplex housing, apartments above commercial uses, rental housing and/or dedication of land or housing units to a housing authority or local service club as per the *Local Government Act* provisions. Zoning bylaws for Porteau Cove will include density bonus options to encourage the development of some affordable housing as part of the housing mix.
- 5.3.6 Protection of existing trees, vegetation and wetlands is a priority for new development and planting of new trees to retain the visual and environmental values of the site will be required. Minimizing visual impacts of development from Porteau Cove Provincial Park, including lighting, will also be a priority during the subdivision or development permit process.

- 5.3.7 All residential development, except for single family lots larger than 600m² in area, is designated as a Development Permit Area in accordance with Section 919.1 of the Local Government Act for regulation of form and character of intensive and multi-family residential development. A Development Permit issued in accordance with the guidelines of this plan is required prior to subdivision approval or issuance of a building permit.

Commercial Policies

- 5.3.8 A range of commercial uses is supported within the area shown as the Village Centre on Appendix 1. Uses in this area will include those serving local residents as well as travelers on the Sea to Sky Highway. Live/work units and home occupations will be supported to encourage employment within the community.
- 5.3.9 To ensure land is retained for long-term commercial needs, the provision of commercial land will be considered a community amenity for the purposes of obtaining the residential density bonus.
- 5.3.10 Upper storey residential use, particularly rental housing, is supported in the commercial area.
- 5.3.11 A “retreat centre” or similar type of specialized lodge facility may be supported in the upper residential area, subject to rezoning on a site-specific basis and detailed information on the use and location.
- 5.3.12 To ensure a high standard of design for the commercial area, all commercial or mixed use buildings must obtain a Development Permit to regulate the form and character of commercial development in accordance with the Development Permit Area guidelines of this plan.

Parks and Open Space Policies

- 5.3.13 In accordance with the provisions of the *Local Government Act*, park dedication will be required as a condition of subdivision approval, with park locations generally in accordance with the areas shown on Appendix 2. Park dedication will include, but not be limited to, an approximately 1.5 hectares waterview park upland of Howe Sound, an approximately 0.5 hectare community park in the Village centre, viewpoint parks, and a future combined school/park site of approximately 2.0 ha in the later phase of the upper development.
- 5.3.14 Provision of a comprehensive trail system that enhances the existing trail network throughout the site is a key element of the site design, and public trails will be required as a condition of subdivision approval. The proposed trail network, consisting of the trails and trail head parking areas is shown conceptually on Appendix 2. Trail priorities include links to the existing Deeks Lake and Howe Sound Crest trails, trails that provide access to the community amenity and park areas, as well as trail connections between the residential areas. Trails shall be looped and interconnected to the greatest extent possible.
- 5.3.15 Trail linkage from the proposed waterview park to Porteau Cove Provincial Park is supported subject to BC Parks concurrence that the linkage can be appropriately located in a manner that enhances relationships with and minimize impacts on the Provincial Park, and can be integrated with other facilities and uses of the park.

- 5.3.16 Public access to the waterfront at Porteau Cove is desirable as it provides additional opportunity for both park visitors and community residents to access the shoreline. However, the foreshore area is owned by CN Rail, and approval from the rail authority to cross the double rail tracks abutting the Porteau Cove property is required. Development of a pedestrian crossing is supported in principle, but it is recognized that a formal rail crossing is a longer term goal, and will require approvals from CN Rail and Fisheries and Oceans Canada related to environmental impacts.
- 5.3.17 A small public parking area is needed to support access to the community waterview (upland) park, although parking must not become a dominant feature of the site and must not be developed as a parking access area for the Provincial Park. The northerly existing entrance to the Porteau Cove Provincial Park will continue to be the primary access point to the provincial park for the public and for future residents of the Porteau Cove community.
- 5.3.18 Private open space areas and recreation amenities will be required as appropriate within multi-family strata developments.

Community Amenities and Services Policies

- 5.3.19 A community use building for recreation and social activities is required to meet the long-term needs of the estimated 3,000 to 3,500 residents of the Porteau Cove community. The facility should be centrally located in the Village centre as indicated conceptually on Appendix 1. Provision of this facility will be considered as a key community amenity to implement the residential density bonus described in section 5.3.3.
- 5.3.20 The need for other community service facilities, particularly a fire hall, ambulance and/or school site will be considered in consultation with the School District, provincial authorities and volunteer fire departments to assess the overall community needs for the Britannia Beach, Furry Creek, and Porteau Cove communities. A future school site will be provided in the Porteau Cove community as shown on Appendix 1. If the School District confirms at a later date that the school is not needed, the site will be dedicated as community park. Discussions regarding shared facilities or services, including participation in Search and Rescue services, may also include the Village of Lions Bay subject to their interest in shared facilities.
- 5.3.21 Confirmation of the facility requirements, phasing of facility development and securing of sites through development agreements shall be completed prior to adoption of zoning bylaws for the Porteau Cove community.

5.4 Sustainability Strategy to Maintain Ecological Integrity and Biodiversity

The following actions will be followed within the Porteau Cove community to achieve the environmental sustainability principles:

Protect Environmentally Sensitive Areas

Protect environmentally sensitive areas and focus development in the less vulnerable areas of the site by:

- completing a detailed environmental impact assessment, and build according to the recommendations of the report;
- providing buffer zones around old growth forests, rock outcrops, riparian areas, wetlands, steep slopes, and debris flow areas.

Design landscape and open space to protect environmentally sensitive areas and key natural features to achieve both recreational and ecological objectives.

Minimize Site Disruption

Minimize the extent of site disruption caused by site regrading and cuts and fills for all structures and roads located on slopes by:

- sensitive building siting;
- designing to match contours;
- modulation in building form;
- tree preservation where feasible and
- maintaining as much of the existing vegetation as possible.

Rehabilitation

Rehabilitate disturbed areas after development using native or native compatible plants. Reuse existing plants on site where possible through a plant salvage and replanting program.

Use Native Plants in New Landscaping

New landscaping should specify native or native compatible plants for use in the landscape to provide habitat value and limit need for irrigation once established.

Environmental Management Plan

Prepare an Environmental Management Plan (EMP) that includes mitigation measures to manage impacts to the physical and biological environments of the site. Environmental management measures will include avoidance of key areas, design changes, construction mitigation, habitat enhancement measures and monitoring.

Protect Slopes

Areas of the site over 40% slope will not be built upon as a general rule. Where slopes over 40% are disturbed, measures such as retaining walls and revegetation will be used to minimize risk and erosion. Appropriate setbacks from all slopes will be determined through geotechnical assessment.

Creek Setbacks

Minimize impacts to fish habitat, wildlife habitat and water quality by establishing setbacks along all creeks that protect the integrity and habitat values of the watercourses. Incorporate wetlands, open water areas, and creek systems into the open space system in an ecologically responsible manner.

Creek Crossings

Minimize the number of creek crossings and limit/mitigate negative effects of such crossings by maximizing the use of free span bridges or arched culverts to preserve the natural creekbed habitat, where appropriate.

Green Network & Trails

Provide a network of green corridors and trails throughout the site to connect residential areas with amenities and services, as well as provide connections with regional recreational facilities for the larger community. Trailhead parking for regional trails will be included in the development.

Environmental Education

Work with residents and trail user groups to reinforce awareness of natural areas, watercourses, wetlands and the old growth forest through interpretive signage.

Fire Smart

Incorporate Fire Smart strategies in detail site design as appropriate. These include: setting buildings back from the edge of slopes; selective thinning and limbing up of coniferous trees in development areas; and planting only deciduous trees and lawn within 10 meters of buildings. Such strategies must be balanced with other sustainability strategies and design principles.

Minimize Maintenance

Design landscape with the goal of minimizing the need for ongoing energy, water and chemical use by minimizing formal lawn areas and maximizing use of native and adaptive drought tolerant plants.

Environmentally Sensitive Area Policies

- 5.4.1 Natural open space areas such as steep slopes and environmentally sensitive areas will be protected from impacts of development to the greatest extent possible. A detailed environmental assessment of the site area will be required prior to rezoning, and all sensitive natural areas shall be identified. Site planning will follow the report recommendations for setbacks or other mitigative measures to protect or enhance environmental resources.
- 5.4.2 Existing vegetation should be maintained as much as possible during development, and arborist reports shall assess and indicate protective measures for retaining valuable trees.
- 5.4.3 The Porteau Cove site is designated as a Development Permit Area for the protection of the natural environment, and a Development Permit is required prior to subdivision or development or alteration of land on the Porteau Cove site, subject to the Development Permit Area guidelines of this plan. Environmental features include wetlands, watercourses, riparian areas, old growth forest, important plant communities, wildlife habitat, fish habitat and vegetation (including any unique, rare or endangered species). Some of the key areas are indicated on Appendix 1. More specific mapping will be completed as part of the detailed environmental assessment, and will be used to guide Development Permits for the site.

Natural Hazards Policies

- 5.4.4 The Porteau Cove community is designated as a Development Permit Area to protect development from hazardous conditions. Areas of potential risk due to debris flow or debris flood hazards are shown conceptually on Appendix 3, based on preliminary geotechnical assessment. Appendix 4 indicates portions of the site with steep slopes.
- 5.4.5 Prior to subdivision or development or alteration of the Porteau Cove lands, detailed geotechnical assessment is required to identify areas of risk on a site-specific basis, to provide detailed recommendations to reduce or mitigate risks and to confirm that the site can be safely used for the intended purpose, in accordance with the Development Permit Area guidelines of this plan.. The geotechnical study should identify any areas that are unsuitable for development, and contain recommendations to protect development and the public.
- 5.4.6 Section 219 covenants will be required as appropriate at the time of subdivision to ensure geotechnical study recommendations are followed over time, and that future property owners are aware of potential site hazards.

5.5 Sustainability Strategy for Greener and Smarter Infrastructure

To ensure infrastructure is developed to meet the long-term population requirements of the community, is financially feasible, and minimizes impacts to the natural environment the following actions will be taken:

Alternative Energy

Use alternative energy sources, such as solar, geothermal, and hydro, where feasible, within the project.

Solar Lighting

Incorporate solar panels to light trail signage at trailheads where feasible.

Natural Drainage

Employ a surface runoff management system where possible throughout the site that includes biofiltration swales, on-site detention and percolation areas. Ensure the stormwater management plan protects the water quality and quantity entering watercourses.

Increase permeability

Minimize paved road widths, provide parallel parking and sidewalks on only one side of the road, and use permeable paving for parking areas, trails and other areas to reduce site disturbance and increase stormwater permeability.

Rain-water Catchment

Where feasible, use public open spaces such as parks as rain-water catchment areas.

Reduce Water Demand

Reduce water demand through a variety of measures, including:

- o Specification of low flow fixtures;
- o Individual water meters;
- o Minimizing need for landscape irrigation, using high efficiency irrigation systems; and
- o Encourage the capture and reuse of rainwater, particularly for landscape uses.

Solid Waste Management

Support the waste reduction, reuse and recycling initiatives of the SLRD solid waste management plan.

Recycling and Composting

Make provisions for recycling and composting facilities in the design and operations of the site. Ensure all solid waste facilities, including dumpsters and any composting facilities, follow Bear Smart principles.

Infrastructure Policies

- 5.5.1 All community services and infrastructure will meet the standards of Squamish-Lillooet Regional District Subdivision and Development Servicing Bylaw No.741, except where specifically varied by Development Variance Permit. Variance of current standards will be considered by the Regional Board where the variances result in reduced environmental or visual impacts, while still providing a suitable level of service.
- 5.5.2 Prior to adoption of a rezoning bylaw to permit subdivision or development at Porteau Cove, owners must verify that adequate water supply is available, and submit water, sanitary sewer and stormwater sewer master plans for SLRD approval.
- 5.5.3 A public works yard will be required for the community. The size and location of this site will be determined as part of the master plan or subdivision application process as deemed appropriate by the SLRD in consultation with the applicant. The site must be secured prior to adoption of zoning bylaws. All land areas required for the water, sanitary and storm sewer facilities shall be secured by development agreements prior to rezoning, and shall be transferred to the Squamish-Lillooet Regional District at the time of subdivision.
- 5.5.4 Water, sewer and storm sewer systems shall meet all applicable provincial standards, including development and implementation of a water quality monitoring plan for water and sanitary systems..
- 5.5.5 The groundwater aquifer in the Deeks Creek fan shall be protected from contamination through establishment of well head protection areas that incorporate appropriate development setbacks and diversion of surface runoff away from ground water sources/wellheads. A long-term plan for protection of this area and the water supply shall be accepted by the SLRD prior to rezoning.

- 5.5.6 Site development shall follow best management practices for stormwater, with emphasis on flood protection, debris flow protection, and minimizing impacts on watercourses or riparian areas through increased on-site retention and infiltration wherever possible, in accordance with Bylaw 741, provincial stormwater management guidelines and the Development Permit guidelines of this plan.
- 5.5.7 A Fire Protection Plan must be prepared and accepted by the Squamish-Lillooet Regional District prior to completion of the site rezoning. The Fire Protection Plan is to include commitments for sprinklering of buildings, wildfire interface, water supply and fire-fighting services and equipment.

5.6 **Transportation Sustainability Strategy**

The Porteau Cove development will incorporate the following approaches to transportation:

Transportation Alternatives

Encourage transportation alternatives by incorporating transit stops at the highway interchange and a park & ride facility into the design.

Trip Reduction

Support programs such as car sharing, carpooling and vanpooling, and community shuttles and provide suitable site areas to accommodate these programs.

Integrated System

Integrate the roadway, sidewalks and trails so they operate as a comprehensive system, providing transportation options for residents.

Traffic Calming

Reduce speeds and provide traffic calming through minimized paving widths, steeper road grades and design.

Transportation Policies

- 5.6.1 Pedestrian movement in the form of trails and sidewalks will be a priority for all subdivision and development approvals.
- 5.6.2 Alternatives to private vehicle use are supported, and suitable sites shall be provided throughout the community for transit stops and for park and ride facilities near the Village.
- 5.6.3 Road design should minimize the impact on the environment by following the natural contour of the land to the greatest extent possible, providing bridge crossings at creeks, and shall provide adequate areas for future public transit service, emergency vehicles and school bus service.

- 5.6.4 A second access route to the Porteau Cove community is highly desirable, and all efforts shall be made to secure a secondary means of access to accommodate emergency requirements as a minimum.
- 5.6.5 Site design shall accommodate the long-term requirements on the Ministry of Transportation for a future widening of the Sea-To-Sky Highway, and site access will be by means of a grade separated interchange to MOT standards.

5.7 Development Permit Areas

General Guidelines Applicable to All Development Permit Areas

1. Where a property is subject to multiple Development Permit Areas, separate Development Permits under this section are not required, provided the guidelines for each Development Permit Area are addressed in the Development Permit.
2. Development Permits may be issued for phases of development involving several individual buildings or lots where appropriate.
3. Building permits will not be issued unless a development permit is approved by the Squamish-Lillooet Regional District unless otherwise exempted in this Plan;
4. A development permit issued or received under the above does not exempt any person from securing a building permit or any requirement of a bylaw, statute or regulation.

5.7.1 Development Permit Area #3 – Intensive Residential, Multi-family Residential and Commercial Development

Area

The Porteau Cove Development Permit Area #3 is identified on Appendix A attached to this bylaw, and includes sites to be developed as Small Lot Single Family, Duplex, Townhomes, Apartment, Live/Work, Retail or Commercial use.

Category

Pursuant to Sections 919.1(e) and 919.1(f) of the Local Government Act, the Porteau Cove area is designated as a development permit area for the establishment of objectives for the form and character of intensive single-family residential, commercial and multi-family development. For the purpose of this section, intensive single-family residential includes all single-family areas with minimum lot sizes of 600m² or less.

Justification

The Electoral Area D Official Community Plan contains policies and objectives regarding the visual quality along Highway 99 and Howe Sound, providing public access to the shoreline, and encouraging building forms that blend in with the natural surroundings. Creating a new community at Porteau Cove provides the opportunity to implement a high standard of building design and landscaping to ensure these objectives are met. The guidelines are intended to permit development of the land while controlling the character and appearance of the building siting, exterior materials, landscaping, lighting and parking areas.

Guidelines

The following guidelines provide initial guidance for future building form and character. More detailed Development Permit Area guidelines will be prepared and included as part of the zoning bylaw for the Porteau Cove community, particularly to define the building forms that will be developed within Porteau Cove.

Green Building Strategy

1. Buildings in the Porteau Cove community shall incorporate green building standards to the greatest extent possible, including the following design approaches:
 - Providing for rainwater harvesting, green roofs, rooftop gardens;
 - Orienting buildings and structures to maximize solar access;
 - Incorporating larger overhangs;
 - Locating living spaces next to naturally lit areas;
 - Using materials with recycled content;
 - Using rapidly renewable materials where appropriate;
 - Using healthy materials (non-toxic and low-emitting);
 - Specifying low flow plumbing fixtures and appliances, energy efficient lighting and other measures to reduce resource use; and
 - Using roofing materials that are durable, fire retardant and supportive of rainwater harvesting systems.
 - Select materials for durability and ease of maintenance to reduce costs, future waste, cleaning problems and pollution from cleaning materials.
 - Cladding will fit with the site's character, and be sourced regionally where feasible

Sustainable Site Design

2. Overall site design shall be based on sustainability principles, and will:
 - Minimize the extent of site disruption caused by site regrading and cuts and fills for all structures and roads located on slopes by a combination of modulation in building form, tree preservation and extensive revegetation.
 - Preserve existing vegetation to the greatest extent possible, and provide landscaping and screening elements to ensure visual privacy and separation to neighbouring properties and enhance the development.
 - Use exterior lighting of buildings and parking areas that is low intensity and not cause excessive night-time illumination to be cast on adjoining properties or the shoreline, and should be at a pedestrian scale.

General Design Principles

3. The design of buildings and structures should be consistent with the area's coastal temperate rainforest character with the use of pitched roofs, exposed timber and natural materials. Appropriate building materials include wood, stone, treated/textured concrete. Building colours should be muted and consist of natural colours and must also be complementary to neighbouring buildings.
4. The design of buildings should minimize the obstruction of views.

5. The siting and design of all structures must minimize the visual impact of development from Highway 99, Howe Sound and Porteau Cove Provincial Park by appropriate siting of lot and building locations, maximizing tree retention, replanting and careful placement and selection of street and building lighting.
6. The siting of buildings and landscaping shall be used to minimize the noise and visual impacts of Highway 99 and CN Rail lines within residential areas.
7. Long modules of joined units and excessive repetition of unit design shall be avoided.
8. Large surface areas shall be broken down into smaller parking areas (e.g. to a maximum of 20 cars) and landscaped throughout.
9. Commercial area signage shall be compatible with the overall building design elements, and corporate design elements may not be permitted where they conflict with the building design elements or materials. Signs should not be illuminated from within.

5.7.2 Development Permit Area #4– Environmentally Sensitive Areas

Area

Porteau Cove Development Permit Area #4 refers to the site area shown on Appendix 1, which identifies the watercourses, wetlands, riparian areas and old growth forest within the Porteau site. Other environmentally sensitive areas, including important plant communities and areas of fish and wildlife habitat will be identified through the detailed environmental assessment, and will be subject to these guidelines.

Category

Pursuant to Section 919.1(a) of the Local Government Act, the Porteau Cove development site is designated as a development permit area for protection of the natural environment, its ecosystems and biological diversity.

Justification

The Porteau Cove development site includes a range of valuable and sensitive environmental features. Preliminary environmental assessment of the Porteau Cove site (Pottinger Gaherty Environmental Consultants Ltd., March 2005 and PWL Preliminary Rezoning Application, Creeks and Vegetation maps, December 2004) indicates the presence of environmentally valuable or sensitive areas, including an area of old growth forest, possible red-listed plant communities, and a network of permanent and ephemeral streams and wetlands. Ensuring protection of these sensitive areas during development is a fundamental planning principle for the Porteau Cove development and a goal of the Official Community Plan. The use of housing forms and siting to concentrate development in less sensitive portions of the site, leaving a significant portion of the land in a relatively undisturbed state is the primary means of protecting these areas, and to maintaining the visual and environmental qualities of the site.

Guidelines

1. Land must not be altered and building permits will not be issued unless a development permit is approved by the Squamish-Lillooet Regional District unless otherwise exempted in this Plan;

2. A detailed Environmental Impact Assessment and Environmental Management Plan is required to be submitted prior to completion of rezoning for the site. The recommendations of that plan will be used to guide Development Permits for the site, to provide site-specific impact assessment and detailed management recommendations, which may modify the guidelines of this bylaw where appropriate. The detailed environmental assessment will also provide the basis for mitigation and onsite habitat augmentation.
3. Specific environmental protection and enhancement measures applicable to this site include:
 - (a) Establish setbacks along all creeks that protect the integrity and habitat values of the watercourses in perpetuity. Impacts to fish habitat and water quality will be minimized by avoiding wherever possible, watercourses, sensitive wetland and their riparian zones. The number of stream crossings will be kept to an absolute minimum and free-span bridges or arched culverts will be used in stream crossings to preserve the natural streambed habitat.
 - (b) Ensure connectivity for wildlife traversing the site, primarily through the riparian setback corridor. Impacts to wildlife and wildlife habitats will be minimized by avoiding development on or near rare and endangered wildlife species and their habitats, providing buffer zones around sensitive wildlife features and corridors for wildlife movement. Controlled time frames for construction will be established to avoid critical bird nesting periods.
 - (c) Environmentally sensitive old growth forest areas and other areas containing rare or endangered plant species will be protected from development to the greatest extent possible, and where necessary, adequate buffers provided.
 - (d) The stormwater management plan will protect the water quality and quantity entering watercourses, in part through separation of clean runoff from road runoff;
 - (e) Removal of trees and vegetation from the site shall only occur as recommended by the Environmental Assessment, supported by detailed review by a professional arborist. Longer term protection of vegetation on steeply sloped areas may be managed through covenants registered on property titles if appropriate.
 - (f) Plan a plant salvage and replanting program to reuse existing plants on site.
 - (g) Reinforce awareness of natural areas, watercourses, wetlands and the old growth forest through education programs, signage and information kiosks;
 - (h) Use the principles and plant lists contained in the Naturescape Guidelines for site planting where possible;
 - (i) Ensure careful placement of barrier planting using appropriate native species along watercourses and wetlands to discourage public access to sensitive riparian areas;
 - (j) Create or improve wildlife habitats with the use of native plant material and plant massing;
 - (k) Promote the use of indigenous plants in private landscaping, while respecting Firesmart and Bear Smart objectives.

4. Riparian areas shall be protected in accordance with the guidelines and requirements of senior provincial and federal agencies, and in accordance with the Riparian Areas Regulations. The development permit area includes all lands within 30 metres of the top of bank of the watercourse, except where otherwise agreed in consultation with the Ministry of Environment and Fisheries and Oceans Canada, and as provided for under the Riparian Areas Regulations.
5. Environmental and cultural impacts will be minimized or avoided during construction by:
 - (a) preparing an Environmental Construction Management Plan (ECMP) and sediment control plan (SCP) incorporating Best Management Practices;
 - (b) establishing and temporary silt fencing of selected riparian areas to prevent sediment release for the duration of construction;
 - (c) establishing and permanently fencing off selected environmentally sensitive areas;
 - (d) drafting construction tender documents that will require contractor and trade adherence to environmental objectives as part of their contractual obligations;
 - (e) establishing controlled timeframes for construction to avoid construction during wet fall months;
 - (f) providing a professional environmental monitor (EM) with authority to modify construction practices or, if needed, halt construction to protect the environment; and
 - (g) ceasing work and contacting the provincial Archaeology Branch if archaeological materials are discovered during development.

5.7.3 Development Permit Area #5– Natural Hazards

Area

Porteau Cove Development Permit Area #5 refers to the site area shown on Appendix 3 (Potential Natural Hazards) and Appendix 4 (Steep Slopes).

Category

Pursuant to Section 919.1(b) of the Local Government Act, the Porteau Cove development site is designated as a development permit area for the protection of development from hazardous conditions.

Justification

The steeply sloping terrain conditions and presence of numerous watercourses on the Porteau Cove site present special challenges in terms of potential erosion problems, debris flow hazard, stormwater drainage, groundwater management, and protection of the environmental and visual values of steep slopes.

Preliminary geotechnical analysis of the Porteau Cove site (Thurber Engineering Ltd., Porteau Cove Development Geotechnical Hazard Assessment, February 11, 2004) indicates the site is characterized by complex bedrock terrain with generally thin or negligible soil cover, and that the property is potentially affected by debris flows and debris floods which originate in the headwaters of creeks which traverse the property. Kallahne Creek has a moderate risk of debris flow hazard, and a detention basin or creek channelization are under consideration as mitigation measures. Deeks Creek is considered to have a relatively low risk of debris flow hazard, but a deflection berm is indicated on Appendix 3 to minimize the potential for creek avulsion. A similar berm may be required to mitigate potential creek avulsion risk where the Creek 3 channel is in close proximity to Bertram Creek. The report also notes potential localized rockfall hazards due to steep slopes, and the need for precautionary creek channel setbacks. These areas are shown conceptually on Appendix 3, and will require site specific assessment.

Appendix 4 indicates areas of steep slopes on the Porteau Cove site (PWL, Slope Analysis map, August 2005). The Development Permit Area #5 guidelines apply to sloped areas over 20% grade.

Guidelines

1. As a general guide, development should not be sited in areas with natural hazards. Development should be designed to respect natural terrain conditions with minimum disruption to areas of steep slope or natural hazards. Where development occurs within or near hazardous areas, suitable development practices shall be followed and alternative development standards will be considered where the modified standards result in less alteration of natural site conditions.
2. A detailed geotechnical assessment prepared by a qualified geotechnical professional must be submitted as part of the Development Permit application to provide site-specific assessment and building siting and construction recommendations as appropriate. The report shall address all issues related to site drainage, soil slippage, seismic constraints, debris flow and debris flood hazards, creek avulsion and flood hazard, rock fall hazards, site clearing and retention of vegetation on steeply sloped lands. The report shall include recommendations for a Drainage Management Plan and stormwater controls and methods for reducing flows to watercourses and maintenance of groundwater regimes as appropriate. The report shall also identify measures to minimize potential erosion or sedimentation before, during and after site development. The report must certify that the land can be safely used for the purpose intended. The geotechnical report may reference phases of the site development or individual properties as appropriate.
3. Detailed engineering studies may be needed to design either protective or flood control works along stream channels where avulsion hazards are present.
4. As a general guide, no development should occur within 15 metres of the top of bank adjacent to watercourses. More detailed geotechnical investigations on a site-specific basis may modify this setback requirement.
5. Areas of the site with grades of 20-40% as indicated generally on Appendix 4 are intended to be used for development, and site development in these areas must be carefully assessed by a geotechnical engineer and all recommendations for ensuring safety of structures and site stability must be followed. Areas over 40% slope are generally not suitable for development. If portions of these steeper slopes are used for development, they must be fully assessed in a geotechnical report and mitigation measures followed.

6. Prior to approval of subdivision, a geotechnical report must indicate a suitable building envelope and driveway access on each lot. Specific geotechnical reports for individual sites may be also required as appropriate prior to issuance of Building Permit.

5.7.4 Exemptions – Development Permit Areas #4 ((Environmentally Sensitive Areas) and #5 (Hazardous Conditions)

Development Permits are not required:

1. Where an environmental assessment report prepared by registered professionals indicates that development can proceed according to the conditions specified in the report, and where senior provincial and federal agencies have supported the recommendations and conditions of the environmental assessment report in writing;
2. Where there are hazardous conditions requiring development precautions which a professional geotechnical report submitted to the Squamish-Lillooet Regional District indicates can otherwise be regulated by the SLRD zoning or building bylaws, or where the mitigation recommendations of the geotechnical report have been completed prior to subdivision approval and written confirmation has been provided by the geotechnical professional, or where the geotechnical report states that the land can be safely used for the purpose intended;
3. For any development or alteration of a site where the proposed construction, including site development activities such as clearing, grading, trenching or pipe installation is located on a portion of the site outside the designated hazard or environmentally sensitive area, to be confirmed by site survey and written confirmation from the appropriate geotechnical engineer or certified environmental professional;
4. Works approved by the SLRD, Fisheries and Oceans Canada and/or Ministry of Environment with respect to trail construction, stream enhancement, and fish and wildlife restoration.
5. For development that is an addition or alteration to an existing building which does not exceed 40 square metres in size and is located outside any designated hazardous conditions or environmentally sensitive area;
6. Where the development is minor and cosmetic in nature such as the replacement of a door or window, replacement of roofing, repairs to exterior finishes and does not involve altering the structure of the building;
7. For emergency repairs to buildings and structures where there is a demonstrable and immediate risk to public safety or property;
8. For a temporary use for which a Temporary Use Permit will be issued by the Squamish-Lillooet Regional District;
9. To resolve emergency situations that present an immediate danger to the including procedures related to flooding, erosion or other immediate threats to life or property, including removal of hazardous trees.
10. For the construction, repair or maintenance of public works by the SLRD or its authorized agents and contractors.

Map Amendments

- (c) Official Community Plan Land Use Plan Map No.4 is amended to redesignate the properties in Porteau Cove as outlined on Schedule A to this bylaw from “Special Planning Area” and “Resource Management” to “Planned Community”;
- (d) Schedule B to Howe Sound East Sub-Area 3 Plan Map B3 – Development Permit Area- is amended to designate:
 - i. the areas shown on Appendix 1 to this bylaw as Development Permit Area #3 (Form and Character of intensive residential, commercial and multi-family development);
 - ii. the areas shown on Appendix 1 to this bylaw as Development Permit Area #4 (Protection of Environment);
 - iii. the areas shown on Appendix 3 to this bylaw as Development Permit Area #5 (Hazardous Conditions);
 - iv. the areas shown on Appendix 4 to this bylaw as Development Permit Area #5 (Steep Slopes).

6.0 Implementation

Objective

- Work with other agencies, land owners and community residents as required to implement the land use plan.

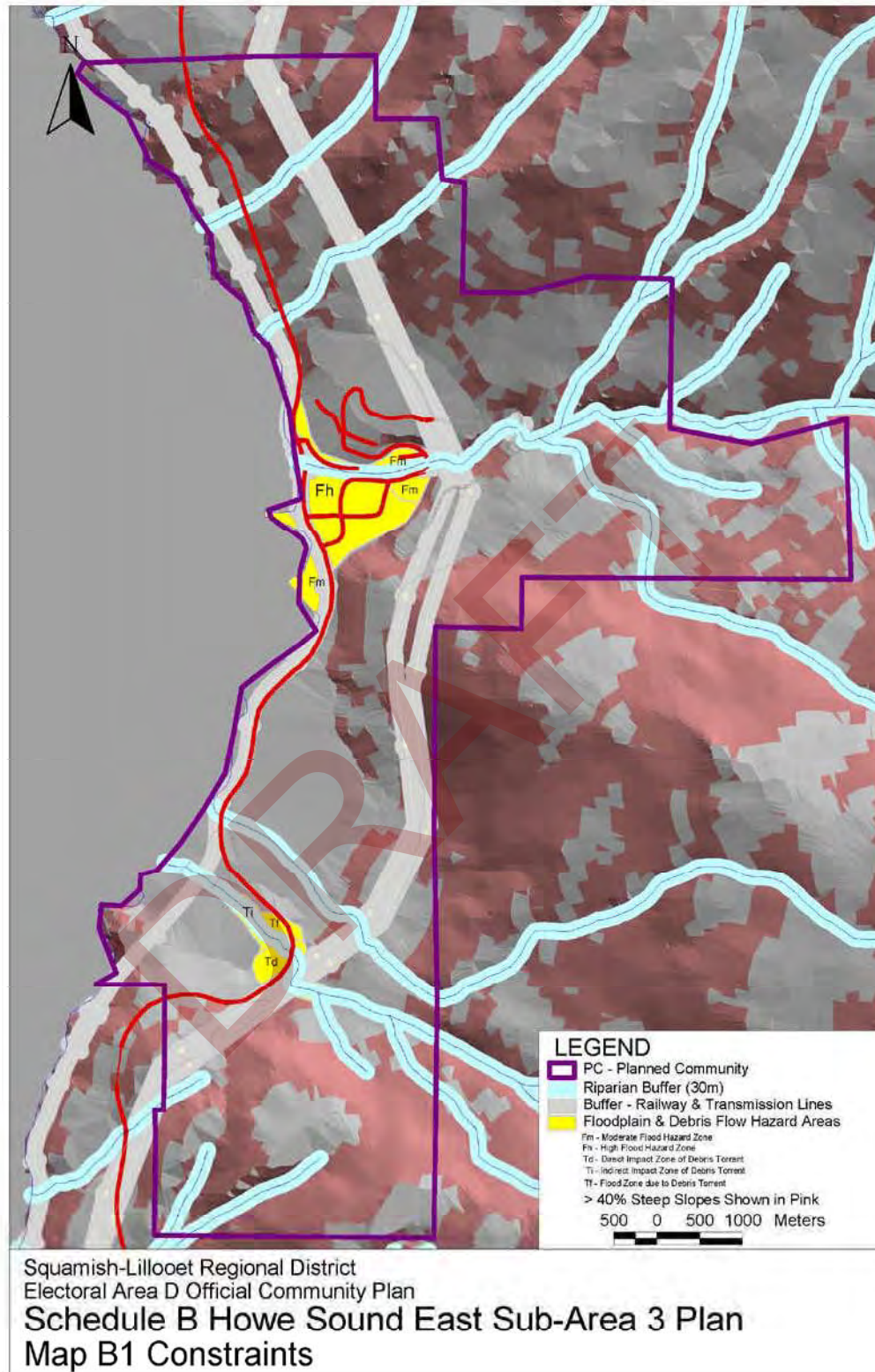
Policies

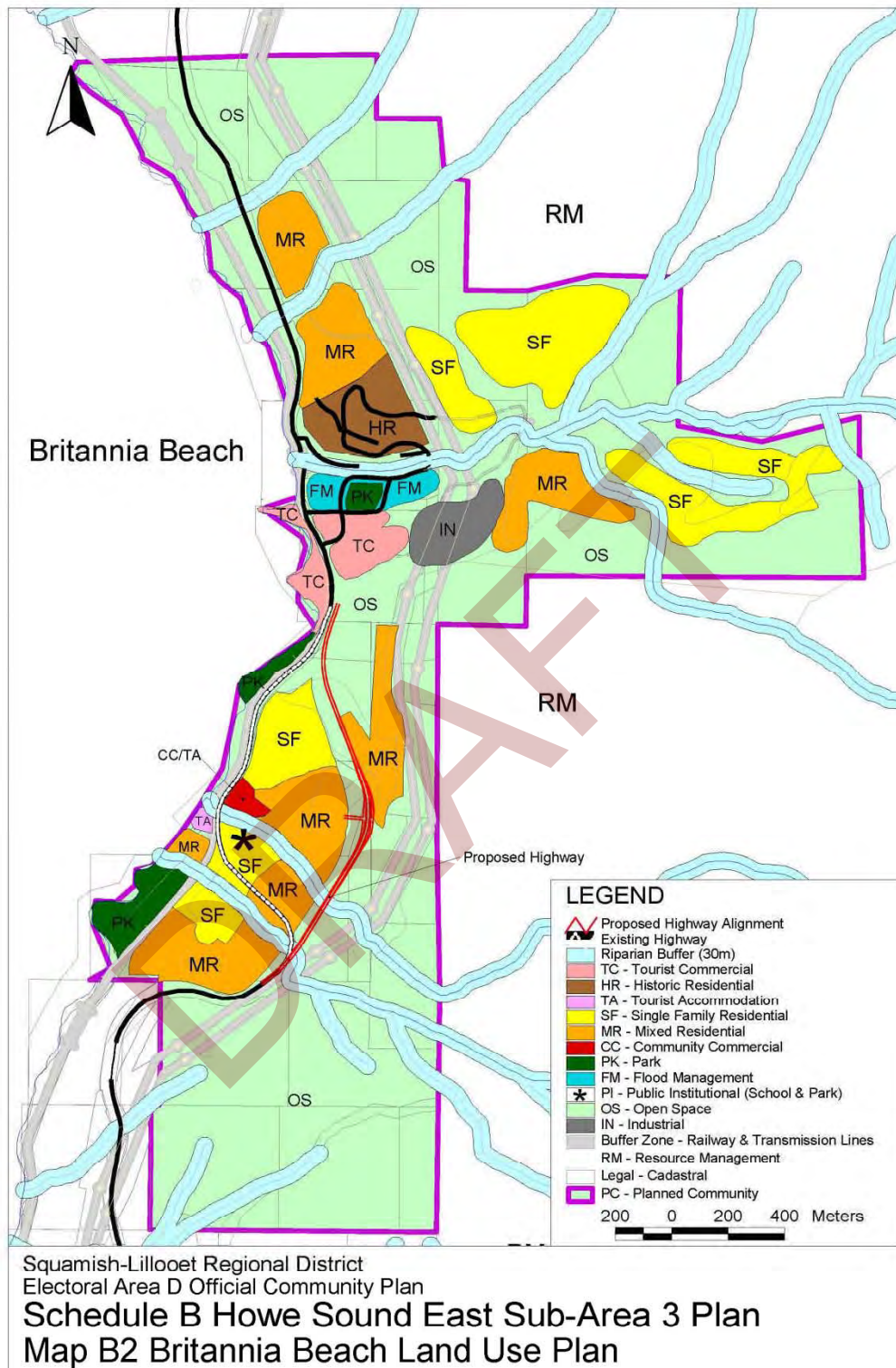
- 6.0.1 Support and encourage commuter rail service along the Sea to Sky Corridor as part of transportation planning studies.
- 6.0.2 Support and encourage development of a Heritage Plan for Britannia North to address issues such as which historic buildings should be protected, which should be kept in their existing locations, which should be moved, and appropriate adaptive reuse of the buildings.
- 6.0.3 If and when future development is planned at Britannia North, support and encourage a transportation planning study to determine how best to provide safe pedestrian and vehicular access across Highway 99 with minimal disruption to the proposed townsite development.
- 6.0.4 Support and encourage the development of municipal road standards for proposed roads within development areas.
- 6.0.5 Consider incorporating into the subdivision servicing bylaw stormwater management provisions consistent with the guidelines in this plan.
- 6.0.6 Support and encourage the preparation of a Management Plan for Britannia Creek to balance flood prevention with fish habitat concerns.
- 6.0.7 Consider the implementation mechanisms available in the *Local Government Act* for provision of amenities and affordable housing in conjunction with future rezoning involving Britannia North or South.

- 6.0.8 Amend the Furry Creek Zoning By-law No. 672, 1998 to incorporate the “Uplands” area and establish zoning regulations consistent with the Preliminary Layout Approval and registered development agreement for the Uplands.
- 6.0.9 For clarity of intent and to assist in future interpretation, the land use designations on Map B2 Britannia Beach Land Use Plan generally represent development concepts. Future land use and development applications that vary in detail from, but are consistent with the overall vision for the community in terms of concept, scale (ie. total number of units), mix of housing types; provision of parks, open space, public facilities and amenities, etc. may be deemed to be consistent with this plan.

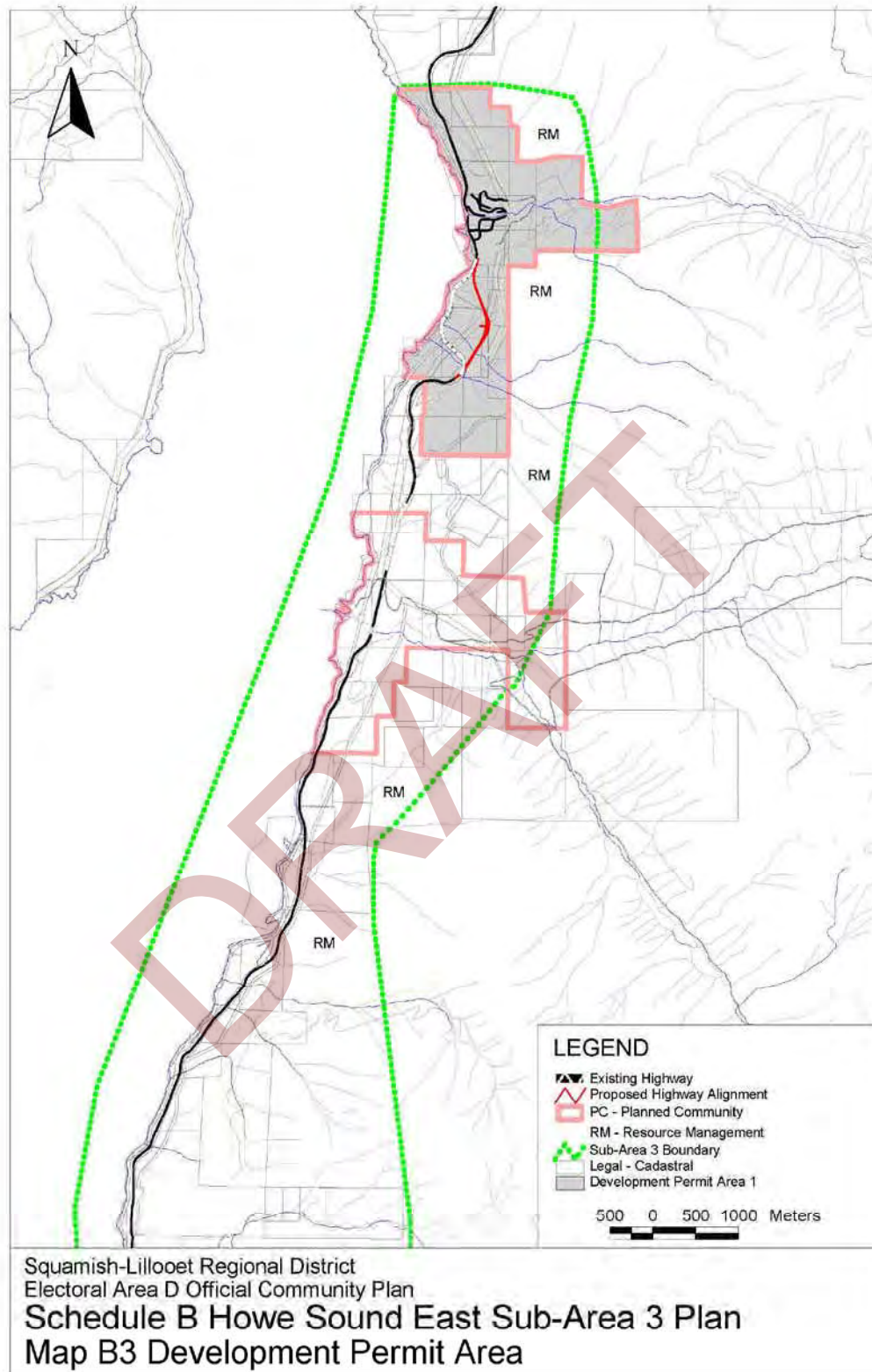
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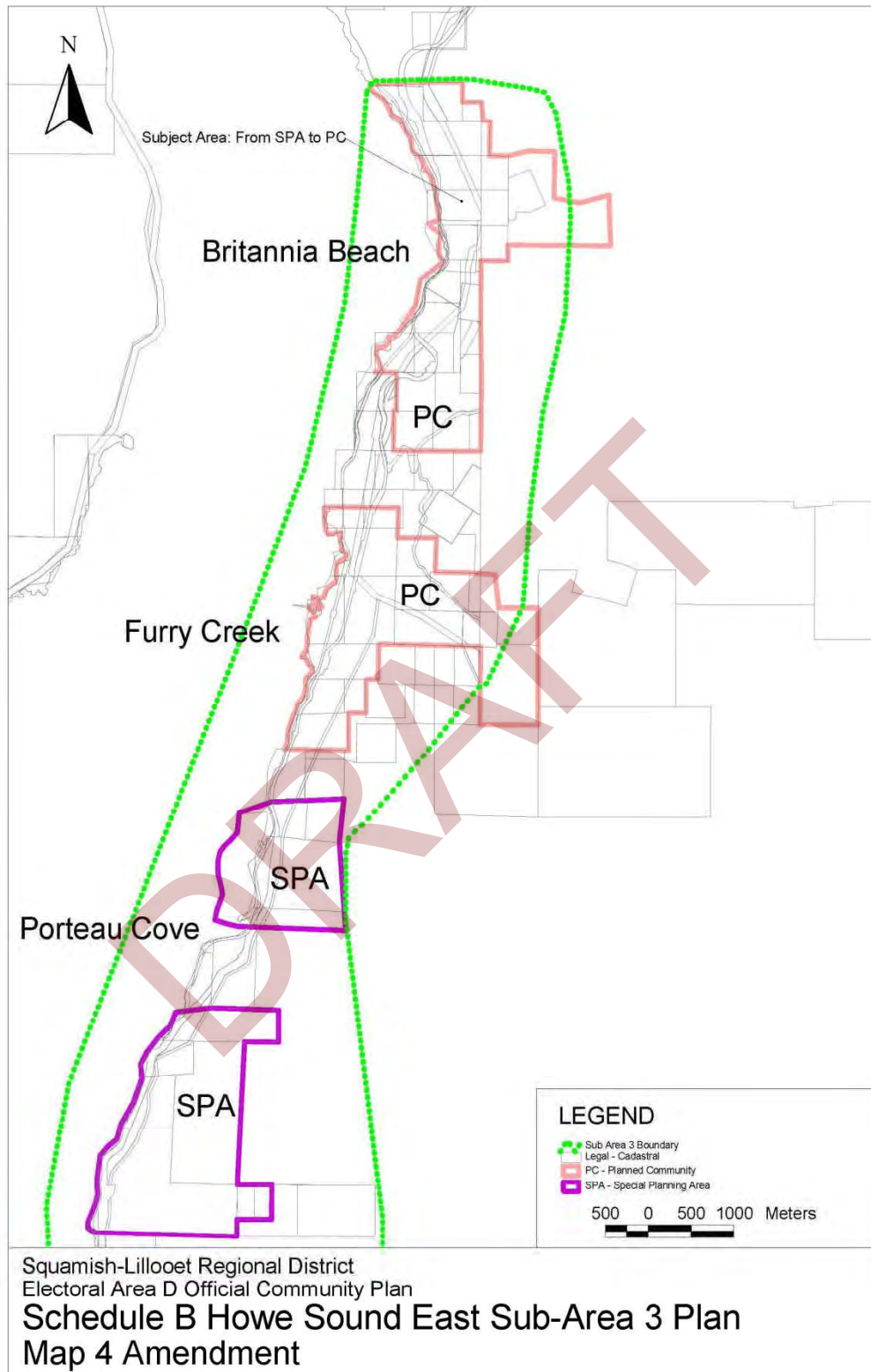




(Plan Amendment By-law 714)



(Plan Amendment By-law 714)



(Plan Amendment By-law 714)

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APPENDIX D
**EXCERPTS FROM PREVIOUS
INVESTIGATION REPORTS**

MAKIN PROPERTY, BRITANNIA BEACH, B.C.

**ENVIRONMENTAL
AND
GEOTECHNICAL ASSESSMENT**

Report

to

CAMPBELL SAUNDERS LTD.

Thurber Environmental Consultants Ltd.
Vancouver, BC

File: 19-2435-0
Date: October 21, 1996

D. Smith, P.Eng.
Project Principal

J. DeCesare, Ph.D.
Senior Environmental Scientist

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Project Geologist

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19-2435-0-2	Site Plan
19-2435-0-3	Monitor Well and Surface Water Sample Locations

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C GROUNDWATER ANALYTICAL RESULTS

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1. INTRODUCTION

This report presents a geotechnical and environmental assessment of the Makin Property near Britannia Beach, south of Squamish, B.C. The assessment is intended to assist in the evaluation of the property.

The study was authorized by Mr. D. Gray of Campbell Saunders Ltd. and has been carried out in general accordance with our proposal of June 20, 1996 except that, as requested by Mr. Gray, the site investigation originally proposed for the second phase of study has been carried out as part of the first phase.

Use of this report is subject to the enclosed Statement of General Conditions.

2. SITE DESCRIPTION

The site, which encompasses 197 ha, is located on the east shore of Howe Sound, approximately 45 km north of Vancouver and immediately south of Britannia Beach, as shown on the location plan, Dwg. 19-2435-0-1. A 1:25000 scale site plan showing the property limits is presented on Dwg. 19-2435-0-2. The property boundaries shown on Dwg. 19-2435-0-2 and -3 are taken from the site plan in the Royal LePage Consulting Services appraisal report of January 31, 1995 for the subject property. The legal descriptions of the 12 parcels which make up the site are given in Appendix D. The legal description is also based on information provided in the Royal LePage appraisal report.

The site is bounded by the Britannia Beach townsite and former Britannia Mine to the north and northeast, forested area to the east, the Furry Creek development to the south and Howe Sound on the western boundary. The majority of the property is located east of Highway 99. Rights-of-way for the B.C. Rail line and B.C Hydro transmission lines traverse the property. Two mountain streams, Thistle and Daisy Creeks flow through the site and

discharge into Howe Sound. Site elevations across the property vary from sea level to El. 340 m.

3. SITE HISTORY

3.1 Information Reviewed

A historical review of landuse and activities on the subject site and surrounding properties was compiled based on the following:

- Air photographs.
- File information and reports by Thurber Environmental Consultants Ltd. (TECL) and Thurber Engineering Ltd. (TEL). TECL and TEL have conducted environmental and geotechnical investigations on the Britannia and Furry Creek lands adjoining the site.
- B.C. Ministry of Energy, Mines and Petroleum Resources' reports.
- B.C. Ministry of Environmental, Lands and Parks' reports.
- Review of reports from other consultants.
- Discussions with people familiar with the site and surrounding area.

3.2 Airphoto Analysis

Airphotos from 1947, 1957, 1969, 1976, 1982 and 1990 were reviewed to identify prior landuses and activities on the site. The key features revealed on the photos were development of a gravel mining operation and the presence of a townsite on the subject property. Gravel extraction was carried out in the area formed by the loop in Highway 99 (see Dwg. 19-2435-0-2) and on the northern portion of the property surrounding and north of Thistle Creek. A townsite was located east of

Minaty Bay in the western part of the loop in the Highway. Several of the homes were located on the west side of Highway 99 near Thistle Creek. Our analysis of the air photos is presented below.

1947 Townsite is visible but Highway 99 has not been constructed. No gravel mining is visible.

1957 Townsite has about 40 residences. Several of the larger buildings are visible along Highway 99 which has been built by this time. Gravel mining has been undertaken at the east end of the loop and northern boundary of the property. A conveyor belt from the north pit over Highway 99 to a barge loading facility along Howe Sound is visible. Several buildings are located on both sides of Highway 99 adjacent to the conveyor belt.

1969 Townsite is visible. In general, all areas north of Thistle Creek and from the Highway to where the slope steepens to the east, have been mined by this time. The conveyor belt and associated buildings over Highway 99 are still visible.

1976 Basically the same as 1969 except mining has expanded south of Thistle Creek and into an area to the east of the townsite (within the Highway loop). A large culvert for vehicle access has been installed under Highway 99, connecting the mine area to the east of the townsite to the larger northern pit. The conveyor belt and associated buildings are no longer present.

1982 It appears that most or all houses from the townsite have been demolished although roads and former house lots are still visible. The former gravel operation to east of the townsite appears overgrown. Significant portions of the main pit are also overgrown.

1990 Townsite is largely overgrown. Some gravel mining has taken place since 1982 in the area east of the former townsite, near Thistle Creek and at the north end of the property.

No evidence of any mine workings associated with the former Britannia Mine, such as adit portals, open pits, waste rock piles, camps or dumps were observed within the property limits on any of the photos.

Anecdotal information from several people familiar with the site confirmed the above findings.

3.3 Off-Site Contaminant Sources

Located directly north and northeast of the subject site, the Britannia Mine operated from 1905 to 1974. Ore was extracted from mine workings comprising approximately 80 km of underground workings and four open pits. Primary access to the underground mine workings was via portals at the 2200 (El. 640 m.), 2700 (El. 470 m) and 4100 (El. 60 m) levels. Portal elevations in feet are identified relative to mean sea level at 4300 feet with decreasing mining level signifying increasing elevation. Elevations in metres are geodetic with El. 0 m at mean sea level or mining level 4300. Major portals are shown and identified on Dwg. 19-2435-0-2. The 4100 portal is the closest to the subject property, with the other mine workings being relatively remote.

Milling facilities to process the ore to produce copper, zinc and pyrite concentrates were located at Britannia Beach.

The principal environmental and contaminant concerns associated with the mine is the generation of acid rock drainage (ARD). ARD is initiated by surface water infiltration from the Jane Basin into the underground workings, subsequent oxidation of naturally occurring sulphide minerals and generation of sulphuric acid. ARD is characterized by low pH and high metal (primarily copper, zinc and iron) concentrations. The principal

receptor for ARD is Britannia Creek and Howe Sound. The main ARD releases are:

- Drainage from the 2200 portal into Jane Creek, which flows into Britannia Creek.
- Drainage from the 4100 portal which collects the vast majority of ARD within the underground workings. This drainage is discharged to Howe Sound via a deep outfall if copper concentrations are below 15 mg/L or directed to a copper cementation plant if copper concentrations exceed 15 mg/L. Treated ARD is then directed to the outfall.
- Direct discharge to Howe Sound via the underground workings which extended below sea level.
- Minor ARD contributions from the 2700 portal into Mineral and Britannia Creeks and discharge from waste rock dumps. These also discharge into Britannia Creek.

Mine workings were also located in the Furry Creek Valley. These works included the Victoria Camp, a portal at 1800 level (El. 760 m), associated adits and waste rock dumps. To date, only one ARD discharge point has been identified, the β -portal at El. 1000 m (1000 level), immediately west of Empress Creek, approximately 7 km upstream of the mouth of Furry Creek. Sampling and analysis of Furry Creek revealed no measurable impact on creek water quality from this ARD source.

In summary, no mine workings or direct ARD discharges onto the subject property were identified.

4. FIELD PROGRAM

4.1 Site Reconnaissance

An initial site reconnaissance was conducted by Dr. J. DeCesare, Ph.D. and Mr. D. Hill, P.Eng. of TEL on June 21, 1996. A second reconnaissance was undertaken by Mr. D. Newton, P.Geo. of TEL on July 23 during the site investigation program described in Section 4.2.

4.2 Monitoring Well Installation and Sampling

A preliminary field program was undertaken to evaluate groundwater and surface water quality on the site. Monitor well locations, shown on Dwg. 19-2435-0-3, were selected to detect any contamination of groundwater resulting from seepage and ground infiltration of ARD, most likely from the 4100 level where the majority of ARD is collected. The settling ponds located below the treatment plant are an additional potential source of ARD seepage.

Three monitor wells were installed on July 23, 1996 using a truck-mounted Becker Hammer drill. All holes were drilled to 7.3 m with open casing. A closed end Becker Penetration Test was also completed at MW 96-3.

Soil conditions were logged during drilling and representative samples were collected at regular intervals for routine visual classification and moisture content determination in the laboratory.

Monitor wells were installed in the open casing. The annulus between the casing and the well was backfilled with silica sand to above the screened section and sealed with bentonite. Wells were developed by removing 5 well volumes with a Waterra inertial pump and purged to constant conductivity readings prior to sampling on August 2, 1996.

Samples for metals were filtered using Waterra (Model FHT-700) in-line 0.45 micron filters. Nitric acid was added in the field to preserve the samples prior to placement in a chilled cooler for transport to Cantest Laboratories. Samples were submitted to the laboratory with accompanying chain of custody documentation.

4.3 Surface Water Sampling

Sample station locations on Thistle and Daisy Creeks are shown on Dwg. 19-2435-0-2. Sample locations were determined based on accessibility and flow conditions.

Samples were collected by immersing the container directly into the stream. Sample locations in Thistle and Daisy were limited by water conditions in the creeks during the sampling program on August 2, 1996. Thistle Creek was dry approximately 150 to 200 m east of Highway 99. Sample "Thistle 1" was collected 30 m upstream of the termination of surface flow. The sample station was located approximately 30 m downstream of a derelict bridge along the gravel road which connects the former gravel mine with the former townsite via the culvert below Highway 99.

Samples "Thistle 2" and Daisy 2" were collected 10 m above the BC Hydro right-of-way. Daisy Creek had surface water flow across the Hydro right-of-way at which point it became dry. Surface water was observed again from 30 m above to 60 m downstream of the Highway 99 crossing. "Daisy 1" was collected approximately 50 m below the highway. Daisy Creek was dry the remaining distance to its discharge point into Howe Sound. Conductivity and pH measurements were made in the field.

5. RESULTS OF FIELD PROGRAM

5.1 Site Reconnaissance

The southern portion and the eastern half of the north portion of the property are largely steeply sloping, rocky and forested land. These areas are accessible by passable and overgrown gravel roads associated with past logging and powerline construction activities. No evidence of mine workings, tailings ponds, dumps or hazardous materials was noted in these areas during the reconnaissance.

Overgrown asphaltic concrete and gravel roadways, above ground powerlines and localized clearings were noted in the area of the former townsite immediately east of Minaty Bay. In addition, the former foundations of several residence were visible. The former townsite is largely overgrown. No evidence of above or below ground tanks were noted. Household debris (ie. bathtubs, plastic, lumber) was noted locally. Minaty Bay is currently being used for recreation (ie. swimming).

The former gravel mining operation in the north portion of the property is largely flat with local mounds and is largely overgrown with shrubs. Approximately 70 to 100 loads of soil have been dumped in the north end of the property near MWs 96-2 and 96-3. The piles comprise varying proportions of silt, sand, gravel, cobbles and boulders with occasional asphaltic concrete fragments and rarely debris (ie. plastic pipe, wood). Some metal slag and debris was noted in approximately 5 to 10 truck loads near MW 96-3.

A 7,000 to 12,000 m³ stockpile of gravel, cobbles and boulders with some sand and occasional silt and asphaltic concrete is located in the northern portion of the pit near MW 96-1. Some cobbles and boulders are oxidized and appear to contain trace levels of sulphide minerals. This material was reportedly removed from Britannia Creek following the flood of 1993.

Two empty and one partially full 220 L drums of Jet B aviation fuel are stored in the centre of the pit. We understand that this area is being used by a local helicopter company to refuel on-site while working in the vicinity. Only minor surface staining was observed near the drums.

5.2 Soil Conditions

Generalized descriptions of the soil conditions encountered are given below. The 3 test hole logs in Appendix A provide detailed descriptions of the soil conditions encountered in the investigation and should be used in preference to the generalized descriptions.

The 3 test holes encountered sand with varying gravel and silt content for the entire 7.3 m depth of investigation. A Becker Penetration Test completed in MW 96-3 indicated the soils are loose to compact in the upper 3.5 m, but dense below. The shallow soils at all three well locations have likely been disturbed during past mining operations but the contact between fill and native soils was not readily apparent.

No staining, suspect odours or mining residues (tailings, waste rock) were noted in any of the holes.

5.3 Groundwater Levels

Groundwater depths ranged from 2.9 to 3.6 m below ground surface in the three wells. No sheen or odour was noted during development or sampling of wells.

5.4 Groundwater and Surface Water Quality

5.4.1 Data Evaluation Criteria

Groundwater and surface water analytical results were evaluated by comparison to marine aquatic life criteria stipulated in the "Approved &

Working Criteria For Water Quality, Ministry of Environment, Water Management Division, Water Quality Branch, May, 1992" and to "Canadian Water Quality Guidelines for Protection of Community Water Supplies (Revised December 1995)". Marine criteria are considered the appropriate aquatic life evaluation criteria because groundwater and surface water (Daisy and Thistle Creeks) discharge to Howe Sound, a salt water body.

5.4.2 Groundwater Quality

Analytical results for monitor well samples are presented in Table 1. Groundwater is characterized as follows:

- pH is near neutral, with values of 6.6 and 6.7. ARD pH values measured at Britannia Mine are typically in the 3 to 4 range.
- Conductivity readings of 25 to 104 us/cm are very low compared to a typical ARD value of 1000 to 3000 us/cm.
- Dissolved copper and zinc concentrations of 2 to 4 ppb and 9 to 13 ppb respectively are considered background levels. For comparison, Cu and Zn ARD values are in the range of 20 to 100 ppm for Cu and 40 to 60 ppm range for Zn.
- All dissolved metals concentrations are below marine aquatic life and drinking water criteria.

The above results indicate that there is no measurable impact of ARD on groundwater quality.

Examination of the purge water and samples revealed no evidence of hydrocarbon contamination such as sheens or odours. Light and heavy extractable petroleum hydrocarbon (LEPH/HEPH) concentrations were below the 1 mg/L detection limit.

5.4.3 Surface Water Quality

Analytical results are summarized in Tables 2 and 3. Examination of the data reveals the following:

- pH values in Daisy Creek are nominally below the 6.5 freshwater aquatic life criterion stipulated in the Canadian Water Quality Guidelines. Thistle Creek values are nominally below the guideline at the upstream end and above the guideline at the downstream sample station. Low pH values are characteristic of creeks flowing into Howe Sound (Percival et al, 1992)¹
- All total metal concentrations are below both aquatic life and drinking water criteria. These results suggest no discernible impact of ARD on water quality in these creeks. These results are in agreement with prior studies by the Ministry of Environment and others, which detected no elevated metal concentrations in Thistle and Daisy Creeks.
- Dissolved anion and nutrient concentrations are very low and well below applicable criteria. Upstream and downstream values are essentially identical.
- Bacteriological results for total and fecal coliforms exceed the corresponding guidelines of no fecal and less than 10 total coliform organisms per 100 mL. Bacterial pollution of these streams is likely a result of the combined effect of low stream flow and fouling by local wildlife. Disinfection would be required to produce drinking water of acceptable quality.

¹For references, see Section 9.

6. GEOTECHNICAL ASSESSMENT

6.1 Gravel Reserves

As described in Section 5.1, gravel mining operations have left a largely flat area, at Highway 99 level along the foreshore, with one large stockpile and several mounds of primarily granular material left on the pit floor. Therefore, the gravel reserves are negligible without one or both of the following actions:

- Lowering of the pit floor to below the foreshore level of the Highway. The site investigation results reported in Section 5.2 show the pit floor to be underlain by at least 7 m of granular material with the groundwater table at about 3 m depth in mid-summer. Thus, providing there is no significant seasonal rise in the groundwater table, which would have to be shown by continued monitoring of the wells, and basements are not contemplated for the development, a further 1 to 2 m of gravel could be removed. This would provide about 150,000 to 200,000 m³ of granular material assuming an average depth of 1.5 m is excavated from the base of the previously mined areas.
- Realignment of Highway 99 to eliminate the loop on the descent to Britannia Beach. The Highway is currently located on a gravel ridge which would become available if the alignment is moved to the east side of the pit and is built as a side hill cut-and-fill. This is currently under study by McElhanney Consulting Services Ltd. Assuming none of the gravel underlying the existing Highway is utilized for the revised alignment, a further 150,000 m³ is estimated to be available.

6.2 Debris Flow and Flooding Hazards

6.2.1 General

The 1983 study by Thurber Consultants Ltd. for the BC Ministry of Transportation and Highways concluded that Thistle and Daisy Creeks have a low debris flow hazard. Additional field and office studies were carried out in 1987 for Makin Pulp and Paper Ltd. The results of these studies are summarized below.

6.2.2 Thistle Creek

Thistle Creek is a stream with a drainage area of 1.6 km², channel length of 2.8 km and a total vertical relief of approximately 800 m. Its maximum instantaneous flood discharge with a 200 year return period has been estimated as 20.6 m³/s.

The stream originates on the western slopes of the Coast Mountains in an area of relatively moderate relief. The upper watershed is formed by bedrock covered by thin soil veneer. It is overgrown by mature, second growth, coniferous forest.

Deposition of debris by the creek appears to occur in two main areas, separated by a bedrock exposure. The lower deposition area coincides with the eastern margin of the gravel pit. The upper deposition area, identified on airphotos, is on a bench upstream of the power line and first waterfall.

There is evidence of occasional avulsion of the creek channel near the power line, producing flood flows in distributary channels to the south of the main channel.

If a debris flow were to occur on Thistle Creek, much of it would deposit on the bench in the vicinity of the power line and none is expected to

reach Highway 99 or the railway. Thus, no development restrictions need apply below El. 30 m as regards debris flow.

The channel for Thistle Creek though the gravel pit has been excavated approximately 6 m wide and 3 m deep, with 2 m high marginal dykes of loose sand and gravel. This channel cross-section is probably sufficient to carry the 200 year flood discharge for a short time, but may be subject to extremely rapid bank erosion and slumping, which could lead to an avulsion to either the north or south side of the channel and flooding of the adjacent areas. Flooding could also result from flow constriction at the existing Highway 99 and railway culverts.

6.2.3 Daisy Creek

The channel of Daisy Creek, at least up to the old Britannia Mine water supply pipeline, is well incised and stable. One point exists where channel overflow to the south could occur and this is in a sharp bend approximately 50 m upstream of Highway 99. Downstream of the Highway, the channel is cut in erodible sand and gravel and potentially unstable, although there are few signs that flood overflow has occurred since the Highway was built.

If a debris flow were to occur on Daisy Creek, most of the debris would be deposited within 50 m uphill and downhill of the Highway embankment. Some run-out may occur along the Creek channel for a further 150 m. Development restrictions should apply to this areas.

Daisy Creek could cause flooding as a result of channel overflow to the left upstream of the Highway, overflow to the right in the event of the Highway culvert being plugged by time or other debris and general overflow on the flat part of the site downstream of the Highway. Most of the flat area south of Thistle Creek must therefore be considered subject to potential flooding from Daisy Creek.

7. CONCLUSIONS

The principal findings of the study completed to date are as follows:

- Landuse on the subject site comprised a gravel mining operation and residential community. A reconnaissance of the property revealed no significant contaminant concerns. Because of the high water table, it is likely that fuel storage tanks for home heating would have been installed above ground.
- The former Britannia Mine is located to the north and northeast of the property. Based on a review of available reports and records and anecdotal information, it is concluded that no mine workings were located on the subject site. The conclusion is supported by a site reconnaissance which uncovered no evidence of mine workings such as adits and waste rock dumps or a mine camp.
- Surface water flow and drainage around the former mine workings is principally into the Britannia Creek catchment. A minor ARD discharge to the Furry Creek via the β -portal at El. 1000 m has been identified. No direct ARD drainage onto the subject property has been identified.
- No groundwater contamination by metals or petroleum hydrocarbons was identified. Groundwater sampling and analysis at the north-western portion of the site detected no evidence of groundwater deterioration by ARD. All dissolved metal concentrations were essentially at background levels and within marine aquatic life and drinking water guidelines.
- Surface water quality for metals and anions in Thistle and Daisy Creeks which flow through the site was within corresponding marine life and drinking water/fresh water aquatic life criteria.

- Bacteriological tests revealed the presence of fecal coliforms and total coliforms which exceed the drinking water guidelines. Elevated bacterial counts are likely the results of low stream flow and wildlife fouling of the stream.
- Geotechnical hazards on the property are derived from potential debris flows on Thistle and Daisy Creeks and flooding caused by the Creeks. These hazards will change if the Highway 99 alignment is revised. Remedial measures to minimize the risk to the property are feasible.
- Gravel reserves on the property are negligible unless the pit floor is lowered close to the water table, or Highway 99 is realigned to the east to allow the gravel ridge on which it is now located to be excavated.

8. RECOMMENDATIONS

No further soil or groundwater investigation is considered warranted based on the preliminary field investigation results. If any contaminant issues are encountered during site development, an environmental consultant should be retained to evaluate the concerns and identify appropriate action.

9. REFERENCES

Goyotte, D. and Ferguson, K. 1985. Environmental Assessment of the Britannia Mine - Howe Sound. File Report. Department of the Environment, Environmental Protection Services Pacific Region North Vancouver, BC.

Moore, B. 1984. Anaconda Britannia Mines, Copper Beach Estates. AE-2194. Receiving Environment Study. Prepared for Waste Management Branch, Ministry of Environment Surrey, BC.

Percival, J.B., Murdock A., Hall, G.E.M., and Dunn, C.E. Geochemical studies in the Howe Sound drainage basin, British Columbia. Current Research, Part A; Geological Survey of Canada, 1992.

Thurber Consultants Ltd. Debris Torrent and Flooding Hazards, Highway 99, Howe Sound. Report to BC Ministry of Transportation and Highways, April 1983.

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STATEMENT OF GENERAL CONDITIONS

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering or environmental consulting practices in this area. No other warranty, expressed or implied, is made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorized use of the Report.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgemental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

(see over...)

Table 1

ANALYTICAL RESULTS FOR MONITOR WELLS

	MW 96-1	MW 96-2	MW 96-3	Marine Aquatic Life Criteria	Drinking Water Criteria
pH	6.7	6.6	6.7		6.5 - 8.5
Conductivity	25	104	45		
Hardness	12.5	57.7	20.8		
Aluminum	111	82	107		200
Arsenic	0.2	0.2	<0.1	36	25
Barium	<10	10	<10	500	1000
Beryllium	<5	<5	<5	100	
Cadmium	<0.2	0.3	<0.2	9	5
Chromium	<1	<1	<1	50	50
Cobalt	<20	<20	<20		
Copper	4	3	2	3	1000
Iron	60	30	70	300	300
Lead	<1	<1	<1	2	10
Manganese	12	24	48	100	50
Mercury	<0.05	<0.05	<0.05	20	1
Molybdenum	<30	<30	<30		
Nickel	<20	<20	<20	75	
Selenium	<0.5	<0.5	<0.5	54	10
Silver	<0.1	<0.1	<0.1	2.3	
Sodium	2	6	4		200
Vanadium	<30	<30	<30		
Zinc	9	13	9	86	5000

All results in ppb except sodium (mg/L)
 pH and conductivity measured in the field
 Conductivity (uS\cm)

* Criterion dependent on pH

** Criterion dependent on hardness

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Table 2

THISTLE AND DAISY CREEKS - METALS

	DAISY 1		DAISY 2		THISTLE 1		THISTLE 2		Marine Aquatic Life Criteria	Drinking Water Criteria
	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total		
METAL										
Aluminum	34	35	53	52	46	133	54	87	36	200
Arsenic	0.1	0.1	0.1	0.1	<0.1	0.1	<0.1	<0.1	25	25
Barium	<10	<10	<10	<10	<10	<10	<10	<10	500	1000
Beryllium	<5	<5	<5	<5	<5	<5	<5	<5	100	
Cadmium	0.7	0.9	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	9	5
Chromium	<1	<1	<1	<1	<1	<1	<1	<1	50	50
Cobalt	<20	<20	<20	<20	<20	<20	<20	<20		
Copper	1	1	1	1	1	1	1	1	3	1000
Iron	<30	<30	<30	<30	<30	<30	<30	30	300	300
Lead	<1	<1	<1	<1	<1	<1	<1	<1	2	10
Manganese	<5	<5	<5	<5	<5	<5	<5	<5	100	50
Mercury	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	20	1
Molybdenum	<30	<30	<30	<30	<30	<30	<30	<30		
Nickel	<20	<20	<20	<20	<20	<20	<20	<20	75	
Selenium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	54	10
Silver	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.3	
Sodium	<2	<2	<2	<2	<2	<2	<2	<2		<200
Vanadium	<30	<30	<30	<30	<30	<30	<30	<30		
Zinc	<5	8	6	<5	11	<5	9	<5	86	5000

All results in ppb except for sodium (mg/L)

* Criterion dependent on pH

** Criterion dependent on hardness

file:\19\2435-0b\surface\ex\l

Table 3

THISTLE AND DAISY CREEKS - PHYSICAL AND ORGANIC PARAMETERS

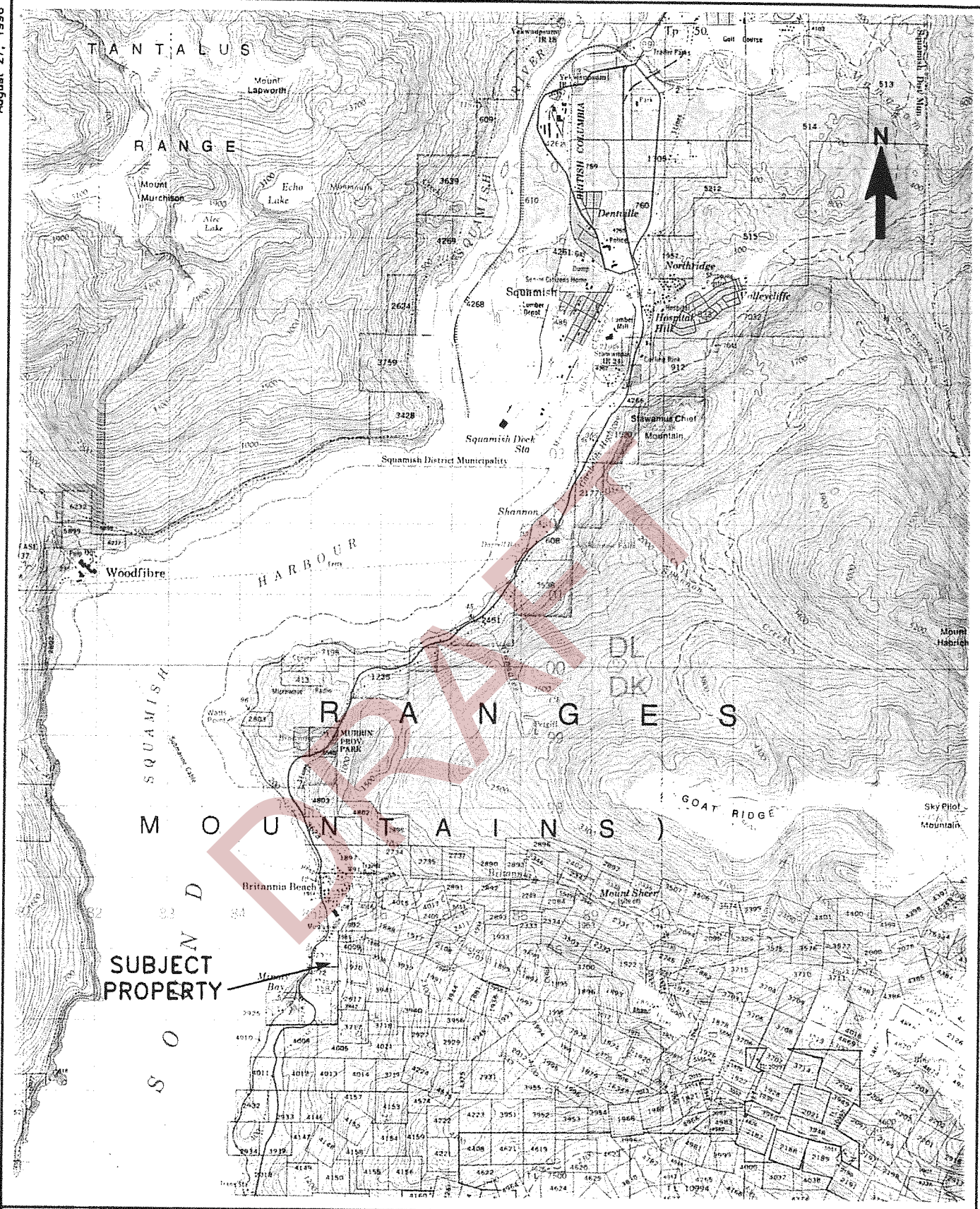
	DAISY 1	DAISY 2	THISTLE 1	THISTLE 2	Marine Aquatic Life Criteria	Drinking Water Criteria
Physical Tests						
Colour CU	<5.0	<5.0	5.9	<5.0		
Conductivity (uS/cm)	33.8	32.8	71.2	74.2		
Total Dissolved Solids	25	25	48	44		
Hardness (CaCO3)	11.9	11.7	32.6	33.9		
pH	6.0	6.3	6.7	6.4	6.5 - 9	6.5 - 8.5
Turbidity (NTU)	0.1	<0.1	0.2	0.1		
Dissolved Anions (mg/L)						
Alkalinity - Total (CaCO3)	8.6	8.2	26.7	27.6		
Chloride Cl	0.6	<0.5	<0.5	<0.5		250
Fluoride F	0.03	0.03	0.03	<0.02	1500	1500
Sulphate SO4	4.2	4.1	6	6.1		500
Nutrients						
Nitrite/Nitrate (as N, mg/L)	0.31	0.287	0.124	0.071		10000
Bacteriological Tests (CFU/100mL)						
Coliform Bacteria - Fecal	4	3	68	4		0
Coliform Bacteria - Total	18	50	240	47		<10

- pH and conductivity measured in the field

CFU - Colony Forming Units

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August 27, 1996

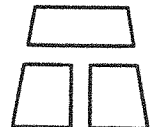


DESIGNED	DN
DRAWN	KM
DATE	August 27, 1996
APPROVED	
SCALE	1:75,000

Campbell Saunders Ltd.

LOCATION PLAN

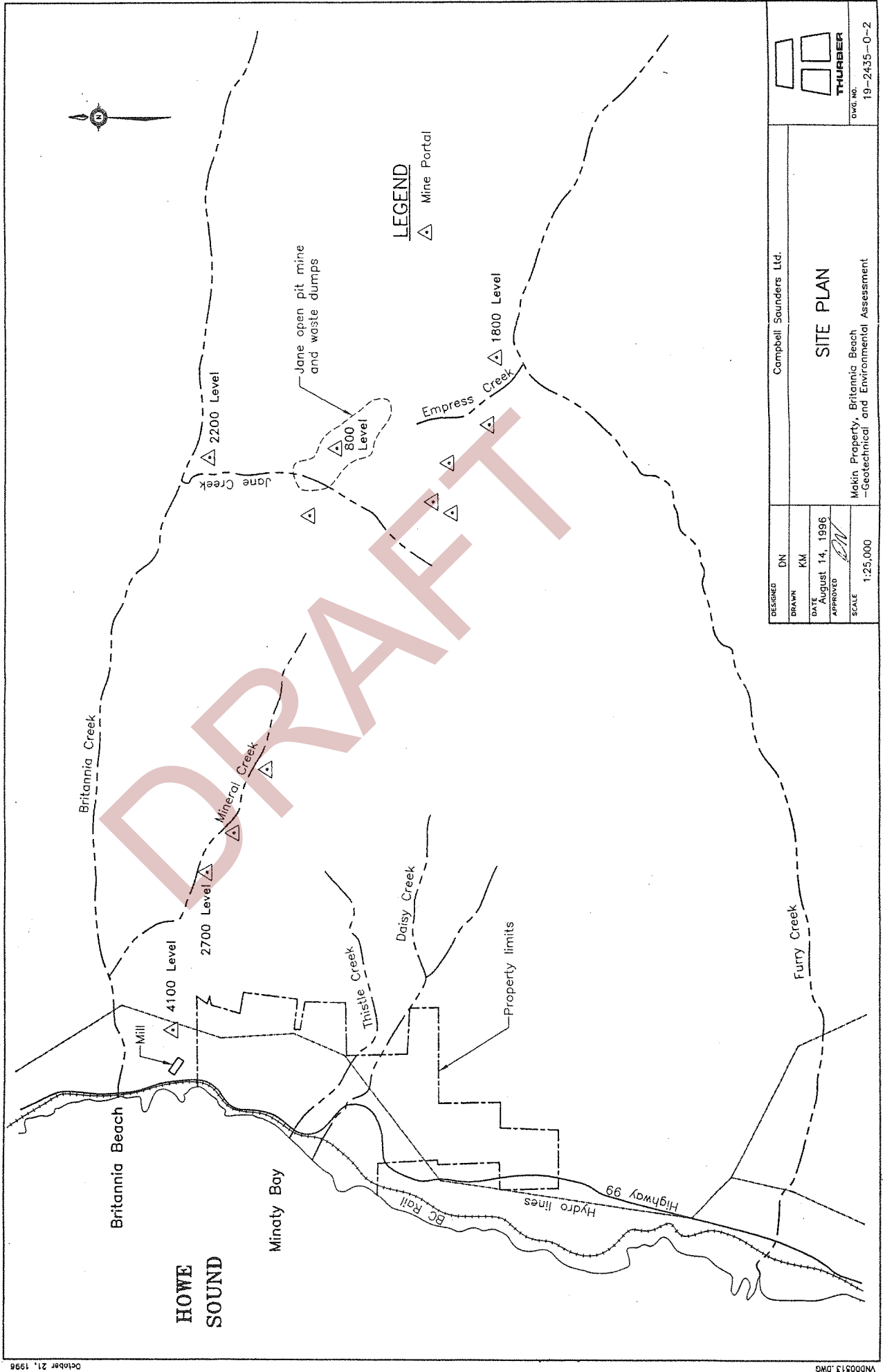
Makin Property, Britannia Beach
-Geotechnical and Environmental Assessment

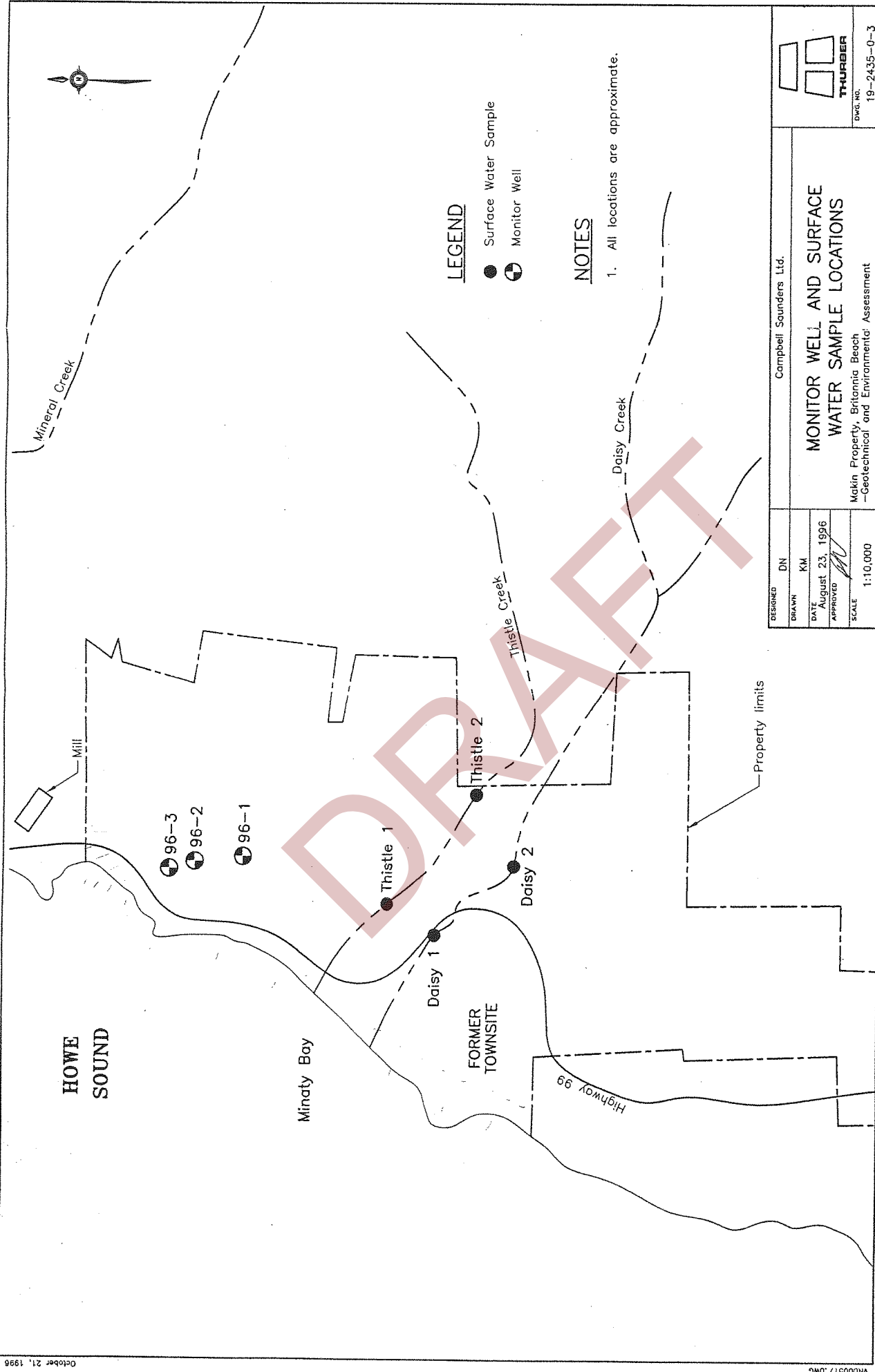


THURBER

DWG. NO.
19-2435-0-1

19-2435-0-1.DWG





DESIGNED		DN	 Campbell Saunders Ltd. DWG. NO. 19-2435-0-3
DRAWN		KM	
DATE		August 23, 1996	
APPROVED			
SCALE		1:10,000	

MONITOR WELL AND SURFACE WATER SAMPLE LOCATIONS

Makin Property, Britannia Beach
-Geotechnical and Environmental Assessment

LOG OF TEST HOLE

TEST HOLE NO.

96-1

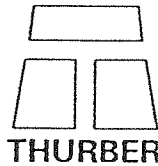
LOCATION: See Dwg. 19-2435-0-3

TOP OF HOLE ELEV:

METHOD: Becker Hammer

DRILLING CO.: SDS Drilling

INSPECTOR: DN



CLIENT: Campbell Saunders Ltd.

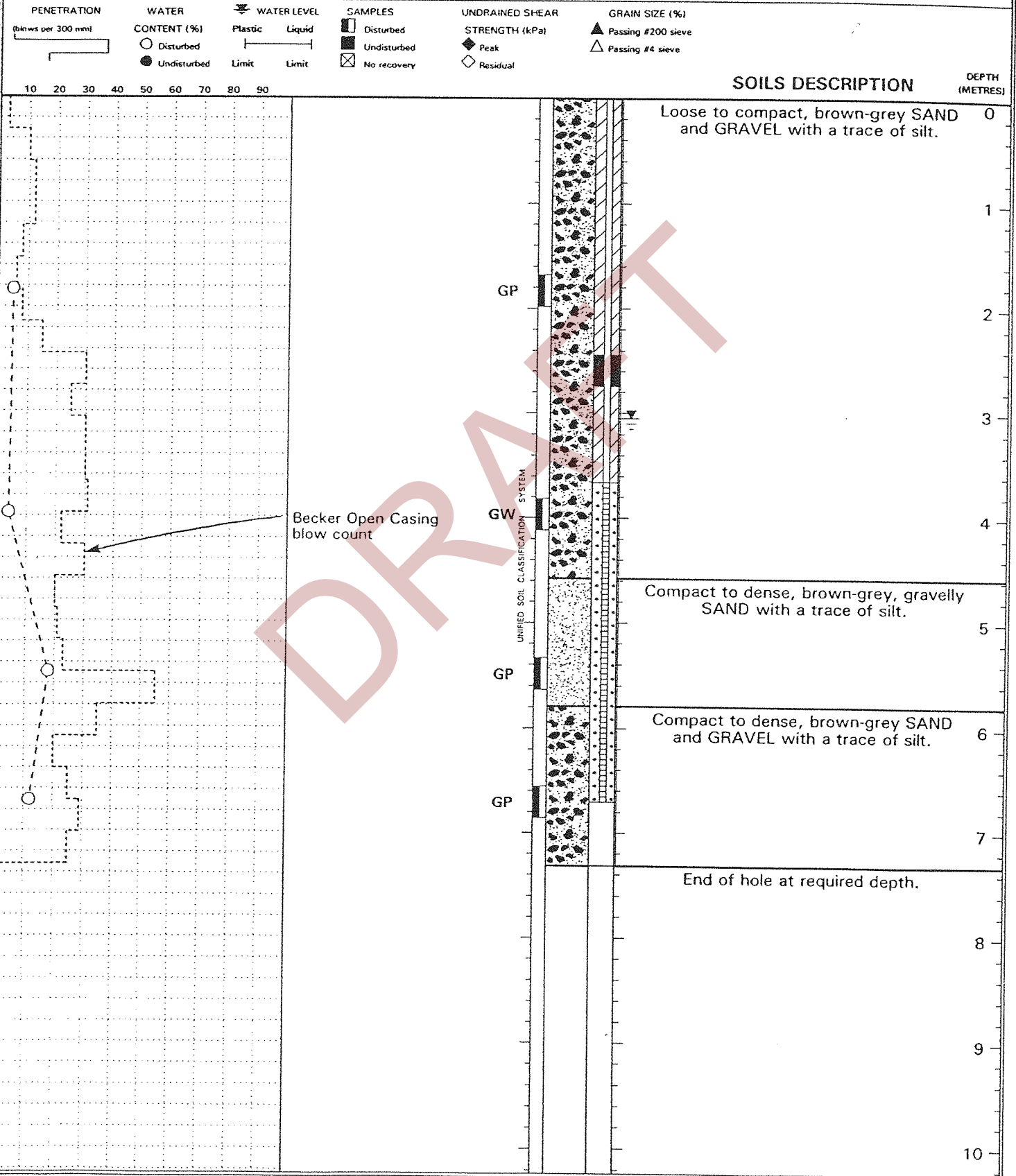
PROJECT: Makin Property

Brittania Beach, BC

DATE: July 23, 1996

FILE NO.: 19-2435-0

SCALE: 1:50



LOG OF TEST HOLE

TEST HOLE NO.

96-2

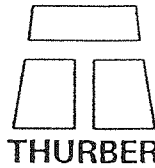
LOCATION: See Dwg. 19-2435-0-3

TOP OF HOLE ELEV:

METHOD: Becker Hammer

DRILLING CO.: SDS Drilling

INSPECTOR: DN



CLIENT: Campbell Saunders Ltd.

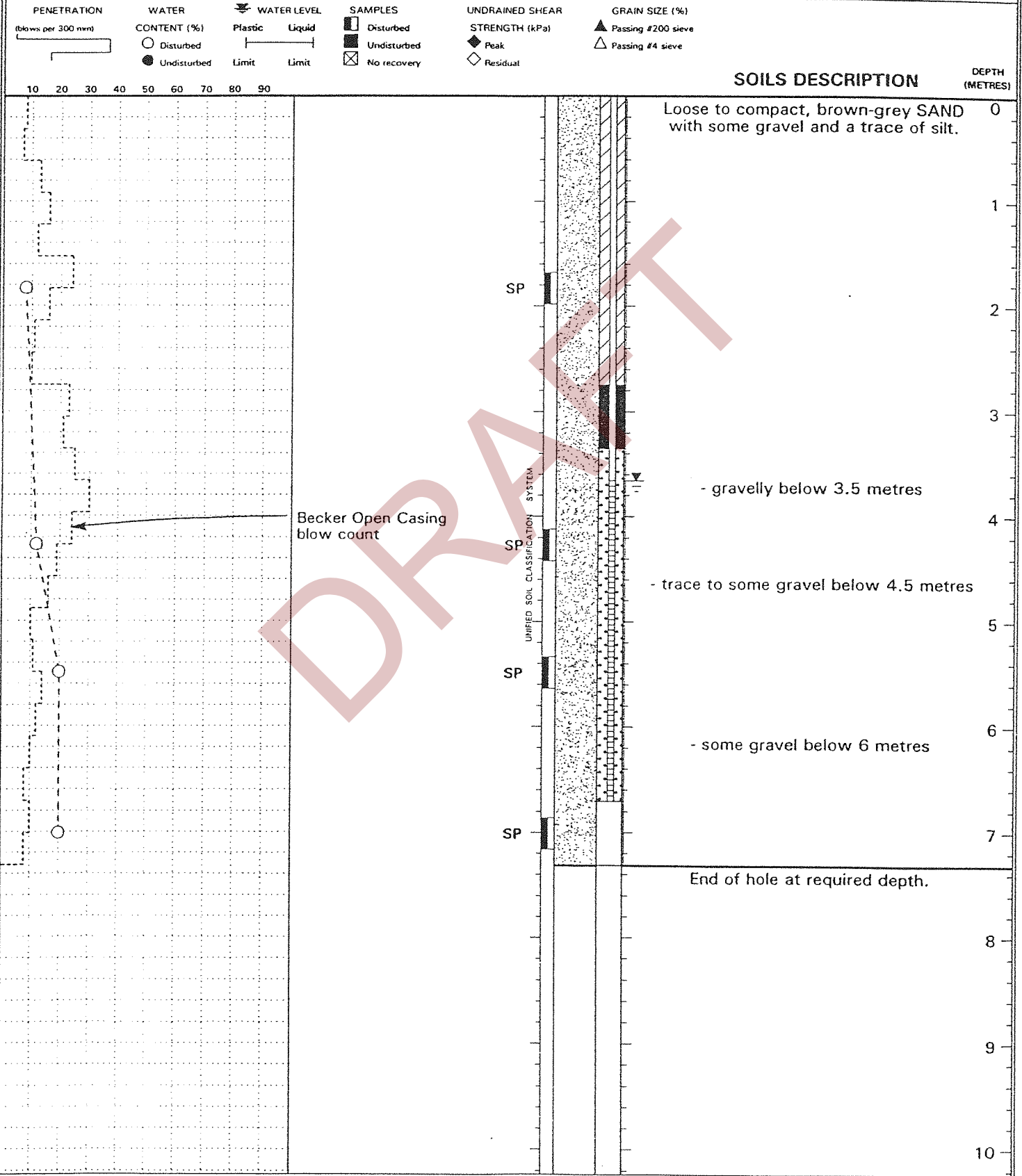
PROJECT: Makin Property

Brittania Beach, BC

DATE: July 23, 1996

FILE NO.: 19-2435-0

SCALE: 1:50



LOG OF TEST HOLE

TEST HOLE NO.
96-3

LOCATION: See Dwg. 19-2435-0-3

CLIENT: Campbell Saunders Ltd.

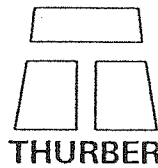
PROJECT: Makin Property
Brittania Beach, BC

TOP OF HOLE ELEV:

METHOD: Becker Hammer

DRILLING CO.: SDS Drilling

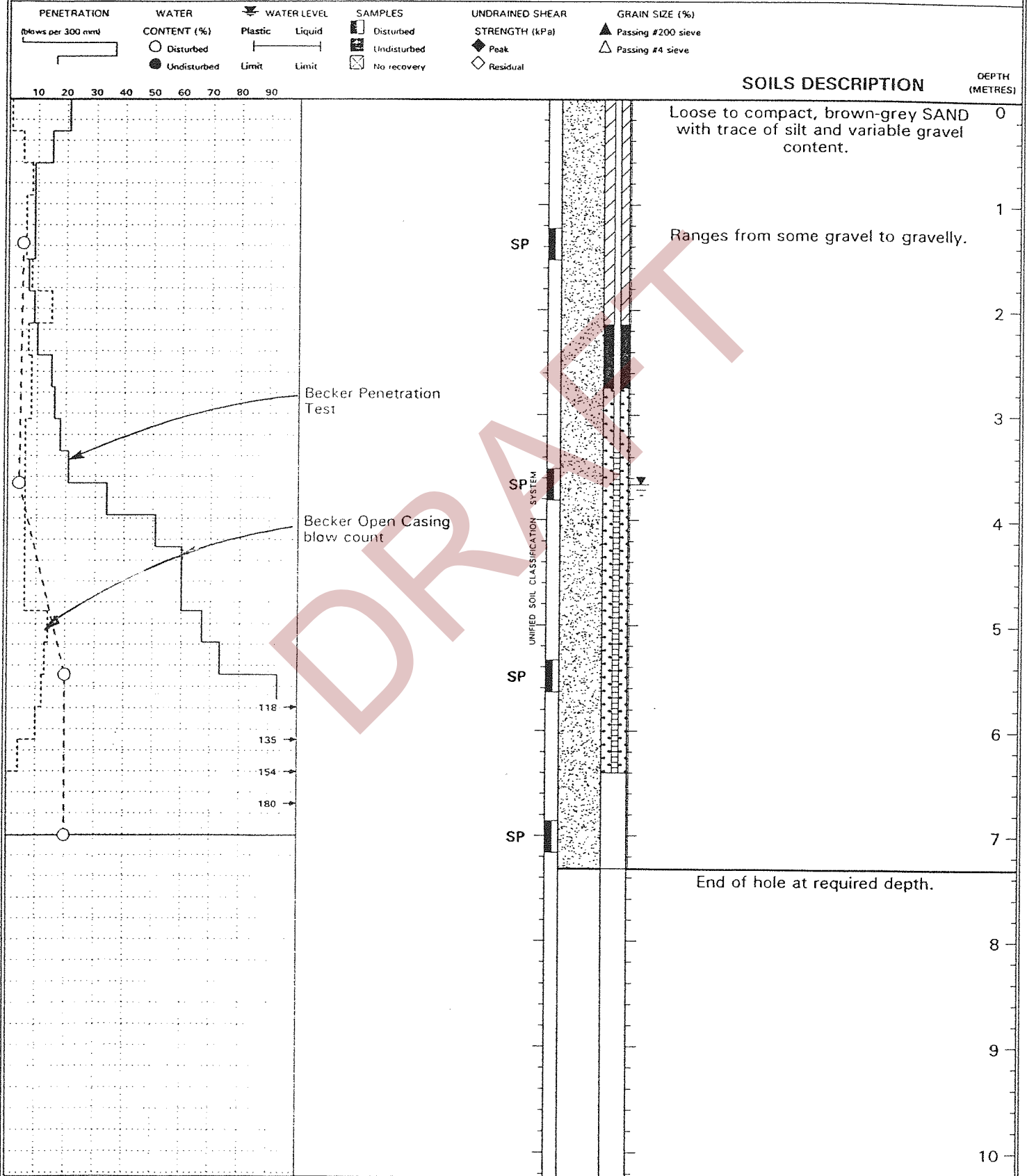
INSPECTOR: DN



DATE: July 23, 1996

FILE NO.: 19-2435-0

SCALE: 1:50





CHEMICAL ANALYSIS REPORT

Date: August 16, 1996

ASL File No. G3745

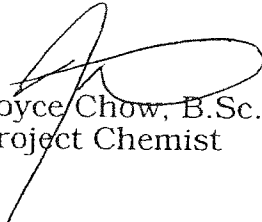
Report On: 19-2435-0 Water Analysis

Report To: **Thurber Env. Consultants Ltd.**
200 - 1445 West Georgia Street
Vancouver, BC
V6G 2T3

Attention: **Dr. John De Cesare**, Senior Environmental Scientist

Received: August 2, 1996

ASL ANALYTICAL SERVICE LABORATORIES LTD.
per:


Joyce Chow, B.Sc.
Project Chemist


Joanne Patrick, B.Sc.
Project Chemist



REMARKS

File No. G3745

Please note that from our laboratory analysis of the water, it was determined that the concentration of some dissolved metals exceeds the concentration of the total metals within a given sample. The cause of this is generally due to the following factors: 1) filter contamination in the field during sample collection, 2) contamination during transport, or 3) analytical variability.

DRAFT



RESULTS OF ANALYSIS - Water

File No. G3745

	96-1	96-2	96-3	Daisy 1	Daisy 2
	96 08 02	96 08 02	96 08 02	96 08 02	96 08 02
Physical Tests					
Colour CU	-	-	-	<5.0	<5.0
Conductivity (umhos/cm)	-	-	-	33.8	32.8
Total Dissolved Solids	-	-	-	33	30
Hardness CaCO3	12.5	57.7	20.8	11.9	11.7
pH	-	-	-	6.80	6.80
Turbidity (NTU)	-	-	-	0.1	<0.1
Dissolved Anions					
Alkalinity - Total CaCO3	-	-	-	8.6	8.2
Chloride Cl	-	-	-	0.6	<0.5
Fluoride F	-	-	-	0.03	0.03
Sulphate SO4	-	-	-	4.2	4.1
Nutrients					
Nitrite/Nitrate Nitrogen N	-	-	-	0.310	0.287
Bacteriological Tests					
Coliform Bacteria - Fecal	-	-	-	4	3
Coliform Bacteria - Total	-	-	-	18	50

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH,

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



RESULTS OF ANALYSIS - Water

File No. G3745

Daisy 1

Daisy 2

96 08 02

96 08 02

Total Metals

Aluminum	T-Al	0.035	0.052
Arsenic	T-As	0.0001	0.0001
Barium	T-Ba	<0.01	<0.01
Beryllium	T-Be	<0.005	<0.005
Boron	T-B	<0.1	<0.1
Cadmium	T-Cd	0.0009	0.0002
Calcium	T-Ca	4.09	4.11
Chromium	T-Cr	<0.001	<0.001
Cobalt	T-Co	<0.02	<0.02
Copper	T-Cu	0.001	0.001
Iron	T-Fe	<0.03	<0.03
Lead	T-Pb	<0.001	<0.001
Lithium	T-Li	<0.02	<0.02
Magnesium	T-Mg	0.411	0.383
Manganese	T-Mn	<0.005	<0.005
Mercury	T-Hg	<0.00005	<0.00005
Molybdenum	T-Mo	<0.03	<0.03
Nickel	T-Ni	<0.02	<0.02
Potassium	T-K	<2	<2
Selenium	T-Se	<0.0005	<0.0005
Silver	T-Ag	<0.0001	<0.0001
Sodium	T-Na	<2	<2
Vanadium	T-V	<0.03	<0.03
Zinc	T-Zn	0.008	<0.005

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH.

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).

**RESULTS OF ANALYSIS - Water**

File No. G3745

		96-1	96-2	96-3	Daisy 1	Daisy 2
		96 08 02	96 08 02	96 08 02	96 08 02	96 08 02
Dissolved Metals						
Aluminum	D-Al	0.111	0.082	0.107	0.034	0.053
Arsenic	D-As	0.0002	0.0002	<0.0001	0.0001	0.0001
Barium	D-Ba	<0.01	0.01	<0.01	<0.01	<0.01
Beryllium	D-Be	<0.005	<0.005	<0.005	<0.005	<0.005
Boron	D-B	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	D-Cd	<0.0002	0.0003	<0.0002	0.0007	<0.0002
Calcium	D-Ca	4.04	15.6	6.13	4.12	4.08
Chromium	D-Cr	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	D-Co	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	D-Cu	0.004	0.003	0.002	0.001	0.001
Iron	D-Fe	0.06	0.03	0.07	<0.03	<0.03
Lead	D-Pb	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	D-Li	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	D-Mg	0.584	4.57	1.32	0.387	0.375
Manganese	D-Mn	0.012	0.024	0.048	<0.005	<0.005
Mercury	D-Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	D-Mo	<0.03	<0.03	<0.03	<0.03	<0.03
Nickel	D-Ni	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	D-Se	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Silver	D-Ag	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	D-Na	2	6	4	<2	<2
Vanadium	D-V	<0.03	<0.03	<0.03	<0.03	<0.03
Zinc	D-Zn	0.009	0.013	0.009	<0.005	0.006
Extractables						
EPH (C10-18)		<1.0	<1.0	-	-	-
EPH (C19-31)		<1.0	<1.0	-	-	-
Total Extr Hydrocarbons (C10-30)		<1.0	<1.0	-	-	-

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH.

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



RESULTS OF ANALYSIS - Water

File No. G3745

		Thistle 1	Thistle 2
		96 08 02	96 08 02
<u>Physical Tests</u>			
Colour	CU	5.9	<5.0
Conductivity	(umhos/cm)	71.2	74.2
Total Dissolved Solids		48	44
Hardness	CaCO ₃	32.6	33.9
pH		7.10	7.16
Turbidity	(NTU)	0.2	0.1
<u>Dissolved Anions</u>			
Alkalinity - Total	CaCO ₃	26.7	27.6
Chloride	Cl	<0.5	<0.5
Fluoride	F	0.03	<0.02
Sulphate	SO ₄	6.0	6.1
<u>Nutrients</u>			
Nitrite/Nitrate Nitrogen	N	0.124	0.071
<u>Bacteriological Tests</u>			
Coliform Bacteria - Fecal		68	4
Coliform Bacteria - Total		240	47

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH,

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



RESULTS OF ANALYSIS - Water

File No. G3745

		Thistle 1	Thistle 2
		96 08 02	96 08 02
Total Metals			
Aluminum	T-Al	0.133	0.087
Arsenic	T-As	0.0001	0.0001
Barium	T-Ba	<0.01	<0.01
Beryllium	T-Be	<0.005	<0.005
Boron	T-B	<0.1	<0.1
Cadmium	T-Cd	<0.0002	<0.0002
Calcium	T-Ca	12.0	12.9
Chromium	T-Cr	<0.001	<0.001
Cobalt	T-Co	<0.02	<0.02
Copper	T-Cu	0.001	0.001
Iron	T-Fe	<0.03	0.03
Lead	T-Pb	<0.001	<0.001
Lithium	T-Li	<0.02	<0.02
Magnesium	T-Mg	0.557	0.538
Manganese	T-Mn	<0.005	<0.005
Mercury	T-Hg	<0.00005	<0.00005
Molybdenum	T-Mo	<0.03	<0.03
Nickel	T-Ni	<0.02	<0.02
Potassium	T-K	<2	<2
Selenium	T-Se	<0.0005	<0.0005
Silver	T-Ag	<0.0001	<0.0001
Sodium	T-Na	<2	<2
Vanadium	T-V	<0.03	<0.03
Zinc	T-Zn	<0.005	<0.005

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH,

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



RESULTS OF ANALYSIS - Water

File No. G3745

		Thistle 1	Thistle 2
		96 08 02	96 08 02
Dissolved Metals			
Aluminum	D-Al	0.046	0.054
Arsenic	D-As	<0.0001	<0.0001
Barium	D-Ba	<0.01	<0.01
Beryllium	D-Be	<0.005	<0.005
Boron	D-B	<0.1	<0.1
Cadmium	D-Cd	<0.0002	<0.0002
Calcium	D-Ca	12.2	12.7
Chromium	D-Cr	<0.001	<0.001
Cobalt	D-Co	<0.02	<0.02
Copper	D-Cu	0.001	0.001
Iron	D-Fe	<0.03	<0.03
Lead	D-Pb	<0.001	<0.001
Lithium	D-Li	<0.02	<0.02
Magnesium	D-Mg	0.551	0.527
Manganese	D-Mn	<0.005	<0.005
Mercury	D-Hg	<0.00005	<0.00005
Molybdenum	D-Mo	<0.03	<0.03
Nickel	D-Ni	<0.02	<0.02
Selenium	D-Se	<0.0005	<0.0005
Silver	D-Ag	<0.0001	<0.0001
Sodium	D-Na	<2	<2
Vanadium	D-V	<0.03	<0.03
Zinc	D-Zn	0.011	0.009

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH,

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



Appendix 1 - QUALITY CONTROL - Replicates

File No. G3745

Water	96-1	96-1
	96 08 02	QC # 69450

Physical Tests

Hardness	CaCO ₃	12.5	12.2
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Dissolved Metals

Aluminum	D-Al	0.111	0.114
Arsenic	D-As	0.0002	0.0002
Barium	D-Ba	<0.01	<0.01
Beryllium	D-Be	<0.005	<0.005
Boron	D-B	<0.1	<0.1
Cadmium	D-Cd	<0.0002	0.0002
Calcium	D-Ca	4.04	3.94
Chromium	D-Cr	<0.001	<0.001
Cobalt	D-Co	<0.02	<0.02
Copper	D-Cu	0.004	0.005
Iron	D-Fe	0.06	0.06
Lead	D-Pb	<0.001	<0.001
Lithium	D-Li	<0.02	<0.02
Magnesium	D-Mg	0.584	0.580
Manganese	D-Mn	0.012	0.013
Mercury	D-Hg	<0.00005	<0.00005
Molybdenum	D-Mo	<0.03	<0.03
Nickel	D-Ni	<0.02	<0.02
Selenium	D-Se	<0.0005	<0.0005
Silver	D-Ag	<0.0001	<0.0001
Sodium	D-Na	2	2
Vanadium	D-V	<0.03	<0.03
Zinc	D-Zn	0.009	0.008

Extractables

EPH (C10-18)	<1.0	<1.0
EPH (C19-31)	<1.0	<1.0
Total Extr Hydrocarbons (C10-30)	<1.0	<1.0

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH,

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



Appendix 2 - METHODOLOGY

File No. G3745

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows:

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

Metals in Water

This analysis is carried out in accordance with procedures described in "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005), followed by instrumental analysis by atomic absorption spectrophotometry (EPA Method 7000), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association. A cold-oxidation procedure involving bromine monochloride is used, followed by instrumental analysis by cold-vapour atomic absorption spectrophotometry (CVAAS).

Extractable Petroleum Hydrocarbons in Water

This analysis is equivalent to British Columbia Ministry of Environment, Lands and Parks Method for "Extractable Petroleum Hydrocarbons in water by GC/FID", January 1996 but does not provide correction for Polycyclic Aromatic Hydrocarbons (PAHs). The procedure involves a methylene chloride solvent extraction followed by analysis of the extract by capillary column gas chromatography with flame ionization detection.



Appendix 2 - METHODOLOGY (cont'd)

File No. G3745

Total Extractable Hydrocarbons in Water

This analysis is carried out in accordance with U.S. EPA Method 3510/8015 (Publ. #SW-846, 3rd Ed., Washington, DC 20460). The procedure involves extraction with methylene chloride. The extract is then reduced in volume and analysed by capillary column gas chromatography with flame ionization detection.

End of Report

DRAFT

APPENDIX D

LEGAL DESCRIPTION OF SITE

Lot A, District Lots 1583, 2001 and 7034, Plan 21576. Parcel Identifier 010-077-227.

Parcel 1 (Reference Plan 4878) of District Lot 1583 Except Part on Plan 21576. Parcel Identifier 010-025-901.

District Lot 2933 excepting Hwy PL #76, Parcel Identifier 010-025-715.

District Lot 4005 excepting those portions dedicated on Plan LMP 17054, Parcel Identifier 010-025-740.

District Lot 4008, Parcel Identifier 010-025-766.

District Lot 4012 excepting those portions dedicated on Plan LMP 17053, Parcel Identifier 010-025-774.

District Lot 1889. Parcel Identifier 010-025-782.

District Lot 1981 East $\frac{1}{2}$ only. Parcel Identifier 010-025-812.

District Lot 1970 except those portions lying within the boundaries of District Lots 1583 and 2001. Parcel Identifier 010-025-863.

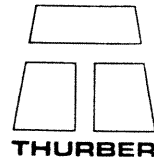
District Lot 4009 except those portions lying within the limits of District Lots 1583 and 2001. Parcel Identifier 010-025-634.

District Lot 1583 except portions in reference Plans 4390 and 4878 and Plan 21576. Parcel Identifier 010-026-151.

District Lot 2617. Parcel Identifier 010-025-677.

**THURBER ENVIRONMENTAL
CONSULTANTS LTD.**

Suite 200, 1445 West Georgia St.
VANCOUVER, B.C. V6G 2T3
Phone [604] 687-0100
Fax [604] 684-5124



May 1, 1997

File:19-2435-0

BC Environment
15326-103A Avenue
Surrey, BC
V3R 7A2

Attention: Ms. K. O'Leary, M.Sc., P. Ag.

**MAKIN PROPERTY, BRITANNIA BEACH, B.C.
SUPPLEMENTARY INFORMATION**

Dear Madam:

Further to the BC Environment (BCE)'s letter of January 8, 1997 (BCE File: 26250/20-3444 Site: 3444), this letter presents supplementary information to address the points and issues raised by BCE regarding the historical and site information.

The only landuses on the property comprised a gravel mining operation in the area formed by the loop in Highway 99 and on the northern portion of the property surrounding and north of Thistle Creek, and a residential community east of Minaty Bay in the western part of the loop in the Highway. The following information sources were utilized.

- Historical air photographs from 1947, 1957, 1969, 1976, 1982 and 1990. Copies of the air photos are attached. As is clear from examination of the air photographs, the vast majority of the site is forested.
- Review of title search records.
- Anecdotal sources including Mr. D. Smith of Thurber Engineering Ltd., Mr. H. Buck of Colliers McCauley Nicholls and Mr. D. Gray of Campbell Saunders. These sources provided information regarding landuses and activities on the site and the adjacent Britannia Mine.

No fire insurance maps from the UBC collection were located for the subject site. No archival information regarding the gravel operation or the townsit was identified at the Squamish Archives or Public Library.

Continued

With respect to specific issues raised in the BCE letter the following information is provided:

- Power for the gravel mining operation and the townsite at Minaty Bay was supplied by BC Hydro. The only potential contaminant concern associated with the gravel operation may have been spills associated with fuelling of on-site vehicles. No evidence indicating that this is a concern was uncovered.

No potentially hazardous materials, such as batteries, electrical equipment etc. were identified at the townsite. Scattered refuse on the site comprised typical household debris such as pop cans and paper waste. No evidence of landfilling was identified. Local practice at nearby townsites, such as Furry Creek, was to burn refuse.

- With respect to BCE's comment that the water table, reportedly at 3 m below grade, would have allowed for placement of residential underground tanks, it is noted that these water levels were recorded in wells installed on the east side of the Highway. The former townsite is located near the foreshore of Howe Sound where groundwater is anticipated to be shallow. If any tanks are uncovered during site development the tanks will be decommissioned and a qualified environmental consultant will be retained to evaluate soil and groundwater conditions around the tank.
- Mr. J. Brodie of BC Rail indicated that there are no records of spills along the BC Rail right-of-way through the property. No evidence of a spill along the rail line was observed during the site reconnaissance.
- Inspection of the helicopter refuelling area, where fuel drums are stored, revealed only very minor surficial (approximately 0.1 m depth) staining over a highly localized area (2m²).
- Six soil stockpiles, containing traces of slag and metallic debris, were identified at the northern portion of the site near the entrance off the highway. Examination of the soils revealed no evidence of potential organic contamination, such as staining or oily residues. No volatile organics were detected in field headspace screening of these materials with an Hnu photoionization detector. The total estimated volume of the stockpiles is 60 m³.

Continued

May 1, 1997

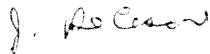
Six representative samples were collected and submitted for metals analysis. The analytical results are presented in Table 1. The standards in the table are based on relocation of the soils to a site where there are no applicable groundwater uses (ie. drinking water or aquatic life). The results indicate that concentrations of copper in all samples exceed the commercial standard of 250 ppm. In addition, lead concentrations in samples 97-5 and 97-6 exceed the corresponding commercial standard of 1000 ppm. The source of this material is unknown but is likely material that has been relocated from the Britannia Mine.

Sample 97-6 has been submitted for SWEP analysis. Any materials classified as Special Waste based on the leachate results will be managed in adherence to the requirements stipulated in the Special Waste Regulation of the Waste Management Act.

The six stockpiles will be removed from site and taken to a suitable disposal facility, likely an industrial landfill in Alberta. We understand that a soil relocation permit is not required for soils that exceed the trigger standards, if these materials are transported out of Province.

We trust that the above information adequately addresses your concerns. Please do not hesitate to call if you have any questions.

Yours very truly,
Thurber Environmental Consultants Ltd.
D. Smith, M.Sc.
Review Principal



John DeCesare, Ph.D.
Senior Environmental Consultant

JD/mt/f

cc: Campbell Saunders
Attn: Mr. D. Gray

Colliers McCauley Nicholls
Attn: Mr. H. Buck

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May 5, 1999

File : 19-3020-0

BC Environment
10470 - 152 Street
Surrey, BC
V3R 0Y3

Attention: Mr. B. Azevedo

**MAKIN LANDS
SUPPLEMENTARY STAGE 2 PRELIMINARY SITE INVESTIGATION (PSI)**

Dear Sirs:

This report presents the findings of a supplementary Stage 2 PSI conducted on the Makin Lands to address contaminant concerns identified by BC Environment.

Use of this report is subject to the attached Statement of General Conditions.

1. BACKGROUND

Thurber Environmental Consultants Ltd. (TECL) previously conducted an environmental and geotechnical assessment of the Makin Lands for Campbell Saunders and reported the findings in the October 21, 1996 report entitled *MAKIN PROPERTY, BRITANNIA BEACH, B.C. ENVIRONMENTAL AND GEOTECHNICAL ASSESSMENT*. Our report dated May 1, 1997 entitled *MAKIN PROPERTY BRITANNIA BEACH, B.C. - SUPPLEMENTARY REPORT* provided the supplementary information requested by BC Environment (BCE). BCE subsequently reviewed the information that was provided and concurred with our conclusions that other than some stockpiled metal contaminated fill, no contaminant concerns were identified on the property. A copy of the correspondence from BCE is attached.

BCE subsequently (attached November 10, 1998 letter) identified additional concerns comprising the potential for soil and groundwater contamination on the lands adjoining the northern boundary of the site near the former Britannia Mine ore processing mill and possible infilling of

Continued

the lower bench lands with tailings and waste rock. For clarity, the lands referred to by BCE as bench lands refer to the foreshore lands located to the west of the BCR rail line.

2. PROGRAM OF WORK

The program of work comprised the following tasks:

- Discussion with Mr. Azevedo of BC Environment regarding the scope of the investigation and any specific information that BCE may have in their possession that the Makin Lands may have been impacted from the former Britannia Mine operation.
- Review of Thurber Environmental Consultants Ltd. (TECL) file information. TECL previously conducted an environmental and geotechnical investigation of the former Britannia Mine property.
- A detailed reconnaissance of the suspect areas of the property to identify visual indications of potential contamination and to select potential sampling locations.
- Implementation of a field program comprising excavation of four test pits in the foreshore near the former Minaty Bay townsite. Samples of fill were collected and submitted for metals analysis.
- Preparation of a report of our findings for submission to BCE.

3. RESULTS AND DISCUSSION

3.1 BCE DISCUSSIONS

The following summarizes the main points of the discussion with Mr. B. Azevedo, the primary BCE contact for this assignment.

- Until 1979, the Makin Lands were owned by Anaconda, operators of the Britannia Mine. The property was subsequently acquired by Dome Petroleum. BCE has no information in their files that would indicate that any mining related activities were carried out on the

Continued

Makin Lands. This is consistent with TECL's environmental assessment findings previously reported for the Makin Lands. In addition, we uncovered no evidence from our contaminant and geotechnical investigation of the Britannia Mine that former mining activities were conducted on or impacted the Makin Lands.

- BCE is concerned that tailings may have been deposited on the foreshore lands to the west of the railway at the northern portion of the site and at the former townsite located at Minaty Bay. The tailings may have been deposited prior to air photo coverage. Therefore, review of air photos may be of limited utility in establishing whether tailings were deposited in the bench lands area.

The other BCE concern, along the north property boundary on the east side of the highway, is the proximity of the former Britannia Mine processing mill, including two concentrators, that was located to the north of the subject site.

3.2 Revised Property Boundary

During the course of the recent investigation, it was determined that the plans previously provided to us showing the property limits are not correct. Following discussions with Mr. H. Buck of J.J. Barnicke Realty and review of new plans in his possession, the revised property limits in the area of interest are shown on Dwg. No. 19-3020-0-1. For comparison, the previously presumed boundary is indicated on the current plan.

The implications of the revised property boundaries are as follows:

- The northern foreshore area is not part of the Makin property. Therefore any tailings or other concerns on these lands are not material to the contaminant status of the Makin Lands.
- The northern boundary of the Makin Lands on the east side of Highway 99 is located approximately 200 m south of where previously believed and therefore well removed from the former Britannia Mine processing mill.

Continued

3.3 Site Reconnaissance

A reconnaissance of the property was carried out by Mr. K. Mow of TECL on January 19 - 20, 1999. Photographs taken during the reconnaissance and test pitting program are attached.

The area on the northern portion of the site, where the former gravel mining operation was located, is largely flat and overgrown with shrubs. As previously described, soil has been stockpiled on the north end of the property. Analytical results from testing of these materials was previously provided to BCE. An estimated 60 m³ of material was classified as contaminated and will be removed during site development.

The Makin foreshore lands at the former Minaty Bay townsite, located west of the BCR rail line, consist of a relatively flat bench 90 to 100 m wide. Bench elevation varies from 4.5 to 6.5 m and slopes up toward the BCR grade to the east, which varies in elevation from approximately 8.6 m at the north end to 11.5 m at the south. The area appears to have some fill overlying the native sand and gravel / bedrock. The surface is covered with 10 to 20 year old trees with some in the 50+ year range as well as some pavement (former road alignment) and household debris from the former townsite.

3.4 Minaty Bay Foreshore Lands Sampling and Analysis Results

The other area of potential concern identified by BCE is the foreshore near the former Minaty Bay townsite. A test pitting program to evaluate soil conditions in this area was conducted on January 25, 1999. Four test pits (TPs 99-6 through 99-9) were excavated with a track-mounted excavator at the locations shown on Dwg. 19-3020-0.

The soil conditions are described on the attached test pit logs, and generally comprised topsoil over fill to depths of 1.5 to 2.3 m, underlain by native granular deposits. No evidence of tailings or waste rock was noted.

North of Daisy Creek (TPs 99-6 and 99-7), the topsoil was 100 to 200 mm thick and was underlain by compact, silty fine sand fill with

Continued

varying gravel content to 0.8 m depth. The lower portion of the fill was compact, sandy gravel with some silt and contained cobbles and boulders to 300 mm diameter.

South of Daisy Creek (TPs 99-8 and 99-9), the fill was more variable than described above, and comprised layers of sands and gravels with variable silt and organic content. Presence of roots and/or wood debris was noted throughout the fill zone.

In both areas, the underlying native soil was compact to dense, grey-brown to brown, sandy, cobbly gravel with a trace to some silt. Groundwater was generally encountered in the native gravel zone at depths of 2.1 to 2.5 m, except at TP 99-6 which was dry. No sheens, odours or other evidence of contamination were observed.

Soil samples were collected with a stainless steel trowel that was decontaminated with a detergent wash and distilled water rinse between samples. Seven samples of fill were selected for metals analysis. The laboratory report is attached.

Soil pH varied from 5.3 to 6.5 with a median pH of 5.7. Metals concentrations are compared to the CSR Residential Landuse (RL) standards with the site specific factor groundwater flow to surface water used by aquatic life. Concentrations of all metals are well below the corresponding RL standards.

3.5 Northern Lands

The northern portion of the Makin Lands were mined for gravel beginning in the early 1950's. No other landuses were identified in our historical review.

Soil and groundwater conditions near the revised northern boundary of the Makin Lands were investigated in 1996. The locations of three monitor wells (MWs 96-1, 2, 3) completed at that time are shown on Dwg. No. 19-3020-0-1. Soil conditions on the property comprised sand with varying gravel and silt content for the entire 7 m depth of investigation. No soils displaying staining or suspect odours, or mining residues such as tailings or waste rock, were encountered in any of the three holes.

Comparison of groundwater quality in the three wells to the current CSR Aquatic Life (AW) standards reveals that all metals concentrations are below the corresponding AW standards. It is our opinion that there are no contaminant concerns in this area and there is no evidence that the former ore processing plant has had any impact on the contaminant status of the property.

2. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this supplementary investigation, it is concluded that:

- The foreshore lands north of Minaty Bay are not part of the Makin Lands and are therefore not a material concern with respect to the contaminant status of the Makin Lands.
- The northern lands on the east side of the highway are located approximately three hundred metres from the former Britannia Mine ore processing mill, not 100 metres as previously believed. This area was formerly part of a gravel operation. A previous investigation established that groundwater concentrations of dissolved metals were well below applicable aquatic life standards.
- Sampling and analysis of fill in the Makin foreshore at Minaty Bay established that metal concentrations were below Residential Landuse standards. No evidence of tailings or waste rock was noted in this area.

In summary, no contaminant concerns relating to deposition of waste rock, tailings or process chemicals or waste from the former Britannia Mine ore processing mill were identified in this supplementary investigation or in the previous investigation. It is our opinion that there has been no impact on the Makin Lands from the former Britannia Mine operation.

No further work is considered warranted.

Please call if you have any questions or required additional clarification on any of the findings presented in this report.

Continued

BC Environment

7

May 5, 1999

4.

Yours very truly,
Thurber Environmental Consultants Ltd.
B. Nakai, M.Sc.
Review Principal

J. De Cesare, Ph.D.
Senior Environmental Scientist

JD/a

cc: Gibralt Capital Corporation
Attention: Mr. B. Brovender

IBI Group
Attention: Mr. P. Levine

DRAFT



Looking northeast from northwest corner of Makin property.



Former gravel pit, looking northeast toward north property line.



Former gravel pit south of Daisy Creek.



Foreshore at former townsite, looking north.



Foreshore/shoreline from former townsite, looking south.



Excavator on-site, January 26, 1999.

TEST PIT LOGS

Notes:

- 1) Depths shown are in metres, measured from ground surface at the test pit location.
- 2) Capital letters (i.e. GM) are Unified Soil Classification System identifications, as determined in the laboratory.
- 3) w denotes moisture content of minus 19 mm sieve material, as determined in the laboratory.
- 4) Test pits were excavated using a track-mounted excavator on January 26, 1999.

TP 99-6

- 0 - 0.8 100 mm loose TOPSOIL over loose to compact, brown, silty, fine SAND with traces of gravel and roots (Fill). SM, w = 23% at 0.4 m.
- 0.8 - 2.0 Compact, brown SAND and GRAVEL with some cobbles and silt and a trace of boulders to 300 mm dia. (Fill). Root layers at 0.8 m and 2.0 m. GM, w = 19% at 1.2 m.
- 2.0 - 3.5 Compact to dense, brown, sandy GRAVEL and COBBLES with a trace to some silt. GP-GM, w = 11% at 3.0 m.
- At 3.5 End of pit at required depth.
Moderate pit wall collapse from surface to 2.0 m.
No free water in pit.

TP 99-7

- 0 - 0.8 200 mm loose TOPSOIL over loose to compact, brown, silty, fine SAND and GRAVEL with traces of and wood debris (Fill). SM/GM, w = 28% at 0.5 m.
- 0.8 - 1.7 Compact to dense, brown-grey, sandy GRAVEL and COBBLES with some silt (Fill). Root layers at 0.8 m and 1.7 m. GM, w = 20% at 1.5 m.
- 1.7 - 3.1 Compact to dense, grey-brown GRAVEL and COBBLES with some sand and a trace of silt.
- At 3.5 End of pit at required depth.
Minor pit wall collapse from surface to 1.7 m.
- At 2.1 Groundwater encountered.

TP 99-8

0 - 0.2	50 mm loose SOD over loose, grey-brown SAND and GRAVEL with a trace of silt (Fill). GP-GM, w = 5% at 0.1 m.
0.2 - 0.45	Loose, dark brown to black, organic silty, fine to medium SAND with some gravel and roots (Fill).
0.45 - 0.8	Compact, brown, gravelly SILT and fine SAND with a trace of roots (Fill). SM/ML, w = 31% at 0.7 m.
0.8 - 1.5	Compact to dense, brown, sandy GRAVEL with some silt and roots (Fill). Root layers at 0.8 m and 1.5 m.
1.5 - 3.3	Dense, brown, sandy GRAVEL and COBBLES with traces of silt and boulders to 350 mm dia. GP-GM, w = 16% at 3.0 m
At 3.3	End of pit at required depth. Moderate pit wall collapse from surface to 1.5 m.
At 2.5	Groundwater encountered.

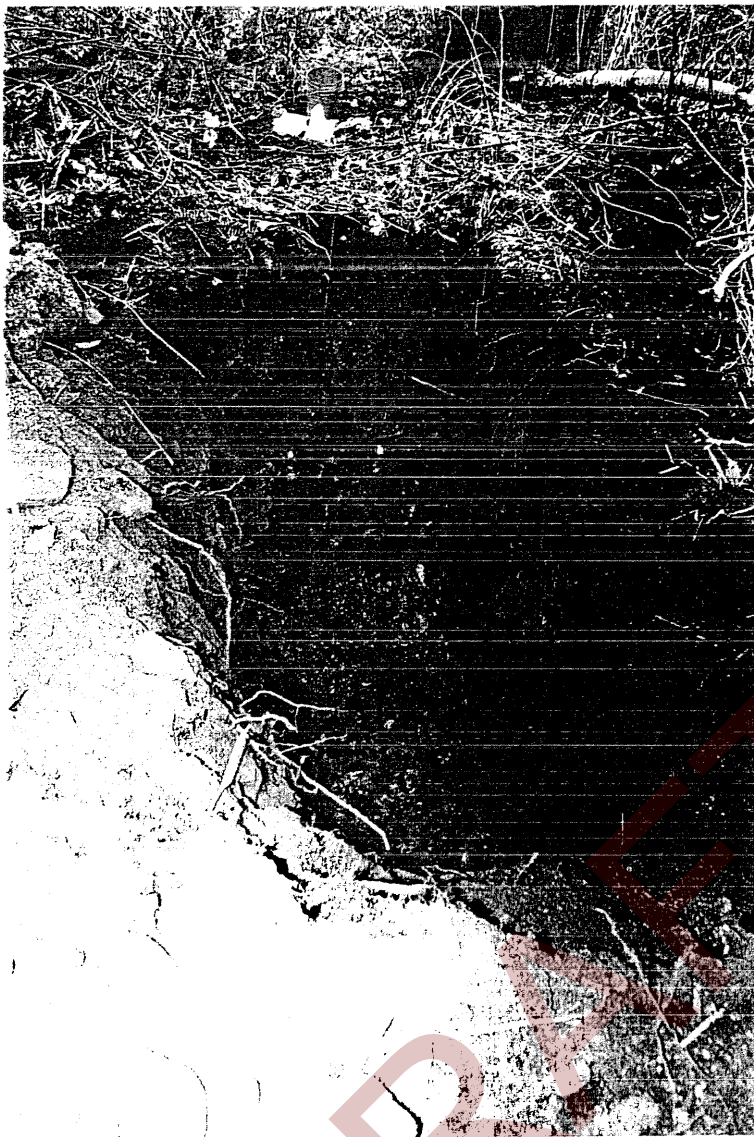
TP 99-9

0 - 0.4	100 mm loose SOD over loose, dark brown, silty to organic silty SAND and GRAVEL with some roots (Fill). GM, w = 15% at 0.2 m.
0.4 - 0.7	Compact, brown SAND and GRAVEL with some silt and zones of sandy silt and traces of roots and wood debris (Fill). GM, w = 25% at 0.5 m.
0.7 - 2.3	Compact to dense, brown SAND and GRAVEL with traces of silt, roots and zones of sandy silt (probable fill). GP-GM, w = 5% at 1.5 m.
2.3 - 3.9	Compact to dense, grey-brown, sandy GRAVEL with a trace to some silt and cobbles. GP-GM, w = 14% at 3.0 m.
At 3.9	End of pit at required depth. Moderate to heavy pit wall collapse from surface to 2.3 m.
At 2.4	Groundwater encountered.



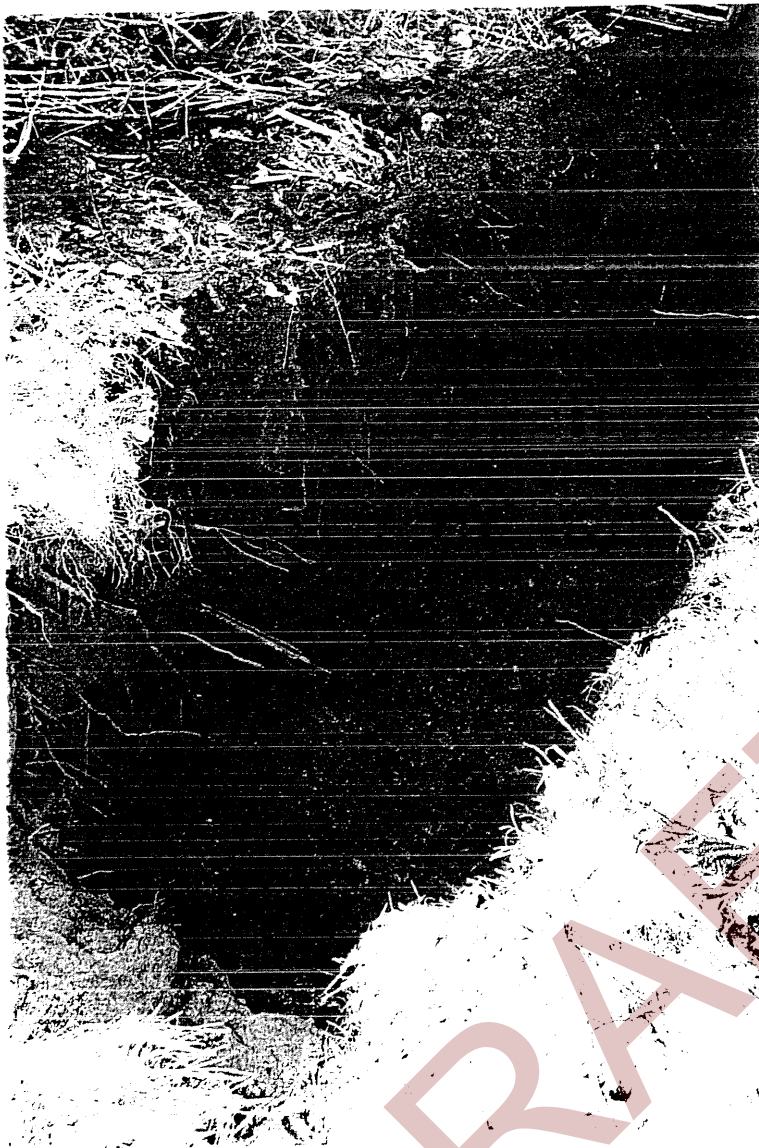
TP 99-6





TP 99-7





TP 99-8





TP 99-9





- ## NOTES

1. Base plan taken from McElhanney Consulting Services Ltd.'s 'Conceptual Highway Access' plan (Job No. 2111-01331-0), Rev. 1 dated November 1996.
2. Test pit and monitor well locations are approximate.

DESIGNED KM	Gibralt Capital Corporation		 THURBER
DRAWN KM	SITE PLAN		
DATE February 4, 1999			
APPROVED			
SCALE 1:10,000	Makin Lands Preliminary Site Investigation	Britannia Beach, B.C.	DWG. NO. 19-3020-0-1

1. THIS DRAWING SHOWS CONTAMINATION SAMPLE LOCATIONS AS A GOOGLE EARTH PLOT IMPORTED INTO THE LEGAL PROPERTY FRAMEWORK. KMZ FILE PROVIDED BY PITEAU ASSOCIATES.
2. RED ICON DENOTES SAMPLE EXCEEDED MAXIMUM METALS CONCENTRATIONS.
3. GREEN ICON DENOTES SAMPLE DID NOT EXCEED MAXIMUM METALS CONCENTRATIONS.
4. BLUE ICONS DENOTE DOMESTIC TEST WELLS AND MONITORING WELLS.
5. DIAMOND ICON SAMPLING LOCATION FOR PHASE 1 AND PHASE 2 PRELIMINARY SITE INVESTIGATION.



TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-01 S56 24-Jun-14 0.20-0.35 4061898-01	TP14-02 S57 24-Jun-14 0.20-0.35 4061898-02	TP14-03 S58 24-Jun-14 0.10-0.25 4061898-03	TP14-04 S59 24-Jun-14 0.15-0.30 4061898-04	TP14-05 S60 24-Jun-14 0.15-0.30 4061898-05	TP14-06 S61 24-Jun-14 0.15-0.30 4061898-06	TP14-07 S62 24-Jun-14 0.15-0.30 4061898-07	TP14-08 S63 24-Jun-14 0.15-0.35 4061898-08	TP14-09 S64 24-Jun-14 0.40-0.50 4061898-09	TP14-10 S65 24-Jun-14 0.20-0.35 4061898-10	TP14-11 S66 24-Jun-14 0.15-0.30 4061898-11	TP14-12 S67 24-Jun-14 0.20-0.40 4061898-12	TP14-13 S68 24-Jun-14 0.20-0.35 4061898-13
Physical Tests																
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾													
pH	NS	NS	NS	6.2	4.9	5.7	5	5.9	5.8	6.8	5.3	6.4	4.5	5.9	4.9	4.6
Total Metals																
Antimony T-Sb mg/kg	20	40	40	0.1	0.3	0.5	0.2	0.7	0.8	0.9	1.6	1.3	0.7	1	1.4	3.6
Arsenic T-As mg/kg	10	10	10	2.4	3.8	4.7	1.7	18.8	19.2	56.6	41.7	60.8	6.3	11.8	22.1	8.8
Barium T-Ba mg/kg	350	350	350	39	71	110	37	60	59	72	56	62	43	107	129	236
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	0.4	0.5	0.4	0.2	0.5	0.5	0.3	0.2	0.4	0.1	0.6	0.4	0.1
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.73	0.67	1.36	0.35	0.73	0.74	1.87	0.33	2.21	0.24	3.33	3.57	0.29
Chromium T-Cr mg/kg	60	60	60	12.7	35.7	51.5	20	30.1	33	123	81	32.3	10.4	15.5	11.3	88.5
Cobalt T-Co mg/kg	25	25	25	12.5	15	17.3	9.1	21.2	22.9	42	25.3	93.8	3.4	26.2	14.4	5.9
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	45.8	82.4	249	56.2	154	206	212	728	387	164	359	439	537
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	18.3	33.7	52.8	20.3	52.4	114	92.7	90.1	186	52.8	80.6	131	170
Manganese mg/kg	2000	2000	2000													
Mercury T-Hg mg/kg	10	25	75	0.09	0.12	0.34	0.07	1.39	0.39	1.32	1.38	0.31	0.21	0.42	0.47	0.16
Molybdenum T-Mo mg/kg	15	15	15	1.7	0.9	1.2	1.1	1.2	5.9	1.1	1.4	2.1	2.7	4.6	5.8	2.9
Nickel T-Ni mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	10.7	22.8	28.8	9	52.4	24.1	79.7	46.3	148	6.2	18.5	9.2	44.8
Selenium T-Se mg/kg	1	1	1	0.7	<0.5	0.5	<0.5	1	0.7	0.7	1.3	2.3	1	2.5	3	1.5
Silver T-Ag mg/kg	20	40	40	<0.2	<0.2	<0.2	<0.2	0.2	0.3	0.3	0.5	0.8	<0.2	0.3	0.4	0.6
Tin T-Sn mg/kg	50	300	300	0.4	0.5	0.9	0.6	0.6	0.5	0.6	0.7	1.1	1	1.4	1.7	10.1
Uranium T-U mg/kg	30	30	30													
Vanadium T-V mg/kg	100	100	100	54.1	69.4	71.9	80.2	72.1	90.8	105	96.2	63.1	44.3	60.8	41.6	43.7
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	188	294	286	165	276	262	373	240	634	97	728	533	135

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-14 S69 24-Jun-14 0.15-0.30 4061898-14	TP14-15 S70 24-Jun-14 0.15-0.30 4061898-15	TP14-16 S71 24-Jun-14 0.10-0.30 4061898-16	TP14-17 S72 26-Jun-14 0.10-0.30 4061898-17	TP14-18 S73 26-Jun-14 0.05-0.30 4061898-18	TP14-19 S74 26-Jun-14 0.05-0.30 4061898-19	TP14-20 S75 26-Jun-14 0.05-0.30 4061898-20	TP14-21 S76 26-Jun-14 0.10-0.30 4061898-21	TP14-22 S77 29-Jul-14 0.10-0.30 4072156-01	TP14-23 S78 29-Jul-14 0.10-0.30 4072156-02	TP14-23 S79 29-Jul-14 0.10-0.30 4072156-03	RPD %	TP14-24 S80 29-Jul-14 0.10-0.30 4072156-04
Physical Tests																
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾													
pH	NS	NS	NS	4.3	5.3	5	4.8	5	5.7	4.9	5	5.2	5	5		5
Total Metals																
Antimony T-Sb mg/kg	20	40	40	2.8	0.3	1.4	7.9	1.1	0.2	2.6	0.4	0.2	0.4	0.4	0	0.3
Arsenic T-As mg/kg	10	10	10	3.9	1.7	4.4	10.7	3.7	3.4	5.2	1.5	3.1	5	5.6	11	4.7
Barium T-Ba mg/kg	350	350	350	32	37	68	174	29	42	88	30	49	102	98	4	35
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.2	0.3	0.2	0.2	0	0.1
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.25	0.38	0.25	0.29	0.16	0.31	0.29	0.11	0.46	1.14	1.15	1	0.53
Chromium T-Cr mg/kg	60	60	60	10.5	9.3	11.6	14.4	11	12.5	13	9	34.7	71	71.6	1	9.1
Cobalt T-Co mg/kg	25	25	25	4.2	5.2	6	5.2	6	7.3	6.4	5.1	14.4	23.5	24.7	5	5.4
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	302	192	363	1880	213	143	310	278	81.1	172	175	2	113
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	58.9	26.8	51.9	273	39.6	10.1	106	30.1	35.1	42.9	40.9	5	22.1
Manganese mg/kg	2000	2000	2000													
Mercury T-Hg mg/kg	10	25	75	0.13	<0.05	0.06	0.21	0.07	<0.05	0.15	0.07	0.1	0.14	0.12	15	0.13
Molybdenum T-Mo mg/kg	15	15	15	1	0.5	1	3.1	1.2	0.7	1.3	0.5	2	0.9	0.9	0	0.8
Nickel T-Ni mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	8.3	8.6	10.9	12.4	9.6	11.5	11.2	9.4	13	36.5	36.5	0	6.8
Selenium T-Se mg/kg	1	1	1	<0.5	<0.5	0.5	1.4	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	-	<0.5
Silver T-Ag mg/kg	20	40	40	<0.2	<0.2	<0.2	0.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2
Tin T-Sn mg/kg	50	300	300	3.7	0.7	5.9	12.1	1.2	2.1	4.1	1.1	0.6	0.5	0.5	0	0.5
Uranium T-U mg/kg	30	30	30													
Vanadium T-V mg/kg	100	100	100	36.5	40.4	37.5	36.6	48.6	42.2	46.2	34.7	103	68.8	71.6	4	41.4
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	73	62	76	118	57	67	96	36	276	375	366	2	92

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply,
value is the lowest of intake of contaminated soil, toxicity to soil invertebrates,
protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-25 S81 29-Jul-14 0.10-0.30 4072156-05	TP14-26 S82 29-Jul-14 0.10-0.30 4072156-06	TP14-27 S83 29-Jul-14 0.10-0.30 4072156-07	TP14-28 S84 29-Jul-14 0.10-0.30 4072156-08	TP14-29 S85 29-Jul-14 0.05-0.30 4072156-09	TP14-30 S86 29-Jul-14 0.10-0.30 4072156-10	TP14-31 S87 29-Jul-14 0.10-0.30 4072156-11	TP14-32 S88 29-Jul-14 0.10-0.30 4072156-12	TP14-33 S89 30-Jul-14 0.10-0.30 4072156-13	TP14-34 S90 30-Jul-14 0.05-0.30 4072156-14	TP14-35 S91 30-Jul-14 0.05-0.30 4072156-15	TP14-35 S92 30-Jul-14 0.05-0.30 4072156-16	RPD %
Physical Tests																
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾													
pH	NS	NS	NS	5.4	5.2	5.7	4.9	4.6	4	4	3.6	5	5.8	5	5	
Total Metals																
Antimony T-Sb mg/kg	20	40	40	0.6	0.3	0.3	0.3	0.3	1	0.7	1.8	0.1	0.2	0.1	0.1	0
Arsenic T-As mg/kg	10	10	10	5.1	5	5.6	9.7	4.1	12.6	9.3	17.7	3.1	2.7	1.9	1.7	11
Barium T-Ba mg/kg	350	350	350	118	36	73	63	61	185	103	210	24	138	22	21	5
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	0.3	0.2	0.4	0.6	0.4	0.1	0.1	<0.1	0.2	0.3	0.2	0.2	0
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	1.8	0.42	0.76	0.53	0.54	0.36	0.17	0.37	0.11	0.11	0.13	0.13	0
Chromium T-Cr mg/kg	60	60	60	26.1	45.6	56.8	71.6	8.8	9.7	7.9	4.8	12.4	16.4	12.2	11.7	4
Cobalt T-Co mg/kg	25	25	25	12.9	11.9	20.3	21.6	7.9	7.3	2.6	1.2	6	11.7	7.1	6.5	9
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	275	109	101	150	132	181	196	342	40.5	95.2	28.6	26.5	8
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	74.8	30	53.7	74.4	26.8	101	63	149	6.8	7.9	5.8	5.3	9
Manganese mg/kg	2000	2000	2000													
Mercury T-Hg mg/kg	10	25	75	0.31	0.11	0.15	0.09	0.11	0.32	0.19	0.75	0.06	<0.05	0.07	0.06	15
Molybdenum T-Mo mg/kg	15	15	15	1.1	0.6	0.7	1.1	1.5	3.1	3.8	3.7	0.8	0.8	1.5	1.2	22
Nickel T-Ni mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	18.3	25.6	31.8	25.1	6	6.2	8.6	5.1	9.5	18.2	10.2	9.2	10
Selenium T-Se mg/kg	1	1	1	0.5	<0.5	<0.5	<0.5	0.7	1.7	0.9	3	<0.5	<0.5	<0.5	<0.5	-
Silver T-Ag mg/kg	20	40	40	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	0.4	0.6	<0.2	<0.2	<0.2	<0.2	-
Tin T-Sn mg/kg	50	300	300	1.1	0.6	0.8	0.4	0.6	2.7	1.3	3.4	0.3	0.7	0.3	0.3	0
Uranium T-U mg/kg	30	30	30													
Vanadium T-V mg/kg	100	100	100	53.4	83.2	80.3	127	37.9	36.7	33.8	16.4	53.2	74.3	51.3	49.5	4
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	361	82	298	289	234	312	61	59	56	76	39	36	8

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-36 S93 30-Jul-14 0.10-0.30 4072156-17	TP14-37 S94 30-Jul-14 0.05-0.30 4072156-18	TP14-38 S95 30-Jul-14 0.10-0.30 4072156-19	TP14-39 S96 30-Jul-14 0.10-0.30 4072156-20	TP14-40 S97 30-Jul-14 0.10-0.30 4072156-21	TP14-41 S98 30-Jul-14 0.10-0.30 4072156-22	TP14-42 S99 30-Jul-14 0.15-0.35 4072156-23	TP14-43 S100 05-Aug-14 0.1-0.4 4080479-01	TP14-43 S101 05-Aug-14 0.8-1.1 4080479-02	TP14-43 S102 05-Aug-14 1.9-2.2 4080479-03	TP14-43 S103 05-Aug-14 2.2-2.5 4080479-04	TP14-44 S104 05-Aug-14 0.1-0.4 4080479-05
Physical Tests															
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾												
pH	NS	NS	NS	5.6	4.9	4.8	4.4	5	5.9	4.8	5.4	5	5.2	5.7	5.2
Total Metals															
Antimony T-Sb mg/kg	20	40	40	1.7	0.7	1.9	6.2	0.1	0.3	0.2	0.2	0.2	<0.1	0.3	0.1
Arsenic T-As mg/kg	10	10	10	4.3	2.7	5.4	9	1.4	4.5	2.9	5.9	3	1.3	19.5	2.7
Barium T-Ba mg/kg	350	350	350	75	60	142	167	28	57	41	52	38	30	71	35
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	0.1	<0.1	0.2	<0.1	0.2	0.5	0.2	0.2	0.2	0.2	0.4	0.1
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.26	0.25	0.34	0.43	0.09	0.73	0.51	0.23	0.11	0.07	0.68	0.23
Chromium T-Cr mg/kg	60	60	60	12	11.4	14.8	17	11.5	20.7	10.7	18	11.7	8.8	34.3	12.3
Cobalt T-Co mg/kg	25	25	25	5.7	6.1	6.3	5	7.4	14.1	5.8	11.1	6.8	5	19.8	7.1
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	530	183	411	865	26.7	92.8	107	63.8	92.3	33.5	89	132
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	108	26.3	75.7	255	4.2	27.5	20.8	18	8.7	4.5	81.3	4.4
Manganese mg/kg	2000	2000	2000												
Mercury T-Hg mg/kg	10	25	75	0.07	0.06	0.12	0.54	<0.05	0.12	0.17	<0.05	0.07	<0.05	<0.05	<0.05
Molybdenum T-Mo mg/kg	15	15	15	1.1	0.7	1.6	7.1	1.4	1.5	1	0.7	0.6	0.4	2.4	1
Nickel T-Ni mg/kg	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	10.1	9.8	10.9	10.6	10	11.3	9.3	11.1	10.1	7.8	12.8	10.4
Selenium T-Se mg/kg	1	1	1	0.7	<0.5	0.9	2.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver T-Ag mg/kg	20	40	40	0.3	<0.2	<0.2	1.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tin T-Sn mg/kg	50	300	300	3.2	1.4	3.4	11.6	0.4	0.6	0.5	0.4	0.8	0.3	0.4	0.2
Uranium T-U mg/kg	30	30	30												
Vanadium T-V mg/kg	100	100	100	42.6	43.5	47.4	43.3	49.7	90.1	43.6	61.6	47.7	39	129	42.4
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	73	62	94	139	36	285	75	136	59	36	388	63

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
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- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-44 S105 05-Aug-14 1.0-1.3 4080479-06	TP14-44 S106 05-Aug-14 1.8-1.9 4080479-07	TP14-45 S107 05-Aug-14 0.1-0.4 4080479-08	TP14-45 S108 05-Aug-14 0.7-1.0 4080479-09	TP14-45 S109 05-Aug-14 0.7-1.0 4080479-10	RPD %	TP14-45 S110 05-Aug-14 1.5-1.8 4080479-11	TP14-46 S111 12-Aug-14 0.1-0.3 4080997-01	TP14-47 S112 12-Aug-14 0.1-0.25 4080997-02	TP14-48 S113 12-Aug-14 0.1-0.3 4080997-03	TP14-49 S114 12-Aug-14 0.1-0.3 4080997-04	TP14-50 S115 12-Aug-14 0.1-0.3 4080997-05
Physical Tests															
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾												
pH	NS	NS	NS	5.3	5.7	5.5	5.9	5.9		5.9	4.9	4.4	5	5.3	4.9
Total Metals															
Antimony T-Sb mg/kg	20	40	40	<0.1	0.1	0.3	0.1	0.1	0	0.1	0.3	1	0.2	1.2	0.4
Arsenic T-As mg/kg	10	10	10	3.3	3.4	3.2	4.6	4.3	7	3.6	3.4	9.6	4.9	11.1	5.1
Barium T-Ba mg/kg	350	350	350	35	38	69	34	31	9	29	46	96	24	132	81
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	0.2	0.2	0.2	0.3	0.3	0	0.3	0.3	<0.1	0.2	0.2	0.2
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.25	0.11	0.36	0.1	0.09	11	0.11	0.27	0.56	0.14	3.17	0.56
Chromium T-Cr mg/kg	60	60	60	10.4	12.9	12.6	13.7	13.4	2	13.3	13.5	7.4	12	11.9	10.7
Cobalt T-Co mg/kg	25	25	25	7.6	7.9	7.7	6.8	6.4	6	7	7.7	2.1	5.1	12.3	6.1
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	107	31.4	81.3	33.1	30.7	8	30.8	119	326	129	410	152
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	3.6	4.7	6	5.8	5.4	7	5.4	20.1	85.9	8.7	157	37.1
Manganese mg/kg	2000	2000	2000												
Mercury T-Hg mg/kg	10	25	75	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	0.14	0.42	0.1	0.7	0.19
Molybdenum T-Mo mg/kg	15	15	15	0.5	0.7	0.4	1.1	1.1	0	1	1.2	2	1.6	3.6	2
Nickel T-Ni mg/kg	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	10.7	14.1	12.8	11.7	11.5	2	11.5	8.2	5.3	7.2	11.5	8.1
Selenium T-Se mg/kg	1	1	1	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	1.4	0.6	1	<0.5
Silver T-Ag mg/kg	20	40	40	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	0.4	<0.2	0.4	<0.2
Tin T-Sn mg/kg	50	300	300	0.2	0.3	0.4	0.3	0.3	0	0.3	0.6	2.1	0.3	2.5	1.2
Uranium T-U mg/kg	30	30	30												
Vanadium T-V mg/kg	100	100	100	41.7	51.7	49.9	57.2	52.9	8	55.3	54.3	28.7	50.9	38.3	50.8
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	66	59	94	82	81	1	75	70	93	40	485	149

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
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- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-51 S116 12-Aug-14 0.05-0.15 4080997-06	TP14-52 S117 12-Aug-14 0.1-0.3 4080997-07	TP14-53 S118 12-Aug-14 0.25-0.35 4080997-08	TP14-54 S119 12-Aug-14 0.1-0.3 4080997-09	TP14-54 S120 12-Aug-14 0.1-0.3 4080997-10	RPD %	TP14-55 S121 14-Aug-14 0.1-0.3 4080997-11	TP14-56 S122 14-Aug-14 0.1-0.3 4080997-12	TP14-57 S123 14-Aug-14 0.1-0.3 4080997-13	TP14-58 S124 14-Aug-14 0.1-0.3 4080997-14	TP14-59 S125 14-Aug-14 0.15-0.35 4080997-15	TP14-60 S126 14-Aug-14 0.1-0.3 4080997-16
Physical Tests															
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾												
pH	NS	NS	NS	5.1	5.5	4.3	4.7	4.6		6	5.4	5.7	4.7	5.5	4.8
Total Metals															
Antimony T-Sb mg/kg	20	40	40	0.4	0.4	0.3	2	1.8	11	0.2	0.3	0.3	0.2	<0.1	0.1
Arsenic T-As mg/kg	10	10	10	5.3	3.7	3.3	25.5	27.8	9	5.5	5.4	4.7	3.1	1.5	1.7
Barium T-Ba mg/kg	350	350	350	73	62	44	142	123	14	41	69	96	28	37	40
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 350 (pH > 8)	0.3	0.3	<0.1	1	0.8	22	0.4	0.2	0.3	0.2	0.2	0.2
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.78	0.76	0.25	2.6	2.05	24	0.46	1.03	0.8	0.23	0.39	0.1
Chromium T-Cr mg/kg	60	60	60	32.2	12.3	9.7	6.6	5.4	20	44.6	11.1	26.7	9.2	8	9.3
Cobalt T-Co mg/kg	25	25	25	12.8	4.9	5.5	28.7	20.2	35	26.2	6.8	14.3	4.7	5.5	6
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	112	133	183	995	929	7	119	113	101	124	53.5	54.5
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH > 5.5)	71.7	33.1	57.4	190	182	4	70.5	26.9	61.9	14.8	5.7	7.3
Manganese mg/kg	2000	2000	2000												
Mercury T-Hg mg/kg	10	25	75	0.24	0.23	0.07	0.68	0.67	1	0.06	0.15	0.16	0.09	0.05	0.06
Molybdenum T-Mo mg/kg	15	15	15	1.2	1.5	1	13.5	10.2	28	1.1	1	1.2	1	0.5	0.9
Nickel T-Ni mg/kg	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	14.8	7.2	5.3	8.3	6.9	18	18	8.7	14.2	7	7.1	8.2
Selenium T-Se mg/kg	1	1	1	<0.5	<0.5	<0.5	4.8	4.8	0	0.6	<0.5	<0.5	<0.5	<0.5	<0.5
Silver T-Ag mg/kg	20	40	40	<0.2	<0.2	0.2	1.8	2.3	24	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tin T-Sn mg/kg	50	300	300	0.8	0.8	0.5	3.6	3.4	6	0.3	0.6	0.6	0.5	0.2	0.5
Uranium T-U mg/kg	30	30	30												
Vanadium T-V mg/kg	100	100	100	57.6	39.7	42	33.5	22.5	39	152	49	88.8	40.2	34	37.5
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH > 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH > 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH > 7.0)	229	169	123	362	270	29	1120	258	332	56	81	42

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-61 S127 14-Aug-14 0.15-0.3 4080997-17	TP14-62 S128 14-Aug-14 0.1-0.3 4080997-18	TP14-63 S129 14-Aug-14 0.1-0.3 4080997-19	TP14-64 S130 14-Aug-14 0.1-0.3 4080997-20	TP14-64 S131 14-Aug-14 0.1-0.3 4080997-21	RPD %	TP14-65 S132 27-Aug-14 0.1-0.3 4090052-01	TP14-66 S133 27-Aug-14 0.1-0.3 4090052-02	TP14-67 S134 27-Aug-14 0.1-0.3 4090052-03	TP14-68 S135 27-Aug-14 0.1-0.3 4090052-04	TP14-69 S136 27-Aug-14 0.15-0.3 4090052-05	TP14-70 S137 27-Aug-14 0.1-0.3 4090052-06
Physical Tests															
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾												
pH	NS	NS	NS	4.4	5.3	5.3	7.2	7		5.3	5.7	5.4	5.1	5.9	5.5
Total Metals															
Antimony T-Sb mg/kg	20	40	40	0.2	0.1	0.2	0.2	0.3	40	0.6	0.2	0.4	0.4	0.3	0.3
Arsenic T-As mg/kg	10	10	10	1.5	1.5	21.1	22.4	24.4	9	4.3	4.2	13	8.4	4.1	5.4
Barium T-Ba mg/kg	350	350	350	32	44	106	115	119	3	35	23	32	43	44	49
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	0.1	0.2	0.2	0.1	0.1	0	0.2	0.3	0.5	0.4	0.5	0.5
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.24	0.08	0.21	0.29	0.37	24	0.77	0.25	0.19	0.28	0.6	0.42
Chromium T-Cr mg/kg	60	60	60	9.5	9	31.6	42.3	43.1	2	11.5	17.3	45	39.8	18.1	20
Cobalt T-Co mg/kg	25	25	25	6.3	6.1	20.2	19.2	22.6	16	7.5	9	13.4	17.9	18.8	20.2
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	73.8	98.4	77.8	72.4	83.2	14	189	33.1	58.1	61	87.7	77.3
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH > 5.5)	13.3	10.6	5	4.4	6.4	37	18.3	14.9	8.1	19.9	38.3	24.5
Manganese mg/kg	2000	2000	2000												
Mercury T-Hg mg/kg	10	25	75	0.11	<0.05	<0.05	0.06	0.08	29	0.08	0.07	0.08	0.14	0.07	0.1
Molybdenum T-Mo mg/kg	15	15	15	0.7	0.4	1.2	2.4	2.7	12	1.3	1.8	8.7	3.1	1.3	1.5
Nickel T-Ni mg/kg	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	9.5	9.9	15	9.4	10.8	14	9.6	10.7	20.9	17.5	15.1	14
Selenium T-Se mg/kg	1	1	1	<0.5	<0.5	<0.5	<0.5	<0.5	-	1	0.9	1.9	0.9	0.7	0.9
Silver T-Ag mg/kg	20	40	40	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	0.3	0.3	<0.2	<0.2
Tin T-Sn mg/kg	50	300	300	0.4	1.5	0.4	0.4	0.4	0	2.7	0.4	0.4	0.5	0.6	0.5
Uranium T-U mg/kg	30	30	30												
Vanadium T-V mg/kg	100	100	100	37.3	37.4	137	110	117	6	42.9	55.7	124	121	146	131
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH > 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH > 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH > 7.0)	52	37	162	87	97	11	130	119	108	134	317	361

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-71 S138 27-Aug-14 0.05-0.3 4090052-07	TP14-72 S139 27-Aug-14 0.05-0.2 4090052-08	TP14-73 S140 27-Aug-14 0.1-0.3 4090052-09	TP14-74 S141 27-Aug-14 0.1-0.3 4090052-10	TP14-74 S142 27-Aug-14 0.1-0.3 4090052-11	RPD %	TP14-75 S143 27-Aug-14 0.05-0.3 4090052-12	TP14-76 S144 27-Aug-14 0.25-0.40 4090052-13	TP14-77 S145 27-Aug-14 0.05-0.3 4090052-14	TP14-78 S146 29-Aug-14 0.15-0.3 4090052-15	TP14-79 S147 29-Aug-14 0.15-0.3 4090052-16	TP14-80 S148 29-Aug-14 0.15-0.3 4090052-17
Physical Tests															
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾												
pH	NS	NS	NS	5.1	5.9	6	5.3	5.2		5	4	4.6	3.8	5.8	4.1
Total Metals															
Antimony T-Sb mg/kg	20	40	40	0.5	0.4	0.4	0.3	0.3	0	0.8	0.7	0.7	3.1	1.6	1.1
Arsenic T-As mg/kg	10	10	10	6.4	14.4	19.4	3.3	3.3	0	9.3	4.2	6.6	45.9	16.3	12.9
Barium T-Ba mg/kg	350	350	350	63	59	94	27	26	4	73	64	75	285	177	152
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	0.5	0.4	0.4	0.2	0.2	0	0.1	<0.1	0.2	<0.1	0.1	<0.1
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.49	3.29	1.79	0.25	0.29	15	0.46	0.29	0.29	0.24	2.8	0.37
Chromium T-Cr mg/kg	60	60	60	24.6	17.7	36.2	11.5	11.4	1	2.2	8.8	13.5	7.4	9.8	3.9
Cobalt T-Co mg/kg	25	25	25	18.3	16.5	22.3	5.4	5.7	5	5.3	2.8	6	1.6	16.2	1.6
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	79	873	161	77	89.1	15	298	400	323	204	916	269
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	54.1	50.9	16.6	13.4	16.3	20	40.9	53.2	53.4	284	221	111
Manganese mg/kg	2000	2000	2000												
Mercury T-Hg mg/kg	10	25	75	0.14	0.3	0.18	0.12	0.12	0	0.15	0.17	0.5	0.57	0.53	0.22
Molybdenum T-Mo mg/kg	15	15	15	2	4	2.5	1.8	1.7	6	1.2	1	1.8	8.8	7.1	2.3
Nickel T-Ni mg/kg	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	70 (pH < 7.5) 250 (pH > 7.5)	8.8	10.9	14.7	8.4	8.1	4	2.2	5.1	10.4	5.9	8.9	3.5
Selenium T-Se mg/kg	1	1	1	1	0.9	1.4	<0.5	<0.5	-	2.1	0.6	1.3	10.9	5	2.1
Silver T-Ag mg/kg	20	40	40	0.2	0.4	0.3	<0.2	<0.2	-	0.7	<0.2	<0.2	2.5	1.2	0.6
Tin T-Sn mg/kg	50	300	300	0.8	0.9	0.5	0.6	0.5	18	2.3	0.7	1.5	8	3.4	1.6
Uranium T-U mg/kg	30	30	30												
Vanadium T-V mg/kg	100	100	100	148	73.1	113	54.8	53.5	2	9	42.7	44.2	20.8	23	13.9
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	269	682	254	70	71	1	122	37	60	87	412	67

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
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- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-81 S149 29-Aug-14 0.15-0.35 4090052-18	TP14-82 S150 29-Aug-14 0.15-0.3 4090052-19	TP14-83 S151 23-Sep-14 0.1-0.3 4091746-01	TP14-84 S152 23-Sep-14 0.1-0.3 4091746-02	TP14-85 S153 23-Sep-14 0.1-0.3 4091746-03	TP14-86 S154 23-Sep-14 0.1-0.3 4091746-04	TP14-87 S155 23-Sep-14 0.1-0.3 4091746-05	TP14-88 S156 23-Sep-14 0.1-0.3 4091746-06	TP14-89 S157 23-Sep-14 0.1-0.3 4091746-07	TP14-90 S158 23-Sep-14 0.1-0.3 4091746-08	TP14-90 S159 23-Sep-14 0.1-0.3 4091746-09	RPD %
Physical Tests															
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾												
pH	NS	NS	NS	4.2	4.6	5.5	5	5.2	6	5.6	5.7	4.7	4.5	4.5	
Total Metals															
Antimony T-Sb mg/kg	20	40	40	1.6	0.2	0.5	0.7	1.1	0.3	0.3	0.3	1.5	0.6	0.6	0
Arsenic T-As mg/kg	10	10	10	24.8	1.9	6.2	7.4	10.4	5.9	6.3	7.8	7	6.3	6.8	8
Barium T-Ba mg/kg	350	350	350	112	38	133	142	241	77	36	47	88	40	40	0
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	<0.1	<0.1	0.6	0.3	0.2	0.8	0.6	0.4	0.1	0.1	<0.1	-
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.24	0.12	1.96	0.94	3.51	2.52	0.34	2.12	0.33	0.08	0.07	13
Chromium T-Cr mg/kg	60	60	60	8.8	9.4	18.2	9.5	5.5	19.2	18.3	16.5	17.3	10.9	10	9
Cobalt T-Co mg/kg	25	25	25	3.5	4.1	12.3	16.5	9.3	21.9	9.3	15.1	4.2	4.2	4.1	2
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	273	120	115	123	410	167	75.4	904	347	191	143	29
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	122	16.5	61.3	69.9	106	45.9	24.6	31.6	270	44.6	42.8	4
Manganese mg/kg	2000	2000	2000												
Mercury T-Hg mg/kg	10	25	75	0.43	0.07	0.27	0.17	0.58	0.14	0.1	0.12	0.17	0.16	0.14	13
Molybdenum T-Mo mg/kg	15	15	15	4.8	0.7	2.4	1.3	2.8	1.7	2.9	1.5	2	1.3	1.3	0
Nickel T-Ni mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	6.2	5.7	12.7	7.8	8.9	16.8	10.7	10.3	5.8	6.6	6.3	5
Selenium T-Se mg/kg	1	1	1	4.6	<0.5	0.6	<0.5	1.1	0.9	<0.5	0.5	1.4	1.2	1.3	8
Silver T-Ag mg/kg	20	40	40	0.8	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	-
Tin T-Sn mg/kg	50	300	300	3.2	0.4	1	1.4	2	0.5	0.4	0.4	11.1	1.9	1.4	30
Uranium T-U mg/kg	30	30	30												
Vanadium T-V mg/kg	100	100	100	30.7	43.9	47.9	52.6	19.5	85.8	82.9	78	38.3	38.6	37.3	3
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	61	61	449	283	500	861	262	312	98	37	34	8

Notes:

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- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-91 S160 23-Sep-14 0.1-0.3 4091746-10	TP14-92 S161 13-Nov-14 0.2-0.4 4110781-01	TP14-93 S162 13-Nov-14 0.15-0.3 4110781-02	TP14-94 S163 13-Nov-14 0.2-0.3 4110781-03	TP14-95 S164 13-Nov-14 0.3-0.5 4110781-04	TP14-96 S165 13-Nov-14 0.3-0.5 4110781-05	T14-97 S166 13-Nov-14 0.2-0.4 4110781-06	TP14-98 S167 13-Nov-14 0.15-0.3 4110781-07	TP14-99 S168 13-Nov-14 0.15-0.3 4110781-08	TP14-99 S169 13-Nov-14 0.15-0.3 4110781-09	TP14-100 S170 13-Nov-14 0.05-0.2 4110781-10	TP14-101 S171 13-Nov-14 0.05-0.2 4110781-11
Physical Tests															
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾												
pH	NS	NS	NS	6.7	4	5.7	4.6	5.8	5.3	5	6.2	6.2	6.2	5.8	5.5
Total Metals															
Antimony T-Sb mg/kg	20	40	40	<0.1	0.6	0.3	0.3	0.3	0.9	0.2	0.2	<0.1	0.1	1.8	0.1
Arsenic T-As mg/kg	10	10	10	0.7	2.8	10.2	1.3	7.5	9.8	12.6	7	2.1	2.3	2.8	3.2
Barium T-Ba mg/kg	350	350	350	29	120	44	115	67	83	64	47	27	28	69	26
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	<0.1	<0.1	0.7	<0.1	0.8	0.2	0.4	0.2	0.2	0.2	0.2	0.3
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	<0.04	0.65	2.15	0.56	5.1	5.87	0.95	0.43	<0.04	<0.04	0.13	0.27
Chromium T-Cr mg/kg	60	60	60	8.7	4.5	18.2	2.9	9.3	8.8	32.3	13.1	10.8	11.2	13.1	13.5
Cobalt T-Co mg/kg	25	25	25	5.5	1.5	17.1	1.8	6.9	14.7	18.8	8.3	5	5.6	6.5	7.2
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	15.4	75	1890	32	141	999	44.5	28.9	18	18.9	65	50.8
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	1.2	50.2	42.5	43.1	17.8	94.2	14.5	16.8	2.4	2.9	35.8	4.2
Manganese mg/kg	2000	2000	2000												
Mercury T-Hg mg/kg	10	25	75	<0.05	0.28	0.14	0.3	0.14	0.49	0.09	0.06	<0.05	<0.05	<0.05	<0.05
Molybdenum T-Mo mg/kg	15	15	15	0.1	0.9	3.8	1.1	3.2	1.9	1.4	1.8	0.4	0.5	1.1	0.7
Nickel T-Ni mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	9.4	5.2	13.1	3.4	14.7	10.8	11.8	12.2	11.2	11	11.2	14.8
Selenium T-Se mg/kg	1	1	1	<0.5	<0.5	0.9	<0.5	2.1	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver T-Ag mg/kg	20	40	40	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	<0.2
Tin T-Sn mg/kg	50	300	300	<0.2	1.3	0.8	0.7	0.6	1.9	0.6	0.4	0.2	0.3	3	0.3
Uranium T-U mg/kg	30	30	30												
Vanadium T-V mg/kg	100	100	100	43.6	14.3	55.1	7.8	36.2	36.4	98.9	53.1	46.8	49.6	42.3	47.2
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	26	123	350	111	418	640	288	99	27	29	60	52

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply, value is the lowest of intake of contaminated soil, toxicity to soil invertebrates, protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP14-101A S172 13-Nov-14 0.1-0.3 4110781-12	TP14-102 S173 13-Nov-14 0.05-0.2 4110781-13	TP14-103 S174 13-Nov-14 0.05-0.2 4110781-14	TP14-104 S175 01-Dec-14 0.05-0.3 4120100-01	TP14-105 S176 01-Dec-14 0.05-0.3 4120100-02	TP14-106 S177 01-Dec-14 0.05-0.3 4120100-03	TP14-107 S178 01-Dec-14 0.05-0.3 4120100-04	TP15-01 S179 09-Mar-15 0.1-0.3 5030833-01	TP15-02 S180 09-Mar-15 0.15-0.3 5030833-02	TP15-03 S181 09-Mar-15 0.1-0.3 5030833-03	TP15-04 S182 09-Mar-15 0.15-0.3 5030833-04	TP15-05 S183 09-Mar-15 0.1-0.3 5030833-05
Physical Tests															
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾				5	6	7	8					
pH	NS	NS	NS	5.5	6.7	6.2	5.6	5.9	6.2	5.2	6.1	5	4	5.5	5.5
Total Metals															
Antimony T-Sb mg/kg	20	40	40	0.2	<0.1	<0.1	0.2	0.1	0.5	0.2	<0.1	0.1	0.5	0.3	0.2
Arsenic T-As mg/kg	10	10	10	6.5	1.2	1.2	3.1	2.7	66.6	2.9	0.5	2.8	11.6	5.4	3.1
Barium T-Ba mg/kg	350	350	350	39	114	35	37	37	21	52	32	26	81	100	31
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 250 (7.5 = pH < 8) 350 (pH > 8)	0.8	0.2	<0.1	0.4	0.3	0.5	0.3	<0.1	0.3	0.4	0.3	0.4
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.67	0.07	0.08	0.24	0.72	0.07	1.41	<0.04	0.1	0.56	8.23	0.11
Chromium T-Cr mg/kg	60	60	60	17.9	10.8	9	23.2	13.3	21.3	18.8	6.3	12.7	25.2	13.4	14.2
Cobalt T-Co mg/kg	25	25	25	11	7	5.2	7.1	9.2	6.3	11.9	4.3	4.6	21.6	9.8	11
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	537	33.1	43	37.2	499	83.4	121	13.6	13.7	124	1240	18
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	7.2	2.7	4.9	5.9	5.5	3.7	10.4	1.1	7.6	34.8	26	8.5
Manganese mg/kg	2000	2000	2000												
Mercury T-Hg mg/kg	10	25	75	0.08	<0.05	<0.05	0.07	<0.05	0.06	0.11	<0.05	0.08	0.25	0.48	0.1
Molybdenum T-Mo mg/kg	15	15	15	1.2	0.4	0.3	1.9	0.8	3	1.2	0.9	1.9	1.4	2.2	3.5
Nickel T-Ni mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	20.4	11.1	8.8	18.3	36.2	10.8	19.8	7.6	9.2	25.7	16.8	18.8
Selenium T-Se mg/kg	1	1	1	0.8	<0.5	<0.5	0.9	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver T-Ag mg/kg	20	40	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tin T-Sn mg/kg	50	300	300	0.4	0.2	0.3	0.4	0.6	0.3	0.4	<0.2	0.5	0.8	0.7	0.4
Uranium T-U mg/kg	30	30	30												
Vanadium T-V mg/kg	100	100	100	56.4	42.5	31.5	53.9	40	45.4	41.8	29	55.9	45.1	44.4	54.3
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	88	40	32	76	115	47	112	21	33	145	342	59

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply,
value is the lowest of intake of contaminated soil, toxicity to soil invertebrates,
protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

TABLE I

SUMMARY OF TOTAL METALS ANALYSES RESULTS FOR SOIL

Location: Sample ID: Depth (m): Date Sampled: ALS File:	Low Density Residential Standard (RL _{LD}) ⁽¹⁾	High Density Residential Standard (RL _{HD}) ⁽¹⁾	Commercial (CL) Standard ⁽¹⁾	TP15-06 S184 09-Mar-15 0.05-0.2 5030833-06	TP15-07 S185 09-Mar-15 0.05-0.2 5030833-07	TP15-08 S186 10-Mar-15 0.15-0.3 5030833-08	TP15-09 S187 10-Mar-15 0.15-0.3 5030833-09	TP15-10 S188 10-Mar-15 0.1-0.3 5030833-10	TP15-11 S189 10-Mar-15 0.1-0.3 5030833-11	TP15-11 S190 10-Mar-15 0.1-0.3 5030833-12	RPD %	TP15-13 S192 10-Mar-15 0.1-0.3 5030833-13
Physical Tests												
Moisture %	NS ⁽²⁾	NS ⁽²⁾	NS ⁽²⁾									
pH	NS	NS	NS	5.9	5	4.7	4.9	5.8	5.6	5.6		6.4
Total Metals												
Antimony T-Sb mg/kg	20	40	40	0.2	0.4	0.1	0.2	0.6	0.1	0.1	0	0.2
Arsenic T-As mg/kg	10	10	10	15.6	10.1	2.3	1.6	13	7.6	8.6	12	17.6
Barium T-Ba mg/kg	350	350	350	29	35	27	34	104	41	45	9	82
Beryllium T-Be mg/kg	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 85 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 150 (pH > 7.5)	1 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 4 (6 = pH < 6.5) 20 (6.5 = pH < 7) 30 (7 = pH < 7.5) 350 (pH > 8)	0.2	0.4	0.3	0.7	0.4	0.5	0.6	18	0.5
Cadmium T-Cd mg/kg	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 20 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 40 (pH > 7.5)	1.0 (pH < 5.5) 1.5 (5.5 = pH < 6.0) 2.0 (6.0 = pH < 6.5) 3.5 (6.5 = pH < 7.0) 15 (7.0 = pH < 7.5) 75 (pH > 7.5)	0.05	0.31	0.1	0.27	6.51	3.13	3.46	10	1.25
Chromium T-Cr mg/kg	60	60	60	11.8	52.8	12.6	11.2	13.5	11.1	11.4	3	24.1
Cobalt T-Co mg/kg	25	25	25	6.1	19.9	5.6	10.1	15.2	7.4	7.6	3	24.5
Copper T-Cu mg/kg	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 150 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	75 (pH < 5.5) 100 (5.5 = pH < 6.0) 300 (pH > 6)	16.8	188	24.5	55.2	1780	297	338	13	52.1
Lead mg/kg	120	120	120 (pH < 5.5) 150 (pH >= 5.5)	5.5	11.8	8	7.5	67.4	7.6	8.2	8	27
Manganese mg/kg	2000	2000	2000									
Mercury T-Hg mg/kg	10	25	75	<0.05	0.08	0.09	0.09	0.47	0.08	0.09	12	0.14
Molybdenum T-Mo mg/kg	15	15	15	0.8	9.9	1.1	2	3.1	1.6	1.7	6	1.3
Nickel T-Ni mg/kg	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	70 (pH<7.5) 250 (pH >7.5)	22.2	33.5	10	16.1	14.6	10.1	10.9	8	15.2
Selenium T-Se mg/kg	1	1	1	0.8	0.7	<0.5	0.6	1.1	<0.5	<0.5	-	0.9
Silver T-Ag mg/kg	20	40	40	<0.2	0.3	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2
Tin T-Sn mg/kg	50	300	300	0.3	0.5	0.4	0.4	2.2	0.4	0.4	0	0.6
Uranium T-U mg/kg	30	30	30									
Vanadium T-V mg/kg	100	100	100	48.1	88.7	53.4	53.7	39.4	47.6	45.2	5	107
Zinc T-Zn mg/kg	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	150 (pH < 6.0) 250 (6.0 = pH < 6.5) 350 (6.5 = pH < 7.0) 450 (pH >= 7.0)	52	307	35	55	422	256	267	4	420

Notes:

- (1) From Contaminated Sites Regulation (CSR). Where matrix standards apply,
value is the lowest of intake of contaminated soil, toxicity to soil invertebrates,
protection of marine/estuarine aquatic life, or protection of Drinking Water.
- (2) "NS" denotes no standard.
- (3) "-" denotes not analyzed.
- (4) Shading denotes concentration exceeds RL_{LD}, RL_{HD}, or CL standard.

APPENDIX E
INFORMATION FROM SITE REGISTRY

As Of: MAR 22, 2020 BC Online: Site Registry 20/03/25
For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:34:27

Folio: Page 1

7 records selected for 5.0 km from latitude 49 deg, 36 min, 56 sec
and Longitude 123 deg, 12 min, 22 sec

Site Id	Lastupd	Address / City
0000436	19MAY31	BRITANNIA MINE SITE BRITANNIA BEACH
0003444	12DEC18	HIGHWAY 99 BRITANNIA BEACH
0005529	02MAY10	FURRY CREEK, KM 26 - SEA TO SKY HIGHWAY FURRY CREEK
0008881	04OCT14	BRITANNIA VILLAGE BRITANNIA BEACH
0008976	20MAR06	BRITANNIA BAY PROPERTIES BRITANNIA BEACH
0008977	13NOV12	BRITANNIA BAY PROPERTIES BRITANNIA BEACH
0016505	14NOV13	34833 HIGHWAY 99 (CROWN LAND) SQUAMISH

DRAFT

As of: JUN 17, 2012 BC Online: Site Registry 12-06-22
For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:39:32

Folio: Page 1

Detail Report

SITE LOCATION

Site ID: 436 Latitude: 49d 36m 44.6s
Victoria File: 26250-20/0517 Longitude: 123d 08m 29.9s
Regional File:
Region: SURREY, LOWER MAINLAND

Site Address: BRITANNIA MINE SITE

City: BRITANNIA BEACH Prov/State: BC
Postal Code:

Registered: OCT 07, 1997 Updated: MAY 18, 2012 Detail Removed: MAY 16, 2012

Notations: 0 Participants: 0 Associated Sites: 0
Documents: 0 Susp. Land Use: 0 Parcel Descriptions: 1

Location Description: LOCATION DERIVED BY BC ENVIRONMENT REFERENCING RECTIFIED
NAD 83 ORTHOPHOTOGRAPHY - NOV.15,1996

Record Status: ACTIVE - UNDER REMEDIATION

Fee category: UNRANKED

=====

PARCEL DESCRIPTIONS

Date Added: APR 27, 1995 Crown Land PIN#:
LTO PID#: 015913970 Crown Land File#:
Land Desc: DISTRICT LOT 892, GROUP 1 NEW WESTMINSTER DISTRICT EXCEPT
FIRST: PART IN REFERENCE PLAN 7313 SECONDLY: PORTIONS IN
PLANS 19960, BCP7078, BCP20372 AND BCP25661

No activities were reported for this site

End of Detail Report

As of: JUN 17, 2012 BC Online: Site Registry 12-06-22
For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:39:50
Folio: Page 1

Detail Report

SITE LOCATION

Site ID: 3444 Latitude: 49d 36m 57.1s
Victoria File: Longitude: 123d 12m 21.8s
Regional File: 26250-20/3444
Region: SURREY, LOWER MAINLAND

Site Address: HIGHWAY 99
City: BRITANNIA BEACH Prov/State: BC
Postal Code:

Registered: MAY 12, 1998 Updated: SEP 08, 2000 Detail Removed: AUG 24, 2000

Notations: 3 Participants: 4 Associated Sites: 0
Documents: 3 Susp. Land Use: 0 Parcel Descriptions: 1

Location Description: E SHORE OF HOWE SOUND, 45 KM N OF VANCOUVER, S OF
BRITANNIA BEACH. LOCATION DERIVED BY BC ENV REFERENCING RECTIFIED NAD 83
ORTHOPHOTOGRAPHY - NOV.15,1996

Record Status: ACTIVE - UNDER ASSESSMENT
Fee category: LARGE SITE, SIMPLE CONTAMINATION

=====

NOTATIONS

Notation Type: PRELIMINARY SITE INVESTIGATION REPORT: INTERNAL REVIEW
REQUESTED

Notation Class: WASTE MANAGEMENT ACT: CONTAMINATED SITES NOTATIONS
Initiated: MAY 07, 1999 Approved: MAY 07, 1999

Ministry Contact: SHUTTER, SIMON (SURREY)

Notation Participants Notation Roles
THURBER ENVIRONMENTAL CONSULTANTS LTD (VANCOUVER) SUBMITTED BY

Notation Type: PRELIMINARY SITE INVESTIGATION REPORT ACCEPTED
Notation Class: WASTE MANAGEMENT ACT: FEE REGULATION S.35(2)
Initiated: JAN 08, 1997 Approved: JAN 08, 1997

Ministry Contact: O`LEARY, KATHERINE E

Notation Participants Notation Roles
THURBER ENVIRONMENTAL CONSULTANTS LTD (VANCOUVER) RECEIVED BY
O`LEARY, KATHERINE E ISSUED BY

Note: DID NOT ENTIRELY SATISFY BC ENVIRONMENT (BCE) EXPECTATIONS FOR PERFORMING A PRELIMINARY SITE INVESTIGATION. LETTER SENT WITH BCE COMMENTS

Notation Type: PRELIMINARY SITE INVESTIGATION REPORT SUBMITTED: INTERNAL REVIEW

Notation Class: WASTE MANAGEMENT ACT: FEE REGULATION S.35(2)

Initiated: OCT 22, 1996 Approved: OCT 22, 1996

As of: JUN 17, 2012 BC Online: Site Registry 12-06-22
For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:39:50

Folio: Page 2

NOTATIONS

Ministry Contact: O`LEARY, KATHERINE E

Notation Participants	Notation Roles
O`LEARY, KATHERINE E	REVIEWED BY
THURBER ENVIRONMENTAL CONSULTANTS LTD (VANCOUVER)	REQUESTED BY
=====	=====

SITE PARTICIPANTS

Participant: MAKIN PULP AND PAPER LTD.
Role(s): OPERATOR
PROPERTY OWNER
Start Date: DEC 03, 1987 End Date:

Participant: O`LEARY, KATHERINE E
Role(s): ALTERNATE MINISTRY CONTACT
Start Date: OCT 22, 1996 End Date:

Participant: SHUTTER, SIMON (SURREY)
Role(s): MAIN MINISTRY CONTACT
Start Date: OCT 22, 1996 End Date: OCT 01, 2006

Participant: THURBER ENVIRONMENTAL CONSULTANTS LTD (VANCOUVER)
Role(s): ENVIRONMENTAL CONSULTANT/CONTRACTOR
Start Date: OCT 22, 1996 End Date:

DOCUMENTS

Title: MAKIN LANDS, SUPPLEMENTARY STAGE 2 PRELIMINARY SITE INVESTIGATION

Authored: MAY 05, 1999 Submitted: MAY 07, 1999

Participants Role

THURBER ENVIRONMENTAL CONSULTANTS LTD (VANCOUVER) AUTHOR

Title: MAKIN PROPERTY, BRITANNIA BEACH, B.C. SUPPLEMENTARY INFORMATION

Authored: MAY 01, 1997

Submitted: MAY 01, 1997

Participants

Role

THURBER ENVIRONMENTAL CONSULTANTS LTD (VANCOUVER) AUTHOR

Title: MAKIN PROPERTY, BRITANNIA BEACH, B.C. ENVIRONMENTAL AND GEOTECHNICAL ASSESSMENT

Authored: OCT 22, 1996

Submitted: OCT 22, 1996

Participants

Role

THURBER ENVIRONMENTAL CONSULTANTS LTD (VANCOUVER) AUTHOR

O'LEARY, KATHERINE E

REVIEWER

PARCEL DESCRIPTIONS

Date Added: FEB 12, 1998

Crown Land PIN#:

LTO PID#: 010077227

Crown Land File#:

Land Desc: LOT A, EXCEPT PART DEDICATED ROAD ON PLAN BCP28651, DISTRICT

LOTS 1583, 2001 AND 7034 PLAN 21576

As of: JUN 17, 2012 BC Online: Site Registry 12-06-22

For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:39:50

Folio: Page 3

PARCEL DESCRIPTIONS

No activities were reported for this site

End of Detail Report

As of: JUN 17, 2012 BC Online: Site Registry 12-06-22
For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:39:55

Folio: Page 1

Detail Report

SITE LOCATION

Site ID: 8881 Latitude: 49d 37m 27.4s
Victoria File: 26250-20/8881 Longitude: 123d 12m 18.9s
Regional File: 26250-20/8881
Region: SURREY, LOWER MAINLAND

Site Address: BRITANNIA VILLAGE

City: BRITANNIA BEACH Prov/State: BC
Postal Code:

Registered: MAR 04, 2004 Updated: OCT 14, 2004 Detail Removed: OCT 06, 2004

Notations: 6 Participants: 9 Associated Sites: 3
Documents: 4 Susp. Land Use: 3 Parcel Descriptions: 1

Location Description: LAT/LONG CONFIRMED USING GOAT BY MINISTRY STAFF
(APPROXIMATE)

Record Status: INACTIVE - REMEDIATION COMPLETE
Fee category: UNRANKED

=====

NOTATIONS

Notation Type: CERTIFICATE OF COMPLIANCE ISSUED (WMA 27.6(2))
Notation Class: WASTE MANAGEMENT ACT: CONTAMINATED SITES NOTATIONS
Initiated: JUL 06, 2004 Approved: JUL 06, 2004

Ministry Contact: LOCKHART, DAVE

Notation Participants	Notation Roles
BRITANNIA BAY PROPERTIES	REQUESTED BY
WHITICAR, DOUGLAS	ROSTERED EXPERT UNDER
	PROTOCOL SIX
SQUAMISH-LILLOOET REGIONAL DISTRICT (PEMBERTON)	RECEIVED BY
WARD, JOHN E H	ISSUED BY

Note: ISSUED TO SITE 8881, 8976, & 8977 ON THE ADVICE OF A ROSTERED
PROFESSIONAL EXPERT (DOUGLAS WHITICAR) UNDER PROTOCOL 6 OF THE CONTAMINATED
SITES REGULATION.

Notation Type: SITE PROFILE REVIEWED - FURTHER INVESTIGATION REQUIRED BY THE
MINISTRY
Notation Class: ENVIRONMENTAL MANAGEMENT ACT: GENERAL

Initiated: MAR 26, 2004

Approved:

Ministry Contact: HACKINEN, COLEEN (SURREY)

Note: RELEASE OF ZONING APPLICATION GRANTED BECAUSE IN THE OPINION OF THE
MANAGER APPROVAL OF THE APPLICATION WOULD NOT POSE SIGNIFICANT RISK OR
THREAT.

As of: JUN 17, 2012 BC Online: Site Registry 12-06-22
For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:39:55

Folio: Page 2
NOTATIONS

Required Actions: DETAILED SITE INVESTIGATION REQUIRED.

Notation Type: SITE PROFILE - FURTHER INVESTIGATION REQUIRED BY THE MINISTRY
Notation Class: WASTE MANAGEMENT ACT: CONTAMINATED SITES NOTATIONS
Initiated: MAR 26, 2004 Approved:

Ministry Contact: HACKINEN, COLEEN (SURREY)

Note: RELEASE OF ZONING APPLICATION GRANTED BECAUSE IN THE OPINION OF THE
MANAGER APPROVAL OF THE APPLICATION WOULD NOT POSE SIGNIFICANT RISK OR
THREAT.

Required Actions: DETAILED SITE INVESTIGATION REQUIRED.

Notation Type: SITE PROFILE RECEIVED
Notation Class: ENVIRONMENTAL MANAGEMENT ACT: GENERAL
Initiated: FEB 19, 2004 Approved:

Ministry Contact: HACKINEN, COLEEN (SURREY)

Notation Participants	Notation Roles
BRITANNIA BAY PROPERTIES	SITE PROFILE SUBMITTED
BY	
BRITANNIA BAY PROPERTIES	SITE PROFILE SUBMITTED
BY	

Notation Type: SITE PROFILE RECEIVED
Notation Class: WASTE MANAGEMENT ACT: CONTAMINATED SITES NOTATIONS
Initiated: FEB 19, 2004 Approved:

Ministry Contact: HACKINEN, COLEEN (SURREY)

Notation Participants	Notation Roles
BRITANNIA BAY PROPERTIES	SITE PROFILE SUBMITTED
BY	
BRITANNIA BAY PROPERTIES	SITE PROFILE SUBMITTED
BY	

Notation Type: NOTICE OF INDEPENDENT REMEDIATION INITIATION SUBMITTED (WMA 28(2))

Notation Class: WASTE MANAGEMENT ACT: CONTAMINATED SITES NOTATIONS

Initiated: NOV 25, 2003 Approved:

Ministry Contact: SMITH, ASHLEY (SURREY) N

Notation Participants	Notation Roles
URS CORPORATION	SUBMITTED BY

Note: UNDERGROUND STORAGE TANK REMOVALS (APPROXIMATELY 45)

=====

As of: JUN 17, 2012 BC Online: Site Registry 12-06-22

For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:39:55

Folio: Page 3

SITE PARTICIPANTS

Participant: BRITANNIA BAY PROPERTIES

Role(s): PROPERTY OWNER

 SITE PROFILE COMPLETOR

 SITE PROFILE CONTACT

Start Date: NOV 25, 2003 End Date:

Participant: HACKINEN, COLEEN (SURREY)

Role(s): MAIN MINISTRY CONTACT

Start Date: FEB 19, 2004 End Date:

Participant: LOCKHART, DAVE

Role(s): ALTERNATE MINISTRY CONTACT

Start Date: JUL 06, 2004 End Date:

Participant: SMITH, ASHLEY (SURREY) N

Role(s): ALTERNATE MINISTRY CONTACT

Start Date: NOV 25, 2003 End Date:

Participant: SQUAMISH-LILLOOET REGIONAL DISTRICT (PEMBERTON)

Role(s): MUNICIPAL/REGIONAL CONTACT
Start Date: JUL 06, 2004 End Date:

Participant: URS CANADA INC
Role(s): ENVIRONMENTAL CONSULTANT/CONTRACTOR
Start Date: MAR 10, 2004 End Date:

Participant: URS CORPORATION
Role(s): ENVIRONMENTAL CONSULTANT/CONTRACTOR
Start Date: NOV 12, 2003 End Date:

Participant: WARD, JOHN E H
Role(s): ALTERNATE MINISTRY CONTACT
Start Date: JUL 06, 2004 End Date:

Participant: WHITICAR, DOUGLAS
Role(s): ROSTERED EXPERT UNDER PROTOCOL SIX
Start Date: JUL 06, 2004 End Date:

=====

DOCUMENTS

Title: (LETTER) TECHNICAL REVIEW IN SUPPORT OF AN APPLICATION FOR A
CERTIFICATE OF COMPLIANCE

Authored: JUN 21, 2004 Submitted: JUN 21, 2004

Participants	Role
URS CANADA INC	AUTHOR

Title: DETAILED SITE INVESTIGATION AND MINE WASTE CLOSURE - DISTRICT LOTS
891, 1897, 3623, 4015 AND 7169A, BRITANNIA VILLAGE, BC

Authored: JUN 18, 2004 Submitted: JUN 18, 2004

Participants	Role
URS CANADA INC	AUTHOR

As of: JUN 17, 2012 BC Online: Site Registry 12-06-22
For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:39:55

Folio: Page 4
DOCUMENTS

Title: STAGE 2 PRELIMINARY SITE INVESTIGATION AND LIMITED SITE REMEDIATION -
DISTRICT LOTS 891, 1897, 3623, 4015 AND 7169A, BRITANNIA VILLAGE, BC

Authored: MAR 10, 2004 Submitted: MAR 10, 2004

Participants	Role
URS CANADA INC	AUTHOR

Title: FINAL STAGE 1 PRELIMINARY SITE INVESTIGATION - DISTRICT LOTS 891,
1897, 3623, 4015 AND 7169A, BRITANNIA VILLAGE, BC
Authored: NOV 12, 2003 Submitted: NOV 12, 2003

Participants	Role
URS CORPORATION	AUTHOR

=====

ASSOCIATED SITES

Site id:	436	Date: FEB 26, 2004
Notes:		

Site id:	8976	Date: JUL 09, 2004
Notes:		

Site id:	8977	Date: JUL 09, 2004
Notes:		

=====

SUSPECTED LAND USE

Description: MUNICIPAL WASTE STORAGE, RECYCLING, COMPOSTING, LANDFILLING
Notes: INSERTED FOR SITE PROFILE DATED 2004-01-12(described on Site
Profile dated 04-01-12)

Description: NONFERROUS METAL CONCENTRATE WHOLESALE BULK STORAGE/SHIPPING
Notes: INSERTED FOR SITE PROFILE DATED 2004-01-12(described on Site
Profile dated 04-01-12)

Description: PETRO. PROD., /PRODUCE WATER STRG ABOVEGRND/UNDERGRND TANK
Notes: INSERTED FOR SITE PROFILE DATED 2004-01-12(described on Site
Profile dated 04-01-12)

=====

PARCEL DESCRIPTIONS

Date Added: FEB 26, 2004	Crown Land PIN#:
LTO PID#: 015977923	Crown Land File#:
Land Desc:	

=====

CURRENT SITE PROFILE INFORMATION (Sec. III to X)
Site Profile Completion Date: JAN 12, 2004

Local Authority Received:

Ministry Regional Manager Received: FEB 19, 2004 Decision: MAR 26, 2004
Decision: INVESTIGATION REQUIRED

Site Registrar Received: MAR 11, 2004 Entry Date: MAR 11, 2004

III COMMERCIAL AND INDUSTRIAL PURPOSES OR ACTIVITIES ON SITE
Schedule 2

Reference	Description
H15	MUNICIPAL WASTE STORAGE, RECYCLING, COMPOSTING, LANDFILLING

AREAS OF POTENTIAL CONCERN

Petroleum, solvent or other polluting substance spills to the environment greater than 100 litres?.....NO
Residue left after removal of piled materials such as chemicals, coal, ore, smelter slag, air quality control system baghouse dust?.....NO
Discarded barrels, drums or tanks?.....NO
Contamination resulting from migration of substances from other properties?.....NO

FILL MATERIALS

Fill dirt, soil, gravel, sand or like materials from a contaminated site or from a source used for any of the activities listed under Schedule 2?.....NO
Discarded or waste granular materials such as sand blasting grit, asphalt paving or roofing material, spent foundry casting sands, mine ore, waste rock or float?.....NO
Dredged sediments, or sediments and debris materials originating from locations adjacent to foreshore industrial activities, or municipal sanitary or stormwater discharges?.....NO

WASTE DISPOSAL

Materials such as household garbage, mixed municipal refuse, or demolition debris?.....YES
Waste or byproducts such as tank bottoms, residues, sludge, or flocculation precipitates from industrial processes or wastewater treatment?.....NO
Waste products from smelting or mining activities, such as smelter slag, mine tailings, or cull materials from coal processing?.....NO
Waste products from natural gas and oil well drilling activities, such as drilling fluids and muds?.....NO
Waste products from photographic developing or finishing laboratories; asphalt tar manufacturing; boilers, incinerators or other thermal facilities (eg. ash); appliance, small equipment or engine repair or salvage; dry cleaning operations (eg. solvents); or automobile and truck parts cleaning or repair?.....NO

TANKS OR CONTAINERS USED OR STORED

Underground fuel or chemical storage tanks?.....NO
Above ground fuel or chemical storage tanks?.....NO

SPECIAL (HAZARDOUS) WASTES OR SUBSTANCES

PCB-containing electrical transformers or capacitors either at grade, attached above ground to poles, located within buildings, or stored?....NO

Waste asbestos or asbestos containing materials such as pipe wrapping,
blown-in insulation or panelling buried?.....NO

As of: JUN 17, 2012 BC Online: Site Registry 12-06-22
For: PB84923 PITEAU ASSOCIATES ENGINEERING 15:39:55

Folio: Page 6

Paints, solvents, mineral spirits or waste pest control products or pest
control product containers stored in volumes greater than 205 litres?...NO

LEGAL OR REGULATORY ACTIONS OR CONSTRAINTS

Government orders or other notifications pertaining to environmental
conditions or quality of soil, water, groundwater or other
environmental media?.....NO

Liens to recover costs, restrictive covenants on land use, or other
charges or encumbrances, stemming from contaminants or wastes remaining
onsite or from other environmental conditions?.....NO

Government notifications relating to past or recurring environmental
violations at the site or any facility located on the site?.....NO

X ADDITIONAL COMMENTS AND EXPLANATIONS

End of Detail Report

DRAFT

As of: APR 12, 2020 BC Online: Site Registry 20-04-13
For: PB84923 PITEAU ASSOCIATES ENGINEERING 12:41:33

Folio: Page 1

Synopsis Report

SITE LOCATION

Site ID: 3444 Latitude: 49d 36m 58.0s
Victoria File: Longitude: 123d 12m 23.0s
Regional File: 26250-20/3444
Region: SURREY, LOWER MAINLAND

Common Name:
Site Address: HIGHWAY 99
City: BRITANNIA BEACH Prov/State: BC
Postal Code: V0N 1J0

Registered: MAY 12, 1998 Updated: DEC 18, 2012 Detail Removed: DEC 17, 2012

Notations: 5 Participants: 4 Associated Sites: 0
Documents: 3 Susp. Land Use: 0 Parcel Descriptions: 9

Location Description: E SHORE OF HOWE SOUND, 45 KM N OF VANCOUVER, S OF
BRITANNIA BEACH. LOCATION CONFIRMED USING ICIS ON 18 DECEMBER, 2012

Status: NOT ASSIGNED
Fee category: LARGE SITE, SIMPLE CONTAMINATION

=====

CURRENT SITE PROFILE INFORMATION (Sec. III to X)

Site Profile Completion Date: MAY 25, 2012

Local Authority Received: DEC 06, 2012

Ministry Regional Manager Received: DEC 06, 2012 Decision: DEC 18, 2012
Decision: INVESTIGATION REQUIRED

Site Registrar Received: DEC 06, 2012 Entry Date: DEC 17, 2012

III COMMERCIAL AND INDUSTRIAL PURPOSES OR ACTIVITIES ON SITE

Schedule 2

Reference	Description
H14	MINE TAILING WASTE DISPOSAL
H6	CONST. DEMO. MATERIAL INCL. CONCRETE AND ASHPALT, LANDFILLIN

AREAS OF POTENTIAL CONCERN

Petroleum, solvent or other polluting substance spills to the environment
greater than 100 litres?.....NO
Residue left after removal of piled materials such as chemicals, coal,
ore, smelter slag, air quality control system baghouse dust?.....NO

Discarded barrels, drums or tanks?.....YES
Contamination resulting from migration of substances from other
properties?.....NO

FILL MATERIALS

Fill dirt, soil, gravel, sand or like materials from a contaminated site
or from a source used for any of the activities listed under Schedule
2?.....YES

As of: APR 12, 2020 BC Online: Site Registry 20-04-13
For: PB84923 PITEAU ASSOCIATES ENGINEERING 12:41:33

Folio: Page 2

Discarded or waste granular materials such as sand blasting grit, asphalt
paving or roofing material, spent foundry casting sands, mine ore,
waste rock or float?.....YES

Dredged sediments, or sediments and debris materials originating from
locations adjacent to foreshore industrial activities, or municipal
sanitary or stormwater discharges?.....NO

WASTE DISPOSAL (QUESTIONS AS OF JANUARY 1 2009)

Materials such as household garbage, mixed municipal refuse, or demolition
debris?.....YES

Waste or byproducts such as tank bottoms, residues, sludge, or
flocculation precipitates from industrial processes or wastewater
treatment?.....NO

Waste products from smelting or mining activities, such as smelter slag,
mine tailings, or cull materials from coal processing?.....NO

Waste products from natural gas and oil well drilling activities, such as
drilling fluids and muds?.....NO

Waste products from photographic developing or finishing laboratories;
asphalt tar manufacturing; boilers, incinerators or other thermal
facilities (eg. ash); appliance, small equipment or engine repair or
salvage; dry cleaning operations (eg. solvents); for from the cleaning
or repair of parts of boats, ships, barges, automobiles or trucks,
including sandblasting grit or paint scrapings?.....NO

TANKS OR CONTAINERS USED OR STORED, OTHER THAN TANKS USED FOR RESIDENTIAL HEATING FUEL

Underground fuel or chemical storage tanks other than storage tanks for
compressed gases?.....YES

Above ground fuel or chemical storage tanks other than storage tanks for
compressed gases?.....NO

HAZARDOUS WASTES OR HAZARDOUS SUBSTANCES

PCB-containing electrical transformers or capacitors either at grade,

attached above ground to poles, located within buildings, or stored?....NO
Waste asbestos or asbestos containing materials such as pipe wrapping,
blown-in insulation or panelling buried?.....NO
Paints, solvents, mineral spirits or waste pest control products or pest
control product containers stored in volumes greater than 205 litres?...NO

LEGAL OR REGULATORY ACTIONS OR CONSTRAINTS

Government orders or other notifications pertaining to environmental
conditions or quality of soil, water, groundwater or other
environmental media?.....NO
Liens to recover costs, restrictive covenants on land use, or other
charges or encumbrances, stemming from contaminants or wastes remaining
onsite or from other environmental conditions?.....NO
Government notifications relating to past or recurring environmental
violations at the site or any facility located on the site?.....NO

X ADDITIONAL COMMENTS AND EXPLANATIONS

End of Synopsis Report

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APPENDIX F
FIELD INVESTIGATION METHODOLOGIES

APPENDIX F

FIELD INVESTIGATION METHODOLOGIES

SOIL SAMPLING PROCEDURES

Soil samples were collected from either hand dug holes or excavated with a backhoe to the specified depth and soil samples were collected by removing material from the side of the hole using a gloved hand. Care was taken to avoid sampling of material that had come into contact with the shovel or bucket.

In all cases, the following procedures were followed to ensure sample integrity:

- All sample containers were new glass jars provided by the project analytical laboratory;
- Clean gloves were worn for each new sample, to avoid the potential for cross contamination;
- Each jar was completely filled with soil so that no headspace exists. Aeration and air contact were minimized;
- The threads of the jar were cleaned before the cap was screwed on;
- The sample was placed on ice in a cooler; and
- Where appropriate, a duplicate soil sample was collected in a re-sealable plastic bag for headspace vapour analysis.

All soil samples were analyzed within allowable holding times specified by the project analytical laboratory.

STOCKPILE SAMPLING PROCEDURES

Collection of samples from soil stockpiles was performed in basic accordance with MOE guidelines set out in the technical guidance documented entitled "Site Characterization and Confirmation Testing". Five aliquots of approximately equal mass were collected from each stockpile and combined in the field to create a single composite sample. The aliquots were collected from a minimum depth of 0.3m into the stockpile. Stockpiles volumes ranged from about 25 m³ to 120 m³.

HEADSPACE VAPOUR ANALYSIS

Headspace vapour analyses on soil samples collected in re-sealable ("Zip-Loc") plastic bags filled approximately half-way with soil. The procedure was as follows:

- After sitting for at least 20 minutes, the bag was vigorously shaken for 15 seconds.
- A Gastech 1238ME combustible gas detector was used to quantify the concentration of volatile vapours in the sample. The bag was opened slightly to allow the sampling probe to be inserted. The detector was operated with the methane elimination on, and the highest meter response was recorded.

MONITORING WELL INSTALLATION

Monitoring well assemblies consisting of solid 50 mm (2") diameter PVC pipes with slotted screens at the base (0.25 mm slot size), were installed in selected boreholes created with a Sonic

APPENDIX F

FIELD INVESTIGATION METHODOLOGIES

drill rig. Washed silica sand was installed around the screened sections and bentonite chips were introduced from the surface to form seals above the sand filters to a minimum thickness of 0.3m. The remaining open space on the borehole was filled with drill cuttings to a depth of approximately 0.3 m below ground. Flush-mount monitoring well covers were cemented into the ground surface to protect the monitoring well casings.

To reduce the risk of introduction of foreign contaminants via the monitoring well materials, only pre-washed and bagged PVC screens and piping were used. All silica sand and bentonite were brought to the Site in clean – unopened bags.

MONITORING WELL DEVELOPMENT

Dedicated sampling devices consisting of Waterra™ inertial pumps were installed in the monitoring wells. These devices were used to remove groundwater and develop the sand-packs surrounding the monitoring well screens. All sampling equipment was supplied by Piteau in new (unused) and clean condition.

GROUNDWATER SAMPLE COLLECTION

All samples were collected using the inertial pumps employed during development.

Samples were placed in appropriate bottles provided by the project laboratory (with preservative, if necessary), labelled, and stored in ice-chilled coolers.

The following procedures were followed to ensure sample integrity:

- To minimize the potential for cross-contamination, the field technician wore clean, disposable latex gloves;
- All sample tubing was dedicated;
- Samples were transferred directly from the sampling device to analyte-specific sample bottles provided by the laboratory;
- Samples are placed with ice in an insulated cooler, and were analyzed within allowable holding times.

Samples collected included some or all of the following:

- One 250 mL plastic bottle for dissolved metals – at the time of sampling the groundwater was passed through a 0.5 µm filter to remove solid particulates and acidified to fix dissolved metals.

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APPENDIX G
TEST PIT AND MONITORING WELL LOGS



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Gravelly Sand Brown, moist, trace silt, (fill)			S1	
	-0.70			0.70		
1		Sand Grey, moist, some gravel, trace, cobbles, trace metal and rubber pieces (fill)			S2	
	-1.40			1.40		
2		Gravelly Sand Dark grey, trace wood pieces, trace metal debris (fill)			S3	
	-2.20			2.20		
		Sand Grey, moist, some gravel (native)			S4	
	-2.60			2.60		
		End of Hole				
3						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Sand Brown, moist, some gravel, trace silt, (fill)			S5	10 PPM
	-0.40			0.40		
		Gravelly Sand Grey, moist, some silt (native)			S6	
1						
	-1.20			1.20		
		End of Hole				
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Sand Light brown, moist, some gravel (native)			S7	0 PPM
1					S8	
	-1.20	End of Hole		1.20		
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Gravely Sand Brown, moist, some silt (fill)			S9	
	-0.30	Gravely Sand Red brown, moist, some silt (native)		0.30	S10	
	-0.90	End of Hole		0.90		
1						
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Gravelly Sand Red brown, moist, some silt (native)			S11/12	
	-0.70			0.70		
	-0.90	Gravelly Sand Light brown, moist			S13	
1		End of Hole		0.90		
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Gravelly Sand Light brown, moist, some angular cobbles and boulders (fill)			S14	
	-0.60			0.60		
		Sand Dark brown, moist, some gravel			S15	
	-0.90			0.90		
1		End of Hole				
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Gravelly Sand Light brown, moist, some angular cobbles and boulders (fill)			S16	
	-0.80			0.80		
1		Sand Dark brown, moist, some gravel			S17	
	-1.10			1.10		
		End of Hole				
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Sand Light grey brown, moist, some gravel (native)			S18	
					S19	
	-0.90			0.90		
1		End of Hole				
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Sand Brown, some gravel, some silt			S20/21	
	-0.30			0.30		
		Sand Light grey brown, moist, some gravel (native)			S22	
	-0.60			0.60		
		End of Hole				
1						
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Sand Light brown, some gravel, some silt			S23	
	-0.20			0.20		
		Sand Light grey brown, moist, some gravel (native)			S24	
	-0.70			0.70		
		End of Hole				
1						
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 4, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Sand Grey brown, some gravel, some silt (fill)			S25	10 PPM
	-0.20			0.20		
		Gravelly Sand Brown, moist, some silt (fill)			S26	10 PPM
	-0.70			0.70		
		End of Hole				
1						
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 5, 2013



Client: Taicheng Development Corp.

Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Gravelly Sand Grey, moist (fill)			S27	
	-0.30			0.30		
		Gravelly Sand Brown, moist, some silt (fill)			S28	
	-0.90			0.90		
1		Sand Grey, moist (native)			S29	
	-1.20			1.20		
		End of Hole				
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 5, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
		Gravelly Sand Brown, moist, some cobbles (fill)			S30	
	-0.30	Sand Grey brown, moist, some gravel		0.30	S31	
	-0.70	Sand Grey, moist, med to coarse grained, some gravel (native)		0.70	S32	
1	-1.00	End of Hole		1.00		
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 5, 2013



Project: Stage 2 PSI, Britannia South Project

Location: Britannia Beach

Project Number: 3160

Field Engineer: Robert Bulger

Client: Taicheng Development Corp.

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Lithology	Depth (mbg)	Sample ID	Remarks
0	0.00	Ground Surface		0.00		
	-0.10	Sand Light brown, moist, some gravel, trace silt		0.10	S33/34	
		Sand Grey, moist, some gravel (native)			S35	
1						
	-1.20			1.20		
		End of Hole				
2						

Test Pit Contractor: MBD Construction

Excavation Method: Excavator

Test Pit Completion Date: Feb 5, 2013

Client: Taicheng Development Corp.

Project: Makins Lands

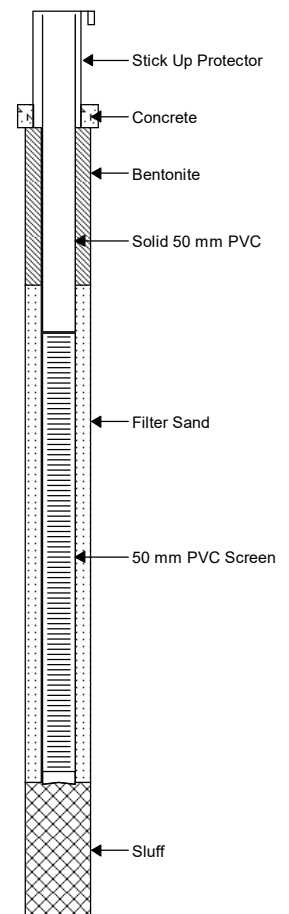
Location: Britannia Beach

Project Number: 3160

Logged By: Robert Bulger

Borehole Diameter: 10 cm (4")

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Depth (mbg)	Lithology	Sample ID	Remarks	Constructed Well
-3 ft m							
	0.0	Ground Surface	0.0				
2		Sand Grey brown, moist, fine to med grained, moist becoming wet @ 2.4 m (native)					
7							
12							
17							
5							
17	-5.5	End of Hole	5.5				
22							



Drilling Contractor: Omega Drilling

Drilling Method: Sonic

Drilling Started: May 19 2015

Drilling Ended: May 19 2015

Client: Taicheng Development Corp.

Project: Makins Lands

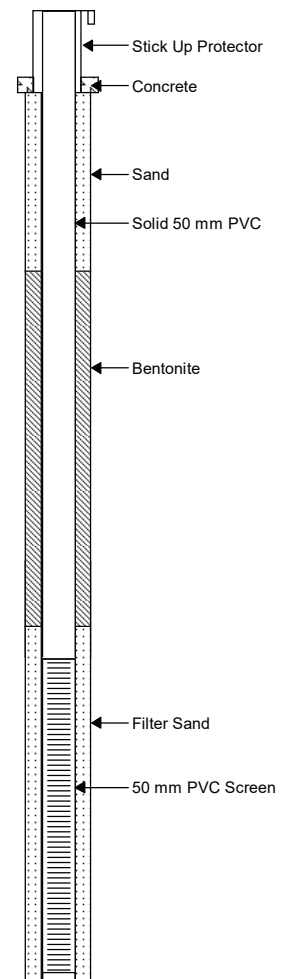
Location: Britannia Beach

Project Number: 3160

Logged By: Robert Bulger

Borehole Diameter: 10 cm (4")

Depth Below Ground Surface	Elevation (maSL)	Lithologic Description	Depth (mbg)	Lithology	Sample ID	Remarks	Constructed Well
ft m							
-3							
	0.0	Ground Surface	0.0				
2		Sand Grey brown, moist					
	-1.2		1.2				
7		Sand Grey brown, moist, some silt, some gravel, dense (native till)					
	-3.7		3.7				
12		Gravelly Sand Grey, moist, some silt, dense (till)					
17							
22							
	-7.3		7.3				
27		Sand Grey, wet, some gravel					
	-8.5		8.5				
32		End of Hole					



Drilling Contractor: Omega Drilling

Drilling Method: Sonic

Drilling Started: May 19 2015

Drilling Ended: May 19 2015

DRAFT

APPENDIX H
LABORATORY ANALYSIS CERTIFICATES



PITEAU ASSOC. ENGINEERING LTD.
ATTN: David Tiplady
215 - 260 West Esplanade
North Vancouver BC V7M 3G7

Date Received: 07-FEB-13
Report Date: 14-FEB-13 10:32 (MT)
Version: FINAL

Client Phone: 604-986-8551

Certificate of Analysis

Lab Work Order #: L1266292

Project P.O. #: 3160

Job Reference: BRITANNIA SOUTH

C of C Numbers: 1, 2, 3, 4

Legal Site Desc:

DRAFT

Brent Mack
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-1 SOIL/SEDIMENT 04-FEB-13 S1	L1266292-2 SOIL/SEDIMENT 04-FEB-13 S2	L1266292-3 SOIL/SEDIMENT 04-FEB-13 S3	L1266292-5 SOIL/SEDIMENT 04-FEB-13 S5	L1266292-7 SOIL/SEDIMENT 04-FEB-13 S7
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	13.8	14.2	13.8	15.8	14.0
	pH (1:2 soil:water) (pH)	6.71	5.95	5.63	4.97	
Metals	Antimony (Sb) (mg/kg)	0.72	0.55	0.15	<0.10	
	Arsenic (As) (mg/kg)	5.32	1.99	1.47	1.19	
	Barium (Ba) (mg/kg)	43.6	42.4	43.9	42.6	
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	<0.20	
	Cadmium (Cd) (mg/kg)	0.065	0.141	0.079	<0.050	
	Chromium (Cr) (mg/kg)	9.68	9.00	8.63	8.63	
	Cobalt (Co) (mg/kg)	5.54	5.12	5.03	4.99	
	Copper (Cu) (mg/kg)	39.2	79.8	32.2	21.9	
	Lead (Pb) (mg/kg)	6.32	14.5	6.93	4.21	
	Mercury (Hg) (mg/kg)	0.161	<0.050	<0.050	<0.050	
	Molybdenum (Mo) (mg/kg)	<0.50	0.67	0.73	<0.50	
	Nickel (Ni) (mg/kg)	8.65	8.07	7.84	8.43	
	Selenium (Se) (mg/kg)	<0.20	0.39	<0.20	<0.20	
	Silver (Ag) (mg/kg)	<0.10	0.14	<0.10	<0.10	
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	<0.050	
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	
	Uranium (U) (mg/kg)	0.227	0.221	0.182	0.188	
	Vanadium (V) (mg/kg)	34.8	34.3	33.7	36.3	
	Zinc (Zn) (mg/kg)	101	53.2	86.7	32.1	
Volatile Organic Compounds	Benzene (mg/kg)	<0.040			<0.040	
	Ethylbenzene (mg/kg)	<0.050			<0.050	
	Methyl t-butyl ether (MTBE) (mg/kg)	<0.20			<0.20	
	Styrene (mg/kg)	<0.050			<0.050	
	Toluene (mg/kg)	<0.050			<0.050	
	ortho-Xylene (mg/kg)	<0.050			<0.050	
	meta- & para-Xylene (mg/kg)	<0.050			<0.050	
	Xylenes (mg/kg)	<0.075			<0.075	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	92.0			87.9	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	93.1			88.4	
Hydrocarbons	EPH10-19 (mg/kg)	<200	<200	<200	<200	<200
	EPH19-32 (mg/kg)	<200	<200	<200	<200	<200
	LEPH (mg/kg)	<200			<200	<200
	HEPH (mg/kg)	<200			<200	<200
	Volatile Hydrocarbons (VH6-10) (mg/kg)	<100			<100	
	VPH (C6-C10) (mg/kg)	<100			<100	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-9 SOIL/SEDIMENT 04-FEB-13 S9	L1266292-11 SOIL/SEDIMENT 04-FEB-13 S11	L1266292-12 SOIL/SEDIMENT 04-FEB-13 S12	L1266292-14 SOIL/SEDIMENT 04-FEB-13 S14	L1266292-15 SOIL/SEDIMENT 04-FEB-13 S15
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	13.8	21.3	20.7	8.43	
	pH (1:2 soil:water) (pH)	5.29	5.76	5.63	5.79	5.89
Metals	Antimony (Sb) (mg/kg)	0.16	0.19	0.16	<0.10	<0.10
	Arsenic (As) (mg/kg)	2.42	3.77	3.56	1.49	2.15
	Barium (Ba) (mg/kg)	27.6	38.8	37.5	38.3	37.5
	Beryllium (Be) (mg/kg)	<0.20	0.36	0.34	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	0.065	0.151	0.134	0.233	0.107
	Chromium (Cr) (mg/kg)	12.0	19.5	17.1	8.10	9.91
	Cobalt (Co) (mg/kg)	4.51	5.96	5.41	4.98	5.55
	Copper (Cu) (mg/kg)	17.7	19.3	15.4	18.2	28.7
	Lead (Pb) (mg/kg)	8.97	8.03	7.44	2.14	2.90
	Mercury (Hg) (mg/kg)	<0.050	0.060	0.060	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	0.69	1.28	1.04	<0.50	<0.50
	Nickel (Ni) (mg/kg)	9.48	9.95	9.35	8.03	10.2
	Selenium (Se) (mg/kg)	0.21	0.44	0.37	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.396	0.491	0.436	0.378	0.235
	Vanadium (V) (mg/kg)	37.4	49.8	48.5	34.7	37.2
	Zinc (Zn) (mg/kg)	41.4	53.0	53.7	46.1	55.3
Volatile Organic Compounds	Benzene (mg/kg)	<0.040			<0.040	
	Ethylbenzene (mg/kg)	<0.050			<0.050	
	Methyl t-butyl ether (MTBE) (mg/kg)	<0.20			<0.20	
	Styrene (mg/kg)	<0.050			<0.050	
	Toluene (mg/kg)	<0.050			<0.050	
	ortho-Xylene (mg/kg)	<0.050			<0.050	
	meta- & para-Xylene (mg/kg)	<0.050			<0.050	
	Xylenes (mg/kg)	<0.075			<0.075	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	92.9			94.7	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	92.5			94.9	
Hydrocarbons	EPH10-19 (mg/kg)	<200	<200	<200	<200	
	EPH19-32 (mg/kg)	<200	<200	<200	<200	
	LEPH (mg/kg)	<200				
	HEPH (mg/kg)	<200				
	Volatile Hydrocarbons (VH6-10) (mg/kg)	<100			<100	
	VPH (C6-C10) (mg/kg)	<100			<100	

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-16 SOIL/SEDIMENT 04-FEB-13 S16	L1266292-17 SOIL/SEDIMENT 04-FEB-13 S17	L1266292-18 SOIL/SEDIMENT 04-FEB-13 S18	L1266292-20 SOIL/SEDIMENT 04-FEB-13 S20	L1266292-21 SOIL/SEDIMENT 04-FEB-13 S21
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	9.23				
	pH (1:2 soil:water) (pH)	6.63	5.43	6.49	6.90	6.83
Metals	Antimony (Sb) (mg/kg)	<0.10	0.27	<0.10	0.90	0.64
	Arsenic (As) (mg/kg)	0.992	1.49	1.34	3.14	3.24
	Barium (Ba) (mg/kg)	36.0	53.5	38.9	61.4	62.5
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	0.23	0.22
	Cadmium (Cd) (mg/kg)	<0.050	0.168	<0.050	0.124	0.134
	Chromium (Cr) (mg/kg)	7.88	9.79	8.41	14.4	15.5
	Cobalt (Co) (mg/kg)	4.99	5.89	4.78	5.93	6.14
	Copper (Cu) (mg/kg)	16.2	31.4	21.6	31.3	29.7
	Lead (Pb) (mg/kg)	1.46	27.2	2.06	10.2	10.3
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	<0.50	1.77	1.77
	Nickel (Ni) (mg/kg)	8.12	9.25	7.94	7.36	7.82
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	0.23	0.24
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	0.11	0.11
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.196	0.215	0.188	0.485	0.526
	Vanadium (V) (mg/kg)	30.7	39.0	33.7	59.4	63.3
	Zinc (Zn) (mg/kg)	29.8	67.7	30.9	43.2	46.5
Volatile Organic Compounds	Benzene (mg/kg)					
	Ethylbenzene (mg/kg)					
	Methyl t-butyl ether (MTBE) (mg/kg)					
	Styrene (mg/kg)					
	Toluene (mg/kg)					
	ortho-Xylene (mg/kg)					
	meta- & para-Xylene (mg/kg)					
	Xylenes (mg/kg)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/kg)	<200				
	EPH19-32 (mg/kg)	<200				
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Volatile Hydrocarbons (VH6-10) (mg/kg)					
	VPH (C6-C10) (mg/kg)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-22 SOIL/SEDIMENT 04-FEB-13 S22	L1266292-23 SOIL/SEDIMENT 04-FEB-13 S23	L1266292-25 SOIL/SEDIMENT 04-FEB-13 S25	L1266292-26 SOIL/SEDIMENT 04-FEB-13 S26	L1266292-27 SOIL/SEDIMENT 04-FEB-13 S27
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)					
	pH (1:2 soil:water) (pH)	7.34	6.18	8.14	7.53	6.91
Metals	Antimony (Sb) (mg/kg)	<0.10	0.27	0.17	0.22	0.13
	Arsenic (As) (mg/kg)	1.23	2.93	2.03	4.73	2.41
	Barium (Ba) (mg/kg)	42.0	79.0	59.9	52.7	43.5
	Beryllium (Be) (mg/kg)	<0.20	0.23	<0.20	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	<0.050	0.101	0.077	0.096	0.103
	Chromium (Cr) (mg/kg)	7.82	13.3	11.1	15.0	8.16
	Cobalt (Co) (mg/kg)	5.23	6.13	6.54	8.70	6.04
	Copper (Cu) (mg/kg)	29.7	36.2	18.9	37.9	17.9
	Lead (Pb) (mg/kg)	3.51	8.08	4.32	5.34	7.09
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	2.88	<0.50	0.98	<0.50
	Nickel (Ni) (mg/kg)	7.75	6.53	7.88	12.4	8.48
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	0.12	<0.10	<0.10	<0.10
	Thallium (Tl) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.165	0.669	0.901	0.858	0.196
	Vanadium (V) (mg/kg)	33.7	56.7	46.0	50.7	39.2
	Zinc (Zn) (mg/kg)	33.4	35.0	38.6	47.9	48.3
Volatile Organic Compounds	Benzene (mg/kg)					
	Ethylbenzene (mg/kg)					
	Methyl t-butyl ether (MTBE) (mg/kg)					
	Styrene (mg/kg)					
	Toluene (mg/kg)					
	ortho-Xylene (mg/kg)					
	meta- & para-Xylene (mg/kg)					
	Xylenes (mg/kg)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Volatile Hydrocarbons (VH6-10) (mg/kg)					
	VPH (C6-C10) (mg/kg)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-28 SOIL/SEDIMENT 04-FEB-13 S28	L1266292-30 SOIL/SEDIMENT 04-FEB-13 S30	L1266292-31 SOIL/SEDIMENT 04-FEB-13 S31	L1266292-32 SOIL/SEDIMENT 04-FEB-13 S32	L1266292-33 SOIL/SEDIMENT 04-FEB-13 S33
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	7.91				
	pH (1:2 soil:water) (pH)		7.94	7.10	6.80	6.20
Metals	Antimony (Sb) (mg/kg)		0.16	<0.10	<0.10	<0.10
	Arsenic (As) (mg/kg)		1.95	1.16	0.600	1.06
	Barium (Ba) (mg/kg)		47.6	47.4	34.7	39.7
	Beryllium (Be) (mg/kg)		<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd) (mg/kg)		0.057	<0.050	<0.050	0.067
	Chromium (Cr) (mg/kg)		7.98	8.41	6.40	8.20
	Cobalt (Co) (mg/kg)		5.86	5.74	4.70	5.73
	Copper (Cu) (mg/kg)		16.8	22.8	17.8	48.1
	Lead (Pb) (mg/kg)		5.36	2.29	1.14	1.34
	Mercury (Hg) (mg/kg)		<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)		1.00	<0.50	<0.50	<0.50
	Nickel (Ni) (mg/kg)		5.46	8.04	7.05	9.53
	Selenium (Se) (mg/kg)		<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)		<0.10	<0.10	<0.10	<0.10
	Thallium (Tl) (mg/kg)		<0.050	<0.050	<0.050	<0.050
	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)		0.514	0.202	0.214	0.129
	Vanadium (V) (mg/kg)		41.2	37.1	24.9	40.5
	Zinc (Zn) (mg/kg)		28.7	31.1	25.5	28.7
Volatile Organic Compounds	Benzene (mg/kg)	<0.040				
	Ethylbenzene (mg/kg)	<0.050				
	Methyl t-butyl ether (MTBE) (mg/kg)	<0.20				
	Styrene (mg/kg)	<0.050				
	Toluene (mg/kg)	<0.050				
	ortho-Xylene (mg/kg)	<0.050				
	meta- & para-Xylene (mg/kg)	<0.050				
	Xylenes (mg/kg)	<0.075				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	90.5				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	89.6				
Hydrocarbons	EPH10-19 (mg/kg)	<200				
	EPH19-32 (mg/kg)	<200				
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Volatile Hydrocarbons (VH6-10) (mg/kg)	<100				
	VPH (C6-C10) (mg/kg)	<100				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-34 SOIL/SEDIMENT 04-FEB-13 S34	L1266292-35 SOIL/SEDIMENT 04-FEB-13 S35	L1266292-36 SOIL/SEDIMENT 04-FEB-13 S36	L1266292-37 SOIL/SEDIMENT 04-FEB-13 S37	L1266292-38 SOIL/SEDIMENT 04-FEB-13 S38
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)					
	pH (1:2 soil:water) (pH)	6.16	6.03	7.11	6.25	6.43
Metals	Antimony (Sb) (mg/kg)	<0.10	<0.10	0.27	0.10	0.27
	Arsenic (As) (mg/kg)	0.743	1.48	3.13	1.84	2.35
	Barium (Ba) (mg/kg)	35.1	30.2	71.3	95.2	46.9
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	0.21	<0.20
	Cadmium (Cd) (mg/kg)	0.069	0.081	0.121	<0.050	0.107
	Chromium (Cr) (mg/kg)	6.92	6.62	18.8	12.8	16.8
	Cobalt (Co) (mg/kg)	4.94	5.53	7.15	11.2	5.12
	Copper (Cu) (mg/kg)	45.0	29.1	25.5	82.6	18.4
	Lead (Pb) (mg/kg)	1.29	1.04	8.15	2.21	12.2
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	0.56	5.81	<0.50
	Nickel (Ni) (mg/kg)	7.97	7.75	11.7	5.89	6.25
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	0.31	0.21
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Thallium (Tl) (mg/kg)	<0.050	<0.050	0.065	0.065	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U) (mg/kg)	0.132	0.135	0.470	1.06	0.502
	Vanadium (V) (mg/kg)	33.1	27.8	55.9	78.0	64.1
	Zinc (Zn) (mg/kg)	25.4	31.3	57.1	29.9	41.1
Volatile Organic Compounds	Benzene (mg/kg)					
	Ethylbenzene (mg/kg)					
	Methyl t-butyl ether (MTBE) (mg/kg)					
	Styrene (mg/kg)					
	Toluene (mg/kg)					
	ortho-Xylene (mg/kg)					
	meta- & para-Xylene (mg/kg)					
	Xylenes (mg/kg)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Volatile Hydrocarbons (VH6-10) (mg/kg)					
	VPH (C6-C10) (mg/kg)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1266292-39				
		Description	SOIL/SEDIMENT				
		Sampled Date	04-FEB-13				
		Sampled Time					
		Client ID	S39				
Grouping	Analyte						
SOIL							
Physical Tests	Moisture (%)						
	pH (1:2 soil:water) (pH)	5.47					
Metals	Antimony (Sb) (mg/kg)	0.12					
	Arsenic (As) (mg/kg)	2.05					
	Barium (Ba) (mg/kg)	38.4					
	Beryllium (Be) (mg/kg)	<0.20					
	Cadmium (Cd) (mg/kg)	0.069					
	Chromium (Cr) (mg/kg)	11.6					
	Cobalt (Co) (mg/kg)	6.15					
	Copper (Cu) (mg/kg)	24.4					
	Lead (Pb) (mg/kg)	4.74					
	Mercury (Hg) (mg/kg)	<0.050					
	Molybdenum (Mo) (mg/kg)	1.81					
	Nickel (Ni) (mg/kg)	8.16					
	Selenium (Se) (mg/kg)	0.26					
	Silver (Ag) (mg/kg)	<0.10					
	Thallium (Tl) (mg/kg)	<0.050					
	Tin (Sn) (mg/kg)	<2.0					
	Uranium (U) (mg/kg)	0.502					
	Vanadium (V) (mg/kg)	47.2					
	Zinc (Zn) (mg/kg)	32.5					
	Volatile Organic Compounds	Benzene (mg/kg)					
Ethylbenzene (mg/kg)							
Methyl t-butyl ether (MTBE) (mg/kg)							
Styrene (mg/kg)							
Toluene (mg/kg)							
ortho-Xylene (mg/kg)							
meta- & para-Xylene (mg/kg)							
Xylenes (mg/kg)							
Surrogate: 4-Bromofluorobenzene (SS) (%)							
Surrogate: 1,4-Difluorobenzene (SS) (%)							
Hydrocarbons	EPH10-19 (mg/kg)						
	EPH19-32 (mg/kg)						
	LEPH (mg/kg)						
	HEPH (mg/kg)						
	Volatile Hydrocarbons (VH6-10) (mg/kg)						
	VPH (C6-C10) (mg/kg)						

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-1 SOIL/SEDIMENT 04-FEB-13 S1	L1266292-2 SOIL/SEDIMENT 04-FEB-13 S2	L1266292-3 SOIL/SEDIMENT 04-FEB-13 S3	L1266292-5 SOIL/SEDIMENT 04-FEB-13 S5	L1266292-7 SOIL/SEDIMENT 04-FEB-13 S7
Grouping	Analyte					
SOIL						
Hydrocarbons	Surrogate: 3,4-Dichlorotoluene (SS) (%)	100.1			99.0	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.050			<0.050	<0.050
	Acenaphthylene (mg/kg)	<0.050			<0.050	<0.050
	Anthracene (mg/kg)	<0.050			<0.050	<0.050
	Benz(a)anthracene (mg/kg)	<0.050			<0.050	<0.050
	Benzo(a)pyrene (mg/kg)	<0.050			<0.050	<0.050
	Benzo(b)fluoranthene (mg/kg)	<0.050			<0.050	<0.050
	Benzo(g,h,i)perylene (mg/kg)	<0.050			<0.050	<0.050
	Benzo(k)fluoranthene (mg/kg)	<0.050			<0.050	<0.050
	Chrysene (mg/kg)	<0.050			<0.050	<0.050
	Dibenz(a,h)anthracene (mg/kg)	<0.050			<0.050	<0.050
	Fluoranthene (mg/kg)	<0.050			<0.050	<0.050
	Fluorene (mg/kg)	<0.050			<0.050	<0.050
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.050			<0.050	<0.050
	2-Methylnaphthalene (mg/kg)	<0.050			<0.050	<0.050
	Naphthalene (mg/kg)	<0.050			<0.050	<0.050
	Phenanthrene (mg/kg)	<0.050			<0.050	<0.050
	Pyrene (mg/kg)	<0.050			<0.050	<0.050
	Surrogate: Acenaphthene d10 (%)	79.9			87.8	85.8
	Surrogate: Chrysene d12 (%)	97.8			112.9	100.7
	Surrogate: Naphthalene d8 (%)	76.3			80.9	82.5
	Surrogate: Phenanthrene d10 (%)	83.2			95.0	85.7

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-9 SOIL/SEDIMENT 04-FEB-13 S9	L1266292-11 SOIL/SEDIMENT 04-FEB-13 S11	L1266292-12 SOIL/SEDIMENT 04-FEB-13 S12	L1266292-14 SOIL/SEDIMENT 04-FEB-13 S14	L1266292-15 SOIL/SEDIMENT 04-FEB-13 S15
Grouping	Analyte					
SOIL						
Hydrocarbons	Surrogate: 3,4-Dichlorotoluene (SS) (%)	111.9			105.5	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.050				
	Acenaphthylene (mg/kg)	<0.050				
	Anthracene (mg/kg)	<0.050				
	Benz(a)anthracene (mg/kg)	<0.050				
	Benzo(a)pyrene (mg/kg)	<0.050				
	Benzo(b)fluoranthene (mg/kg)	0.063				
	Benzo(g,h,i)perylene (mg/kg)	<0.050				
	Benzo(k)fluoranthene (mg/kg)	<0.050				
	Chrysene (mg/kg)	<0.050				
	Dibenz(a,h)anthracene (mg/kg)	<0.050				
	Fluoranthene (mg/kg)	<0.050				
	Fluorene (mg/kg)	<0.050				
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.050				
	2-Methylnaphthalene (mg/kg)	<0.050				
	Naphthalene (mg/kg)	<0.050				
	Phenanthrene (mg/kg)	<0.050				
	Pyrene (mg/kg)	<0.050				
	Surrogate: Acenaphthene d10 (%)	89.8				
	Surrogate: Chrysene d12 (%)	109.4				
	Surrogate: Naphthalene d8 (%)	86.7				
	Surrogate: Phenanthrene d10 (%)	93.3				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-16 SOIL/SEDIMENT 04-FEB-13 S16	L1266292-17 SOIL/SEDIMENT 04-FEB-13 S17	L1266292-18 SOIL/SEDIMENT 04-FEB-13 S18	L1266292-20 SOIL/SEDIMENT 04-FEB-13 S20	L1266292-21 SOIL/SEDIMENT 04-FEB-13 S21
Grouping	Analyte					
SOIL						
Hydrocarbons	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Surrogate: Acenaphthene d10 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-22 SOIL/SEDIMENT 04-FEB-13 S22	L1266292-23 SOIL/SEDIMENT 04-FEB-13 S23	L1266292-25 SOIL/SEDIMENT 04-FEB-13 S25	L1266292-26 SOIL/SEDIMENT 04-FEB-13 S26	L1266292-27 SOIL/SEDIMENT 04-FEB-13 S27
Grouping	Analyte					
SOIL						
Hydrocarbons	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Surrogate: Acenaphthene d10 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-28 SOIL/SEDIMENT 04-FEB-13 S28	L1266292-30 SOIL/SEDIMENT 04-FEB-13 S30	L1266292-31 SOIL/SEDIMENT 04-FEB-13 S31	L1266292-32 SOIL/SEDIMENT 04-FEB-13 S32	L1266292-33 SOIL/SEDIMENT 04-FEB-13 S33
Grouping	Analyte					
SOIL						
Hydrocarbons	Surrogate: 3,4-Dichlorotoluene (SS) (%)	78.2				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Surrogate: Acenaphthene d10 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-34 SOIL/SEDIMENT 04-FEB-13 S34	L1266292-35 SOIL/SEDIMENT 04-FEB-13 S35	L1266292-36 SOIL/SEDIMENT 04-FEB-13 S36	L1266292-37 SOIL/SEDIMENT 04-FEB-13 S37	L1266292-38 SOIL/SEDIMENT 04-FEB-13 S38
Grouping	Analyte					
SOIL						
Hydrocarbons	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Surrogate: Acenaphthene d10 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1266292-39 SOIL/SEDIMENT 04-FEB-13 S39				
Grouping	Analyte					
SOIL						
Hydrocarbons	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Surrogate: Acenaphthene d10 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Arsenic (As)	DUP-H	L1266292-1, -11, -12, -14, -15, -16, -17, -18, -2, -20, -21, -22, -23, -25, -26, -27, -3, -30, -31, -32, -33, -34, -35, -36, -37, -38, -39, -5, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
EPH-TUMB-FID-VA	Soil	EPH in Solids by Tumbler and GCFID	BCMELP CSR

Extractable Hydrocarbons in Sediment/Soil

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Solids by GC/FID, Version 2.1 July 1999". The procedure, based on EPA 3570, uses a rotary extraction technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene or kept in hexane/acetone and analyzed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

Accuracy target values for Reference Materials used in this method are derived from averages of long-term method performance, as certified values do not exist for the reported parameters.

HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/245.7
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This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic fluorescence spectrophotometry (EPA Method 245.7).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

LEPH/HEPH-CALC-VA	Soil	LEPHs and HEPHs	BC MOE LABORATORY MANUAL (2005)
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Light and Heavy Extractable Petroleum Hydrocarbons in Solids. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Indeno(1,2,3-c,d)pyrene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A
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This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

MOISTURE-VA	Soil	Moisture content	ASTM D2974-00 Method A
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This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

PAH-TMB-H/A-MS-VA	Soil	PAH - Rotary Extraction (Hexane/Acetone)	EPA 3570/8270
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This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3545 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL
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Reference Information

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

VH-HSFID-VA Soil VH in soil by Headspace GCFID EPA8260B, 5021, 5035, BC MOE

This analysis involves the extraction of a subsample of the sediment/soil with methanol. Aliquots of the methanol extract are then added to water and reagents, then heated in a sealed vial to equilibrium. The headspace from the vial is analyzed for Volatile Hydrocarbons (VH) by capillary column gas chromatography with flame-ionization detection (GC/FID). The methanol extraction and VH analysis are carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1 July 1999).

VH-SURR-FID-VA Soil VH Surrogates for Soils BCMELP CSR ANALYTICAL METHOD 2

VOC7-L-HSMS-VA Soil VOCs in soil by Headspace GCMS EPA8260B, 5021, 5035, BC MOE

The soil methanol extract is added to water and reagents, then heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Soil VOC7 and/or VOC Surrogates for Soils EPA METHODS 8260B & 524.2

VPH-CALC-VA Soil VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

XYLENES-CALC-VA Soil Sum of Xylene Isomer Concentrations EPA 8260B & 524.2

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1	2	3	4
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GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

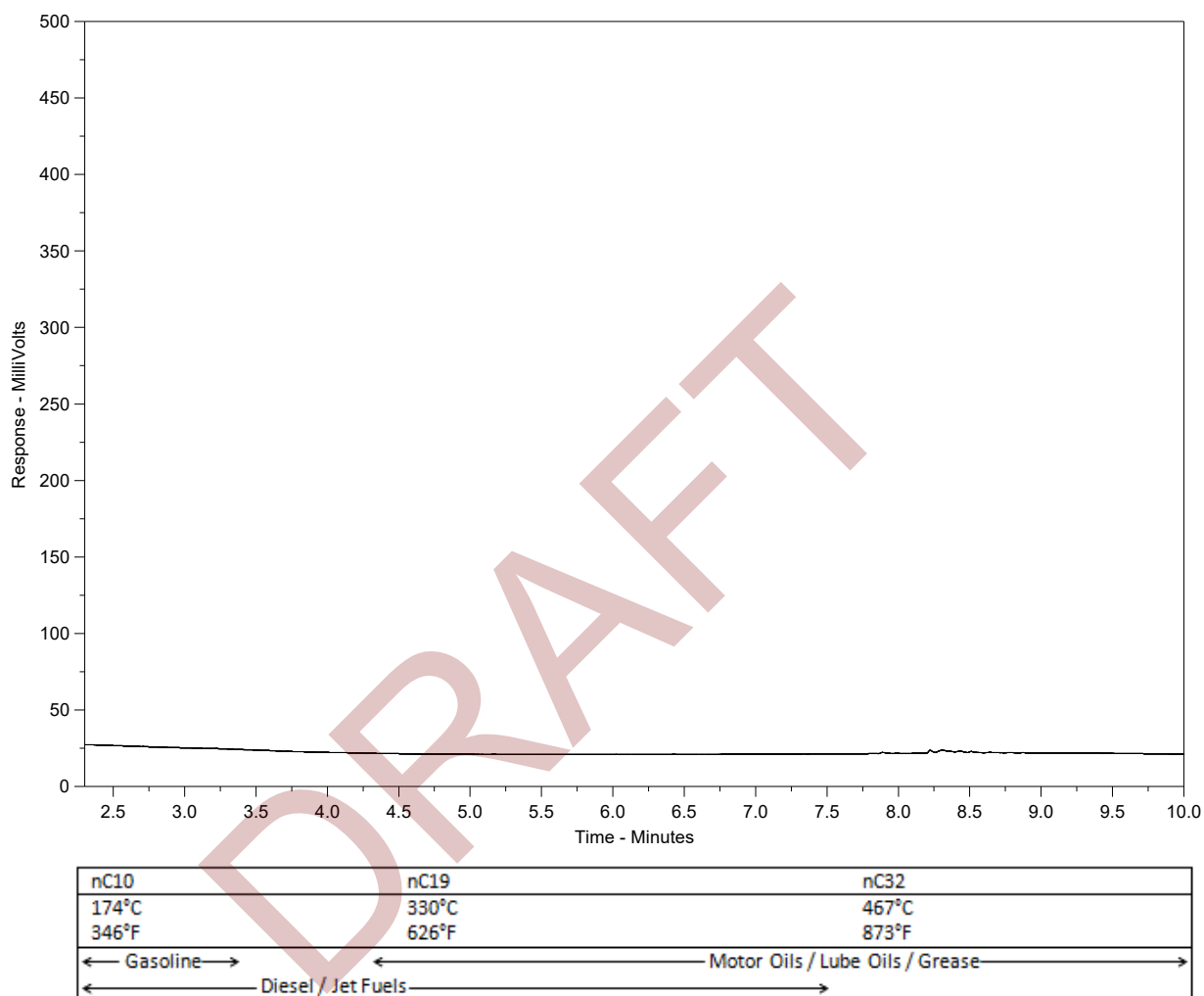
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-1
Client Sample ID: S1



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

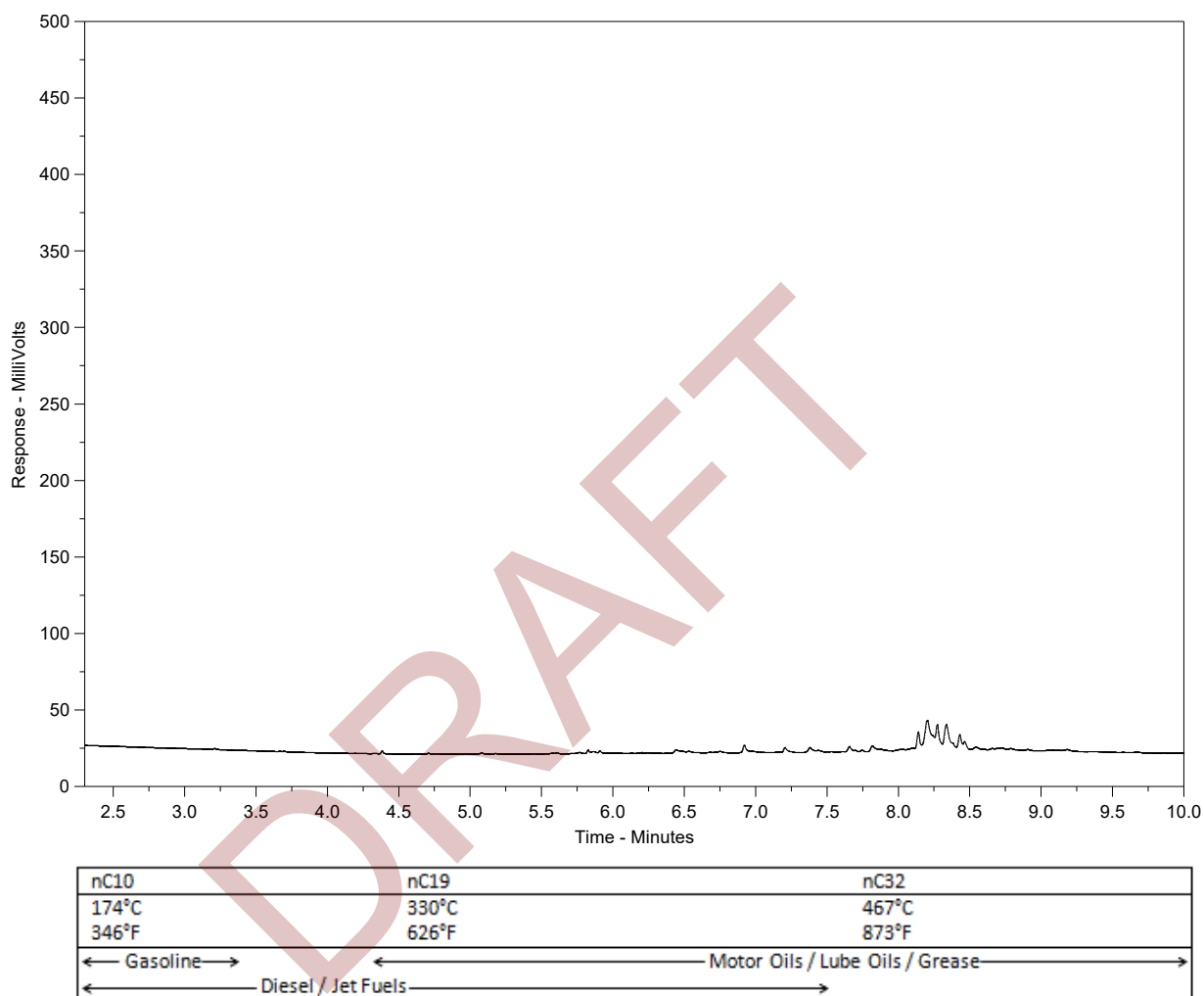
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-2
Client Sample ID: S2



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

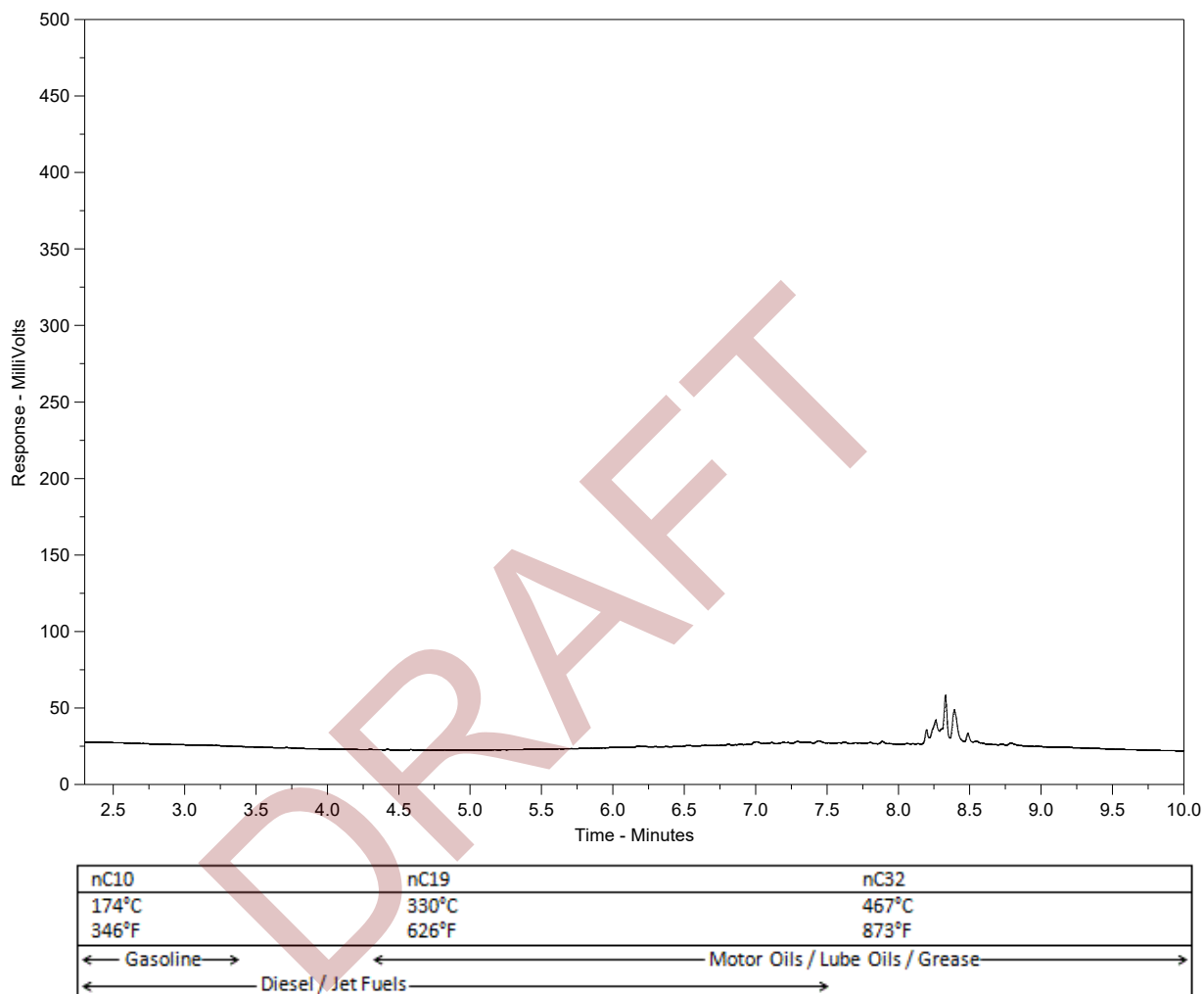
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-3
Client Sample ID: S3



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

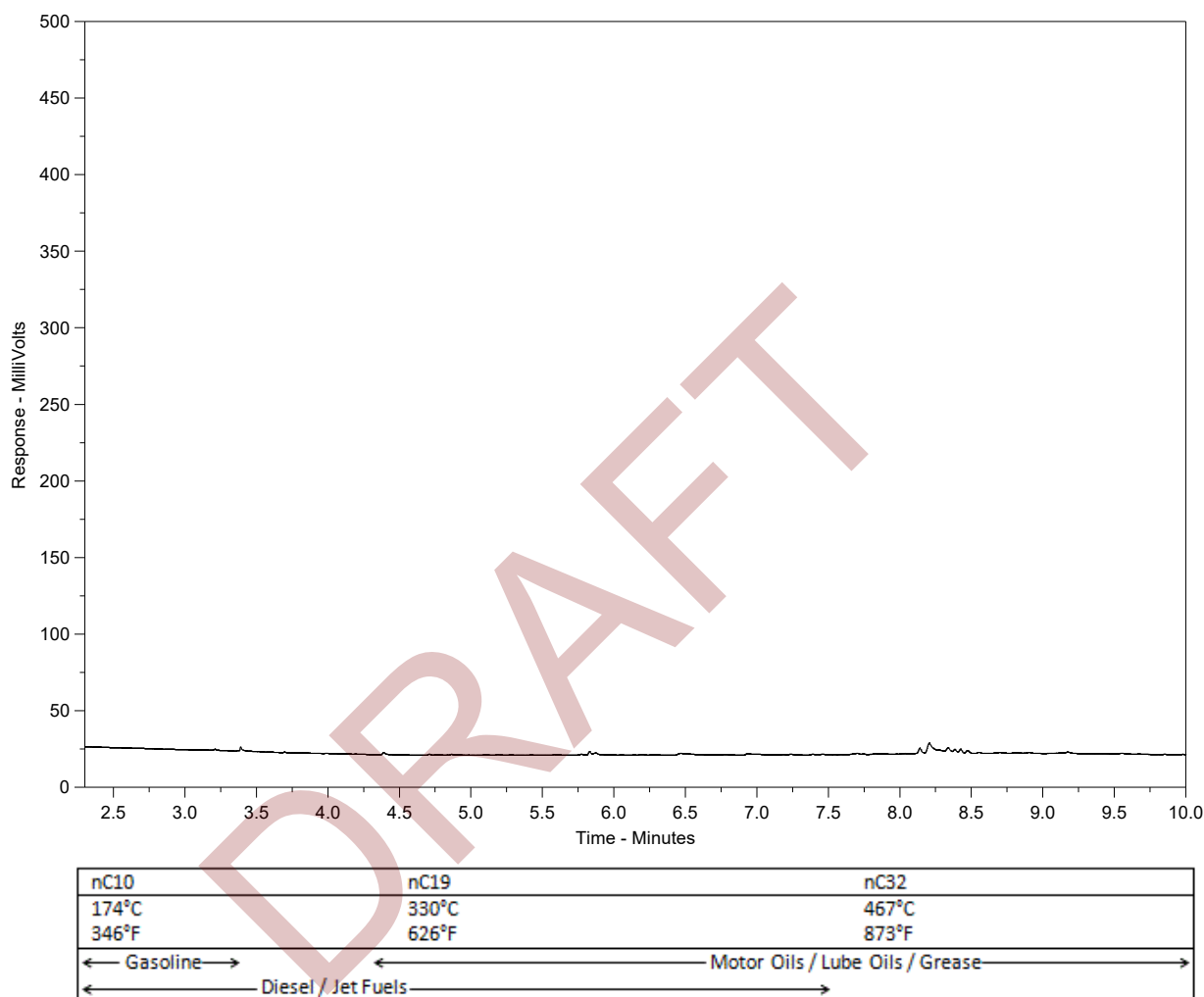
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-5
Client Sample ID: S5



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

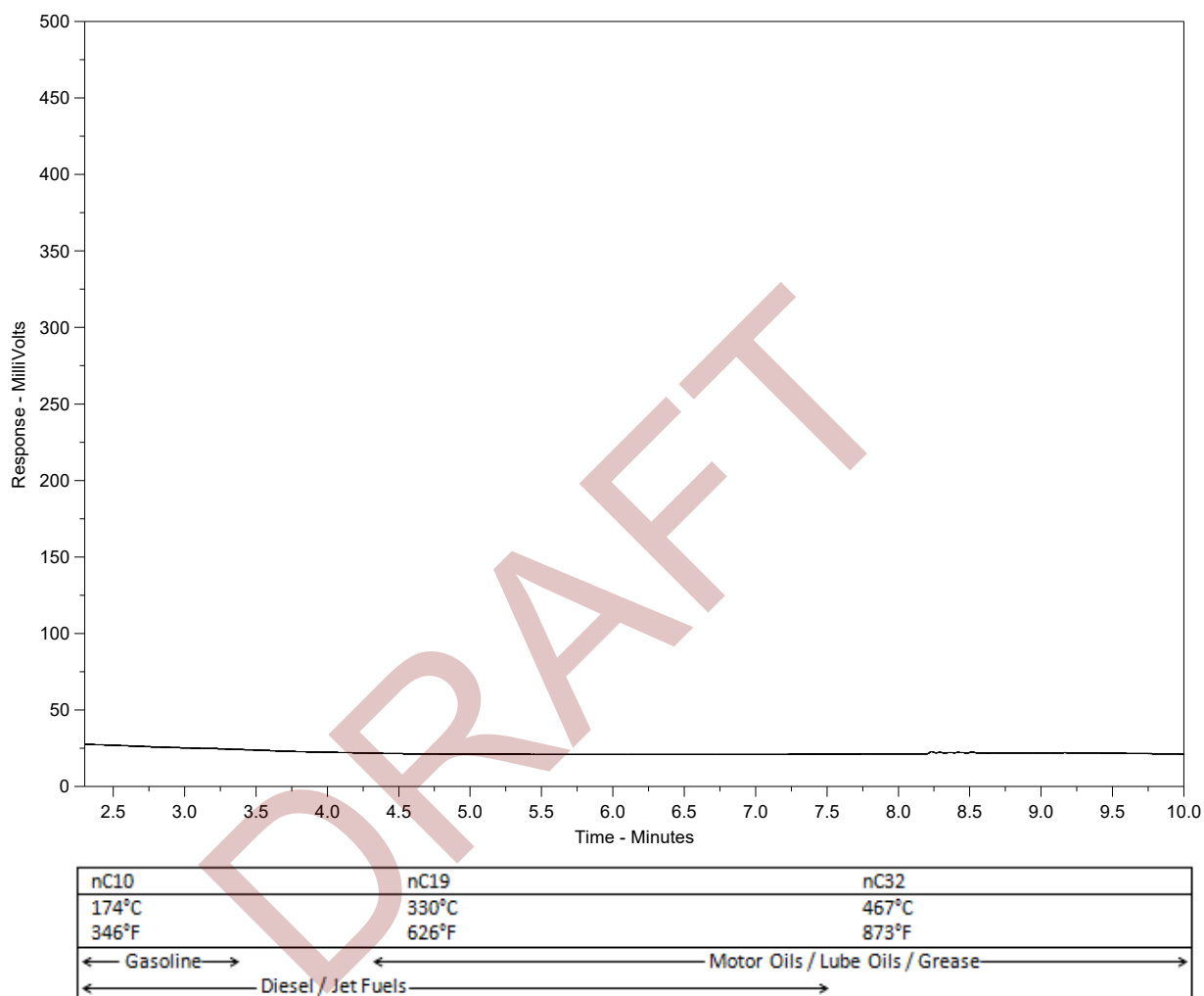
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-7
Client Sample ID: S7



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

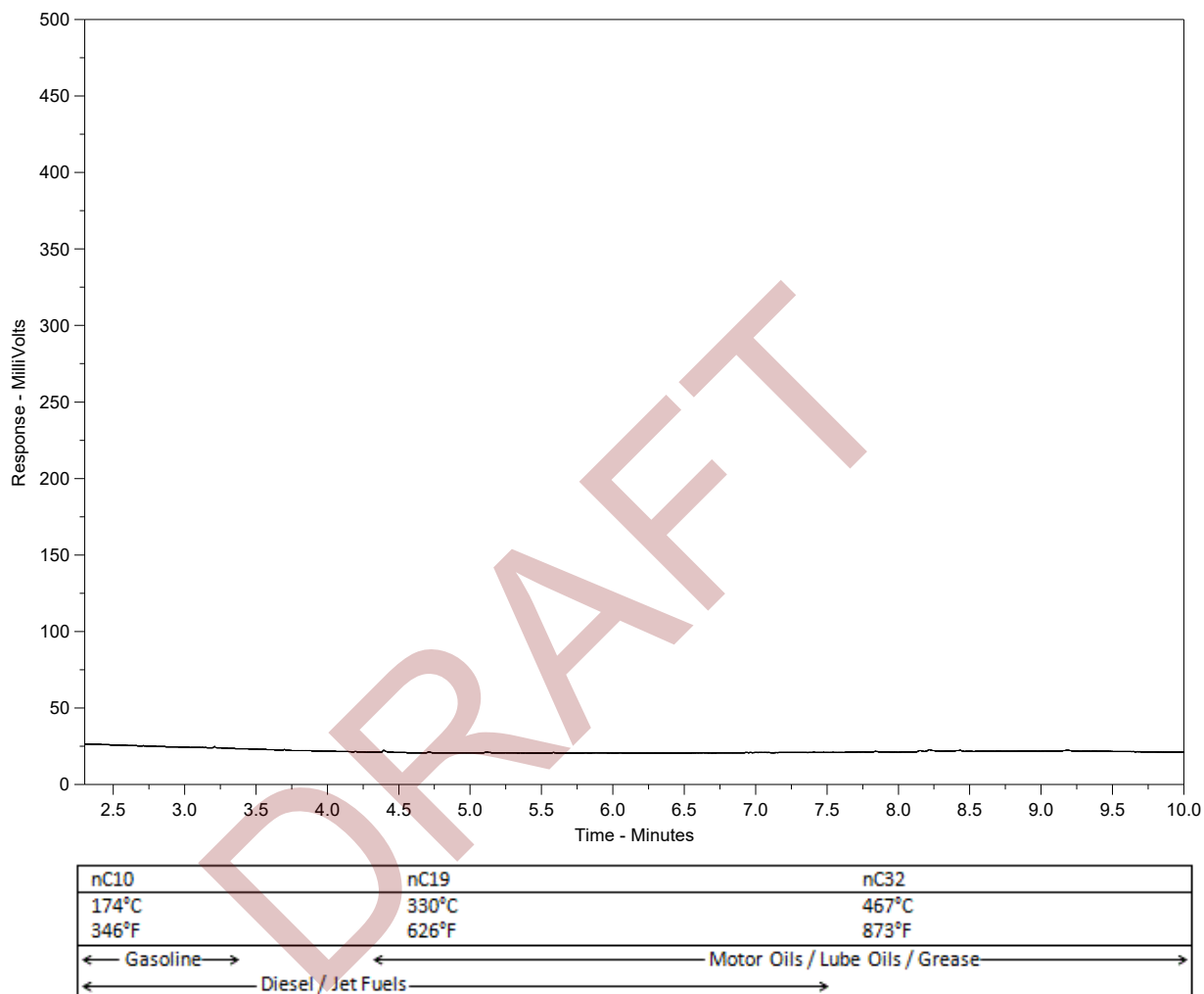
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-9
Client Sample ID: S9



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

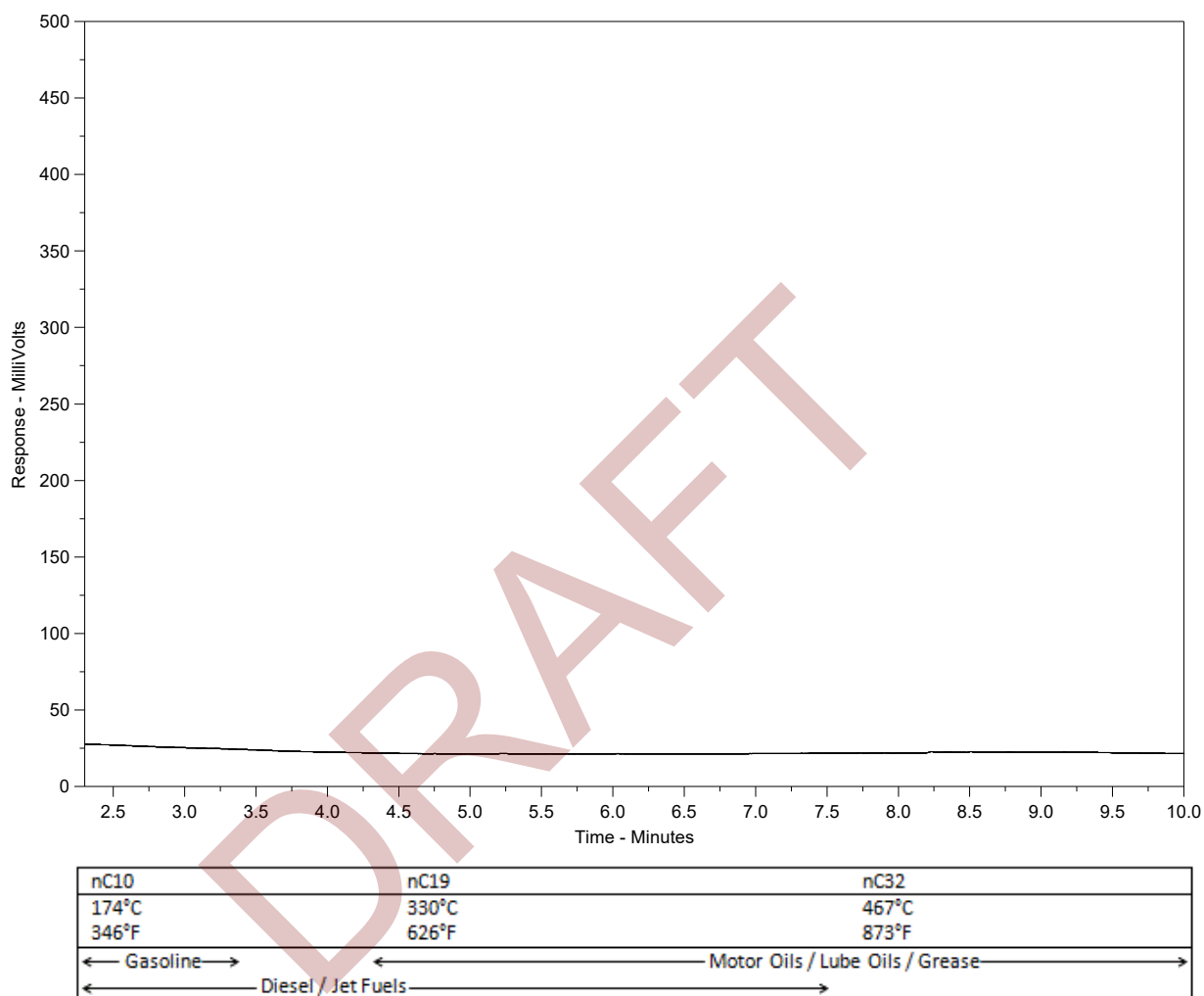
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-11
Client Sample ID: S11



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

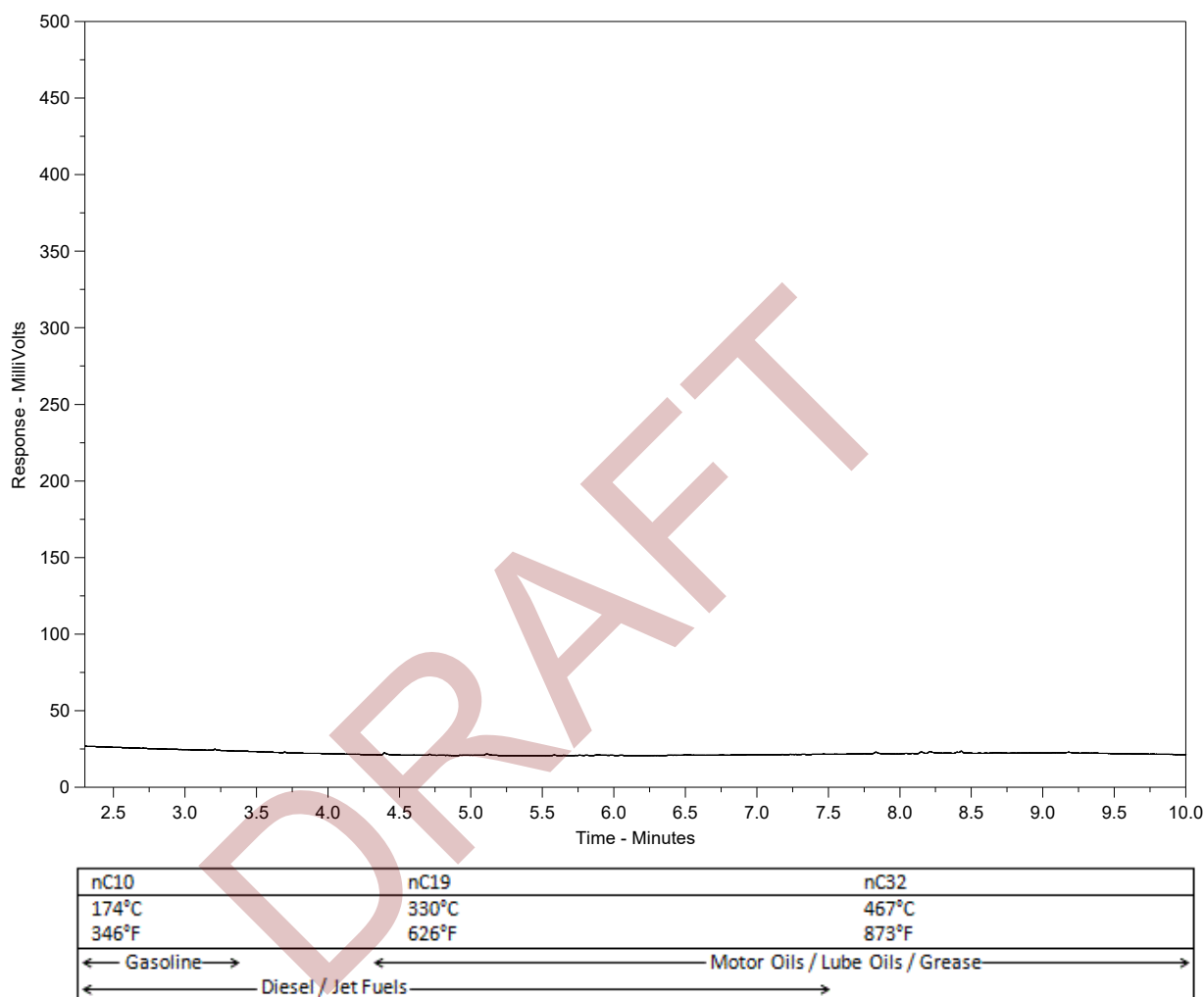
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-12
Client Sample ID: S12



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

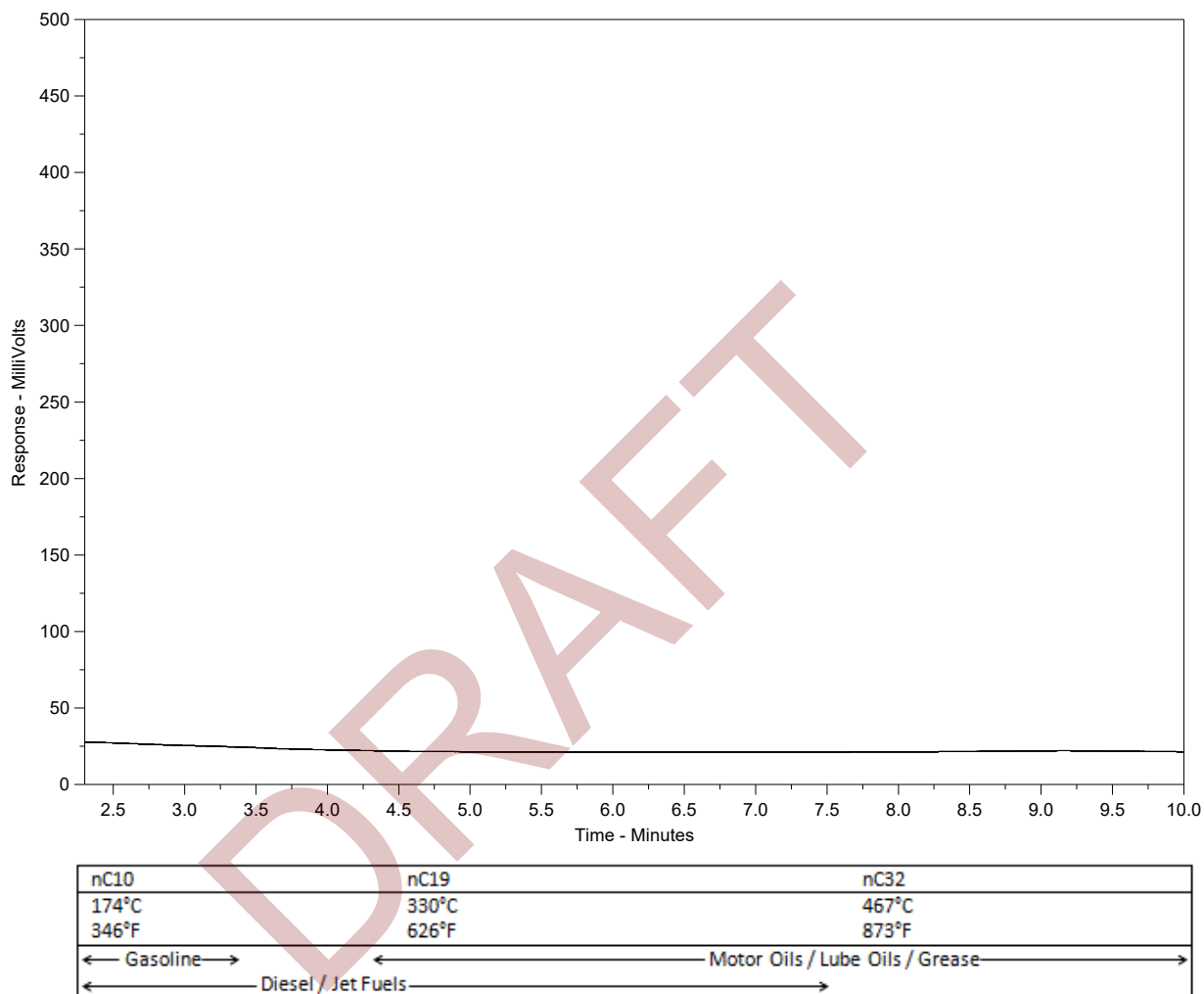
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-14
Client Sample ID: S14



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

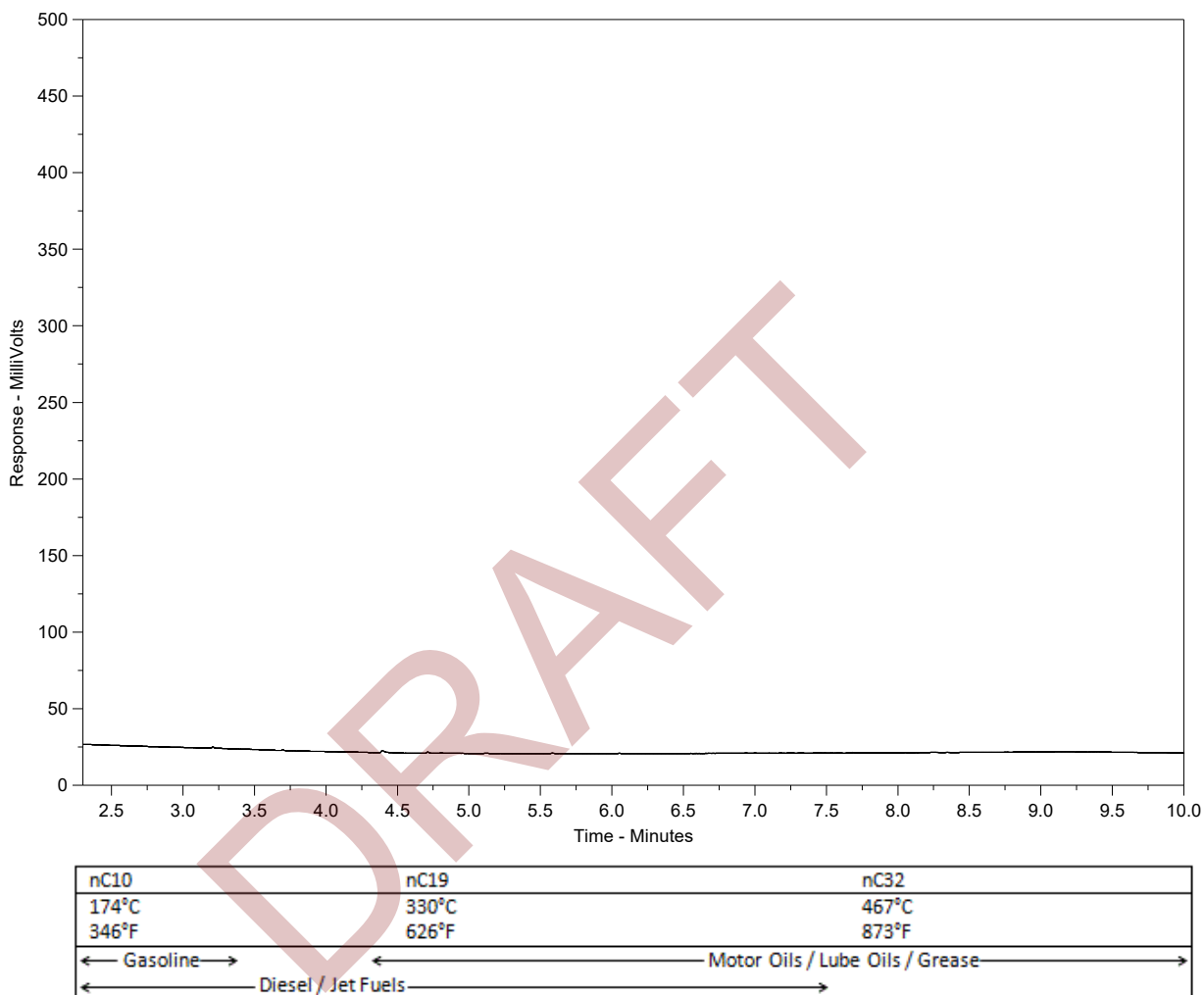
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-16
Client Sample ID: S16



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

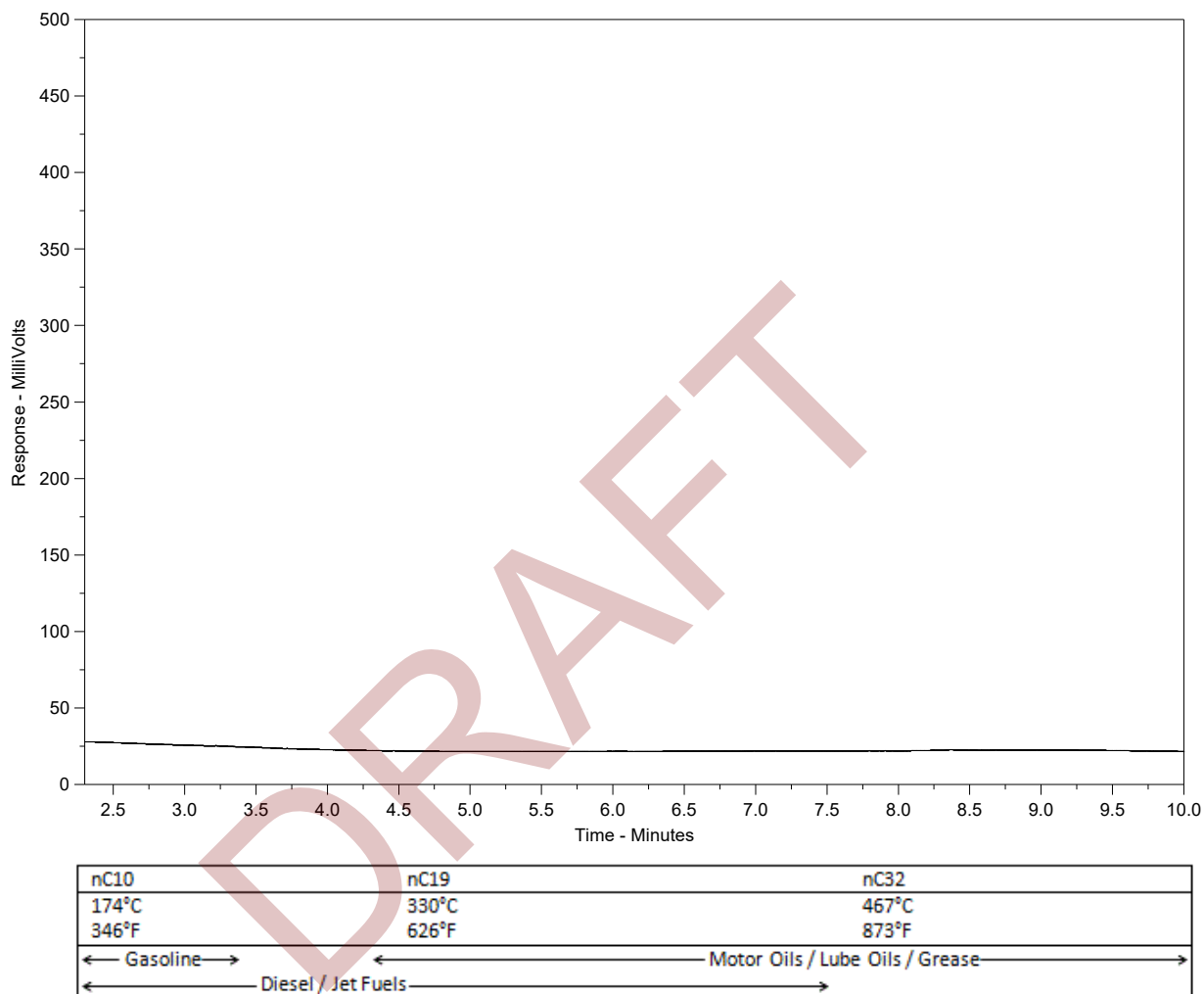
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1266292-28
Client Sample ID: S28



The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.



Report to:			Report / Email Distribution			Service Requested: (rush - subject to availability)														
Company: Piteau Associates			☒ Standard ☐ Other			☒ Regular (Default)														
Contact: David Tiplady/Robert Bulger			☒ PDF ☒ Excel ☐ Digital			☐ Priority (2-3 Business Days) - 50% Surcharge														
Address: 215-260 West Esplanade North Vancouver, BC			Email 1: dtiplady@piteau.com			☐ Emergency (1 Business Day) - 100% Surcharge														
V7M 3G7			Email 2:			☐ For Emergency < 1 Day, ASAP or Weekend - Contact ALS														
Phone: Fax:						Analysis Request														
Invoice To: Same as Report ? ☒ Yes ☐ No			Client / Project Information:			Please indicate below Filtered, Preserved or both (F, P, F/P)														
Company:			Job #: 3160, Main Land Britannia South																	
Contact:			PO / AFE: 3160																	
Address:			Legal Site Description:																	
Phone: Fax:			Quote #:																	
Lab Work Order # (lab use only)			ALS Contact: Brent Mack			Sampler: JRB														
L1266292																				
Sample #	Sample Identification (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	CSR Metals	EPH	PAH	BETXAPH	VPH	LEPH/HEPH	Hold	Salt					Number of Containers			
S1		04-Feb-13		Soil/Sediment	X			X		X										
S2		04-Feb-13		Soil/Sediment	X	X														
S3		04-Feb-13		Soil/Sediment	X	X														
S4		04-Feb-13		Soil/Sediment																
S5		04-Feb-13		Soil/Sediment	X			X		X										
S6		04-Feb-13		Soil/Sediment																
S7		04-Feb-13		Soil/Sediment						X										
S8		04-Feb-13		Soil/Sediment																
S9		04-Feb-13		Soil/Sediment	X			X		X										
S10		04-Feb-13		Soil/Sediment																
S11		04-Feb-13		Soil/Sediment	X	X														
S12		04-Feb-13		Soil/Sediment	X	X														
Special Instructions / Regulations / Hazardous Details																				
* Please do a 1 day Rush on sample B378																				
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.																				
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.																				
SHIPMENT RELEASE (client use)					SHIPMENT RECEPTION (lab use only)					SHIPMENT VERIFICATION (lab use only)										
Released by:		Date & Time:		Received by:		Date:		Time:		Temperature:		Verified by:		Date & Time:		Observations:				
J Robert Bulger		Feb 6/13		BR		Feb 7		10:10		7.0						Yes / No ? If Yes attach SIF				



L1266292-COFC

Report to:		Report F		Service Requested: (rush - subject to availability)																	
Company: Piteau Associates		☒ Standard		☒ Regular (Default)																	
Contact: David Tiplady/Robert Bulger		☒ PDF ☒ Excel ☐ Digital		☐ Priority (2-3 Business Days) - 50% Surcharge																	
Address: 215-260 West Esplanade North Vancouver, BC		Email 1: dtiplady@sharpiteau.com		☐ Emergency (1 Business Day) - 100% Surcharge																	
V7M 3G7		Email 2:		☐ For Emergency < 1 Day, ASAP or Weekend - Contact ALS																	
Phone: Fax:				Analysis Request																	
Invoice To: Same as Report? ☒ Yes ☐ No		Client / Project Information:		Please indicate below Filtered, Preserved or both (F, P, F/P)																	
Company:		Job #: 3160, Makin Lands Br. Hanna South																			
Contact:		PO / AFE: 3160																			
Address:		Legal Site Description:																			
Phone: Fax:		Quote #:																			
Lab Work Order # (lab use only)		ALS Contact: Brent Mack		Sampler: JRB																	
L 1266292																					
Sample #		Sample Identification		Date (dd-mmm-yy)		Time (hh:mm)		Sample Type		CSR Metals EPH PAH BTEX/PH VPH LEPH/HEPH Hold Salt											
		(This description will appear on the report)								Number of Containers											
S13				04-Feb-13				Soil/Sediment													
S14				04-Feb-13				Soil/Sediment													
S15				04-Feb-13				Soil/Sediment													
S16				04-Feb-13				Soil/Sediment													
S17				04-Feb-13				Soil/Sediment													
S18				04-Feb-13				Soil/Sediment													
S19				04-Feb-13				Soil/Sediment													
S20				04-Feb-13				Soil/Sediment													
S21				04-Feb-13				Soil/Sediment													
S22				04-Feb-13				Soil/Sediment													
S23				04-Feb-13				Soil/Sediment													
S24				04-Feb-13				Soil/Sediment													
Special Instructions / Regulations / Hazardous Details																					
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.																					
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.																					
SHIPMENT RELEASE (client use)				SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)													
Released by:		Date & Time:		Received by:		Date:		Time:		Temperature:		Verified by:		Date & Time:		Observations:					
J-Robert Bulger		Feb 6/13		BP		Feb 7		10:10		7.0						Yes / No ? If Yes attach SIF					



**Chain of
Ca**



L1266292-COFC

COC #

Page 3 of 4

Report to:		Report Format / Distribution:		Service Requested: (rush - subject to availability)																	
Company: Piteau Associates		☐ Standard ☐ Other		☒ Regular (Default)																	
Contact: David Tiplady/Robert Bulger		☐ PDF ☐ Excel ☐ Digital		☐ Priority (2-3 Business Days) - 50% Surcharge																	
Address: 215-260 West Esplanade North Vancouver, BC		Email 1:		☐ Emergency (1 Business Day) - 100% Surcharge																	
V7M 3G7		Email 2:		☐ For Emergency < 1 Day, ASAP or Weekend - Contact ALS																	
Phone: Fax:				Analysis Request																	
Invoice To: Same as Report? ☒ Yes ☐ No		Client / Project Information:		Please indicate below Filtered, Preserved or both (F, P, F/P)																	
Company:		Job #: 3144-AR-Soil characterization																			
Contact:		PO / AFE: 3160																			
Address:		Legal Site Description:																			
Phone: Fax:		Quote #:																			
Lab Work Order # (lab use only)		ALS Contact: Brent Mack		Sampler: JRB																	
151266292																					
Sample #		Sample Identification (This description will appear on the report)		Date (dd-mm-yy)		Time (hh:mm)		Sample Type		CSR Metals		EPH	PAH	BETX/PH	VPH	LEPH/HEPH	Hold	Salt	Number of Containers		
S25				05-Feb-13				Soil/Sediment		X											
S26				05-Feb-13				Soil/Sediment		X											
S27				05-Feb-13				Soil/Sediment		X											
S28				05-Feb-13				Soil/Sediment				X		X							
S29				05-Feb-13				Soil/Sediment													
S30				05-Feb-13				Soil/Sediment		X											
S31				05-Feb-13				Soil/Sediment		X											
S32				05-Feb-13				Soil/Sediment		X											
S33				05-Feb-13				Soil/Sediment		X											
S34				05-Feb-13				Soil/Sediment		X											
S35				05-Feb-13				Soil/Sediment		X											
S36				05-Feb-13				Soil/Sediment		X											
Special Instructions / Regulations / Hazardous Details																					
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.																					
SHIPMENT RELEASE (client use)						SHIPMENT RECEPTION (lab use only)						SHIPMENT VERIFICATION (lab use only)									
Released by:		Date & Time:		Received by:		Date:		Time:		Temperature:		Verified by:		Date & Time:		Observations: Yes / No ? If Yes attach SIF					
J. Robert Bulger		Feb 6/13		BP		Feb. 7		10:10		7.0											

REPORTED TO Piteau Associates Engineering Ltd. (Vancouver)
300-788 Copping Street
North Vancouver, BC V7M 3G6

TEL (604) 986-8551
FAX (604) 985-7286

ATTENTION David Tiplady

WORK ORDER 5051740

PO NUMBER

PROJECT 3160

PROJECT INFO Minati Bay

RECEIVED / TEMP May-26-15 10:03 / 16°C
REPORTED Jun-02-15

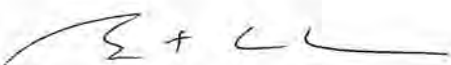
General Comments:

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

DRAFT

Authorized By:


Brent Coates, B.Sc.
Division Manager, Richmond

Please contact CARO if more information is needed or to provide feedback on our services.

Locations:

#110 4011 Viking Way
Richmond, BC V6V 2K9
Tel: 604-279-1499 Fax: 604-279-1599

#102 3677 Highway 97N
Kelowna, BC V1X 5C3
Tel: 250-765-9646 Fax: 250-765-3893

17225 109 Avenue
Edmonton, AB T5S 1H7
Tel: 780-489-9100 Fax: 780-489-9700

www.caro.ca

REPORTED TO PROJECT Piteau Associates Engineering Ltd. (Vancouver)
3160

WORK ORDER REPORTED 5051740
Jun-02-15

Analysis Description	Method Reference	Technique	Location
Dissolved Metals	APHA 3030 B / APHA 3125 B	0.45 µm Filtration / Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Richmond
Hardness (as CaCO ₃)	APHA 2340 B	Calculation	N/A
Mercury, dissolved by CVAFS	EPA 245.7*	BrCl ₂ Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Method Reference Descriptions:

APHA Standard Methods for the Examination of Water and Wastewater, 22nd Edition, American Public Health Association/American Water Works Association/Water Environment Federation
EPA United States Environmental Protection Agency Test Methods

Glossary of Terms:

MRL Method Reporting Limit
< Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences
mg/L Milligrams per litre

SAMPLE ANALYTICAL DATA

REPORTED TO PROJECT Piteau Associates Engineering Ltd. (Vancouver)
3160

WORK ORDER REPORTED 5051740
Jun-02-15

Analyte	Result / Recovery	MRL / Limits	Units	Prepared	Analyzed	Notes
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Sample ID: MW15-01 (5051740-01) [Water] Sampled: May-25-15

Calculated Parameters

Hardness, Total (Diss. as CaCO ₃)	47.1	5.0	mg/L	N/A	N/A	
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Dissolved Metals

Aluminum, dissolved	< 0.05	0.05	mg/L	N/A	Jun-01-15	
Antimony, dissolved	0.003	0.001	mg/L	N/A	Jun-01-15	
Arsenic, dissolved	< 0.005	0.005	mg/L	N/A	Jun-01-15	
Barium, dissolved	< 0.05	0.05	mg/L	N/A	Jun-01-15	
Beryllium, dissolved	< 0.001	0.001	mg/L	N/A	Jun-01-15	
Boron, dissolved	< 0.04	0.04	mg/L	N/A	Jun-01-15	
Cadmium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jun-01-15	
Calcium, dissolved	14.4	2.0	mg/L	N/A	Jun-01-15	
Chromium, dissolved	< 0.005	0.005	mg/L	N/A	Jun-01-15	
Cobalt, dissolved	< 0.0005	0.0005	mg/L	N/A	Jun-01-15	
Copper, dissolved	< 0.002	0.002	mg/L	N/A	Jun-01-15	
Iron, dissolved	< 0.10	0.10	mg/L	N/A	Jun-01-15	
Lead, dissolved	< 0.001	0.001	mg/L	N/A	Jun-01-15	
Lithium, dissolved	< 0.001	0.001	mg/L	N/A	Jun-01-15	
Magnesium, dissolved	2.7	0.1	mg/L	N/A	Jun-01-15	
Manganese, dissolved	0.042	0.002	mg/L	N/A	Jun-01-15	
Mercury, dissolved	< 0.00002	0.00002	mg/L	Jun-01-15	Jun-02-15	
Molybdenum, dissolved	0.001	0.001	mg/L	N/A	Jun-01-15	
Nickel, dissolved	< 0.002	0.002	mg/L	N/A	Jun-01-15	
Selenium, dissolved	< 0.005	0.005	mg/L	N/A	Jun-01-15	
Silver, dissolved	< 0.0005	0.0005	mg/L	N/A	Jun-01-15	
Sodium, dissolved	2.2	0.2	mg/L	N/A	Jun-01-15	
Strontium, dissolved	0.09	0.01	mg/L	N/A	Jun-01-15	
Thallium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jun-01-15	
Titanium, dissolved	< 0.05	0.05	mg/L	N/A	Jun-01-15	
Uranium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jun-01-15	
Vanadium, dissolved	< 0.01	0.01	mg/L	N/A	Jun-01-15	
Zinc, dissolved	< 0.04	0.04	mg/L	N/A	Jun-01-15	

Sample ID: MW15-02 (5051740-02) [Water] Sampled: May-25-15

Calculated Parameters

Hardness, Total (Diss. as CaCO ₃)	56.3	5.0	mg/L	N/A	N/A	
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Dissolved Metals

Aluminum, dissolved	< 0.05	0.05	mg/L	N/A	Jun-01-15	
Antimony, dissolved	0.002	0.001	mg/L	N/A	Jun-01-15	
Arsenic, dissolved	< 0.005	0.005	mg/L	N/A	Jun-01-15	
Barium, dissolved	< 0.05	0.05	mg/L	N/A	Jun-01-15	
Beryllium, dissolved	< 0.001	0.001	mg/L	N/A	Jun-01-15	
Boron, dissolved	< 0.04	0.04	mg/L	N/A	Jun-01-15	
Cadmium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jun-01-15	
Calcium, dissolved	17.8	2.0	mg/L	N/A	Jun-01-15	

SAMPLE ANALYTICAL DATA

REPORTED TO PROJECT Piteau Associates Engineering Ltd. (Vancouver)
3160

WORK ORDER REPORTED 5051740
Jun-02-15

Analyte	Result / Recovery	MRL / Limits	Units	Prepared	Analyzed	Notes
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Sample ID: MW15-02 (5051740-02) [Water] Sampled: May-25-15, Continued

Dissolved Metals, Continued

Chromium, dissolved	< 0.005	0.005	mg/L	N/A	Jun-01-15
Cobalt, dissolved	< 0.0005	0.0005	mg/L	N/A	Jun-01-15
Copper, dissolved	< 0.002	0.002	mg/L	N/A	Jun-01-15
Iron, dissolved	< 0.10	0.10	mg/L	N/A	Jun-01-15
Lead, dissolved	< 0.001	0.001	mg/L	N/A	Jun-01-15
Lithium, dissolved	< 0.001	0.001	mg/L	N/A	Jun-01-15
Magnesium, dissolved	2.9	0.1	mg/L	N/A	Jun-01-15
Manganese, dissolved	0.058	0.002	mg/L	N/A	Jun-01-15
Mercury, dissolved	< 0.00002	0.00002	mg/L	Jun-01-15	Jun-02-15
Molybdenum, dissolved	0.003	0.001	mg/L	N/A	Jun-01-15
Nickel, dissolved	< 0.002	0.002	mg/L	N/A	Jun-01-15
Selenium, dissolved	< 0.005	0.005	mg/L	N/A	Jun-01-15
Silver, dissolved	< 0.0005	0.0005	mg/L	N/A	Jun-01-15
Sodium, dissolved	4.3	0.2	mg/L	N/A	Jun-01-15
Strontium, dissolved	0.08	0.01	mg/L	N/A	Jun-01-15
Thallium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jun-01-15
Titanium, dissolved	< 0.05	0.05	mg/L	N/A	Jun-01-15
Uranium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jun-01-15
Vanadium, dissolved	< 0.01	0.01	mg/L	N/A	Jun-01-15
Zinc, dissolved	< 0.04	0.04	mg/L	N/A	Jun-01-15

Sample ID: MW15-03 (5051740-03) [Water] Sampled: May-25-15

Calculated Parameters

Hardness, Total (Diss. as CaCO ₃)	23.4	5.0	mg/L	N/A	N/A
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Dissolved Metals

Aluminum, dissolved	< 0.05	0.05	mg/L	N/A	Jun-01-15
Antimony, dissolved	0.002	0.001	mg/L	N/A	Jun-01-15
Arsenic, dissolved	< 0.005	0.005	mg/L	N/A	Jun-01-15
Barium, dissolved	< 0.05	0.05	mg/L	N/A	Jun-01-15
Beryllium, dissolved	< 0.001	0.001	mg/L	N/A	Jun-01-15
Boron, dissolved	< 0.04	0.04	mg/L	N/A	Jun-01-15
Cadmium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jun-01-15
Calcium, dissolved	8.2	2.0	mg/L	N/A	Jun-01-15
Chromium, dissolved	< 0.005	0.005	mg/L	N/A	Jun-01-15
Cobalt, dissolved	< 0.0005	0.0005	mg/L	N/A	Jun-01-15
Copper, dissolved	< 0.002	0.002	mg/L	N/A	Jun-01-15
Iron, dissolved	< 0.10	0.10	mg/L	N/A	Jun-01-15
Lead, dissolved	< 0.001	0.001	mg/L	N/A	Jun-01-15
Lithium, dissolved	< 0.001	0.001	mg/L	N/A	Jun-01-15
Magnesium, dissolved	0.7	0.1	mg/L	N/A	Jun-01-15
Manganese, dissolved	0.035	0.002	mg/L	N/A	Jun-01-15
Mercury, dissolved	< 0.00002	0.00002	mg/L	Jun-01-15	Jun-02-15
Molybdenum, dissolved	0.002	0.001	mg/L	N/A	Jun-01-15
Nickel, dissolved	< 0.002	0.002	mg/L	N/A	Jun-01-15

SAMPLE ANALYTICAL DATA

REPORTED TO PROJECT Piteau Associates Engineering Ltd. (Vancouver)
3160

WORK ORDER REPORTED 5051740
Jun-02-15

Analyte	Result / Recovery	MRL / Limits	Units	Prepared	Analyzed	Notes
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Sample ID: MW15-03 (5051740-03) [Water] Sampled: May-25-15, Continued

Dissolved Metals, Continued

Selenium, dissolved	< 0.005	0.005	mg/L	N/A	Jun-01-15
Silver, dissolved	< 0.0005	0.0005	mg/L	N/A	Jun-01-15
Sodium, dissolved	1.3	0.2	mg/L	N/A	Jun-01-15
Strontium, dissolved	0.03	0.01	mg/L	N/A	Jun-01-15
Thallium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jun-01-15
Titanium, dissolved	< 0.05	0.05	mg/L	N/A	Jun-01-15
Uranium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jun-01-15
Vanadium, dissolved	< 0.01	0.01	mg/L	N/A	Jun-01-15
Zinc, dissolved	< 0.04	0.04	mg/L	N/A	Jun-01-15

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Jun-02-15

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in fibatchesfl and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- ⌚ **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- ⌚ **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- ⌚ **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- ⌚ **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
Dissolved Metals, Batch B5F0021									
Blank (B5F0021-BLK1)				Prepared: Jun-01-15, Analyzed: Jun-01-15					
Aluminum, dissolved	< 0.05	0.05 mg/L							
Antimony, dissolved	< 0.001	0.001 mg/L							
Arsenic, dissolved	< 0.005	0.005 mg/L							
Barium, dissolved	< 0.05	0.05 mg/L							
Beryllium, dissolved	< 0.001	0.001 mg/L							
Boron, dissolved	< 0.04	0.04 mg/L							
Cadmium, dissolved	< 0.0001	0.0001 mg/L							
Calcium, dissolved	< 2.0	2.0 mg/L							
Chromium, dissolved	< 0.005	0.005 mg/L							
Cobalt, dissolved	< 0.0005	0.0005 mg/L							
Copper, dissolved	< 0.002	0.002 mg/L							
Iron, dissolved	< 0.10	0.10 mg/L							
Lead, dissolved	< 0.001	0.001 mg/L							
Lithium, dissolved	< 0.001	0.001 mg/L							
Magnesium, dissolved	< 0.1	0.1 mg/L							
Manganese, dissolved	< 0.002	0.002 mg/L							
Molybdenum, dissolved	< 0.001	0.001 mg/L							
Nickel, dissolved	< 0.002	0.002 mg/L							
Selenium, dissolved	< 0.005	0.005 mg/L							
Silver, dissolved	< 0.0005	0.0005 mg/L							
Sodium, dissolved	< 0.2	0.2 mg/L							
Strontium, dissolved	< 0.01	0.01 mg/L							
Thallium, dissolved	< 0.0002	0.0002 mg/L							
Titanium, dissolved	< 0.05	0.05 mg/L							
Uranium, dissolved	< 0.0002	0.0002 mg/L							
Vanadium, dissolved	< 0.01	0.01 mg/L							
Zinc, dissolved	< 0.04	0.04 mg/L							
Duplicate (B5F0021-DUP1)				Source: 5051740-01 Prepared: Jun-01-15, Analyzed: Jun-01-15					
Aluminum, dissolved	< 0.05	0.05 mg/L		< 0.05				16	
Antimony, dissolved	< 0.001	0.001 mg/L		0.003				21	
Arsenic, dissolved	< 0.005	0.005 mg/L		< 0.005				10	

QUALITY CONTROL DATA

REPORTED TO PROJECT Piteau Associates Engineering Ltd. (Vancouver)
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REPORTED Jun-02-15

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
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Dissolved Metals, Batch B5F0021, Continued

Duplicate (B5F0021-DUP1), Continued		Source: 5051740-01		Prepared: Jun-01-15, Analyzed: Jun-01-15					
Barium, dissolved	< 0.05	0.05 mg/L		< 0.05				6	
Beryllium, dissolved	< 0.001	0.001 mg/L		< 0.001				20	
Boron, dissolved	< 0.04	0.04 mg/L		< 0.04				13	
Cadmium, dissolved	< 0.0001	0.0001 mg/L		< 0.0001				24	
Calcium, dissolved	14.6	2.0 mg/L		14.4			2	10	
Chromium, dissolved	< 0.005	0.005 mg/L		< 0.005				7	
Cobalt, dissolved	< 0.0005	0.0005 mg/L		< 0.0005				12	
Copper, dissolved	< 0.002	0.002 mg/L		< 0.002				20	
Iron, dissolved	< 0.10	0.10 mg/L		< 0.10				10	
Lead, dissolved	< 0.001	0.001 mg/L		< 0.001				14	
Lithium, dissolved	< 0.001	0.001 mg/L		< 0.001				15	
Magnesium, dissolved	2.7	0.1 mg/L		2.7			2	9	
Manganese, dissolved	0.043	0.002 mg/L		0.042			3	10	
Molybdenum, dissolved	0.002	0.001 mg/L		0.001				16	
Nickel, dissolved	< 0.002	0.002 mg/L		< 0.002				14	
Selenium, dissolved	< 0.005	0.005 mg/L		< 0.005				23	
Silver, dissolved	< 0.0005	0.0005 mg/L		< 0.0005				20	
Sodium, dissolved	2.3	0.2 mg/L		2.2			3	9	
Strontium, dissolved	0.09	0.01 mg/L		0.09			2	9	
Thallium, dissolved	< 0.0002	0.0002 mg/L		< 0.0002				12	
Titanium, dissolved	< 0.05	0.05 mg/L		< 0.05				20	
Uranium, dissolved	< 0.0002	0.0002 mg/L		< 0.0002				11	
Vanadium, dissolved	< 0.01	0.01 mg/L		< 0.01				14	
Zinc, dissolved	< 0.04	0.04 mg/L		< 0.04				11	

Matrix Spike (B5F0021-MS1)		Source: 5051740-02		Prepared: Jun-01-15, Analyzed: Jun-01-15					
Antimony, dissolved	0.316	0.001 mg/L	0.400	0.002	78	71-112			
Arsenic, dissolved	0.176	0.005 mg/L	0.200	< 0.005	88	82-112			
Barium, dissolved	0.88	0.05 mg/L	1.00	< 0.05	88	80-109			
Beryllium, dissolved	0.099	0.001 mg/L	0.100	< 0.001	99	75-111			
Cadmium, dissolved	0.0885	0.0001 mg/L	0.100	< 0.0001	89	84-109			
Chromium, dissolved	0.373	0.005 mg/L	0.400	< 0.005	93	87-115			
Cobalt, dissolved	0.374	0.0005 mg/L	0.400	< 0.0005	93	85-118			
Copper, dissolved	0.384	0.002 mg/L	0.400	< 0.002	96	84-121			
Iron, dissolved	1.92	0.10 mg/L	2.00	< 0.10	94	71-129			
Lead, dissolved	0.198	0.001 mg/L	0.200	< 0.001	99	81-111			
Manganese, dissolved	0.421	0.002 mg/L	0.400	0.058	91	66-125			
Nickel, dissolved	0.350	0.002 mg/L	0.400	< 0.002	87	85-115			
Selenium, dissolved	0.083	0.005 mg/L	0.100	< 0.005	83	77-113			
Silver, dissolved	0.0887	0.0005 mg/L	0.100	< 0.0005	89	52-131			
Thallium, dissolved	0.101	0.0002 mg/L	0.100	< 0.0002	101	82-111			
Vanadium, dissolved	0.36	0.01 mg/L	0.400	< 0.01	89	85-111			
Zinc, dissolved	0.91	0.04 mg/L	1.00	< 0.04	90	85-115			

Reference (B5F0021-SRM1)		Prepared: Jun-01-15, Analyzed: Jun-01-15							
Aluminum, dissolved	0.22	0.05 mg/L	0.233		96	58-142			
Antimony, dissolved	0.046	0.001 mg/L	0.0430		108	75-125			
Arsenic, dissolved	0.402	0.005 mg/L	0.438		92	81-119			
Barium, dissolved	3.03	0.05 mg/L	3.35		90	83-117			
Beryllium, dissolved	0.206	0.001 mg/L	0.213		97	80-120			
Boron, dissolved	1.89	0.04 mg/L	1.74		109	74-117			
Cadmium, dissolved	0.202	0.0001 mg/L	0.224		90	83-117			
Calcium, dissolved	8.0	2.0 mg/L	7.69		104	76-124			
Chromium, dissolved	0.415	0.005 mg/L	0.437		95	81-119			
Cobalt, dissolved	0.125	0.0005 mg/L	0.128		98	76-124			
Copper, dissolved	0.847	0.002 mg/L	0.844		100	84-116			
Iron, dissolved	1.25	0.10 mg/L	1.29		97	74-126			

QUALITY CONTROL DATA

REPORTED TO PROJECT Piteau Associates Engineering Ltd. (Vancouver)
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Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
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Dissolved Metals, Batch B5F0021, Continued

Reference (B5F0021-SRM1), Continued			Prepared: Jun-01-15, Analyzed: Jun-01-15						
Lead, dissolved	0.106	0.001 mg/L	0.112		94	72-128			
Lithium, dissolved	0.107	0.001 mg/L	0.104		103	60-140			
Magnesium, dissolved	6.7	0.1 mg/L	6.92		97	81-119			
Manganese, dissolved	0.325	0.002 mg/L	0.345		94	84-116			
Molybdenum, dissolved	0.426	0.001 mg/L	0.426		100	83-117			
Nickel, dissolved	0.790	0.002 mg/L	0.840		94	74-126			
Selenium, dissolved	0.025	0.005 mg/L	0.0331		77	70-130			
Sodium, dissolved	18.8	0.2 mg/L	19.1		98	72-128			
Strontium, dissolved	0.84	0.01 mg/L	0.916		91	84-113			
Thallium, dissolved	0.0366	0.0002 mg/L	0.0393		93	57-143			
Uranium, dissolved	0.238	0.0002 mg/L	0.266		89	85-115			
Vanadium, dissolved	0.80	0.01 mg/L	0.869		92	87-113			
Zinc, dissolved	0.81	0.04 mg/L	0.881		92	72-128			

Dissolved Metals, Batch B5F0039

Blank (B5F0039-BLK1)			Prepared: Jun-01-15, Analyzed: Jun-02-15						
Mercury, dissolved	< 0.00002	0.00002 mg/L							
Duplicate (B5F0039-DUP1)			Source: 5051740-03 Prepared: Jun-01-15, Analyzed: Jun-02-15						
Mercury, dissolved	< 0.00002	0.00002 mg/L		< 0.00002				20	
Reference (B5F0039-SRM1)			Prepared: Jun-01-15, Analyzed: Jun-02-15						
Mercury, dissolved	0.00359	0.00002 mg/L	0.00456		79	50-150			



Environmental

CERTIFICATE OF ANALYSIS

Work Order : **VA20A3817**
Client : **Piteau Associates Engineering Ltd.**
Contact : David Tiplady
Address : 300 - 788 Copping Street
North Vancouver BC Canada V7M 3G6
Telephone : ----
Project : 3160
PO : ----
C-O-C number : 17-758494
Sampler : ----
Site : ----
Quote number : ----
No. of samples received : 2
No. of samples analysed : 2

Page : 1 of 4
Laboratory : Vancouver - Environmental
Account Manager : Brent Mack
Address : 8081 Lougheed Highway
Burnaby BC Canada V5A 1W9
Telephone : +1 604 253 4188
Date Samples Received : 24-Mar-2020 13:27
Date Analysis Commenced : 26-Mar-2020
Issue Date : 31-Mar-2020 11:22

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Brieanna Allen	Department Manager - Organics	Organics, Burnaby, British Columbia
Erick Magalhaes	Laboratory Analyst	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia



General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	Description
mg/kg	milligrams per kilogram
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.



Analytical Results

Sub-Matrix: Soil					Client sample ID	RB1	RB2	----	----	----
(Matrix: Soil/Solid)										
Client sampling date / time					23-Mar-2020	23-Mar-2020				
Analyte	CAS Number	Method	LOR	Unit	VA20A3817-001	VA20A3817-002	-----	-----	-----	-----
					Result	Result	----	----	----	----
Physical Tests										
pH (1:2 soil:water)	----	E108	0.10	pH units	7.37	5.49	----	----	----	----
Metals										
aluminum	7429-90-5	E440	50	mg/kg	15800	10300	----	----	----	----
antimony	7440-36-0	E440	0.10	mg/kg	0.58	<0.10	----	----	----	----
arsenic	7440-38-2	E440	0.10	mg/kg	3.22	1.04	----	----	----	----
barium	7440-39-3	E440	0.50	mg/kg	74.5	36.0	----	----	----	----
beryllium	7440-41-7	E440	0.10	mg/kg	0.18	0.10	----	----	----	----
bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	----	----	----	----
boron	7440-42-8	E440	5.0	mg/kg	<5.0	<5.0	----	----	----	----
cadmium	7440-43-9	E440	0.020	mg/kg	0.175	0.043	----	----	----	----
calcium	7440-70-2	E440	50	mg/kg	4760	2020	----	----	----	----
chromium	7440-47-3	E440	0.50	mg/kg	13.0	7.41	----	----	----	----
cobalt	7440-48-4	E440	0.10	mg/kg	6.50	5.43	----	----	----	----
copper	7440-50-8	E440	0.50	mg/kg	25.4	25.9	----	----	----	----
iron	7439-89-6	E440	50	mg/kg	17800	13400	----	----	----	----
lead	7439-92-1	E440	0.50	mg/kg	16.2	3.01	----	----	----	----
lithium	7439-93-2	E440	2.0	mg/kg	5.7	3.3	----	----	----	----
magnesium	7439-95-4	E440	20	mg/kg	4440	4110	----	----	----	----
manganese	7439-96-5	E440	1.0	mg/kg	322	276	----	----	----	----
mercury	7439-97-6	E510	0.0500	mg/kg	<0.0500	<0.0500	----	----	----	----
molybdenum	7439-98-7	E440	0.10	mg/kg	0.51	0.30	----	----	----	----
nickel	7440-02-0	E440	0.50	mg/kg	8.30	8.13	----	----	----	----
phosphorus	7723-14-0	E440	50	mg/kg	573	423	----	----	----	----
potassium	7440-09-7	E440	100	mg/kg	830	580	----	----	----	----
selenium	7782-49-2	E440	0.20	mg/kg	<0.20	<0.20	----	----	----	----
silver	7440-22-4	E440	0.10	mg/kg	0.30	<0.10	----	----	----	----
sodium	7440-23-5	E440	50	mg/kg	273	243	----	----	----	----
strontium	7440-24-6	E440	0.50	mg/kg	34.0	28.4	----	----	----	----
sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	----	----	----	----
thallium	7440-28-0	E440	0.050	mg/kg	<0.050	<0.050	----	----	----	----
tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	----	----	----	----



Analytical Results

Sub-Matrix: Soil

(Matrix: Soil/Solid)

					Client sample ID	RB1	RB2	----	----	----
					Client sampling date / time	23-Mar-2020	23-Mar-2020	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20A3817-001	VA20A3817-002	-----	-----	-----	-----
					Result	Result	---	---	---	---
Metals										
titanium	7440-32-6	E440	1.0	mg/kg	732	637	----	----	----	----
tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	----	----	----	----
uranium	7440-61-1	E440	0.050	mg/kg	0.552	0.316	----	----	----	----
vanadium	7440-62-2	E440	0.20	mg/kg	46.3	33.4	----	----	----	----
zinc	7440-66-6	E440	2.0	mg/kg	70.6	28.6	----	----	----	----
zirconium	7440-67-7	E440	1.0	mg/kg	1.2	2.4	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

4 ENVIRONMENTAL

This section contains the Initial Environmental Review prepared by Cascade Environmental Ltd in February 2012. The report was subsequently updated by field survey and flagging of stream banks and riparian area boundaries by Cascade Environmental. The flagged boundaries were ground surveyed by Bunbury Surveys and the resulting mapping forms the basis of the base map for the design. The mapping is illustrated on the drawing *Existing Features*.

This report is more than 5 years old and is in the process of being reviewed by the author to verify currency of contents.



CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

Initial Environmental Review – Revision 1

South Britannia Beach, British Columbia



Prepared by:

Cascade Environmental Resource Group Ltd.
Unit 203 – 38026 2nd Ave.
Squamish, BC, V8B 0C3

Prepared for:

Tai Cheng Development Corporation
c/o MVH Urban Planning Design Inc.
12601 19A Avenue
South Surrey, BC, Canada V4A 7M1

File #: 454-01-06

Date: July 28, 2014



CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

Acknowledgements

Cascade Environmental would like to thank Balanced Environmental Services Inc. of North Vancouver, for their contribution and support in producing the marine section of this report.



Executive Summary

Tai Cheng Development Corporation is proposing to develop South Britannia Beach (subject site) into the newest community within commuting distance to Squamish and Vancouver, BC. Preliminary community plans include a mix of residential, commercial and municipal amenities that are geared towards young professionals with outdoor recreational interests. The proponent is in discussions with local government, the Squamish Lillooet Regional District (SLRD), to identify opportunities and constraints in planning and developing the proposed community. A number of consultants are retained to provide input to aid in planning in respect to the various permitting requirements. Cascade Environmental Resource Group Ltd. (Cascade) was retained to perform the environmental assessment of the lands, creeks, and foreshore to identify potential opportunities and constraints for development. The Official Community Plan for the SLRD Area D (SLRD, 2011) outlines the vision for the Britannia Beach community, which includes the subject site. The first item in the list of seven visions is to develop a community that “Respects the natural environment and adheres to principles of environmental sustainability”. This Environmental Review aims to aid the proponent in meeting the environmental vision of the SLRD.

Cascade Environmental conducted a terrestrial ecosystem assessment following the standards developed by the provincial Resource Inventory Committee (1998). An underwater survey of the Howe Sound foreshore along the property was also conducted using a Towed Optical Assessment Device (TOAD). Streams and wetlands on site were also delineated and assessed. Wildlife and wildlife habitat was determined through direct observation and through ecosystem suitability analysis.

Terrestrial Ecosystem Mapping

The subject site contains a single biogeoclimatic subzone: Coastal Western Hemlock Dry Maritime subzone (CWHdm). This subzone is characterized by warm, relatively dry summers and moist, mild winters with little snowfall. The environmental assessment indicates that the site has been largely influenced by past gravel extraction activities (in addition to past logging and electrical transmission lines), with approximately 25% of the site currently consisting of exposed soils or managed vegetation (low growing shrubs/ground cover). The remaining vegetated portion of the site was further divided into four BEC site series, which were further divided into 20 ecosystem units based on the site series, site condition modifiers, structural stage and stand composition. The site series on site included: CWHdm01 Western Hemlock – Flat Moss, CWHdm03 Douglas-fir Western Hemlock – Salal, CWHdm05 Western Redcedar – Sword Fern, and CWDdm07 Western Redcedar – Foamflower. One of the site series, CWHdm05 is blue listed in British Columbia indicating that there is not an immediate threat, but there is special concern due to sensitivity to human activities or natural events. The proposed development layout avoids these units, except for 1.88 ha of proposed single family residential area in the northern portion of the subject site.

Wildlife and Wildlife Habitat

Wildlife and wildlife sign observed, and wildlife that could potentially occur on site based on habitat conditions, are listed in Table 9. Ten bird species, four mammals, three amphibians and three invertebrates are identified by the BC Conservation Data Centre as blue (special concern) or red (threatened or endangered) listed species that occur in the CWHdm biogeoclimatic zone within the Squamish Lillooet Regional District. Two blue listed species are confirmed to occur on the subject site and four blue listed species possibly occur. Red listed species are unlikely to be found on site. Of the two confirmed blue listed species, the great blue heron occurs as a transient (i.e., passing through or feeding at the site) but very unlikely as a breeding resident as heron rookeries are relatively obvious to observe (which they weren't). The coastal tailed frog, the other confirmed species, has been found in Daisy Creek, and is likely to occur in Thistle Creek as well. Tailed frogs live in steep mountain streams and in adjacent riparian forests, which are protected by the Riparian Areas Regulation. The northern red-legged frog and the western toad are other blue



listed amphibians that potentially could occur on site, particularly in the wetlands. Two bird species, the band-tailed pigeon and the olive-sided flycatcher also have the potential to occur on site.

Aquatic & Marine Habitat

Several creeks, ponds and wetlands occur within the proposed development area; these include Thistle Creek, the 1st tributary to Thistle Creek (Drainage 1, aka Gravel Creek and associated ponds and wetlands), the 2nd tributary to Thistle Creek (aka Drainage 2), Daisy Creek, and Drainage 3 (aka Minaty Bay Creek). Several other creeks and drainage occur on the subject site, but are not in the vicinity of the proposed development.

Thistle Creek flows north-westerly from the steep slopes characterizing the eastern half of the property, to discharge into Howe Sound approximately 490 m north of Minaty Bay. Its first two reaches are known to be fish bearing (coho salmon, rainbow trout and cutthroat trout), however a large waterfall precludes fish movements into the creek's steeper 3rd reach. Due to gravel extraction activities, a portion of the creek's 2nd reach is perched above the lands to the north.

Thistle Creek's 1st tributary consists of a series of two wetlands and two ponds, fed by "Gravel Creek". Fish have been captured in the 1st pond above Thistle Creek, but not further upstream, likely due to the ephemeral conditions, low flows and shallow depths. "Gravel Creek" is known to be dry in summer through early fall. Downstream of the creek's headwaters, between the powerlines and the gravel pit, Gravel Creek is confined in a series of roadside ditches. The pool/wetland complex that forms the lower reach of "Gravel Creek" appears to be a remnant of past gravel extraction activities. The system consists of two pools that vary in depth from approximately 0.5 to 3 m that are joined by a ditch and then discharge to Thistle Creek via a ditch and small diameter culvert. The entire system from the water input to the outflow is constructed in what appears to be a haphazard fashion and not designed for fisheries or other habitat interests. Rainbow trout were caught in the pool closest to Thistle Creek causing the low gradient pool/ ditch system to be considered fish habitat due to its connectivity and lack of fish barriers; however the wetland and pond complex appear to provide better amphibian than fisheries habitat.

The 2nd tributary of Thistle Creek is a small channel that tends westward through the powerlines above the proposed development, before flowing into a north-south tending cut-off ditch. Water entering the cut-off ditch generally tends southward, although it can flow either direction, and has known to flow northward into "Gravel Creek" and occasionally flow overland into the gravel pit causing erosion of the gravel embankment. The water flowing in the channel southwards makes its way into Thistle Creek. The lowest reach has an average gradient of 19%, and as there are no barriers to fish movements, should be considered potentially fish bearing.

Daisy Creek flows roughly parallel to Thistle Creek to discharge into Howe Sound approximately 210 m north of Minaty Bay. Daisy Creek is known to be fish bearing upstream from its mouth to Highway 99. Cascade Environmental have captured cutthroat trout throughout this section of the creek, and the FISS data base indicates unknown salmon species presence in the drainage. Coastal tailed frog has also been found throughout this creek, but particularly upstream of Highway 99.

Drainage 3 (aka Minaty Bay Creek) flows approximately parallel to Daisy Creek and flows into Minaty Bay. The drainage is small with an approximate wetted width of 1 m, and flows from a culvert that drains lands upslope of Highway 99. Although stream gradient is not great enough to preclude fish presence, the small size of the drainage, and very shallow depths does not present quality fish habitat. For this reason, this drainage is not likely fish habitat.



A foreshore assessment along Howe Sound and a marine assessment were also conducted as part of the Environmental Review. North of Thistle Creek the foreshore exhibits the highest level of disturbance, with evidence of old wharfs, old concrete, some riprap sections. South of Thistle Creek the Howe Sound foreshore is more natural, with gravel/pebble beaches and bedrock outcroppings. The subsurface marine assessment indicates substrates dominated by fines in the north, pebble, cobble and boulder nearer Thistle Creek, and areas of bedrock with steep vertical faces in Minaty Bay. Sea life was generally sparsely distributed in the north, with the occasional crab, sea star and empty cockle clam shell, while striped seaperch were abundant near the sunken vessels. A variety of sea life was observed in Minaty Bay including anemones, green sea urchin, sea stars, tube worms, sea cucumbers, among others.

Environmental Opportunities and Constraints

The Environmental Review identified several invasive plant species that should be addressed if the property is developed. These include English holly, Japanese knotweed, Himalayan blackberry and periwinkle. No rare or endangered plant species were encountered, but one blue listed ecological community was noted. (CWHdm03 Douglas-fir – western hemlock / salal). Large tracts of undisturbed plant communities are considered more ecologically important than disturbed, fragmented or second growth communities. The proposed development will disturb approximately 1.88 ha of young forest within this community.

Preserving or rehabilitating key ecosystem components, including Thistle and Daisy Creeks and their associated riparian areas, the pool/wetland system, and large veteran trees will serve to protect wildlife values and mitigate development impacts. To protect nesting birds, as required under the Wildlife Act, clearing of vegetation should be conducted outside the typical breeding bird window of April 1 to July 31, unless a song bird nest survey is conducted by a qualified professional to identify and establish buffers around any active nests, until the young have fledged. These measures will also serve to protect the olive sided flycatcher (threatened) and the band-tailed pigeon (special concern) should they occur on site. The great blue heron (special concern) is known to be a visitor to site, and will continue to do so, providing the aquatic and riparian habitat is maintained or enhanced. The retention and/or enhancement of aquatic habitat and associated riparian habitat will also ensure the continued presence on site of the confirmed coastal tailed frog, and the likely presence of northern red-legged frog and western toad (all species of special concern).

Stream side protection and enhancement areas (SPEAs) were calculated for the various drainages on site using the *Riparian Areas Regulation* (RAR) detailed methodology, with the following results:

- Daisy Creek – 15.0 m (21.9 m to South)
- Minaty Bay Creek - 10.5 m
- Thistle Creek Reach 1 (approximately from the bridge downstream - 16.2 m
- Thistle Creek Reach 2 (upstream of the access road bridge) - 15.0 m
- Gravel Creek - 13.2 m
- Wetland 1 and 2 – 15m, 30 m to South
- Pond 1 and 2 – 15 m, 30 m to South

SPEAs for creeks outside the current development area (Minaty Bay northward and from Howe Sound upslope to the electrical transmission powerline) have not been established; a 30 m RAR assessment area should be established along those drainages (as well as the drainages where the SPEA has been calculated, until those RAR assessments have been filed).

A marine foreshore buffer of 15 m is recommended, subject to review by Fisheries and Oceans Canada DFO).



Proposed Development

The present proposed development plan calls for preservation of Daisy Creek within a 25 m buffer, which exceeds the recommendation of the RAR. Thistle Creek would also receive a 25 m buffer, which also exceeds the RAR requirements; however, as a portion of the 2nd reach is perched, some remedial engineering works may be required. Any such works would require provincial *Water Act* approval as well as approval or project review under the federal *Fisheries Act*. To conform to those acts, any remedial stream works would likely involve some mitigation/compensatory stream/riparian enhancements.

A 15 m buffer is proposed for Minaty Bay Creek (aka Drainage 3), which is greater than the 10.5 m SPEA as determined by the detailed RAR assessment. The location of this creek needs to be surveyed to accurately determine its location. Depending on that survey, the creek may be relocated as part of the development. As with Thistle creek any works in and about the creek would be subject to the noted federal and provincial legislation.

The proposed development plan calls for relocation of Gravel Creek (aka Thistle Creek Tributary #1) and the associated ponds and wetlands. These features will be located to the north and west of the existing features and be designed primarily as amphibian habitat, although the connection to Thistle Creek would not preclude the presence of fish. A riparian buffer within a width of 15 m would be located on either side of the aquatic features. As the current vegetation in the Gravel Creek area is predominantly juvenile red alder amongst exposed soils and gravel, this area will be revegetated with appropriate native species. In addition to these enhancement works, the section of Gravel Creek and Thistle Creek Tributary #2 between the powerlines and the gravel pit will likely be realigned out of the present ditch system, to provide better flood protection for the development and to provide for enhanced aquatic and riparian habitat. These works will require provincial *Water Act* approval as well as approval or project review under the federal *Fisheries Act*. As the current alignment of these drainages is within drainage ditches and through a gravel pit, it is the intention to have a net increase in usable aquatic and riparian habitat as a result of the above enhancement program.

Environmental Permitting

As proposed, there are no identified Canadian Environmental Assessment Act (CEAA) triggers associated with the project, and therefore, a CEAA review/application is not required. The British Columbia Environmental Assessment Act (BCEAA) will be triggered by the project if groundwater extraction required for the project exceeds the rate of 75 litres per second; otherwise the BCEAA will not be applicable. The project will have to conform to various federal and provincial environmental legislation with specific applications submitted under the *Fisheries Act* and *Water Act* for any works in and about creeks and watercourses, and an application under the *Wildlife Act* for salvage and inventory permits.



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1.0 Introduction

Tai Cheng Development Corporation is proposing to develop South Britannia Beach (subject site) into the newest community within commuting distance to Squamish and Vancouver, BC. Preliminary community plans include a mix of residential, commercial and municipal amenities that are geared towards young professionals with outdoor recreational interests. The Site is located immediately south of the small unincorporated community of Britannia Beach within the Squamish Lillooet Regional District (SLRD) Electoral Area D (Map 1). The project boundary encompasses approximately 600 acres of privately owned land that spans District Lots 1889, DL1981, REM DL 4009, DL 1970, 2617, 3717, 4005, 4008, 4012, 2933, 1583, 5210, Parcel 1 DL 2001, parcel 1 DL1583, Lot A DL 1583, 2001, and 7034, Lot A DL 2001 & 7053, and DL 5210. While the majority of lands are owned by the proponent, two parcels are included in the project boundary that are not owned by the proponent but intended for acquisition. These are Lot A DL 2001 & 7053, and DL 5210. The project is divided into three phases; Phase 1 encompasses lands at the northern portion of the project boundary, followed by Phase 2, and Phase 3 (Map 2). The majority of lands are located east of Highway 99, although the project supports 1.8 km of ocean front onto Howe Sound. The ocean front varies from sheltered pebble beach to exposed, steep, armoured banks.

The proponent is in discussions with local government (i.e., SLRD) to identify opportunities and constraints in planning and developing the proposed community. A number of consultants are retained to provide input to aid in planning in respect to the various permitting requirements. Cascade Environmental Resource Group Ltd. (Cascade) was retained to perform the environmental assessment of the lands, creeks, and foreshore to identify potential opportunities and constraints for development.

The Official Community Plan for the SLRD Area D (SLRD, 2011) outlines the vision for the Britannia Beach community, which includes the subject site. The first item in the list of seven visions is to develop a community that:

- Respects the natural environment and adheres to principles of environmental sustainability.

This Initial Environmental Review aims to aid the proponent in meeting the environmental vision of the SLRD.

1.1 Scope

The intent of the baseline inventory is to document and provide background bio-physical information to the proponents and their design team to enable a town design that protects and enhances the valued ecosystem components of the property.

The purpose of the environmental assessment is to identify and document the existing environmental conditions of the property. Knowledge and understanding of the environmental value and possible legal protection of various environmental aspects will aid in sustainable town planning and avoid costly design changes further in the planning process.

Existing environmental conditions are documented by identifying likely ecosystems from existing mapped data with field verification. The methodology followed for ecosystem identification is the provincially accepted Standard for Terrestrial Ecosystem Mapping in British Columbia (RIC, 1998). Further research included field inspection of stream habitats, and a review of provincial online resources for fisheries values and the potential for rare and endangered wildlife presence. All information was compiled to identify potential environmental opportunities and constraints for development.



1.2 The Project Team

Acting as lead environmental consultant, **Cascade's** project team consisted of Mike Nelson, R.P.Bio., Dave Williamson, B.E.S., Certified Terrestrial Ecosystem Mapper, Alexandra Pierce, MBA, PMP, Amber Michaud, M.Sc., R.P.Bio., Kersti Vaino, B.Sc., B. Tech., Ken McNamara, B.Sc., A.Sc.T., Candace Rose-Taylor, M.Sc., and Lori Homstol, M.Sc., P.Bio. GIS support was provided by Todd Hellinga, B.Sc., GIS AS, Ryan Coatta, B.Sc., ADP Technology GIS. The marine portion of the environmental assessment was conducted by **Balanced Environmental Services Inc.** (Balanced), whose team consisted of Scott Christie, R.P.Bio., Warren Appleton, R.P.Bio., Duncan Clark, B.I.T., and Mark Thompson, B.I.T.

1.3 Methodology

Terrestrial and Intertidal Environmental Review

Initial site analysis began by assessing available map information including Vegetation Resources Inventory (VRI), existing ortho-photographs, and topographic information, and creating vegetation units as part of the pre-typing exercise. The pre-typed conditions were then verified or updated through field surveys. Field surveys were conducted in October and November of 2011 whereby observations of existing site conditions were made and Ground Inspection Forms (GIF) field forms were filled out. Following field surveys, the initial pre-typed vegetation units are refined to produce the final map representing the current conditions of ecosystems on the site. The Standard for Terrestrial Ecosystem Mapping in British Columbia is the accepted methodology that was used during these tasks.

Other information collected during field surveys includes documentation of vegetation, soils, terrain, significant trees, wildlife, wildlife habitat, and aquatic habitat. Site investigations were conducted by walking the site and targeting areas identified during the pre-typing as potentially sensitive or showing variation in tree cover from adjoining forests.

Aquatic Habitat

Aquatic habitat in Thistle and Daisy Creeks was evaluated following the Level 1 Fish Habitat Assessment Procedures (Johnston and Slaney, 1996). The level 1 assessment uses several features to characterize habitat conditions, particularly: adult holding pools, spawning gravel quality and quantity, rearing pool area and frequency, cover in pools and riffles, large woody debris (LWD) frequency and distribution, substrate characteristics of the stream bed, off-channel habitat, and nutrient concentrations during the summer growing season. The remaining watercourses on site were evaluated using the overview fish habitat assessment procedure (Johnston and Slaney, 1996) and through the completion of site cards (RIC, 1999) at representative sections. Channel width measurements were taken in order to calculate the mean channel width as per the Riparian Areas Regulation (RAR) detailed assessment methodology under the Fish Protection Act (Malaspina University College, 2006). Using the RAR detailed assessment methodology, the preliminary Streamside Protection and Enhancement Area (SPEA) was then determined for design purposes. Fish and amphibian presence was determined through a review of previous sampling efforts conducted by Cascade Environmental (CERG, 2007b, 2007c, 2008) and through a limited fish trapping program in the ponds at the outlet of Gravel Creek.

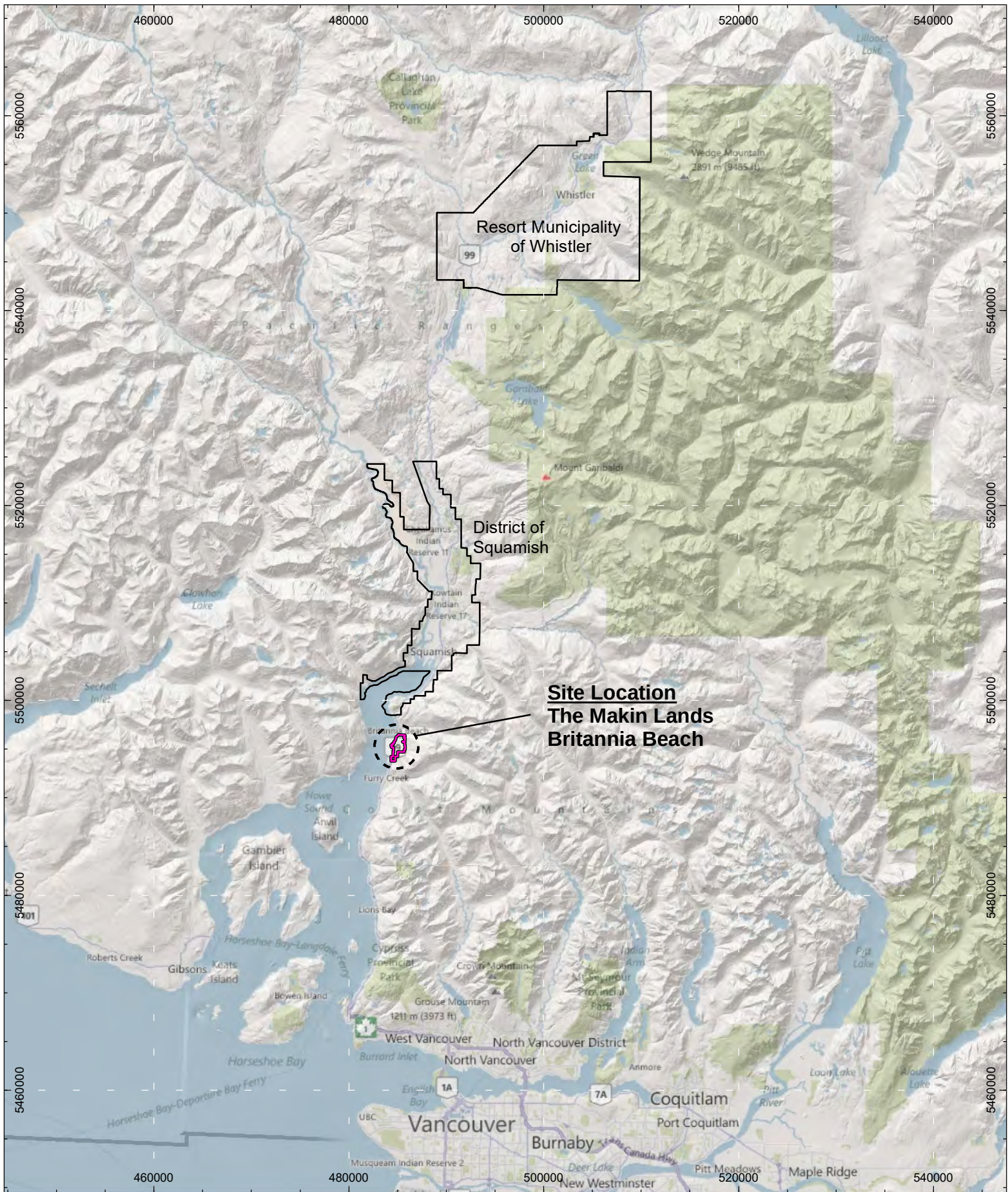
Underwater Biophysical Survey

The underwater biophysical survey of the foreshore along the property was conducted using a Towed Optical Assessment Device (TOAD) Sled vehicle to survey the underwater habitat along two transects at 0 m and -15 m chart datum contours of the South Britannia Beach foreshore. The first transect at 0 m was the approximate low water level. The TOAD Sled was towed 30 m to 150 m behind a boat at a speed of 2-5 knots and was operated by a professional biologist diver. Substrate, organisms and anthropogenic objects were recorded during these surveys. Changes in

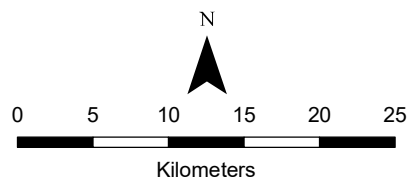
substrate observed during the two transects were communicated to the surface crew via wired communications and recorded using GPS. Survey data was then used to categorize the foreshore into three distinct areas of similar conditions. Survey data collected during the TOAD Sled transects was then mapped to illustrate underwater habitat conditions (drawing no. 5360-D-01.2).

Additionally, conditions observed during the two TOAD Sled transects were used to identify three stations of interest where biologists descended by SCUBA to photo document typical conditions. Station 1 was located at the north end of the survey area in Britannia Bay (UTM coordinates 485125 E, 5496456 N, zone 10). Station 2 was located at the south end of Britannia Bay (UTM coordinates 484981 E, 5496348 N, and Station 3 was located at the southwestern side of the bedrock point at the south end of Minaty Bay (UTM coordinates 484311 E, 5495425 N). Station 1 and 2 are located within the area of the proposed marina, whereas Station 3 is located at the proposed "Pier at the Point" location.

Preliminary hydrographic data was collected from the dive boat's digital depth sounder and GPS during the two TOAD Sled transects. This data was used to generate preliminary contours describing the depth and slope of the seabed within the survey area.

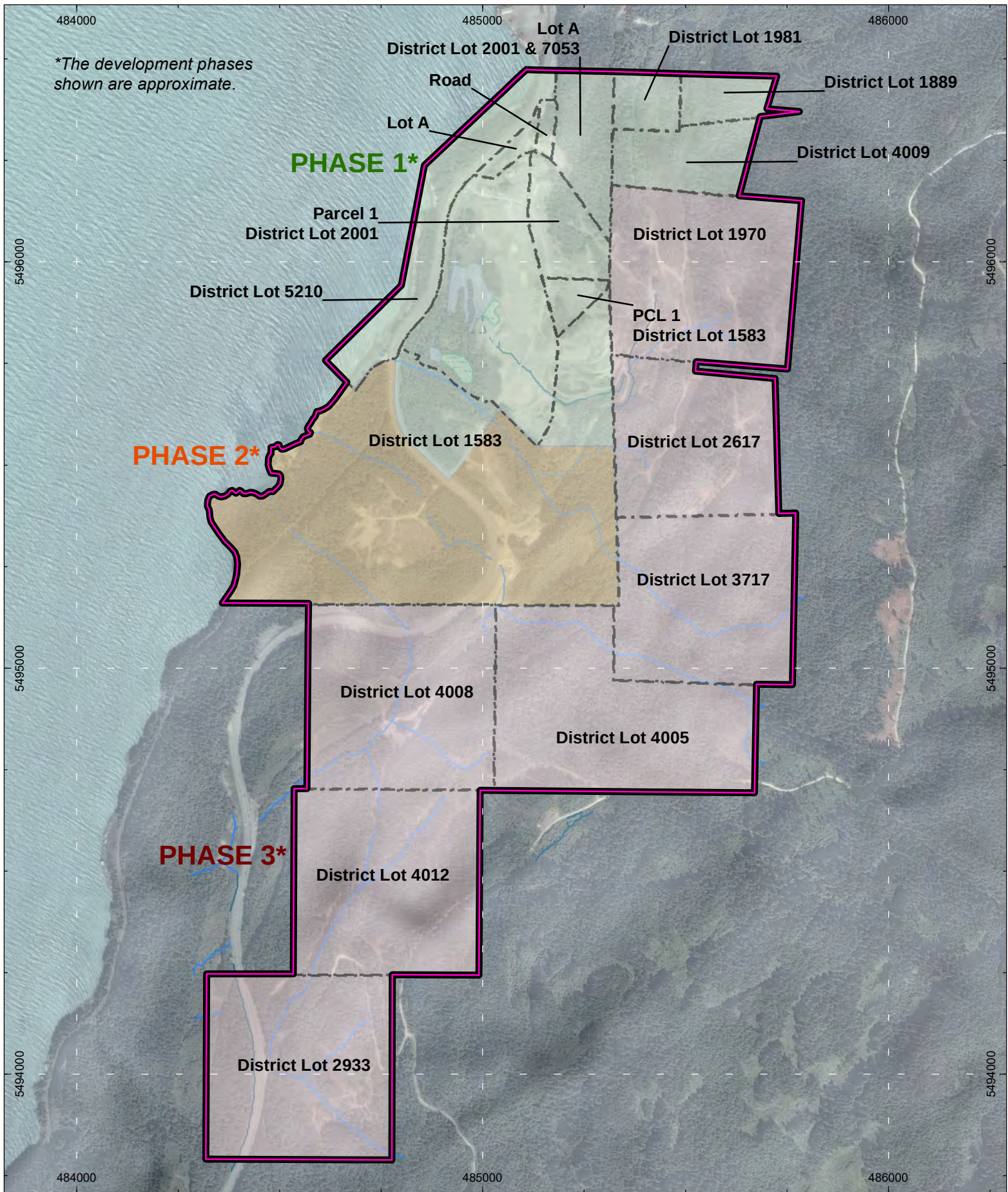


GIS Cartographer: Ryan Coatta
 Date: December 14, 2011
 CERF File#: 454-01-01
 Projection: UTM Zone 10N NAD83

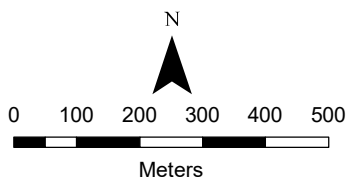


The Makin Lands
 Britannia Beach, BC

Map 1 - Location Map



GIS Cartographer: Ryan Coatta
 Date: January 5, 2012
 CERF File#: 454-01-01
 Projection: UTM Zone 10N NAD83



The Makin Lands
 Britannia Beach, BC

Map 2 - Property Overview



2.0 Existing Environmental Conditions

2.1 Physical Environment

2.1.1 Climate

The study area lies within the Southern Pacific Range Ecosection, within the Coast and Mountains Ecoprovince in southern British Columbia (ILMB, 2011). Located on the eastern shores of Howe Sound, a fjord positioned north of Vancouver's Burrard Inlet and east of Georgia Strait, Vancouver Island and the Pacific Ocean, the area is characterized by high precipitation on steep, rugged mountains. Climate in the Britannia Beach area is greatly influenced by the proximity to the ocean. This source of moisture results in typically cool wet weather in the autumn, winter and spring. Summers are relatively cool, although hot dry spells do occur. Green and Klinka (1994) describe the CWHdm biogeoclimatic zone as having warm, relatively dry summers and moist, mild winters with little snowfall. Growing seasons are long, and feature only minor water deficits on zonal sites (see Section 2.2.2).

The meteorological records from the Squamish Environment Canada Weather Station (Canadian Climate Normals 1971 - 2000) record an annual total precipitation of 2,367 mm, which mainly falls as rain (Environment Canada, 2011). The total precipitation peaks in the month of November, and is least in the month of August, with averages of 378.9 and 59.6 mm, respectively. The mean annual temperature is 9.0°C with August being the warmest month, and January being the coldest month. Mean daily maximum temperatures in August increase to 24.5°C, with a mean daily temperature of 17.8°C, whereas mean daily minimum temperatures in January decrease to -2.5°C with mean daily temperatures of 0.2°C.

The area is buffeted on occasion by strong catabatic winds out flowing down the Squamish and Cheakamus Valleys to Howe Sound. The strongest of these winds usually occurs in winter months, when a cold, high pressure area develops in the interior of the province, and outflows to low pressure areas on the coast. In addition to these seasonal winds, the Squamish area is subject to diurnal air movements typical of mountainous areas. Winds typically blow off shore, to the south, in the morning, and change to onshore winds, to the north, in the afternoon.

2.1.2 Geology

The Squamish area, extending north and south past the subject site, is underlain by granitic rock, significant amounts of which are exposed in the study area.

2.1.3 Geomorphology

The subject site is characterized by steep treed, bedrock cliffs leading into areas of decomposed bedrock and rubble. The north western portion of property was historically operated as a gravel pit indicating a location of glacial moraine deposits.

2.1.4 Hydrology

The subject site consists primarily of exposed bedrock and shallow well to rapidly drained soils over underlying granitic bedrock and rubble. The hydrology of the site is therefore primarily surface flow or shallow subsurface flow, although no seepages were observed. The forest provides adequate soil and organic material to prevent significant bedrock instigated surface flows. Few to no areas of pooling exist on the steep slopes of the site due to the relatively consistent downward gradient of the site. Significant pooling does occur at the south western border of the historic gravel pit. A constructed drainage ditch directs runoff from the hill sides into constructed pools and depressions that has created a series of permanently wetted pools connected by ditches. The pool system drains into Thistle Creek via a culvert.



Surface flow occurs in the form of creeks and drainages including Thistle and Daisy Creeks and a number of unnamed smaller drainages. Both Thistle and Daisy Creeks flow in a north westerly aspect and drain into Howe Sound north of Minaty Bay. Both Thistle and Daisy creeks experience a significant decrease in gradient descending from the steep hill sides to the flats (i.e. gravel pit area) resulting in waterfalls that are impassable to fish. Drainages on the northern portion of the property generally drain through the gravel pit to Howe Sound, whereas drainages on the southern portion of the property generally flow south easterly to drain into Howe Sound approximately 1 km south of Minaty Bay.

2.2 Terrestrial Environment

2.2.1 Soils

The type of bedrock on a site affects the soil mineralogy and thus nutrient regime through the release of bases (e.g. calcium, magnesium, potassium) during weathering (Green and Klinka, 1994). The subject site is underlain by granite bedrock, and parent materials formed from granite yield nutrient-poorer soils with low base content and coarser textures. Therefore, as a generalization, soils on the subject site can be expected to have poorer nutrient regimes (i.e., very poor, poor and medium) than soils in areas without granite bedrock.

The soils on the site vary based on the local topography. The convex rocky outcrops have little to no soil development while gullies/ hummocks and gently sloping areas are receiving areas and have deeper soils. Although much of the soils located on the lower elevation, flatter areas of the site are disturbed, richer and moister soils were documented in these areas.

Soil moisture regime on the property vary from moderately dry (xeric) soils at upslope areas with bedrock outcrops and shallow soils to receiving areas with deeper soils of moist (subhygric) soil moisture regimes. Soils vary from very rapid to moderately well drainage.

2.2.2 Biogeoclimatic Zone Classification (CWHdm)

A standard method of land classification used in BC is the Biogeoclimatic Ecosystem Classification system (BEC). The biogeoclimatic ecosystem classification describes the variation in climate, vegetation, and site conditions occurring within ecosections. BEC is also hierarchal, with separate climate and site levels (Resource Information Standards Committee (RIC, 1998). There are six levels of organization with increasing specificity: zone, subzone, phase, variant, site association, and site series. At the highest level, biogeoclimatic zones are classed based on broad macroclimatic patterns; at the lowest level, site series describes the vegetation potential of the land area based on its ability to support the same climax plant association, and displaying the same soil moisture and nutrient regimes (RIC, 1998). For the purposes of this report, descriptions are set at the biogeoclimatic subzone, variant, and site series levels of detail.

The study area lies within the Southern Pacific Range Ecosections of the Coast and Mountains Ecoregion (Demarchi, 1995). The subject site contains a single biogeoclimatic subzone: Coastal Western Hemlock Dry Maritime subzone (CWHdm). Occurring at elevations between 0 m and 650 m, this biogeoclimatic variant occurs on the low elevation mainland from Jervis Inlet to the Chilliwack River. This subzone is characterized by warm, relatively dry summers and moist, mild winters with little snowfall. Growing seasons are long, and feature only minor water deficits on zonal (representative) sites. Tree cover for zonal sites is dominated by Douglas-fir, western redcedar, and western hemlock with typical shrubs including salal and red huckleberry, with less common species including dull Oregon grape, vine maple, bracken and sword fern.



2.2.3 Site Classification

Within each biogeoclimatic subzone there are a finite number of recurring site types that occur dependent on variations in soil and physiographic properties. Sites with similar environmental properties, particularly soil moisture and soil nutrient regimes will produce similar plant communities at late successional stages. Therefore, sites can be classified using characteristic environmental properties in addition to characteristic stable plant communities. Keeping in mind that plant communities will vary from the characteristic plant communities at earlier successional stages, but should result in one kind of climax plant community.

Site Series classification is the most common category used in field reconnaissance. A site series is specific to the subzone, although the same stable, late seral or plant community may occur in more than one subzone. General site classification is the typical sequence of site series and covers dry/nutrient-poor to wet/nutrient rich soils. Special site classification includes site series with atypical soil moisture and nutrient processes or unique environmental properties such as floodplains, sites with strongly fluctuating water tables, or shoreline and ocean spray sites.

The dm subzone contains nine general or typical site series and three special site series (Green & Klinka, 1994). Of the nine general site series, site series 01 is considered zonal with mid range soil nutrient and soil moisture regimes. The remaining eight general site series are classified based on being drier or wetter, or richer or poorer than the zonal site. The site series classification level is further described using Terrestrial Ecosystem Mapping (TEM) units that are based on the structural stage of the vegetation and the geomorphology of the site. Four site series or TEM units were identified on the subject site, many of which were found in conditions that varied from the assumed typical conditions. Table 1 lists the TEM units and the conditions in which the units were identified. As expected, the zonal site series represents the largest surface area at 796,842, followed by site series 07 at 374,047 m², site series 05 at 266,639 m², and site series 03 at 226,842 m², these are TEM codes HM, RF, RS, DS, respectively. The TEM units are illustrated on Map 3: Existing Environmental Conditions.

2.2.4 Terrestrial Ecosystem Mapping

Terrestrial Ecosystem Mapping (TEM) is built on the foundation of the BEC system principles. TEM provides the framework in which biotic and abiotic elements can be integrated to provide information on the spatial distribution of ecological units on the ground. Aerial photos and field surveys are used to delineate ecosystem polygons containing features with the similar site conditions, using variables such as vegetation, soil, aspect, and vegetation structural stage. This information can then be used to develop wildlife habitat capability / suitability mapping based upon individual species habitat preferences.

The derivation of the TEM code is described as:

TEM code abbreviations					
2	RS	kf	5	s	B

- 2 refers to decile (i.e., 20%);
- RS is the TEM unit that refers to the *site series* designation, which denotes subtle changes in microclimate and soil conditions, as reflected by changes in vegetation present;
- k and f are *site modifier* designations, which reflect geomorphological variation within a given site series;
- 5 refers to the *structural stage* designation;
- s refers to the structural stage modifier;
- B refers to the structure of the forest stand.



Table 1: Site Series at South Britannia Beach - Typical Conditions

TEM Code Designation	BEC Site Series	Interpretation – typical condition
HM	01: Hw – Flat moss	Significant slope, middle slope position, deep medium-textured soils
DS	03: FdHw – Salal	Significant slope, middle to upper slope position, warm aspect, deep medium-textured soils
RS	05: Cw – Sword fern	Significant slope, middle slope position, deep medium-texture soils, richer nutrient regime
RF	07: Cw - Foamflower	Gentle slope, lower slope position, richer nutrient regime, receiving moisture, medium textured soil

Source: MOE, 2006.

Table 2: Site Series Site Modifiers

TEM Code modifier	Interpretation
j	Gentle slope – the site series occurs on low angle slopes (<35% in CWH)
k	Cool aspect – the site series occurs on cool, northerly or easterly aspects, on moderately steep slopes.
t	Terrace
w	Warm aspect – the site series occurs on warm, southerly or westerly aspects (135°-285°), on moderately steep slopes (35%-100% slope in the CWH).
x	Drier than typical
d	Deep soil (>100 cm to bedrock)
s	Shallow soils – the site series occurs where soils are considered to be shallow to bedrock (20-100 cm).
v	Very shallow soils – the site series occurs where soils are considered to be very shallow to bedrock (less than 20 cm).

Source: MOELP & MOF, 1998.



Table 3: Vegetation Structural Stage Definitions

TEM Code Designation	Interpretation
3b – Shrub/Herb	Shrub dominated communities maintained by environmental conditions or disturbance, vegetation < 10 metres tall, tree cover <10%, time since disturbance < 40 years
4 – Pole/Sapling	Trees greater than 10 m tall, typically densely stocked, have overtopped shrub and herb layers; younger stands are vigorous (usually greater than 10-15 years old); older stagnated stands (up to 100 years old) are also included; self-thinning and vertical structure not yet evident in the canopy
5 – Young Forest	Self thinning has become evident and the forest canopy has begun differentiation into distinct layers, trees between 40 and 80 years old
6 – Mature Forest	Trees established after the last disturbance have matured; a second cycle of shade tolerant trees may have become established; under-stories become well developed as the canopy opens up, and tree age ranges between 80-250 years.

Source: MOELP & MOF, 1998.

Table 4: Structural Stage Modifiers

TEM Code Designation	Interpretation
s – single-storied	Closed forest stand dominated by the over-storey crown class (dominant and co-dominant trees) intermediate and suppressed trees comprise less than 20% of all crown classes combined; advanced regeneration in the understory is generally sparse.

Source: MOELP & MOF, 1998.

Table 5: Stand Composition Modifiers

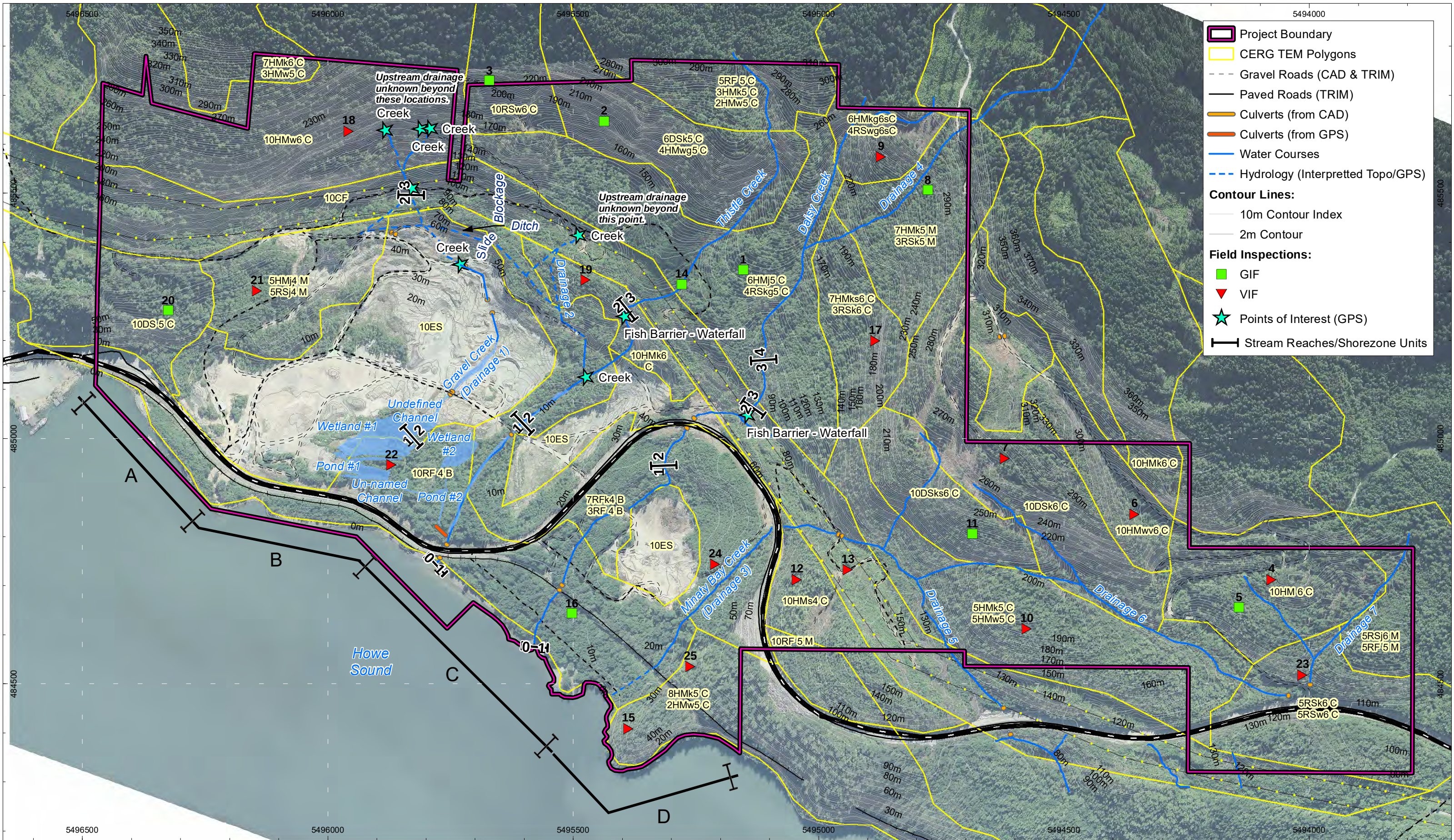
TEM Code Designation	Interpretation
C – Coniferous	Greater than 75% of total tree layer cover is coniferous
B - Broadleaf	Greater than 75% of total tree layer cover is broadleaf
M – Mixed	Neither coniferous or broadleaf account for greater than 75% of total tree layer cover

Source: MOELP & MOF, 1998.



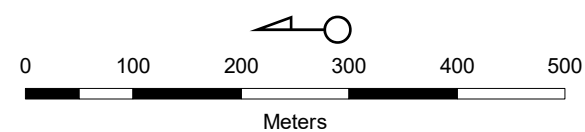
Table 6: Terrestrial Ecosystem Units at South Britannia Beach

TEM unit and modifiers	Name	Area (ha)	Structural stage
CF	Cultivated field	21.44	n/a
ES	Exposed soil	30.08	n/a
DS	Douglas fir, Western hemlock – salal	4.65	5 coniferous
DSk	Douglas fir, Western hemlock – salal, cool aspect	4.93 11.31	5 coniferous 6 coniferous
DSks	Douglas fir, Western hemlock – salal, cool aspect, shallow soils	5.29	6 coniferous
HM	Western hemlock – flat moss	7.71	6 coniferous
HMj	Western hemlock – flat moss, gentle slope	3.54 10.76	4 mixed 5 coniferous
HMk	Western hemlock – flat moss, cool aspect	11.26 4.84 4.65	5 coniferous 5 mixed 6 coniferous
HMkg	Western hemlock – flat moss, cool aspect, gullying	1.74	6 single storied coniferous
HMks	Western hemlock – flat moss, cool aspect, shallow soils	3.52	6 coniferous
HMs	Western hemlock – flat moss, shallow soils	2.96	4 coniferous
HMw	Western hemlock – flat moss, warm aspect	8.49 14.58	5 coniferous 6 coniferous
HMwg	Western hemlock – flat moss, warm aspect, gullying	3.29	5 coniferous
HMwv	Western hemlock – flat moss, warm aspect, very shallow soils	2.97	6 coniferous
RF	Western redcedar – foamflower	21.49 2.31 1.65	4 broadleaf 5 coniferous 5 mixed
RFk	Western redcedar – foamflower, cool aspect	13.27	4 broadleaf
RFw	Western redcedar – foamflower, warm aspect	0.07	5 coniferous
RSj	Western redcedar – sword fern, gentle slope	3.54 1.34	4 mixed 6 mixed
RSk	Western redcedar – sword fern, cool aspect	2.07 5.79	5 mixed 6 coniferous
RSkg	Western redcedar – sword fern, cool aspect, gullying	7.17	5 coniferous
RSw	Western redcedar – sword fern, warm aspect	6.20	6 coniferous
RSwg	Western redcedar – sword fern, warm aspect, gullying	1.16	6 single storied coniferous
Total		224.03	



Map 3: Existing Conditions - Ditch Review

Pre-Development
South Britannia Beach, British Columbia



GIS Cartographer: Todd Hellinga
Date: July 28, 2014
CERG File#: 454-01-06
Projection: UTM Zone 10N NAD83

2.2.2.3 Vegetation Associations

TEM Code HM - Site Series 01 – Hw – Flat moss

The zonal site series was observed at plots 1, 2, 4, 5, 6, 8, 9, 10, 12, 14, 15, 17, 18, 19, 21, and 24, totalling an approximate area of 80.29 ha. Variances from the typical HM conditions are described by using modifiers to address the specific conditions of each site. Eight variants were identified that take into account change in aspect, soil depth, land form and varying structural stages. Dominant and associated vegetation observed within the plots are recorded and presented in the expanded legend. A typical zonal site is presented in Photo 1.



Photo 1: Typical conditions of site series 01. This photo was taken at plot 6 on October 25, 2011.

TEM Expanded legend

Map Unit:	Description:		Biogeoclimatic Unit:	
HM	Western hemlock - Flat moss		CWHdm	
Typical Situation:	Significant slopes; middle slope position; deep medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
HM6C	Mature Forest Coniferous	Western redcedar Western hemlock salal	Big leaf maple Bitter cherry Paper birch Douglas-fir Red huckleberry Oregon grape Sword fern Lady fern oceanspray	4, 5
Comments:				



Map Unit:	Description:			Biogeoclimatic Unit:
HMj	Western hemlock - Flat moss, gentle slopes			CWHdm
Typical Situation:	Significant slopes; middle slope position; gentle slopes; deep medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
HMj4M	Pole/Sapling Mixed Coniferous/Broadleaf	Western redcedar Red alder Sword fern	Western hemlock Big leaf maple Douglas-fir Trailing blackberry Red huckleberry Salmonberry Lady fern	21
HMj5C	Young Forest Coniferous	Western redcedar Western hemlock Big leaf maple Paper birch Sword fern Bracken fern	Black cottonwood Red huckleberry	1, 14
Comments:	The invasive species, Himalayan blackberry was observed at plot 21 at low levels. Invasive species are not representative of site series.			

Map Unit:	Description:			Biogeoclimatic Unit:
HMk	Western hemlock - Flat moss, cool aspect			CWHdm
Typical Situation:	Significant slopes; middle slope position; northerly or easterly aspect; deep medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
HMk5C	Young Forest Coniferous	Western redcedar Western hemlock Paper birch Douglas-fir Salal	Red huckleberry Copperbush Sword fern Bracken fern Spiny wood fern	10, 15, 25
HMk5M	Young Forest Mixed Coniferous/Broadleaf	Western hemlock Sword fern Big leaf maple	Western redcedar Paper birch White flower rhododendron Salmonberry Red huckleberry Spiny wood fern	8
HMk6C	Mature Forest Coniferous	Western hemlock Western redcedar	Big leaf maple Paper birch Salmonberry Red huckleberry Sword fern	19
Comments:				

Map Unit:	Description:			Biogeoclimatic Unit:
HMkg	Western hemlock - Flat moss, cool aspect, gullyng			CWHdm
Typical Situation:	Significant slopes; middle slope position; deep medium textured soils; northerly or easterly aspect; gullyng occurring in some areas.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
HMgk6sC	Mature Forest Single Storied Coniferous	Western hemlock	Western redcedar Big leaf maple Red huckleberry Oceanspray Red alder Sword fern	9
Comments:				



Map Unit:	Description:			Biogeoclimatic Unit:
HMks	Western hemlock - Flat moss, cool aspect, shallow soils			CWHdm
Typical Situation:	Significant slopes; middle slope position; northerly or easterly aspect; shallow medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
HMks6C	Young Forest Coniferous	Western hemlock Western redcedar Big leaf maple	Salmonberry Sword fern	17
Comments:				

Map Unit:	Description:	Biogeoclimatic Unit:		
HMs	Western hemlock - Flat moss, shallow soils	CWHdm		
Typical Situation:	Significant slopes; middle slope position; shallow medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
HMs4C	Pole/Sapling Coniferous	Western hemlock Douglas-fir Western redcedar Salal	Copperbush Red huckleberry Bunchberry Bracken fern	12
Comments:				

Map Unit:	Description:			Biogeoclimatic Unit:
HMw	Western hemlock - Flat moss, warm aspect			CWHdm
Typical Situation:	Significant slopes; middle slope position; southerly or westerly aspect; deep medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
HMw5C	Young Forest Coniferous	Western redcedar Western hemlock Paper birch Douglas-fir Salal	Red huckleberry Copperbush Sword fern Bracken fern Spiny wood fern	10, 15, 25
HMw6C	Mature Forest Coniferous	Western hemlock Western redcedar Douglas-fir Big leaf maple *Himalayan blackberry Hardhack	Paper birch Red huckleberry Salmonberry Salal Trailing blackberry Oregon grape Thimbleberry Sword fern Maidenhair fern	18
Comments:				

Map Unit:	Description:			Biogeoclimatic Unit:
HMwg	Western hemlock - Flat moss, warm aspect, gullyng			CWHdm
Typical Situation:	Significant slopes; middle slope position; southerly or westerly aspect; deep medium textured soils; gullyng occurring.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
HMwg5C	Young Forest Coniferous	Douglas-fir Western redcedar Sword fern	Western hemlock Big leaf maple Oceanspray Red alder Red elderberry Red huckleberry Trailing blackberry False azalea	2
Comments:				



Map Unit:	Description:		Biogeoclimatic Unit:	
HMwv	Western hemlock - Flat moss, warm aspect, very shallow soils		CWHdm	
Typical Situation:	Significant slopes; middle slope position; southerly or westerly aspect; very shallow medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
HMwv6C	Mature Forest Coniferous	Western hemlock Western redcedar Big leaf maple Paper birch Red huckleberry Salmonberry Licorice fern Sword fern	Douglas-fir Red alder Black gooseberry Copperbush Red elderberry Trailing blackberry	6
Comments:				

TEM Code DS – Site Series 03 - FdHw – salal

Site Series 03 was observed at plots 2, 7, 11, and 20, totalling an approximate area of 26.17 ha. Variances from the typical DS conditions are described by using modifiers to address the specific conditions of each site. Three variants were identified that take into account change in aspect, soil depth, and varying structural stages. Dominant and associated vegetation observed within the plots are recorded and presented in the expanded legend. Photo documentation of conditions typical of site series 03 is presented in Photo 2.



Photo 2: Typical conditions of Site Series 03. This photo was taken at Plot 7 on October 25, 2011.



TEM Expanded Legend

Map Unit:	Description:	Biogeoclimatic Unit:		
DS	Douglas fir, Western hemlock – salal	CWHdm		
Typical Situation:	Significant slope, middle to upper slope position; warm aspect; deep medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
DS5C	Young Forest Coniferous	Western hemlock Western redcedar	Big leaf maple Douglas-fir Red elderberry Red huckleberry	20
Comments:				

Map Unit:	Description:	Biogeoclimatic Unit:		
DSk	Douglas fir, Western hemlock – salal, cool aspect			CWHdm
Typical Situation:	Significant slope, middle to upper slope position; northerly or easterly aspect with moderately steep slopes; deep medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
DSk5C	Young Forest Coniferous	Douglas-fir Western redcedar Sword fern	Western hemlock Big leaf maple Oceanspray Red alder Red elderberry Red huckleberry Trailing blackberry False azalea	2
DSk6C	Mature Forest Coniferous	Western hemlock Western redcedar Douglas-fir	Red huckleberry Big leaf maple Paper birch Lodgepole pine False azalea	7
Comments:				

Map Unit:	Description:	Biogeoclimatic Unit:		
DSks	Douglas fir, Western hemlock – salal, cool aspect, shallow soils	CWHdm		
Typical Situation:	Significant slope, middle to upper slope position; northerly or easterly aspect with moderately steep slopes; shallow medium textured soils.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
DSks6C	Mature Forest Coniferous	Western hemlock Western redcedar Douglas-fir Salal	Paper birch Copperbush Red huckleberry Oregon grape Sword fern	11
Comments:				



TEM Code RS – Site Series 05 – Cw – Sword fern

Site Series 05 was identified at plots 1, 3, 14, 8, 9, 17, 21, 23 and at an unverified polygon, totalling an approximate area of 27.27 ha. Variances from the typical RS conditions are described by using modifiers to address the specific conditions of each site. Six variants were identified that take into account change in aspect, soil depth, and varying structural stages. Dominant and associated vegetation observed within the plots are recorded and presented in the expanded legend. Typical site series 05 conditions are presented in Photo 3.



Photo 3: Typical conditions of Site Series 05. Photo taken at Plot 1 on October 21, 2011.

TEM Expanded Legend

Map Unit:	Description:	Biogeoclimatic Unit:		
RSj	Western redcedar - Sword fern, gentle slope	CWHdm		
Typical Situation:	Gently sloping topography; middle slope position; deep medium - textured soils; richer nutrient regime.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
RSj4M	Pole/Sapling Mixed Broadleaf/Coniferous	Western redcedar Red alder Sword fern	Western hemlock Big leaf maple Douglas-fir Trailing blackberry Red huckleberry Salmonberry Lady fern	21
RSj6M	Mature Forest Mixed Broadleaf/Coniferous	Western redcedar Douglas-fir Western hemlock Big leaf maple Red alder Vine maple Sword fern	Salal Red huckleberry Oregon grape Spiny wood fern Bracken fern	
Comments:	The invasive species, Himalayan blackberry was observed at plot 21 at low levels. Invasive species are not representative of site series.			



Map Unit:	Description:			Biogeoclimatic Unit:
RSk	Western redcedar - Sword fern, cool aspect			CWHdm
Typical Situation:	Significant slope; middle slope position; northerly or easterly aspect; deep medium - textured soils; richer nutrient regime.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
RSk5M	Young Forest Mixed Broadleaf/Coniferous	Western hemlock Sword fern Big leaf maple	Western redcedar Paper birch White flower rhododendron Salmonberry Red huckleberry Spiny wood fern	8
RSk6C	Mature Forest Coniferous	Western hemlock Western redcedar Big leaf maple Paper birch Sword fern	Salmonberry Red elderberry Red huckleberry Spiny wood fern	17, 23
Comments:				

Map Unit:	Description:			Biogeoclimatic Unit:
RSkg	Western redcedar - Sword fern, cool aspect, gullyng			CWHdm
Typical Situation:	Significant slope; middle slope position; northerly or easterly aspect; deep medium - textured soils; richer nutrient regime; gullyng occurring.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
RSkg5C	Young Forest Coniferous	Western redcedar Western hemlock Big leaf maple Paper birch Sword fern Bracken fern	Blackcottonwood Red huckleberry	1, 14
Comments:				

Map Unit:	Description:			Biogeoclimatic Unit:
RSw	Western redcedar - Sword fern, warm aspect			CWHdm
Typical Situation:	Significant slope; middle slope position; southerly or westerly aspect; deep medium - textured soils; richer nutrient regime.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
RSw6C	Mature Forest Coniferous	Western redcedar Western hemlock Douglas-fir Big leaf maple Paper birch Sword fern	Red elderberry Red huckleberry Red alder Maidenhair fern Spiny wood fern	3, 23
Comments:				

Map Unit:	Description:			Biogeoclimatic Unit:
RSwg	Western redcedar - Sword fern, warm aspect, gullyng			CWHdm
Typical Situation:	Significant slope; middle slope position; southerly or westerly aspect; deep medium - textured soils; richer nutrient regime; gullyng occurring.			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
RSwg6sC	Mature Forest Single Storied Coniferous	Western hemlock	Western redcedar Big leaf maple Red huckleberry Oceanspray Red alder Sword fern	9
Comments:				



TEM Code RF – Site Series 07 – Cw - Foamflower

Site Series 07 was identified at plots 16, 22, 24 and at two unverified polygons, totalling an approximate area of 38.79. Variances from the typical RF conditions are described by using modifiers to address the specific conditions of each site. Eight variants were identified that take into account change in aspect, soil depth, and varying structural stages. Dominant and associated vegetation observed within the plots are recorded and presented in the expanded legend. Typical conditions of site series 07 are presented in Photo 4.



Photo 4: Typical conditions of Site Series 07. Photo taken at Plot 24 on November 1, 2011.



TEM Expanded Legend

Map Unit:	Description:			Biogeoclimatic Unit:
RF	Western redcedar – Foamflower			CWHdm
Typical Situation:	Gentle slope; lower slope position; richer nutrient regime, receiving moisture, medium – textured soil			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
RF4B	Pole/Sapling Broadleaf	Big leaf maple Red alder Black cottonwood Western redcedar Sword fern Salmonberry Hardhack	Red huckleberry Sitka mountain ash Vine maple Trailing blackberry Thimbleberry Douglas-fir	16, 22, 24
RF5C	Young Forest Coniferous	Western redcedar Western hemlock Douglas-fir Vine maple Salmonberry Sword fern	Salal Red huckleberry Deer fern Bracken fern	
RF5M	Young Forest Mixed Broadleaf/Coniferous	Western redcedar Western hemlock Douglas-fir Red alder Big leaf maple Vine maple Salmonberry Sword fern	Salal Red huckleberry Deer fern Bracken fern	
Comments:	The invasive species, English ivy was observed at plot 16 at abundant levels. Although all invasives negatively impact native ecosystems, this species is aggressive and severely restricts native ecosystem succession. Other invasive species observed at plot 16 are Japanese knotweed, and English holly. Invasive species are not representative of site series.			

Map Unit:	Description:			Biogeoclimatic Unit:
RFk	Western redcedar – Foamflower, cool aspect			CWHdm
Typical Situation:	Gentle slope; lower slope position; northerly or easterly aspect; richer nutrient regime, receiving moisture, medium – textured soil			
Map Symbol	Structural Stage	Plant Species		Plot Numbers
		Dominants	Associates	
RFk4B	Pole/Sapling Broadleaf	Red alder Big leaf maple Salmonberry Sword fern	Douglas-fir Western redcedar	24
Comments:				



TEM Code CF – Cultivated Field

The TEM code “cultivated field” was the best disturbed site descriptor for the land located under powerlines on the subject property. Approximately 21.44 ha of land exist in this vegetation state. Vegetation exists in a maintained state of structural stage 3b. Species observed include salmonberry, thimbleberry, trailing blackberry, red alder, hardharck, bigleaf maple, western hemlock, western redcedar, willow, pacific ninebark, sword fern and bracken fern (Photo 5).



Photo 5: Typical vegetation found within the CF zone on the subject site. October 27, 2011

TEM Code ES – Exposed Soils

The TEM code “exposed soil” was the best disturbed site descriptor for the land that was historically mined of gravel. Approximately 30.08 ha of land exist in this state. Some shrub vegetation growth is observed on the periphery of the site, although the majority is bare gravel with minimal growth (Photo 6).



Photo 6: Typical conditions of the ES zone on the subject site. November 1, 2011



2.2.2.4 Vegetation

A number of native and non-native plant species were identified on the subject property (Table 7). The diversity of native trees, shrubs, and forbs observed on the property appears healthy. The number of invasive, non-native species ranges from trace amounts in some areas to significant in other areas. Many of these invasives are aggressive and, if unmaintained, will out compete native species and result in a low diversity forest. The implications of a forest of low vegetation diversity, is that wildlife that rely the displaced native plant species will also become displaced from their native range.

Table 7: Vegetation identified on the subject site.

Common Name	Scientific Name
Trees	
Western redcedar	<i>Thuja plicata</i>
Western hemlock	<i>Tsuga heterophylla</i>
Douglas-fir	<i>Pseudotsuga menziesii</i>
Shorepine	<i>Pinus contorta</i> var. <i>contorta</i>
Red alder	<i>Alnus rubra</i>
Black cottonwood	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>
Bigleaf maple	<i>Acer macrophyllum</i>
Paper birch	<i>Betula papyrifera</i>
Shrubs	
Salal	<i>Gaultheria shallon</i>
Copperbush	<i>Elliottia pyroliflora</i>
False azalea	<i>Menziesia ferruginea</i>
Red huckleberry	<i>Vaccinium parviflorum</i>
Alaskan blueberry	<i>Vaccinium alaskense</i>
Black gooseberry	<i>Ribes lacustre</i>
Vine maple	<i>Acer circinatum</i>
Salmonberry	<i>Rubus spectabilis</i>
Oceanspray	<i>Holodiscus discolor</i>
Trailing blackberry	<i>Rubus ursinus</i>
Red elderberry	<i>Sambucus racemosa</i> ssp. <i>pubens</i>
Nootka rose	<i>Rosa nutkana</i>
Oregon grape	<i>Mahonia aquifolium</i>
Sitka mountain ash	<i>Sorbus sitchensis</i>
Hardhack	<i>Spirea douglasii</i>
Thimbleberry	<i>Rubus parviflorus</i>
Non-native invasive shrubs	
English holly	<i>Ilex aquifolium</i>
Japanese knotweed	<i>Fallopia japonica</i>
English Ivy	<i>Hedera helix</i>
Himalayan blackberry	<i>Rubus armeniacus</i>
Periwinkle	<i>Vinca major</i>
Forbs	
Bunchberry	<i>Cornus canadensis</i>
Swordfern	<i>Polystichum munitum</i>
Lady fern	<i>Athyrium filix-femina</i>
Bracken fern	<i>Pteridium aquilinum</i>
Maidenhair fern	<i>Adiantum pedatum</i>
Spiny wood fern	<i>Dryopteris expansa</i>
Licorice fern	<i>Polypodium glycyrrhiza</i>
Fireweed	<i>Epilobium angustifolium</i>
Bleeding heart	<i>Lamprocapnos spectabilis</i>



2.2.2.4 Rare and Endangered Plant Species and Ecological Communities

Plant and animal species, and ecological communities of concern in British Columbia have a provincial status designation, which is summarized on the B.C. Ministry of Sustainable Resource Management Conservation Data Centre (BC CDC, 2011). This status designation is based on sorting species into groups with similar conservation risks. This system assigns species into Red, Blue, or Yellow status. Below is a brief summary of the system used in designating wildlife in BC and Canada:

- Red listed species are legally designated as Endangered or Threatened under the BC *Wildlife Act*.
 - o Endangered species are facing imminent extirpation or extinction.
 - o Threatened species are likely to become endangered if limiting factors are not reversed.
- Blue listed species are species not immediately threatened, but of concern.
 - o Special concern is due to characteristics that make them particularly sensitive to human activities or natural events.
- Yellow listed species are not at risk and include all those not Red or Blue listed.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada) is a federal advisory committee whose mandate is to create a single, official, scientifically sound, national classification of wildlife species at risk (includes plant species). COSEWIC ranks species on a set of criteria based on the best available information. Based on the ranking recommended by COSEWIC, species may be included on Schedule 1 of the *Species at Risk Act* (SARA) at which point they are protected under this act. This ranking system uses the following terminology:

- Extinct (XX)
- Extirpated (XT)
- Endangered (E)
- Threatened (T)
- Special Concern (SC)
- Not At Risk (NAR)
- Data Deficient (DD)

The tables below include listed (i.e. rare and threatened) species that have the potential to occur on the subject site. This potential is based on broad habitat preferences delineated by forest district and biogeoclimatic zone. Potential occurrences are then designated as unlikely or possible based upon species specific habitat requirements and an on-site assessment of those habitats. Note that a comprehensive evaluation of the study area for each species was not possible due to time constraints, seasonal migration patterns, and the transient nature of some species.

Plant Species

No rare and endangered plant species were identified to occur on the subject site.

Ecological Communities

The term "ecological" is a direct reference to the integration of non-biological features such as soil, landform, climate and disturbance factors. The term "community" reflects the interactions of living organisms (plants, animals, fungi, bacteria, etc.), and the relationships that exist between the living and non-living components of the "community". Currently, the most common ecological communities that are known in BC are based on the Vegetation Classification component of the Ministry of Forests and Range Biogeoclimatic Ecosystem Classification, which focuses on the terrestrial plant associations of BC's native plants.



One blue listed ecological community (Douglas-fir – western hemlock / salal Dry Maritime) exists within the study area Table 8. Large tracts of undisturbed plant communities are considered more ecologically important than disturbed, fragmented or second growth communities. The most significant communities are therefore the oldest and largest tracts of old or mature forest, and any red listed communities.

Table 8: Rare and endangered ecological communities occurring on the site.

Site Series Name Common Name <i>Scientific name</i>	TEM Code	Status	BCG Zone	Polygons	Structural stage
		BC List			
Douglas-fir - western hemlock / salal Dry Maritime <i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> Dry Maritime	DS	Blue	CWHdm/03	2	6
				8	6
				12	6
				19	5

Source: BC Conservation Data Centre, 2011.

2.2.3 Wildlife & Wildlife Habitat

Wildlife or wildlife signs observed during site visits include black bear, black tailed deer (Photo 7), blue heron (Photo 8), and common garter snake. As field surveys were only conducted during one season (i.e., October and November) and was likely out of season for viewing certain species, and that intensive species inventory methods were not used (e.g., trapping, fur traps, bird call identification) a list is compiled noting bird, mammal, amphibian and reptile species that may frequent or inhabit the site. The importance of this table is to elucidate that suitable habitat for many different species is available on site, and that maintenance of vegetated areas can benefit a large array of species. Table 9 lists species that could frequent the subject site based on their distribution and habitat preferences.



Table 9: Wildlife species potentially occurring on the subject site.

Scientific Name	Common Name	Scientific Name	Common Name
Birds			
<i>Anthus rubescens</i>	American Pipit	<i>Junco hyemalis</i>	Dark-eyed Junco
<i>Bombycilla cedrorum</i>	Cedar Waxwing	<i>Loxia curvirostra</i>	Red Crossbill
<i>Bonasa umbellus</i>	Ruffed Grouse	<i>Melospiza melodia</i>	Song Sparrow
<i>Bubo virginianus</i>	Great Horned Owl	<i>Oporornis tolmiei</i>	MacGillivray's Warbler
<i>Buteo jamaicensis</i>	Red-tailed Hawk	<i>Parus rufescens</i>	Chestnut-backed Chickadee
<i>Carduelis pinus</i>	Pine siskin	<i>Passerella iliaca</i>	Fox Sparrow
<i>Carpodacus purpureus</i>	Purple Finch	<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak
<i>Cathartes aura</i>	Turkey vulture	<i>Picoides pubescens</i>	Downy Woodpecker
<i>Catharus guttatus</i>	Hermit thrush	<i>Picoides villosus</i>	Hairy Woodpecker
<i>Catharus ustulatus</i>	Swainson's thrush	<i>Pipilo erythrophthalmus</i>	Spotted Towhee
<i>Certhia americana</i>	Brown creeper	<i>Piranga ludoviciana</i>	Western Tanager
<i>Chordeiles minor</i>	Common nighthawk	<i>Regulus calendula</i>	Ruby-crowned Kinglet
<i>Colaptes auratus</i>	Northern flicker	<i>Regulus satrapa</i>	Golden-crowned Kinglet
<i>Contopus sordidulus</i>	Western wood-pewee	<i>Selasphorus rufus</i>	Rufous Hummingbird
<i>Corvus caurinus</i>	Northwestern Crow	<i>Sitta canadensis</i>	Red-breasted Nuthatch
<i>Corvus corax</i>	Common Raven	<i>Sphyrapicus ruber</i>	Red-breasted Sapsucker
<i>Cyanocitta stelleri</i>	Steller's Jay	<i>Strix varia</i>	Barred Owl
<i>Dendroica petechia</i>	Yellow Warbler	<i>Sturnus vulgaris</i>	European Starling
<i>Dendroica townsendi</i>	Townsend's Warbler	<i>Tachycineta bicolor</i>	Tree Swallow
<i>Dryocopus pileatus</i>	Pileated Woodpecker	<i>Tachycineta thalassina</i>	Violet-green Swallow
<i>Empidonax difficilis</i>	Pacific-slope Flycatcher	<i>Troglodytes troglodytes</i>	Winter Wren
<i>Empidonax hammondi</i>	Hammond's Flycatcher	<i>Turdus migratorius</i>	American Robin
<i>Empidonax traillii</i>	Willow Flycatcher	<i>Vermivora celata</i>	Orange-crowned Warbler
<i>Glaucidium gnoma</i>	Northern Pygmy-Owl	<i>Vireo huttoni</i>	Hutton's Vireo
<i>Haliaeetus leucocephalus</i>	Bald Eagle	<i>Wilsonia pusilla</i>	Wilson's Warbler
<i>Hirundo rustica</i>	Barn Swallow	<i>Zonotrichia leucophrys</i>	White-crowned Sparrow
<i>Ixoreus naevius</i>	Varied Thrush		
Mammals			
<i>Canus latrans</i>	coyote	<i>Odocoileus hemionus columbianus</i>	black-tailed deer
<i>Canus lupus</i>	gray wolf	<i>Peromyscus</i>	mice



<i>Castor canadensis</i>	beaver	<i>Procyon lotor</i>	raccoon
<i>Lynx rufus</i>	bobcat	<i>Puma concolor</i>	cougar
<i>Martes americanus</i>	marten	<i>Spilogale gracilis</i>	spotted skunk
<i>Microtus</i> spp.	voles	<i>Tamiasciurus</i> spp.	squirrels
<i>Mustela erminea</i>	short-tailed weasel	<i>Ursus americanus</i>	black bear
<i>Mustela vison</i>	mink	<i>Vulpes vulpes</i>	red fox
<i>Myotis</i> spp.	bats		
Amphibians			
<i>Ascaphus truei</i>	coastal tailed frog	<i>Hyla regilla</i>	Pacific tree frog
<i>Ambystoma gracile</i>	northwestern salamander	<i>Psedacris triseriata</i>	chorus frog
<i>Ambystoma macrodactylum</i>	long-toed salamander	<i>Rana aurora</i>	red-legged frog
<i>Bufo boreas</i>	western toad	<i>Taricha granulose</i>	rough-skinned newt
Reptiles			
<i>Thamnophis sirtalis</i>	common garter snake	<i>Thamnophis ordinoides</i>	northwestern garter snake
<i>Thamnophis elegans</i>	western terrestrial garter snake		

2.2.3.1 Rare and Endangered Wildlife Species

Rare and endangered wildlife species are provided the same provincial and federal status as rare and endangered plants described in section 2.2.2.4. Rare or endangered species that have the potential to occur on the subject site are presented in Table 10. Potential occurrence is based on broad habitat preferences delineated by forest district and biogeoclimatic zone that are then designated as unlikely or possible based upon species specific habitat requirements and an on-site assessment of those habitats. Note that a comprehensive evaluation of the study area for each species was not possible due to time constraints, seasonal migration patterns, and the transient nature of some species.

Ten bird species, four mammals, three amphibians and three invertebrates are identified by the BC CDC Ecosystem Explorer as occurring in the CWHdm biogeoclimatic zone within the Squamish Lillooet Regional District. Two species are confirmed to occur on the subject site, five possibly occur and 13 are unlikely to occur. Of the two confirmed species, the great blue heron occurs as a transient (i.e., passing through or feeding at the site) but very unlikely as a breeding resident as heron rookeries are relatively obvious to observe. The coastal tailed frog is the second confirmed species to occur on the subject site at Daisy Creek. Tailed frogs live in steep mountain streams and in adjacent riparian forests, which are protected by the Riparian Areas Regulation.



Table 10: Rare and endangered wildlife species potentially occurring in the study area.

Common Name <i>Scientific name</i>	Status		Habitat Requirements	Potential Occurrence	Comment
	BC List	COSEWIC			
Birds					
Band-tailed pigeon <i>Patagioenas fasciata</i>	Blue	Special Concern ¹	Coniferous and mixed deciduous lowland forests. Closest known occurrence is the Squamish area.*	Possible	May not be impacted as occurs in closed canopy forests near edges
Barn swallow <i>Hirundo rustica</i>	Blue	Threatened	Open areas, fields, and ponds with vertical nesting habitat, especially buildings. Closest known occurrence is the Squamish area.*	Unlikely due to lack of open field habitat within study area	
Great blue heron <i>Ardea herodias fannini</i>	Blue	Special Concern ¹	Aquatic areas <0.5 m deep, fish bearing streams and rivers, undisturbed nesting in tall trees.	Unlikely resident due to ephemeral nature of Daisy and Thistle Creek but confirmed as a transient	
Green heron <i>Butorides virescens</i>	Blue	n/a	Aquatic areas especially slow moving, shallow waters with good riparian cover. Nearest sighting Garibaldi Springs.	Unlikely as a resident as no large tracks of slow moving water found onsite but possible as a transient	
Marbled murrelet <i>Brachyramphus marmoratus</i>	Blue	Threatened ¹	Coastal areas within 2 km of shore, occasionally on rivers and lakes within 20 km of the ocean in old growth forest. Closest known occurrence is Brittain River.	Unlikely	
Northern Goshawk <i>Accipiter gentilis laingi</i>	Red	Threatened ¹	Coastal forests of BC, especially central and northern coastal islands.	Unlikely, distribution likely restricted to Vancouver Island, Queen Charlotte Islands and central and northern coast	



Common Name <i>Scientific name</i>	Status		Habitat Requirements	Potential Occurrence	Comment
	BC List	COSEWIC			
Spotted owl <i>Strix occidentalis</i>	Red	Endangered ¹	Old growth, dense, multi-layer canopy coniferous forest with a range of snags and nesting hollows available.	Unlikely	Spotted owl surveys were conducted in 2006, and 2007 as part of the highway upgrades. No spotted owls were detected (Cascade, 2006 & 2007a).
Olive-sided flycatcher <i>Contopus cooperi</i>	Blue	Threatened ¹	Mixed coniferous-deciduous forest with old growth snags along forest edges. Closest known occurrence is the Squamish area.	Possible	
Peregrine falcon <i>Falco peregrinus anatum</i>	Red	Special Concern (Threatened ¹)	Cliff edges near water, interior rivers and wetlands. Closest known occurrence is the Stawamus Chief Provincial Park	Unlikely	Minimal nesting habitat exists on site. Individuals may pass through the area although breeding is unlikely.
Western screech-owl <i>Megascops kennicottii kennicottii</i>	Blue	Special Concern ¹	Lower elevations in coniferous or mixed forests that are often associated with water. Closest known occurrence is the Squamish area.	Unlikely as this sub species is generally confined to Vancouver Island	Further investigation needed to ascertain if this subspecies occurs in the area.
Mammals					
Fisher <i>Martes pennanti</i>	Blue	n/a	Low to mid-elevation large tracts (>100 ha) dense forests <2500 m in elevation.	Unlikely	
Grizzly bear <i>Ursus arctos</i>	Blue	Special Concern	Non-forested or partially forested sites with a wide range of foraging opportunities and habitats.	Unlikely	Closest sighting at Squamish townsite in 2007



Common Name <i>Scientific name</i>	Status		Habitat Requirements	Potential Occurrence	Comment
	BC List	COSEWIC			
Pacific water shrew <i>Sorex bendirii</i>	Red	Endangered ¹	Riparian or marshy habitats below 850 m in coniferous / mixed forests.	Unlikely	
Wolverine <i>Gulo gulo luscus</i>	Blue	Special Concern	A range of habitat types from valley bottoms to alpine meadows, strongly associated with the presence of large ungulate prey.	Unlikely, potential habitat is rated as low, and may be extirpated from the lower mainland	
Amphibians					
Coastal tailed frog <i>Ascaphus truei</i>	Blue	Special Concern ¹	Clear, cold swift-moving mountain streams with coarse substrates in older forest sites.	Confirmed Daisy Creek, Likely Thistle Creek	
Northern red-legged frog <i>Rana aurora</i>	Blue	Special Concern ¹	Wetlands, pools, and riparian areas of upland forests.	Possible	
Western toad <i>Bufo boreas</i>	Blue	Special Concern ¹	Wide range of upland forested habitat and aquatic (ponds, lakes, slow streams) habitat for breeding.	Possible	
Invertebrates					
Dun Skipper <i>Euphyes vestris</i>	Blue	Threatened ¹	Known to use low moist spots in fields, meadows, right of ways, etc. Closest known occurrence is Burns Bog, Delta, BC.	Unlikely	
Propertius duskywing <i>Erynnis propertius</i>	Blue	n/a	Open Garry oak or mixed woodlands with associated food plants. Closest known occurrences are the Gulf Islands.	Unlikely	
Vivid dancer <i>Argia vivida</i>	Red	n/a	Spring fed stream or pools.	Unlikely	

Source: BC Conservation Data Centre, 2011

1. Rankings included in Schedule 1 of SARA.



Photo 7: Black-tailed deer scat indicates presence on the subject site, October 25, 2011.



Photo 8: Great Blue Heron observed on the old wharf pilings in Howe Sound approximately 10 m offshore from South Britannia Beach, November 4, 2011.



2.3 Aquatic Environment

2.3.1 Thistle Creek

Thistle Creek (Watershed Code: 900-086900) flows north-westerly from the steep slopes characterizing the eastern half of the property, to discharge into Howe Sound approximately 490 m north of Minaty Bay (Map 3). Thistle Creek was divided into three reaches based on stream gradient and fish presence. Reach 1 spans from the discharge culvert at Howe Sound to the first bridge crossing, reach 2 extends from the bridge crossing to the water falls, and reach 3 extends upslope from the top of the waterfalls.

Reach 1 is approximately 343 m in length, extending from Howe Sound to the first access road bridge (Map 3). The channel is constructed and in the past was regularly excavated of gravels (pers. comm. Tony Mahood, MBD Construction Services Ltd. October 20, 2011). The result is a homogeneous riffle lacking any significant pools, cascades, woody debris or meanders (Photo 9). This stretch of creek is relatively flat with an average stream gradient of 1.5 %, average channel width of 6.1 m and average wetted width of 3.1 m. Flow stage was low during the October 20, 2011 stream assessment, with an average water depth of 0.17 m, and an average bank-full depth of 0.54 m. Temperature was measured at 10°C, and the water turbidity was noted as clear. Bed material was dominated by gravel with cobbles being subdominant. D95 in this reach was 25 cm, with a D of 25 cm as well. Trace amounts of cover were present as small woody debris (SWD), large woody debris (LDW), and overstream vegetation. The stream banks are sloping consisting of a substrate dominated by fines and gravels. Riparian vegetation was a young deciduous forest with a crown closure of 21-40%.

Cascade Environmental personnel found both salmon (coho) (*Oncorhynchus kisutch*) and trout (rainbow and cutthroat) (*O. mykiss* and *O. clarki*, respectively) in reach 1 during fish salvages for the recent upgrade of Highway 99 in August 2007. In addition as part of this field assessment, rainbow trout were caught in the wetlands that are connected to Thistle Creek (see section 2.3.4), indicating that the Thistle Creek system still supports fish. Although presence of coastal tailed-frogs is not confirmed in Thistle Creek, the stream is considered to support tailed frog habitat and tailed frogs are confirmed to occur in the nearby Daisy Creek.

Reach 2 is approximately 353 m in length and extends from the access road bridge to the waterfalls at the upstream reach break (Map 3). This reach is more complex than reach 1 supporting some cascades, pools, and woody debris although still appears to be an altered stream (Photo 10). This stretch of creek is steeper with an average stream gradient of 5.7 %, average channel width of 6.0 m and average wetted width of 2.7 m measured on October 20, 2011. Flow stage at that time was low with an average water depth of 0.2 m. The average bank-full depth was 0.82 m. Temperature was measured at 10°C, and the water turbidity was noted as clear. Bed material was dominated by cobble with boulders being subdominant. D95 in this reach was 75 cm, with a D of 40 cm. Abundant cover existed in the form of LWD, boulders and overstream vegetation. The stream banks are sloped consisting of a substrate dominated by fines and gravels. Riparian vegetation was a young deciduous forest with a crown closure of 21-40%. Instream woody debris and stream complexity increased towards the waterfalls, and the forest changed to a coniferous dominated stand.

As no barriers to fish passage exist between or within fish bearing reach 1 and 2, reach 2 is considered fish bearing up to the waterfalls at the upstream reach break.



Photo 9: Reach 1 view upstream from the reach midpoint. October 20, 2011.



Photo 10: Reach 2 of Thistle Creek supports a steeper gradient and greater instream complexity than reach 1 characteristics. October 20, 2011.

Reach 3 extends approximately 689 m from the waterfalls to the property boundary (Map 3; Photo 11 and 12). The reach is considered non fish bearing as the waterfalls are impassable to fish and Thistle Creek is not fed by an upstream lake. Six minnow traps were set in Reach 3 overnight October 26, 2011. No fish were caught after a soak time of 24 hours. Upstream of the falls, this reach has an average stream gradient of 5.7 %, average channel width of 6.0 m and average wetted width of 2.7 m. Thistle Creek flows into an area of alluvial fan as the creek flows off of the steep upper slopes and before reaching the waterfalls (Thurber, 2011). Flow stage was low on November 4, 2011, with an average water depth of 0.2 m, and an average bank-full depth of 0.82 m. Temperature was measured at 4°C, and the water turbidity was noted as clear. Bed material was dominated by cobble with boulders being subdominant. D95 in this reach was 75 cm, with a D of 40 cm. Abundant cover existed in the form of LWD, boulders and over-stream vegetation. The stream banks are sloped consisting of a substrate dominated by fines and gravels. Riparian vegetation was a young deciduous forest with a crown closure of 21-40%.



Photo 11: Thistle Creek waterfalls mark the division between reach 2 and 3. October 20, 2011



Photo 12: View of Thistle Creek reach 3 facing downstream. October 26, 2011

2.3.2 Daisy Creek

Daisy Creek (Watershed Code: 900-086800) roughly flows parallel to Thistle Creek to discharge into Howe Sound approximately 210 m north of Minaty Bay (Map 3). Daisy Creek was divided into four reaches based on stream gradient, fish presence and stream morphology. Reach 1 extends from the discharge culvert at Howe Sound approximately 500 m upstream, reach 2 begins approximately 90 m downstream of the highway and extends to the water falls located just above the highway, reach 3 extends from the top of the waterfalls approximately 100 m upstream to a bedrock formed waterfall, and reach 4 extends from the bedrock waterfall approximately 375 m upstream.

Reach 1 extends approximately 500 m from Howe Sound (Map 3). The reach has similar morphology to that of reach 1 of Thistle Creek although it supports a slightly higher level of complexity with a slightly larger range in substrate size, more woody debris in the channel and a slightly steeper gradient of 3.5% (Photo 13). The average channel width was 5.5 m and the average wetted width was 3.4 m measured during the stream assessment of October 26, 2011. Flow stage was low during the stream assessment with an average water depth of 0.18 m, and an average bank-full depth of 0.66 m. Water turbidity was noted as clear. Bed material was dominated by gravel with cobbles being subdominant. D95 in this reach was 34 cm, with a D of 43 cm. Trace amounts of cover were present as LWD, and boulders. The stream banks are vertical and consisting of fines, gravel and cobbles. Riparian vegetation was a young deciduous forest with a crown closure of 21-40%.

Cascade Environmental personnel found cutthroat trout and tailed frog inhabiting reach 1 during salvage efforts conducted in August 2008 (Cascade, 2008). The Ministry of Environment Fisheries Information Summary System (FISS) indicates Daisy Creek to supports salmon (species not



specified) and threespine stickleback, although these species were not caught during the recent fish sampling.

Reach 2 is approximately 256 m in length extending from reach 1 to the bottom of the waterfalls located upstream of Highway 99, and is characterized as cascade-pool morphology, containing more functional woody debris than reach 1 (Photo 14; Map 3). This stretch of creek is steeper with an average stream gradient of 21 %, average channel width of 8.4 m and average wetted width of 3.7 m. Flow stage is low with an average water depth of 0.2 m, and an average bank-full depth of 0.7 m. Water turbidity was noted as clear, and bed material was dominated by boulder with cobble being subdominant. D95 in this reach was 58 cm, with a D of 80 cm. Instream cover exists in the form of LWD and boulders. The stream banks are vertical consisting of a substrate dominated by boulders. Riparian vegetation is a young deciduous forest with a crown closure of 21-40%.

Cutthroat trout and tailed frog were also found in reach 2, during salvage efforts conducted in August 2008 (Cascade, 2008). The waterfalls located upstream of Highway 99, the upstream reach break) is the extent of fish passage in Daisy Creek. The waterfalls were formed in 2007 as part of the debris barrier construction, as part of the Highway 99 upgrade project, effectively prevents upstream fish migration from reach 2 to reach 3. No barriers to tailed frogs exist in the Daisy Creek system, indicating that tailed frogs are likely present throughout the stream.



Photo 13: View upstream within reach 1 of Daisy Creek. October 26, 2011.



Photo 14: View upstream from the start of reach 2, Daisy Creek. October 26, 2011.

Reach 3 extends approximately 100 m from the top of the waterfalls located upstream of Highway 99 to a bedrock controlled waterfall marking the upstream reach limit (Photo 15; Map 3). The waterfalls located upstream of the highway, the downstream reach break, were created in 2007 during the construction of the debris basin, which caused the reach to become impassable to upstream fish movements. A large cutthroat trout (28 cm) was caught in September 2007 approximately 80 m upstream of the constructed falls (Photo 16; Cascade, 2007b). The reach was surveyed again for fish in 2008 (Cascade, 2008) and no fish were caught. This reach is also considered to contain tailed frog, as this species has been found in both upstream and downstream reaches.

The reach is cascade-pool morphology with significant amounts of woody debris and coarse debris accumulation (Photo 17). The channel upstream of the waterfalls is relatively mobile and prone to debris flows. A debris basin was built at the toe of the waterfalls during the upgrade of Highway 99. Thurber Engineering assessed the creek in 1997 to have a moderately high



probability of producing a debris flow event with a magnitude of 17,500 m³ (Pers. comm. Dave Smith, Thurber Engineering, November 25, 2011).

The reach is steep with an average stream gradient of 23 %, average channel width of 7.7 m and an average wetted width of 4.8 m. Flow stage is low, temperature was measured at 5.5°C, and the water turbidity was noted as clear. Bed material was dominated by boulders with cobbles being subdominant. D95 in this reach was 55 cm, with a D of 65 cm. Medium amounts of cover existed in the form of LWD and over-stream vegetation, with trace amounts of undercut banks. The stream banks are sloped consisting of a substrate dominated by cobbles and boulders. Riparian vegetation was a young mixed forest with a crown closure of 1-20%.



Photo 15: Daisy Creek waterfalls. The falls are a barrier to fish passage and mark the division between reach 2 and 3. November 4, 2011.



Photo 16: Cascade personnel caught a large (28 cm) cutthroat trout in 2007 approximately 80 m upstream of the waterfalls in Reach 3. September 17, 2007.



Photo 17: View downstream in reach 3, Daisy Creek, November 4, 2011.



Reach 4 extends from the bedrock falls (Photo 18) approximately 375 m upstream. The downstream bedrock falls is comprised of multiple steps with an overall gradient of 30% over a length of 30 m. This bedrock chute constitutes a barrier to fish passage. Stream morphology of the reach is step pool with frequently exposed bedrock and log jams forming drops up to 2.5 m in height, all of which constitute barriers to fish passage (Photo 19). Additionally a slot canyon of approximately 50 m in length exists about 100 m into the reach and presents a substantial barrier to fish passage. Average channel width was 10.2 m with an average wetted width of 3.4 m on April 24, 2008. Gradient averaged 18.5%. Stream substrate is dominated by boulders with cobbles and gravel sub-dominant. Abundant cover is provided by large woody debris including log jams, boulders, deep pools, and moderate amounts of small woody debris and over-stream vegetation. One tailed frog tadpole was captured in this reach incidental to the electrofishing effort; however, no fish were captured by either electrofishing or G-trapping (Cascade, 2008). The fish survey was not conducted beyond the end of this reach as no fish were detected in this reach, nor within reach 3 during the April 2008 sampling period.



Photo 18: View of the bedrock waterfalls marking the break between reach 3 and 4 of Daisy Creek. Photo taken facing upstream. April 24, 2008.



Photo 19: Reach 4 has numerous log/boulder jams greater than 2 m in height. April 24, 2008.



2.3.3 Unnamed Drainages

Drainage 1 - 1st Tributary to Thistle Creek

This tributary (aka Gravel Creek) drains into reach 1 of Thistle Creek, immediately upstream of Highway 99. The tributary drains the lands to the north of Thistle Creek flows through the gravel pit. This tributary can be divided into three reaches based on the level of disturbance and differences in channel morphology. Reach 1 consists of a series of excavated pools connected by ditches to the confluence with Thistle Creek (Photo 20). This reach is described in more detail in the wetland section below (Section 2.3.4). The second reach consists of a channelized stream (i.e. ditch) that directs water from the hillside across the low gradient historic gravel pit into the ponds (Photo 21). Riparian vegetation along this reach is sparse and where vegetation exists, it is limited to pioneering species. The third reach is steep and extends up the hillside to the headwaters of the drainage. Reach 3 flows perpendicular and under two roads that follow the contour lines. As no significant roadside ditching was observed, the alignment of reach 3 is considered to be relatively undisturbed. As this section of drainage 1 flows through the hydro right-of-way, and across two roads, the riparian vegetation is generally low level shrubs consistent with those land uses (Photo 22). Further up the slope riparian vegetation changes to coniferous forest at the drainage headwaters. Fish presence in reach 1 was confirmed during this assessment (See section 2.3.4), and as no barriers to fish passage exist between reach 1 and 2, reach 2 is also considered fish bearing. Due to the steep gradients observed in reach 3, this reach is not considered fish habitat.



Photo 20: View facing south of the wetland pool system; 1st Tributary to Thistle Creek, Reach 1. November 15, 2011



Photo 21: View facing downstream of the ditch flowing into the wetland pool system, 1st tributary to Thistle Creek, Reach 2. November 15, 2011



Photo 22: Maintained shrub riparian vegetation of reach 3. October 31, 2011.

Drainage 2 - 2nd Tributary to Thistle Creek

This tributary drains into Thistle Creek in Reach 2. The tributary is small with a channel width of 2.8 m and a wetted width of 1.4 measured on October 20, 2011. The average stream gradient was 19 % with dominant substrate of gravel and cobbles being subdominant. Riparian vegetation is a deciduous young forest (Photo 23). Although drainage 2 is small, no barriers to fish passage were observed and the stream gradient does not preclude fish presence. Therefore, drainage 3 is considered fish habitat.

Drainage 3

This tributary (aka Minaty Bay Creek) flows approximately parallel to Daisy Creek and flows into Minaty Bay (Map 3). The drainage is small with an approximate wetted width of 1 m, and flows from a culvert that drains lands upslope of Highway 99 (Photo 24). Stream substrate is gravel with a mix of young deciduous and coniferous riparian vegetation. Although stream gradient is not great enough to preclude fish presence, the small size of the drainage does not present quality fish habitat. For this reason, this drainage is not likely fish habitat, although an assessment for fish presence is recommended.



Photo 23: View upstream of the 2nd tributary to Thistle Creek. October 20, 2011.



Photo 24: View upstream of drainage 3. Photo taken approximately 100 m upstream of the railroad crossing. November 1, 2011.

Drainage 4

This tributary drains into Daisy Creek in Reach 4. The average channel width is 4.2 m with a wetted width of 3.0 measured on October 25, 2011. The drainage is very steep with an average gradient of 48 %. Dominant substrate is gravel with boulders being subdominant. Riparian vegetation is a young mixed forest (Photo 25). Due to the steep gradient of the stream, this drainage is not considered fish habitat.

Drainage 5

This drainage is very small and becomes subsurface approximately 50 m upstream of the culvert under Highway 99. The channel width was 2.5 m, wetted width was 1 m, and residual pool depth was 0.05 m measured on November 1, 2011. The stream gradient was 15 % and supported gravel substrate. Riparian vegetation is young deciduous forest. Based on the shallow depth of the drainage and the subsurface nature of the creek, the drainage is not considered fish habitat.



Photo 25: View upstream in drainage 4. Photo taken approximately 260 m upstream from the confluence with Daisy Creek. October 25, 2011.



Photo 26: View of drainage 5 just upstream of the highway crossing culvert. Photo taken facing downstream.

Drainage 6

This tributary drains the steep slopes bordering the Furry Creek Forest Service Road at the southern end of the property. The drainage was partially subsurface flowing under large boulders (Photo 27). The drainage is small with a channel width of 3.5 m and a wetted width of 1.7 m measured on October 25, 2011. The average gradient was 29 % with dominant substrate of boulder and gravel subdominant. Riparian vegetation is mature mixed forest. Due to the steep gradient and the morphology of the drainage (i.e., partially subsurface), the drainage is not considered fish habitat.

Drainage 7

This tributary drains the southernmost portion of the property. The average channel width is 7.0 m with a wetted width of 4.4 measured on November 1, 2011. The drainage is steep with an average gradient of 33 %. Dominant substrate is cobble with lesser amounts of gravel (Photo 28). The drainage flows through a young coniferous forest. Due to the steep gradient of the drainage, this drainage is not considered fish habitat.



Photo 27: Drainage 6 is small and partially flows subsurface. The amount of surface flow is shown relative to a boot. Photo taken approximately 550 m upstream of Hwy 99. October 25, 2011.



Photo 28: View of drainage 7 facing upstream. Photo taken upstream of the confluence with drainage 6. November 1, 2011.

2.3.4 Wetlands

A significant area of permanent pooled surface water has gathered on the south eastern border of the historic gravel pit area (Photo 20). The pool system is part of drainage 1 - the 1st Tributary to Thistle Creek, as described above. The system consists of two pools with associated wetlands that vary in depth from approximately 0.5 to 3 m that is joined by a ditch and then discharge to Thistle Creek by a ditch and culvert. The entire system from the water input to the outflow is



constructed in what appears to be a haphazard fashion and not designed for fisheries interests. Rainbow trout were caught in the pool closest to Thistle Creek causing the low gradient pool/ ditch system to be considered fish habitat due to its connectivity and lack of fish barriers. Although water is observed flowing into and out of the pool system, water in the pools and connecting ditch circulates at such a low rate that flow cannot be distinguished. Due to the low flow, substrate in the pools and connecting ditch is very fine with a layer of decomposing leaf litter. Water clarity was transparent allowing a clear view of the pool bottom. Riparian vegetation surrounding the pools varies from sedge at the eastern pool boundary to shrub and a mixed forest on to the west.

2.3.5 Foreshore Assessment (intertidal zone)

The foreshore assessment was conducted on November 4 between 08:30 and 11:00. The assessment was conducted at the lowest tide available during the study period. A lower tide was desirable but did not occur during daylight hours within the field period. The low tide on November 4 was 2.1 m (6.70 ft) at 07:57 according to the Canadian Hydrographic Service (DFO, 2011).

The South Britannia Beach foreshore is divided into four shorezone units: shorezone unit A extends approximately 419 m south from the northern property boundary, shorezone unit B is approximately 357 m in length and extends to the northern side of the Thistle Creek outlet, shorezone unit C is approximately 643 m in length and extends from Thistle Creek to the south end of Minaty Beach, and shorezone unit D extends approximately 430 from the south end of Minaty beach to the southern property boundary (Map 3).

The shoreline in shorezone unit A has experienced the highest level of disturbance (Photo 29-34). It is closest to Britannia Creek and the historic tailing disposal site, and was the site of a wharf used during the operation of the aggregates mine that existed at South Britannia Beach. The wharf presence is evidenced by old creosote-treated wooden pilings along the foreshore. Substrate in this section is dominated by imported riprap rock used for bank/shoreline retention, in addition to wooden planks and logs. Soil erosion upslope from the high intertidal zone is characteristic along this unit, as well as the presence of concrete and trash. Intertidal biodiversity is very low, supporting rockweed (*Fucus gardneri*), and acorn barnacle (*Balanus spp.*), without much sign of any other species.



Photo 29: View of shorezone unit A from the northern property boundary facing south. Photo taken at 08:31, November 4, 2011.



Photo 30: View of the old wharf facing south within shorezone unit A, November 4, 2011.



Photo 31: Eroded soil above the intertidal zone, shorezone unit A, November 4, 2011.



Photo 32: Anthropogenic alterations to the foreshore in shorezone unit A, November 4, 2011.

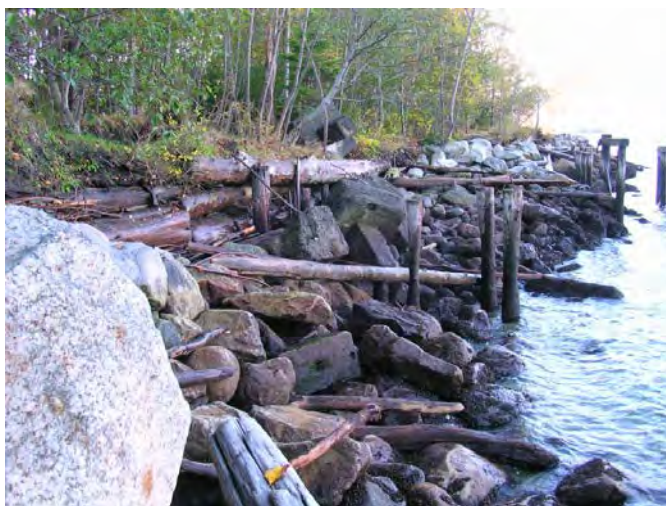


Photo 33: Old pilings and wood retaining walls within shorezone unit A, November 4, 2011.



Photo 34: View of the old wharf pilings facing south, shorezone unit A, November 4, 2011.

Shorezone unit B is also disturbed although to a lesser degree. Substrate is composed of angular cobble sized rock and is likely imported. The substrate is smaller than the boulders in shorezone unit A. A large number of logs have floated into a small bay creating a physically complex intertidal zone (Photo 35). Soil erosion is significant above the high intertidal zone and has resulted in near vertical or undercut banks (Photo 36). Rockweed was the only algae species observed within this unit. Acorn barnacles and a dead Dungeness crab (*Cancer magister*) were observed in this unit.

Numerous concrete blocks, likely old abutments for a structure, were observed on the shore. Although not natural, the concrete surface provides attachment opportunities for sessile organisms. That said there is no shortage of rock in this area for attachment opportunities.



Photo 35: View facing south from the northern boundary of shorezone unit B, November 4, 2011.



Photo 36: View facing upstream at the southern boundary of shorezone unit B. Bank erosion persists through this shorezone unit, November 4, 2011.

The inflow of Thistle Creek marks the northern limit of shorezone unit C (Photo 37). This shorezone unit is characterized as having native gravel shore substrate and extends further into Howe Sound than shorezone units A and B. Healthy coniferous vegetation grows at the boundary between the intertidal and uplands zones in addition to woody debris dispersed on the upper intertidal (Photo 38). Daisy Creek flows into the sound immediately north of Minaty Bay. An old concrete boat launch exists at Minaty Bay (Photo 39). A bedrock outcrop interrupts the gravel shoreline and creates the pebble beach of Minaty Bay (Photo 40).



Photo 37: Thistle Creek marks the northern boundary of shorezone unit C along the foreshore, November 4, 2011.



Photo 38: Shoreline of shorezone unit C, November 4, 2011.



Photo 39: Concrete boat launch into Minaty Bay, November 4, 2011.



Photo 40: Minaty Bay is a pebble beach contained by rocky outcrops of both the north and southern beach boundaries, November 4, 2011.

Shorezone unit D spans from the south side of Minaty Beach to the southern property boundary (Photo 41; Map 3). The shorezone unit is characterized by forested bedrock cliffs that rise sharply out of the ocean with rocky benches and small tide pools at the water's edge. Coniferous forest begins at the high tide level and extends up the rocky cliff. Shorezone unit D was not inventoried due to the difficult access along the rocky cliffs.



Photo 41: View of shorezone unit D facing south from Minaty Bay, November 4, 2011.

2.3.6 Marine Environment

Biophysical results of the marine environment were collected by Balanced Environmental Services Inc. on December 2, 2011 by a team of biologist divers. Tides on December 2, 2011 were not exceptionally low, ranging from 2.0 m at 03:59 to 4.7 m at 11:20, and 2.4 m at 18:34 to 3.2 m at 23:47 (DFO, 2011). All species observed during the TOAD Sled Survey and the SCUBA dives are compiled in Table 11.



Area 1 – Britannia Bay

The Britannia Bay shoreline consists primarily of a riprap armoured slope with an upper elevation matching that of Highway 99 and a lower elevation that varied, but generally extended below the low water line (0 m chart datum) (Photo 42). Below the toe of the riprap slope, the seabed consisted primarily of mud. The north end side of the bay was covered by a mix of woody debris, detritus, leaf litter and other organic matter overlying mud and fine sediments (Photo 43). In the shallow subtidal this “muddy” zone transitions to a more granular pebble and cobble seabed towards the south end of the bay (drawing 5360-D-01.2). Mud substrate was consistently observed throughout the subtidal zone, along the -15m contour (Photo 44). Numerous derelict timber structures including pilings, decking, logs and other anthropogenic materials were observed at the north end of the bay, while timber piling and two sunken fishing vessels were observed at the south end of Britannia Bay (Photo 45).

Biological conditions varied with elevation and substrate type. The intertidal riprap was colonized by biota commonly found within Howe Sound including barnacles (*Balanus glandula*), sea lettuce (*Ulva sp.*), seastars (*Evasterias troschelii*) and rockweed (*Fucus sp.*). Sugar wrack kelp (*Laminaria saccharina*) was observed attached to rocks, boulders, logs and anthropogenic materials near the low water mark. Crabs (*Cancer sp.*), sea stars (*Pycnopodia helianthoides*) and empty cockle clam shells (*Clinocardium nuttallii*) were observed on the mud seabed. The density of most organisms was sparse, especially where woody debris was present. Striped seaperch (*Embiotoca lateralis*) were abundant near the sunken vessels.



Photo 42: Riprap in Area 1 provides recruitment opportunities for algae and invertebrates, December 2, 2011. Photo by Balanced.



Photo 43: Woody debris, algae and sea star (*P. helianthoides*) in Area 1, December 2, 2011. Photo by Balanced.



Photo 44: Crab partially buried in mud substrate in Area 1, December 2, 2011. Photo by Balanced.



Photo 45: Striped seaperch (*E. lateralis*) in the vicinity of a sunken vessel in Area 1, December 2, 2011. Photo by Balanced.

Area 2 – Area between Britannia Bay and Minaty Bay

The segment of shoreline between Britannia Bay and Minaty Bay measures approximately 1 km in length and corresponds to shorezone units B and C (section 2.3.5). The upper intertidal zone shows a considerable amount of erosion on the northern half of this shoreline. Substrate conditions consisted of a mixture of pebble, cobble and boulder within the intertidal and shallow subtidal zones, with patches of sand observed in depressions and areas with a more gradual slope (drawing 5360-D-01.2). The substrate eventually transitions to mud at deeper elevations. Intertidal cobble and boulders were colonized by sessile biota commonly found within Howe Sound including barnacles, mussels (*Mytilus trossulus*), sea lettuce, and rockweed. Sugar wrack kelp was observed along the low water contour at densities as high as 75% coverage where hard substrate (boulder and cobble) was found. Crabs and seastars were observed on mud in the subtidal zone. No clam siphons were observed within the surveyed areas, however, invertebrate holes were observed in the mud substrate located in the middle of the survey area at the -15m contour.

Area 3 – Minaty Bay and Minaty Point

The southern portion of the site located south of Minaty Bay consists primarily of bedrock with steep vertical faces, descending to depths below those that could be observed by the diver (drawing 5360-D-01.2). A light dusting of sand was observed on the more horizontal surfaces. A variety of organisms were observed in this area including anemones (*Urticina* and *Metridium spp.*), green sea urchins (*Strongylocentrotus droebachiensis*), sea stars (*Pisaster ochraceus*, *Evasterias troschellii*, *Dermasterias imbricata*, and *Pycnopodia helianthoides*), tubeworms, sea cucumbers (*Parastichopus californicus*), tunicates, feather stars (*Florometra serratissima*), brittle stars, lingcod (*Ophiodon elongatus*), and chitons (Photo 46-51).

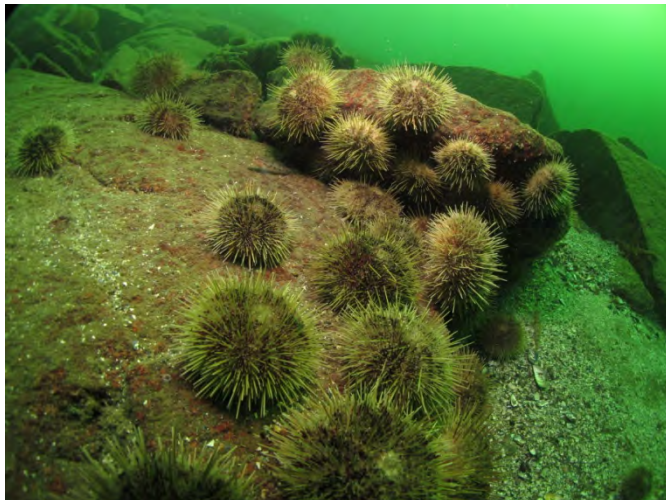


Photo 46: Green sea urchins (*S. droebachiensis*) on rocky substrate in Area 3, December 2, 2011. Photo by Balanced.



Photo 47: Anemone (*Urticina* sp.) in Area 3, December 2, 2011. Photo by Balanced.

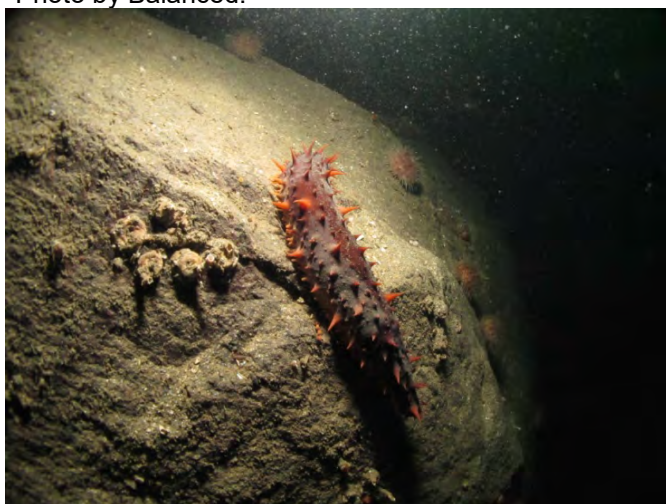


Photo 48: Sea cucumber (*C. californicus*) in Area 3, December 2, 2011. Photo by Balanced.



Photo 49: Sea stars (*P. helianthodes*) and (*D. imbricata*) on bedrock in Area 3, December 2, 2011. Photo by Balanced.



Photo 50: Feather star (*F. serratissima*) in Area 3, December 3, 2011. Photo by Balanced.



Photo 51: Lingcod (*O. elongates*) and plumose anemone (*Metridium sp.*) in Area 3, December 2, 2011. Photo by Balanced.

Table 11: Summary of marine biota observed during the TOAD Sled and SCUBA surveys (data from Balanced).

Common name	Scientific name	Area 1	Area 2	Area 3
Invertebrates				
Anemone	<i>Urticina sp.</i>			X
Anemone	<i>Metridium sp</i>			X
Barnacle	<i>Balanus glandula</i>	X	X	
Brittle star	<i>n/a</i>			X
Chitons	<i>n/a</i>			X
Cockle clam shell	<i>Clinocardium nuttallii</i>	X		
Crab	<i>Cancer sp.</i>	X	X	
Feather star	<i>Florometra serratissima</i>			X
Green sea urchins	<i>Strongylocentrotus droebachiensis</i>			X
Ochre star	<i>Pisaster ochraceus</i>			X
Leather star	<i>Dermasterias imbricata</i>			X
Mottled star	<i>Evasterias troschelii</i>	X		X
Mussel	<i>Mytilus trossulus</i>		X	
Sea star	<i>n/a</i>		X	
Sea cucumber	<i>Parastichopus californicus</i>			X
Sunflower star	<i>Pycnopodia helianthoides</i>	X		X
Tubeworms	<i>n/a</i>			X
Tunicates	<i>n/a</i>			X
Fish				
Striped seaperch	<i>Embiotoca lateralis</i>	X		
Lingcod	<i>Ophiodon elongatus</i>			X
Algae				
Rockweed	<i>Fucus sp.</i>	X	X	
Sugar wrack kelp	<i>Laminaria saccharina</i>	X	X	
Sea lettuce	<i>Ulva sp.</i>	X	X	
Rock crust	<i>Hildenbrandia sp. or Mastocarpus sp.</i>	X		
Total		10	7	14



Photo 1. Typical intertidal riprap at Station 1 colonized by a variety of biota including rockweed, barnacles, and red rock crust (*Hildenbrandia* and/or *Mastocarpus spp.*).

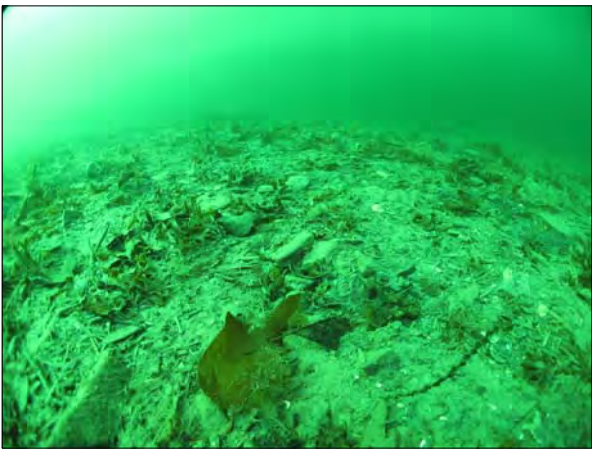


Photo 2. The subtidal zone of Britannia Bay is primarily composed of woody debris and detritus overlaying a mud seabed.



Photo 3. While no clam siphons were observed, evidence of clams (empty cockle shells) were present.



Photo 4. One of two sunken vessels observed in the vicinity of Station 2.



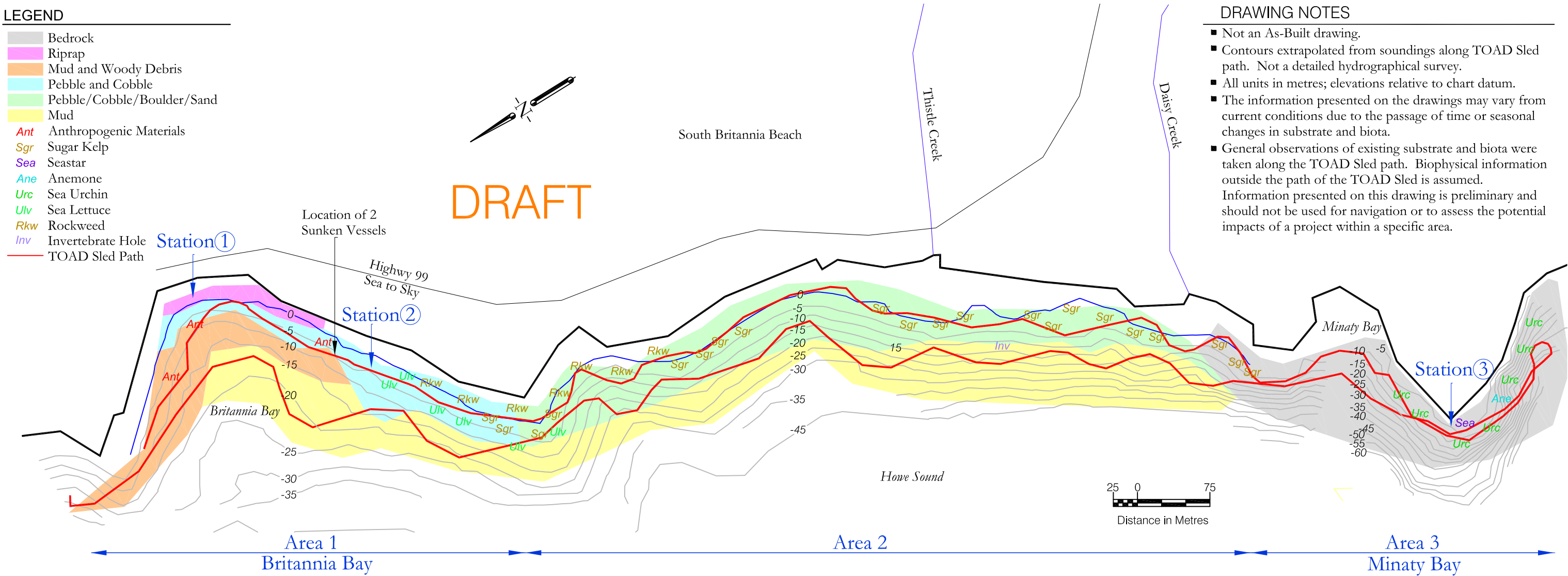
Photo 5. Green sea urchins were abundant on subtidal bedrock at Station 3.

LEGEND

- Bedrock
- Riprap
- Mud and Woody Debris
- Pebble and Cobble
- Pebble/Cobble/Boulder/Sand
- Mud
- Ant Anthropogenic Materials
- Sgr Sugar Kelp
- Sea Seastar
- Ane Anemone
- Urc Sea Urchin
- Ulv Sea Lettuce
- Rkw Rockweed
- Inv Invertebrate Hole
- TOAD Sled Path

DRAWING NOTES

- Not an As-Built drawing.
- Contours extrapolated from soundings along TOAD Sled path. Not a detailed hydrographical survey.
- All units in metres; elevations relative to chart datum.
- The information presented on the drawings may vary from current conditions due to the passage of time or seasonal changes in substrate and biota.
- General observations of existing substrate and biota were taken along the TOAD Sled path. Biophysical information outside the path of the TOAD Sled is assumed. Information presented on this drawing is preliminary and should not be used for navigation or to assess the potential impacts of a project within a specific area.



NOT FOR CONSTRUCTION

		Client 	Author 	Checked by	XIE	PROJECT PRELIMINARY UNDERWATER BIOPHYSICAL SURVEY OF SOUTH BRITANNIA BEACH DEVELOPMENT SHORELINE, BRITANNIA BEACH, BC
				Drawn by	WA	
				Date	Jan 16, 2012	
				Scale	As Shown	
				Inspectors	WA,DC,MT	
Ref. No.	REFERENCE					Paper



2.4 Valued Ecosystem Components

Valued Ecosystem Components (VECs) are components of the environment that have the greatest value and sensitivity to the proposed development. The VECs identified by Cascade are those that enhance ecosystems creating or maintaining suitable habitats for native wildlife species to thrive. VECs are defined by the Canadian Environmental Assessment Agency (CEAA) as:

Any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concern (Hegmann et al., 1999).

Cascade identified six VECs existing on the subject site that are wildlife and wildlife habitat, wildlife corridors, riparian areas, fish and fish habitat, the Howe Sound foreshore, and the Thistle Creek waterfall.

2.4.1 Wildlife and Wildlife Habitat

Wildlife Trees

Wildlife trees include significant standing snags, veteran trees, and trees with broken tops, holes or cavities (Photo 52). These trees are important as perching, foraging, and nesting sites for a variety of birds and mammals. Areas with deeper soils and age class designations of ≥ 6 (i.e. mature and old growth forest) generally contain a greater density of wildlife trees due to the age of the forest. Many wildlife trees were observed on the site including trees with feeding holes and cavities that were suitable for denning or nesting.

Veteran Trees

Old growth trees were not observed on the subject site, although stumps and downed timber from old growth trees were observed. Even though old growth forest stands were not observed on the site veteran Douglas-fir, western redcedar and western hemlock trees of diameters ranging from 70 to 99 cm were recorded with one multi-stemmed western red cedar measuring 286 cm at breast height (DBH).

A comprehensive significant tree survey was not conducted on the subject site due to limited accessibility up very steep slopes and project scope constraints. Some areas within the property show evidence of selective logging where significant sized trees of a certain species were removed from the forest. In these cases, the forest is left in an unnaturally open state with minimal to no understory and little to no woody debris or standing snags. Other areas characteristic of the property support significant downed rotting wood on the forest floor, and dead standing snags.

Coarse Woody Debris

Micro habitats resulting from downed wood decay and nutrient cycling provide a range of life-cycle opportunities for smaller ground-dwelling wildlife (e.g. squirrels, shrews, and voles). Over time woody debris decomposes to produce additional growing material for other plants. This is especially important in areas underlain with bedrock, as is common on the subject site. Many of the terrestrial units contained coarse woody debris in a variety of sizes and decay classes, providing habitat for a range of plant and animal species. Coarse woody debris is prolific throughout the subject area, except in younger structural stage forests and cleared, disturbed sites (Photo 53).



Photo 52: Wildlife tree observed within plot 23. November 1, 2011.



Photo 53: A downed tree is a source of coarse woody debris in Plot 23. November 1, 2011

2.4.2 Wildlife Corridors

Currently the subject site is undeveloped and provides wildlife many travel options for traversing the property. These travel options or travel corridors are important to consider during the planning and design stages of the community. By providing travel corridors for wildlife, human-animal conflicts may be reduced, the natural exchange of individuals between animal populations can be maintained, and the community will have a lower ecological impact on the natural environment.

Cascade identified a few wildlife travel paths during the field surveys of October and November 2011. The travel paths were generally north south oriented, of relatively easy travel terrain (i.e., not straight up or down cliffs), and evidenced by old and new scat of deer and bear.

The first travel path was a low gradient trail located upslope of an overgrown forestry road and downslope of a steep vegetated cliff near plot 7. While the vegetated cliff upslope of the trail restricted travel, a steep bank on the downhill side of the forest road further restricted access creating an apparent pinch-point travel route that followed contour lines in a north south orientation. Other wildlife trails were observed near plot 8, 9 and 11. Although Wildlife trails are not necessarily wildlife corridors, they exhibit wildlife movement through the site. Vegetated wildlife travel options or wildlife corridors are important ecological components to consider during the design and planning stages of the community.



2.4.3 Riparian Areas

A riparian area is the interface (ecotone) between a stream (aquatic ecosystem) and land (terrestrial ecosystem) and is ecologically significant habitat for many reasons. Riparian habitats provide high structural heterogeneity and plant species diversity compared to the relatively uniformity of adjacent forests, resulting in a broad diversity of bird, mammal, and amphibian species. Creek habitats are utilized as drinking and preening areas for wildlife, and breeding areas for frogs and salamanders. In addition, the vegetation along streams act to maintain stream water quality through stabilizing soil, providing shade, leaf litter and insect drop and woody debris to aquatic habitat. Riparian areas also provide connectivity to wildlife corridors and stream access for wildlife.

The subject site supports two named fish bearing creeks, namely Thistle and Daisy Creek, and a number of unnamed drainages. All waterways that flow into fish bearing waters will have associated riparian setbacks as determined by the provincial Riparian Areas Regulation (RAR). The upper reaches of Daisy and Thistle Creeks and the unnamed drainages are not likely fish bearing, but all of the drainages flow into fish bearing waters. Although these streams may not support fish, all of the functions of vegetated riparian setbacks will benefit fish downstream.

The riparian areas of both Daisy and Thistle Creeks extend across the lower elevation portions of the property and are young forest indicating past disturbance (Photo 54). Riparian vegetation in these areas is deciduous trees with shrub layer undergrowth. Although these areas are not pristine, the lower elevation riparian areas of Daisy and Thistle areas provide some of the only low gradient, deciduous habitat available on the property. Deciduous forests provide different inputs to the stream such as increased leaf litter in autumn. The riparian areas of Daisy and Thistle Creeks and the many unnamed drainages located on the steep sloped portion of the property are generally forested by coniferous or mixed stands varying in structural stage from young to mature forest (Photo 55). Riparian habitats in these areas generally have larger woody debris, and larger sized particles to contribute to the stream. Upslope riparian areas are generally less disturbed in recent years (recognizing that the majority of the property was logged in the past 100 years), and are connected to larger tracts of forest.

Although the streams on site generally flow perpendicular to contours, travel options through riparian areas will complement north-south oriented wildlife corridors.



Photo 54: Riparian vegetation characteristic of Reach 1 Thistle Creek. October 20, 2011.



Photo 55: Riparian vegetation characteristic of Reach 3 Daisy Creek. November 4, 2011.



2.4.4 Fish and Fish Habitat

The health of a stream is generally an indicator of the health of the surrounding environment. The lower elevation reaches of Daisy and Thistle Creeks are fish bearing (MOE-FISS, 2011). Thistle Creek supports rainbow, cutthroat trout, sculpins, and coho salmon (Cascade, 2007c) whereas Daisy Creek supports salmon, threespine stickleback, and cutthroat trout (Cascade, 2007b). The aquatic habitats of Thistle and Daisy Creeks are described further in sections 2.3.1., and 2.3.2. Streams inhabited by fish are ecologically important components that are protected by a variety of legislation including *Fisheries Act*, *Water Act*, and the Riparian Areas Regulation.

2.4.5 Howe Sound Foreshore

Intertidal zones are typically very productive and diverse areas supporting a variety of algae, and sessile organisms that in turn create habitat for transient organisms such as fish and invertebrates. The South Britannia Beach foreshore has experienced tremendous impacts over the past century with the presence of the historic mine and associated village. The foreshore was contaminated with toxic levels of metals, disposal of trash and mine tailings, as well as severe foreshore alterations including shoreline armouring and industrial usage. Since the mine closure, a great deal of sediment monitoring has occurred showing that contaminant concentrations are decreasing and that algal and sessile invertebrate organisms are returning. The foreshore assessment of November 4, 2011 showed the dominant species to be rockweed (*Fucus gardneri*), and acorn barnacles (*Balanus spp.*). The presence of inter-tidal sea life indicates that contaminant levels have decreased to levels where more tolerant species can thrive. The foreshore is a valued ecosystem component with significant potential for improvement through shoreline remediation.

2.4.6 Thistle Creek Waterfall

Thistle Creek waterfalls were identified as a valued ecosystem component as it is the only such waterfall on the property (Photo 11). The falling water aerates the stream water, and the higher velocity of water has the capabilities to move woody debris down the system. The cliffs around the falls could provide protected habitat to cliff dwelling bird or mammal species, although this has not been confirmed. In addition to ecological values, the falls are valued for their aesthetics and grandeur.

2.5 Socio-Economic Conditions

2.5.1 Cultural and Heritage Resources

No archeological or heritage features were observed in the study area by the Cascade field crew. Cascade observed rock retaining walls in the forest immediately south east of Minaty Bay that was likely associated with staff residences for Britannia mine personnel (i.e., 20th century). Additionally, waste heaps containing items such as empty metal drums, house hold appliances (e.g., washing machine, stoves), and automobiles were observed in district lots 2001 and 7053 (Photo 56 & 57). Items identified in the waste heaps appeared to be from the 20th century and are likely associated with the community that inhabited the area during the operation of the Britannia mine.

A request to the archaeological branch of the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) was made to ensure that any archaeological sites listed in provincial records as occurring on the subject property are known to the proponent. Hayley Bond, of the archaeological branch of MFLNRO, indicated in an email received December 20, 2011, that provincial records indicate no known archeological sites are recorded within the 231 hectare area of interest (i.e., study boundary). However, provincial archaeological potential mapping indicates that areas along the foreshore (Figure 2) have potential to contain unknown archaeological sites. Additionally, the large size of the development area is reason for the MFLNRO to suspect that unknown archaeological sites potentially exist.



Photo 56: Waste heap in DL 2001 and 7053 containing automobiles and other scrap metal. November 1, 2011



Photo 57: Waste heap in DL 2001 and 7053 containing empty metal drums, household appliances and other scrap metal. November 1, 2011.



Figure 2: Archaeological potential mapping of South Britannia Beach provided by the Archaeological Branch of the MFLNRO upon request for archaeological site information.



2.5.2 Timber Harvesting

Evidence of previous timber harvesting was observed at a few locations at the subject site including springboard notches in larger stumps, relic logging equipment, rusted coiled wire and old wooden bridge likely used to harvest old growth trees in the early 1900s. No harvest activity on or near the property was observed during site visits. Further harvesting of timber at the subject site is not planned, although no official protection is afforded to any areas of the site.

The provincially maintained Furry Creek Forest Service Road exists at the southern border of the property which provides access to higher elevation parts of the property and lands beyond the property boundaries.

2.5.3 Recreation and Tourism

The subject site is privately owned and operated and does not support any public amenities. A well constructed tree house was observed adjacent to Howe Sound on the narrow strip of land between Highway 99 and the ocean (Photo 58). Fire pits were observed near the tree house and at Minaty Bay along with constructed benches indicating that people use these sites for recreation. Minaty Bay is a small, pebble beach with breathtaking views across Howe Sound. Although recreation on the site is limited as the access to the beach is on privately owned property, the beach and surrounding area has immense recreation opportunities.

A hiking trail called “Ty’s Trail” was identified within Lot A of DL 7053 during the site visit. The lands occupied by the trail are not currently owned by the proponent, albeit intended for acquisition.

The subject site is located immediately south of Britannia Beach, home of the Britannia Mining Museum. The museum is designated a British Columbia Historic Landmark and a National Historic Site. The mine, in addition to travellers heading north to Squamish and Whistler, draw regional and international visitors into the area.



Photo 58: Tree house located on the shore adjacent to Reach A. November 4, 2011.

2.5.4 Noise Levels

The subject area experiences relatively low noise levels, with the greatest source being Highway 99.



3.0 Environmental Opportunities and Constraints

This section includes a discussion of the environmental conditions of the site that may pose opportunities and constraints to development. A map indicating these features is presented at the end of this section (Map 4).

3.1 Physical Environment

3.1.1 Climate

The study site experiences a mild climate and while not constraining to development, modest snow removal may be required in the winter and adequate design allowances made for stormwater control. For many residents of the Sea to Sky corridor, the mild climate is the reason that many have settled in this area, which presents a significant opportunity for the development of a community at the subject site.

3.1.2 Geology

The abundance of exposed bedrock within the subject area may pose a constraint to development. Drilling and blasting will likely be required on slopes to create housing densities higher than what the natural topography will allow.

3.1.3 Geomorphology

The subject site is characterized by shallow soils, steep slopes and a relatively flat area at the location of the historic gravel pit. Soil erosion may occur as a result of land clearing. Vegetation should be retained where possible, and effective soil and erosion control methods should be applied to minimize soil loss and to prevent mudslides.

3.1.4 Hydrology

All waterways that flow into fish bearing waters are protected under the provincial Riparian Areas Regulation and subject to a 30 m Riparian Assessment Area. Stream setbacks may present a constraint to development in that resulting SPEA (Streamside Protection and Enhancement Area) must be protected from development. Conversely, the presence of natural waterways can improve the aesthetics of the area and present opportunities for sustainable neighbourhood design.

3.2 Terrestrial Environment

3.2.1 Soils

The soils in the subject area pose no obvious environmental constraint to the proposed development.

3.2.2 Vegetation

The majority of the vegetation on the subject property presents no constraints to development. Although not specifically protected, veteran and wildlife trees should be maintained, where feasible, due to their habitat values described in section 2.4.1.

Vegetation located within riparian areas is protected under the Riparian Areas Regulation. Riparian setbacks are constraining to development, whether vegetated or not.

Although not constraining, vegetation growing on slopes acts to stabilize the slope and hold soils in place, which benefits the environment and serves to protect against material sliding down rock faces into developed areas.



Invasive Plant Management

The presence of non-native, invasive plant species on the subject property can result in decreased biodiversity and ecological integrity by displacing less competitive native plant species. Invasive plant species observed on the site include English holly, Japanese knotweed, English Ivy, Himalayan blackberry, and periwinkle (Table 7). These species are aggressive and thrive in disturbed areas where they quickly get a root-hold before native colonizers, and eventually render the area impossible for a native plant to penetrate. Removal or management of these species is recommended. Removal methods are described in section 4.0.

3.2.2.1 Rare and Endangered Plant Species and Ecological Communities

Rare and Endangered Plant Species

No rare or endangered plant species were identified during site surveys on the subject site.

Rare and Endangered Ecological Communities

One blue listed ecological community (Site Series 03 - Douglas-fir – western hemlock / salal, Dry Maritime BEC Subzone) exists within three polygons in the study area, totalling 226,842 m². Large tracts of undisturbed plant communities are considered more ecologically important than disturbed, fragmented or second growth communities. The most significant communities are therefore the oldest and largest tracts of old or mature forest, and any red listed communities.

Due to disturbances caused by the historic uses of the property (i.e., timber harvesting and gravel mining) the value of the ecological communities identified on the property are decreased.

3.2.3 Wildlife & Wildlife Habitat

Preserving or rehabilitating key ecosystem components, such as Thistle and Daisy Creeks and their associated riparian areas, the pool/ ditch system, and large veteran trees will serve to protect wildlife values and mitigate development impacts.

Although many valued ecosystem components are not afforded legislated protection, provincial and federal acts such as the *BC Water Act*, *Riparian Area Regulation* of the *BC Fish Protection Act*, the *Federal Fisheries Act*, and *BC Wildlife Act* ensure that these ecosystem components are protected from developmental impacts.

Breeding birds are protected as outlined in Section 34 of the *BC Wildlife Act*, which states:

A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys

(a) a bird or its egg,

(b) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl or,

(c) the nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg.

Clearing should occur outside of the typical breeding period of April 1 to July 31 if possible; if not feasible, a nesting bird survey should be completed by a qualified environmental professional prior to any clearing to ensure that no active nests are disturbed. Active nests of all song birds and raptors are legally protected, whereas inactive nests of bald eagle, golden eagle, peregrine falcon, gyrfalcon, osprey and burrowing owl are similarly protected (Demarchi and Bently, 2005). If active/ inactive nests are identified, they must be protected by species-specific vegetation buffers depending on the species of bird that occupies or created the nest.



3.2.3.1 Rare and Endangered Species

The residences of species listed as Threatened or higher on Schedule 1 of the Federal *Species at Risk Act* are protected by Section 33 of the Act, which states:

No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada.

The olive-sided flycatcher (threatened), peregrine falcon (threatened), and band-tailed pigeon (special concern) possibly occur on the subject site. Efforts to avoid damaging suitable habitat during the typical breeding period of April 1 to July 31 should be taken to prevent harm against these species. If clearing is proposed to occur during this period, a breeding bird survey conducted by a Qualified Environmental Professional should precede clearing activities. If either of the Threatened species is observed, appropriate protection measures will be implemented, possibly imposing a constraint to development.

The great blue heron was observed on the site and is thought to be a transient (i.e., does not breed on the property). The heron was observed feeding in the pool system, and therefore pool habitat or similar habitat should be maintained on the site.

The blue listed coastal tailed frog is confirmed to inhabit Daisy Creek and is considered likely to inhabit Thistle Creek as well. In addition occurrence of the northern red-legged frog and the western toad are considered possible. In addition to the protection afforded to aquatic and riparian areas by the Riparian Areas Regulation, the Ministry of Environment outlines species specific wildlife habitat areas (WHA) that should be retained. WHAs for amphibians (red-legged frog, and coastal tailed frog) should include a core area encompassing the wetland/ stream plus a 30 m riparian reserve beyond the high water mark, and a 20 m management zone beyond the core area (Maxcy, 2004; Mallory 2004).

3.3 Aquatic Environment

3.3.1 Thistle and Daisy Creeks, Unnamed Drainages, and Wetlands

The Riparian Areas Regulation (RAR) requires that setbacks be established on waterways that are fish bearing or flow into fish bearing waters. All of the waterbodies on the property are fish bearing or flow into fish bearing waters and are subject to the RAR to maintain and protect fisheries values. In addition to the RAR, these waterways are also subject to the federal *Fisheries Act* and provincial *Water Act*.

An RAR assessment has been conducted (although not currently filed), and the streamside protection and enhancement areas (SPEAs) were calculated for the various drainages on site using the *Riparian Areas Regulation* (RAR) detailed methodology, with the following results:

- Daisy Creek (downstream of Highway 99) - 15.0 m, 21.9 m to South
- Minaty Bay Creek (Drainage 3) - 10.5 m
- Thistle Creek Reach 1 - 16.2 m
- Thistle Creek Reach 2 - 15.0 m
- Gravel Creek (Drainage 1) - 13.2 m
- Wetland 1 and 2 – 15m, 30 m to South
- Pond 1 and 2 – 15 m, 30 m to South

SPEAs for creeks outside the current development area (Minaty Bay northward and from Howe Sound upslope to the electrical transmission powerline) have not been established; a 30 m RAR assessment area should be established along those drainages (as well as the drainages where



the SPEA has been calculated, until those RAR assessments have been filed). No development or clearing of native vegetation can be conducted within the setback areas.

The current proposed development plan (Map 5) calls for preservation of Daisy Creek within a 25 m buffer, which exceeds the recommendation of the RAR. Thistle Creek would also receive a 25 m buffer, which also exceeds the RAR requirements; however, as a portion of the 2nd reach is perched, some remedial engineering works may be required. Any such works would require provincial *Water Act* approval as well as approval or project review under the federal *Fisheries Act*. To conform to those acts, any remedial stream works would likely involve some mitigation/compensatory stream/riparian enhancements.

A 15 m buffer is proposed for Minaty Bay Creek (aka Drainage 3), which is greater than the 10.5 m SPEA as determined by the detailed RAR assessment. The location of this creek needs to be surveyed to accurately determine its location. Depending on that survey, the creek may be relocated as part of the development. As with Thistle creek any works in and about the creek would be subject to the noted federal and provincial legislation.

The proposed development plan calls for relocation of Gravel Creek (aka Thistle Creek Tributary #1) and the associated ponds and wetlands. These features will be located to the north and west of the existing features and be designed primarily as amphibian habitat, although the connection to Thistle Creek would not preclude the presence of fish. A riparian buffer within a width of 15 m would be located on either side of the aquatic features. As the current vegetation in the Gravel Creek area is predominantly juvenile red alder amongst exposed soils and gravel, this area will be revegetated with appropriate native species. In addition to these enhancement works, the section of Gravel Creek and Thistle Creek Tributary #3 between the powerlines and the gravel pit will likely be realigned out of the present ditch system, to provide better flood protection for the development and to provide for enhanced aquatic and riparian habitat. These works will require provincial *Water Act* approval as well as approval or project review under the federal *Fisheries Act*. As the current alignment of these drainages is within drainage ditches and through a gravel pit, it is the intention to have a net increase in usable aquatic and riparian habitat as a result of the above enhancement program.

3.3.2 Foreshore and Minaty Bay

Development along the foreshore is subject to the federal *Fisheries Act* and the *Navigation Protection Act*. A marine foreshore buffer of 15 m is recommended, subject to review/approval from Fisheries and Oceans Canada (DFO) under the *Fisheries Act*. Any work proposed to occur below the high tide mark will require *Fisheries Act* and *Navigation Protection Act* authorization.

In addition, the Official Community Plan (OCP) of the SLRD outlines policies in section 2.3 Parks and Open Space that reference the foreshore and Minaty Bay areas. Specifically these policy items are:

- *In conjunction with future rezoning of the Britannia South lands (including the Makin Lands), encourage provision of an additional waterfront park at Minaty Bay, in the general location shown on the land use plans of the OCP (not attached), to protect the beach, the picnic area, and the peninsula, retaining the natural character of this public use area. The minimum recommended size for the park is 4.9 hectares (12 acres), which includes land in the bluff area on the south side of the bay, as well as the picnic area north-east of the beach, extending east to the railway tracks.*
- *Encourage provision of pedestrian access along the shoreline of Howe Sound on the Britannia South frontage and the Britannia North frontage, with a pedestrian link between these two areas.*



Source: OCP Bylaw 495, February 2011

Development in the Minaty Bay riparian area and the foreshore of Howe Sound are constrained by the OCP policies listed above.

3.3.3 Marine Environment

The underwater habitat survey presents a preliminary understanding of the substrate and biotic conditions of the South Britannia Beach foreshore. The foreshore was categorized into three areas. Of the three areas, Area 1 appears to be the most impacted from anthropogenic disturbances including riprap bank retention, extensive mud substrate descending from approximately the -7 m contour, wood debris and sunken fishing vessels. Area 2 is steeper and supports a wider band of pebble/ cobble substrate prior to transitioning to mud at approximately the -20 contour. Area 3 is characterized by bedrock substrate and quickly descending depths.

It is not surprising that Area 3 supports the highest number of species, as rock substrate allows for more recruitment of sessile species, which in turn attracts more mobile/ predatory species. Fourteen species were documented in this area, including 13 invertebrate species, and one fish species (Table 11). Considering the amount of anthropogenic disturbance observed in Area 1, it is somewhat surprising that it supports the second highest number of species with ten species observed. Five invertebrate species, one fish species and four species of algae were observed in Area 1 (Table 11). Seven species were observed in Area 2, including four invertebrate species and three species of algae.

The preliminary underwater biophysical survey did not reveal any organisms or habitats that are rare or protected under the *Species at Risk Act* that would present a constraint to development.

Options identified for habitat improvements are:

- Shoreline stabilization, removal of invasive species and/or planting of native trees and shrubs; creation of a more natural transition from the marine to upland environment.
- Intertidal shoreline restoration and protection from erosion; construction of saltmarsh habitat or placement of boulder clusters in the intertidal zone.
- Construction of subtidal artificial reefs.

Although all of the habitat improvement options presented above will benefit the marine environment, the extent of the proposed development and the compensation requirements of reviewing agencies will determine the options that should be further investigated.

The marine survey information included herein is a preliminary assessment and should be utilized as such. Further information is needed for structure design and placement.

3.4 Valued Ecosystem Components

3.4.1 Wildlife Habitat

Habitat features such as wildlife trees, large trees and coarse woody debris are ecologically important forest qualities to retain as they provide unique nesting, denning, feeding, and perching opportunities that do not exist in younger forest stands. These features are recommended for retention, although they are not provided legislated protection.

3.4.2 Wildlife Corridors

Valley bottoms are typically travel pathways preferred by wildlife as valley bottoms are often the easiest travel route. Wildlife travel paths observed during site visits were predominantly in the north-south orientation; therefore it is desirable to include north-south linkages in the community



design stages to avoid impeding wildlife travel up and down the valley. Best practices for wildlife management involve leaving original wildlife travel corridors intact when possible, and creating wildlife travel corridors in suitable habitat in order to minimize the impacts of developments at the site (Herrero, 2000). Bears in particular show an affinity to maintain their travel corridors even after development occurs, even if this means entering the newly developed area (L. Homstol, bear conflict specialist, pers. comm., December 5, 2011). Therefore, development in existing wildlife corridors may contribute to human-wildlife conflict. Wildlife sensitive to human activity may abandon their travel route and potentially become locally extirpated. Trails with significant human use may be appropriate for human-tolerant species such as deer or martin, but the human activity on the trail would exclude more sensitive wildlife such as fishers, wolves and grizzly bears. The most effective corridor systems are based on current wildlife movement, which can be observed using snowtracking, remote cameras or radio-collaring wildlife.

Although legislation does not mandate that wildlife corridors be included in community design, including wildlife corridors will likely reduce human - wildlife conflict, and will likely become a valued community asset in the form of wild space for residents to utilize. Standards for corridor planning were developed in Canmore in the late 1990s for large and smaller mammals (Herrero, 2000). The smaller secondary corridors are likely adequate to manage the mammals likely occurring on the subject site including deer, black bear and smaller wildlife that occur on the site. Very steep topography (over 25 degrees) should not be included in wildlife corridors as wildlife will opt for easier travel paths. Disturbed habitat (e.g. power lines) can be used as wildlife corridor as long as the cover requirements described above are met. Important habitats such as riparian areas or natural meadows should be linked whenever possible.

The development of wildlife corridors could help meet the recommendations of the SLRD OCP to create a trail system throughout the community and to adjacent communities (e.g., Furry Creek), linking commercial areas, residential areas, and parks and open space (see section 3.5.3).

3.4.3 Riparian Areas

Riparian areas on waterways that flow into fish bearing waters are protected under the provincial Riparian Areas Regulation (described in section 2.4.3 and 3.3.1), and therefore development within 30 m of the high water mark, or within the applicable SPEA, of streams and waterways will be constrained.

Riparian areas also provide an opportunity in the form of wildlife passage that connect uplands to the ocean, allowing for wildlife movement outside of developed areas.

Community design should occur in conjunction with or after a RAR Assessment is conducted on nearby streams to ensure that development designs conform to RAR setbacks.

3.4.4 Fish and Fish Habitat

All of the waterbodies on the property are either fish-bearing or flow into fish bearing waters and are subject to the *BC Water Act*, *Riparian Area Regulation* of the *BC Fish Protection Act*, and the Federal *Fisheries Act* to maintain and protect fisheries values.

3.4.5 Foreshore

Development on the foreshore of Howe Sound is constrained by the requirement to submit and obtain approvals, or a letter of understanding, under the federal *Fisheries Act*, and potentially the federal *Navigation Protection Act*. In addition, depending on the proposed development application, compensatory habitat may be requested by agencies before approval is considered.



3.5 Socio-Economic Conditions

3.5.1 Cultural and Heritage Resources

No cultural or heritage resources were observed during the site visit. While waste heaps observed on DL 2001 and 7053, do not appear to be old enough to be considered cultural or heritage resources, removal of the waste may be an opportunity for mitigation.

No known archaeological sites were identified in the provincial archaeological database; however, MFLNRO has reason to suspect that unknown archaeological sites could exist within the study boundary. As both recorded and unrecorded archaeological sites are protected under the *Heritage Conservation Act*, Hayley Bond, of the archaeological branch of MFLNRO recommended in an email received December 20, 2011 that a qualified archaeologist be engaged prior to land-altering activities occurring to ensure compliance with the *Heritage Conservation Act*.

MFLNRO made this recommendation to ensure that unreported archaeological sites are not harmed, as contravention of the *Heritage Conservation Act* can occur when a recorded or unrecorded archaeological site is knowingly or unknowingly disturbed. Therefore, an archaeological survey in itself does not ensure compliance with the Act, only that it will educate the property owner of any existing archaeological sites.

3.5.2 Timber Harvesting

Timber harvesting does not present a constraint to development as the subject site is privately owned. The majority of forest on the site is second growth representing a lower ecological value than old growth forest. Thus previously harvested areas are generally more appropriate for development than less disturbed forests. Logging and or removal of vegetation on private property is considered development under the RAR and is subject to the regulation.

3.5.3 Recreation and Tourism

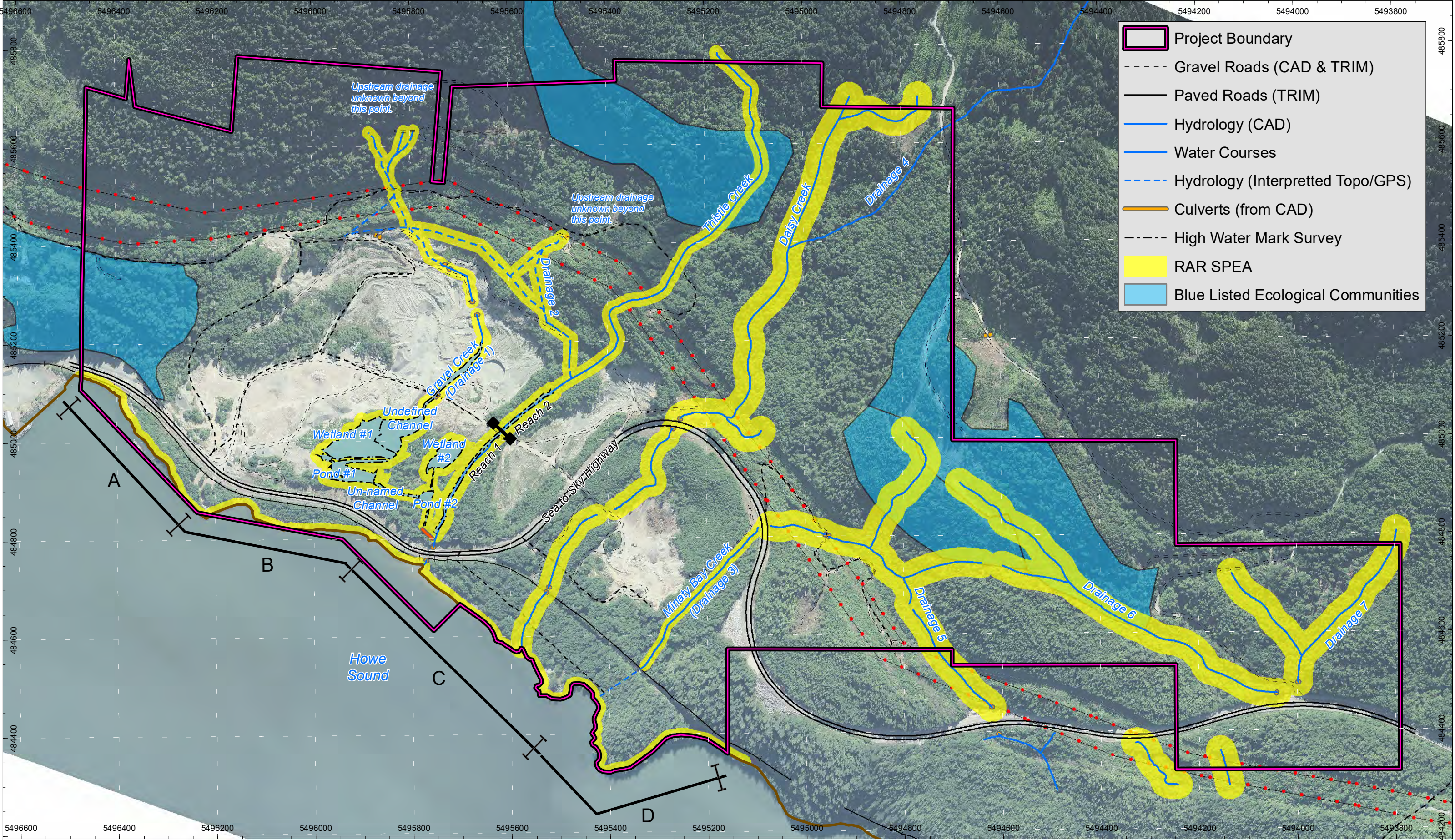
The SLRD OCP encourages the provision of a trail system throughout the community and to adjacent communities (e.g., Furry Creek), linking commercial areas, residential areas, parks, and open space. It encourages provision of trail-head facilities (e.g. road access, small parking lot, and signage) where possible and appropriate. The trail system should include trails for walking, hiking, and bicycle use. The OCP also suggests that consideration be given to designation of specific trails that can accommodate mountain biking (Section 2.3.6. of OCP, 2011).

Few recreation or tourist features were observed on the property. A bench and table were observed near Minaty Bay. The lands surrounding Minaty Bay are currently owned by the proponent and are private property. These recreation features at Minaty Bay are not significant and do not present constraints to development; however, the OCP parkland designation does.

A hiking trail called "Ty's Trail" was identified within Lot A of DL 7053 during the site visit, and a couple of rustic fire pits and a tree house were observed near the foreshore. Although these lands are located within the project boundary, they are not currently owned by the proponent. The proponent included the lands in the project boundary as the lands may be acquired in the future. If the lands are acquired, the purpose, use and location of the trail should be explored more fully.

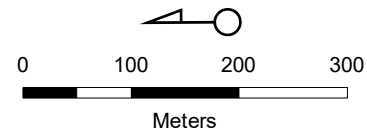
3.5.4 Noise Levels

Construction noise is regulated under the Squamish Lillooet Regional District Bylaw No. 1234, 2011 to occur only within the hours of 7:00 am and 10:00 pm on weekdays and 8:00 am and 10:00 pm on weekends.



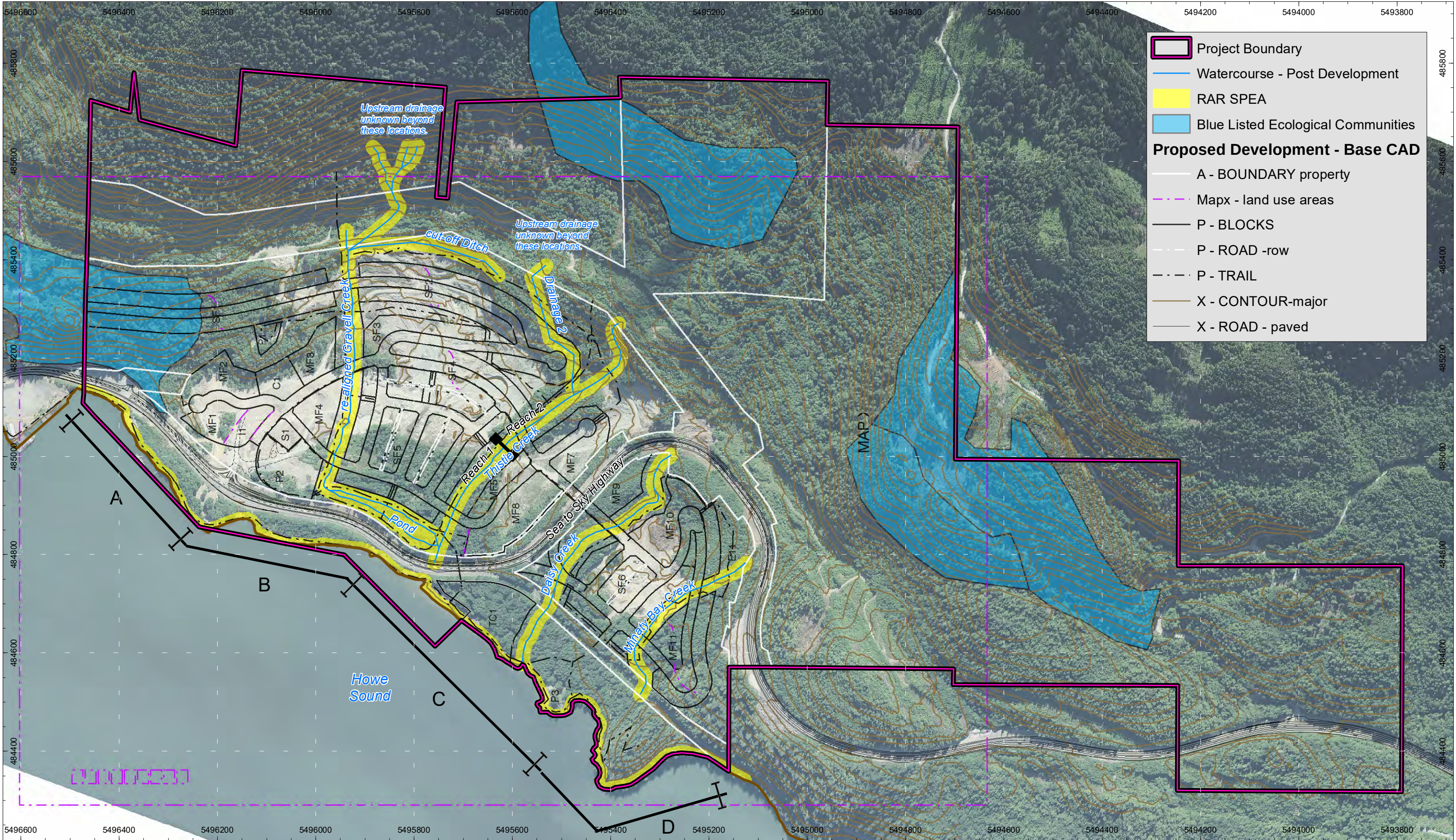
Map 4 - Environmental Constraints and Opportunities

Pre-Development
South Britannia Beach, British Columbia



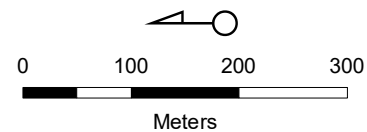
GIS Cartographer: Todd Hellinga
Date: July 28, 2014
CERG File#: 454-01-06
Projection: UTM Zone 10N NAD83





Map 5 - Environmental Constraints and Opportunities

Post-Development
South Britannia Beach, British Columbia



GIS Cartographer: Todd Hellinga
Date: July 28, 2014
CERG File#: 454-01-06
Projection: UTM Zone 10N NAD83



4.0 Regulatory Approvals

The South Britannia development will be subject to legislation and regulation for environmental protection, as well as associated environmental permits and authorizations from various levels of government. Due to recent changes in the Canadian Environmental Assessment Act (CEAA), the project will not be subject to a federal environmental assessment review process. Further, due to the removal of a marina development from development plans, the project will only be subject to the British Columbia Environmental Assessment Act (BCEAA) if groundwater extraction exceeds a prescribed volume, based on identified potential design features that trigger involvement by the BC Environmental Assessment Office (BCEAO). While the project will likely not require a full Environmental Assessment, a number of permits and authorizations from other agencies will be required. These are described herein.

4.1 CEAA Applicability

A revised Canadian Environmental Assessment Act came into force on July 6, 2012. Under the new CEAA regulation, the list of “triggers” for projects requiring federal environmental assessment is greatly reduced, and the bulk of environmental assessment is now coordinated at the provincial level. There are no identified CEAA triggers associated with the site.

4.2 BCEAA Applicability

The South Britannia project is potentially reviewable based on potential triggers identified in the *BC Environmental Assessment Act Reviewable Projects Regulation, Section 9.4 – Groundwater Extraction Projects*. The *BC Environmental Assessment Office (BCEAO)* requires the application process described below (see also Table 12: BCEAA Approval Process Chart). The requirements under this portion of the regulation are “*a new facility that (a) consists of one or more works for the extraction of groundwater to be used for the same project or where, in the reasonable opinion of the executive director, the works are so closely related they can be considered to form a single project, is operated intermittently or continuously for ≥ 1 year, and is designed to be operated so that groundwater is extracted at a rate of ≥ 75 litres/second*” (BCEAO, 2010). If the groundwater extraction requirements of the project exceed the parameters listed above, the project is subject to the following review process:

- 1. Project is deemed to be reviewable under the *Environmental Assessment Act*:** The South Britannia project is potentially reviewable under the criteria for a review under the *Reviewable Projects Regulation* if the design includes the trigger described above. A project description is prepared and submitted to the BCEAO that clearly identifies the scope of the project and the scale of the triggers. Once the Project Description is received, the agency will assign a project lead for the review to make a determination of requirement for review under the BCEAA. If the project is deemed reviewable, the project lead will then issue an order under Section 10 of the *Environmental Assessment Act*, creating the formal requirement for an environmental assessment and notifying government agencies, First Nations and local governments of the order. If the Project Description details triggering thresholds that are marginally exceeded and provides acceptable mitigation measures to ensure no “significant adverse environmental, economic, social, heritage or health effect”, the reviewer may “wave out” the project as per s. 10(1)(b) of the Act.
- 2. Working Group formed:** Once the Section 10 Order is issued, the EAO will form a Working Group including representatives from relevant provincial and federal government agencies, First Nations, and local government. The Working Group advises the EAO on issues related to the proposed project and helps in assessing the adequacy of any proposed mitigation measures. The proponent is not a member of the working group, but is advised to attend meetings and will be asked by the Working Group to provide the



majority of the information to be included in the application for an environmental assessment certificate.

3. **Procedural (Section 11) Order:** The EAO will establish the scope, procedures and methods of the Environmental Assessment by issuing a procedural order under section 11 of the *Environmental Assessment Act*, directing the scope of the project and setting forth required First Nations and other consultation activities and timeframes.
4. **Proponent provides draft application information:** The EAO will issue a document outlining the application information requirements (formally “terms of reference”), identifying the issues to be addressed in the assessment and the information to be included in the application. All issues raised by government agencies, First Nations, local governments, stakeholders and the public are monitored, documented and responded to by the proponent, and the adequacy of these responses is assessed by the EAO. To develop the application information requirements the following steps are followed:
 - The proponent prepares a draft Environmental Assessment
 - The EAO seeks feedback from the working group, First Nations and the public.
 - The EAO approves and formally issues the application information requirements document when it is satisfied that the document is complete and suitable for the assessment.

The application information requirements generally contain the following key components:

- Description of the project, including all project elements
 - Spatial and temporal boundaries of the assessment
 - Consultation to take place
 - Project setting and characteristics, including a description of a wide range of baseline studies that the proponent will undertake
 - Scope of the assessment, including a list of all potential effects that will be considered
 - Methodology for assessing impacts and mitigating effects
 - Assessment of the potential significant adverse effects, including proposed mitigation measures and residual effects
 - Commitment to provide environmental management systems and monitoring plans
5. **Cumulative impacts analysis:** According the BCEAO User Guide (2011), “*Cumulative impacts are likely impacts from prior development, existing activities; and, reasonably foreseeable future development that is sufficiently certain to proceed*” (p. 26). The cumulative impacts assessment process considers Valued Components (VCs), deemed important by stakeholders in the assessment process including government agencies, the public, and First Nations. VCs can include environmental, economic, social, heritage and/or health components. Cumulative impacts are relevant to the extent to which historical or proposed actions may combine with the project to create ‘significant’ adverse impacts. The EAO considers the following sources when assessing cumulative impacts for the mutually agreed VCs:
 - Approved land use plans (i.e. the regional OCP, LRMP, watershed management plans, etc.) that designate the most appropriate activities for the land base



- Comprehensive baseline studies which set out the current conditions and are informed by effects of prior development
- Potential overlapping impacts that may occur due to other developments, even if not directly related to the South Britannia project
- Reasonably foreseeable future developments

6. Application prepared and submitted: The application submitted must address all issues outlined in the application information requirements. It will include baseline data of the study area and an analysis of the potential environmental, social, health, heritage, and economic effects of the project. The bulk of the application will focus on mitigation measures or compensation strategies to avoid or minimize significant adverse effects. The application will also include a “table of commitments” outlining the proponent’s commitments if a certificate is issued. Commitments include activities such as mitigation strategies and monitoring and the final version of this table is attached to the EA certificate. A report documenting completed and planned public and First Nations consultation activities must also be included with the application.

7. Application evaluated by the EAO: The EAO evaluates the submitted application for completeness and either requests additional information or formally accepts the application. Once the application is accepted, the EAO has a maximum of 180 days to complete its review. The public, working group, and First Nations are provided a final opportunity to comment during this phase, soliciting comments are EAO-led open houses, working group meetings and other streams. The EAO also begins drafting an assessment report during the review period, which includes all concerns that have been addressed and any outstanding issues. This document is shared with the proponent, the working group and the First Nations for input. The report will also include an explanation of the EAO’s conclusions regarding whether the EAO has concluded the Crown’s duty to consult and accommodate has been met. In addition to the assessment report, the EAO provides the responsible ministers with:

- Recommendations as to whether to issue an EA certificate
- Draft EA certification, in the event the responsible ministers to decide to issue it

A draft EA certificate includes schedules that specify the details according to which the project must be designed and constructed, and the commitments the proponent has made to address concerns raised through the EA process; as well as reporting requirements and a specified deadline, 5 years from the date the certificate is issued, by which the project must be substantially started.

8. Minister’s decision: The responsible ministers (Minister of Environment and other ministries relevant to the project) have 45 days following the receipt of the assessment report and related documents to make a decision. This process has three potential outcomes:

- The ministers issue an environmental assessment certificate with any conditions deemed necessary
- The ministers refuse to issue a certificate
- The ministers send the project back to the EAO for further study or assessment

9. Post-certification and permitting: Once the ministers have issued the certificate, the EAO may hold a post-certification meeting with the proponent and permitting agencies; a lead ministry may then assume responsibility to act as the primary point of contact for permitting activities. Due to considerable overlap between agencies’ permitting requirements, the *Environmental Assessment Act* allows applicants to apply for



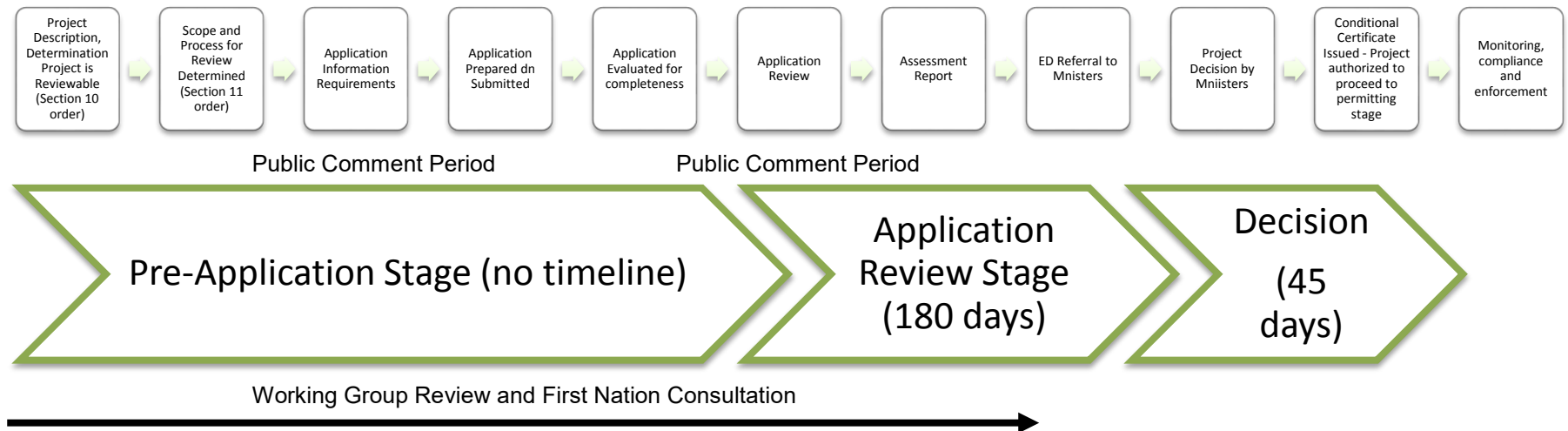
“concurrent permitting”, which if accepted means that the relevant agencies must render a decision on permit applications within 60 days of the issuance of an environmental assessment certificate. This decision may be to issue or reject the permit applications, or to specify a date on which the proponent may expect a decision, including reasons for postponement.

10. Compliance and enforcement: Environmental assessment certificates typically include requirements for compliance reports, ongoing monitoring and other measures to ensure the commitments in the certificate are met. The EAO collects information regarding compliance through the following channels:

- Periodic compliance reports as a condition of environmental assessment certificates
- Information obtained by other government agencies involved with the project
- Concerns or complaints from public, stakeholders, local governments and First Nations
- The EAO may inspect the proponent's activities if appropriate

The environmental assessment process is complete when all conditions listed in the certificate are satisfied.

Figure 3: BCEAA Approval Process Chart





4.3 Fisheries Act

A new *Fisheries Act* came into force in late 2013. Section 35 of the new Fisheries Act states that “No person shall carry on any work, undertaking or activity that result in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery. A person may carry on work, undertaking or activity without contravening subsection (1) if the carrying on of the work, undertaking or activity is authorized by a prescribed person or entity and the work, undertaking or activity is carried on in accordance with the prescribed conditions” (DFO, 2014). If DFO requires an authorization, it must be obtained before works commence. The process for determining requirements for and, if needed, obtaining an authorization are as follows:

- 1. Complete Project Notification and Review Application Form**
 - Pending confirmation from DFO, a detailed submission is prepared as follows.
- 2. Prepare a proposal** including the following information
 - Type of activity
 - Rationale for the project
 - Proof of ownership
 - Detailed site map, including property lines and average annual high water mark
 - Detailed site plans including construction details, timing, building techniques and materials and any additional relevant information including a description of any possible alternative designs being considered
 - A list of equipment to be used
 - Photographs of the work site and surrounding shoreline
 - Proposed project timeline
 - Description of the substrate at the work site
 - Description of existing fish habitat and fish communities at or near the site
 - Any mitigation measures you plan to introduce harmful impact
 - A list of federal, provincial and municipal government agencies that the proponent has been in contact with regarding the project
- 3. Submit the proposal** to the regional DFO office
- 4. DFO reviews the proposal**, with three potential results:
 - There is no fish habitat, DFO has no concerns
 - There is fish habitat but harm to fish can be avoided and DFO will assist with mitigation and redesign measures that will avoid harm to fish, a letter of advice may be issued instead of an authorization
 - There is fish habitat and harm to fish cannot be avoided through redesign, relocation or mitigative measures, in this case:
 - o DFO may determine the harm to fish is unacceptable and no authorization may be granted
 - o DFO may consider the harm to fish acceptable and may issue an authorization, which will include a requirement for a plan to compensate



for the loss of fish habitat; an environmental assessment is required before DFO can issue an authorization

5. **Apply for an Authorization** if determined by DFO after its review of the project by completing the authorization form provided by a DFO representative. DFO staff will work directly with the project team to ensure that conditions detailed within the authorization, including specific mitigation, compensation and monitoring activities, are met.

4.4 Water Act

The South Britannia development may trigger two provisions under the *Water Act*.

4.4.1 Stream Modifications

Under the *Water Act*, proponents are required to submit for approval under Section 9 for “*changes in and about a stream*” which are defined as “*any modification to the nature of the stream including the land, vegetation, natural environment or flow of water within the stream, or any activity or construction within the stream channel that has or may have an impact on a stream*” (BC MOE, 2014). An application for approval is subject to the following process:

1. **Description of proposed works** including information on what stream changes are proposed and where. It is also advised that a rationale and construction timeline are included in the description and that the description take into consideration and attempt to answer the various levels of government review outlined below.
2. **Identification of water rights** including all water licensees that could be impacted by the proposed changes, what those impacts might be, and how they can be mitigated.
3. **Identification of land interests** including consideration of potential impacts on land interests. Provide land titles for all properties in the area of the streams, as well as information regarding neighbouring tenures and rights-of-way. It is also recommended that changes to riparian setbacks be identified, explained, and mapped.
4. **Consideration of potential environmental impacts**, including a report prepared by a Registered Professional Biologist (R.P.Bio.) outlining the impacts on regionally significant fish or wildlife as well as a description of the existing environmental setting and potential impacts to environmental values.
5. **First Nations consultation** is conducted by MOE, but proponents are encouraged to provide a summary of communications with First Nations and of related engagement activities and outcomes. Additionally, describe any known information about aboriginal interests in the area, how they might be affected, and proposed opportunities to address any adverse impacts.
6. **Referral** to other government agencies including but not limited to Fisheries and Oceans Canada and local government is conducted by MOE. Identify any other permits or authorizations that may be required (i.e. BCEAO and/or Fisheries Act) or copies of any received permits.
7. **Approval** with conditions, which will likely include management practices and monitoring requirements.

4.4.2 Groundwater Extraction

If the volume of groundwater extraction does not meet or exceed the 75 litres/second required to trigger the BCEAA process, water infrastructure for the development will be considered a



'community well' and will be subject to construction and reporting requirements under the *Groundwater Protection Regulation*. Specifically, the well location and supporting documentation including construction reports, pumping test reports and any documentation with geological information is required by the Ministry of Environment. Additionally, use of a certified well driller and certified pump installer are required for well construction. Under the *Water Sustainability Act*, scheduled to come into force in 2015, groundwater will be licensed, and application and water rental fees will be applied for groundwater extraction.

4.5 Additional Regulatory Framework

In addition to the *BCEAO*, *Fisheries Act*, and *Water Act* processes there is other regulatory legislation that forms the underlying framework for the South Britannia Project. The federal, provincial and local government legislation and regulations include, but are not limited to:

Federal

- *Canadian Environmental Protection Act*, Environmental Emergency Regulations;
- *Species at Risk Act*;
- *Migratory Birds Convention Act*;
- *Wildlife Act*;
- *Transportation of Dangerous Goods Act*, Transportation of Dangerous Goods Regulation; and
- *Pest Control Products Act*, Pest Control Products Regulation.

Provincial

- *Environmental Management Act*;
- Public Notification Regulation;
- Open Burning Regulation;
- Municipal Sewage Regulation;
- Code of Practice for Use of Reclaimed Water;
- Spill Reporting Regulation;
- Hazardous Waste Regulation;
- Contaminated Sites Regulation;
- *Fish Protection Act*;
- Riparian Areas Regulation;
- *Drinking Water Protection Act*
- Groundwater Protection Regulation;
- *Wildlife Act*;
- *Integrated Pest Management Act*;
- *Highways Act*;
- *Forest Act*;
- *Forest and Range Practices Act*;



- *Forest Practises Code of BC Act;*
- *Health Act;*
- Sewage Disposal Regulation;
- Food Premises Regulation;
- *Heritage Conservation Act;*
- *Electrical Safety Act;*
- *Canadian Power Engineers and Boiler and Pressure Vessel Safety Act;*
- *Gas Safety Act;*
- *Fire Services Act;*
- *Utilities Commission Act;*
- *Workers Compensation Act;*
- Workers Compensation Board of BC; and
- *Fire Services Act;*
- BC Fire Code Regulation.

Local Government

- Squamish Lillooet Regional District Liquid Waste Management Plan;
- SLRD Electoral Area D Official Community Plan
- Zoning Bylaw;
- Building Bylaw;
- Solid Waste Management Plan

Table 12: Summarized Regulatory Approvals, Authorizations, and other Requirements

Agency	Department or Branch	Legislative Mandate of Agency	Authorization, Permit, License or Notification	Timing	Trigger(s)	Applicability
FEDERAL AGENCIES						
Environment Canada		- <i>Species at Risk Act</i> . - <i>Migratory Birds Convention Act</i> - <i>Canadian Environmental Protection Act</i>	Specialist Advice; no authorization required.	During construction	Land clearing of potential habitat	Yes
Fisheries and Oceans Canada		<i>Fisheries Act</i>	Section 35 Authorization	TBA	Creek realignment a	Yes
PROVINCIAL AGENCIES						
Ministry of Environment	BC Environmental Assessment Office	<i>BC Environmental Assessment Act (BCEAA)</i>	Section 9, <i>Reviewable Projects Regulation</i> , Marina Developments	TBA	TBA, based on rate of groundwater extraction	Yes, if extraction exceeds parameters (75 litres/ second)
Ministry of Environment	Environmental Stewardship Division	<i>Fish Protection Act</i> (Riparian Areas Regulation)	Section 12, <i>Riparian Area Regulation</i> (RAR), Section 4(2)(b).	TBA	Riparian intrusions for roads and crossings.	Yes
Ministry of Environment	Environmental Stewardship Division, Fish and Wildlife Branch	<i>Wildlife Act</i>	Prohibits damage / destruction to wildlife. The proponent will abide by the habitat protection requirements detailed in the Act.	TBA	Land clearing or disturbance to wildlife.	Yes
Ministry of Environment	Environmental Stewardship Division, Fish and Wildlife Branch	<i>Wildlife Act</i>	General Permit Application to relocate fish and amphibian species (i.e. red legged frog – if present)	Prior to construction	If species are found during survey	Yes
Ministry of Environment / Forests, Lands and Natural Resource Operations	Water Stewardship Division	<i>Water Act</i> <i>Water Regulation</i>	Section 9 Permit or Section 7 Notification for works in and around a stream (e.g. culverts).	Prior to construction short term	Crossings as works in and about a stream	Yes



Ministry of Environment / Forests, Lands and Natural Resource Operations	Water Stewardship Division	<i>Water Act Groundwater Protection Regulation</i>	Installation of water well must be in accordance with regulations if not a BCEAO trigger	TBA	Installation of a water well (if required)	Yes, if wells installed
Ministry of Health	Public Health Protection	<i>Drinking Water Protection Act and Regulation</i>	Waterworks Construction Permit	Prior to construction of new water supply system	If new groundwater supply is used for drinking water	Yes, if wells installed
Worker's Compensation Board of BC (WCB)		Various regulations	The proponent must adhere to all relevant WCB regulations.	n/a	Construction, land clearing works, etc.	Yes
Ministry of Forests Lands and Natural Resource Operations	Archaeology Branch	<i>Heritage Conservation Act</i>	Site Inspection Permit	1 month (approx.)	Identification of heritage issues	Yes, if archaeological resources found on site.
MUNICIPAL AND REGIONAL AGENCIES						
Vancouver Coastal Health Authority			Review and approval of Food Service Facility Plans	Prior to construction	Construction of food service facilities	Yes
Squamish Lillooet Regional District (SLRD)	Planning Department	Official Community Plan Zoning Bylaw	<i>BC Local Government Act</i> , Div. 7, Section 903 Re-zoning	Prior to construction	Change in Land Use	Yes
SLRD	District Approving Officer	Subdivision Bylaw and relevant provincial legislation	<i>BC Local Government Act</i> , Div. 7, Section 938 Subdivision	Prior to subdivision	Creation of land parcels.	Yes
SLRD	Planning / Engineering	Legal / Planning	Development Permit (DP) is required.	Prior to construction	Site development.	Yes
SLRD	Building Department	Legal / Planning	Building Permit, e.g., utility connections to municipal infrastructure.	Prior to construction	Construction	Yes
SLRD	Bylaw Department	Bylaw to Regulate Noise or Sound	Noise Bylaw Variance	n/a	Creating noise	Unknown



5.0 Recommendations and Conclusions

Based on the information reviewed and the site conditions observed, the following recommendations are made to minimize potential negative impacts on the site arising from development:

1. Clearing of trees should be avoided during the typical bird breeding season (between April 1 and July 31). Any clearing during this period should be preceded by a breeding bird survey conducted by a Qualified Environmental Professional. Any occupied song bird or raptor nests identified during this time must be protected from clearing with appropriate vegetated buffers. If any bird species at risk are identified, additional mitigation measures may be required to protect the species.
2. Riparian assessment area of thirty (30) meters must be retained until RAR assessments are completed and filed by a Qualified Environmental Professional. Stream specific Streamside Protection and Enhancement Areas (SPEAs) have been determined for the various creeks in the proposed development area, but as of the time of writing of this report, have not been filed with the Ministry of Environment. Additionally, SPEAs must be delineated and protected from clearing/ intrusions prior to any development.

A Riparian Areas Regulation (RAR) Assessment has been conducted, but not filed, for Thistle Creek which determined a SPEA of 16.2 m for the first reach and 15.0 m for the second reach. This setback and accompanying RAR measures can be accommodated with the current design (see Map 5); however, as a portion of the 2nd reach is perched, some remedial engineering works may be required. Any such works would require provincial *Water Act* approval as well as approval or project review under the federal *Fisheries Act*. To conform to those acts, any remedial stream works would likely involve some mitigation/compensatory stream/riparian enhancements.

Drainage 1 (Gravel Creek) experienced significant disturbance with the previous gravel quarrying operations, such that the drainage has been channelized for part of its length with unconsolidated, braided flows in other areas. The drainage was noted to be dry in late summer. The drainage's waters also flow through two ponds, likely constructed as part of the previous gravel extraction operations, and a shallow pond which naturally evolved into a wetland. Fish were observed in the drainage from the 1st pond downstream, but not elsewhere in the drainage.

The proposed development plan calls for relocation of Gravel Creek and the associated ponds and wetlands. These features will be located to the north and west of the existing features and be designed primarily as amphibian habitat, although the connection to Thistle Creek would not preclude the presence of fish. A riparian buffer within a width of 15 m would be located on either side of the aquatic features. As the current vegetation in the Gravel Creek area is predominantly juvenile red alder amongst exposed soils and gravel, this area will be revegetated with appropriate native species. The drainage relocation will require approvals under the BC *Water Act*, administered by the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) and under the Federal *Fisheries Act*, administered by Fisheries and Oceans Canada (DFO).

Drainage 2, a tributary of Thistle Creek, is located immediately upslope of the proposed development. Below, west of the powerline, the drainage is currently directed into a cut-off ditch at approximately the 65m elevation line. The ditch directs the majority of the drainage's waters to a small ravine that forms the lower 100 m of Drainage 2; however a



portion of the waters flows northward, and has been noted in the past (2010, Pers. Comm. Tony Mahood) to breach the ditch and flow overland into Drainage 1 (Gravel Creek). Evidence of overland flows was also observed by Cascade Environmental during a site visit on September 20, 2012. The stability and flooding potential of this drainage will need to be evaluated by an appropriately qualified engineer. A RAR assessment of the drainage will also need to be conducted if development/work is to occur within the 30 m assessment area. Any works in and about the drainage would require approval and/or notification (depending on the level of disturbance) under the Water Act, and possibly the Fisheries Act.

A RAR Assessment was conducted, but not filed, for Daisy Creek which determined a SPEA of 15.0 m downstream of Highway 99, with a 21.9 m buffer on the south side of the creek. The present proposed development plan calls for preservation of Daisy Creek within a 25 m buffer, which exceeds the recommendation of the RAR.

A RAR Assessment was conducted, but not filed, for Drainage 3 (Minaty Bay Creek) which determined a SPEA of 10.5. The drainage is small creek that was observed dry in the summer months, with a convoluted/dispersed discharge to Minaty Bay. The location of this creek needs to be surveyed to accurately determine its location. Depending on that survey, the creek may be relocated as part of the development. As with Thistle Creek any works in and about the creek would be subject to the noted federal and provincial legislation.

A review of the marine proposed 15 m marine setback will need to be conducted with DFO.

3. Habitat management for listed amphibian species should be considered in the riparian area assessment. Maxcy (2004) and Mallory (2004) recommend that wildlife habitat areas (WHA) for red-legged frog and coastal tailed frog should include a core area encompassing the wetland / stream plus a 30 m riparian reserve beyond the high water mark, and a 20 m management zone beyond the core area.

Although red-legged frog potentially could occur on site, no specimens were observed during the IER or during subsequent RAR assessments. Potential breeding habitat can be found in the two ponds and wetland associated with Gravel Creek. It is recommended that an egg mass survey of these three features be conducted in May to ascertain the presence of red-legged frog. Egg mass surveys give a good indication of red-legged frog densities, as females lay a single egg mass per year. If found, or assumed to be found if no surveys are conducted, then suitable breeding pool habitat should be developed to compensate for the loss of pond habitat noted in Item 2 above. Prior to relocating and/or draining the three waterbodies, an amphibian salvage should be conducted; this will require a salvage permit from the Permit and Authorization Service Bureau, MFLNRO.

4. The SLRD Official Community Plan outlines plans for a 4.9 hectare park at Minaty Bay and pedestrian access along the shoreline of Howe Sound adjacent to the subject site. This park is included in the current development plan.
5. Noise resulting from development should be kept to a minimum and should abide by the SLRD Noise Bylaw. Noise resulting from machinery should be restricted to the hours of 7:00 a.m. to 10:00 p.m. on weekdays and 8:00 a.m. to 10:00 p.m. on weekends.
6. The development of a wildlife management plan is recommended to ensure that protocols are in place to resolve issues with wildlife before they become health and safety concerns.



In addition, the wildlife management plan should address specific design elements to control, avoid or mitigate against issues with wildlife, covering topics such as habitat to avoid during development, garbage management, and recommended plant species to avoid planting.

In addition to the Best Management practices detailed in Develop with Care 2012: Environmental Guidelines for Urban and Rural land Development in BC (<http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare2012/index.html>) which provide ecological guidelines for development, it is recommended that the development utilize applicable green development building design standards, such as the Bird-Friendly Development Guidelines (City of Toronto, 2007), to address bird mortalities from expanses of glass and reflective surfaces, light pollution, and other building and urban development issues.

7. Wildlife trees including large veteran trees, snags, or trees with broken tops or holes in them should be retained wherever possible for their aesthetic and wildlife habitat values.

Candidate wildlife trees should be evaluated by a danger tree assessor. Where a wildfire tree is deemed hazardous, a hierarchical approach should be used to address the hazard, such that preservation and relocation of development (e.g. relocation of a trail) is considered first, modification of the tree is considered second, and removal of the tree is considered last.

8. Invasive plant species should be removed or managed on the subject property, through the development of an invasive species management plan.



Statement of Limitations

This Document was prepared by **Cascade Environmental Resource Group Ltd.** for the account of **Tai Cheng Development Corporation and MVH Urban Planning and Design.**

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This document should not be construed to be:

- A Phase 1 – Environmental Site Assessment;
- A Stage 1 – Preliminary Site Investigation (as per the Contaminated Sites Regulations of the *Environmental Management Act*);
- An Environmental Impact Assessment.

5.0 References

- BC Conservation Data Centre (BC CDC). 2011. BC Species and Ecosystems Explorer. BC Ministry of Environment. Victoria, BC. (<http://a100.gov.bc.ca/pub/eswp/>).
- Cascade Environmental Resource Group Ltd. (Cascade). 2008. Daisy Creek August Fish/ Frog Salvages, Segment 3. Prepared for Peter Kiewit Sons.
- Cascade Environmental Resource Group Ltd. (Cascade). 2007a. Spotted Owl Survey Results, Segments 1, 3 and 4, 2007, Sea to Sky Highway Improvement Project. Prepared for Hatfield Group Ltd.
- Cascade Environmental Resource Group Ltd. (Cascade). 2007b. Fish Habitat Assessment; Daisy Creek, Sea to Sky Highway Improvement Project, Segment 3, DB6, 2007. Prepared for Hatfield Group Ltd.
- Cascade Environmental Resource Group Ltd. (Cascade). 2007c. Inventory collection results: Thistle Creek, submitted to DFO.
- Cascade Environmental Resource Group Ltd. (Cascade). 2006. Spotted Owl Survey Results, DB6,DB&, 2006, Sea to Sky Highway Improvement Project. Prepared for Hatfield Group Ltd.
- Demarchi, D.A. 1995. Ecoregions of British Columbia, Fourth Edition. BC Ministry of Environment, Lands and Parks, Wildlife Branch, B.C. Map (1:2000000).
- Demarchi, M. W. and M. D., Bently. 2005. Best management practices for raptor conservation during urban and rural land development in British Columbia. Prepared for BC Ministry of Environment.
- Environment Canada. 2011. Canadian Climate Normals 1971-2000. Environment Canada. Ottawa, ON. Retrieved November 28, 2011 from http://climate.weatheroffice.gc.ca/climate_normals).
- Fisheries and Oceans Canada (DFO) Canadian Hydrographic Service. Tides, Currents, and Water Levels. Squamish (station #7811) 7 days Tidal Prediction for November 4. Retrieved November 1, 2011 from <http://www.tides.gc.ca/cgi-bin/tide-shc.cgi?queryType=showFrameset&zone=10&language=english®ion=1&stnnum=7811>
- Green, R.N. and K. Klinka, 1994. Field guide to site identification and interpretation for the Vancouver Forest Region. Land management handbook number 28. BC Ministry of Forests. Victoria, BC, p 20, 78-79.
- Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling and D. Stalker. 1999. Cumulative Effects Assessment Practitioners Guide. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency (CEAA), Hull, Quebec.
- Herrero J. 2000. Wildlife Corridors in the Southern Canmore Region. Prepared for Bow CORD, Bow Valley Naturalists, Canadians for Corridors, Canadian Parks and Wilderness Society and UTSB Research. Document available at http://www.stratalink.com/corridors/wildlife_corridors_report.htm



- Integrated Land Management Bureau (ILMB). iMap BC. Retrieved November 10, 2011 from <http://webmaps.gov.bc.ca>
- Johnston, N.T. and P.A. Slaney. 1996. Fish Habitat Assessment Procedures. Watershed Restoration Technical Circular No. 8, revised April 1996. Watershed Restoration Program, Ministry of Environment, Lands and Parks and Ministry of Forests.
- Malaspina University College. 2006. Riparian Areas Regulation Assessment Methodology – Participant’s Manual. Nanaimo, BC.
- Maxcy, K.A. 2004. Red-legged frog (*Rana aurora aurora*) - Accounts and Measures for Managing Identified Wildlife – Accounts V. 2004. Retrieved January 31, 2012 from http://www.env.gov.bc.ca/wld/frpa/iwms/documents/Amphibians/a_redleggedfrog.pdf
- Mallory, A. 2004. Coastal tailed frog (*Ascaphus truei*) - Accounts and Measures for Managing Identified Wildlife - Accounts V. 2004. Retrieved January 31, 2012 from http://www.env.gov.bc.ca/wld/frpa/iwms/documents/Amphibians/a_coastaltailedfrog.pdf
- Ministry of Environment. 2011. Fisheries Information Summary System, Daisy and Thistle Creek fish species distribution. <http://www.env.gov.bc.ca/fish/fiss/index.html>
- Ministry of Environment. 2006. Provincial Site Series and Map Code List. BC Ministry of Environment. Victoria, BC. (<http://www.env.gov.bc.ca/ecology/tem/list.html>).
- Ministry of Environment, Land and Parks and Ministry of Forests. 1998. Field manual for describing terrestrial ecosystems. Land management handbook number 25. BC Ministry of Environment, Lands, and Parks and BC Ministry of Forests. Victoria, BC.
- Resources Inventory Committee of British Columbia. 1999. Reconnaissance (1:20,000) Fish and Fish Habitat Inventory – Site Card Field Guide. Victoria, BC.
- Resource Inventory Committee (RIC). 1998. Standard for Terrestrial Ecosystem Mapping in British Columbia.
- Squamish Lillooet Regional District. 2011. Electoral Area D Official Community Plan Bylaw No. 495, 1994, Consolidated copy February 2011.
- Thurber Engineering Ltd. 2011. Village at Britannia Beach Interim Geotechnical Assessment. Prepared for Taicheng Development Corporation.
- Squamish Lillooet Regional District. 2011. Electoral Area D Official Community Plan Bylaw No. 495, 1994, Consolidated copy February 2011.



6.0 Appendices

6.1 Riparian Assessment (SPEA width)

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: April 17, 2012

Description of Water bodies involved (number, type)

Reach One, Thistle Creek

Stream	X
Wetland	
Lake	
Ditch	
Number of reaches	2
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel Width(m)		Gradient (%)	
starting point	4.6		I, <u>Mike Nelson</u> , hereby certify that: a) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and d) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
upstream	6.2		
	6.0		
	5.5		
	4.7		
	4.2	low	
downstream	5.1	1	
	4.8	1	
	6.6		
	7.3	high	
	5.5	1	
Total: minus high /low	49		
mean	5.4	1	
	R/P	C/P	S/P
Channel Type	X		

Site Potential Vegetation Type (SPVT)

	Yes	No		
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u> , hereby certify that: a) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and d) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.	
Polygon No:			Method employed if other than TR	
SPVT Type	LC	SH		TR
			X	
Polygon No:				Method employed if other than TR
SPVT Type	LC	SH	TR	
Polygon No:				Method employed if other than TR
SPVT Type	LC	SH	TR	
Polygon No:				Method employed if other than TR
SPVT Type	LC	SH	TR	

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

SPVT Type

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Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	1LB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	16.2						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	16.2						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	16.2	(For ditch use table3-7)					

Segment No:	1RB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	16.2						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	N/A						
		South bank	Yes		No	X	
SPEA maximum	16.2	(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

- a) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;
- b) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;
- c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and
- d) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: April 17, 2012

Description of Water bodies involved (number, type)

Reach two, Thistle Creek

Stream	X
Wetland	
Lake	
Ditch	
Number of reaches	2
Reach #	2

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel Width(m)		Gradient (%)	I, <u>Mike Nelson</u> , hereby certify that: e) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; f) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; g) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and h) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
starting point	4.6		
upstream	4.0	2	
	5.3		
	6.4		
	4.9		
downstream	9.1	5	
	3.6		
	3.6		
	6.3	1	
	5.0		
	5.1		
Total: minus high /low	25.2		
mean	5.0	3	
	R/P	C/P	
Channel Type	X		

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u> , hereby certify that: e) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; f) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; g) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and h) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type			

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	2LB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15.0						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	15.0						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	15.0	(For ditch use table3-7)					

Segment No:	2RB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15.0						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	N/A						
		South bank	Yes		No	X	
SPEA maximum	15.0	(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

- e) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;
- f) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;
- g) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and
- h) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: April 17, 2012

Description of Water bodies involved (number, type)

One, Gravel Creek

Stream	X
Wetland	
Lake	
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel Width(m)		Gradient (%)	
starting point	3.8	1	I, <u>Mike Nelson</u> , hereby certify that: i) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; j) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; k) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and l) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
upstream	5.9	1	
	5.0		
	3.6		
	4.0		
downstream	3.8	9	
	5.3		
	4.9		
	4.4		
	4.8	1	
	3.5		
Total: minus high /low	39.6		
mean	4.4	3	
	R/P	C/P	S/P
Channel Type	X		

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u> , hereby certify that: i) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; j) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; k) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and l) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
Polygon No:	1		Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type			

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Segment No:	1LB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	13.2						
Litter fall and insect drop ZOS (m)	13.2						
Shade ZOS (m) max	13.2						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	13.2	(For ditch use table3-7)					

Segment No:	1RB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	13.2						
Litter fall and insect drop ZOS (m)	13.2						
Shade ZOS (m) max	N/A						
		South bank	Yes		No	X	
SPEA maximum	13.2	(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

i) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;

j) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;

k) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

l) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: April 17, 2012

Description of Water bodies involved (number, type)

One, Unnamed Channel # 1

Stream	X
Wetland	
Lake	
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel Width(m)		Gradient (%)	I, <u>Mike Nelson</u> , hereby certify that: m) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; n) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; o) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and p) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
starting point	3.0	1	
upstream	2.2		
	2.5		
	2.8		
	5.0		
	2.1		
downstream	4.0		
	3.2		
	2.3		
	1.7		
	2.8		
Total: minus high /low	24.9		
mean	2.8		
	R/P	C/P	
Channel Type	X		

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u> , hereby certify that: m) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; n) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; o) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and p) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
Polygon No:	1		Method employed if other than TR
	LC	SH	TR
SPVT Type			X
Polygon No:			Method employed if other than TR
	LC	SH	TR
SPVT Type			
Polygon No:			Method employed if other than TR

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

SPVT Type

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Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	1LB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	10.0						
Litter fall and insect drop ZOS (m)	10.0						
Shade ZOS (m) max	8.4						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes	X	No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	10.0	(For ditch use table3-7)					

Segment No:	1RB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	10.0						
Litter fall and insect drop ZOS (m)	10.0						
Shade ZOS (m) max	N/A						
		South bank	Yes		No	X	
SPEA maximum	10.0	(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

m) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;

n) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;

o) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

p) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: April 16, 2014

Description of Water bodies involved (number, type)

One, Unnamed Channel # 2

Stream	X
Wetland	
Lake	
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel Width(m)		Gradient (%)	
starting point	1.5	1	I, <u>Mike Nelson</u> , hereby certify that: q) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; r) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; s) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and t) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
upstream	1.8		
	1.4	low	
	1.6		
	1.6		
	2.1		
downstream	1.7		
	1.8		
	3.4	high	
	1.7		
	1.7	1	
Total: minus high /low	15.5		
mean	1.7	1	
	R/P	C/P	S/P
Channel Type	X		

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u> , hereby certify that: q) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; r) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; s) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and t) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
Polygon No:	1		Method employed if other than TR
SPVT Type	LC	SH	TR
			X
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	TR
Polygon No:			Method employed if other than TR
SPVT Type			

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	1LB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	10.0						
Litter fall and insect drop ZOS (m)	10.0						
Shade ZOS (m) max	5.1						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes	X	No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	10.0	(For ditch use table3-7)					

Segment No:	1RB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	10.0						
Litter fall and insect drop ZOS (m)	10.0						
Shade ZOS (m) max	N/A						
		South bank	Yes		No	X	
SPEA maximum	10.0	(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

q) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;

r) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;

s) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

t) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: April 16, 2014

Description of Water bodies involved (number, type)

One, Unnamed Pond # 1

Stream	
Wetland	
Lake	X
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel Width(m)		Gradient (%)	
starting point		I, <u>Mike Nelson</u> , hereby certify that: a) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and d) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.	
upstream			
downstream			
Total: minus high /low mean			
	R/P	C/P	S/P
Channel Type			

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u> , hereby certify that: a) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and d) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
Polygon No:	1		Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type			

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	1WNE	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15.0						
Litter fall and insect drop ZOS (m)	15						
Shade ZOS (m) max	N/A						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	15.0	(For ditch use table3-7)					

Segment No:	1S	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15.0						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	30.0						
		South bank	Yes	X	No		
SPEA maximum		(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

- I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;
- I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;
- I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and
- In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: April 16, 2014

Description of Water bodies involved (number, type)

One, Unnamed Wetland # 1

Stream	
Wetland	X
Lake	
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel Width(m)		Gradient (%)	
starting point	high	I, <u>Mike Nelson</u> , hereby certify that: e) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; f) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; g) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and h) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.	
upstream			
downstream			
	low		
Total: minus high /low mean			
	R/P	C/P	S/P
Channel Type			

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u> , hereby certify that: e) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; f) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; g) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and h) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
Polygon No:	1		Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type			

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Segment No:	1ENW	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15.0						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	N/A						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes	X	No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	15.0	(For ditch use table3-7)					

Segment No:	1S	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15.0						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	30.0						
		South bank	Yes	X	No		
SPEA maximum	30.0	(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

e) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;

f) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;

g) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

h) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Zone of Sensitivity (ZOS) and resultant SPEA**Section 2. Results of Riparian Assessment (SPEA width)**

Refer to Chapter 3 of Assessment Methodology

Date: April 14, 2016

Description of Water bodies involved (number, type)

One, Unnamed Pond # 2

Stream	
Wetland	
Lake	X
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel	Width(m)	Gradient (%)
starting point		
upstream		
downstream		
Total: minus high /low mean		
Channel Type	R/P	C/P

I, Mike Nelson, hereby certify that:

i) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;

j) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership ;

k) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

l) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Site Potential Vegetation Type (SPVT)

SPVT Polygons	Yes	No	
			Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes
			I, <u>Mike Nelson</u>, hereby certify that: i) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i>; j) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u>; k) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and l) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
Polygon No:	1		Method employed if other than TR
SPVT Type	LC	SH	TR
			X
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	TR

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Polygon No:		Method employed if other than TR	
SPVT Type			

Segment No:	1ENW	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15						
Litter fall and insect drop ZOS (m)	15						
Shade ZOS (m) max	N/A						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	15.0	(For ditch use table3-7)					

Segment No:	1S	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15.0						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	30.0						
		South bank	Yes	X	No		
SPEA maximum	30.0	(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

i) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;

j) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;

k) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

l) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: April 14, 2016

Description of Water bodies involved (number, type)

One, Unnamed Wetland # 2

Stream	
Wetland	X
Lake	
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel Width(m)		Gradient (%)	
starting point	high	I, <u>Mike Nelson</u> , hereby certify that: m) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; n) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; o) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and p) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.	
upstream			
downstream			
	low		
Total: minus high /low mean			
	R/P	C/P	S/P
Channel Type			

Site Potential Vegetation Type (SPVT)

	Yes	No		
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u> , hereby certify that: m) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; n) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; o) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and p) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.	
Polygon No:	1		Method employed if other than TR	
	LC	SH		TR
SPVT Type			X	
Polygon No:				Method employed if other than TR
	LC	SH	TR	
SPVT Type				

Segment No:	1ENW	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15	FORM 1					
Litter fall and insect drop ZOS (m)	15						
Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report							
Shade ZOS (m) max	n/a	South bank	Yes		No	X	
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)				Man-made, straight, no significant headwaters or springs, uniform width		
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	15.0	(For ditch use table3-7)					

Segment No:	1S	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	15.0						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	30.0						
		South bank	Yes	X	No		
SPEA maximum		(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

m) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;

n) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;

o) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

p) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: Dec 6, 2012

Description of Water bodies involved (number, type)

One, Daisy Creek d/s of Highway

Stream	X
Wetland	
Lake	
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

Channel Width(m)		Gradient (%)		
starting point upstream	5.2	low		I, <u>Mike Nelson</u> , hereby certify that: q) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; r) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; s) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and t) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
	6.9		7	
	6.3			
	8.4			
downstream	9.3	high		
	8.5			
	12.9			
	9.4			
	6.3			
	5.3		4	
	5.7			
Total: minus high /low mean	66.1			
	7.3	5.5		
	R/P	C/P	S/P	
Channel Type		X		

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u>, hereby certify that: q) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i>; r) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u>; s) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and t) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type			

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	1LB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	14.6						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	21.9						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	21.9	(For ditch use table3-7)					

Segment No:	1RB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	14.6						
Litter fall and insect drop ZOS (m)	15.0						
Shade ZOS (m) max	N/A						
		South bank	Yes		No	X	
SPEA maximum	15.0	(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

q) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;

r) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;

s) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

t) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

Section 2. Results of Riparian Assessment (SPEA width)

Refer to Chapter 3 of Assessment Methodology

Date: Dec 6, 2012

Description of Water bodies involved (number, type)

One, Minaty Bay Creek

Stream	X
Wetland	
Lake	
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

	Channel Width(m)		Gradient (%)	
starting point	5.7	High		I, <u>Mike Nelson</u> , hereby certify that: u) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; v) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; w) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and x) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
upstream	2.0	Low		
	3.0			
	2.0		7	
	3.5			
	2.2			
downstream	5.4			
	4.2			
	3.9			
	2.1			
	5.2	h	8	
Total: minus high /low	31.5		7.5	
mean	3.5			
	R/P	C/P	S/P	
Channel Type			X	

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Mike Nelson</u> , hereby certify that: u) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i> ; v) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Live at Squamish Limited Partnership</u> ; w) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and x) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type	LC	SH	
Polygon No:			Method employed if other than TR
SPVT Type			

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	1LB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	10.0						
Litter fall and insect drop ZOS (m)	10.5						
Shade ZOS (m) max	10.5						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					Man-made, straight, no significant headwaters or springs, uniform width	
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	10.5	(For ditch use table3-7)					

Segment No:	2RB	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons					
LWD, Bank and Channel Stability ZOS (m)	10.0						
Litter fall and insect drop ZOS (m)	10.5						
Shade ZOS (m) max	N/A						
		South bank	Yes		No	X	
SPEA maximum	10.5	(For ditch use table3-7)					

I, Mike Nelson, hereby certify that:

u) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;

v) I am qualified to carry out this part of the assessment of the development proposal made by the developer Live at Squamish Limited Partnership;

w) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

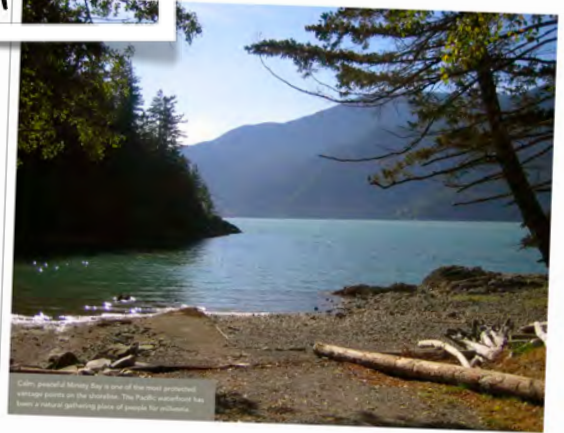
x) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

5 SQUAMISH NATION CULTURE

This section contains a report prepared by Sheryl Fisher who practices as Rivers Consulting Solutions. Ms. Fisher is a member of the Skwxwu7mesh Uxwumixw (Squamish Nation) and has prepared this report to provide context to the history and cultural background of the site. Ms. Fisher has been retained by Taicheng (beginning in December 2014) to assist in consultations with the Skwxwu7mesh Uxwumixw in integrating the historical culture of the site and current interests of Skwxwu7mesh into the development plan.

South Britannia

Squamish Nation Background & Report



By: Sheryl Fisher
Rivers Consulting Solutions

Date: April 12, 2013

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Part 1 - Background



The purpose and direction of this report is; to provide historical and other cultural background on Squamish Nation for the South Britannia property and to present the opportunities for proposed venues within the South Britannia project. Providing first hand knowledge, history gathering, interviews and summarizing findings and providing recommendations and ideas about study area and the relationship to Squamish Nation. Report sections can be analyzed and decisions towards development and collaboration between Taicheng Development Corporation and Squamish Nation can be developed. Also providing Squamish Nation background of culture, history and spirit of South Britannia site specifically. After analyzing all aspects and legacies involved, providing in report form, my personal insights, recommendations & opinion for each section. Any part of the Report imagery or words, can be utilized by Taicheng Development Corporation with full permission from Sheryl Fisher. Also, continued support to enhance the report when required. Each area can be expanded or elaborated where interested. In doing this, we have been able to seek a meaningful expression for the Coast Salish Culture and how to best Educate from start to finish of the project and capturing the true 'Spirit' of Squamish Peoples.



Research & Findings

Interviews

Interviews With Squamish Elders, Historians Archeologists, Community Members & Chiefs/Research & Findings:

In meeting Squamish Nation elders, they mentioned the common history known as Shishayu7ay, a place of ghosts or 'place of screech owls' as stated by late historian, Andy Natrall. It is also a 'place of steelhead', as stated by August Jack. There is also a place name that is south of Britannia Beach (Makin Bowl site included) that is called 'Swakwl' which refers to the common loon in Squamish Language. August Jack stated that the name was applied to a large boulder that was as large as a house, near the water's edge, 400 yards south of the mill. Current interviews with Chiefs and historians also mentioned that it was a place of clay that the weavers would travel to prepare their wool for weaving. It was a transitional place that the Squamish people would stop and stay over while traveling by ocean going canoe. Woven cedar bark mats were permanently placed in there for resting. Elder Gwen Harry shared great insight into future 'Cross-Cultural' educational sharing experiences with songs, dance, art with Chinese, Japanese (Ainu), Hawaiians, Maori and any others along the Pacific Rim area. Archeologist Kevin Rivers confirmed that Rudy Reimer and himself had previously studied the specific site and had no significant findings, mostly broken dishes and old clothing.

Record of Significant Features & Recommendations:

- ☀ Bless the land first and foremost. Could collaborate on traditional Squamish blessing and traditional Chinese blessing to create a custom ceremony in moving forward.
- ☀ The legend of the large boulder at located on site, south of the Britannia Mine could be part of the attraction at the fishing village location. The rocks from the mountain, provide great pits and can be utilized for various creations and integration.
- ☀ The natural clay that was known by the wool weavers to go prepare their wool and pray for ceremonial blankets, regalia and artifacts. Clay art and workshop space could be developed for enhancing the first nations pottery artists and live demonstrations. could be on site.
- ☀ The screeching owls were significant winged owls, believed to have connections and messages from the spirit world. The “Owls In the Village”, similar to the “Eagles & Whales in the City” concept, where individual artists create their own design of screeching owl. This could be done as live demonstrations and integrated throughout the village and sculpture park.
- ☀ The beautiful low level beach landing that was utilized conveniently by the sea-going canoes to land and camp while in transit to villages. Was also a transitional camp during the gold rush days and when the copper was located. This could be featured in the hotel and resort concept of passing through and enjoying the pristine location and unique cultural experience.
- ☀ Ocean Going or race canoes can be carved for live demonstrations, with gatherings and cultural performances celebrated. Perhaps a ‘Clubhouse’ to shelter and house the canoes. Cross Cultural Pacific Rim sharing experiences.
- ☀ Artifacts, maps and old significant documents could also be safely housed in the museum. Traditional children’s games and activities can also be incorporated.
- ☀ The ocean was the source of sustenance and the transportation highway. The natural history of the site can be demonstrated with reference to the Squamish Nation Culture.

☀️ Annual Squamish Nation Amalgamation Days celebration can take place at various venues and sites on July 23rd, each year. This will also educate and bring more people to experience the museum and canoe gatherings.

☀️ Continue to engage the Squamish valley elders for guidance, input and support in moving forward with development and opportunities. They are strong in governance and have even more regard than our Chiefs & Council or any other member of the Nation. They have developed and facilitated many activities and programs, and youth discipline circles, served on council, first female Chief of Squamish Nation, just to name a few. Highlight including being key in starting the National Residential school program, bringing healing ceremonies forward for all the Residential School survivors and facilitating circles. They are truly valuable and a treasure and will bring so much to the new South Britannia Community. They would be lead in providing input for the blessing ceremonies.

☀️ Squamish Valley elder Gwen Harry mentioned that there also needs to be cultural sharing experiences, not just entertainment or performances. There have been many held over the past years and they have been very successful and more valuable she said. They have had exchanges with Chinese, Japanese, Europe, Hawaii, Maori, Guatemala, as well as, multi denominational religious exchanges and hosting many other gatherings. This has always been important for them to engage in.

Squamish History in Region

Skwxwu7mesh Uxwumixw



The Skwxwu7mesh Uxwumixw will protect the Amalgamation and enhance the Uxwumixw cultural values and traditions through respect, equality and harmony for all. The Squamish are a Coast Salish Nation, are an ocean going people whose sturdy cedar dugout canoes were carved by stone chisels and knives. Their artisans weaved intricate designs in mountain goat wool and made unique cedar bark baskets. They also carved Sel'seltn (spindle whorls), house posts and welcome figures using designs that are distinctly Coast Salish form-lines and style.

Historical Squamish



Sea-Going Canoe builders



Squamish children playing



Traditional longhouse in
Kitsilano



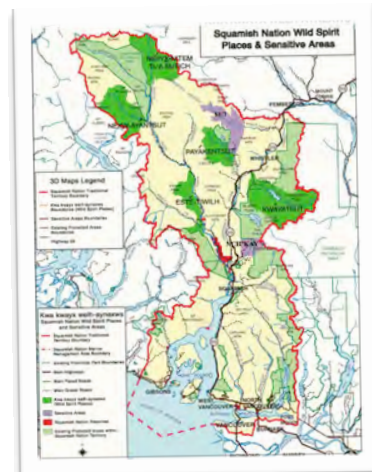
Hereditary Chiefs from 16 Villages



Amalgamation Signing
July 23, 1923



Squamish Thunderbird Logo
designed by Stan Joseph Jr.



Squamish Traditional Territory
Map with Wild Spirit Places

Current Culture

Regalia

Squamish use wool woven regalia, cedar regalia and velvet because velvet is the closest looking to seal skin. We still practise our traditions creating regalia that have been practised since time immemorial. We are proud of our culture and history. Cedar woven hats or wool woven headbands are worn as well, they also assisted with weather protection



Songs & Dances

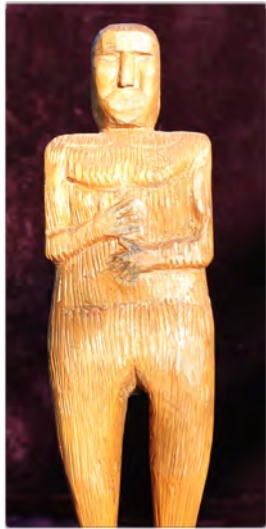
Squamish stelmelx thrive in sharing our songs and dances for various events, ceremonies and purposes. Songs honour animals, rites of passage, sacred and celebratory reasons. Some can be shared publicly and others are only practised privately and no recordings or cameras are allowed to be out. Songs are done to pray and raise cedar carvings or bless canoes. They are a part of our everyday lives today and will continue for future generations.

Gatherings

Many events take place for canoe gatherings and are magnificent when 100's of sea-going or race canoes are gathered for travels or races. They are traditionally carved by one cedar tree and the Squamish 'Ka'7hulh' is 45 feet in length and was mainly carved by master canoe builder, Cedric Billy. Her first journey in 1993 was to paddle to Bella Bella, BC for the first revival of sea-going canoes. Today, she participates on annual canoe gatherings and "Protect the Salish Sea" event. We also gather in the longhouse, Chief Joe Mathias Centre and Totem Hall for various events and ceremonies. Whenever there is a great reason and good food, Squamish will gladly participate. Cross cultural protocol agreements have been made with local First Nations, Maori & Hawaii of the Pacific Rim area as well. Many international cultural exchanges have taken place over the past 50 years, with Squamish traveling abroad. Artists have been commissioned to create welcome figures, doors and other art throughout the world, also sharing our culture through songs, story telling and teaching the art to others.

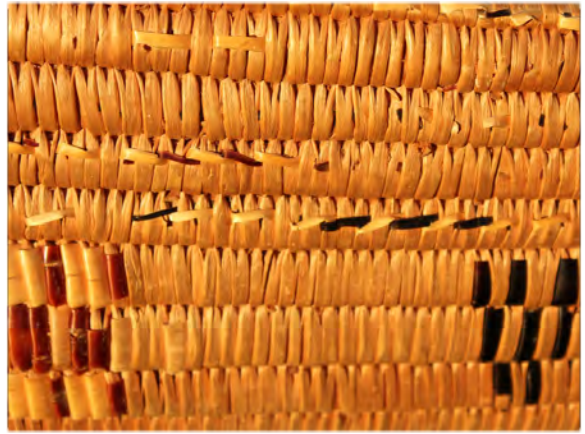


Historical Art & Artifacts



Chief

Carving by Khahtsahlano, August Jack, early 1900's



Baby Cradle

Cedar woven cradle with designs representing elements of life, made in 1950's



Chief Khahtsahlano

Self portrait, signed 1912.
Chief's head



Goat Wool Woven Blankets

Squamish Chiefs, 1906 on their way to England to meet King Edward VII wearing traditional regalia, North Vancouver, British Columbia

Current Art Community



Modern Regalia portrayal at
Squamish Lil'wat Cultural
Centre



Cedar Eagle 25 foot installation
at Squamish Gaming Centre



Gateway to Ancient Wisdom
made of cedar and steel



Painting on cedar at Chief Joe
Mathias Centre



Welcome Canoe and sign for
Mosquito Creek Marina



Welcome figure made of old
growth cedar tree



Modern welcome figure on city
street in North Vancouver



Bronze spindle whorl inlaid to
concrete benches on Spirit Trail



Steel and brick sculpture
depicting legend and bricks
representing cedar basket



Part Two - Opportunities For Cultural Integration

Approaches for Discovery Centre & Coast Salish Museum

- ☑ Showcase for Coast Salish Culture & the natural history of the region.
- ☑ Scope of programs can feature children's games, activities and drawing to have a hands on approach that would also interest adults.
- ☑ Storytellers & cultural performers and exchanges can enhance the visit or experience
- ☑ Squamish family heirlooms such as maps, significant documents and artifacts can be safely housed and shared for all visitors to see.
- ☑ Target visitors are primarily tourists, schools/children, families and local residents
- ☑ Britannia is a located along the Cultural Journey map, ending at the Squamish Lil'wat Cultural Centre. There is already a beautiful kiosk in the shape of Squamish traditional cedar woven hat, with some history provided. This can be built upon to enhance the 'Spirit' of the site.
- ☑ The niche from Squamish Lil'wat Cultural Centre would be the historical artifacts that would be gathered & housed at the museum/centre. They are

primarily 'New & Commissioned' pieces. We could be 'Old and Historical' in the artifacts and documents inside, along with, new and contemporary pieces.

☑ The natural history of rock, mountains, water, cedar, clay, wool, owls, transient & legends can be interactive in exhibits, demonstrations, events, food, theatre, permanent collections, traveling exhibits & support.

☑ Special dinners and celebrations can take place, carving demonstrations, flora and fauna displays and presentations, lectures and films, guided tours in the museum, trails and in Howe Sound can be provided by the Squamish Nation 'Ambassadors'.

☑ Keep the Squamish Nation elders from Squamish valley engaged for guidance, advice, support and ceremonial direction when required and needed.

Additional Comments

Inventory of collections could come from personal collections or Squamish people and Nation, as well as, West Vancouver community. There is also an opportunity through working with Chief Janice George to house repatriated artifacts from around the world. Contemporary and traditional art and artifacts can be featured in the museum, along with historical maps and significant documents. The connection of clay, wool, cedar, rock, fish & marine life can be tied directly to Shishayu7ay village and enhanced in the museum and aquarium. Children's interactive displays can be incorporated through Squamish games, songs, art and activities which can involve the Skomish Valley Education Department of Squamish Nation. Having already created coloring pages, legend books, puppet cutouts, and other children's arts & crafts activities, specifically about Squamish Nation, as well as, curriculum for the Schools in Squamish District. There are so many resources to access and build upon through various areas of Construction & Trades, Security, Retail, Art, Performance, Employment, Cultural, Historical, Entrepreneurial, just to identify a few.



Events Plaza

The first ceremony to take place, should be the integrated blessing ceremony before breaking ground to ensure a spiritual and cultural connection to the land, life and future development. Providing a assembly space for ceramics and weavings with kilns and looms provided to artists to utilize. An outdoor shed and carving room could provide large enough space for artist demonstrations of canoes, welcome figures, Owls in the Village and other creations. Perhaps, artist in residence spaces to allow for collaborations with other Aboriginals or even Chinese artists, sharing cultures. Theatre and Aboriginal performances of all genres can be highlighted. Interactive dancing, carving, drawing, weaving, storytelling & participating in ceremonies for the visitors to experience. Bone game competitions, parade of nations and other events connected to Squamish Nation can be promoted. Activities featured by 1 artist/performer to hundreds can be the spectrum of events. Cross cultural exchanges can be shared and witnessed by passersby. Once again, many activities can be created or developed enhancing the experience for all.

Oceanfront Promenade Venues

A Coast Salish restaurant, featuring traditional seafoods, berries and local menu can be featured along the oceanfront promenade. The Wilderness hotel, capturing the Salish Spirit and Squamish history, marketed for the transitional experience and capturing the core Squamish cultural experience while staying there. This would enhance the tourists experience and leave a memorable imprint. Having the cultural facility can also feature smoking salmon traditionally for visitors to watch and learn, with plants and berries growing to visualize the preparation of the menus. Retail opportunities for Coast Salish Artists could be provided, with artist demonstrations also featured along the promenade. Ocean Going Canoe ventures can be offered for added cultural experience, great teaching and lessons come from pulling together as one in a canoe.



Building upon the cultural bridge that was just revealed in the entrance of Squamish, BC. A similar or more unique cultural bridge could be developed across the train tracks in Britannia, allowing a personal journey through and accessing the waterfront and promenade. Ideas from Folio were shared, such as the Olympic Sculpture Park in Seattle, with the grande scale of sculptures and bridge. Also, ideas of utilizing glass and lighting to feature art. Creating something new and innovative, while staying true to the Sustainable aspect.



The Marina can be enhanced by housing the ‘Canoe Clubhouse’ and berths for the ocean-going canoes, tours and interactive journeys can be provided throughout the summer. This would also naturally beautify the Marina, celebrating the canoes that were traditionally the cars of our ancestors. Today the Squamish Nation are owners of two Marinas in North Vancouver and Mosquito Creek Marina currently provides the Clubhouse.



Spirit Trail

Similar to the Spirit Trail on the Squamish Mission IR #1 Reserve, the Britannia promenade could be enhanced through telling stories and educating at the same time. Having various artist mediums throughout and having local plants used for medicines featured along the Spirit Trail journey. Storytellers or performers can enhance the journey along the Spirit Trail. Having interpretive guided tours/walks, sharing history, culture and legends of celebrating points of interest along the way. Artist demonstrations could also take place along the Spirit Trail. Having themed events could also be featured.



Cedar Figures Display Park

Cedar Welcome Figures, Coast Salish style could feature the various artists and depict legends. They were protectors and would welcome visitors to our place. They can weather through time and continue to tell the story for generations. In collaborating with Folio, ideas were shared about the Display Park would be the focal point for Cedar Figures collection. This could be old, historical one that maybe acquired to newly commissioned pieces. This would be staying true to the grand scope of legends and stories, along with the natural environment of the land. While educating Squamish lineage. Can be similar to the Stanley Park Totem Pole area that draws many tourists for photo opportunities as well.



Public Realm Art

Traditional and contemporary art can be created by various mediums such as wood, glass, metal, wool, cedar bark, clay. Also created in various sizes and shapes, artists have worked with engineers to ensure safety of larger installations. Manhole coverings or bench decorations can be created by bronze and incorporate our spindle whorl designs and legends. The decorated “Owls in the Village” can be designed by individual artists, including Chinese artists and displayed, creating a very distinct and unique visual. Ideas shared by Folio also stay true to the mediums, shapes and styles of Squamish Artists by using various methods and sizes of Public Art. Focusing mainly on contemporary pieces, in contrast with the historical artifacts in the museum. Manholes, benches, on buildings, entrances, bridge, trails and any other public art pieces that can be incorporated throughout the whole site.



Public Realm Art



Ambleside Beach

Carved by Xwalacktun, Rick Harry, representing the 'Two Sisters' legend, commissioned by District of West Vancouver



Marine Drive, North Vancouver

Carved by Jody Broomfield, series of salmon along sidewalk, commissioned by City of North Vancouver



Athletes Village, Vancouver

Carved by Wade Baker, all steel Canadian maple leaf
commissioned by VANOC



Spirit Trail, North Vancouver

Carved by Wade Baker, titled "Gateway to Ancient Wisdom",
commissioned by City of North Vancouver

Cultural Journey

Enhancing the Cultural Journey Experience

Squamish Nation and the Province of BC collaborated on the Sea to Sky Cultural Journey route from Horseshoe Bay to Whistler. Ending at the Squamish Lil'wat Cultural Centre. Kiosks were individually situated at various points of interest, providing history and information of the Squamish peoples. Place names in Squamish language are featured on the main signs, alongside the english place names. Paddle kilometer markers are also featured



Britannia Point of Interest

Building upon this journey, the waterfront and museum/aquarium could integrate this into engaging a stopover by passing tourists.



Conclusion

Summary

There were many resources and people to reference and gather information on the site specifically. There is so many directions to take the information to move forward with on developing the new village. Each area can be explored even further if decided. Squamish people have a unique history and story to share with the world, they have always been known to be hospitable, innovative and inclusive. These values and brand can be integrated in any aspect of the development and building of the project. Added that we have always been protectors of the land, it fits well with the Sustainability component of the project as well. Respecting the grandmother earth and father sky has always been key to making decisions for future generations to enjoy and continue to practise. Looking at the grandness of the scale of legends of the Xays brothers transforming Squamish people into mountains, rocks and other land forms, as well as, the size of animals in many legends are larger than dinosaurs in scale can be considered in developing nodes/buildings or activities/events. Making the village of South Britannia a holistic, sustainable & cultural community, fitting the values and traditions of Squamish Nation.

Next Steps

- * Community Information Sessions in Squamish and North Vancouver
- * Meet with Chiefs & Council after to present outcomes
- * Engage Squamish membership and artists, skilled industry specific members and department heads with potential cultural, contract/employment opportunities
- * Continue to gather history and facts about South Britannia Site
- * Delve further into each area to develop and collaborate
- * Continue to research museums, cultural centres, marinas, children's interactive concepts, retail opportunities, artist opportunities & any other.
- * Look at cross cultural immersion/education opportunities
- * Continue engaging the Squamish Nation Squamish Valley elders for ideas and guidance in moving forward. Including how to go about doing the Squamish Nation blessing of the site.
- * Continue meeting with Councillors, Dale Harry and Joshua Joseph from Squamish Valley. Chiefs, Bill Williams, Ian Campbell and Gibby Jacob in updating and reporting or seeking advice in moving forward with project.
- * Any other collaborations/ideas shared by both parties, as this is the first of its kind to be ventured with a Proprietor & First Nation. Needs to be documented each and every step.
- * I would also like to include video and images of Community meetings or significant events taking place for archival or promotional material.

Bibliography

Author Last Name, First Name. "Reference Title." City: Publisher, Date.

Matthews, Major J.S. "Conversations with Khahtsahlano 1932-1954." City of Vancouver Archivist: 1955.

Committee, Lands and Resources, Squamish Nation. "Xay Temixw Land Use Plan." First Draft: May, 2001.

Squamish Nation, Land Use and Occupancy. "Discussion: Place Names 61-104 (Horshoe Bay & Shannon Falls to Roberts Creek)." Pages 440 & 441. North Vancouver: Unknown.

Kwa Kwayx Welh-Aynexws. "Squamish Nation Wild Spirit Places & Sensitive Areas" map. North

Squamish Nation. "Squamish Nation First Nation Traditional Territory" map. North Vancouver, BC: unknown

Squamish Nation. Website, "www.squamish.net". North Vancouver, BC: revised website April 11, 2013. Images used on cover page (logo), pages 7, 8, 11 & 13.

Squamish/Lil'wat Cultural Centre. Website, "slcc.ca". Whistler, BC: 2012. Images used on pages 19 & 22.

Sheryl Fisher. Photo Images pages 9, 10, 11, 12, 15, 17, 18, 19, 20 & 21.

Artists: Xwalacktun/Rick Harry, Jody Broomfield, Wade Baker, Aaron Nelson-Moody, Squamish Ocean Canoe Society, Cedric Billy, Alroy Baker, Stan Joseph Jr., Lillian Rivers & Sheryl Fisher

Interviewees: Elder Audrey Rivers, Elder Gwen Harry, Elder Alana Andrew, Elder Shirley Toman, Chief Janice George, Chief Bill Williams, Chief Ian Campbell, Councillor Dale Harry, Weaver-Willard Joseph, Historian-Aaron Joseph, Archeologist-Kevin Rivers, Tom Harry and Henry Williams. Squamish BC & North Vancouver BC: 2013

6 PHASE 1 GEOTECHNICAL AND HAZARD

This section contains a preliminary geotechnical and hazards review prepared by Thurber Engineering in February 2012. The report summarizes their preliminary findings in respect of the following:

- Geologic conditions
- Slope stability
- Debris flow potential
- Road layout and construction
- Waterfront development
- Water supply dams on Britannia Ck

This section contains two reports by Thurber Engineering Ltd. The 2012 report is a general overview of geotechnical conditions and debris hazard potential. The 2016 report is an assessment of debris flow hazard potential with preliminary recommendations for mitigation. Note that Turje's engineering summary and associated drawings have provided an alternative mitigation that more practically addresses site conditions.

Tiger Bay subsequently retained SFA Geotechnical Engineering Ltd of Squamish to complete a test pit excavation program and prepare a geotechnical assessment report that is included in the next section of this document.

MAKIN PROPERTY, BRITANNIA BEACH, B.C.

**ENVIRONMENTAL
AND
GEOTECHNICAL ASSESSMENT**

Report

to

CAMPBELL SAUNDERS LTD.

Thurber Environmental Consultants Ltd.
Vancouver, BC

File: 19-2435-0
Date: October 21, 1996

D. Smith, P.Eng.
Project Principal

J. DeCesare, Ph.D.
Senior Environmental Scientist

D. Newton, P.Geo.
Project Geologist

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APPENDICES

A DRAWINGS

19-2435-0-1	Location Plan
19-2435-0-2	Site Plan
19-2435-0-3	Monitor Well and Surface Water Sample Locations

B MONITOR WELL LOGS

C GROUNDWATER ANALYTICAL RESULTS

D LEGAL DESCRIPTION OF SITE

1. INTRODUCTION

This report presents a geotechnical and environmental assessment of the Makin Property near Britannia Beach, south of Squamish, B.C. The assessment is intended to assist in the evaluation of the property.

The study was authorized by Mr. D. Gray of Campbell Saunders Ltd. and has been carried out in general accordance with our proposal of June 20, 1996 except that, as requested by Mr. Gray, the site investigation originally proposed for the second phase of study has been carried out as part of the first phase.

Use of this report is subject to the enclosed Statement of General Conditions.

2. SITE DESCRIPTION

The site, which encompasses 197 ha, is located on the east shore of Howe Sound, approximately 45 km north of Vancouver and immediately south of Britannia Beach, as shown on the location plan, Dwg. 19-2435-0-1. A 1:25000 scale site plan showing the property limits is presented on Dwg. 19-2435-0-2. The property boundaries shown on Dwg. 19-2435-0-2 and -3 are taken from the site plan in the Royal LePage Consulting Services appraisal report of January 31, 1995 for the subject property. The legal descriptions of the 12 parcels which make up the site are given in Appendix D. The legal description is also based on information provided in the Royal LePage appraisal report.

The site is bounded by the Britannia Beach townsite and former Britannia Mine to the north and northeast, forested area to the east, the Furry Creek development to the south and Howe Sound on the western boundary. The majority of the property is located east of Highway 99. Rights-of-way for the B.C. Rail line and B.C Hydro transmission lines traverse the property. Two mountain streams, Thistle and Daisy Creeks flow through the site and

discharge into Howe Sound. Site elevations across the property vary from sea level to El. 340 m.

3. SITE HISTORY

3.1 Information Reviewed

A historical review of landuse and activities on the subject site and surrounding properties was compiled based on the following:

- Air photographs.
- File information and reports by Thurber Environmental Consultants Ltd. (TECL) and Thurber Engineering Ltd. (TEL). TECL and TEL have conducted environmental and geotechnical investigations on the Britannia and Furry Creek lands adjoining the site.
- B.C. Ministry of Energy, Mines and Petroleum Resources' reports.
- B.C. Ministry of Environmental, Lands and Parks' reports.
- Review of reports from other consultants.
- Discussions with people familiar with the site and surrounding area.

3.2 Airphoto Analysis

Airphotos from 1947, 1957, 1969, 1976, 1982 and 1990 were reviewed to identify prior landuses and activities on the site. The key features revealed on the photos were development of a gravel mining operation and the presence of a townsite on the subject property. Gravel extraction was carried out in the area formed by the loop in Highway 99 (see Dwg. 19-2435-0-2) and on the northern portion of the property surrounding and north of Thistle Creek. A townsite was located east of

Minaty Bay in the western part of the loop in the Highway. Several of the homes were located on the west side of Highway 99 near Thistle Creek. Our analysis of the air photos is presented below.

1947 Townsite is visible but Highway 99 has not been constructed. No gravel mining is visible.

1957 Townsite has about 40 residences. Several of the larger buildings are visible along Highway 99 which has been built by this time. Gravel mining has been undertaken at the east end of the loop and northern boundary of the property. A conveyor belt from the north pit over Highway 99 to a barge loading facility along Howe Sound is visible. Several buildings are located on both sides of Highway 99 adjacent to the conveyor belt.

1969 Townsite is visible. In general, all areas north of Thistle Creek and from the Highway to where the slope steepens to the east, have been mined by this time. The conveyor belt and associated buildings over Highway 99 are still visible.

1976 Basically the same as 1969 except mining has expanded south of Thistle Creek and into an area to the east of the townsite (within the Highway loop). A large culvert for vehicle access has been installed under Highway 99, connecting the mine area to the east of the townsite to the larger northern pit. The conveyor belt and associated buildings are no longer present.

1982 It appears that most or all houses from the townsite have been demolished although roads and former house lots are still visible. The former gravel operation to east of the townsite appears overgrown. Significant portions of the main pit are also overgrown.

1990 Townsite is largely overgrown. Some gravel mining has taken place since 1982 in the area east of the former townsite, near Thistle Creek and at the north end of the property.

No evidence of any mine workings associated with the former Britannia Mine, such as adit portals, open pits, waste rock piles, camps or dumps were observed within the property limits on any of the photos.

Anecdotal information from several people familiar with the site confirmed the above findings.

3.3 Off-Site Contaminant Sources

Located directly north and northeast of the subject site, the Britannia Mine operated from 1905 to 1974. Ore was extracted from mine workings comprising approximately 80 km of underground workings and four open pits. Primary access to the underground mine workings was via portals at the 2200 (El. 640 m.), 2700 (El. 470 m) and 4100 (El. 60 m) levels. Portal elevations in feet are identified relative to mean sea level at 4300 feet with decreasing mining level signifying increasing elevation. Elevations in metres are geodetic with El. 0 m at mean sea level or mining level 4300. Major portals are shown and identified on Dwg. 19-2435-0-2. The 4100 portal is the closest to the subject property, with the other mine workings being relatively remote.

Milling facilities to process the ore to produce copper, zinc and pyrite concentrates were located at Britannia Beach.

The principal environmental and contaminant concerns associated with the mine is the generation of acid rock drainage (ARD). ARD is initiated by surface water infiltration from the Jane Basin into the underground workings, subsequent oxidation of naturally occurring sulphide minerals and generation of sulphuric acid. ARD is characterized by low pH and high metal (primarily copper, zinc and iron) concentrations. The principal

receptor for ARD is Britannia Creek and Howe Sound. The main ARD releases are:

- Drainage from the 2200 portal into Jane Creek, which flows into Britannia Creek.
- Drainage from the 4100 portal which collects the vast majority of ARD within the underground workings. This drainage is discharged to Howe Sound via a deep outfall if copper concentrations are below 15 mg/L or directed to a copper cementation plant if copper concentrations exceed 15 mg/L. Treated ARD is then directed to the outfall.
- Direct discharge to Howe Sound via the underground workings which extended below sea level.
- Minor ARD contributions from the 2700 portal into Mineral and Britannia Creeks and discharge from waste rock dumps. These also discharge into Britannia Creek.

Mine workings were also located in the Furry Creek Valley. These works included the Victoria Camp, a portal at 1800 level (El. 760 m), associated adits and waste rock dumps. To date, only one ARD discharge point has been identified, the β -portal at El. 1000 m (1000 level), immediately west of Empress Creek, approximately 7 km upstream of the mouth of Furry Creek. Sampling and analysis of Furry Creek revealed no measurable impact on creek water quality from this ARD source.

In summary, no mine workings or direct ARD discharges onto the subject property were identified.

4. FIELD PROGRAM

4.1 Site Reconnaissance

An initial site reconnaissance was conducted by Dr. J. DeCesare, Ph.D. and Mr. D. Hill, P.Eng. of TEL on June 21, 1996. A second reconnaissance was undertaken by Mr. D. Newton, P.Geo. of TEL on July 23 during the site investigation program described in Section 4.2.

4.2 Monitoring Well Installation and Sampling

A preliminary field program was undertaken to evaluate groundwater and surface water quality on the site. Monitor well locations, shown on Dwg. 19-2435-0-3, were selected to detect any contamination of groundwater resulting from seepage and ground infiltration of ARD, most likely from the 4100 level where the majority of ARD is collected. The settling ponds located below the treatment plant are an additional potential source of ARD seepage.

Three monitor wells were installed on July 23, 1996 using a truck-mounted Becker Hammer drill. All holes were drilled to 7.3 m with open casing. A closed end Becker Penetration Test was also completed at MW 96-3.

Soil conditions were logged during drilling and representative samples were collected at regular intervals for routine visual classification and moisture content determination in the laboratory.

Monitor wells were installed in the open casing. The annulus between the casing and the well was backfilled with silica sand to above the screened section and sealed with bentonite. Wells were developed by removing 5 well volumes with a Waterra inertial pump and purged to constant conductivity readings prior to sampling on August 2, 1996.

Samples for metals were filtered using Waterra (Model FHT-700) in-line 0.45 micron filters. Nitric acid was added in the field to preserve the samples prior to placement in a chilled cooler for transport to Cantest Laboratories. Samples were submitted to the laboratory with accompanying chain of custody documentation.

4.3 Surface Water Sampling

Sample station locations on Thistle and Daisy Creeks are shown on Dwg. 19-2435-0-2. Sample locations were determined based on accessibility and flow conditions.

Samples were collected by immersing the container directly into the stream. Sample locations in Thistle and Daisy were limited by water conditions in the creeks during the sampling program on August 2, 1996. Thistle Creek was dry approximately 150 to 200 m east of Highway 99. Sample "Thistle 1" was collected 30 m upstream of the termination of surface flow. The sample station was located approximately 30 m downstream of a derelict bridge along the gravel road which connects the former gravel mine with the former townsite via the culvert below Highway 99.

Samples "Thistle 2" and Daisy 2" were collected 10 m above the BC Hydro right-of-way. Daisy Creek had surface water flow across the Hydro right-of-way at which point it became dry. Surface water was observed again from 30 m above to 60 m downstream of the Highway 99 crossing. "Daisy 1" was collected approximately 50 m below the highway. Daisy Creek was dry the remaining distance to its discharge point into Howe Sound. Conductivity and pH measurements were made in the field.

5. RESULTS OF FIELD PROGRAM

5.1 Site Reconnaissance

The southern portion and the eastern half of the north portion of the property are largely steeply sloping, rocky and forested land. These areas are accessible by passable and overgrown gravel roads associated with past logging and powerline construction activities. No evidence of mine workings, tailings ponds, dumps or hazardous materials was noted in these areas during the reconnaissance.

Overgrown asphaltic concrete and gravel roadways, above ground powerlines and localized clearings were noted in the area of the former townsite immediately east of Minaty Bay. In addition, the former foundations of several residence were visible. The former townsite is largely overgrown. No evidence of above or below ground tanks were noted. Household debris (ie. bathtubs, plastic, lumber) was noted locally. Minaty Bay is currently being used for recreation (ie. swimming).

The former gravel mining operation in the north portion of the property is largely flat with local mounds and is largely overgrown with shrubs. Approximately 70 to 100 loads of soil have been dumped in the north end of the property near MWs 96-2 and 96-3. The piles comprise varying proportions of silt, sand, gravel, cobbles and boulders with occasional asphaltic concrete fragments and rarely debris (ie. plastic pipe, wood). Some metal slag and debris was noted in approximately 5 to 10 truck loads near MW 96-3.

A 7,000 to 12,000 m³ stockpile of gravel, cobbles and boulders with some sand and occasional silt and asphaltic concrete is located in the northern portion of the pit near MW 96-1. Some cobbles and boulders are oxidized and appear to contain trace levels of sulphide minerals. This material was reportedly removed from Britannia Creek following the flood of 1993.

Two empty and one partially full 220 L drums of Jet B aviation fuel are stored in the centre of the pit. We understand that this area is being used by a local helicopter company to refuel on-site while working in the vicinity. Only minor surface staining was observed near the drums.

5.2 Soil Conditions

Generalized descriptions of the soil conditions encountered are given below. The 3 test hole logs in Appendix A provide detailed descriptions of the soil conditions encountered in the investigation and should be used in preference to the generalized descriptions.

The 3 test holes encountered sand with varying gravel and silt content for the entire 7.3 m depth of investigation. A Becker Penetration Test completed in MW 96-3 indicated the soils are loose to compact in the upper 3.5 m, but dense below. The shallow soils at all three well locations have likely been disturbed during past mining operations but the contact between fill and native soils was not readily apparent.

No staining, suspect odours or mining residues (tailings, waste rock) were noted in any of the holes.

5.3 Groundwater Levels

Groundwater depths ranged from 2.9 to 3.6 m below ground surface in the three wells. No sheen or odour was noted during development or sampling of wells.

5.4 Groundwater and Surface Water Quality

5.4.1 Data Evaluation Criteria

Groundwater and surface water analytical results were evaluated by comparison to marine aquatic life criteria stipulated in the "Approved &

Working Criteria For Water Quality, Ministry of Environment, Water Management Division, Water Quality Branch, May, 1992" and to "Canadian Water Quality Guidelines for Protection of Community Water Supplies (Revised December 1995)". Marine criteria are considered the appropriate aquatic life evaluation criteria because groundwater and surface water (Daisy and Thistle Creeks) discharge to Howe Sound, a salt water body.

5.4.2 Groundwater Quality

Analytical results for monitor well samples are presented in Table 1. Groundwater is characterized as follows:

- pH is near neutral, with values of 6.6 and 6.7. ARD pH values measured at Britannia Mine are typically in the 3 to 4 range.
- Conductivity readings of 25 to 104 us/cm are very low compared to a typical ARD value of 1000 to 3000 us/cm.
- Dissolved copper and zinc concentrations of 2 to 4 ppb and 9 to 13 ppb respectively are considered background levels. For comparison, Cu and Zn ARD values are in the range of 20 to 100 ppm for Cu and 40 to 60 ppm range for Zn.
- All dissolved metals concentrations are below marine aquatic life and drinking water criteria.

The above results indicate that there is no measurable impact of ARD on groundwater quality.

Examination of the purge water and samples revealed no evidence of hydrocarbon contamination such as sheens or odours. Light and heavy extractable petroleum hydrocarbon (LEPH/HEPH) concentrations were below the 1 mg/L detection limit.

5.4.3 Surface Water Quality

Analytical results are summarized in Tables 2 and 3. Examination of the data reveals the following:

- pH values in Daisy Creek are nominally below the 6.5 freshwater aquatic life criterion stipulated in the Canadian Water Quality Guidelines. Thistle Creek values are nominally below the guideline at the upstream end and above the guideline at the downstream sample station. Low pH values are characteristic of creeks flowing into Howe Sound (Percival et al, 1992)¹
- All total metal concentrations are below both aquatic life and drinking water criteria. These results suggest no discernible impact of ARD on water quality in these creeks. These results are in agreement with prior studies by the Ministry of Environment and others, which detected no elevated metal concentrations in Thistle and Daisy Creeks.
- Dissolved anion and nutrient concentrations are very low and well below applicable criteria. Upstream and downstream values are essentially identical.
- Bacteriological results for total and fecal coliforms exceed the corresponding guidelines of no fecal and less than 10 total coliform organisms per 100 mL. Bacterial pollution of these streams is likely a result of the combined effect of low stream flow and fouling by local wildlife. Disinfection would be required to produce drinking water of acceptable quality.

¹For references, see Section 9.

6. GEOTECHNICAL ASSESSMENT

6.1 Gravel Reserves

As described in Section 5.1, gravel mining operations have left a largely flat area, at Highway 99 level along the foreshore, with one large stockpile and several mounds of primarily granular material left on the pit floor. Therefore, the gravel reserves are negligible without one or both of the following actions:

- Lowering of the pit floor to below the foreshore level of the Highway. The site investigation results reported in Section 5.2 show the pit floor to be underlain by at least 7 m of granular material with the groundwater table at about 3 m depth in mid-summer. Thus, providing there is no significant seasonal rise in the groundwater table, which would have to be shown by continued monitoring of the wells, and basements are not contemplated for the development, a further 1 to 2 m of gravel could be removed. This would provide about 150,000 to 200,000 m³ of granular material assuming an average depth of 1.5 m is excavated from the base of the previously mined areas.
- Realignment of Highway 99 to eliminate the loop on the descent to Britannia Beach. The Highway is currently located on a gravel ridge which would become available if the alignment is moved to the east side of the pit and is built as a side hill cut-and-fill. This is currently under study by McElhanney Consulting Services Ltd. Assuming none of the gravel underlying the existing Highway is utilized for the revised alignment, a further 150,000 m³ is estimated to be available.

6.2 Debris Flow and Flooding Hazards

6.2.1 General

The 1983 study by Thurber Consultants Ltd. for the BC Ministry of Transportation and Highways concluded that Thistle and Daisy Creeks have a low debris flow hazard. Additional field and office studies were carried out in 1987 for Makin Pulp and Paper Ltd. The results of these studies are summarized below.

6.2.2 Thistle Creek

Thistle Creek is a stream with a drainage area of 1.6 km², channel length of 2.8 km and a total vertical relief of approximately 800 m. Its maximum instantaneous flood discharge with a 200 year return period has been estimated as 20.6 m³/s.

The stream originates on the western slopes of the Coast Mountains in an area of relatively moderate relief. The upper watershed is formed by bedrock covered by thin soil veneer. It is overgrown by mature, second growth, coniferous forest.

Deposition of debris by the creek appears to occur in two main areas, separated by a bedrock exposure. The lower deposition area coincides with the eastern margin of the gravel pit. The upper deposition area, identified on airphotos, is on a bench upstream of the power line and first waterfall.

There is evidence of occasional avulsion of the creek channel near the power line, producing flood flows in distributary channels to the south of the main channel.

If a debris flow were to occur on Thistle Creek, much of it would deposit on the bench in the vicinity of the power line and none is expected to

reach Highway 99 or the railway. Thus, no development restrictions need apply below El. 30 m as regards debris flow.

The channel for Thistle Creek though the gravel pit has been excavated approximately 6 m wide and 3 m deep, with 2 m high marginal dykes of loose sand and gravel. This channel cross-section is probably sufficient to carry the 200 year flood discharge for a short time, but may be subject to extremely rapid bank erosion and slumping, which could lead to an avulsion to either the north or south side of the channel and flooding of the adjacent areas. Flooding could also result from flow constriction at the existing Highway 99 and railway culverts.

6.2.3 Daisy Creek

The channel of Daisy Creek, at least up to the old Britannia Mine water supply pipeline, is well incised and stable. One point exists where channel overflow to the south could occur and this is in a sharp bend approximately 50 m upstream of Highway 99. Downstream of the Highway, the channel is cut in erodible sand and gravel and potentially unstable, although there are few signs that flood overflow has occurred since the Highway was built.

If a debris flow were to occur on Daisy Creek, most of the debris would be deposited within 50 m uphill and downhill of the Highway embankment. Some run-out may occur along the Creek channel for a further 150 m. Development restrictions should apply to this areas.

Daisy Creek could cause flooding as a result of channel overflow to the left upstream of the Highway, overflow to the right in the event of the Highway culvert being plugged by time or other debris and general overflow on the flat part of the site downstream of the Highway. Most of the flat area south of Thistle Creek must therefore be considered subject to potential flooding from Daisy Creek.

7. CONCLUSIONS

The principal findings of the study completed to date are as follows:

- Landuse on the subject site comprised a gravel mining operation and residential community. A reconnaissance of the property revealed no significant contaminant concerns. Because of the high water table, it is likely that fuel storage tanks for home heating would have been installed above ground.
- The former Britannia Mine is located to the north and northeast of the property. Based on a review of available reports and records and anecdotal information, it is concluded that no mine workings were located on the subject site. The conclusion is supported by a site reconnaissance which uncovered no evidence of mine workings such as adits and waste rock dumps or a mine camp.
- Surface water flow and drainage around the former mine workings is principally into the Britannia Creek catchment. A minor ARD discharge to the Furry Creek via the β -portal at El. 1000 m has been identified. No direct ARD drainage onto the subject property has been identified.
- No groundwater contamination by metals or petroleum hydrocarbons was identified. Groundwater sampling and analysis at the north-western portion of the site detected no evidence of groundwater deterioration by ARD. All dissolved metal concentrations were essentially at background levels and within marine aquatic life and drinking water guidelines.
- Surface water quality for metals and anions in Thistle and Daisy Creeks which flow through the site was within corresponding marine life and drinking water/fresh water aquatic life criteria.

- Bacteriological tests revealed the presence of fecal coliforms and total coliforms which exceed the drinking water guidelines. Elevated bacterial counts are likely the results of low stream flow and wildlife fouling of the stream.
- Geotechnical hazards on the property are derived from potential debris flows on Thistle and Daisy Creeks and flooding caused by the Creeks. These hazards will change if the Highway 99 alignment is revised. Remedial measures to minimize the risk to the property are feasible.
- Gravel reserves on the property are negligible unless the pit floor is lowered close to the water table, or Highway 99 is realigned to the east to allow the gravel ridge on which it is now located to be excavated.

8. RECOMMENDATIONS

No further soil or groundwater investigation is considered warranted based on the preliminary field investigation results. If any contaminant issues are encountered during site development, an environmental consultant should be retained to evaluate the concerns and identify appropriate action.

9. REFERENCES

Goyotte, D. and Ferguson, K. 1985. Environmental Assessment of the Britannia Mine - Howe Sound. File Report. Department of the Environment, Environmental Protection Services Pacific Region North Vancouver, BC.

Moore, B. 1984. Anaconda Britannia Mines, Copper Beach Estates. AE-2194. Receiving Environment Study. Prepared for Waste Management Branch, Ministry of Environment Surrey, BC.

Percival, J.B., Murdock A., Hall, G.E.M., and Dunn, C.E. Geochemical studies in the Howe Sound drainage basin, British Columbia. Current Research, Part A; Geological Survey of Canada, 1992.

Thurber Consultants Ltd. Debris Torrent and Flooding Hazards, Highway 99, Howe Sound. Report to BC Ministry of Transportation and Highways, April 1983.

DRAFT

STATEMENT OF GENERAL CONDITIONS

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering or environmental consulting practices in this area. No other warranty, expressed or implied, is made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorized use of the Report.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgemental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

(see over...)

Table 1

ANALYTICAL RESULTS FOR MONITOR WELLS

	MW 96-1	MW 96-2	MW 96-3	Marine Aquatic Life Criteria	Drinking Water Criteria
pH	6.7	6.6	6.7		6.5 - 8.5
Conductivity	25	104	45		
Hardness	12.5	57.7	20.8		
Aluminum	111	82	107		200
Arsenic	0.2	0.2	<0.1	36	25
Barium	<10	10	<10	500	1000
Beryllium	<5	<5	<5	100	
Cadmium	<0.2	0.3	<0.2	9	5
Chromium	<1	<1	<1	50	50
Cobalt	<20	<20	<20		
Copper	4	3	2	3	1000
Iron	60	30	70	300	300
Lead	<1	<1	<1	2	10
Manganese	12	24	48	100	50
Mercury	<0.05	<0.05	<0.05	20	1
Molybdenum	<30	<30	<30		
Nickel	<20	<20	<20	75	
Selenium	<0.5	<0.5	<0.5	54	10
Silver	<0.1	<0.1	<0.1	2.3	
Sodium	2	6	4		200
Vanadium	<30	<30	<30		
Zinc	9	13	9	86	5000

All results in ppb except sodium (mg/L)
 pH and conductivity measured in the field
 Conductivity (uS\cm)

* Criterion dependent on pH

** Criterion dependent on hardness

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Table 2

THISTLE AND DAISY CREEKS - METALS

	DAISY 1		DAISY 2		THISTLE 1		THISTLE 2		Marine Aquatic Life Criteria	Drinking Water Criteria
	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total		
METAL										
Aluminum	34	35	53	52	46	133	54	87	36	200
Arsenic	0.1	0.1	0.1	0.1	<0.1	0.1	<0.1	<0.1	25	25
Barium	<10	<10	<10	<10	<10	<10	<10	<10	500	1000
Beryllium	<5	<5	<5	<5	<5	<5	<5	<5	100	
Cadmium	0.7	0.9	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	9	5
Chromium	<1	<1	<1	<1	<1	<1	<1	<1	50	50
Cobalt	<20	<20	<20	<20	<20	<20	<20	<20		
Copper	1	1	1	1	1	1	1	1	3	1000
Iron	<30	<30	<30	<30	<30	<30	<30	30	300	300
Lead	<1	<1	<1	<1	<1	<1	<1	<1	2	10
Manganese	<5	<5	<5	<5	<5	<5	<5	<5	100	50
Mercury	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	20	1
Molybdenum	<30	<30	<30	<30	<30	<30	<30	<30		
Nickel	<20	<20	<20	<20	<20	<20	<20	<20	75	
Selenium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	54	10
Silver	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.3	
Sodium	<2	<2	<2	<2	<2	<2	<2	<2		<200
Vanadium	<30	<30	<30	<30	<30	<30	<30	<30		
Zinc	<5	8	6	<5	11	<5	9	<5	86	5000

All results in ppb except for sodium (mg/L)

* Criterion dependent on pH

** Criterion dependent on hardness

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Table 3

THISTLE AND DAISY CREEKS - PHYSICAL AND ORGANIC PARAMETERS

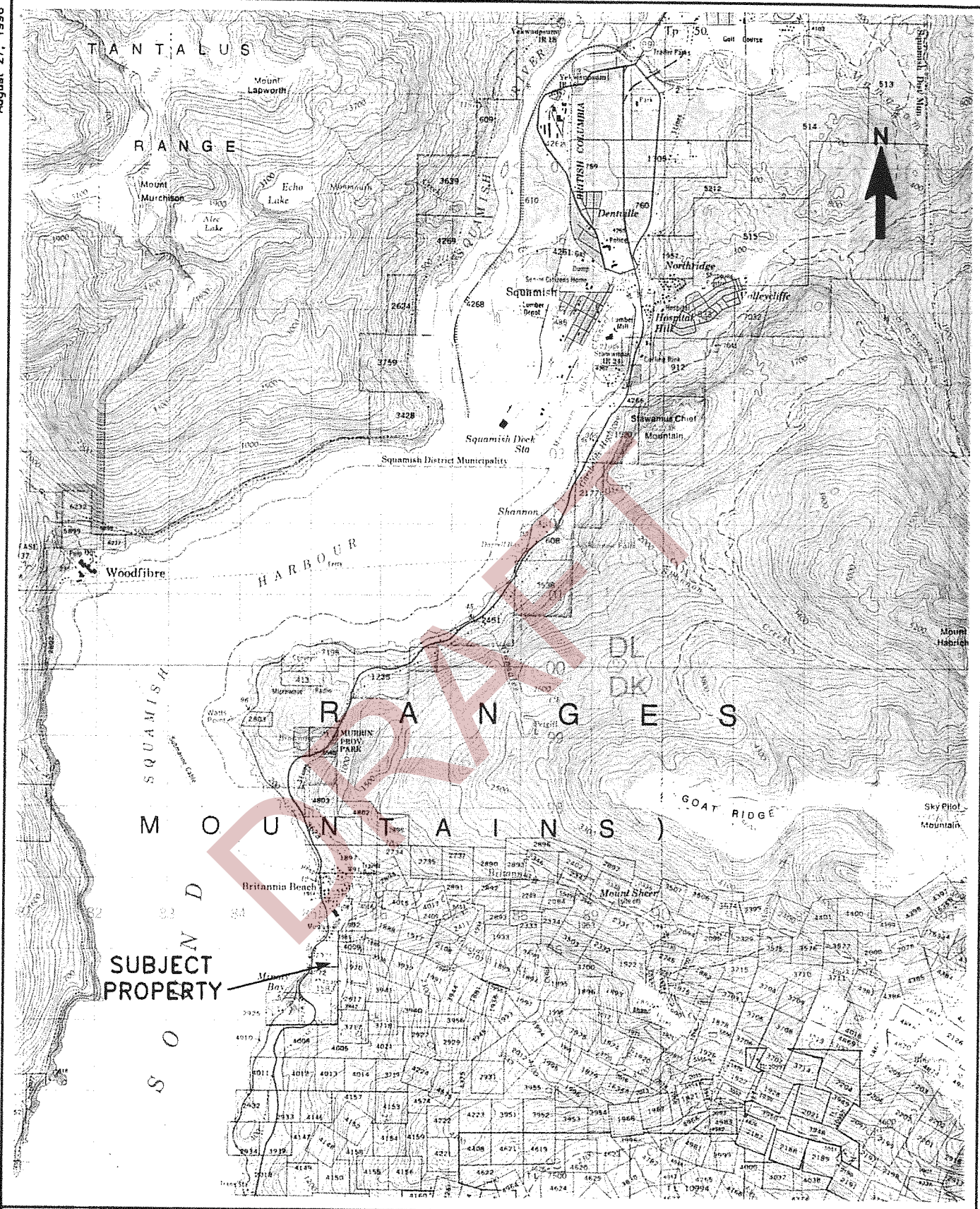
	DAISY 1	DAISY 2	THISTLE 1	THISTLE 2	Marine Aquatic Life Criteria	Drinking Water Criteria
Physical Tests						
Colour CU	<5.0	<5.0	5.9	<5.0		
Conductivity (uS/cm)	33.8	32.8	71.2	74.2		
Total Dissolved Solids	25	25	48	44		
Hardness (CaCO ₃)	11.9	11.7	32.6	33.9		
pH	6.0	6.3	6.7	6.4	6.5 - 9	6.5 - 8.5
Turbidity (NTU)	0.1	<0.1	0.2	0.1		
Dissolved Anions (mg/L)						
Alkalinity - Total (CaCO ₃)	8.6	8.2	26.7	27.6		
Chloride Cl	0.6	<0.5	<0.5	<0.5		250
Fluoride F	0.03	0.03	0.03	<0.02	1500	1500
Sulphate SO ₄	4.2	4.1	6	6.1		500
Nutrients						
Nitrite/Nitrate (as N, mg/L)	0.31	0.287	0.124	0.071		10000
Bacteriological Tests (CFU/100mL)						
Coliform Bacteria - Fecal	4	3	68	4		0
Coliform Bacteria - Total	18	50	240	47		<10

- pH and conductivity measured in the field

CFU - Colony Forming Units

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August 27, 1996

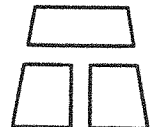


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DRAWN	KM
DATE	August 27, 1996
APPROVED	
SCALE	1:75,000

Campbell Saunders Ltd.

LOCATION PLAN

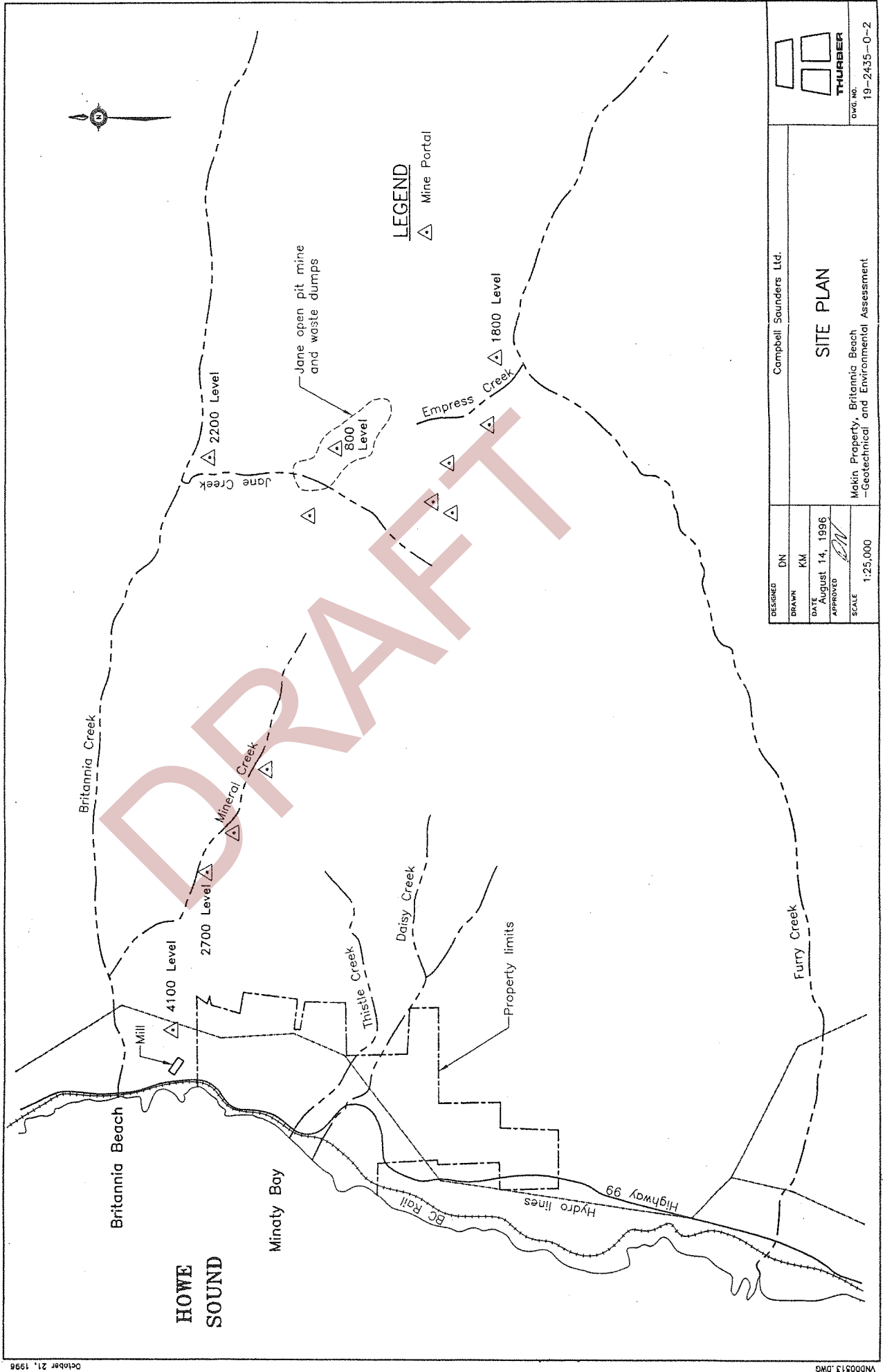
Makin Property, Britannia Beach
-Geotechnical and Environmental Assessment



THURBER

DWG. NO.
19-2435-0-1

19-2435-0-1.DWG

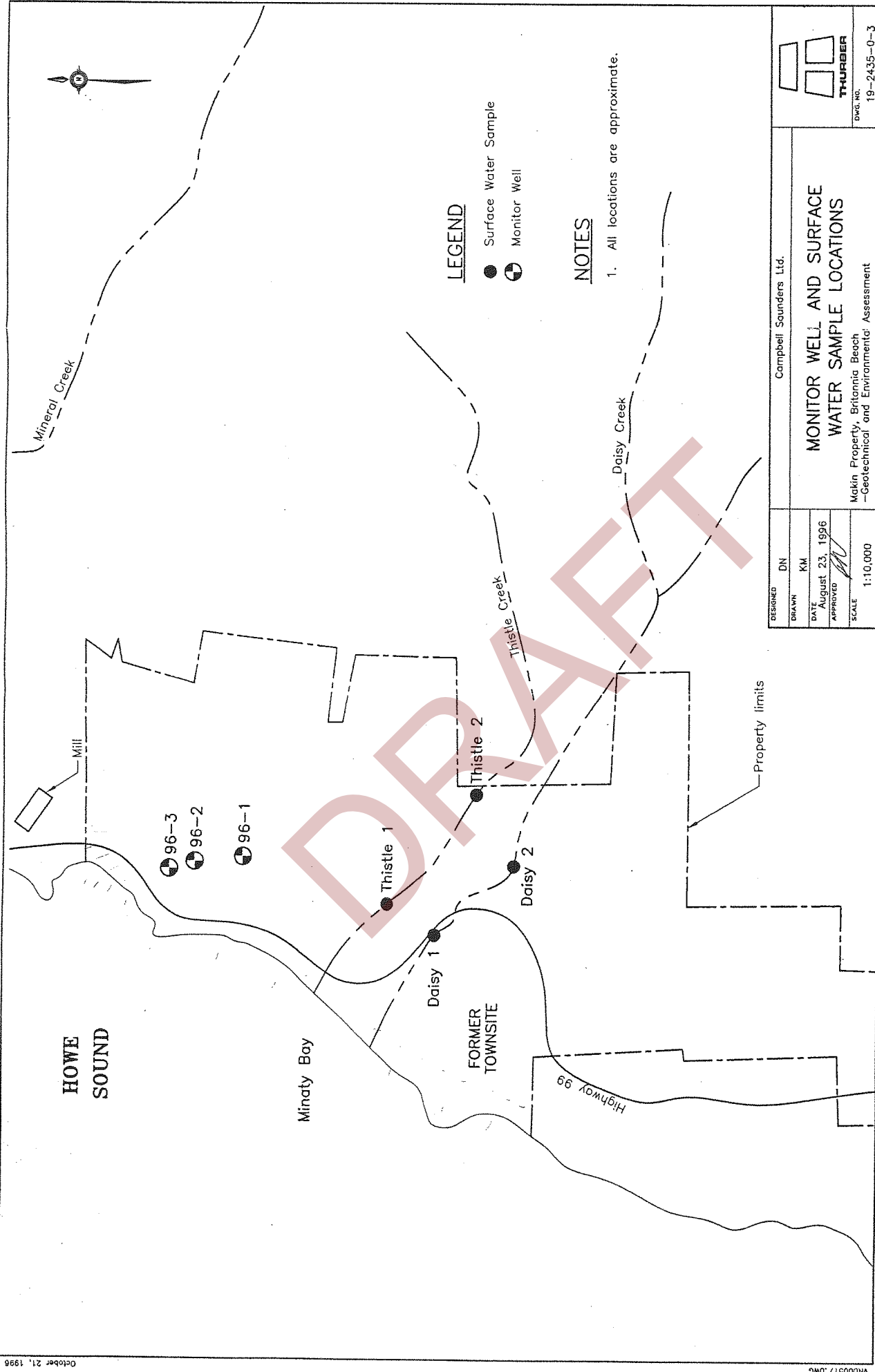


DESIGNED	DN
DRAWN	KM
DATE	August 14, 1996
APPROVED	<i>DN</i>
SCALE	1:25,000

Campbell Saunders Ltd.

SITE PLAN

Makin Property, Britannia Beach
-Geotechnical and Environmental Assessment



DESIGNED		DN	 Campbell Saunders Ltd. THURBER DWG. NO. 19-2435-0-3
DRAWN		KM	
DATE		August 23, 1996	
APPROVED			
SCALE		1:10,000	

**MONITOR WELL AND SURFACE
WATER SAMPLE LOCATIONS**

Makin Property, Britannia Beach
-Geotechnical and Environmental Assessment

LOG OF TEST HOLE

TEST HOLE NO.

96-1

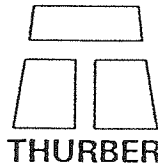
LOCATION: See Dwg. 19-2435-0-3

TOP OF HOLE ELEV:

METHOD: Becker Hammer

DRILLING CO.: SDS Drilling

INSPECTOR: DN



CLIENT: Campbell Saunders Ltd.

PROJECT: Makin Property

Brittania Beach, BC

DATE: July 23, 1996

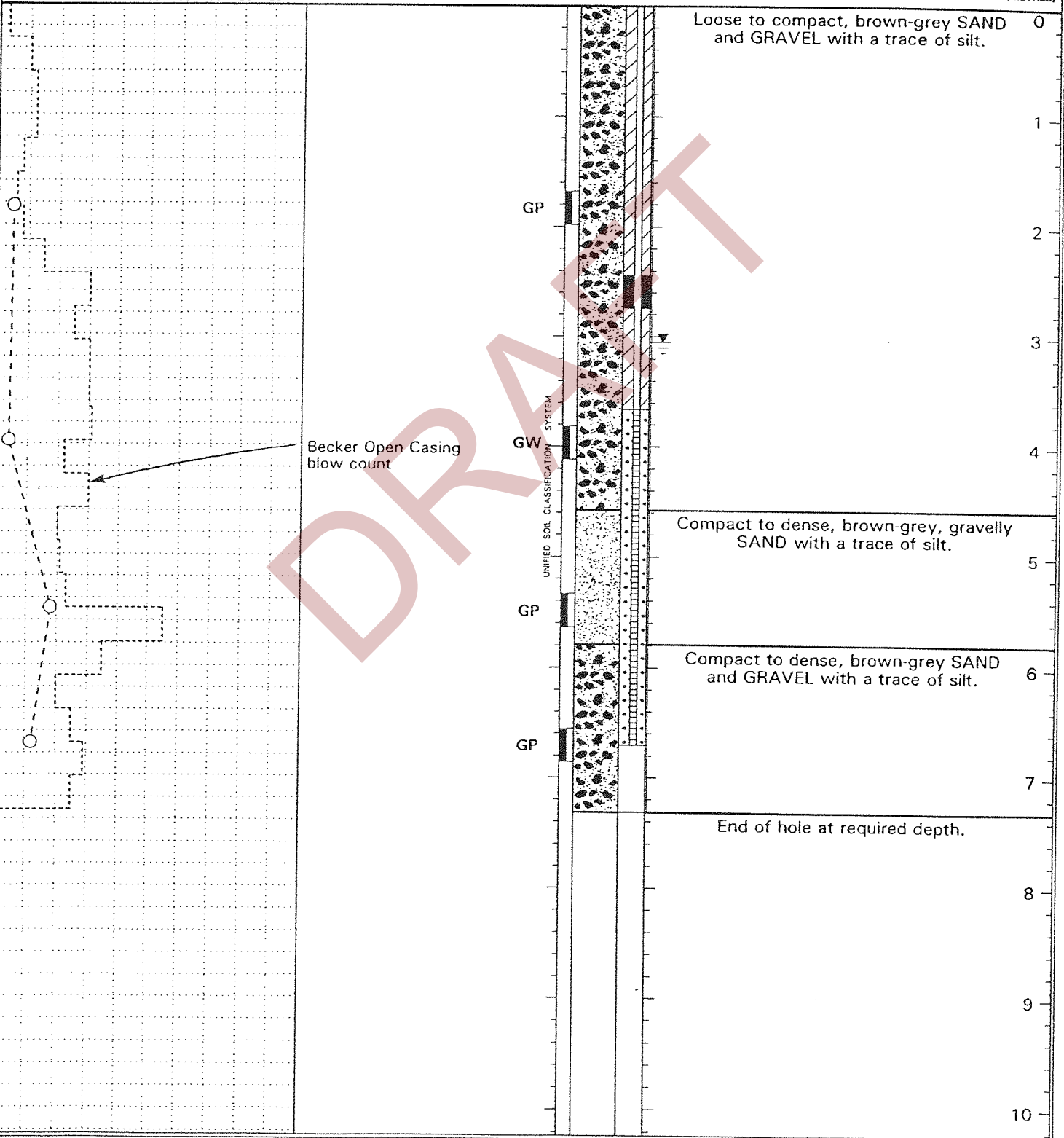
FILE NO.: 19-2435-0

SCALE: 1:50

PENETRATION (blows per 300 mm)	WATER CONTENT (%)	WATER LEVEL Plastic Liquid	SAMPLES	UNDRAINED SHEAR STRENGTH (kPa)	GRAIN SIZE (%)
	○ Disturbed ● Undisturbed	Limit Limit	□ Disturbed ■ Undisturbed ⊗ No recovery	◆ Peak ◇ Residual	▲ Passing #200 sieve △ Passing #4 sieve

SOILS DESCRIPTION

DEPTH
(METRES)



LOG OF TEST HOLE

TEST HOLE NO.

96-2

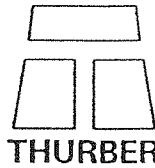
LOCATION: See Dwg. 19-2435-0-3

TOP OF HOLE ELEV:

METHOD: Becker Hammer

DRILLING CO.: SDS Drilling

INSPECTOR: DN



CLIENT: Campbell Saunders Ltd.

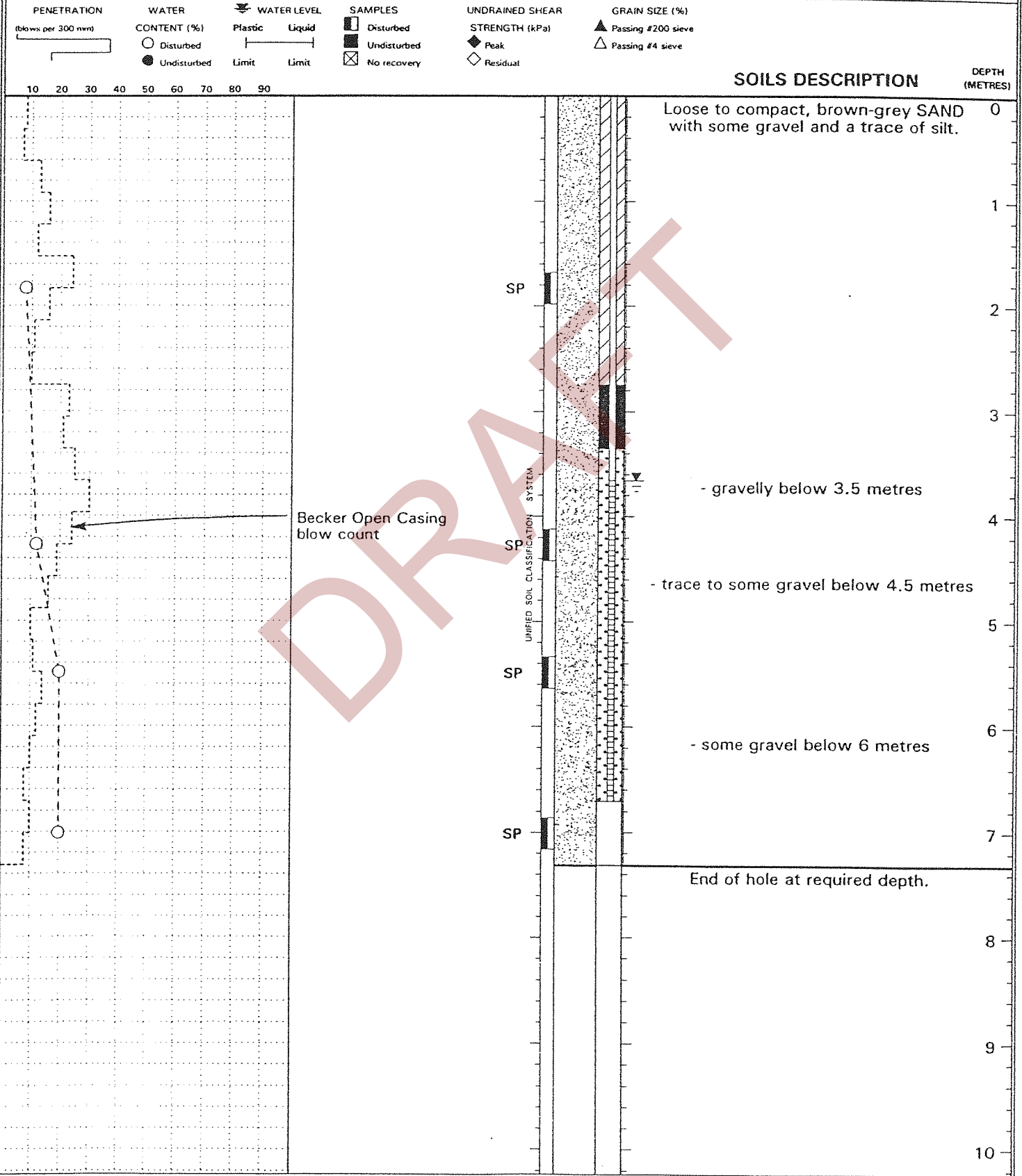
PROJECT: Makin Property

Brittania Beach, BC

DATE: July 23, 1996

FILE NO.: 19-2435-0

SCALE: 1:50



LOG OF TEST HOLE

TEST HOLE NO.
96-3

LOCATION: See Dwg. 19-2435-0-3

CLIENT: Campbell Saunders Ltd.

PROJECT: Makin Property

Brittania Beach, BC

TOP OF HOLE ELEV:

METHOD: Becker Hammer

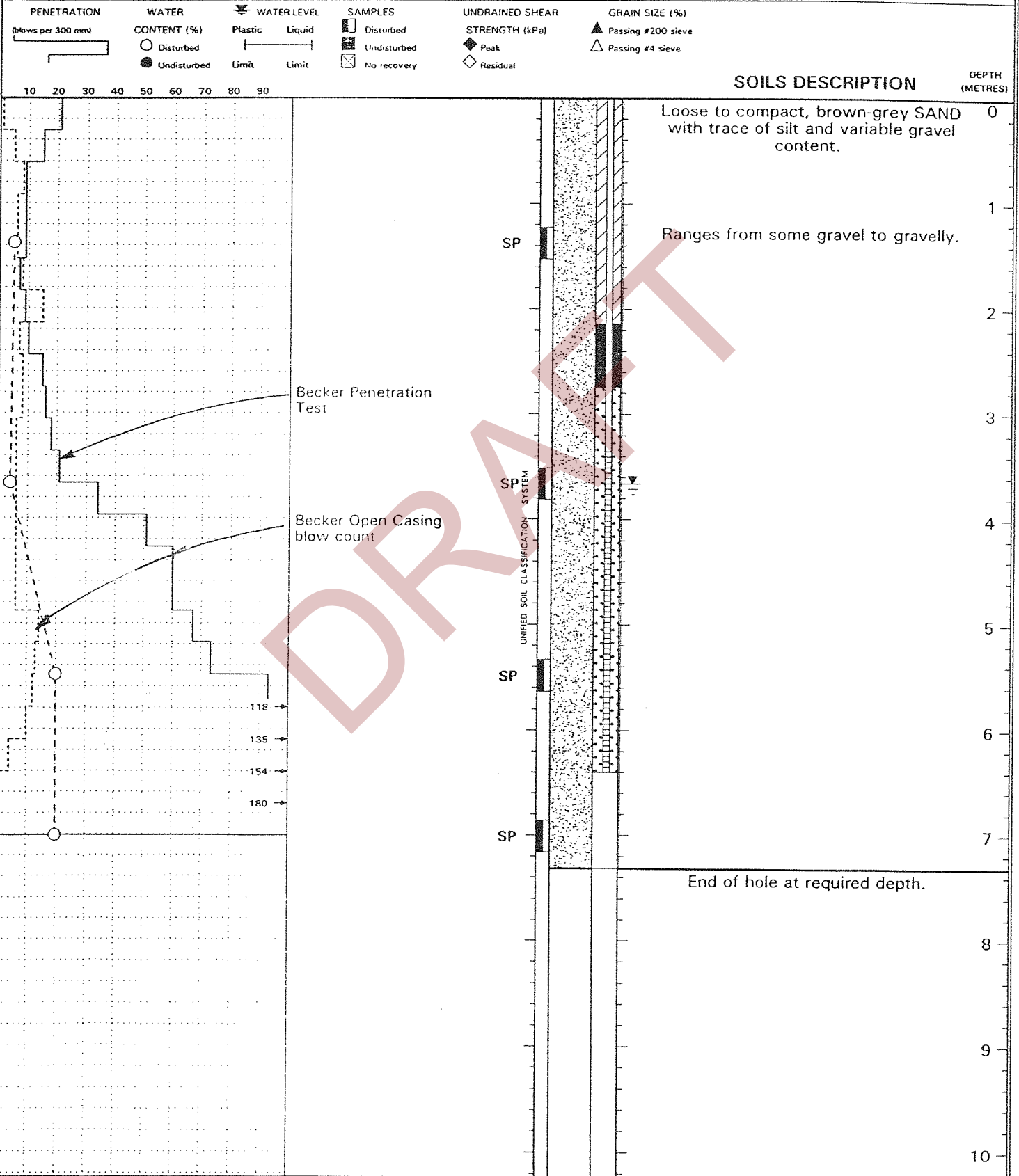
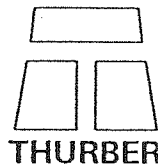
DATE: July 23, 1996

DRILLING CO.: SDS Drilling

FILE NO.: 19-2435-0

SCALE: 1:50

INSPECTOR: DN





CHEMICAL ANALYSIS REPORT

Date: August 16, 1996

ASL File No. G3745

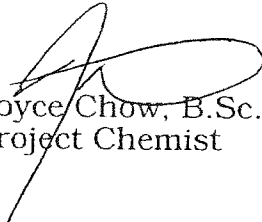
Report On: 19-2435-0 Water Analysis

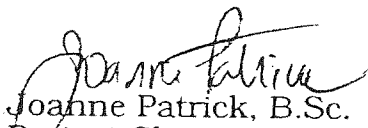
Report To: **Thurber Env. Consultants Ltd.**
200 - 1445 West Georgia Street
Vancouver, BC
V6G 2T3

Attention: **Dr. John De Cesare**, Senior Environmental Scientist

Received: August 2, 1996

ASL ANALYTICAL SERVICE LABORATORIES LTD.
per:


Joyce Chow, B.Sc.
Project Chemist


Joanne Patrick, B.Sc.
Project Chemist



REMARKS

File No. G3745

Please note that from our laboratory analysis of the water, it was determined that the concentration of some dissolved metals exceeds the concentration of the total metals within a given sample. The cause of this is generally due to the following factors: 1) filter contamination in the field during sample collection, 2) contamination during transport, or 3) analytical variability.

DRAFT



RESULTS OF ANALYSIS - Water

File No. G3745

	96-1	96-2	96-3	Daisy 1	Daisy 2
	96 08 02	96 08 02	96 08 02	96 08 02	96 08 02
Physical Tests					
Colour CU	-	-	-	<5.0	<5.0
Conductivity (umhos/cm)	-	-	-	33.8	32.8
Total Dissolved Solids	-	-	-	33	30
Hardness CaCO3	12.5	57.7	20.8	11.9	11.7
pH	-	-	-	6.80	6.80
Turbidity (NTU)	-	-	-	0.1	<0.1
Dissolved Anions					
Alkalinity - Total CaCO3	-	-	-	8.6	8.2
Chloride Cl	-	-	-	0.6	<0.5
Fluoride F	-	-	-	0.03	0.03
Sulphate SO4	-	-	-	4.2	4.1
Nutrients					
Nitrite/Nitrate Nitrogen N	-	-	-	0.310	0.287
Bacteriological Tests					
Coliform Bacteria - Fecal	-	-	-	4	3
Coliform Bacteria - Total	-	-	-	18	50

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH,

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



RESULTS OF ANALYSIS - Water

File No. G3745

Daisy 1

Daisy 2

96 08 02

96 08 02

Total Metals

Aluminum	T-Al	0.035	0.052
Arsenic	T-As	0.0001	0.0001
Barium	T-Ba	<0.01	<0.01
Beryllium	T-Be	<0.005	<0.005
Boron	T-B	<0.1	<0.1
Cadmium	T-Cd	0.0009	0.0002
Calcium	T-Ca	4.09	4.11
Chromium	T-Cr	<0.001	<0.001
Cobalt	T-Co	<0.02	<0.02
Copper	T-Cu	0.001	0.001
Iron	T-Fe	<0.03	<0.03
Lead	T-Pb	<0.001	<0.001
Lithium	T-Li	<0.02	<0.02
Magnesium	T-Mg	0.411	0.383
Manganese	T-Mn	<0.005	<0.005
Mercury	T-Hg	<0.00005	<0.00005
Molybdenum	T-Mo	<0.03	<0.03
Nickel	T-Ni	<0.02	<0.02
Potassium	T-K	<2	<2
Selenium	T-Se	<0.0005	<0.0005
Silver	T-Ag	<0.0001	<0.0001
Sodium	T-Na	<2	<2
Vanadium	T-V	<0.03	<0.03
Zinc	T-Zn	0.008	<0.005

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH.

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).

**RESULTS OF ANALYSIS - Water**

File No. G3745

		96-1	96-2	96-3	Daisy 1	Daisy 2
		96 08 02	96 08 02	96 08 02	96 08 02	96 08 02
Dissolved Metals						
Aluminum	D-Al	0.111	0.082	0.107	0.034	0.053
Arsenic	D-As	0.0002	0.0002	<0.0001	0.0001	0.0001
Barium	D-Ba	<0.01	0.01	<0.01	<0.01	<0.01
Beryllium	D-Be	<0.005	<0.005	<0.005	<0.005	<0.005
Boron	D-B	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	D-Cd	<0.0002	0.0003	<0.0002	0.0007	<0.0002
Calcium	D-Ca	4.04	15.6	6.13	4.12	4.08
Chromium	D-Cr	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	D-Co	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	D-Cu	0.004	0.003	0.002	0.001	0.001
Iron	D-Fe	0.06	0.03	0.07	<0.03	<0.03
Lead	D-Pb	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	D-Li	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	D-Mg	0.584	4.57	1.32	0.387	0.375
Manganese	D-Mn	0.012	0.024	0.048	<0.005	<0.005
Mercury	D-Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	D-Mo	<0.03	<0.03	<0.03	<0.03	<0.03
Nickel	D-Ni	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	D-Se	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Silver	D-Ag	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	D-Na	2	6	4	<2	<2
Vanadium	D-V	<0.03	<0.03	<0.03	<0.03	<0.03
Zinc	D-Zn	0.009	0.013	0.009	<0.005	0.006
Extractables						
EPH (C10-18)		<1.0	<1.0	-	-	-
EPH (C19-31)		<1.0	<1.0	-	-	-
Total Extr Hydrocarbons (C10-30)		<1.0	<1.0	-	-	-

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH.

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



RESULTS OF ANALYSIS - Water

File No. G3745

		Thistle 1	Thistle 2
		96 08 02	96 08 02
<u>Physical Tests</u>			
Colour	CU	5.9	<5.0
Conductivity (umhos/cm)		71.2	74.2
Total Dissolved Solids		48	44
Hardness	CaCO3	32.6	33.9
pH		7.10	7.16
Turbidity (NTU)		0.2	0.1
<u>Dissolved Anions</u>			
Alkalinity - Total	CaCO3	26.7	27.6
Chloride	Cl	<0.5	<0.5
Fluoride	F	0.03	<0.02
Sulphate	SO4	6.0	6.1
<u>Nutrients</u>			
Nitrite/Nitrate Nitrogen	N	0.124	0.071
<u>Bacteriological Tests</u>			
Coliform Bacteria - Fecal		68	4
Coliform Bacteria - Total		240	47

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH,

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



RESULTS OF ANALYSIS - Water

File No. G3745

		Thistle 1	Thistle 2
		96 08 02	96 08 02
Total Metals			
Aluminum	T-Al	0.133	0.087
Arsenic	T-As	0.0001	0.0001
Barium	T-Ba	<0.01	<0.01
Beryllium	T-Be	<0.005	<0.005
Boron	T-B	<0.1	<0.1
Cadmium	T-Cd	<0.0002	<0.0002
Calcium	T-Ca	12.0	12.9
Chromium	T-Cr	<0.001	<0.001
Cobalt	T-Co	<0.02	<0.02
Copper	T-Cu	0.001	0.001
Iron	T-Fe	<0.03	0.03
Lead	T-Pb	<0.001	<0.001
Lithium	T-Li	<0.02	<0.02
Magnesium	T-Mg	0.557	0.538
Manganese	T-Mn	<0.005	<0.005
Mercury	T-Hg	<0.00005	<0.00005
Molybdenum	T-Mo	<0.03	<0.03
Nickel	T-Ni	<0.02	<0.02
Potassium	T-K	<2	<2
Selenium	T-Se	<0.0005	<0.0005
Silver	T-Ag	<0.0001	<0.0001
Sodium	T-Na	<2	<2
Vanadium	T-V	<0.03	<0.03
Zinc	T-Zn	<0.005	<0.005

Remarks regarding the analyses appear at the beginning of this report.
EPH = Extractable Petroleum Hydrocarbons
Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.
Results are expressed as milligrams per litre except for pH,
Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



RESULTS OF ANALYSIS - Water

File No. G3745

		Thistle 1	Thistle 2
		96 08 02	96 08 02
Dissolved Metals			
Aluminum	D-Al	0.046	0.054
Arsenic	D-As	<0.0001	<0.0001
Barium	D-Ba	<0.01	<0.01
Beryllium	D-Be	<0.005	<0.005
Boron	D-B	<0.1	<0.1
Cadmium	D-Cd	<0.0002	<0.0002
Calcium	D-Ca	12.2	12.7
Chromium	D-Cr	<0.001	<0.001
Cobalt	D-Co	<0.02	<0.02
Copper	D-Cu	0.001	0.001
Iron	D-Fe	<0.03	<0.03
Lead	D-Pb	<0.001	<0.001
Lithium	D-Li	<0.02	<0.02
Magnesium	D-Mg	0.551	0.527
Manganese	D-Mn	<0.005	<0.005
Mercury	D-Hg	<0.00005	<0.00005
Molybdenum	D-Mo	<0.03	<0.03
Nickel	D-Ni	<0.02	<0.02
Selenium	D-Se	<0.0005	<0.0005
Silver	D-Ag	<0.0001	<0.0001
Sodium	D-Na	<2	<2
Vanadium	D-V	<0.03	<0.03
Zinc	D-Zn	0.011	0.009

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH,

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



Appendix 1 - QUALITY CONTROL - Replicates

File No. G3745

Water	96-1	96-1
	96 08 02	QC # 69450

Physical Tests

Hardness	CaCO ₃	12.5	12.2
----------	-------------------	------	------

Dissolved Metals

Aluminum	D-Al	0.111	0.114
Arsenic	D-As	0.0002	0.0002
Barium	D-Ba	<0.01	<0.01
Beryllium	D-Be	<0.005	<0.005
Boron	D-B	<0.1	<0.1
Cadmium	D-Cd	<0.0002	0.0002
Calcium	D-Ca	4.04	3.94
Chromium	D-Cr	<0.001	<0.001
Cobalt	D-Co	<0.02	<0.02
Copper	D-Cu	0.004	0.005
Iron	D-Fe	0.06	0.06
Lead	D-Pb	<0.001	<0.001
Lithium	D-Li	<0.02	<0.02
Magnesium	D-Mg	0.584	0.580
Manganese	D-Mn	0.012	0.013
Mercury	D-Hg	<0.00005	<0.00005
Molybdenum	D-Mo	<0.03	<0.03
Nickel	D-Ni	<0.02	<0.02
Selenium	D-Se	<0.0005	<0.0005
Silver	D-Ag	<0.0001	<0.0001
Sodium	D-Na	2	2
Vanadium	D-V	<0.03	<0.03
Zinc	D-Zn	0.009	0.008

Extractables

EPH (C10-18)	<1.0	<1.0
EPH (C19-31)	<1.0	<1.0
Total Extr Hydrocarbons (C10-30)	<1.0	<1.0

Remarks regarding the analyses appear at the beginning of this report.

EPH = Extractable Petroleum Hydrocarbons

Coliform results are expressed as Colony Forming Units (CFU) per 100 mL.

Results are expressed as milligrams per litre except for pH,

Conductivity (umhos/cm), Turbidity (NTU), and Colour (CU).



Appendix 2 - METHODOLOGY

File No. G3745

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows:

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

Metals in Water

This analysis is carried out in accordance with procedures described in "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005), followed by instrumental analysis by atomic absorption spectrophotometry (EPA Method 7000), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association. A cold-oxidation procedure involving bromine monochloride is used, followed by instrumental analysis by cold-vapour atomic absorption spectrophotometry (CVAAS).

Extractable Petroleum Hydrocarbons in Water

This analysis is equivalent to British Columbia Ministry of Environment, Lands and Parks Method for "Extractable Petroleum Hydrocarbons in water by GC/FID", January 1996 but does not provide correction for Polycyclic Aromatic Hydrocarbons (PAHs). The procedure involves a methylene chloride solvent extraction followed by analysis of the extract by capillary column gas chromatography with flame ionization detection.



Appendix 2 - METHODOLOGY (cont'd)

File No. G3745

Total Extractable Hydrocarbons in Water

This analysis is carried out in accordance with U.S. EPA Method 3510/8015 (Publ. #SW-846, 3rd Ed., Washington, DC 20460). The procedure involves extraction with methylene chloride. The extract is then reduced in volume and analysed by capillary column gas chromatography with flame ionization detection.

End of Report

DRAFT

APPENDIX D

LEGAL DESCRIPTION OF SITE

Lot A, District Lots 1583, 2001 and 7034, Plan 21576. Parcel Identifier 010-077-227.

Parcel 1 (Reference Plan 4878) of District Lot 1583 Except Part on Plan 21576. Parcel Identifier 010-025-901.

District Lot 2933 excepting Hwy PL #76, Parcel Identifier 010-025-715.

District Lot 4005 excepting those portions dedicated on Plan LMP 17054, Parcel Identifier 010-025-740.

District Lot 4008, Parcel Identifier 010-025-766.

District Lot 4012 excepting those portions dedicated on Plan LMP 17053, Parcel Identifier 010-025-774.

District Lot 1889. Parcel Identifier 010-025-782.

District Lot 1981 East $\frac{1}{2}$ only. Parcel Identifier 010-025-812.

District Lot 1970 except those portions lying within the boundaries of District Lots 1583 and 2001. Parcel Identifier 010-025-863.

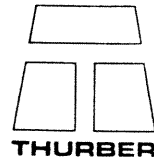
District Lot 4009 except those portions lying within the limits of District Lots 1583 and 2001. Parcel Identifier 010-025-634.

District Lot 1583 except portions in reference Plans 4390 and 4878 and Plan 21576. Parcel Identifier 010-026-151.

District Lot 2617. Parcel Identifier 010-025-677.

**THURBER ENVIRONMENTAL
CONSULTANTS LTD.**

Suite 200, 1445 West Georgia St.
VANCOUVER, B.C. V6G 2T3
Phone [604] 687-0100
Fax [604] 684-5124



May 1, 1997

File:19-2435-0

BC Environment
15326-103A Avenue
Surrey, BC
V3R 7A2

Attention: Ms. K. O'Leary, M.Sc., P. Ag.

**MAKIN PROPERTY, BRITANNIA BEACH, B.C.
SUPPLEMENTARY INFORMATION**

Dear Madam:

Further to the BC Environment (BCE)'s letter of January 8, 1997 (BCE File: 26250/20-3444 Site: 3444), this letter presents supplementary information to address the points and issues raised by BCE regarding the historical and site information.

The only landuses on the property comprised a gravel mining operation in the area formed by the loop in Highway 99 and on the northern portion of the property surrounding and north of Thistle Creek, and a residential community east of Minaty Bay in the western part of the loop in the Highway. The following information sources were utilized.

- Historical air photographs from 1947, 1957, 1969, 1976, 1982 and 1990. Copies of the air photos are attached. As is clear from examination of the air photographs, the vast majority of the site is forested.
- Review of title search records.
- Anecdotal sources including Mr. D. Smith of Thurber Engineering Ltd., Mr. H. Buck of Colliers McCauley Nicholls and Mr. D. Gray of Campbell Saunders. These sources provided information regarding landuses and activities on the site and the adjacent Britannia Mine.

No fire insurance maps from the UBC collection were located for the subject site. No archival information regarding the gravel operation or the townsite was identified at the Squamish Archives or Public Library.

Continued

With respect to specific issues raised in the BCE letter the following information is provided:

- Power for the gravel mining operation and the townsite at Minaty Bay was supplied by BC Hydro. The only potential contaminant concern associated with the gravel operation may have been spills associated with fuelling of on-site vehicles. No evidence indicating that this is a concern was uncovered.

No potentially hazardous materials, such as batteries, electrical equipment etc. were identified at the townsite. Scattered refuse on the site comprised typical household debris such as pop cans and paper waste. No evidence of landfilling was identified. Local practice at nearby townsites, such as Furry Creek, was to burn refuse.
- With respect to BCE's comment that the water table, reportedly at 3 m below grade, would have allowed for placement of residential underground tanks, it is noted that these water levels were recorded in wells installed on the east side of the Highway. The former townsite is located near the foreshore of Howe Sound where groundwater is anticipated to be shallow. If any tanks are uncovered during site development the tanks will be decommissioned and a qualified environmental consultant will be retained to evaluate soil and groundwater conditions around the tank.
- Mr. J. Brodie of BC Rail indicated that there are no records of spills along the BC Rail right-of-way through the property. No evidence of a spill along the rail line was observed during the site reconnaissance.
- Inspection of the helicopter refuelling area, where fuel drums are stored, revealed only very minor surficial (approximately 0.1 m depth) staining over a highly localized area (2m²).
- Six soil stockpiles, containing traces of slag and metallic debris, were identified at the northern portion of the site near the entrance off the highway. Examination of the soils revealed no evidence of potential organic contamination, such as staining or oily residues. No volatile organics were detected in field headspace screening of these materials with an Hnu photoionization detector. The total estimated volume of the stockpiles is 60 m³.

Continued

May 1, 1997

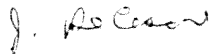
Six representative samples were collected and submitted for metals analysis. The analytical results are presented in Table 1. The standards in the table are based on relocation of the soils to a site where there are no applicable groundwater uses (ie. drinking water or aquatic life). The results indicate that concentrations of copper in all samples exceed the commercial standard of 250 ppm. In addition, lead concentrations in samples 97-5 and 97-6 exceed the corresponding commercial standard of 1000 ppm. The source of this material is unknown but is likely material that has been relocated from the Britannia Mine.

Sample 97-6 has been submitted for SWEP analysis. Any materials classified as Special Waste based on the leachate results will be managed in adherence to the requirements stipulated in the Special Waste Regulation of the Waste Management Act.

The six stockpiles will be removed from site and taken to a suitable disposal facility, likely an industrial landfill in Alberta. We understand that a soil relocation permit is not required for soils that exceed the trigger standards, if these materials are transported out of Province.

We trust that the above information adequately addresses your concerns. Please do not hesitate to call if you have any questions.

Yours very truly,
Thurber Environmental Consultants Ltd.
D. Smith, M.Sc.
Review Principal



John DeCesare, Ph.D.
Senior Environmental Consultant

JD/mt/f

cc: Campbell Saunders
Attn: Mr. D. Gray

Colliers McCauley Nicholls
Attn: Mr. H. Buck

**THURBER ENVIRONMENTAL
CONSULTANTS LTD.**

Suite 200, 1445 West Georgia St.
VANCOUVER, B.C. V6G 2T3
Phone (604) 687-0100
Fax (604) 684-5124



May 5, 1999

File : 19-3020-0

BC Environment
10470 - 152 Street
Surrey, BC
V3R 0Y3

Attention: Mr. B. Azevedo

**MAKIN LANDS
SUPPLEMENTARY STAGE 2 PRELIMINARY SITE INVESTIGATION (PSI)**

Dear Sirs:

This report presents the findings of a supplementary Stage 2 PSI conducted on the Makin Lands to address contaminant concerns identified by BC Environment.

Use of this report is subject to the attached Statement of General Conditions.

1. BACKGROUND

Thurber Environmental Consultants Ltd. (TECL) previously conducted an environmental and geotechnical assessment of the Makin Lands for Campbell Saunders and reported the findings in the October 21, 1996 report entitled *MAKIN PROPERTY, BRITANNIA BEACH, B.C. ENVIRONMENTAL AND GEOTECHNICAL ASSESSMENT*. Our report dated May 1, 1997 entitled *MAKIN PROPERTY BRITANNIA BEACH, B.C. - SUPPLEMENTARY REPORT* provided the supplementary information requested by BC Environment (BCE). BCE subsequently reviewed the information that was provided and concurred with our conclusions that other than some stockpiled metal contaminated fill, no contaminant concerns were identified on the property. A copy of the correspondence from BCE is attached.

BCE subsequently (attached November 10, 1998 letter) identified additional concerns comprising the potential for soil and groundwater contamination on the lands adjoining the northern boundary of the site near the former Britannia Mine ore processing mill and possible infilling of

Continued

the lower bench lands with tailings and waste rock. For clarity, the lands referred to by BCE as bench lands refer to the foreshore lands located to the west of the BCR rail line.

2. PROGRAM OF WORK

The program of work comprised the following tasks:

- Discussion with Mr. Azevedo of BC Environment regarding the scope of the investigation and any specific information that BCE may have in their possession that the Makin Lands may have been impacted from the former Britannia Mine operation.
- Review of Thurber Environmental Consultants Ltd. (TECL) file information. TECL previously conducted an environmental and geotechnical investigation of the former Britannia Mine property.
- A detailed reconnaissance of the suspect areas of the property to identify visual indications of potential contamination and to select potential sampling locations.
- Implementation of a field program comprising excavation of four test pits in the foreshore near the former Minaty Bay townsite. Samples of fill were collected and submitted for metals analysis.
- Preparation of a report of our findings for submission to BCE.

3. RESULTS AND DISCUSSION

3.1 BCE DISCUSSIONS

The following summarizes the main points of the discussion with Mr. B. Azevedo, the primary BCE contact for this assignment.

- Until 1979, the Makin Lands were owned by Anaconda, operators of the Britannia Mine. The property was subsequently acquired by Dome Petroleum. BCE has no information in their files that would indicate that any mining related activities were carried out on the

Continued

Makin Lands. This is consistent with TECL's environmental assessment findings previously reported for the Makin Lands. In addition, we uncovered no evidence from our contaminant and geotechnical investigation of the Britannia Mine that former mining activities were conducted on or impacted the Makin Lands.

- BCE is concerned that tailings may have been deposited on the foreshore lands to the west of the railway at the northern portion of the site and at the former townsite located at Minaty Bay. The tailings may have been deposited prior to air photo coverage. Therefore, review of air photos may be of limited utility in establishing whether tailings were deposited in the bench lands area.

The other BCE concern, along the north property boundary on the east side of the highway, is the proximity of the former Britannia Mine processing mill, including two concentrators, that was located to the north of the subject site.

3.2 Revised Property Boundary

During the course of the recent investigation, it was determined that the plans previously provided to us showing the property limits are not correct. Following discussions with Mr. H. Buck of J.J. Barnicke Realty and review of new plans in his possession, the revised property limits in the area of interest are shown on Dwg. No. 19-3020-0-1. For comparison, the previously presumed boundary is indicated on the current plan.

The implications of the revised property boundaries are as follows:

- The northern foreshore area is not part of the Makin property. Therefore any tailings or other concerns on these lands are not material to the contaminant status of the Makin Lands.
- The northern boundary of the Makin Lands on the east side of Highway 99 is located approximately 200 m south of where previously believed and therefore well removed from the former Britannia Mine processing mill.

Continued

3.3 Site Reconnaissance

A reconnaissance of the property was carried out by Mr. K. Mow of TECL on January 19 - 20, 1999. Photographs taken during the reconnaissance and test pitting program are attached.

The area on the northern portion of the site, where the former gravel mining operation was located, is largely flat and overgrown with shrubs. As previously described, soil has been stockpiled on the north end of the property. Analytical results from testing of these materials was previously provided to BCE. An estimated 60 m³ of material was classified as contaminated and will be removed during site development.

The Makin foreshore lands at the former Minaty Bay townsite, located west of the BCR rail line, consist of a relatively flat bench 90 to 100 m wide. Bench elevation varies from 4.5 to 6.5 m and slopes up toward the BCR grade to the east, which varies in elevation from approximately 8.6 m at the north end to 11.5 m at the south. The area appears to have some fill overlying the native sand and gravel / bedrock. The surface is covered with 10 to 20 year old trees with some in the 50+ year range as well as some pavement (former road alignment) and household debris from the former townsite.

3.4 Minaty Bay Foreshore Lands Sampling and Analysis Results

The other area of potential concern identified by BCE is the foreshore near the former Minaty Bay townsite. A test pitting program to evaluate soil conditions in this area was conducted on January 25, 1999. Four test pits (TPs 99-6 through 99-9) were excavated with a track-mounted excavator at the locations shown on Dwg. 19-3020-0.

The soil conditions are described on the attached test pit logs, and generally comprised topsoil over fill to depths of 1.5 to 2.3 m, underlain by native granular deposits. No evidence of tailings or waste rock was noted.

North of Daisy Creek (TPs 99-6 and 99-7), the topsoil was 100 to 200 mm thick and was underlain by compact, silty fine sand fill with

Continued

varying gravel content to 0.8 m depth. The lower portion of the fill was compact, sandy gravel with some silt and contained cobbles and boulders to 300 mm diameter.

South of Daisy Creek (TPs 99-8 and 99-9), the fill was more variable than described above, and comprised layers of sands and gravels with variable silt and organic content. Presence of roots and/or wood debris was noted throughout the fill zone.

In both areas, the underlying native soil was compact to dense, grey-brown to brown, sandy, cobbly gravel with a trace to some silt. Groundwater was generally encountered in the native gravel zone at depths of 2.1 to 2.5 m, except at TP 99-6 which was dry. No sheens, odours or other evidence of contamination were observed.

Soil samples were collected with a stainless steel trowel that was decontaminated with a detergent wash and distilled water rinse between samples. Seven samples of fill were selected for metals analysis. The laboratory report is attached.

Soil pH varied from 5.3 to 6.5 with a median pH of 5.7. Metals concentrations are compared to the CSR Residential Landuse (RL) standards with the site specific factor groundwater flow to surface water used by aquatic life. Concentrations of all metals are well below the corresponding RL standards.

3.5 Northern Lands

The northern portion of the Makin Lands were mined for gravel beginning in the early 1950's. No other landuses were identified in our historical review.

Soil and groundwater conditions near the revised northern boundary of the Makin Lands were investigated in 1996. The locations of three monitor wells (MWs 96-1, 2, 3) completed at that time are shown on Dwg. No. 19-3020-0-1. Soil conditions on the property comprised sand with varying gravel and silt content for the entire 7 m depth of investigation. No soils displaying staining or suspect odours, or mining residues such as tailings or waste rock, were encountered in any of the three holes.

Comparison of groundwater quality in the three wells to the current CSR Aquatic Life (AW) standards reveals that all metals concentrations are below the corresponding AW standards. It is our opinion that there are no contaminant concerns in this area and there is no evidence that the former ore processing plant has had any impact on the contaminant status of the property.

2. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this supplementary investigation, it is concluded that:

- The foreshore lands north of Minaty Bay are not part of the Makin Lands and are therefore not a material concern with respect to the contaminant status of the Makin Lands.
- The northern lands on the east side of the highway are located approximately three hundred metres from the former Britannia Mine ore processing mill, not 100 metres as previously believed. This area was formerly part of a gravel operation. A previous investigation established that groundwater concentrations of dissolved metals were well below applicable aquatic life standards.
- Sampling and analysis of fill in the Makin foreshore at Minaty Bay established that metal concentrations were below Residential Landuse standards. No evidence of tailings or waste rock was noted in this area.

In summary, no contaminant concerns relating to deposition of waste rock, tailings or process chemicals or waste from the former Britannia Mine ore processing mill were identified in this supplementary investigation or in the previous investigation. It is our opinion that there has been no impact on the Makin Lands from the former Britannia Mine operation.

No further work is considered warranted.

Please call if you have any questions or required additional clarification on any of the findings presented in this report.

Continued

BC Environment

7

May 5, 1999

4.

Yours very truly,
Thurber Environmental Consultants Ltd.
B. Nakai, M.Sc.
Review Principal

J. De Cesare, Ph.D.
Senior Environmental Scientist

JD/a

cc: Gibralt Capital Corporation
Attention: Mr. B. Brovender

IBI Group
Attention: Mr. P. Levine

DRAFT



Looking northeast from northwest corner of Makin property.



Former gravel pit, looking northeast toward north property line.



Former gravel pit south of Daisy Creek.



Foreshore at former townsite, looking north.



Foreshore/shoreline from former townsite, looking south.



Excavator on-site, January 26, 1999.

TEST PIT LOGS

Notes:

- 1) Depths shown are in metres, measured from ground surface at the test pit location.
- 2) Capital letters (i.e. GM) are Unified Soil Classification System identifications, as determined in the laboratory.
- 3) w denotes moisture content of minus 19 mm sieve material, as determined in the laboratory.
- 4) Test pits were excavated using a track-mounted excavator on January 26, 1999.

TP 99-6

- 0 - 0.8 100 mm loose TOPSOIL over loose to compact, brown, silty, fine SAND with traces of gravel and roots (Fill). SM, w = 23% at 0.4 m.
- 0.8 - 2.0 Compact, brown SAND and GRAVEL with some cobbles and silt and a trace of boulders to 300 mm dia. (Fill). Root layers at 0.8 m and 2.0 m. GM, w = 19% at 1.2 m.
- 2.0 - 3.5 Compact to dense, brown, sandy GRAVEL and COBBLES with a trace to some silt. GP-GM, w = 11% at 3.0 m.
- At 3.5 End of pit at required depth.
Moderate pit wall collapse from surface to 2.0 m.
No free water in pit.

TP 99-7

- 0 - 0.8 200 mm loose TOPSOIL over loose to compact, brown, silty, fine SAND and GRAVEL with traces of and wood debris (Fill). SM/GM, w = 28% at 0.5 m.
- 0.8 - 1.7 Compact to dense, brown-grey, sandy GRAVEL and COBBLES with some silt (Fill). Root layers at 0.8 m and 1.7 m. GM, w = 20% at 1.5 m.
- 1.7 - 3.1 Compact to dense, grey-brown GRAVEL and COBBLES with some sand and a trace of silt.
- At 3.5 End of pit at required depth.
Minor pit wall collapse from surface to 1.7 m.
- At 2.1 Groundwater encountered.

TP 99-8

0 - 0.2	50 mm loose SOD over loose, grey-brown SAND and GRAVEL with a trace of silt (Fill). GP-GM, w = 5% at 0.1 m.
0.2 - 0.45	Loose, dark brown to black, organic silty, fine to medium SAND with some gravel and roots (Fill).
0.45 - 0.8	Compact, brown, gravelly SILT and fine SAND with a trace of roots (Fill). SM/ML, w = 31% at 0.7 m.
0.8 - 1.5	Compact to dense, brown, sandy GRAVEL with some silt and roots (Fill). Root layers at 0.8 m and 1.5 m.
1.5 - 3.3	Dense, brown, sandy GRAVEL and COBBLES with traces of silt and boulders to 350 mm dia. GP-GM, w = 16% at 3.0 m
At 3.3	End of pit at required depth. Moderate pit wall collapse from surface to 1.5 m.
At 2.5	Groundwater encountered.

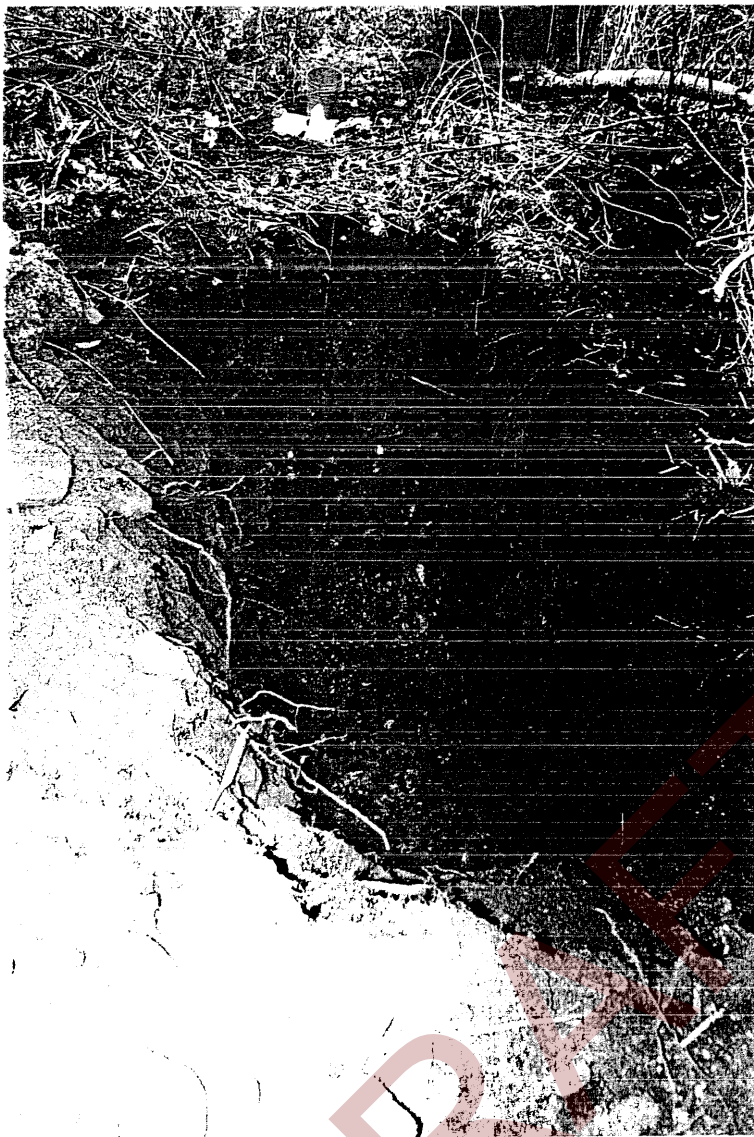
TP 99-9

0 - 0.4	100 mm loose SOD over loose, dark brown, silty to organic silty SAND and GRAVEL with some roots (Fill). GM, w = 15% at 0.2 m.
0.4 - 0.7	Compact, brown SAND and GRAVEL with some silt and zones of sandy silt and traces of roots and wood debris (Fill). GM, w = 25% at 0.5 m.
0.7 - 2.3	Compact to dense, brown SAND and GRAVEL with traces of silt, roots and zones of sandy silt (probable fill). GP-GM, w = 5% at 1.5 m.
2.3 - 3.9	Compact to dense, grey-brown, sandy GRAVEL with a trace to some silt and cobbles. GP-GM, w = 14% at 3.0 m.
At 3.9	End of pit at required depth. Moderate to heavy pit wall collapse from surface to 2.3 m.
At 2.4	Groundwater encountered.



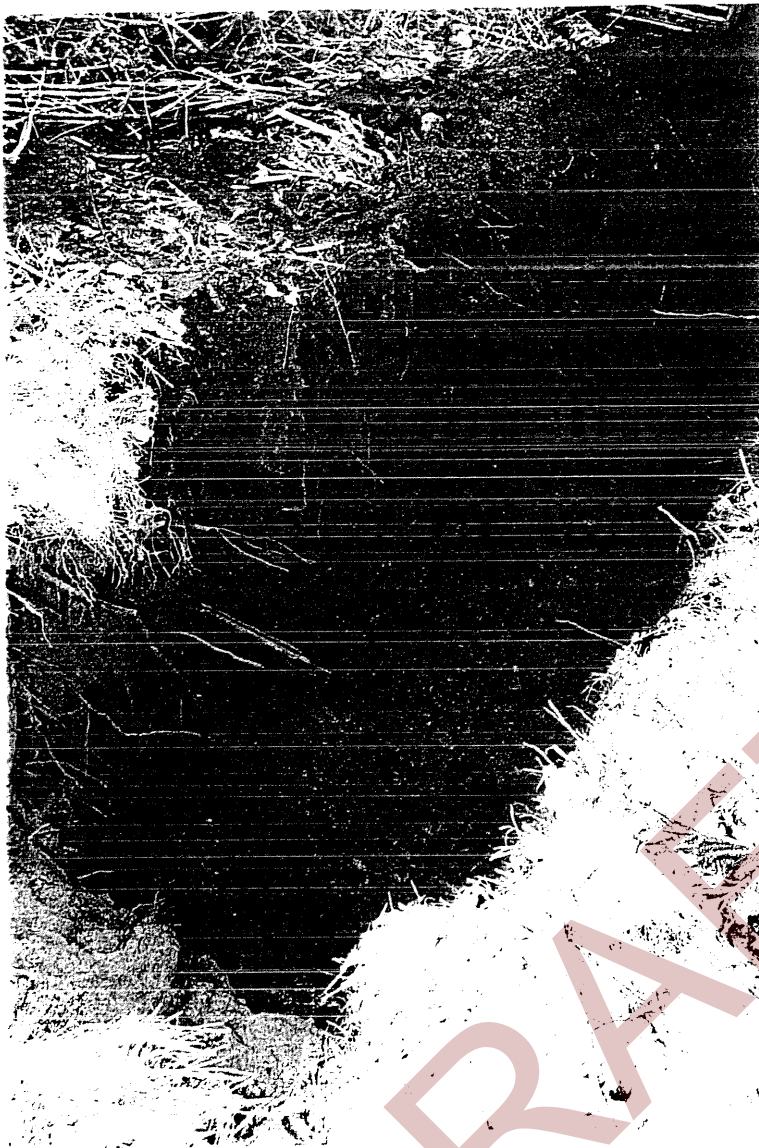
TP 99-6





TP 99-7





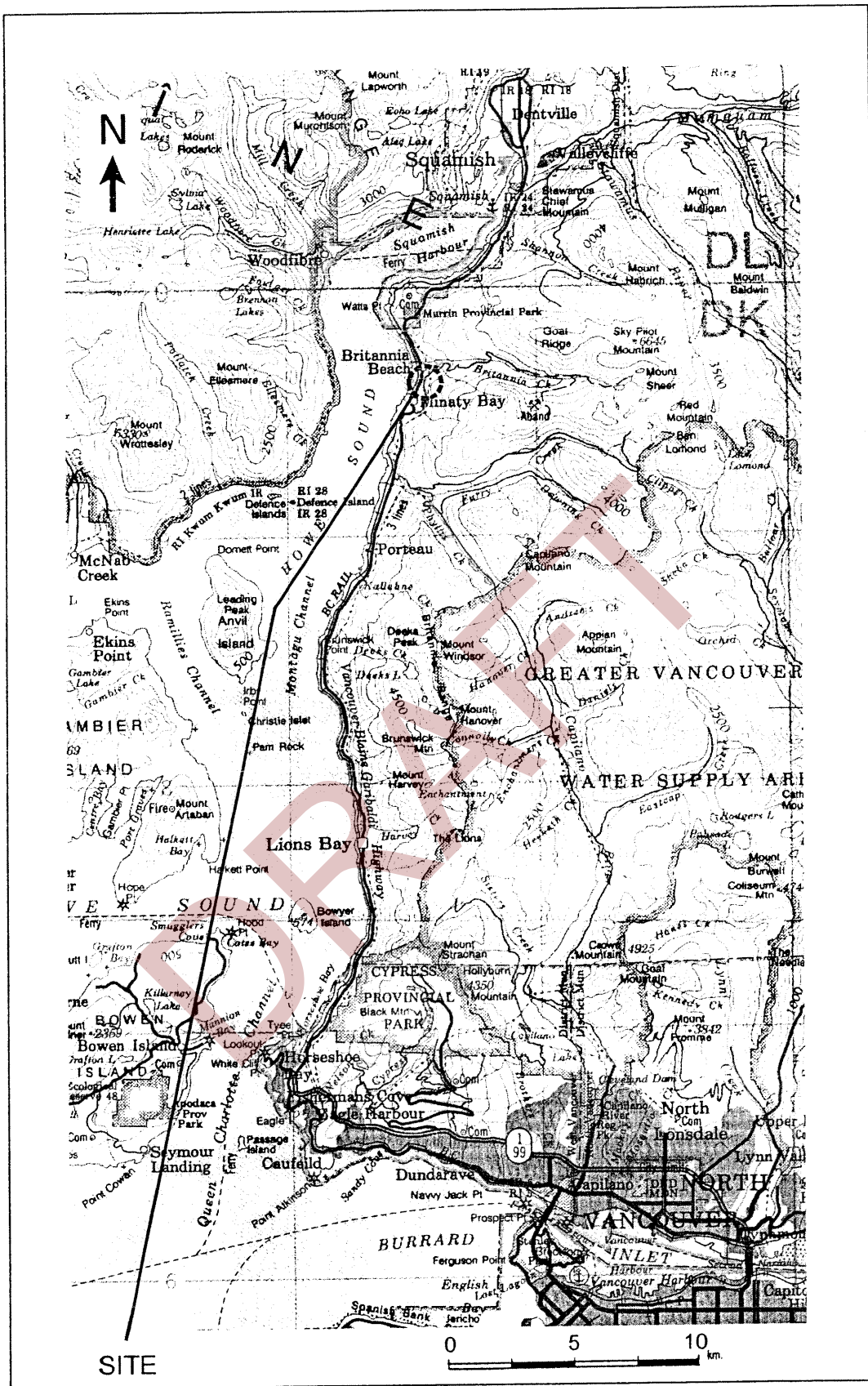
TP 99-8



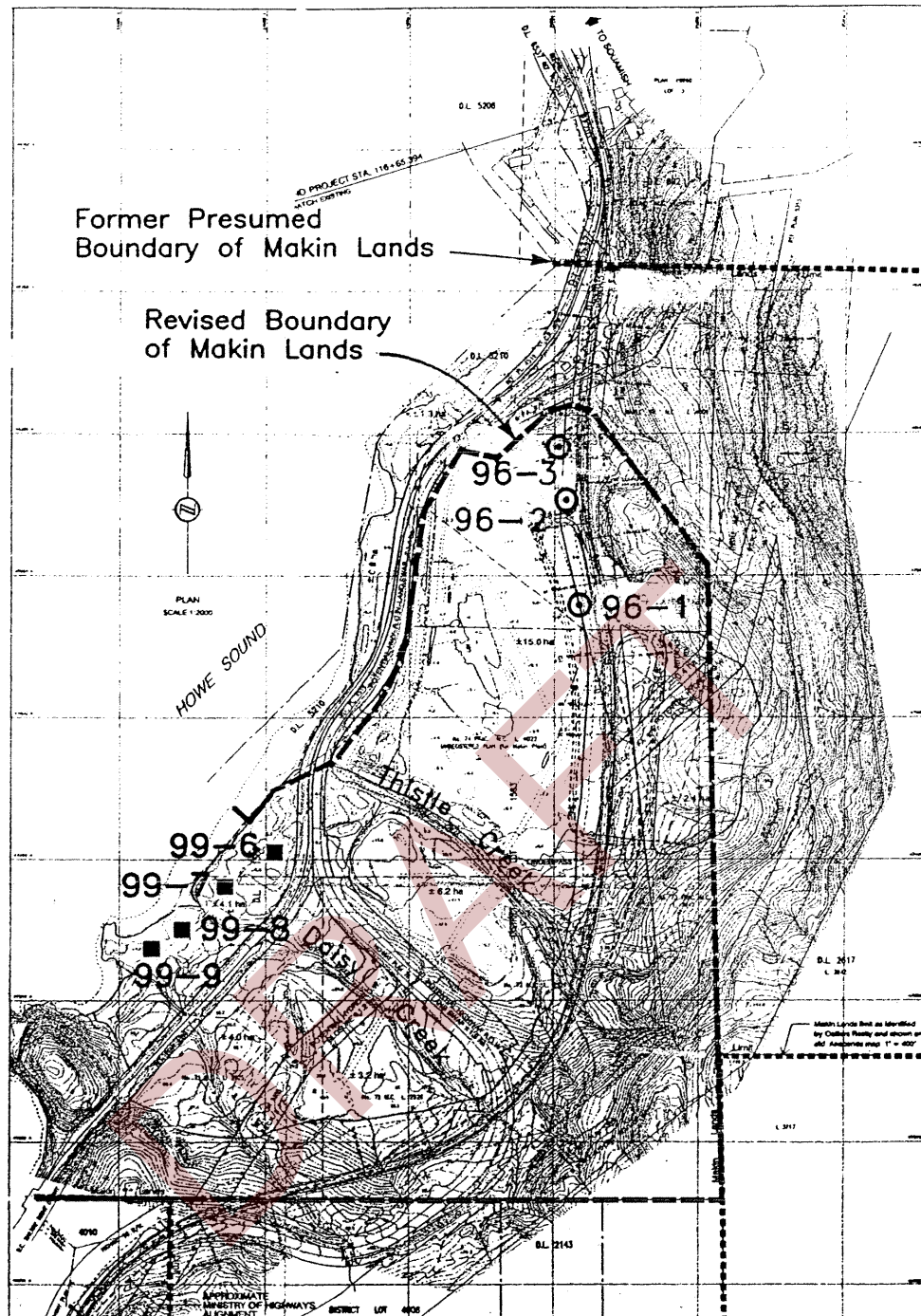


TP 99-9





Site Location plan

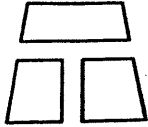


LEGEND

- Test pit
- ⊙ Monitor well

NOTES

1. Base plan taken from McElhanney Consulting Services Ltd.'s 'Conceptual Highway Access' plan (Job No. 2111-01331-0), Rev. 1 dated November 1996.
2. Test pit and monitor well locations are approximate.

DESIGNED KM	Gibralt Capital Corporation	
DRAWN KM	 THURBER	
DATE February 4, 1999		
APPROVED		
SCALE 1:10,000	Makin Lands Preliminary Site Investigation	DWG. NO. 19-3020-0-1
SITE PLAN		



THURBER ENGINEERING LTD.

February 15, 2012

File: 19-5356-0

Taicheng Development Corporation
710 - 100 Park Royal South
West Vancouver, BC V5T 1A2

Attention: Mr. Cary Zhou

**SOUTH BRITANNIA BEACH, B.C.
GEOTECHNICAL ASSESSMENT**

Dear Sirs:

This report presents a geotechnical assessment of the proposed South Britannia Beach development (the Site) in support of a rezoning submission for the property.

The report summarizes our preliminary findings in respect of the following:

- Geologic Conditions
- Slope Stability
- Debris Flow Potential
- Road Layout and Construction
- Waterfront Development
- Water Supply Dams on Britannia Creek

Each of these topics is discussed separately below.

1. INTRODUCTION

The development area covers an area of about 190 ha and comprises 16 District Lots (DLs), as shown on the *Property Parcels* drawing prepared by Folio Hotel and Resort Architecture (Folio) for the September 2011 Master Plan. This drawing is included as Figure 1. Within the DLs, the property rises to a maximum El. 330 m but east of the property boundary, the mountain slope rises to well above El. 1500 m.

The *Zoning Diagram* (Figure 2) prepared by Folio for the Master Plan indicates a wide variety of development proposals, from a Town Centre primarily in the abandoned gravel pit area between Highway 99 and the base of the excavated slope to low density, residential lots along the steeper upper slopes. The current development scenario may differ from that shown on the Master Plan.

2. GEOLOGIC CONDITIONS

The Geologic Survey of Canada (GSC) has prepared a surficial geology map of the Lower Sea to Sky Corridor, including the proposed development area, under Open File 5322. A portion of



THURBER ENGINEERING LTD.

this map covering the study area is shown on Figure 3. Within this area, the GSC indicates the following geologic units exist:

Af – Alluvial fan sediments comprising poorly sorted sand and gravel

Gmt – Glaciomarine terrace sediments comprising sand and gravel deposited above the alluvial sediments.

Gmd – Proglacial deltaic sediments comprising sand and gravel with minor silt and clay content

Gmv – Glaciomarine veneer comprising sand and gravel deposited by glacial meltwater

Cv – Colluvial veneer, generally less than 3 m thick, comprising rock fragments in a matrix of boulders, cobbles, gravel, sand and silt.

Tv – Glacial till veneer 1 m thick on average covering bedrock, with frequent bedrock outcrops

R – Bedrock, mainly comprising weak argillites and siltstones with some more resistant metamorphosed volcanic rocks and quartz diorite.

In summary, slopes on the property comprise 2 main stratigraphic units, namely granular material (sand and gravel) in the lower, flatter areas and bedrock-controlled terrain with frequent bedrock outcrops in the upper steeper areas. The airphoto terrain analysis and site reconnaissance we have completed to date generally confirm the GSC interpretation.

3. SLOPE STABILITY

The slope map prepared by Folio (Figure 4) from available mapping with 2 m contours shows that much of DLs 1889, 4009, 1970, 2617, 3717, 4005, 4008 and 4012 and the East Half of DL 1981 have slopes in excess of 50%. In comparison, a slope limitation in general use by municipalities is 30%. The steeper slopes result in more difficult road access and house locations and introduce the possibility of slope instability. However, no areas of existing or potential slope instability (except for excavated slopes around the perimeter of the gravel pit) or bedrock cliffs with associated rockfall that could affect building sites have been identified by the work completed to date.

We have briefly looked at the stability of natural slopes above the east property limits using airphoto interpretation and contours on 1:50,000 scale NTS maps. These contours show that, up to about El. 1150 m, the average slope is about 21° or 38%. This is not steep enough to create slope stability issues except for the possibility of rockfall from cliffs which could run-out down the forested slope into the development area.

Client: Taicheng Development Corporation
File No.: 19-5356-0
E-File: e_ds_lct_Geotechnical Assessment

Date: February 15, 2012

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Gravel slopes around the pit should be graded to 2H:1V for stability and to allow vegetation growth.

4. DEBRIS FLOW POTENTIAL ON DAISY AND THISTLE CREEKS

4.1 Daisy Creek

Daisy Creek is confined in a deep bedrock gorge lined with talus aprons from near Highway 99 up to El. 400 m, well above the property line. Steep bedrock gorges and cascades continue further upstream. The coarse debris accumulations in the channel attest to frequent heavy sediment movement in the Creek. Large trees grow undamaged on the margins of the channel in several places, showing that high debris flow discharges are not frequent. Our 1983 assessment, completed for the Ministry of Transportation and Highways (MoTH), was that there was a low probability of a debris flow, with a design magnitude of 24,000 m³. The design flow potential was re-evaluated in 1997 by ground traverses and changed to a moderately high probability event with a 17,500 m³ magnitude.

During the Sea to Sky Highway Improvement Project in 2006 – 2007, a debris catchment basin was provided immediately upstream of the Highway, designed for a debris storage volume of 25,000 m³. This basin was designed to protect the Highway but also serves to protect the development for an event up to the design magnitude. If a larger event occurs, it is expected that the berm will be overtopped by the debris which will flow over the Highway and into the proposed residential area downhill. Thus, it is recommended that all residential units on the south side of the Highway inside the Highway 99 loop be provided with a concrete foundation wall to 1 m above ground level on the uphill side. This will serve to protect the buildings from debris run-out.

4.2 Thistle Creek

Thistle Creek has two alluvial fans, a lower one on the floor of the former gravel pit near El. 20 m and an upper one on B.C. Hydro's right of way near El. 110 m. The two are connected by a steep bedrock gorge.

Upstream of the transmission lines, the Creek crosses a bedrock bench, covered by a blanket of glacial drift. The Creek channel is poorly confined on the bench, with a slope angle of less than 5°. There are several points where an avulsion to the north or south could occur. One such point was used in the past to construct a diversion ditch at about El. 140 m, diverting the creek flow south parallel with the transmission lines and discharging into Daisy Creek. The diversion probably served to keep Thistle Creek out of the gravel pit. The diversion ditch is excavated in glacial drift with cut slopes up to 5 m high. Its channel is formed in dense gravely sand and shows little sign of past erosion, indicating that the diversion was probably never used to carry high winter flows. The diversion, if used, could easily avulse into a gully trending parallel with Daisy Creek and approximately 100 m north from it. The main channel of Thistle Creek is not blocked off at the diversion and the diversion ditch is dry.



Upstream of the bench, Thistle Creek traverses further bedrock benches, separated by steps. A large bench at El. 300 m forms a flat area, probably a former pond in a bedrock depression, now filled with gravel. There is a small concrete gravity dam (5 m maximum height), founded on bedrock and completely backfilled by gravel on the same bench. The Creek channel branches above this point and becomes quite narrow.

Our 1983 study for MoTH concluded that there was a low probability of occurrence of a debris flow but recommended that a magnitude of 17,500 m³ should be assumed. This evaluation was completed without the benefit of an examination of the Creek channel above the lower fan. Our 1997 study, which included a traverse of the Creek up to the El. 330 m bench, concluded that the potential for Thistle Creek to form a debris flow or debris flood was negligible. Debris generated in the upper watershed would largely deposit on the bench at El. 330 m. A limited amount of debris (less than 1,000 m³) could be generated below this level, but this would deposit on the bench upstream of the transmission line, where it could easily divert the channel. Lack of debris movement is also indicated by the presence of the Britannia Mine water supply pipe trestle at El. 235 m. The trestle is badly rotted but undamaged by the creek flows.

Only normal bedload sediment is considered capable of reaching the lower fan on the property. To protect Highway 99 from bedload movement, the 1997 study recommended a small sediment basin of 2,000 m³ capacity be provided in the Creek channel immediately upstream of the Highway. During the Sea to Sky Highway Improvement Project, a sediment basin was not provided, but a larger culvert was installed.

4.3 Summary

The discussion in Sections 4.1 and 4.2 is summarized as follows:

- Potential avulsion or diversion points on Thistle Creek should be securely blocked off by erosion-resistant earthworks. Alternatively, small sediment basins, racks and culverts could be provided on the crossings of all the potential, avulsion paths.
- Residences below Highway 99 in the vicinity of Daisy Creek should incorporate a concrete wall to 1m above the ground surface on the uphill side.

5. ROAD LAYOUT AND CONSTRUCTION

An extensive network of roads has been developed by Kerr Wood Leidal Associates Ltd. (KWL) to provide access to potential development pods on the Taicheng Property. The alignments are preliminary and have been developed using the topographic plan with 2 m contour interval without field checking. Much of the alignments traverse bedrock-controlled slopes. Excavation depths and fill heights exceeding 5 m on centreline are not uncommon. Retaining walls, comprising MSE (mechanically stabilized embankments) walls or cast-in-place concrete gravity or cantilever walls will be required to minimize downhill fill encroachment or upslope excavation. Rock cuts will undoubtedly require installation of slope mesh and rock bolts in some areas.



From a geotechnical perspective, the cross-sections developed by KWL need to be field checked once the road centrelines have been staked. However, for planning purposes, the road alignments and cross-sections appear reasonable.

6. WATERFRONT DEVELOPMENT

The Taicheng property includes about 800 m of waterfront centred around the outlet of Daisy Creek into Howe Sound. However, Folio's *Zoning Diagram* suggests waterfront development will extend over an overall length of about 1,700 m. Few details of the proposed development have been provided but a 400 boat marina is shown in the most northerly 400 m. Placement of fill into Howe Sound may be considered though a 1957 failure of the railway embankment at Britannia Beach into Howe Sound resulting from fill placement should be borne in mind.

Piles required for the marina will likely be installed through the tailings deposited in Howe Sound from the Britannia Mine operation, estimated to amount to a total of 20 million m³ since operations commenced in 1899. The tailings are loose and potentially liquefiable during a strong earthquake. Pile design will need to consider this phenomenon.

It is understood that the bank protection measures may include a seawall in the marina area at the north end of the property and riprap protection elsewhere. Both measures are considered to be feasible.

7. WATER SUPPLY DAMS ON BRITANNIA CREEK

7.1 General

Storage of 1.5 million m³ of water on Britannia Creek is required to supplement the supply available from groundwater for the first phase of development. The current dam layout on Britannia Creek is illustrated in Figure 5, reproduced from Water Management Consultants (WMC)'s July 8, 2002 report to Golder Associates. The intake, penstock route and powerhouse locations for Flash River's proposed hydroelectric development on Britannia Creek has been added to WRC's drawing. Comments on each of the dams, including the scope of design work currently underway on Lower and Tunnel Dams by TEL-KWL are presented below.

Information sources available for this discussion, in addition to the WMC report, include:

- C. Robert Bland's May 1992 report to BC Environment
- Klohn Leonoff (KL)'s September 16, 1988 report to Copper Beach Estates

KL's report was received from the Dam Safety Branch of the BC Ministry of Environment without the drawings which KL referred to. We have requested these drawings from MoE to complete our assessment of the existing Dams and potential replacement Dams.



7.2 Lower Dam

Lower Dam is the lowest dam on the Creek and is at El. 280m. It is a concrete dam, completely infilled with sediment. The TEL-KWL study proposes that it will not be cleaned out and, therefore, will not provide any water storage.

7.3 Tunnel Dam

Tunnel Dam is at El. 610m. It is a mass concrete structure, about 6m high. Considerable deterioration was reported in 1988 and the dam was infilled with more than 40,000m³ of sediment as a consequence of breaching the upstream Park Lane Dam in 1989. The TEL-KWL study proposes that a 6m deep slot be cut into the dam to allow the creek to flow through it and an upstream grillage built to store a volume of about 50,000m³ of debris derived from the valley slopes and channels of Britannia Creek and tributaries between Tunnel Dam and Park Lane Dam. No consideration is being given in the TEL-KWL study for any contribution to the debris volume at Tunnel Dam by Jane Creek debris flows or a Jane Basin landslide. Both of these events would impact Britannia Creek in the vicinity of Tunnel Dam. In summary, therefore, no water storage will be provided by Tunnel Dam.

7.4 Park Lane Dam

Park Lane Dam was built at El. 1080m in about 1916 with 570,000m³ of storage. It is a concrete buttress dam, 12m high with a crest length of 152m. By 1989, it was in an advanced state of deterioration and was breached in May 1989 by blasting a slot to drain the reservoir. The slot extends 6 to 7m below the crest and is 4m wide at the bottom and 9m wide at the crest.

The existing Dam would have to be demolished and rebuilt to the same crest elevation to current design standards to provide 570,000m³ of water storage. Some of this would be lost below a low level outlet, resulting in a live storage volume of somewhat less than 570,000m³. There is a possibility of debris flows originating from upstream of Park Lane Dam but, with limited watersheds, the volume reaching Park Lane Dam would be small and may deposit on flatter ground upstream of the Dam.

7.5 Utopia Lake Dams

Two concrete buttress dams were building in 1922 at El. 1244m. The Main Dam is 15m high with a crest length of 68m. The Wing (or Saddle) Dam is about 6m high with a crest length of 104m. The Dams provided 990,000m³ of storage. KL's 1988 study indicated the dams were not safe for seismic loading. The Wing Dam was breached in 1989 by blasting 2m square holes about 4m below the dam crest to provide a low level outlet. The quantity of gravel stored behind the Dams is not known.



The 2 Dams probably require extensive rehabilitation or reconstruction to current standards to be used for the Village water supply, but a storage volume of nearly 1 million m³ appears to be feasible.

7.6 Mountain Lake Dams

KL's report indicated that one 3.7m high concrete gravity dam was built on rock in about 1915 with a crest at about El. 1460m. WMC's report indicates there were 2 small concrete gravity dams that were built with a tunnel to Park Lane Dam. The larger dam is 9m high with a crest length of 67m. The smaller dam is 5m high and has a crest length of 24m. KL's 1988 study reported that one dam was in very poor condition but not unsafe because of its small impoundment. WMC indicates that the second dam was snow covered but this comment is not contained in the KL report. We cannot resolve these discrepancies but the Dams are unlikely to provide much storage, particularly since Bland states that the dams were only 1 to 2m high.

7.7 Summary

Reconstruction of Park Lane Dam and reconstruction or extensive rehabilitation of Utopia Lake Dams should provide about 1.5 million m³ of water storage on Britannia Creek.

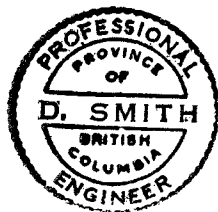
8. CLOSURE

Use of this report is subject to the enclosed Statement of Limitations and Conditions.

We trust that this report is sufficient for your present needs. Should you require clarification of any item or additional information, please contact us at your convenience.

Yours truly,
Thurber Engineering Ltd.


Dave Smith, P.Eng.
Principal



DS/cw

cc: Folio Hotel and Resort Architecture
Attn: Mr. Ron Lea

Coldwell Banker
Attn: Mr. Paul Prade

Client: Taicheng Development Corporation
File No.: 19-5356-0
E-File: e_ds_let_Geotechnical Assessment

Date: February 15, 2012

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Topographic map showing land parcels and districts. The map includes the following labels:

- DISTRICT LOT 3717
- DISTRICT LOT 2617
- DISTRICT LOT 1970
- DISTRICT LOT 4009
- DISTRICT LOT 4003
- DISTRICT LOT 4012
- DISTRICT LOT 4010
- DISTRICT LOT 4011
- DISTRICT LOT 4008
- DISTRICT LOT 1583
- DISTRICT LOT 5210
- LOT A
- PARCEL 1
- PARCEL 2
- ROAD
- CREEK

Scale: 0 50 100 200 300 500'

North Arrow: N

CONTIGUOUS LAND

Hotel and Resort Architecture

Fig. 1

ZONING DIAGRAM

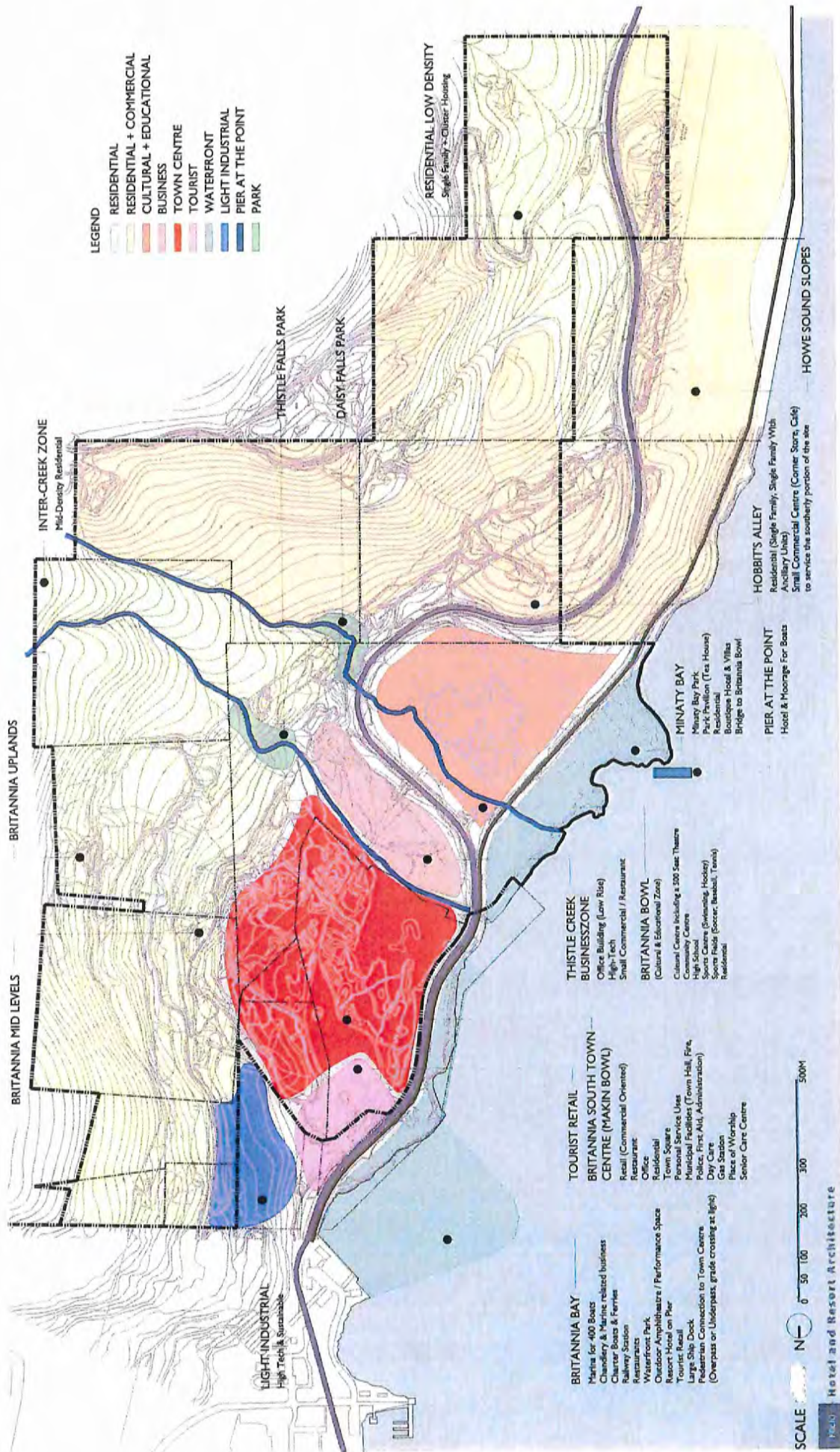


FIG. 2

Britannia Beach

Af

Gmd

Minaty Bay

Af

Gmt

F

R

Gmd

Cv

Gmv

Cv

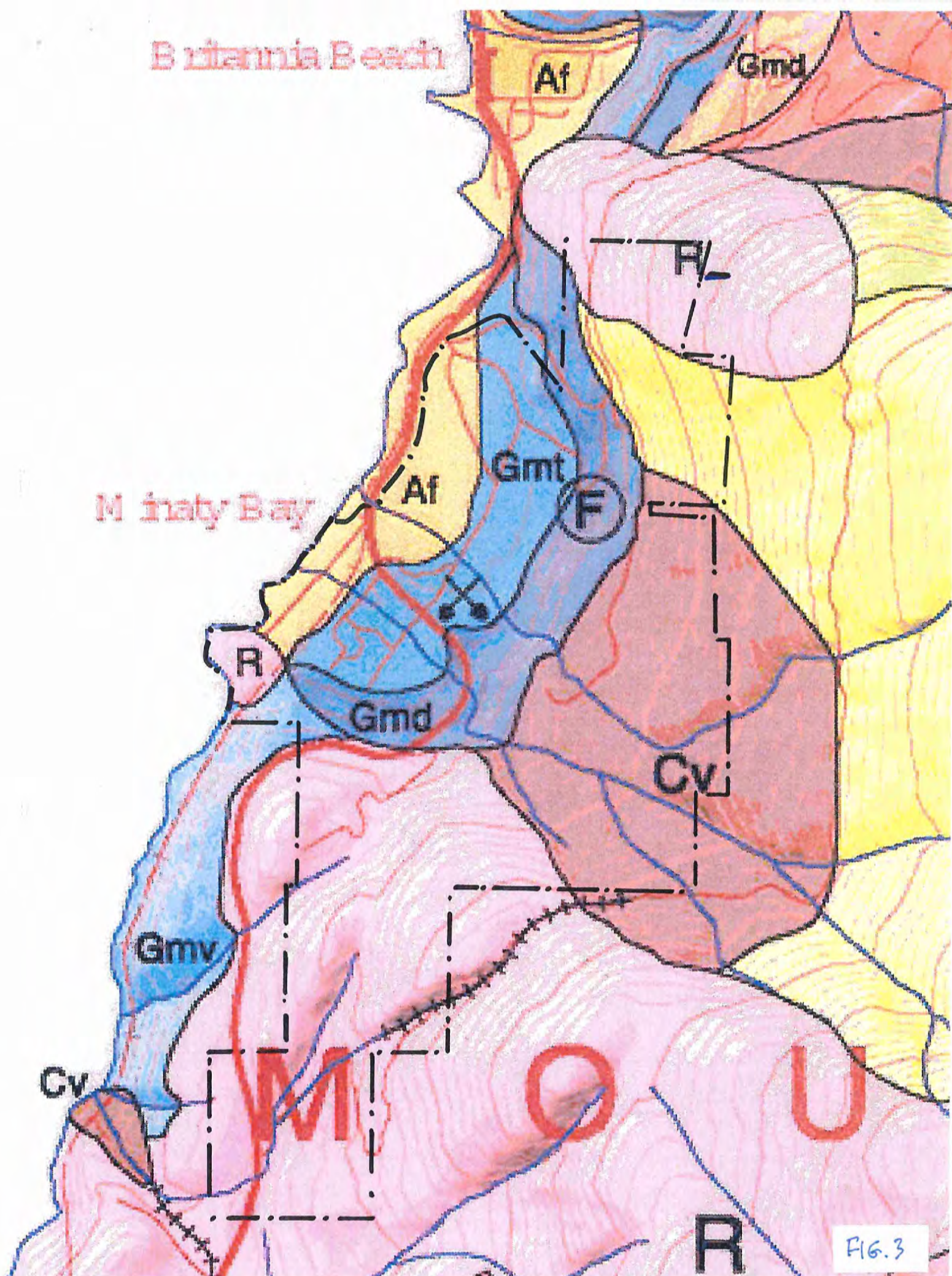
M

O

U

R

FIG. 3



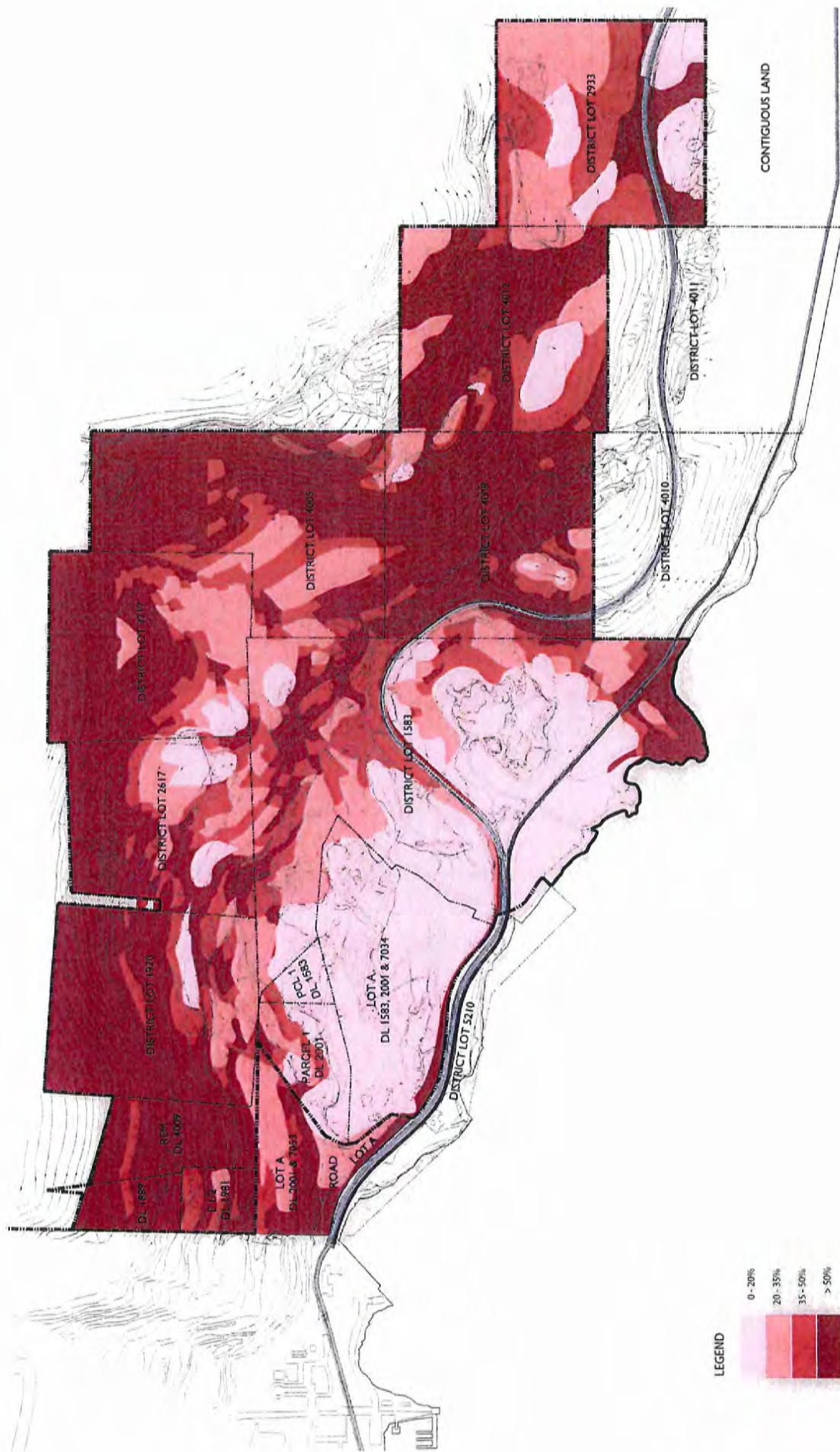


FIG. 4

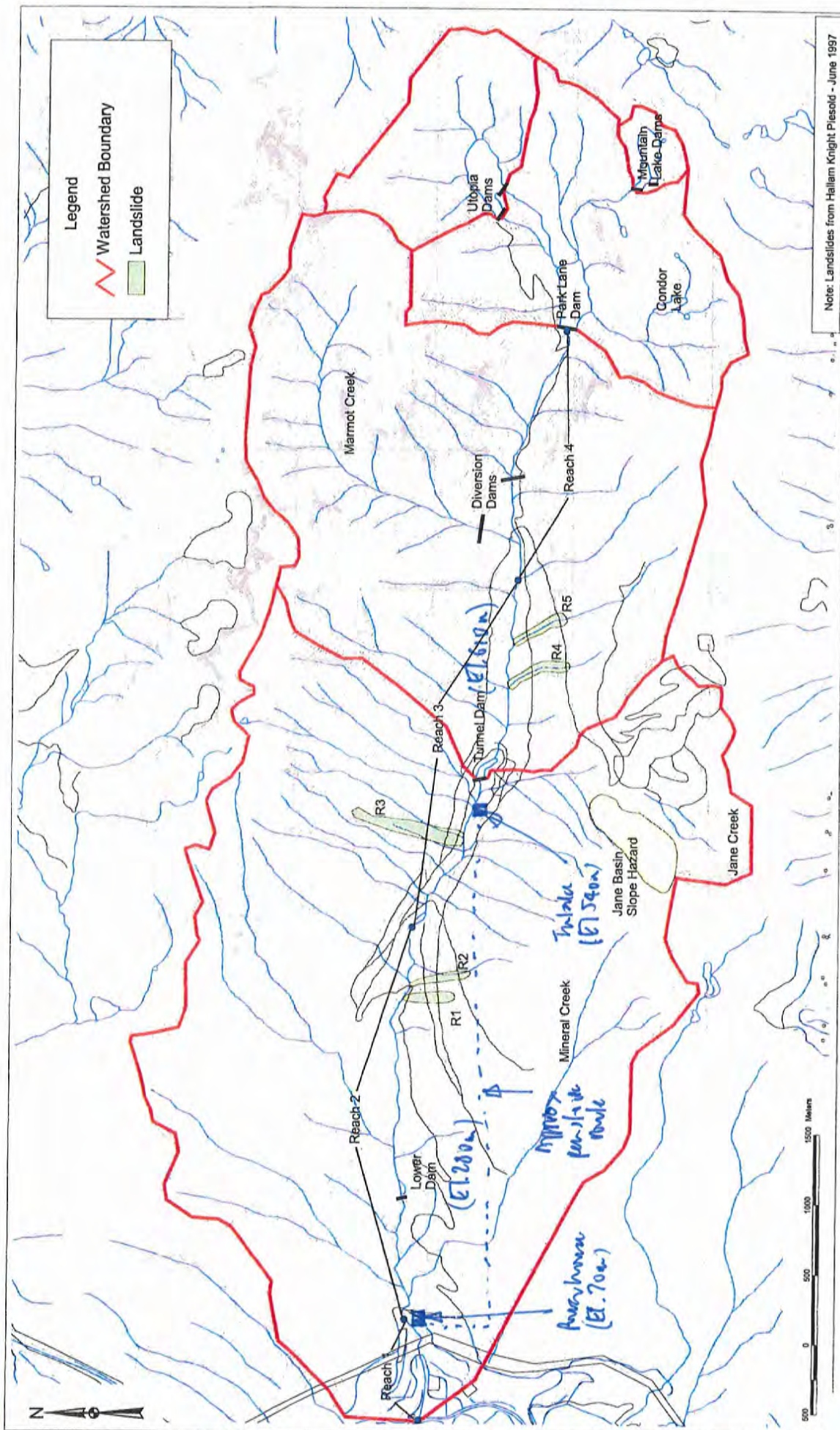


FIG. 5



June 13, 2016

File: 19-5356-1

Taicheng Development Corporation
710 - 100 Park Royal South
West Vancouver, BC V5T 1A2

Attention: Mr. Daniel Lou

**BRITANNIA SOUTH DEVELOPMENT, B.C.
DETAILED DEBRIS FLOW HAZARD ASSESSMENT AND PRELIMINARY EVALUATION OF
MITIGATION OPTIONS**

Dear Daniel:

This report presents Thurber Engineering Ltd. (Thurber)'s detailed debris flow hazard assessment for Daisy, Gravel and Thistle Creeks where they pass through the proposed Britannia South development. The report includes a summary of our Gravel, Thistle and Daisy Creek reconnaissance, debris flow runout modelling for Daisy Creek and presents our preliminary recommendations for mitigation measures. This report builds on and supersedes the Thurber December 9, 2015 report provided previously.

This report has been prepared for the exclusive use of Taicheng Development Corporation (Taicheng). Any use which a third party makes of this report, or any reliance on decisions based on it are the responsibility of such third parties. Thurber accepts no responsibility for damage incurred by third parties as a result of decisions made or actions taken based on this report. It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

1. INTRODUCTION

The proposed Britannia South development will comprise local roads and commercial and residential development with a possible school.

In preparation of this report, the following items were reviewed. For discussion purposes, we will refer to the Items using the numbers below.

1. South Britannia Creek Beach Master Plan Volume 1 of 3 dated November 2014
2. Turje Britannia Beach South Site Development and Servicing Volume 1 of 2 – Summary Report dated May 11, 2016
3. Turje report titled South Britannia Development Gravel Creek Flood Revised Report dated May 7, 2016
4. Thurber report titled South Britannia Beach B.C. Geotechnical Assessment dated February 15, 2012
5. Britannia Mining and Smelting Company Limited's Plan Showing Location of Beach Power House and South Valley Dams

Item 1 shows the current development / master plan area in relation to the other properties owned by Taicheng Development Corporation. Based on Figure 2 in Item 1, there may be further development that occurs upslope from the present development plan. This report does not cover areas outside of the currently proposed development and development in other areas will need to be assessed separately. Item 2 shows where within the development single family, multifamily, commercial and school elements are proposed which are reproduced in part on Dwg. 1 to 3. The currently proposed development area was previously used as a gravel pit.

Currently there is a debris basin constructed on Daisy Creek just upstream of Highway 99 as shown in Photo 1 and 2.



Photo 1: Debris Basin Looking Upstream from Spillway October 16, 2015



Photo 2: Daisy Creek Debris Basin Culvert Outlet

The Daisy Creek debris basin was constructed as part of the upgrade to Highway 99 completed prior to 2010. The basin was specifically designed to protect Highway 99 but offers some protection to the proposed development. The Ministry of Transportation and Infrastructure (MoTI) is currently responsible for operations and maintenance of the basin.

Thurber's February 15, 2012 report to Taicheng discusses debris flow hazards on Thistle and Daisy Creeks based on studies completed in 1983 and 1997. The report recommends potential avulsion or diversion points on Thistle Creek be blocked off by erosion-resistant earthworks or alternatively, small sediment basins, racks and culverts be provided on the crossings of all the potential avulsion paths.

The February 2012 report also recommends that residential buildings in the vicinity of Daisy Creek incorporate a concrete wall to 1 m above the ground surface on the uphill side. We understand that the Squamish Lillooet Regional District (SLRD) and Taicheng prefer that flood proofing be completed without the measures being incorporated into the building envelope. Thus, there is a requirement to either raise the buildings up on fill pads or capture all debris in upstream mitigation works.

On January 28, 2016 Item 1 indicates significant creek water flow caused Gravel Creek to avulse its channel along an access road and flow across the road causing erosion and associated sediment transport into the main gravel pit area. On the same day a debris flow appears to have



occurred on Daisy Creek blocking the lower culvert and causing water and sediment to spill out the upper culvert. Clear water also flowed down the highway and into the lands to the north.

In June 2012 the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) released the document *“Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC” (Flood Assessment Guidelines)*. These APEGBC 2012 guidelines build on the APEGBC May 2010 Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC. The APEGBC 2012 guidelines discuss the required steps to be taken to mitigate the risk of flooding, including debris flows, for proposed residential developments. These guidelines were used for the assessment presented herein.

2. DEBRIS FLOW DEFINITION

Debris flows are described by Hungr et al (2014) as being “very rapid [3 m/minute] to extremely rapid [5 m/second] surging flow of saturated debris [mixture of soil, rock and wood] in a steep channel.” Debris flow involve “entrainment of material and water from the flow path”. Debris flows often initiate as landslides or rockfalls in steep portions of the channel and this supplies the energy to initiate the entrainment of additional water, soil, rock and woody debris. Debris flows are often initiated during periods of heavy rainfall or rain on snow events and thus are often associated with water floods. Hungr et al. (2014) reports that the peak discharge of the largest surge may be up to an order of magnitude (10 times) that of a hydrological flood. Debris flows typically initiate and travel within channels with gradients steeper than 10° to 20° and slow and stop when the channel widens and becomes flatter than 5° to 20°. A debris flow generally has a solids content of 60% or more by volume.

3. SITE RECONNAISSANCE

A site reconnaissance was completed on October 16, 2015 by Ben Singleton-Polster, P.Eng. and Paul Wilson, P.Eng. of Thurber. A foot traverse was completed up the north and south channel of Daisy Creek channel to about El. 450 m and Thistle Creek below about El. 300 m. On May 5, 2016 an additional foot traverse was completed by Ben Singleton-Polster, P.Eng. and Paul Turje, P.Eng. of P.S. Turje & Associates Ltd. of the Daisy Debris Basin and Daisy Creek below Highway 99. Ben Singleton-Polster remained on site and completed a foot traverse up Gravel Creek to about El. 390 m. During the May 5 site reconnaissance Paul Turje advised that Minaty Creek located on the south side of the development was insignificant, unlikely to avulse or overflow and too small to cause debris flows and thus this creek was not assessed. Details of the site reconnaissance of Daisy, Thistle and Gravel Creeks is provided below.



3.1 Daisy Creek

The October 16, 2015 site reconnaissance on Daisy Creek showed the creek channel is generally bedrock-controlled. From the existing debris basin located adjacent to Highway 99 to about 200 m upstream of the basin inlet, the sides of the channel comprise lobes of rocky debris indicative of previous debris flow deposition. Above this fan, the channel is narrow and bedrock controlled for about 100 m before gradually opening up to a broader bedrock controlled channel with bedload comprising sub-angular cobbles and boulders up to about 4 m diameter. The sides of the channel often comprise coarse talus slopes derived from rockfall off bedrock slopes on the sides of the channel.

At about El. 280 m, a 1.2 m high concrete dam was observed on the creek. The dam was partially breached on the right bank and retaining sediment on the left bank. The dam appeared to have been used to divert water to a wood stove culvert running along the north bank of the creek. The location of the dam is shown on Dwg. 1. The main channel splits into the north and south channels at about El. 315 m, 950 m upstream of the basin inlet. A forest service road (FSR) crosses the north and south channels at about El. 380 and 370 m, respectively. Above the FSR, the north channel becomes less constrained and opens up into a fan-like deposit for about 300 m before continuing back into a steep bedrock controlled-channel with large angular boulders.

Two potential avulsion points on Daisy Creek were noted on the lower section at about 300 and 350 m above the debris basin inlet. Debris flow runout modelling discussed in Section 4 confirms the potential for avulsion at these locations. This will need to be assessed further for future development upslope of the currently proposed development.

Debris flow yield rates were estimated based on exposed conditions, local experience and engineering judgement. Daisy Creek yield rates for the lower reach were estimated to be 1 m³/m to 2 m³/m while the majority of the channel above the steep bedrock section was estimated to yield between 4 m³/m to 7 m³/m. Localized channel side slope instabilities that could potential contribute to the debris flow hazard were also noted.

Item 3 reports that this culvert was blocked and highways maintenance crews unplugged it during the storm event. The May 5, 2016 inspection of the debris basin showed an approximately 2,000 m³ to 3,000 m³ debris flow had blocked the lower basin culvert as evidenced by gravel terraces and gravel in the base of the upper culvert. Further, Item 3 reports that water overflowed the channel between the debris basin outlet and the highway culvert. The water flowed down the highway and was diverted to the north near the gravel pit underpass.



3.2 Thistle Creek

Thistle Creek extends up from the gravel pit for about 1,200 m to where it crosses a FSR at approximately El. 430 m. The October 16, 2015 site reconnaissance on Thistle Creek was completed between a flat terrace at approximately El. 120 m and an approximately 5 m high dam at about El. 280 m. The dam is filled with gravel up to the crest and water is spilling over the top. Below the dam Thistle Creek generally is bedrock controlled within an incised channel. Below El. 120 m to the existing gravel pit where the current development is proposed, the creek is reported by Item 4 to be bedrock controlled. On the terrace at El. 120 m is a large ditch linking Thistle to Daisy Creek that currently is not in use and does not appear to have had significant water flowing in recent times. There are large gently sloping terrace located at about El. 120 m and 250 m. Based on our observations these terraces are flat and broad enough to likely cause debris flow deposition. The observations of the October 16, 2016 reconnaissance are generally consistent with those contained in Item 4.

Debris flow yield rates were estimated based on exposed conditions, local experience and engineering judgement. Yield rates for the majority of the creek are estimated to be 1 m³/m to 2 m³/m. These yield rates assume that the 5 m high dam is removed as currently planned by the Ministry of Forests Lands and Natural Resource Operations (MFLNRO).

3.3 Gravel Creek

The May 5, 2016 site reconnaissance on Gravel Creek showed that the creek is generally bedrock controlled and thickly covered in woody debris left from previous logging and clearing activities. From the existing gravel pit where the current development, is proposed Gravel Creek generally follows an access road before continuing uphill through the Hydro right of way and then up through old clear-cuts. The creek becomes indistinct near El. 260 m. Above about El. 260 m there are a number of smaller seasonal creeks. No evidence of the dam shown on Item 5 was observed. Due to the indistinct nature of the creek in this area it may be possible that the dam was missed during our brief inspection.

Gravel Creek crosses roads below and within the Hydro right of way and abandoned logging roads above the Hydro right of way through culverts. On the uppermost logging road at about El. 190 m a small debris slide comprising logs and gravel was observed.

Debris flow yield rates within Gravel Creek will be limited to point releases from blocked culverts and, if sufficiently large and mobile, woody debris may be entrained resulting in yield rates of between 1 m³/m to 3 m³/m.



4. OLD BRITANNIA MINE DAMS

The 1.2 m high dam on Daisy Creek was not observed during previous studies. The location of the Daisy Creek dam along with the 5 m high dam on Thistle Creek identified during 1997 debris flow studies were provided to the MFLNRO who are currently in the process of decommissioning old dams within the limits of the old Britannia Mine Site. MFLNRO determined that the dams are part of a larger complex of dams that diverted water into the 'Furry Creek Pipe Line A' which connected to a power house in Britannia Beach. The dams and pipelines are shown in Item 5 which is attached for reference. MFLNRO has indicated that they plan to decommission the Thistle Creek dam in the near future but have no immediate plans for the Daisy Creek dam. Removal of the Thistle Creek dam will not change our previous recommendation to block-off potential erosion / avulsion points along Thistle Creek.

5. GEOTECHNICAL HAZARD AND RISK

The terms hazard and risk are related yet different. The Hazard can be described broadly as what is the probability or likelihood of an event occurring that causes harm to people, property or the environment. Risk is the combination of the hazard and consequence should that hazard occur.

Within Canada there is no commonly defined range of acceptable risk/safety. The APEGBC 2010 guidelines state that "it is not the role of a Professional Engineer or Professional Geoscientist to define such levels of safety; they must be established and adopted by the local government or the provincial government after considering a range of societal values". Within BC acceptable risk is provided by local governments (e.g. SLRD) and/or Ministry of Transportation and Infrastructure (MoTI) who has jurisdiction over subdivision development outside of areas of local government control. These government agencies often rely on the a report by Cave (1993) titled Hazard Acceptability Thresholds for Development Approvals by Local Governments and the APEGBC 2010 and 2012 guidelines. The Cave report recommends consideration of up to a 10,000 year hazard return period be used for new subdivisions. APEGBC 2012 recommends hazard return periods of up to 2,500 years be assessed for subdivisions with greater than 100 new lots. The District of North Vancouver is one of the few approving authorities that has defined an acceptable level of risk as 100,000 year return period for new developments when using a quantitative risk assessment methodology.

Estimation of hazards associated with large/long return periods such as over 1,000 years is difficult and the errors associated with estimating increase with large return periods. Considerable judgement is required to assess large return period hazards and the assumptions associated with large return periods are uncertain. For the purposes of our assessment and this report we have designed to a 2,500 year return period hazard as recommended in the APEGBC 2012 Guidelines. In consideration of potential larger return period hazards, we have considered "what if" scenarios that are possible.

6. HAZARD MAGNITUDE-FREQUENCY ESTIMATE

Debris flow hazard magnitudes for various return periods were estimated using observations from our site reconnaissance, data sets from other creeks prone to debris flows hazards on Highway 99 between Horseshoe Bay and Squamish and engineering judgement. Debris flow magnitudes were estimated for the return periods discussed in the APEGBC 2012 Guidelines and are shown in Tables 1, 2 and 3 for Daisy Creek, Thistle Creek and Gravel Creek respectively.

Table 1
Estimated Debris Flow Magnitudes for Daisy Creek

Return Period (years)	Debris Flow Volume (m ³) *
200	8,000
500	13,000
1,000	18,000
2,500	23,000

* Estimated debris flow volumes are +/-2,000 m³

It should be noted that if MFLNRO were to remove the 1.2 m dam on Daisy Creek, it is our opinion that it would have a negligible effect on the estimated debris volumes. The above estimates assume that the potential avulsion points on Thistle Creek will be blocked

Table 2
Estimated Debris Flow Magnitudes for Thistle Creek

Return Period (years)	Debris Flow Volume (m ³) *
200	500
500	900
1,000	1,300
2,500	2,000

* Estimated debris flow volumes are +/-500 m³

It should be noted that these assumptions assume MFLNRO will remove the 5 m dam on Thistle Creek and that the potential avulsion points will be blocked.

Table 3
Estimated Debris Flow Magnitudes for Gravel Creek

Return Period (years)	Debris Flow Volume (m ³) *
200	700
500	1,100
1,000	1,600
2,500	2,400

* Estimated debris flow volumes are +/-500 m³

It should be noted that these assumptions assume that the culverts on the abandoned logging road are removed and that the road is deactivated in the vicinity of the creek.

7. DAISY CREEK DEBRIS FLOW RUNNOUT ANALYSIS

To evaluate the effectiveness of the existing basin on Daisy Creek and characterize the residual hazard to the proposed development, debris flow runout analyses were completed using the software DAN3D by O. Hungr Geotechnical Engineering Inc. DAN3D implements the numerical model developed by Hungr and McDougall (McDougall and Hungr 2004 and 2005) to complete dynamic analysis of three dimensional models to predict the velocity and extent of motion of rapid landslides such as debris flows and avalanches, flow slides and rock avalanches. The models can simulate landslides which entrain path material and have variable rheology.

Observations of past debris flow events on Daisy Creek were used to establish a set of 'calibrated' Voellmy and frictional rheology parameters for analysis of debris flow runout behaviour. Runout behaviour using parameters calibrated for debris flow events on Charles Creek and Kallahne Creeks on Highway 99 were also assessed.

The DAN3D ground surface input for the model was based on 2013 LiDAR data collected by MFLNRO as part of a larger study of the Britannia Creek watershed. The model extents were set to about 300 m below the highway and about 750 m above the debris basin. Due to modelling limitations in DAN3D the culverts were modelled as plugged. For large events, the culverts will likely plug; for smaller events, the culverts may pass some debris.

The debris flow rheology parameters and volumes for the return periods shown in Section 3 were then used to assess the debris flow runout potential, effectiveness of the existing basin and the residual hazard to the proposed development. Selected model results are shown on Figures 1, 2 and 3. The results indicate that the existing basin is generally effective at mitigating the debris flow hazard. However, there are conditions or "what if" scenarios (fluid debris flow rheology, high debris flow volumes and/or improper basin maintenance and cleanout) in which basin overflow can occur. In circumstances where basin overflow occurs, the debris flow runout and/or residual clear water flood may do one or more of the following:



- Deposit in the flat area to the north of the basin and east of the highway
- Travel northbound along the highway, flowing down the Highway 99 embankment in the direction of Thistle Creek
- Travel across Highway 99 along the general alignment of the Daisy Creek channel

8. DEBRIS FLOW RUNOUT MITIGATION FOR SUBDIVISION

As discussed above, Thurber's February 15, 2012 report recommends potential avulsion or diversion points on Thistle Creek be blocked off by erosion-resistant earthworks. The recommendations provided below for Daisy Creek assume that these recommendations will be implemented. Detailed mapping of avulsion locations will need to be completed during detailed design after a topographic survey has been completed of the area.

Based on the results of the DAN3D analysis, we recommend the area north of the debris basin be excavated to create supplemental storage volume. The material excavated should be placed immediately to the north to extend and strengthen the existing berm on the north side of highway. This berm should wrap around to Thistle creek and then extend up and around the multifamily development near Gravel Creek. For preliminary layout purposes, the berm should be minimum 2 m high, a crest width of 2 m and 1.5H:1V side slopes. The berm size will need to be finalized in detailed design once development grades are established. A 3,000 m³ debris basin should be constructed on the upper edge of the development on Thistle and Gravel Creeks. The debris basins should have a trash rack comprising vertical steel piles with appropriate embedment depth for scour at the outlet of Thistle and Gravel Creeks. This berm should also be armoured with riprap to mitigate the risk of erosion during clear water flows. The extent of riprap should be confirmed based on clear water flow analysis. The exact size and locations of the berms and debris basins must be confirmed by Thurber during detailed design and prior to construction.

In an overflow scenario, debris and/or clear water flows could impact the portion of the development immediately adjacent to the creeks. To mitigate these conditions, we recommend designing bridges to accommodate floating debris and raising road grades and development lots by a minimum of 1.2 m in these areas. Details of the mitigation works need to be finalized during detailed design when final road and lot grades have been established. Details related to the road crossing of Daisy Creek will also have an impact on final design. Preliminary locations of the recommended mitigation works are shown on Dwg. 3.

During detailed design, a debris flow mitigation works operation and maintenance manual should be produced. As part of developing the operations and maintenance manual, a discussion will be required between SLRD, Britannia South Development Strata and MoTI on long-term roles and responsibilities.



In addition to the above project specific requirements, Section G3.3 of the APEGBC 2012 Flood Assessment Guidelines recommends a minimum Flood Construction Level of 0.6 m. Accordingly, all buildings within the fan area should be raised up on fill pads a minimum 0.6 m above the surrounding grades.

9. CLOSURE

We trust that this report is sufficient for your present needs. Should you require clarification of any item or additional information, please contact us at your convenience.

Yours truly,
Thurber Engineering Ltd.
Paul Wilson, P.Eng.
Review Principal



Ben Singleton-Polster, P.Eng.
Project Engineer

Attachments: Statement of Conditions and Limitations
Dwgs. 1 to 5
Figures 1, 2 and 3
Britannia Mining and Smelting Company Limited – Plan Showing Location of
Beach Power House and South Valley Dams

Cc: Long Cheng
Paul Turje, P.Eng.
Michael Von Hansen



References:

Association of Professional Engineers and Geoscientists of British Columbia (APEGBC), 2010. Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC. Dated May 2010.

Association of Professional Engineers and Geoscientists of British Columbia (APEGBC), 2012. Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC. Dated June 2012.

Hungr, O, Leroueil, S and Picarelli, L. 2014. The Varnes classification of landslide types, an update, Landslides, Volume 11, Issue 2, pp 167–194.

The District of North Vancouver, November 10, 2009, Report to Council, Natural Hazards Risk Tolerance Criteria. Accessed May 19, 2016

Cave, P.W. (1992a, revised 1993). Hazard Acceptability Thresholds for Development Approvals by Local Governments. In Proceedings of Geological Hazards Workshop, University of Victoria, BC. February 20-21, 1991. BC Geological Survey Branch, Open File 1992-15, p 15-26

STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

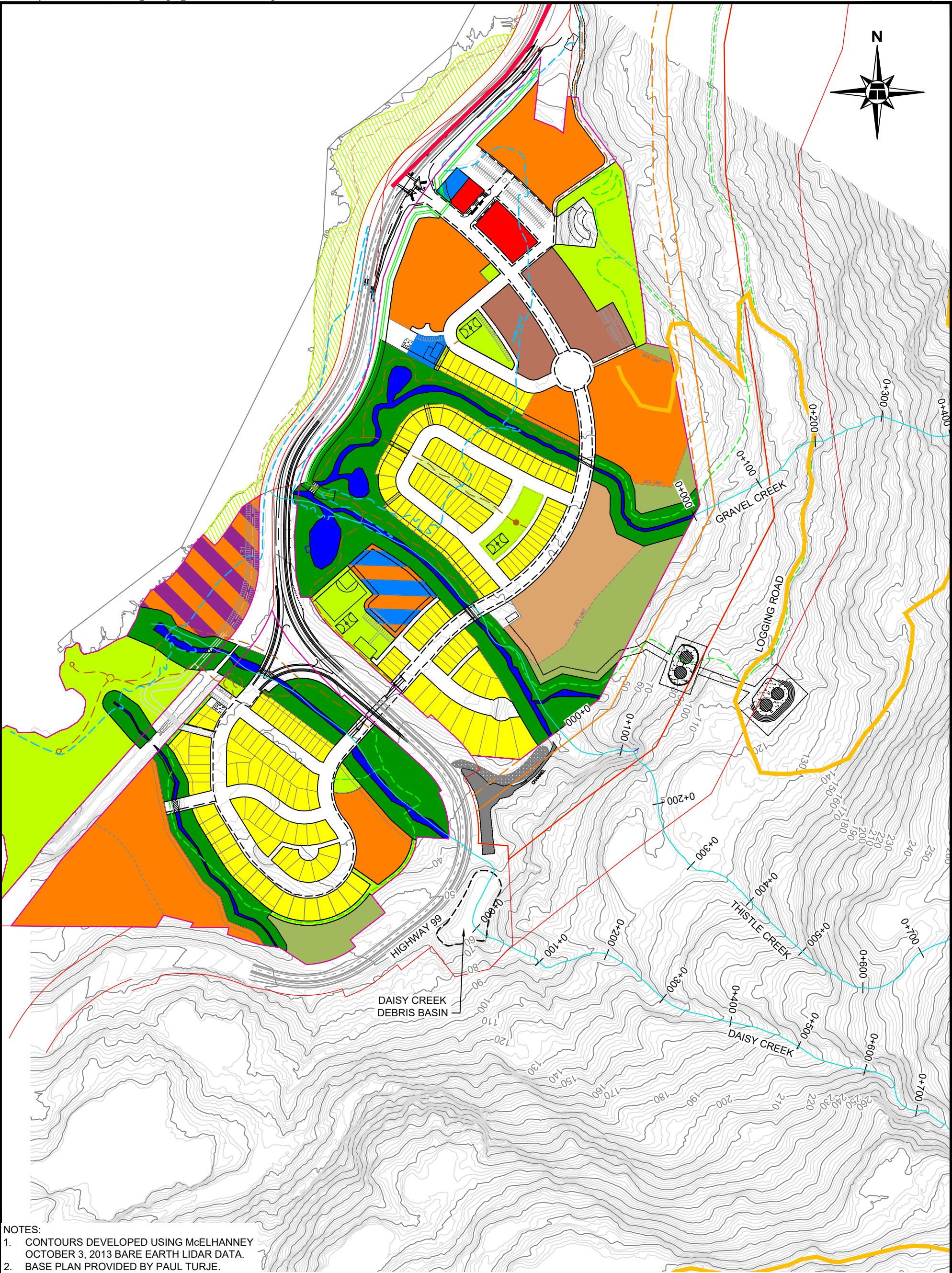
- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

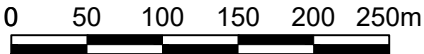
7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

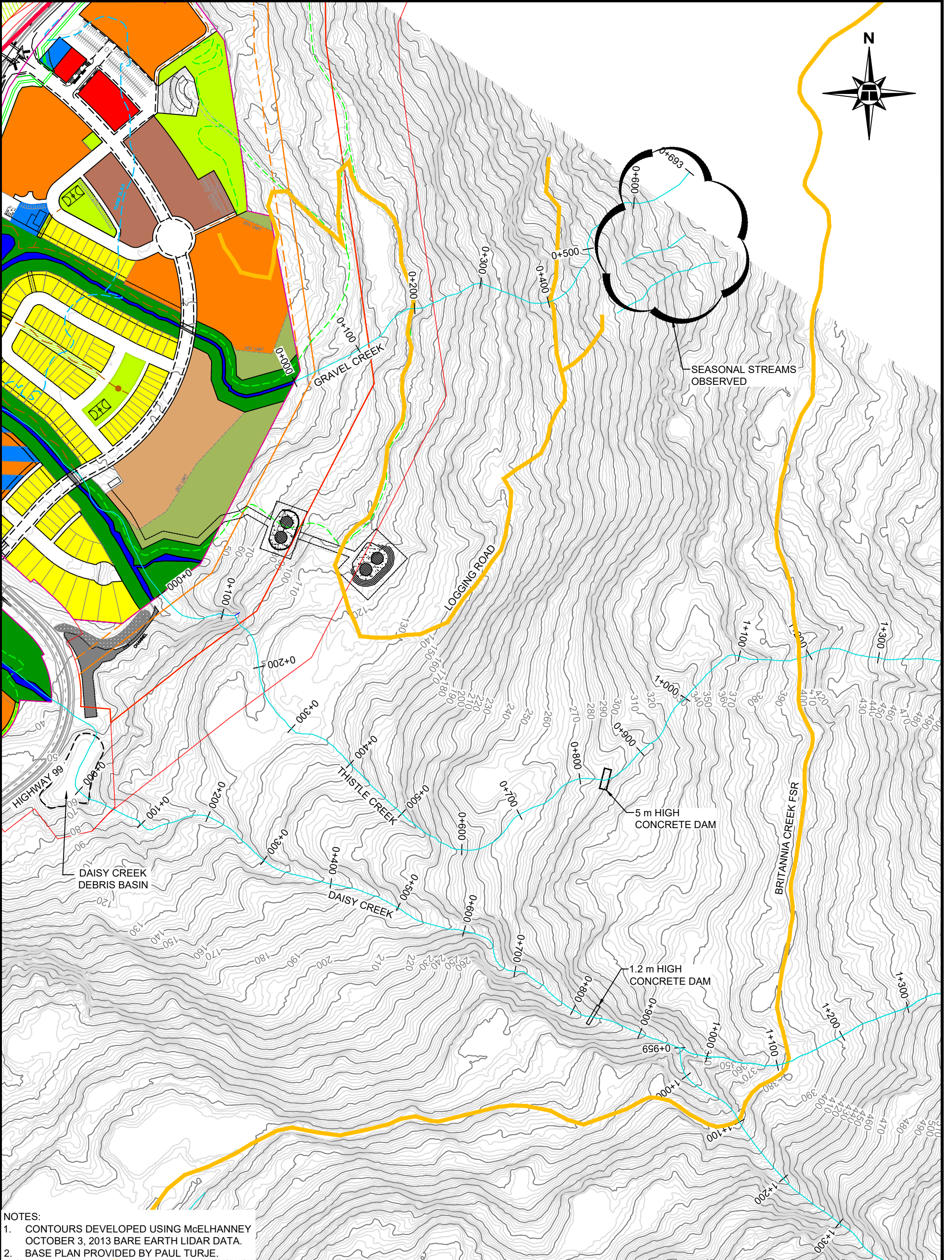


- NOTES:
1. CONTOURS DEVELOPED USING McELHANNEY OCTOBER 3, 2013 BARE EARTH LIDAR DATA.
 2. BASE PLAN PROVIDED BY PAUL TURJE.

- LEGEND:
- PARK - P
 - ENVIRONMENTALLY SENSITIVE (RIPARIAN) - ES
 - TOURIST COMMERICAL AND / OR MF1
 - SINGLE FAMILY LOTS (FREEHOLD) - SF1
 - MULTI-FAMILY LOTS (TOWNHOUSE, CLUSTER) - MF1
 - MULTI-FAMILY LOTS (TOWNHOUSE, APARTMENT) - MF2
 - MULTI-FAMILY LOTS (APARTMENT) - MF3



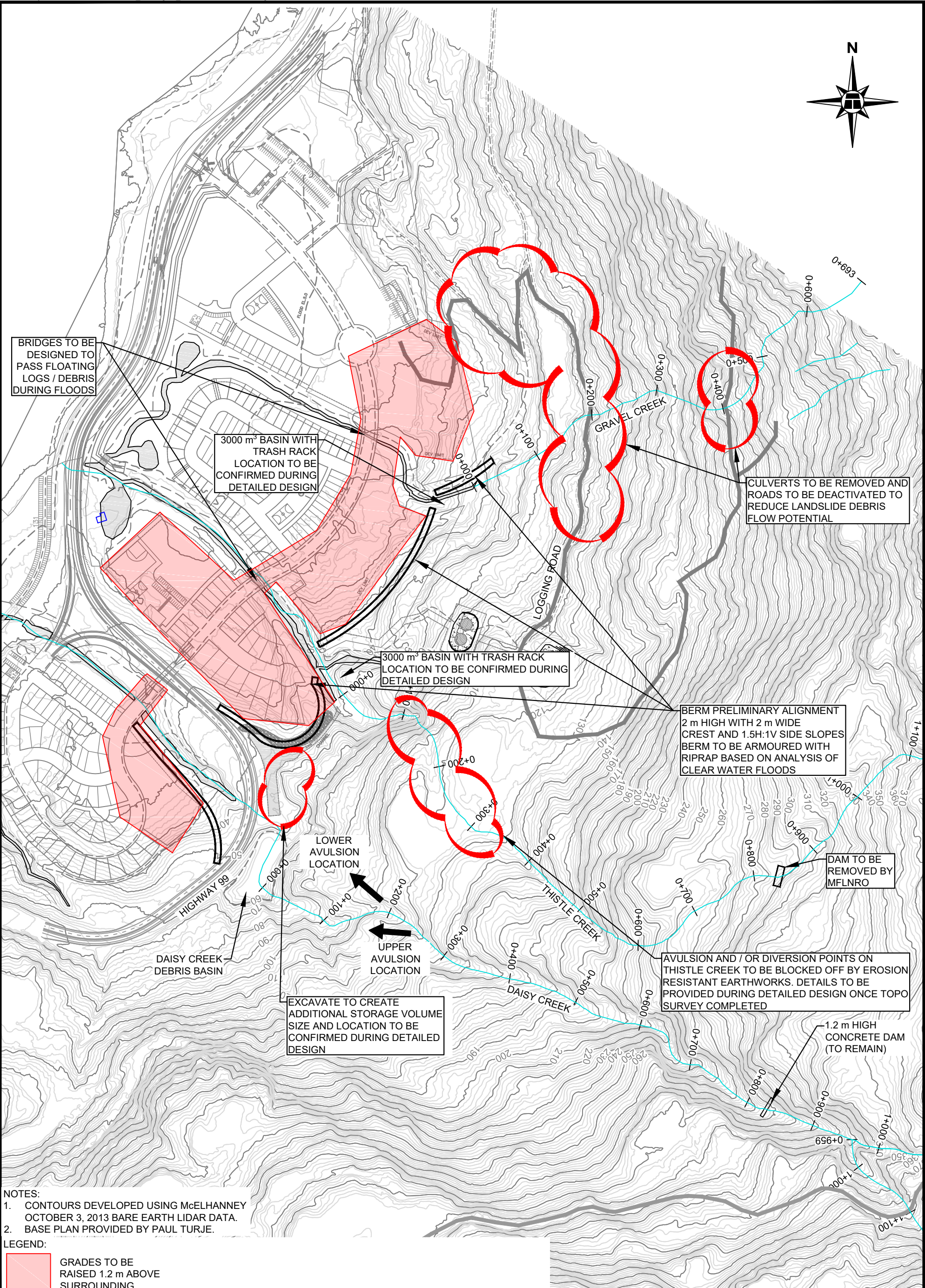
 THURBER ENGINEERING LTD.	CLIENT	TAICHENG DEVELOPMENT CORPORATION			DESIGNED	DRAWN	APPROVED
					BSP	NAK	PJW
		SITE PLAN - PROPOSED DEVELOPMENT			DATE	SCALE	
		BRITANNIA SOUTH DEVELOPMENT DEBRIS FLOW PRELIMINARY ASSESSMENT			02/06/16	1:5000	
		DAISY, THISTLE AND GRAVEL CREEKS			PROJECT No.	DWG. No.	REV.
					19-5356-1	1	0



NOTES:
1. CONTOURS DEVELOPED USING McELHANNEY OCTOBER 3, 2013 BARE EARTH LIDAR DATA.
2. BASE PLAN PROVIDED BY PAUL TURJE.

- LEGEND:
- | | |
|---|---|
| PARK - P | MULTI-FAMILY LOTS (APARTMENT) - MF3 |
| ENVIRONMENTALLY SENSITIVE (RIPARIAN) - ES | |
| TOURIST COMMERCIAL AND / OR MF1 | |
| SINGLE FAMILY LOTS (FREEHOLD) - SF1 | |
| MULTI-FAMILY LOTS (TOWNHOUSE, CLUSTER) - MF1 | |
| MULTI-FAMILY LOTS (TOWNHOUSE, APARTMENT) - MF2 | |

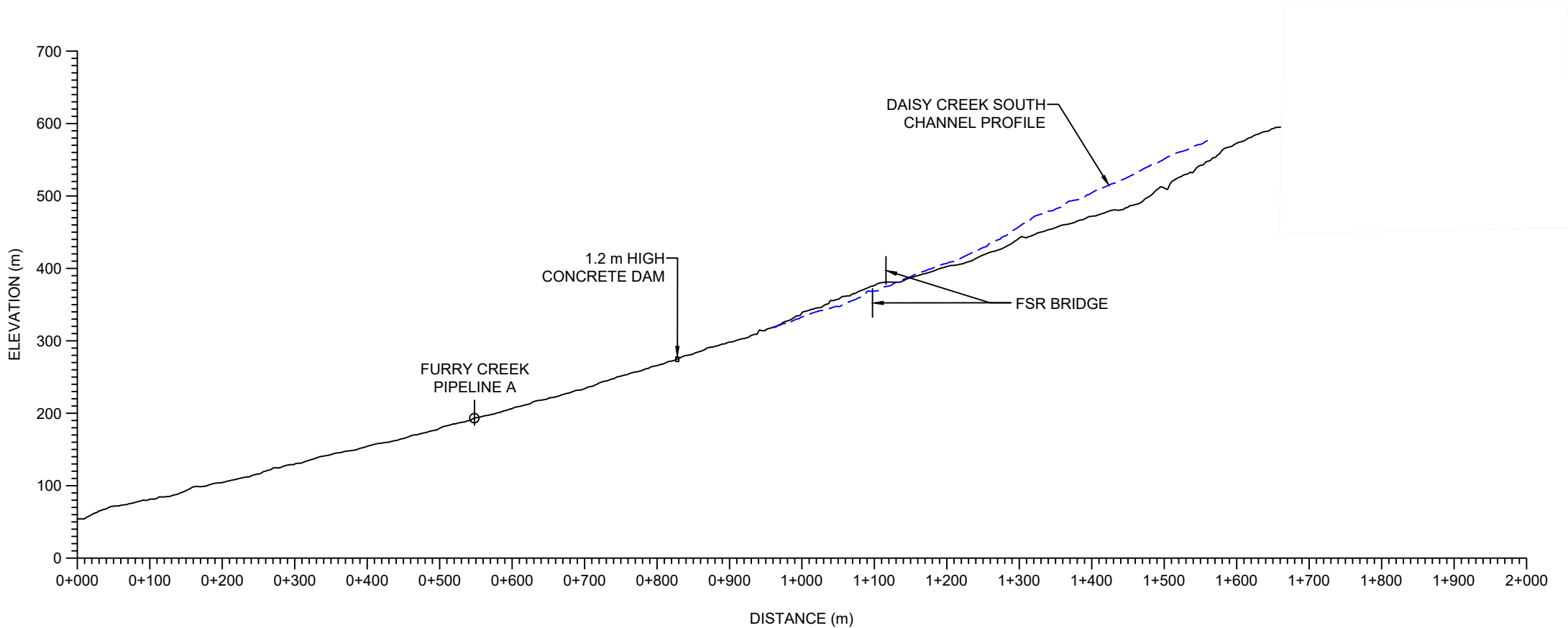
 THURBER ENGINEERING LTD.	CLIENT	TAICHENG DEVELOPMENT CORPORATION		DESIGNED	DRAWN	APPROVED
				BSP	NAK	PJW
	SITE PLAN - CONTOURS & DAMS BRITANNIA SOUTH DEVELOPMENT DEBRIS FLOW PRELIMINARY ASSESSMENT			DATE	SCALE	
				06/02/16	1:5000	
		DAISY, THISTLE AND GRAVEL CREEKS		PROJECT No.	DWG. No.	REV.
				19-5356-1	2	0



 THURBER ENGINEERING LTD.	CLIENT	TAICHENG DEVELOPMENT CORPORATION			DESIGNED BSP	DRAWN NAK/KBB	APPROVED PJW	
	SITE PLAN - DEBRIS FLOW MITIGATION WORKS BRITANNIA SOUTH DEVELOPMENT DEBRIS FLOW PRELIMINARY ASSESSMENT DAISY, THISTLE AND GRAVEL CREEKS				DATE 10/06/16		SCALE 1:5000	
					PROJECT No. 19-5356-1		DWG. No. 3	REV. 0

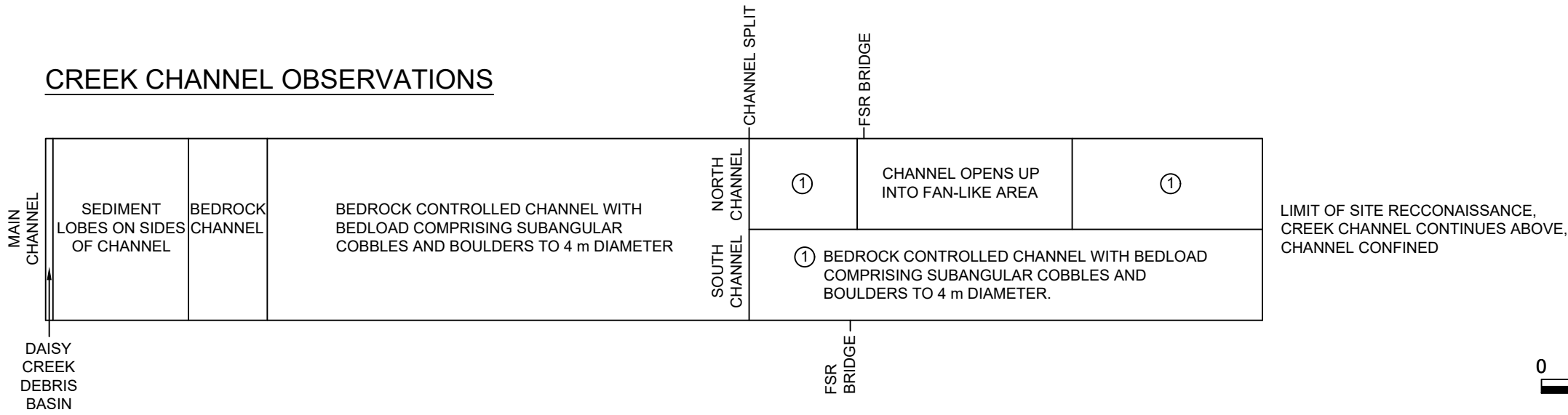
Plotted: June 6, 2016

S:\Data\Projects\19\5000-5999\5356\106_Drafting\03_WORKING\19-5356-1.dwg



DAISY CREEK PROFILE

CREEK CHANNEL OBSERVATIONS



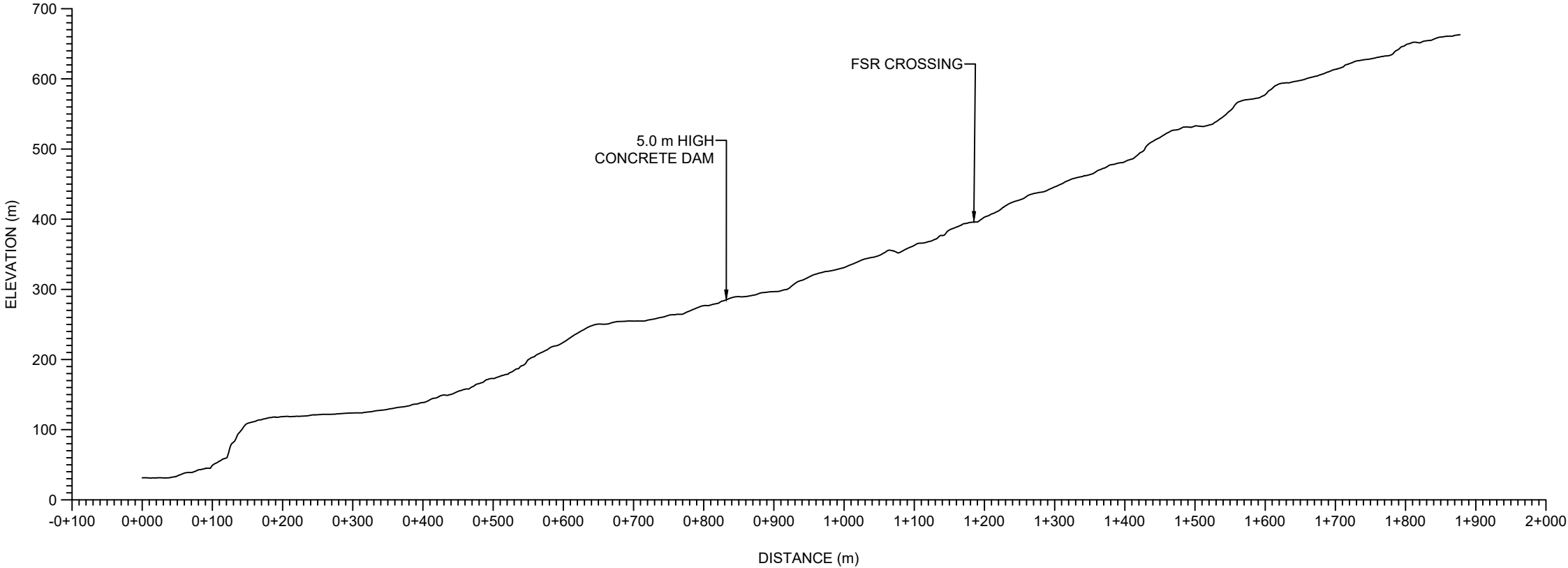
LEGEND:
— DAISY CREEK MAIN CHANNEL
- - - DAISY CREEK SOUTH CHANNEL



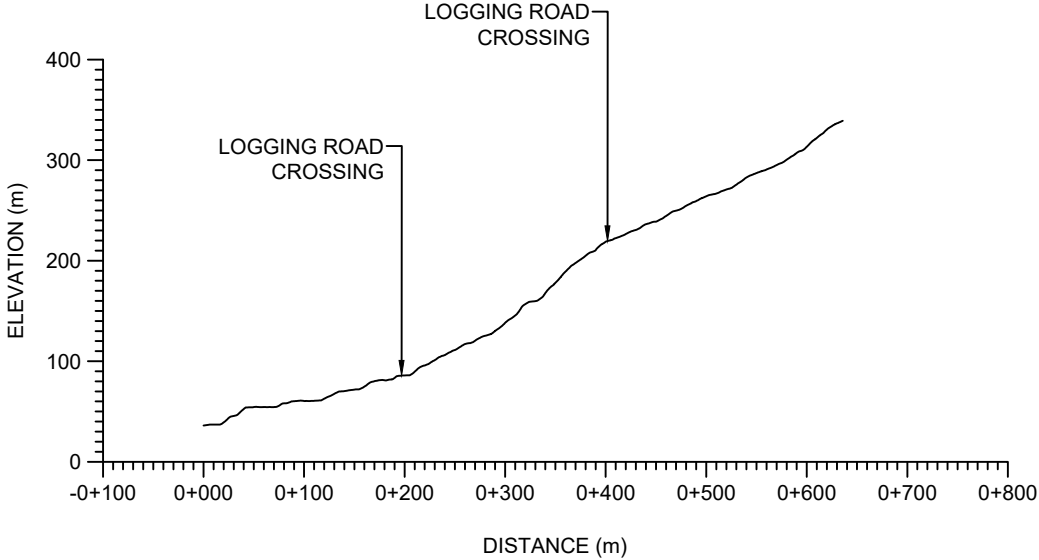
CLIENT	TAICHENG DEVELOPMENT CORPORATION		
DAISY CREEK PROFILE BRITANNIA CREEK COPPER DEBRIS PRELIMINARY ASSESSMENT DAISY CREEK, BC	DESIGNED	DRAWN	APPROVED
	BSP	NAK	PJW
	DATE	SCALE	
	25/05/16	1:7500	
	PROJECT No.	DWG. No.	REV.
	19-5356-1	4	1

Plotted: June 6, 2016

S:\Data\Projects\19\5000-5999\5356\106_Drafting\03_WORKING\19-5356-1.dwg



THISTLE CREEK PROFILE



GRAVEL CREEK PROFILE

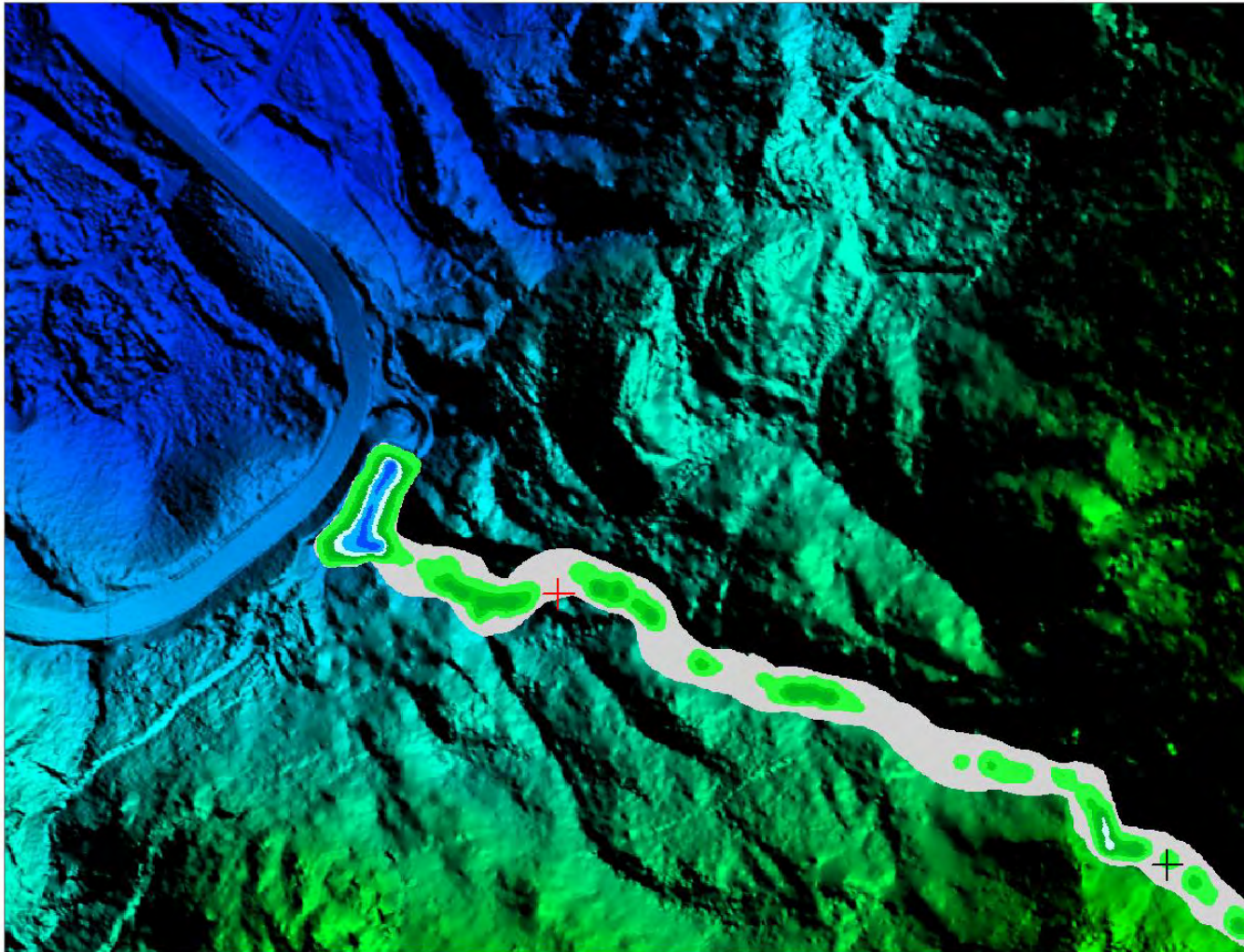


LEGEND:
CREEK CHANNEL



CLIENT	TAICHENG DEVELOPMENT CORPORATION		
THISTLE AND GRAVEL CREEK PROFILE			
BRITANNIA CREEK COPPER DEBRIS PRELIMINARY ASSESSMENT			DAISY CREEK, BC

DESIGNED BSP	DRAWN KYC	APPROVED PJW
DATE 25/05/16		SCALE 1:7500
PROJECT No. 19-5356-1	DWG. No. 5	REV. 1



TAICHENG DEVELOPMENT CORPORATION



THURBER ENGINEERING LTD.

EXAMPLE OF EVENT RETAINED BY BASIN

ENG: BSP

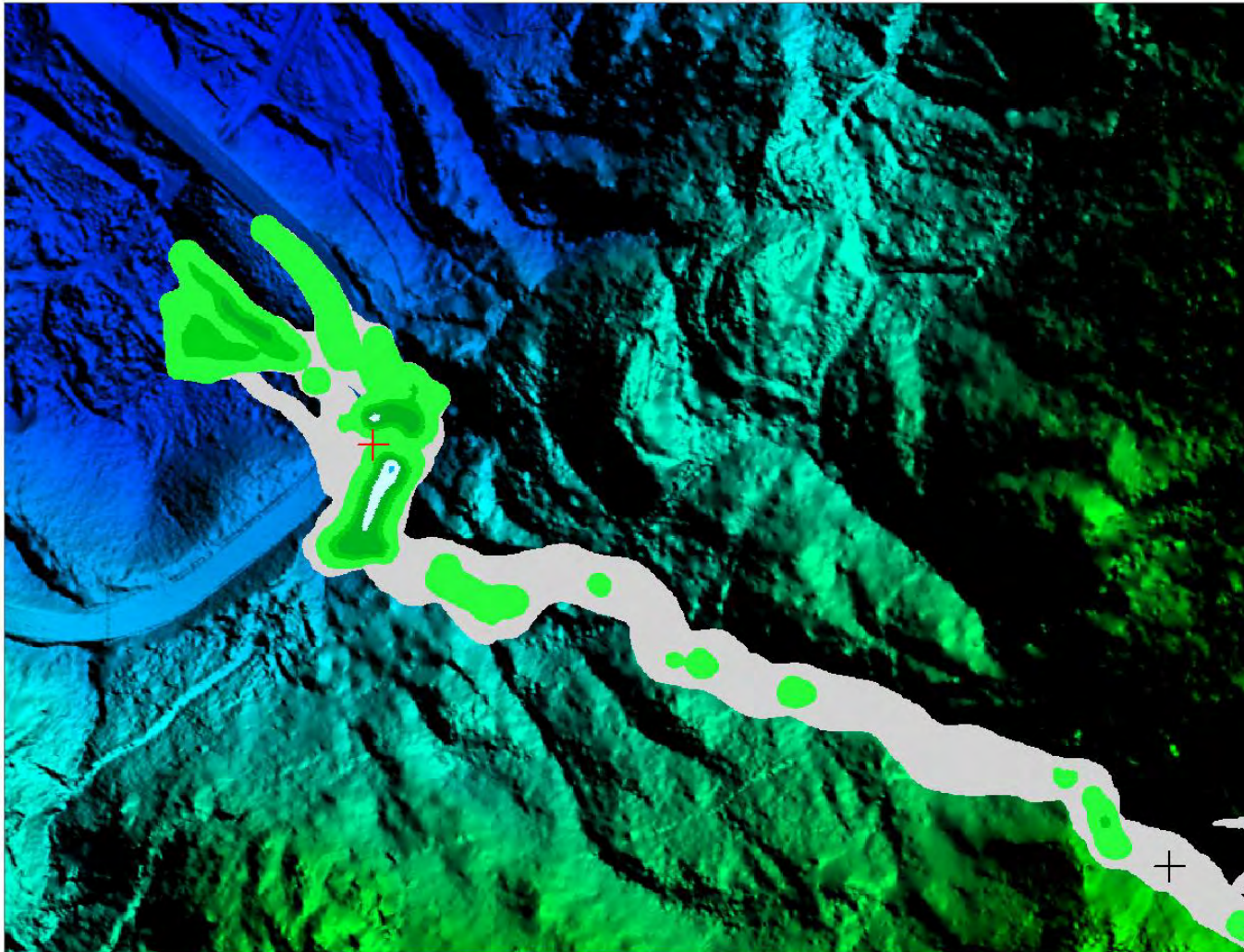
DWN: BSP

SCALE:
1:7,500

Daisy Creek Debris Flow Hazard Assessment
Britannia Beach, B.C.

DATE:
December 4, 2015

FIGURE: 1



TAICHENG DEVELOPMENT CORPORATION



TYPICAL OVERFLOW PATTERN
NO AVULSION UPSTREAM OF BASIN

ENG: BSP

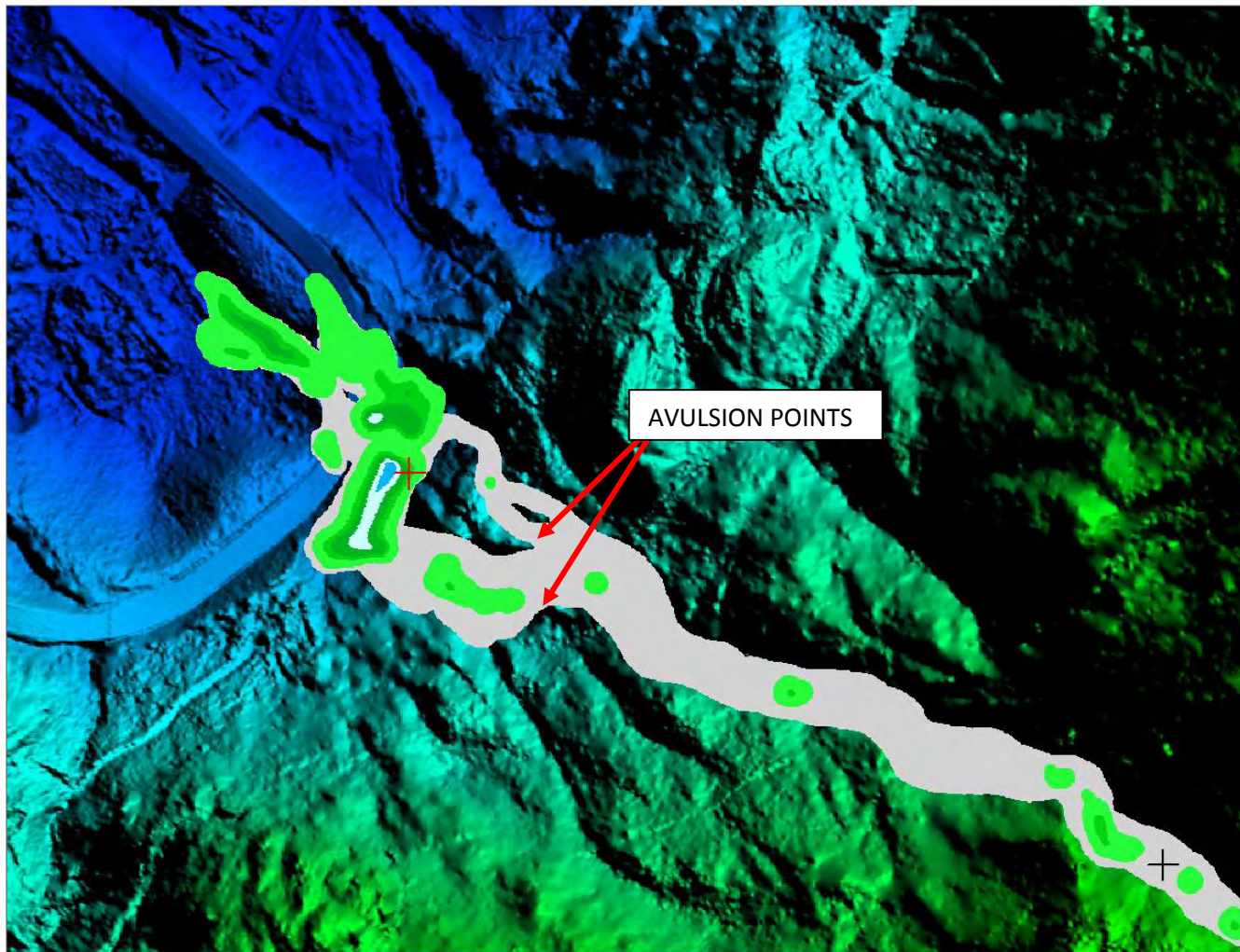
DWN: BSP

SCALE:
1:7,500

Daisy Creek Debris Flow Hazard Assessment
Britannia Beach, B.C.

DATE:
December 4, 2015

FIGURE: 2



TAICHENG DEVELOPMENT CORPORATION



THURBER ENGINEERING LTD.

TYPICAL OVERFLOW PATTERN
WITH AVULSION UPSTREAM OF BASIN

ENG: BSP

DWN: BSP

SCALE:
1:7,500

Daisy Creek Debris Flow Hazard Assessment
Britannia Beach, B.C.

DATE:
December 4, 2015

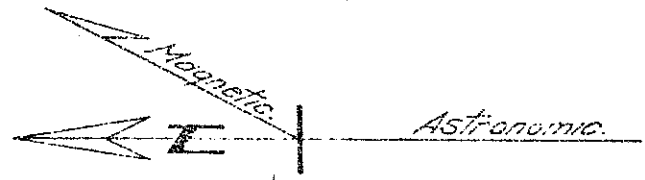
FIGURE: 3

SCALE OF

10000 9000 8000 7000 6000 5000

Pipe Line C.

Mineral Creek



Lynn V.

Beth Lake

BRITANNIA MINING & SMELTING
COMPANY LIMITED.
PLAN SHOWING LOCATION OF
BEACH POWER HOUSE AND SOUTH
VALLEY DAMS.

Furry Creek

BEACH OR NRI
POWER HOUSE
Ele. 165.

#1 Creek
Ele. 950.

Thistle Cr.
Daisy Cr.

Ele. 910.

Ele. 910.

Ele. 937.

Ele. 922.5
#4 Creek.

Ele. 901.

Ele. 939.

Ele. 1008.5

Ele. 938.

Ele. 910.
Ele. 938.
#6 Creek.

Ele. 1007.

South Fork
Dam.

Britannia
Beach.

HOWE
SOUND.

Furry Creek

#2 Creek.

#3 Creek.

#5 Creek.

Line A.

Plan "A"

7 PHASE 2 GEOTECHNICAL

This section contains the 2019 geotechnical report issued by SFA Geotechnical Engineering Ltd., that documents site investigations, findings and recommendations for development.

The section also contains a 2020 geotechnical report issued by SFA Geotechnical Engineering Ltd. that documents site investigations for the proposed Wavegarden surf park.



205 – 38026 2nd Ave.
Squamish, BC V8B 0C3
604-785-8957

Tigerbay Development Corporation
27154 Sea to Sky Hwy 99
Britannia Beach, BC, V0N 1J0

April 15, 2019
File: 1181

Attention: Mr. Tony Petricevic

**Re: Preliminary Geotechnical Recommendations and Summary Report,
Proposed Comprehensive Development, South Britannia Beach, BC**

1.0 INTRODUCTION

We understand that Tigerbay Development Corporation is proposing to develop an area of land south of the existing Britannia Beach mine and town site. It is proposed to construct a comprehensive development which is expected to include townhouses, apartments, hotels, commercial and community facilities, camping areas, parking structures and an outdoor wavegarden. In addition, new roads and services will be required to service the development.

This report summarizes the results of a number of geotechnical investigations completed by others of the soil and groundwater conditions which have been completed at the site and provides preliminary geotechnical recommendations for design consideration by the planning, design, and consulting team. The work has been conducted in general conformance with our proposal dated February 8, 2019.

This report has been prepared exclusively for Tigerbay Development Corporation and for the use of others within their design and construction team, however it remains the property of SFA Geotechnical Inc.

2.0 SITE DESCRIPTION

The proposed development site is located immediately south of the Britannia Beach town site approximately 10 km southwest of Squamish. The site is bounded by the Britannia Beach mine complex to the north, a BC Hydro Transmission Line right-of-way to the east, Highway 99 to the south, and Highway 99 and Howe Sound to the west. The site is irregular in shape, is up to 1,500 m long north to south and 700 m east-west and has an area of 780,000 square metres.

The site is a former gravel pit which has been mined heavily. The site is generally flat towards the northwest, transitioning to steep mountainside terrain towards the east and north. The southern terrain is hilly and generally slopes down towards the west but with localized variation. The site is bisected by several creeks which drain through the former gravel pit to the west. There is a CN Rail right-of-way along the southwest side of the site. Past investigations were limited to the area east of the rail line.

3.0 SITE INVESTIGATION

The site was previously investigated a number of times by GeoPacific Consultants Ltd.. The investigations included the following:

- The excavation of 34 test pits on June 29th and 30th 2015. The test pits were excavated throughout the site to help determine the overall shallow soil conditions.
- Four test holes, and two cone penetration test (CPT) soundings were completed on July 16th and 17th 2015 to help identify the deeper stratigraphy and assess the liquefaction potential of the subsurface soils.
- The excavation of 15 additional test pits on March 21 and 25, 2016.
- Three monitoring wells were installed on July 17th 2015 and five monitoring wells on May 6, 2016, to help evaluate the influence of the tides on the groundwater level below the site as well as to help determine the seasonal variability of the groundwater level.

The test pit, test hole, monitoring well and CPT locations are shown on our drawing 1181-1 included following the text of this report and the test hole logs are included in Appendix A.

We have been provided with preliminary drawings prepared by GeoPacific which show the surficial soils present on the site as well as two contour plans depicting the surficial fill piles as well as estimates of fill depths. We have included the drawings in Appendix B for reference, however we have not verified the accuracy of the drawings.

4.0 SUBSURFACE CONDITIONS

4.1 Published Surficial Geology

The Geological Survey of British Columbia describes the surficial geology as alluvial fan sediments that are very poorly sorted, dominantly sand and gravel sediment that form at the base of slopes. These sediments variably overly glaciomarine terrace sediments comprising stratified massive sand and gravel deposits and stratified proglacial deltaic sediments consisting of dominantly sand and gravel with minor silt and clay, locally up to 10m thick, over glaciomarine silt and clay.

4.2 Subsurface Conditions

The following general soil profile is based our review of the available subsurface information.

Fill Material:

Fill materials were encountered in the majority of the test holes and test pits throughout the site. The fill was variable and included granular soils with varying amounts of silt and clay and some blasted rock and boulders. Varying amounts of organics was found within the fill materials including wood, large logs and topsoil. Some garbage was found present within the fill material near surface but occasionally buried to depths of up to 2.5m.

The fill on the northern portion of the site was generally up to 1.7 m thick. However, the fill was observed to be up to 4.8 m thick immediately north of Hwy 99 and up to 2.8 m thick on the eastern edge of the site.

The fill on the southern portion of the site was up to 5.2 m thick. The thickest deposits were observed near the center of the site. Much of the thicker deposits were mixed with organic material.

Gravel and Cobbles (deltaic sediments):

The deltaic sediments were generally identified within the northeastern corner of the site as much of this deposit is expected to have been quarried. These soils comprise of glaciomarine gravels with some cobbles and boulders with interbedded sand lenses. The material was observed to be compact to dense.

Sand (glaciomarine terrace sediments):

Thick sequences of medium to coarse sand with some gravel and trace cobbles were identified and was observed to be dense. This deposit was found to underlie much of the site's flatter areas.

Silt and Clay with gravel (prograde marine and lodgment tills):

Till-like silt and clay with varying amounts of sand, gravel and cobbles was observed beneath the overlying gravel with sand throughout much of the site. The material was found to be dense to very dense.

Bedrock (meta-sediment and granite):

Bedrock was identified as hard crystalline very fine grained meta sedimentary rock, coarse grained granite, and granodiorite as is observed in rock bluffs along the eastern edge of the site.

4.3 Groundwater Conditions

Six groundwater monitoring wells were installed in the northern third of the site and were originally monitored by GeoPacifc. The groundwater level was observed in the six wells at depths of between 1.7 and 4.5 m. The groundwater level was found to be heavily tidally influenced with daily groundwater levels noted to vary by up to 0.75 m. Water table fluctuations will also vary seasonally with higher levels anticipated during wetter months.

Perched water was encountered during the investigations in some of the southern test pits over the less permeable silt and clay till like soils.

We have been provided with past groundwater monitoring which was undertaken by GeoPacifc in May of 2016. The results show the response of the groundwater in the monitoring wells to tidal variation. We recommend that the existing well elevations be surveyed so that this information can be tied into a geodetic Datum. The results of the monitoring are included in Appendix C of this report.

5.0 DISCUSSION**5.1 General Comments**

It is proposed to construct a comprehensive development which is to include townhouses, apartments, hotels, commercial and community facilities, camping areas, parking structures and a wave garden and associated roads and services.

Based on the information currently available we expect that it would be possible to support the proposed buildings on conventional reinforced concrete spread foundations. We expect that many of the buildings will be supported directly on the native granular soils or engineered fill.

It should be appreciated that further investigation and site specific design requirements may be necessary at specific building locations once designs have been finalized and structural loading is available. The following recommendations are provided for discussion and planning purposes.

5.2 Seismicity

The site is located in a seismically active zone. Therefore, earthquakes and their impact on the development must be considered.

5.2.1 Seismic Hazard

The seismic provisions in 2018 British Columbia Building Code (2018 BCBC) are adopted from the 2015 National Building Code (NBC) which state that the intent of seismic design is to:

1. Protect the life and safety of building occupants and the general public as the building responds to strong ground shaking (ie. prevents major failure and/or collapse of structures where collapse is defined to be a state where occupants can no longer exit the building because of structural failure)
2. Limit building damage during low to moderate levels of ground shaking
3. Increase the likelihood that post-disaster buildings can continue to be occupied and functional following strong ground shaking, though low levels of damage can be expected in such buildings

For design purposes, the 2015 NBC strong ground shaking is defined in terms of the mean ground motion amplitude having a probability of exceedance of 2% in 50 year. This equates to a 1 in 2,475 earthquake which is termed as the design ground motion (DGM).

For the purpose of this report peak ground motion amplitudes of less than half of the DGM are considered low to moderate levels of ground shaking.

5.2.2 Liquefaction Assessment

It is generally accepted that loose to compact sand and non-plastic silt are prone to liquefaction or strain softening during cyclic loading caused by large earthquakes. Once liquefaction has been triggered, experience has shown that permanent vertical and horizontal ground movements may be experienced. The strength reduction caused by soil liquefaction can cause a substantial reduction in load carrying capacity which may lead to foundation punching failure. Once liquefaction is triggered, significant, permanent, vertical and horizontal movements may be experienced.

For our analysis, we have relied on the 2015 National Building Code interpolated Seismic Hazard Values from Natural Resources Canada, which indicate that the peak ground acceleration (PGA) at this location is 0.27g (where g is the acceleration of gravity) for the DGM event.

Based on the test hole logs and CPT soundings, we have not identified any soils which are considered to be susceptible to liquefaction triggering.

As the development progresses and new information becomes available we should be asked to reassess the potential for liquefaction at this site.

5.3 Flood Hazards

We understand that a coastal flood hazard has been identified at the site from Howe Sound which abuts the property to the west. We understand that a dike is proposed along the western edge of the development. At

this time, we have not been asked to provide geotechnical recommendations related to the dike or flood hazard. However, we can provide these services upon request. Regardless, setbacks from the dike will be required in accordance with provincial guidelines.

We further understand that the flood construction level (FCL) being considered for the site is 5.6 m outside the dike and 4.95 m inside the dike. Therefore, site filling or structural lift (ie. parkades) will be required throughout the western half of the site to ensure that habitable space is located above the FCL.

6.0 PRELIMINARY RECOMMENDATIONS

6.1 Site Preparation

6.1.1 Site Stripping

Site preparation associated with the proposed development will include removing all existing structures, foundations, underground services, asphalt, fill, topsoil, and any other material considered to compromise the design recommendations stated herein. In all cases related to the construction, including placement of permanent fills and the proposed grading areas, these “unsuitable” materials should be excavated to expose a subgrade consisting of native sands, gravels, glacial till or bedrock. Where granular soils are encountered the subgrade should be compacted in place prior to the placement of any foundations or engineered fill.

Site stripping should extend beyond the outer edge of foundations or roads by a distance equal to the total thickness of fill required included all engineered fill, subbase, and base materials. For example, if 1 meter of fill is to be placed below foundations or asphalt, then stripping should extend a minimum distance of 1 meter beyond the outside edge.

6.1.2. Temporary Excavations

We expect that temporary slopes can be designed at a maximum slope of 1V:1.5H within the compact to very dense sands to sand and gravels. Regardless, temporary excavations should be reviewed by a geotechnical engineer as required by WorkSafe BC temporary excavation guidelines.

It will be necessary to bench the excavations so that any fill material is placed on a level subgrade. Stripped subgrades must be reviewed by SFA prior to fill placement.

6.1.3 Engineered Fill

Following the recommended site stripping engineered fill may be required beneath foundations and roadways. In the context of this report “engineered fill” is defined as sand to sand and gravel or well graded 150 mm minus blast rock, compacted in maximum 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.

6.1.4 Re-Use of Existing Fill

Any excavated fill materials containing organics and other deleterious materials should not be re-used as engineered fill, though they may be re-used in landscape areas.

Excavated native granular soils would likely be suitable for use as engineered fill provided that the materials are free of any deleterious materials.

The till like soils will be sensitive to moisture due to the high fines content. Therefore, it will be necessary to excavate, stockpile and place the till material in the dry summer months if it is to be utilized as engineered fill.

6.2 Building Recommendations

6.2.1 Foundations

Following the recommended site preparation, the subgrade soil would be considered suitable to support conventional spread foundations at serviceability limit state (SLS) bearing pressure of up to 150 kPa and a factored ultimate limit state (ULS) of 300 kPa for foundations supported on native soils or engineered fill.

6.2.2 Settlement of Foundations

Post-construction settlements of less than 25 mm are expected with differential settlements less than 30 mm over a 10 m span (1 in 300).

6.2.3 Frost Protection

Footings should be buried a minimum of 450 mm below the surface for frost protection.

6.2.4 Seismic Design of Foundations

The site is generally underlain by compact to dense sand and gravel and in some cases bedrock. We recommend that any structural design consider the site classification “Site Class C”, in accordance with Table 4.1.8.4.A. of the 2018 British Columbia Building Code (BCBC) for design purposes.

6.2.5 Slab-On-Grade Floors

All grade supported concrete slab should be underlain by a minimum of 150 mm of 19 mm clear crushed gravel, to prevent moisture from accumulating below the slab, placed over compacted “engineered fill” as described in this report. The gravel should be lightly tamped in place. We recommend that a poly moisture barrier be placed overlying the gravel beneath the grade supported slabs to help reduce moisture within the concrete slab.

6.2.6 Underground Structures and Basements

The water table was identified at depths ranging from 1.7 and 4.5 m below site grade. We recommend that any foundations, including for the proposed wave garden, remain above the long term ground water level. If foundations, basements or the wave garden are placed beneath the water table, permanent waterproofing and detailed design will be required to ensure that the buoyancy forces have been adequately accommodated for.

6.2.7 Foundation Drainage

We recommend that the buildings include a conventional perimeter drainage system to help intercept and control any migratory water at the foundation level and to help ensure that water does not accumulate below the floor slabs or adjacent foundation walls. The under slab fill should have a hydraulic connection to the perimeter drain to help ensure water does not build up below the slab or adjacent to foundation walls. This can be achieved with weep holes or by placing gravel below foundations.

6.2.8 Lateral Pressures on Foundation Walls

We anticipate that some buildings may include below grade construction and therefore earth pressure will develop against the buried foundation walls. We assume that foundation walls will be backfilled with free draining material and that the walls would be fully drained. We recommend that the foundation walls be designed using the following earth pressures:

1. Static: $P_a = 5.4 * H$
Where;
 P_a = Lateral earth pressure due to static loading (kPa), triangular distribution;
 H = Wall height (m).
2. Seismic: $P_e = 2.76 H$
Where;
 P_e = Earth induced earth pressure (kPa), inverted triangular distribution;
 H = Wall height (m).

These lateral pressures are based upon unfactored soil parameters and are considered to be unfactored loads. Any additional surcharge loads located near the foundation walls should be added to the earth pressures given.

6.3 New Roads and Utilities

6.3.1 Roads

Following the recommended site preparation, it is our opinion that the pavement section provided below will be sufficient to carry the anticipated vehicle loads for on-site roads.

Table 1: Recommended <u>Minimum</u> Pavement Structure for On-Site Roads & Parking Areas	
Material	Thickness (mm)
Asphaltic Concrete	85
19 mm minus crush gravel base	150
100 mm minus, well graded, clean, sand and gravel subbase course	300

All base and subbase fills should be compacted to a minimum of 95% Modified Proctor dry density with a moisture content within 2% of optimum for compaction. Density testing should be conducted on these materials and the results forwarded to the geotechnical engineer for review.

SFA should be asked to review our pavement section recommendations once road classifications, truck routes and fire access routes are known.

6.3.2 Utilities

Utilities are expected to be underlain by compact to dense sand or sand and gravel. We recommend that any trenches be sloped or shored as per the latest Work Safe BC regulations. We recommend that all service trenches be backfilled with clean granular material, which conforms to Master Municipal Construction Document standards, compacted to 95% "Modified Proctor" dry density (ASTM D1557), with a moisture content within 2% of optimum for compaction. If for any reason the backfill becomes saturated prior to

compaction it must be removed and replaced with dry fill.

7.0 CLOSURE

The preceding comments and recommendations should be considered preliminary at this stage as the above referenced project is in the conceptual design stage. Architectural and structural designs should be provided to SFA well in advance of the permitting process for our review and to update this report, if required.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or would like clarification of any of the above, please do not hesitate to call.

For:

SFA Geotechnical Inc.



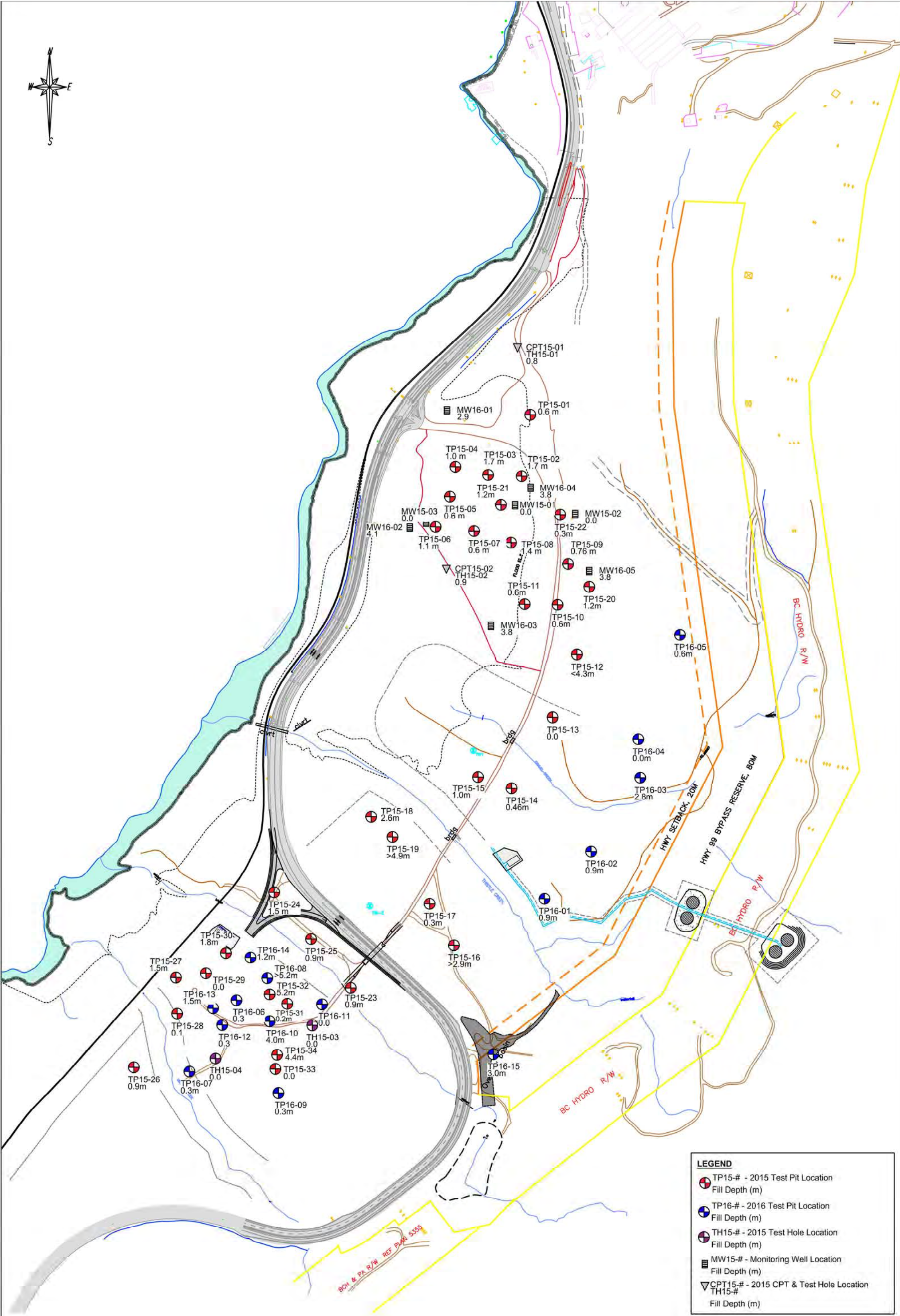
Jessica Gagne, P.Eng.
Project Engineer

Reviewed by:



April 15, 2019

Steven Fofonoff, M.Eng., P.Eng.
Principal



SITE: South Britannia Beach, SLRD, BC		1181-1 DRAWING NO.		1181 PROJECT NO.	2019/03/01 DATE	SFA GEOTECHNICAL ENGINEERING	SFA GEOTECHNICAL INC. 205-38026 2ND AVE. SQUAMISH, BC, V8B 0C3 604 898 1093
TITLE: SITE PLAN & FILL DEPTH - GEOTECHNICAL INVESTIGATIONS		NTS SCALE AT A4	JG DRAWING	SF CHECKED	N/A REVISION		

APPENDIX A – TEST HOLE,
TEST PIT & MONITORING WELL LOGS

2015 Test Pit Logs
TP15-01 to TP15-34

Test Pit Log: TP15-01

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Gravel FILL Sub-angular, sandy, some sub-round to sub-angular blast rock and cobbles, brown	2.0			
2		Sand Coarse, some interbedded sub-round gravel, dry to moist, grey 4' becomes trace gravel	9.0			
3		End of Test Pit				

Logged: AB
Method: Excavator
Date: 2015-06-29

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP15-02

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Some rounded cobbles, dry, very dense to dense with depth, dry, brown, trace organics (wood debris, rootlets)				
2						
3						
4						
5			5.5			
6		Sand Coarse, some sub-round gravel, dry to moist, grey				
7						
8						
9						
10		End of Test Pit	9.5			
11						
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-03

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Some rounded cobbles, very dense to dense with depth, dry, brown, trace organics (wood debris, rootlets)				
2						
3						
4						
5			5.5			
6		Sand Coarse, some sub-round gravel, dry to moist, grey				
7						
8						
9						
10			9.5			
11						
12						
13						
14						
15						
		End of Test Pit				

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-04

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL With rounded cobbles, dry, grey to brown				
2						
3			3.5			
4		Gravel Sub-round, grey, dry	4.0			
5		Sand Coarse, with sub-angular gravel, trace to some sub-round cobbles, dry, grey				
6						
7		8' turns wet				
8		9' groundwater observed				
9			9.5			
10		End of Test Pit				
11						
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-05

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL With sub-round cobbles, dry, brown, with organics (woody debris)	2.0			
2		Sand and Gravel Coarse sand and sub-angular gravel, some sub-round cobbles, dry, grey				
3						
4						
5						
6		6.5' boulders observed				
7						
8						
9		9' becomes wet				
10		10' groundwater observed	10.5			
11		End of Test Pit				
12						
13						
14						
15						

Logged: AB
Method: Excavator
Date: 2015-06-29

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP15-06

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL With sub-round cobbles, dry, brown, some organics (woody debris)				
2						
3						
4		Sand with Gravel Coarse Sand with sub-round gravel, some rounded cobbles, dry, grey				
5						
6						
7						
8						
9		9' becomes wet				
10		10.5' groundwater observed				
11			11.0			
12		End of Test Pit				
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-07

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL With some sub-round cobbles and trace angular cobbles, dry, brown, trace organics (rootlets)	2.0			
2		Sand and Gravel Coarse sand and rounded gravel, dry, grey				
3						
4						
5						
6						
7		7.5' becomes moist				
8						
9		9.5' becomes wet				
10			10.5			
11		End of Test Pit				
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-08

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Rounded cobbles, trace silt, dry, brown, some organics (rootlets)				
2		3.5' interbedded grey silt layer				
3						
4			4.5			
5		Sand Coarse sand with some sub-rounded gravel, dry, grey				
6						
7			7.0			
8		Sand and Gravel Coarse sand and sub-rounded gravel, dry to moist, grey				
9						
10			10.0			
11		End of Test Pit				
12						
13						
14						
15						

Logged: AB
Method: Excavator
Date: 2015-06-29

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP15-09

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Gravel FILL Sub-round, sandy, dry, brown	1.5			
2		Sand and Gravel FILL Rounded cobbles, dry, brown	2.5			
3		Sand and Gravel Coarse sand and sub-round gravel, dry, grey				
4						
5						
6						
7		7.5' gravel becomes sub-angular				
8						
9			9.0			
10		End of Test Pit				
11						
12						
13						
14						
15						

Logged: AB
Method: Excavator
Date: 2015-06-29

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP15-10

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Sub-angular to angular, some rounded cobbles, very dense, dry, brown	2.0			
2		Sand Medium to coarse, some sub-angular gravel, rounded cobbles in upper 6", dry, grey				
3		3.5' interbedded gravel layer				
4						
5						
6						
7						
8			8.0			
9		Sand and Gravel Medium-coarse sand and sub-angular gravel, dry to moist, grey	9.5			
10		End of Test Pit				
11						
12						
13						
14						
15						

Logged: AB
Method: Excavator
Date: 2015-06-29

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP15-11

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Sub-angular, dry, brown, organics (woody debris) Interbedded silt layer	2.0			
2		Sand and Gravel Coarse sand and sub-angular gravel, dry, grey-brown				
3		8' interbedded silt, dry, black				
4			9.0			
5		End of Test Pit				
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

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Test Pit Log: TP15-12

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Medium sand and sub-round gravel, rounded cobbles, some angular blast rock, dry, brown, with organics (wood), some garbage (plastic)				
2						
3						
4						
5						
6						
7			7.0			
8		Variable FILL Silty, medium sand and sub-round gravel in varying proportions, rounded cobbles, moist, brown				
9						
10						
11						
12						
13						
14			14.0			
15		End of Test Pit				

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-13

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
ft 0		Ground Surface	0.0			
1		Sand and Gravel Coarse sand and sub-round gravel, some round cobbles, dry, brown-grey,				
2		2' interbedded rust-coloured gravel layer				
3						
4						
5						
6		6.5' interbedded rust-coloured gravel layer				
7		7' becomes moist, less gravelly				
8						
9			9.5			
10		End of Test Pit				
11						
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-14

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Dry, brown, with organics (wood, roots)	1.5			
2		Sand Coarse, trace sub-round gravel, dry to moist, grey				
6			6.5			
7		End of Test Pit				Side wall collapse at 6.5'
8						
9						
10						
11						
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-15

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Sub-round gravel, dry, brown, organics (woody debris)				
2						
3			3.0			
4		Sand and Gravel Coarse sand and sub-round gravel, rounded cobbles, moist, brown in upper 1', grey below				
5						
6						
7						
8		8' trace clean cobbles, moist to wet, brown				
9						
10			10.5			
11		End of Test Pit				
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-16

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand FILL Coarse, trace to some sub-round gravel, dry, grey, organics in upper 4"				
2						
3						
4						
5						
6		6' becomes moist, increasing sub-round gravel content				
7						
8						
9						
10			9.5			
11		End of Test Pit				Side wall sloughed in at 9.5'
12						
13						
14						
15						

Logged: AB
Method: Excavator
Date: 2015-06-29

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP15-17

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Topsoil Vegetation, some rounded cobbles, dry, brown, organics (roots)	1.0			
2		Sand Coarse, trace to some rounded gravel, dry, grey-brown				
3						
4		3' interbedded silt, moist, soft to firm, brown				
5						
6						
7						
8						
9						
10			9.5			
11		End of Test Pit				
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-18

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
0		Topsoil	0.5			
1		Variable FILL				
2		Silt, sand, and gravel in varying proportions, dry to moist, brown, organics (wood waste), some trash (plastic)				
3						
4						
5						
6		6' moist to wet with sub-round cobbles				
7						
8		8' Significant Wood Waste Layer				
9			8.5			
10		Sand and Gravel				
11		Coarse sand and sub-round gravel, wet, grey				
12			11.5			
13		End of Test Pit				
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-19

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
0		Topsoil	0.5			
1		Variable FILL				
2		Silt, sand, and gravel in varying proportions, moist, dark brown, organics (wood waste), trash (plastic) in upper				
3						
4		Rounded cobbles at depth				
5						
6		6.5' increasing silt content				
7						
8						
9						
10						
11						
12						
13						
14						
15						
16			16.0			
17		End of Test Pit				
18						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-20

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand FILL Coarse, some sub-round gravel and cobbles, dry to moist, brown, some organics (rootlets)				
2		2.5' Interbedded firm brown silt layer				
3			4.0			
4		Sand Medium to coarse, some sub-round gravel, moist, grey				
5						
6						
7						
8						
9			9.5			
10		End of Test Pit				
11						
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-21

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Dry, brown				
2		2' Interbedded silt layer, dry, brown-orange				
3						
4			4.0			
5		Sand and Gravel Coarse sand and sub-round gravel, dry to moist, grey				
6						
7						
8		9' Interbedded brown gravel layer				
9						
10		11' becomes wet				
11		12' groundwater observed				
12			13.0			
13		End of Test Pit				
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-22

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Topsoil With sand and gravel, dry, brown, organics	1.0			
2		Sand and Gravel Coarse sand and sub-round gravel, some sub-angular cobbles, dry to moist, grey				
3						
4						
5						
6						
7						
8						
9						
10						
11		12.5' becomes wet				
12		13.5' groundwater observed				
13						
14			14.0			
15		End of Test Pit				

Logged: AB

Method: Excavator

Date: 2015-06-29

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-23

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
0		Topsoil/ Vegetation	0.5			
1		Sand and Gravel FILL				
2		Sub-round cobbles, dry, brown				
3			3.0			
4		Sand and Gravel				
5		Medium sand and angular gravel, with many sub-angular cobbles up to 600 mm, dry to moist, dark brown				
6		6' Interbedded angular gravel layer				
7						
8						
9			9.5			
10		End of Test Pit				
11						
12						
13						
14						
15						

Logged: AB
Method: Excavator
Date: 2015-06-30

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP15-24

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
0		Topsoil	0.5			
1		Gravelly, brown, dry, some vegetation and organics				
2		Sand and Gravel FILL				
3		Sub-round gravel and cobbles, dry, dark brown, mixed organics (branches)				
4		4' rubber tire and chicken wire observed				
5			5.0			
6		Silt/Clay				
7		Stiff, dry to moist, grey to blue				
8						
9			9.0			
10		Silty Sand and Gravel				
11		Sub-angular gravel, dry to moist, brown				
12			12.0			
13		End of Test Pit				
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-25

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
0		Topsoil	0.5			
1		Dry, brown, with organics	1.0			
2		Gravel FILL				
		Sub-angular, dry, brown				
3		Sand and Gravel FILL				
		sub-round gravel, dry, brown becoming grey at 2.5'	3.0			
4		Sand and Gravel				
		Medium sand and sub-round gravel, trace silt, sub-round cobbles, dry, brown, possible fill				
6		6' Root layer, increasing cobbles and boulders				
9		9' Root layer				
10			10.5			
11		End of Test Pit				
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-26

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Topsoil Sandy, dry, brown, with vegetation and organics				
2						
3			3.0			
4		Silty Sand and Gravel Sub-round cobbles, dry, brown				
5						
6			6.0			
7		Sand Coarse, with some sub-angular gravel, some cobbles, dry to moist, grey				
8		7' Rust-coloured gravel layer				
9		9' becomes wet				
10			10.5			
11		End of Test Pit				
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-27

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel FILL Sub-round to sub-angular, trace boulders, dry, rust-coloured, some organics (roots)				
2		3' abandoned water hose observed				
3						
4						
5			5.0			
6		Sand and Gravel Coarse sand and sub-round gravel, trace to some round cobbles, moist, grey-brown				
7						
8						
9		9.5' becomes wet				
10		10' groundwater observed				
11			11.5			
12		Lodgment Till Very dense, light brown	12.0			
13		End of Test Pit				
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-28

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
0		Topsoil	0.5			
1		Dry, dark brown				
2		Sand and Gravel				
3		Medium sand and sub-angular gravel, dry, rust-brown, organics (roots), possible fill				
4			4.5			
5		Sand				
6		Medium-coarse sand, some sub-round gravel, dry, grey-brown				
7		8' becomes wet				
8		9' groundwater observed				
9			9.0			
10		Lodgment Till				
11		Very dense, moist to wet, brown				
12			12.0			
13		End of Test Pit				
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-29

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel Sub-round gravel, some rounded cobbles dry/dusty, rust-brown, organics throughout (roots)				
2						
3		3' Interbedded sub-angular gravel, dry, rust-coloured				
4						
5						
6			6.0			
7		Sand Coarse, with some sub-angular gravel, some round cobbles, moist, grey-brown				
8						
9						
10		11.5' becomes wet				
11		12' groundwater observed				
12			12.0			
13		Lodgment Till Very dense, moist to wet, light to rust brown				
14			14.0			
15		End of Test Pit				

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

Page: 1 of 1

Test Pit Log: TP15-30

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand and Gravel Sub-round to sub-angular gravel, some sub-round cobbles, dry, rust-brown, organics (roots), possible fill				
2			6.0			
3		Gravel Sub-angular, trace to some sand, dry, brown-grey	7.5			
4		Gravel Sub-angular, with some coarse sand, rounded cobbles, moist-wet, grey				
5		9.5' Interbedded gravel, deep red	10.0			
6		Sand and Gravel Coarse sand and sub-angular gravel, sub-angular cobbles, moist-wet, brown-grey				
7			16.0			
8		End of Test Pit				

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

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Test Pit Log: TP15-31

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
0		Sand and Gravel FILL	0.5			
1		Dry, brown, some rootlets				
2		Silty Sand and Gravel (TILL)				
3		Rounded cobbles, very dense, dry, grey-blue				
4						
5						
6			6.0			
7		Equipment Refusal				
8		End of Test Pit				
9						
10						
11						
12						
13						
14						
15						

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

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Test Pit Log: TP15-32

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific

Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Gravel FILL Sub-angular, sandy, soft, dry, brown				
2						
3						
4		Variable FILL Silt, sand, and gravel in varying proportions, soft, moist, dark brown, organics throughout (wood debris)	3.5			
5						
6						
7						
8						
9						
10		9.5' Interbedded soft silt/clay, dry-moist, grey-blue, 10' increasing organics, becomes moist to wet				
11						
12						
13						
14						
15						
16						
17			17.0			
18		Lodgment Till Possible native material, light brown	18.0			
19		End of Test Pit				
20						

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

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Test Pit Log: TP15-33

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Sand Fine, with some sub-angular gravel and cobbles, dry, light brown	1.0			
2		Sand Coarse, with some sub-round gravel, some round cobbles, dry-moist, grey				
3						
4						
5		4.5' Interbedded sub-round gravel layer				
6						
7						
8			8.5			
9		Sand and Gravel Coarse sand and sub-round gravel, some round cobbles, dry-moist, grey				
10						
11						
12			12.0			
13		Sand Coarse, some sub-round gravel, some round cobbles, moist, grey				
14						
15						
16			16.0			
17		End of Test Pit				
18						
19						
20						

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

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Test Pit Log: TP15-34

File: 13088

Project: Britannia Beach South Development

Client: Taicheng Development Corp.

Site Location: Britannia Beach, BC

GeoPacific Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (ft)			
0		Ground Surface	0.0			
1		Cobbles Uniform, round, river rock, fill				
2		Variable FILL Silt, sand, and gravel in varying proportions, moist, light to dark brown, with organics throughout (wood debris, roots)				
3						
4						
5						
6						
7						
8						
9						
10		10' Interbedded rounded cobble layer				
11						
12						
13						
14			14.5			
15		Sand Coarse, some sub-angular gravel, some sub-round cobbles, moist, grey	15.0			
16						
17		End of Test Pit				
18						
19						
20						

Logged: AB

Method: Excavator

Date: 2015-06-30

Datum:

Figure Number:

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2016 Test Pit Logs
TP16-01 to TP16-15

Test Pit Log: TP16-01

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0		Ground Surface				
0		Sand (Reworked/Fill) clean sand fill - med sand - well compacted; MOD dense sand; stands vertically cut.	0.0			
1						
2						
3						
4		Silt and Clay (Till-Like) steeply dipping (45deg) layered/ laminated clay +- silt. Forms a local aquatard for light to moderate seepage. HARD/DENSE TO VERY DENSE	0.9			
5			1.2			
6						
7		Sand medium coarse sand (granitic) clean moderately dense to dense				
8						
9						
10						
11						
12		Sand and Gravel graded medium to coarse sand with gravel layering; coarsely bedded to massive sand. gravel comprises rounded basalt and till clay with gravel inclusions.	3.4			
13						
14						
15						
16						
17						
18						
19						
20						
21						
22		End of Test Pit	6.4			
23						
24						
25						

Logged: LVDM
Method: Excavator
Date: 25th March 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-02

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0		Ground Surface				
0		Sand and Gravel (Fill) medium sand with abundant gravel and cobble fill material - loose to moderately dense	0.0			
1						
2						
3						
4		Silt and Clay (Till-Like) HARD/DENSE TO VERY DENSE thinly laminated with gravel to cobble clasts. Forms a local aquatard for light to moderate seepage. Very hard digging.	0.9			
5						
6						
7						
8						
9						
10						
11						
12						
13		Bedrock Hard competent bedrock meta sediments	3.7			
14						
15		End of Test Pit	4.3			
16						
17						
18						
19						
20						

Logged: LVDM
Method: Excavator
Date: 25th March 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-03

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC



215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0 ft 0 m		Ground Surface				
1 2 3 4 5 6 7 8 9		Sand and Gravel (Fill) material: sand gravel in organic soil. Abundant wood fragments and logs @5ft. loose	0.0			
10 11 12 13 14 15		Sand dense bedded to massive clean granitic sand and minor gravel. dense to very dense	2.8			
16 17 18 19 20		End of Test Pit	4.6			

Logged: LVDM
Method: Excavator
Date: 25th March 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-04

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0		Ground Surface	6.1			
1		Sand and Gravel (Exposed in vertically cut bluff above the test pit)	0.0			Exposed above grade bluff
2						
3						
4						
5		bedded clean granitic sand dense well compact with narrow gravel layers.				
6						
7						
8						
9						
10						
11						
12						
13						
14		shoughed sand against the bluff				Local Seepage/flowing from cut bluff
15						
16						
17						
18						
19						
20			0.0			Existing Grade at foot of bluff
21		Sand and Gravel (Excavated in the test pit)	6.1			
22						
23		bedded clean granitic sand dense well compact with narrow gravel layers.				
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34		sloughing sands and high water flow from the test pit wall, sands are supersaturated beneath.				Static Water Table
35						
36						
37						
38			-5.5			
39		End of Test Pit	11.6			
40						

Logged: LVDM
Method: Excavator
Date: 25th March 2016

Datum:
Figure Number:
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Test Pit Log: TP16-05

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

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Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0		Ground Surface				
0		Sand and Gravel (Fill) medium sand with abundant gravel and cobble fill material - loose to moderately dense	0.0			
1						
2						
3		Gravel Very poorly sorted massive gravel and cobble, loose to moderately loose.	0.6			
4						
5						
6						
7						
8						
9		Silt and Clay (Till-Like) HARD/DENSE TO VERY DENSE thinly laminated with gravel to cobble clasts. Forms a local aquatard for light to moderate seepage. Very hard digging.	2.4			
10						
11			3.0			
12		Gravel Very poorly sorted massive gravel and cobble, loose to moderately loose.				
13						
14						
15		Bedrock Hard competent bedrock meta sediments	4.3			
16						
17		End of Test Pit	4.9			
18						
19						
20						

Logged: LVDM
Method: Excavator
Date: 25th March 2016

Datum:
Figure Number:
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Test Pit Log: TP16-06

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0		Ground Surface				
0		Sand and Gravel (Fill) medium sand with abundant gravel and cobble fill material - loose to moderately dense	0.0			
1			0.3			
2		Sand and Gravel Moderately dense orange-brn native coarse sand with 15% rounded gravel and trace cobbles. Transitioning with increasing oxidized silt rich bedding within the sand				
3			1.4			
4		Silty Sand and Gravel dense orange silt and sand with 10% gravel transitioning to silt rich bedding; minor seepage				
5			1.8			
6		Silt and Clay (Till-Like) HARD/DENSE TO VERY DENSE dense grey-blue till like silt; with 10% lodgement gravels; and trace wood fragments; petrified twigs; leaves and carbonaceous seams; shells occur with depth and till becomes softer. Forms a local aquatard for light to moderate seepage. Very hard digging.				
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
		End of Test Pit	4.9			

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-07

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0		Ground Surface				
0		Sand and Gravel (Fill)	0.0			
1		medium sand with abundant gravel and cobble	0.3			
2		fill material - loose to moderatley dense	0.6			
3		Sand and Gravel	0.6			
4		Moderatley dense orange-brn native coarse				
5		sand with 15% rounded gravel and trace				
6		cobbles. Transitioning with increasing oxidized				
7		silt rich bedding within the sand	1.2			
8		Silty Sand and Gravel				
9		dense orange silt and sand with 10% gravel				
10		transitioning to silt rich bedding; minor seepage				
11		Silt and Clay (Till-Like)				
12		HARD/DENSE TO VERY DENSE dense grey-	2.4			
13		blue till like silt; with 10% lodgement gravels;				
14		and trace wood fragments; petrified twigs;				
15		leaves and carbonaceous seams; shells occur				
16		with depth and till becomes softer. Forms a				
17		local aquatard for light to moderate seepage.				
18		Very hard digging.				
19		End of Test Pit				
20						

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-08

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0		Ground Surface				
0		Sand and Gravel (Fill) Loose sand and gravel road base fill	0.0			
1						
2		Silt and Clay (Fill) 0.5-4ft (variably) thick: loose till like fill; silt and clay with trace gravel.	0.5			
3			0.8			
4		Organic Rich Silt (Fill) Loose organic silty loam organic rich with minor sand and gravel. Abundant wood fragments and roots and tree logs. Fill	1.2			
5						
6		Sand and Gravel (Fill) loose sand and gravel fill material. Resembles native; possible aggraded stream and terrace, likely pushed up fill material.				
7						
8						
9						
10		Organic Rich Sand (Fill) Loose organic silty loam organic rich with minor sand and gravel. Abundant wood fragments and roots and tree logs.	2.9			
11						
12						
13						
14						
15		Sand and Gravel (Fill) Loose sand and gravel fill material. Resembles native; possible aggraded stream and terrace interbed deposits	4.6			
16						
17			5.2			
18		End of Test Pit				
19						
20						

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
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Test Pit Log: TP16-09

File: 13088

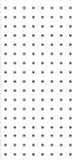
Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0 ft 0 m		Ground Surface				
1		Topsoil Loose organic topsoils; with sand and gravel fill.	0.0 0.3			
2		Sand Native coarse granitic sand with trace gravel; dense bedded basal sand.				
3						
4						
5						
6						
7						
8		Gravel Dense gravel rich layer	2.3 2.6			
9		Sand Native coarse granitic sand with trace gravel; dense bedded basal sand.				
10						
11						
12		Gravel Dense gravel rich layer	3.7 4.0			
13						
14		End of Test Pit				
15						
16						
17						
18						
19						
20						

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
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Test Pit Log: TP16-10

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0 ft 0 m		Ground Surface				
1		Organic Rich Fill Loose organic rich fill with and and gravel	0.0			
2						
3						
4						
5						
6						
7		Silt and Clay (Fill) Loose till like silt and clay fill material	2.0			
8						
9		Silt and Sand (Fill) loose mixed till like silt and reworked native sand and gravel fill - common sloughing of the pit walls	2.4			
10						
11						
12						
13		Silty Sand and Gravel (Till Like) Dense moist sandy silt with minor gravel; appears till like. Possible silt till.	4.0			
14						
15						
16		End of Test Pit	4.7			
17						
18						
19						
20						

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-11

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0 ft 0 m		Ground Surface	0.0			
1		Topsoil Organic rich topsoil.				
2		Gravel and Sand Dense gravel with sand; agraded stream and bank deposits - graded stratification; dominantly rounded poorly sorted gravels with some minor sand layering.				
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
		End of Test Pit	3.0			

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-12

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0 ft 0 m		Ground Surface				
1		Sand and Gravel (Fill) medium sand with abundant gravel and cobble fill material - loose to moderately dense	0.0 0.3			
2		Sand and Gravel Moderately dense orange-brn native coarse sand with 15% rounded gravel and trace cobbles. Transitioning with increasing oxidized silt rich bedding within the sand				
3			1.5			
4			1.8			
5		Silty Sand and Gravel dense orange silt and sand with 10% gravel transitioning to silt rich bedding; minor seepage				
6			2.4			
7		Silt and Clay (Till-Like) HARD/DENSE TO VERY DENSE dense grey-blue till like silt; with 10% lodgement gravels; and trace wood fragments; petrified twigs; leaves and carbonaceous seams; shells occur with depth and till becomes softer. Forms a local aquatard for light to moderate seepage. Very hard digging.				
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
		End of Test Pit				

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-13

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0		Ground Surface				
0		Topsoil (Fill) Organic rich medium sand with abundant gravel and cobble fill material - loose to moderatley dense	0.0			
1			0.3			
2						
3		Sand and Gravel (Fill) Moderatley dense orange-brn coarse sand with rounded gravel and trace cobbles. Reworked Fill-Like sands,				
4						
5						
6		Sand and Gravel Native coarse dominantley dense sand with some gravel	1.5			
7						
8						
9						
10						
11		Silty Sand and Gravel dense orange silt and sand with 10% gravel transitioning to silt rich bedding; minor seepage	3.0			
12			3.4			
13		Silt and Clay (Till-Like) HARD/DENSE TO VERY DENSE dense grey-blue till like silt; with 10% lodgement gravels; and trace wood fragments; petrified twigs; leaves and carbonaceous seams; shells occur with depth and till becomes softer. Forms a local aquatard for light to moderate seepage. Very hard digging.				
14			4.4			
15						
16						
17		End of Test Pit				
18						
19						
20						

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-14

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0		Ground Surface				
0		Topsoil Organic rich topsoil.	0.0			
1		Sand and Gravel (Fill) Moderately loose sand and gravel with mixed in till like silt and clay fill material.				
2						
3						
4		Gravel and Sand Dense gravel with sand; aggraded stream and bank deposits - graded stratification; dominantly rounded poorly sorted gravels with some minor sand layering.	1.2			
5						
6						
7						
8						
9						
10						
11						
12						
13		End of Test Pit	3.7			
14						
15						
16						
17						
18						
19						
20						

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
Page: 1 of 1

Test Pit Log: TP16-15

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	Groundwater	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev. (m)			
0 ft 0 m		Ground Surface				
1		Gravel (Fill) Compacted gravel road base construction fill	0.0			
2		Organic Rich (Fill) Organic rich; sand and gravel; moderately loose fill material. Wood fragments and construction debris.	0.5			
3						
4						
5						
6						
7						
8						
9						
10						
11		Sandy Silt Brown to yellow-brown loose silt and fine sand becoming coarse dense sand - native subgrade.	3.0			
12						
13						
14		Sand and Gravel Dense native sand with minor gravel	4.3			
15			4.6			
16		End of Test Pit				
17						
18						
19						
20						

Logged: LVDM
Method: Excavator
Date: 19th May 2016

Datum:
Figure Number:
Page: 1 of 1

2015 Monitoring Wells
MW15-01 to MW15-03

Test Hole Log: MW15-01

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
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		Sand and gravel compact to dense SAND and GRAVEL, trace silt, gravel <40 mm, brown, slightly moist	0.0				1" PVC monitoring well; Solid from 0.0m to 1.5m Screened from 1.5m to 6.0m Bentonite from 0.0m to 1.2m Filter sand from 1.2m to 6.0m 3.04 m observed water table depth in well: (17-Jul-2015 @14:15)
0.9		Sand and gravel dense coarse SAND and GRAVEL, some cobbles, gravel <50 mm, brown, moist becomes wet @ 2.5 m	0.9				
3.4		Sand and gravel very dense cobbly SAND and GRAVEL, gravel <80 mm, grey, moist to wet	3.4				
5.2		Gravel very dense sandy GRAVEL, some cobbles, coarse grained sand, gravel <40 mm, grey, wet	5.2				
6.1		End of Borehole	6.1				
7							

Logged: ZH

Method: Hollow stem auger

Date: 17-Jul-2015

Datum: Ground elevation

Figure Number: A.05

Page: 1 of 1

Test Hole Log: MW15-02

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
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				
1		Sand and gravel dense coarse SAND and GRAVEL, trace cobbles, gravel <50 mm, brown, dry	0.0				
2							
3							
4							
5							
6							
7							
8							
9							
10							
11		Sand and gravel dense coarse SAND and GRAVEL, some cobbles, gravel <80 mm, brown, moist to wet	3.0				
12							
13							
14		becomes very dense @ 4.0 m					
15							
16							
17							
18							
19							
20							
21		Sand dense gravelly SAND, trace cobbles, gravel <40 mm, grey, moist to wet	6.1				
22							
23		Sand and gravel dense to very dense cobbly SAND and GRAVEL, gravel <60 mm, grey, moist to wet	6.7				
24							
25							
26							
27							
28							
29							
30							
31		End of Borehole	9.1				
32							

Logged: ZH

Method: Hollow stem auger

Date: 17-Jul-2015

Datum: Ground elevation

Figure Number: A.06

Page: 1 of 1

Test Hole Log: MW15-03

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
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				
1		Sand and gravel dense cobbly SAND and GRAVEL, gravel <80 mm, brown, dry	0.0				
2		Sand and gravel dense coarse SAND and GRAVEL, trace cobbles, gravel <50 mm, greyish brown, moist	1.5				
3		Sand dense gravelly SAND, trace cobbles, gravel <50 mm, grey-brown, moist to wet	2.7				
4							
5		Sand and gravel dense to very dense coarse SAND and GRAVEL, trace cobbles, gravel <30 mm, grey, moist to wet	4.9				
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31		End of Borehole	9.1				
32							

Logged: ZH

Method: Hollow stem auger

Date: 17-Jul-2015

Datum: Ground elevation

Figure Number: A.07

Page: 1 of 1

2016 Monitoring Wells
MW16-01 to MW16-05

Test Hole Log: MW16-01

File: 13088

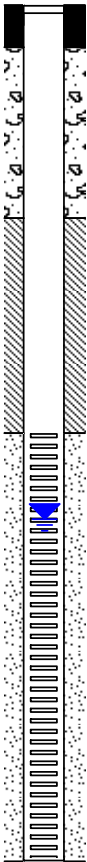
Project: South Britannia Development

Client: Taicheng Development Corporation

Site Location: South Britannia Beach, Squamish, BC



215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Groundwater / Well	Water Level Monitoring Data	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)			
0 ft 0 m		Ground Surface	5.0		Installation = 3.64m (06/05/2016)	Standpipe - concrete cap. Native sand and Gravel Fill to 5ft Bentonite Sealed from 5-10ft Screened with Sand packing 10-20ft
1		Sand and Gravel (Fill)	0.0			
2						
3						
4						
5						
6						
7			2.9			
8		Sand (Native)	2.1			
9		Dense coarse (angular) sand - damp	2.3			
10		Gravel and Sand (Native)	2.7			
11		Dense coarse (angular) sand - damp	1.6			
12		Sand and Gravel (Native)	3.4			
13		Dense coarse (angular) sand - wet				
14						
15						
16						
17						
18						
19						
20			-1.1			
21		End of Borehole	6.1			
22						
23						
24						
25						

Logged: LVDM
Method: Hollow Stem Auger
Date: 6th May 2016

Datum:
Figure Number:
Page: 1 of 1

Site Location: South Britannia Beach, Squamish, BC



215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Groundwater / Well	Water Level Monitoring Data	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)			
0		Ground Surface	5.0		Installation = 2.92m (06/05/2016)	Standpipe - concrete cap. Native sand and Gravel Fill to 5ft Bentonite Sealed from 5-10ft Screened with Sand packing 10-20ft
0		Sand and Gravel (Fill)	0.0			
1						
2						
3	1	Sand and Gravel (Native)	4.1			
4		Dense coarse (angular) sand - damp	0.9			
5						
6	2					
7						
8						
9						
10	3	Wet from 11ft				
11						
12						
13	4					
14						
15						
16	5					
17						
18						
19						
20	6		-1.1			
21		End of Borehole	6.1			
22						
23	7					
24						
25						

Logged: LVDM
Method: Hollow Stem Auger
Date: 6th May 2016

Datum:
Figure Number:
Page: 1 of 1

Test Hole Log: MW16-03

File: 13088

Project: South Britannia Development

Client: Taicheng Development Corporation

Site Location: South Britannia Beach, Squamish, BC



215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Groundwater / Well	Water Level Monitoring Data	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)			
0 ft 0 m		Ground Surface	5.0		Installation - 1.70m (06/05/2016)	Flush Mount & Picket. Native sand and Gravel Fill to 2ft Bentonite Sealed from 2-5ft Screened with Sand packing 5-20ft
1		Sand and Gravel (Fill)	0.0			
2						
3						
4			3.8			
5		Sand and Gravel (Native)	1.2			
6		Dense coarse (angular) sand - damp				
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20			-1.1			
21		End of Borehole	6.1			
22						
23						
24						
25						

Logged: LVDM
Method: Hollow Stem Auger
Date: 6th May 2016

Datum:
Figure Number:
Page: 1 of 1

Site Location: South Britannia Beach, Squamish, BC



Datum:
Figure Number:
Page: 1 of 1

Test Hole Log: MW16-05

File: 13088

Project: South Britannia Development

Client: Taicheng Development Corporation

Site Location: South Britannia Beach, Squamish, BC



215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Groundwater / Well	Water Level Monitoring Data	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)			
0 ft 0 m		Ground Surface	5.0			Flush Mount & Picket. Native sand and Gravel Fill to 2ft
1		Sand and Gravel (Fill)	0.0			
2						
3						
4			3.8			
5		Sand and Gravel (Native)	1.2			Bentonite Sealed from 2-5ft
6		Dense coarse (angular) sand - damp				
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21			-1.1			
22		End of Borehole	6.1			Screened with Sand packing 5-20ft
23						
24						
25						

Logged: LVDM
Method: Hollow Stem Auger
Date: 6th May 2016

Datum:
Figure Number:
Page: 1 of 1

2015 Test Hole Logs
TH15-01 to TH15-04

Test Hole Log: TH15-01 (CPT15-01)

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
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				
1		Sand and gravel [FILL] dense SAND and GRAVEL fill, some cobbles, brown, dry	0.8				
2							
3		Sand and gravel dense to very dense coarse SAND and GRAVEL, gravel <60 mm, brown, slightly moist	4.3				
4							
5							
6							
7							
8							
9							
10				6.2			
11		becomes moist @ 3.4 m					
12							
13							
14							
15		Sand dense to very dense coarse SAND, some gravel <80 mm, trace cobbles, brown, moist	9.1				
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31		End of Borehole					
32							

Logged: ZH
Method: Solid stem auger
Date: 16-Jul-2015

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

Test Hole Log: TH15-02 (CPT15-02)

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
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					
1		Sand and gravel [FILL] dense cobbly SAND and GRAVEL fill, gravel <90 mm, brown, slightly moist	0.9				DCPT refusal @ 0.5 m
2		Sand and gravel dense coarse SAND and GRAVEL, gravel <60 mm, some cobbles, brown, slightly moist		2.8			
3				6.4			
4		Sand and gravel dense to very dense coarse SAND and GRAVEL, gravel <60 mm, trace cobbles, brown, moist	3.7				3.4 m estimated water table depth
5							Drilled out to 4.6 m to complete DCPT sounding
6		becomes gravelly from 6.0 m to 10.5 m					DCPT refusal @ 4.9 m
7				16.2			
8							
9				16.6			
10							
11							
12				15.2			
13							
14							
15			15.2				
		End of Borehole					

Logged: ZH

Method: Solid stem auger

Date: 16-Jul-2015

Datum: Ground elevation

Figure Number: A.02

Page: 1 of 1

Test Hole Log: TH15-03

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
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				
1		Sand and gravel dense coarse SAND and GRAVEL, some cobbles, gravel <90 mm, brown, dry	0.0				DCPT refusal @ 0.6 m
2							
3							
4							
5		Sand and gravel very dense cobbly SAND and GRAVEL, gravel <60 mm, brown, slightly moist	1.2				Drilled out to 3.0 m to complete DCPT sounding
6				3.6			
7							
8							
9							DCPT refusal @ 3.3 m
10							
11							
12							
13		Sand and gravel dense to very dense coarse SAND and GRAVEL, some cobbles, gravel <90 mm, brown, moist	3.7				
14				4.7			
15							
16							
17							
18							
19							
20				5.0			
21							
22							
23							
24							
25		Gravel very dense sandy GRAVEL, some cobbles, brown, dry poor recovery	7.3	4.1			
26							
27							
28							
29		End of Borehole	8.5				Auger refusal @ 8.5 m
30							
31							
32							

Logged: ZH

Method: Solid stem auger

Date: 16-Jul-2015

Datum: Ground elevation

Figure Number: A.03

Page: 1 of 1

Test Hole Log: TH15-04

File: 13088

Project: BRITANNIA BEACH SOUTH DEVELOPMENT

Client: TAICHENG DEVELOPMENT CORP.

Site Location: BRITANNIA BEACH, BC

GeoPacific
Consultants Ltd.

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
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				
1		Sand and gravel dense cobbly SAND and GRAVEL, gravel <60 mm, greyish brown, moist	0.0				
2							
3							
4							
5		Gravel dense GRAVEL, some sand, brown, moist	1.2	4.8			
6							
7		Silt [TILL] very stiff to hard sandy SILT till, trace gravel <20 mm, grey, dry	1.8	20.2			
8							
9							
10				12.7			
11							
12		Sand and gravel [TILL] dense silty SAND and GRAVEL till, some cobbles, gravel <50 mm, brown, moist	3.7				
13							
14		Sand and gravel [TILL] dense to very dense cobbly SAND and GRAVEL till, some silt, gravel <60 mm, brown, moist	4.3				
15							
16				2.8			
17							
18							
19							
20							
21		End of Borehole	6.1				
22							
23							
24							
25							
26							

Logged: ZH
Method: Solid stem auger
Date: 16-Jul-2015

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

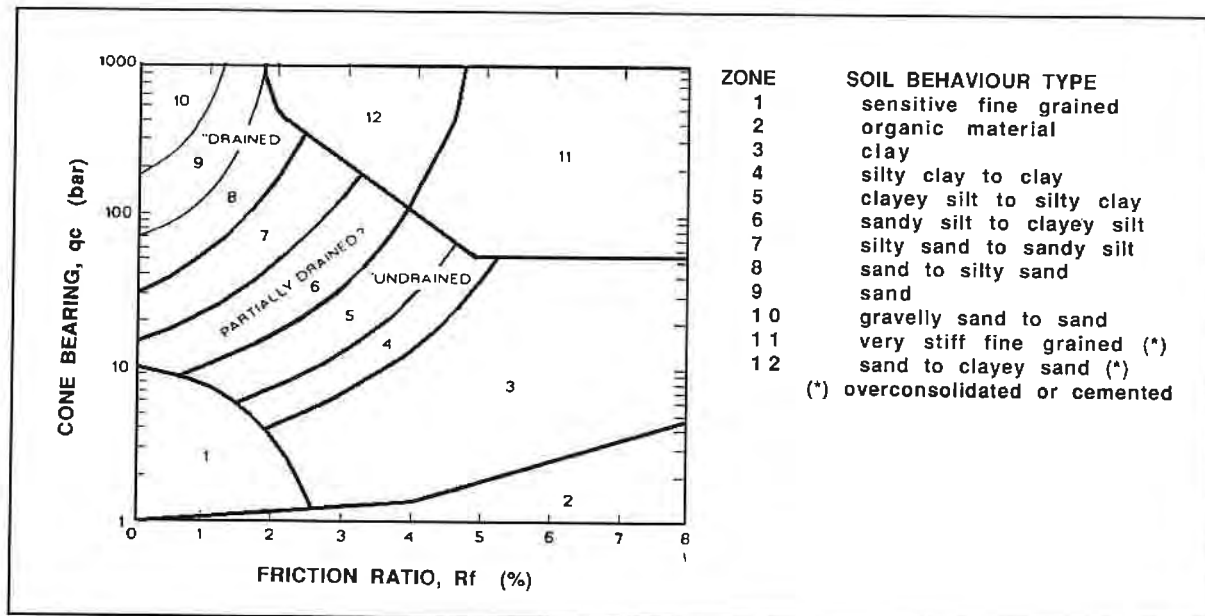
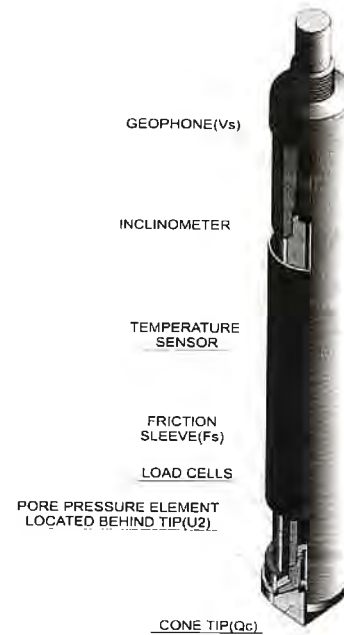
APPENDIX B - ELECTRONIC CONE PENETRATION RESULTS

The system used is owned and operated by GeoPacific and employs a 35.7 mm diameter cone that records tip resistance, sleeve friction, dynamic pore pressure, inclination and temperature at 5 cm intervals on a digital computer system. The system is a Hogentogler electronic cone system and the cone used was a 10 ton cone with pore pressure element located behind the tip and in front of the sleeve as shown on the adjacent figure.

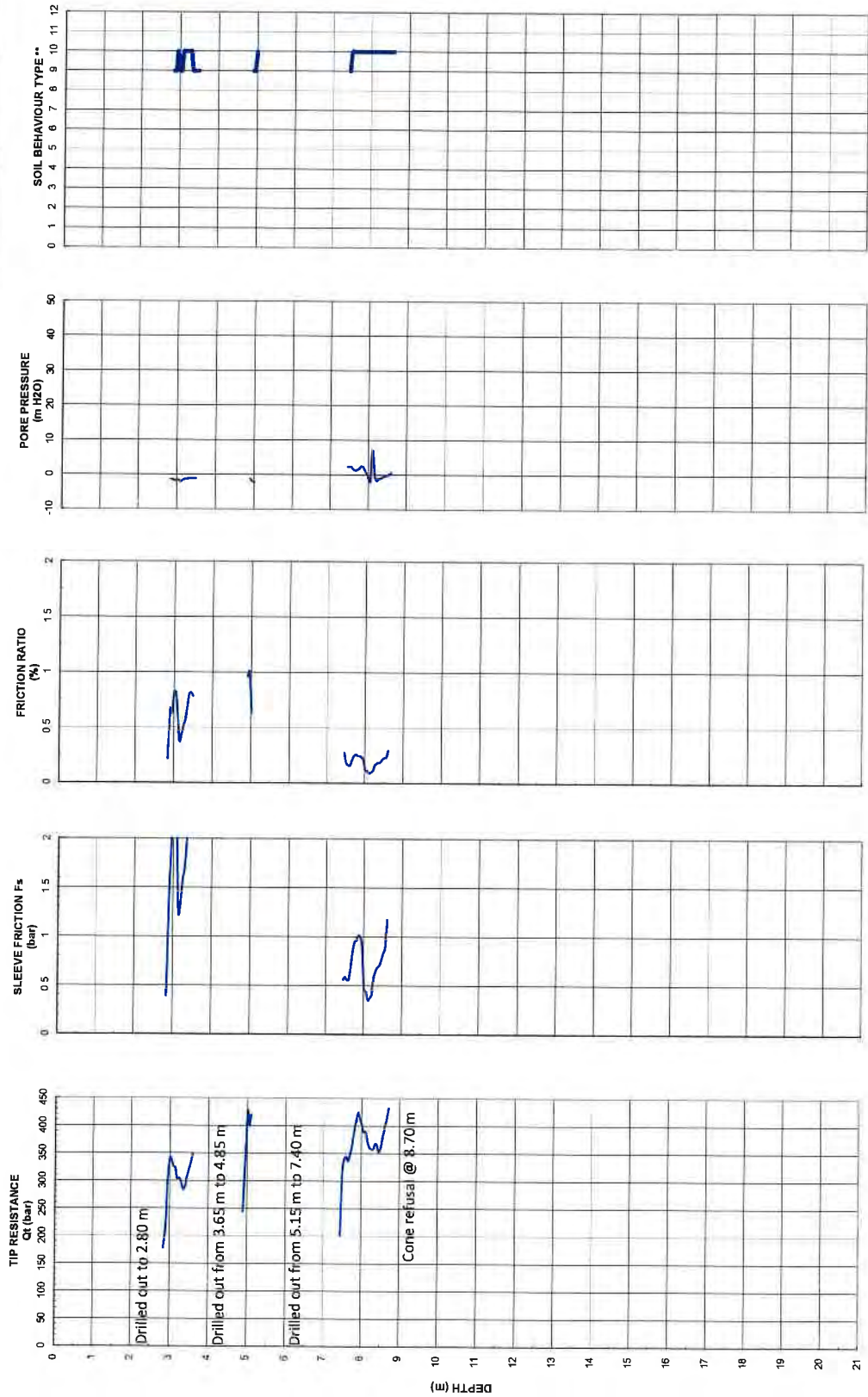
In addition to the capabilities described above, the cone can be stopped at specified depths and dissipation tests carried out. These dissipation tests can be used to determine the groundwater pressures at the specified depth. This is very useful for identifying artesian pressures within specific layers below the ground surface.

Interpretation of the cone penetration test results are carried out by computer using the interpretation chart presented below by Robertson¹. Raw data collected by the field computer includes tip resistance, sleeve friction and pore pressure. The tip resistance is corrected for water pressure and the friction ratio is calculated as the ratio of the sleeve friction on the side of the cone to the corrected tip resistance expressed as a percent. These two parameters are used to determine the soil behaviour type as shown in the chart below. The interpreted soil type may be different from other classification systems such as the Unified Soil Classification that is based upon grain size and plasticity.

Electronic Cone Penetrometer

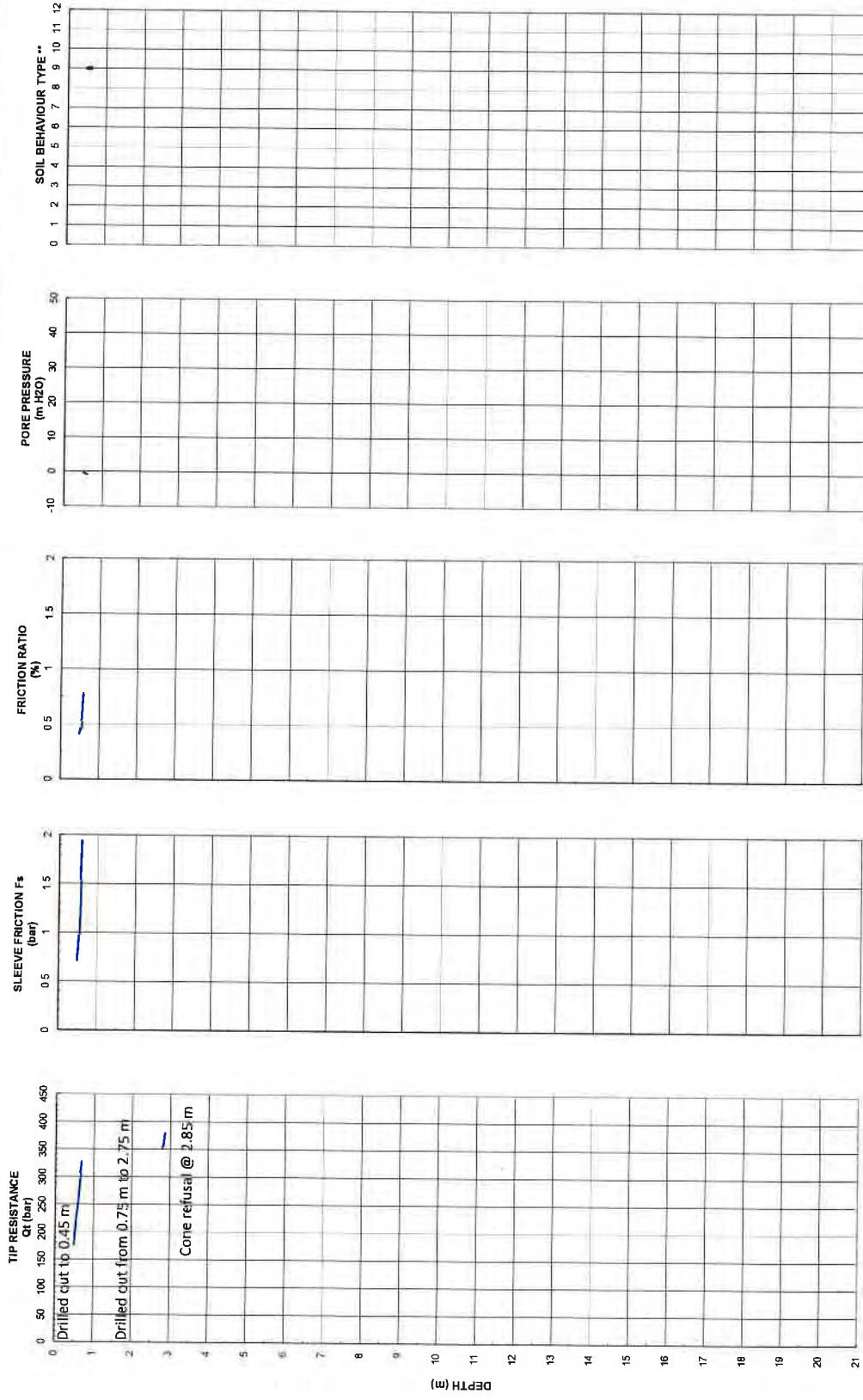


	16-Jul-15	TAICHENG DEVELOPMENT CORPORATION BRITANNIA BEACH, BRITANNIA BEACH	GeoPacific Project #: 13088 Figure: B.01
Sounding: CPT15-01			



- *** Based on Robertson et. al 1986
- | | | |
|-----------------------------|----------------------------|----------------------------|
| 1 Sensitive Fine Grained | 7 Silty Sand to Sandy Silt | 10 Gravely Sand to Sand |
| 2 Organic Material | 8 Sand to Silty Sand | 11 Very Stiff Fine Grained |
| 3 Clay | 9 Sand | 12 Sand to Clayey Sand |
| 4 Silty Clay to Clay | | |
| 5 Clayey Silt to Silty Clay | | |
| 6 Sandy Silt to Clayey Silt | | |

	16-Jul-15	TAICHENG DEVELOPMENT CORPORATION	GeoPacific Project #: 13088
	Sounding: CPT15-02	BRITANNIA BEACH, BRITANNIA BEACH	Figure: B.02



- ** Based on Robertson et. al 1986
- | | | |
|-----------------------------|----------------------------|----------------------------|
| 1 Sensitive Fine Grained | 7 Silty Sand to Sandy Silt | 10 Gravely Sand to Sand |
| 2 Organic Material | 8 Sand to Silty Sand | 11 Very Stiff Fine Grained |
| 3 Clay | 9 Sand | 12 Sand to Clayey Sand |
| 4 Silty Clay to Clay | | |
| 5 Clayey Silt to Silty Clay | | |
| 6 Sandy Silt to Clayey Silt | | |

APPENDIX C - INTERPRETED PARAMETERS

The following charts plot the Standard Penetration Test (SPT) values and the undrained strength of fine grained soils based upon generally accepted correlations. The methods of correlation are presented below.

STANDARD PENETRATION TEST CORRELATION

The Standard Penetration Test $N_{(60)}$ value is related to the cone tip resistance through a Q_c/N ratio that depends upon the mean grain size of the soil particles. The soil type is determined from the interpretation described in Appendix B and the data of Table C.1 below is used to calculate the value of $N_{(60)}$.

Table C.1. Tabulated $Q_c/N_{(60)}$ Ratios for Interpreted Soil Types

Soil Type	Q_c/N Ratio
Organic soil - Peat	1.0
Sensitive Fine Grained	2.0
Clay	1.0
Silty Clay to Clay	1.5
Clayey Silt to Silty Clay	2.0
Silt	2.5
Silty Sand to Sandy Silt	3.0
Clean Sand to Silty Sand	4.0
Clean Sand	5.0
Gravelly Sand to Sand	6.0
Very Stiff Fine Grained	1.0
Sand to Clayey Sand	2.0

The $Q_c/N_{(60)}$ ratio is based upon the published work of Robertson (1985)². The values of N are corrected for overburden pressure in accordance with the correction suggested by Liao and Whitman using a factor of 0.5. Where the correction is of the form:

$$N_1 = \sigma^{0.5} * N$$

All calculations are carried out by computer using the software program CPTint.exe developed by UBC Civil Engineering Department. The results of the interpretation are presented on the following Figures.

UNDRAINED SHEAR STRENGTH CORRELATION

It is generally accepted that there is a correlation between undrained shear strength of clay and the tip resistance as determined from the cone penetration testing. Generally the correlation is of the form:

$$S_u = \frac{(q_c - \sigma_v)}{N_k}$$

where q_c = cone tip resistance, σ = in situ total stress, N_k = cone constant

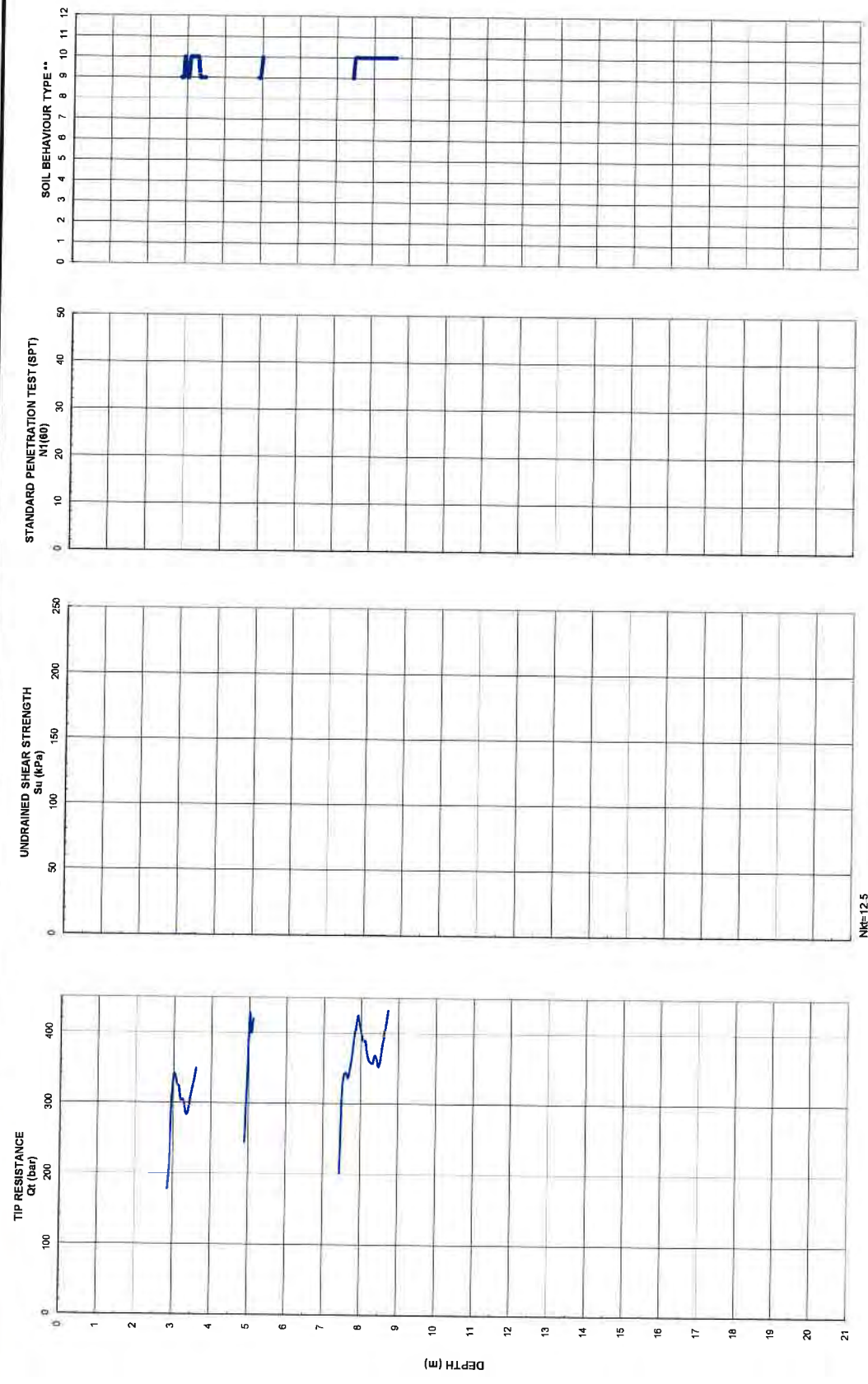
The undrained shear strength of the clay has been calculated using the cone tip resistance and an N_k factor of 12.5. All calculations have been carried out automatically using the program CPTint.exe. The results are presented on the Figures following.



16-Jul-15
Sounding: CPT15-01

TAICHENG DEVELOPMENT CORPORATION
BRITANNIA BEACH, BRITANNIA BEACH

GeoPacific Project #: 13088
Figure: C.01

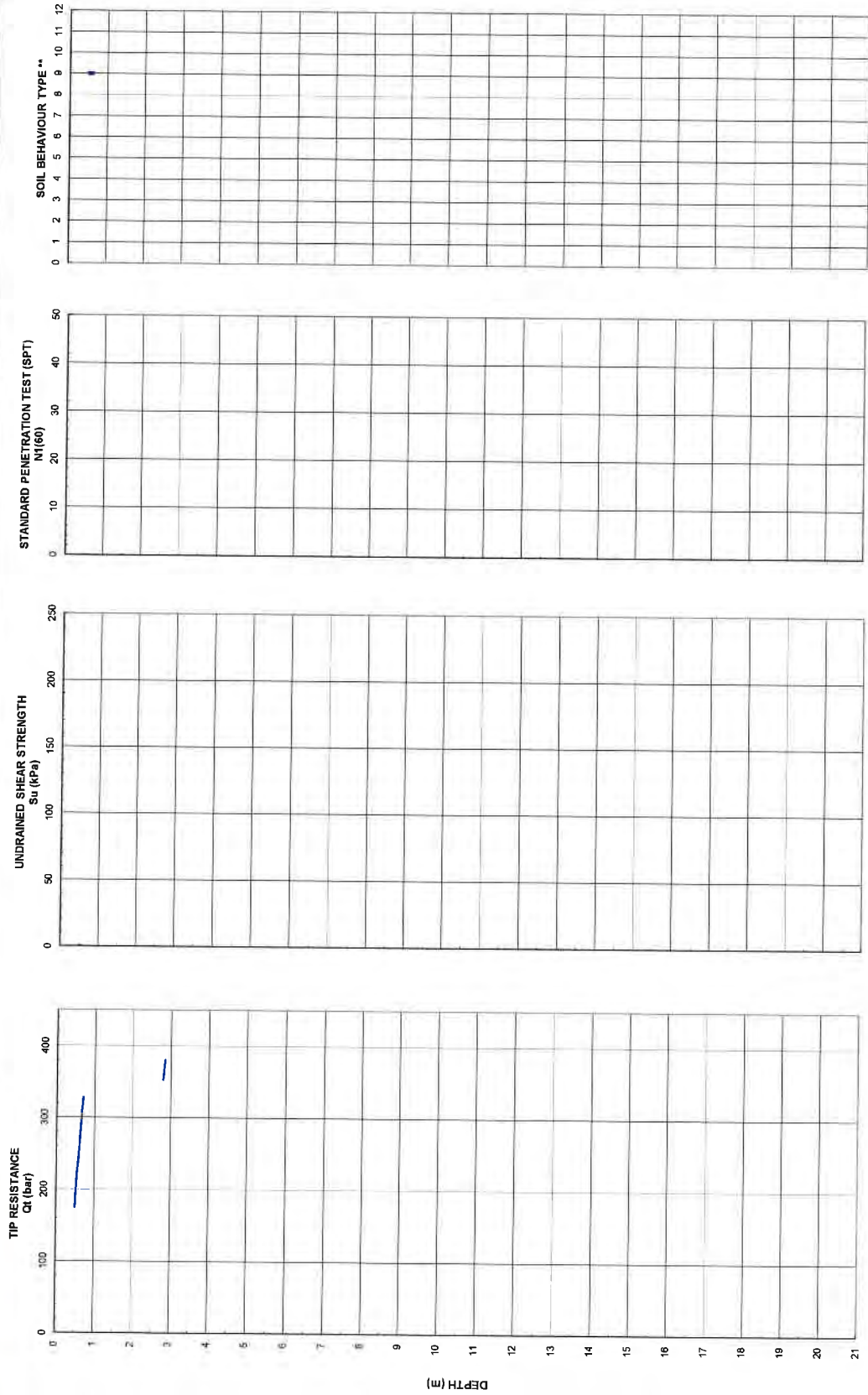


NK=12.5

** Based on Robertson et. al 1986

- 1 Sensitive Fine Grained
- 2 Organic Material
- 3 Clay
- 4 Silty Clay to Clay
- 5 Clayey Silt to Silty Clay
- 6 Sandy Silt to Clayey Silt
- 7 Silty Sand to Sandy Silt
- 8 Sand to Silty Sand
- 9 Sand
- 10 Gravelly Sand to Sand
- 11 Very Stiff Fine Grained
- 12 Sand to Clayey Sand

	16-Jul-15	TAICHENG DEVELOPMENT CORPORATION BRITANNIA BEACH, BRITANNIA BEACH	GeoPacific Project #: 13088 Figure: C.02
	Sounding: CPT15-02		



Nkt=12.5

** Based on Robertson et. al 1986

- | | | | |
|--------------------------|-----------------------------|----------------------------|----------------------------|
| 1 Sensitive Fine Grained | 4 Silty Clay to Clay | 7 Silty Sand to Sandy Silt | 10 Gravelly Sand to Sand |
| 2 Organic Material | 5 Clayey Silt to Silty Clay | 8 Sand to Silty Sand | 11 Very Stiff Fine Grained |
| 3 Clay | 6 Sandy Silt to Clayey Silt | 9 Sand | 12 Sand to Clayey Sand |

APPENDIX C - OVER CONSOLIDATION RATIO ANALYSIS

The over consolidation ratio (OCR) is defined as the ratio between the maximum past vertical pressure on the soil versus the current in-situ vertical pressure. The maximum past vertical pressure is typically caused by the presence of excess overburden which is removed by either natural or man-made reasons. Soil ageing and other chemical precipitation affects can also cause a soil to behave as if it has a higher maximum past pressure, which is sometimes described as pseudo-overconsolidation.

Research by Schmertmann (1974) showed the following equation reasonably approximates the OCR of medium plastic to clayey soils:

$$OCR = \left(\frac{\left(\frac{Su / p'_{oc}}{Su / p'_{nc}} \right)^{5/3} + 0.82}{1.82} \right)$$

Su/p'_{oc} = The undrained shear strength to effective stress ratio of the over consolidated soil

Su/p'_{nc} = The undrained shear strength to effective stress ratio of a normally consolidated soil (OCR = 1). Typically = ~0.2

Soils which are subject to loads less than the maximum past pressure of the soil are typically subject to relatively small elastic settlements. Loads which exceed the maximum past pressure on the soil typically cause consolidation which is the gradual settlement of the ground as a result of expulsion of water from the pores of the soil. The rate of settlement and the time to complete consolidation is a function of the permeability of the soil.

The Schmertman equation has been employed to estimate the OCR of the soils with depth employing the CPT data provided in Appendix B and C.



16-Jul-15

TAICHENG DEVELOPMENT
CORPORATION

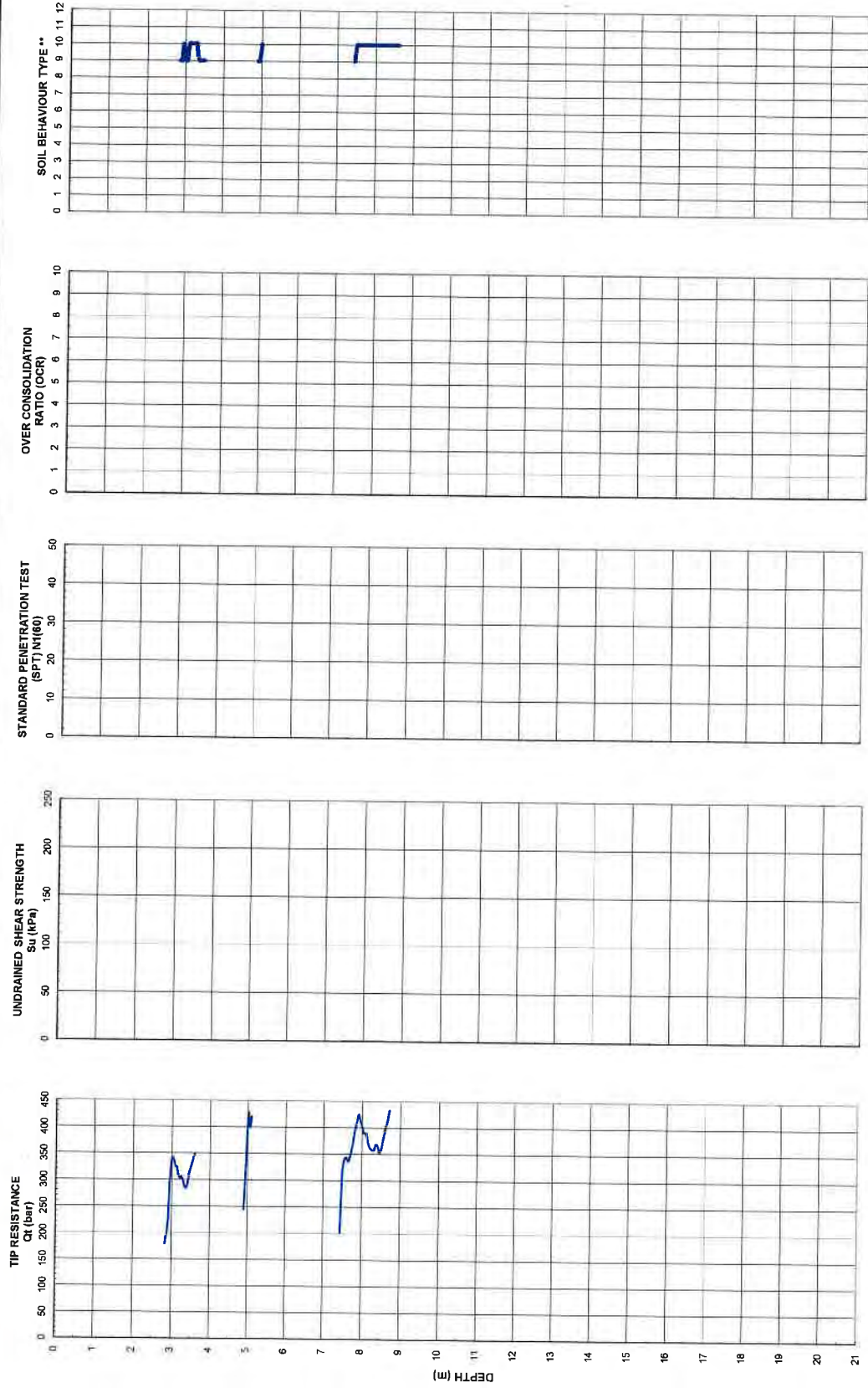
GeoPacific Project #: 13088

GeoPacific
Consultants Ltd.

Sounding: CPT15-01

BRITANNIA BEACH, BRITANNIA BEACH

Figure: C.01



Nk=12.5

** Based on Robertson et. al 1986

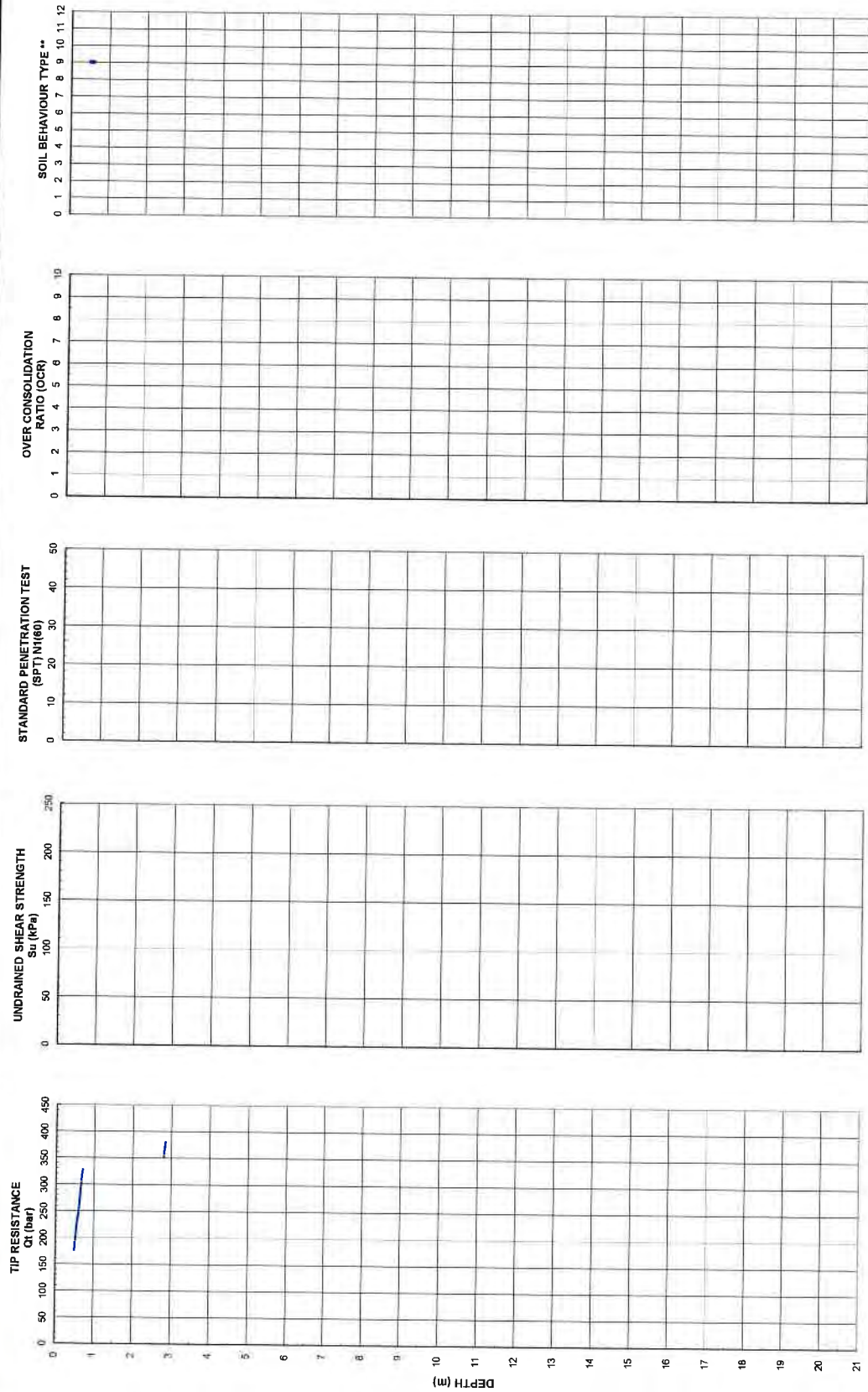
- 1 Sensitive Fine Grained
- 2 Organic Material
- 3 Clay

- 4 Silty Clay to Clay
- 5 Clayey Silt to Silty Clay
- 6 Sandy Silt to Clayey Silt

- 7 Silty Sand to Sandy Silt
- 8 Sand to Silty Sand
- 9 Sand

- 10 Gravelly Sand to Sand
- 11 Very Stiff Fine Grained
- 12 Sand to Clayey Sand

	16-Jul-15	TAICHENG DEVELOPMENT CORPORATION	GeoPacific Project #: 13088
Sounding: CPT15-02	BRITANNIA BEACH, BRITANNIA BEACH	BRITANNIA BEACH, BRITANNIA BEACH	Figure: C.02



Nkt=12.5

** Based on Robertson et. al 1986

- 1 Sensitive Fine Grained
- 2 Organic Material
- 3 Clay

- 4 Silty Clay to Clay
- 5 Clayey Silt to Silty Clay
- 6 Sandy Silt to Clayey Silt

- 7 Silty Sand to Sandy Silt
- 8 Sand to Silty Sand
- 9 Sand

- 10 Gravelly Sand to Sand
- 11 Very Stiff Fine Grained
- 12 Sand to Clayey Sand

APPENDIX D - LIQUEFACTION ANALYSIS

Assessment of the liquefaction potential of the ground has been determined by the Cone Penetration Test (CPT). The method of analysis is presented in the following sections.

FACTOR OF SAFETY AGAINST LIQUEFACTION

The factor of safety against liquefaction calculated here is the ratio of the cyclic resistance of the soil (CRR) to the cyclic stresses induced by the design earthquake (CSR). Where the ratio of CRR/CSR is greater than unity the soils ability to resist cyclic stresses is greater than the cyclic stresses induced by the earthquake and liquefaction will be unlikely. Where the CRR/CSR is less than unity then liquefaction could occur. This ratio is presented as the FOS Against Liquefaction on the following charts. Calculation of the factor of safety is based on Seed (1984)⁶ that determines the CRR from the normalized Standard Penetration Test $N_{1(60)}$ value and the percentage silt content. The value of the cyclic stress ratio has been calculated based on peak horizontal ground acceleration of 0.35g during the 2012 British Columbia Building Code design earthquake, which is consistent with our experience in this area.

SEISMIC INDUCED SETTLEMENT

In the event of a significant earthquake, settlement of the ground surface could occur as a result of densification of the looser soil layers as a result of liquefaction or due to the expulsion of sand in the form of sand dykes or sills from beneath the site. Tokimatsu and Seed (1987)⁷ suggest a method of analysis for estimating vertical settlements as a result of earthquake induced accelerations. In this method the normalized standard penetration blow counts ($N_{1(60)}$) is compared with the cyclic stress ratio for the induced earthquake to determine the volumetric strain resulting from the earthquake shaking. The volumetric strain is assumed to result in only vertical settlement. The vertical settlement is summed for each depth at which settlement is predicted to occur and accumulated from the bottom of the test hole. The results are presented on the following charts labelled as Settlement.

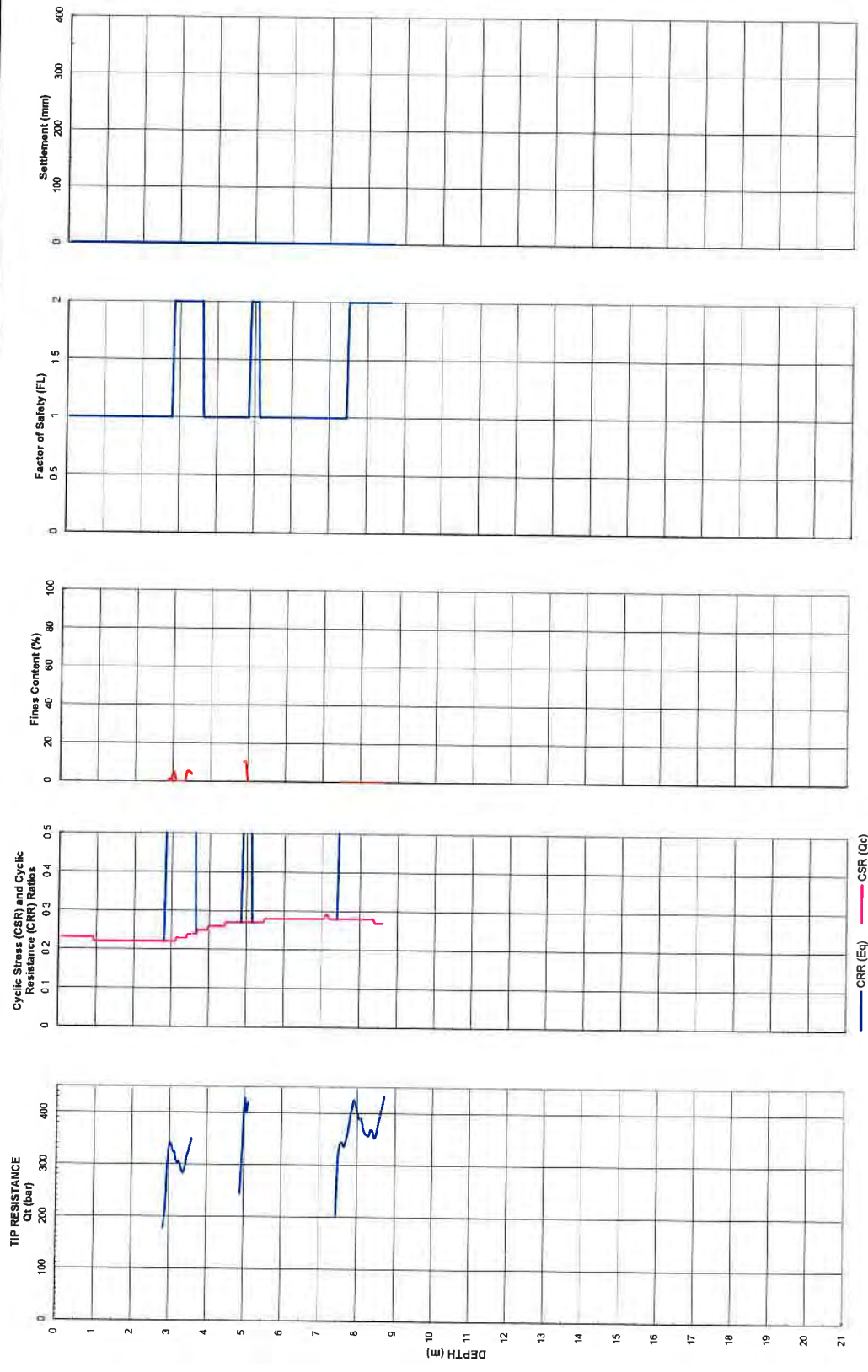
6

Seed, H.B., K. Tokimatsu, L.F. Harder, and R.M. Chung, 1984, "The Influence of SPT Procedures in Soil Liquefaction Resistance Evaluations", Report No. UBC/EERC-84/15, Earthquake Engineering Research Center, University of California, Berkeley.

7

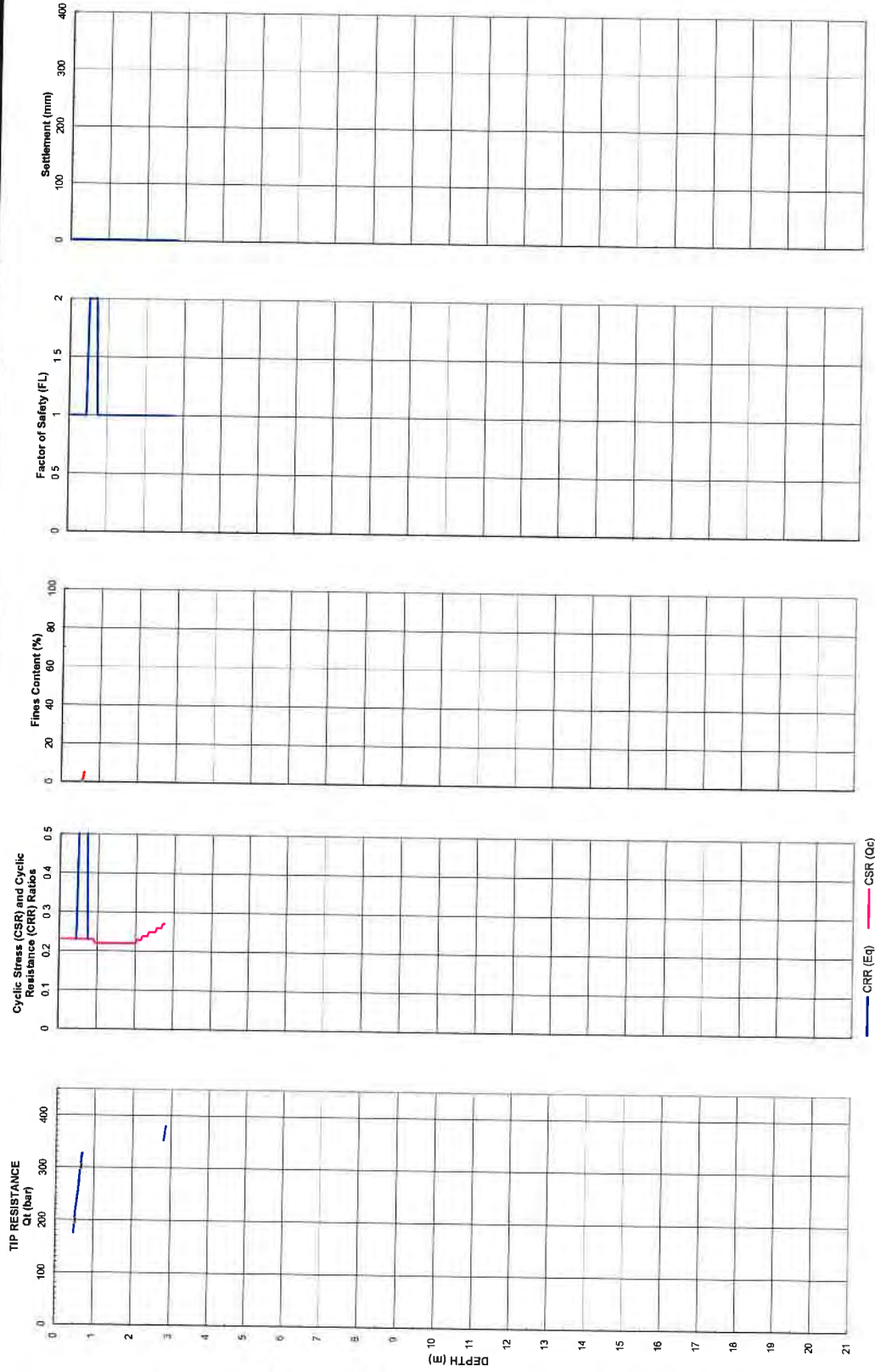
Tokimatsu, K.A.M. and Seed, H.B., 1987. "Evaluation of Settlement in Sands Due to Earthquake Shaking", Journal of Geotechnical Engineering, ASCE, Vol. 113, No. 8, pp. 861-878

	16-Jul-15	TAICHENG DEVELOPMENT CORPORATION	GeoPacific Project #: 13088
	Sounding: CPT15-01	BRITANNIA BEACH, BRITANNIA BEACH	Figure: D.01



Liquefaction interpretation ran with $PGA = 0.35g$

	16-Jul-15	TAICHENG DEVELOPMENT CORPORATION	GeoPacific Project #: 13088
Sounding: CPT15-02	BRITANNIA BEACH, BRITANNIA BEACH		Figure: D.02



Liquefaction Interpretation ran with PGA = 0.35g

July 16&17 Borehole locations

Hole ID:	Northing	Westing
CPT15-01 (TH15-01)	49.61888	123.20622
CPT15-02 (TH15-02)	49.61622	123.20749
TH15-03	49.61069	123.20998
TH15-04	49.61028	123.21178
MW15-01	49.61691	123.20649
MW15-02	49.61679	123.20538
MW15-03	49.61666	123.21031

13088 - Drill report

job number:
13088

date drilled/located:
Drilled: 16&17-July-2015

site location:
Britannia Beach, BC

contractors hired:
On Track Drilling Co. Ltd (Track Drill)

CPTs and depths:
2 @ 4-8 meters

THs and depths:
4 @ 6-15 meters

other tests (shear vanes, SCPT, DCPT):
4 DCPT's
3 monitoring wells installed.

Notes:

At CPT15-01 the cone was refused at numerous depths. We drilled out numerous times to try to advance the cone but no luck. At CPT15-02 we tried the same, after refusal @ 2.85 m we tried drilling out to 6.1 meters, however when pulling the auger out, a rock fell down-hole and the cone was refused at 5.5 m (no data was gathered on this sounding).

If you have any further questions feel free to contact Zach Henry at Ph.: 604 889 4905 or email: henry@geopacific.ca



MOISTURE-DENSITY FIELD REPORT
(ASTM D6938)

CLIENT:	TAICHENG DEVELOPMENT CORPORATION	JOB #:	13088
PROJECT:	BRITANNIA BEACH SOUTH DEVELOPMENT	RECEIVED:	17-Jul-15
LOCATION:	BRITANNIA BEACH, BRITANNIA BEACH	TESTED:	20-Jul-15

HOLE #:	TH15 - 01	TH15 - 01	TH15 - 01	TH15 - 02	TH15 - 02
DEPTH:	9'	18'	26'	5'	9'
M/C:	6.2%	12.8%	14.0%	2.8%	6.4%

HOLE #:	TH15 - 02	TH15 - 02	TH15 - 02	TH15 - 03	TH15 - 03
DEPTH:	21'	29'	39'	7'	15'
M/C:	16.2%	16.6%	15.2%	3.6%	4.7%

HOLE #:	TH15 - 03	TH15 - 03	TH15 - 04	TH15 - 04	TH15 - 04
DEPTH:	19'	24'	4'	6.5'	9'
M/C:	5.0%	4.1%	4.8%	20.2%	12.7%

HOLE #:	TH15 - 04				
DEPTH:	16'				
M/C:	2.8%				

HOLE #:					
DEPTH:					
M/C:					

HOLE #:					
DEPTH:					
M/C:					

COMMENTS:

DISTRIBUTION:

Per: Jakub Szary, B.Sc.

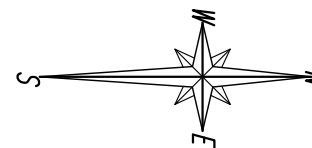
Reviewed By: Dion Lauriente, B.A.Sc., EIT


Senior Lab Technician

JUL 21 2015

Lab Manager

APPENDIX B – SITE PLANS COMPLETED BY OTHERS



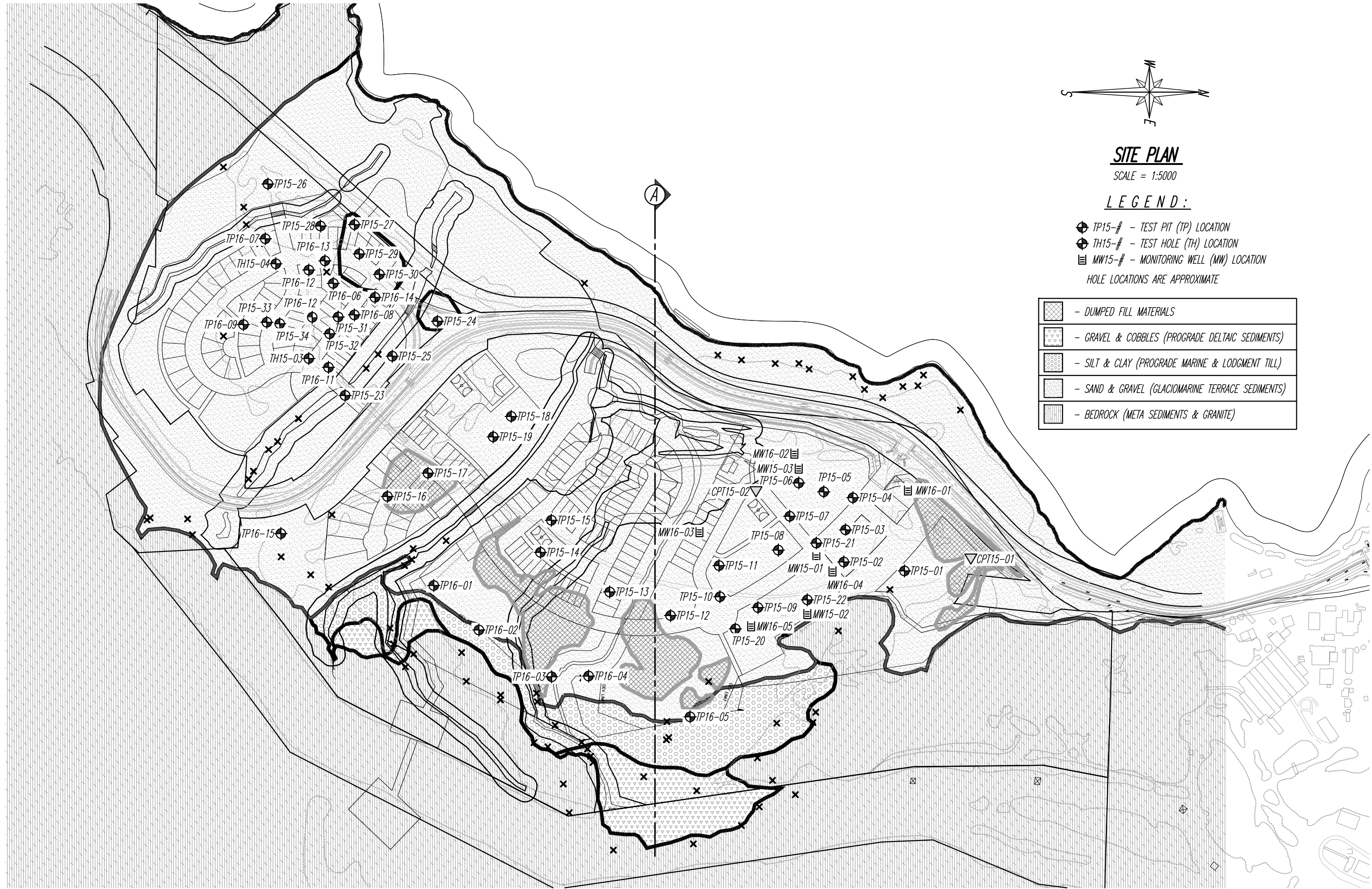
SITE PLAN

SCALE = 1:5000

LEGEND:

- TP15-# - TEST PIT (TP) LOCATION
 - TH15-# - TEST HOLE (TH) LOCATION
 - MW15-# - MONITORING WELL (MW) LOCATION
- HOLE LOCATIONS ARE APPROXIMATE

	- DUMPED FILL MATERIALS
	- GRAVEL & COBBLES (PROGRADE DELTAIC SEDIMENTS)
	- SILT & CLAY (PROGRADE MARINE & LODGMENT TILL)
	- SAND & GRAVEL (GLACIOMARINE TERRACE SEDIMENTS)
	- BEDROCK (META SEDIMENTS & GRANITE)



REFERENCE:



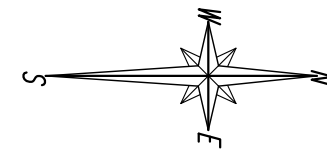
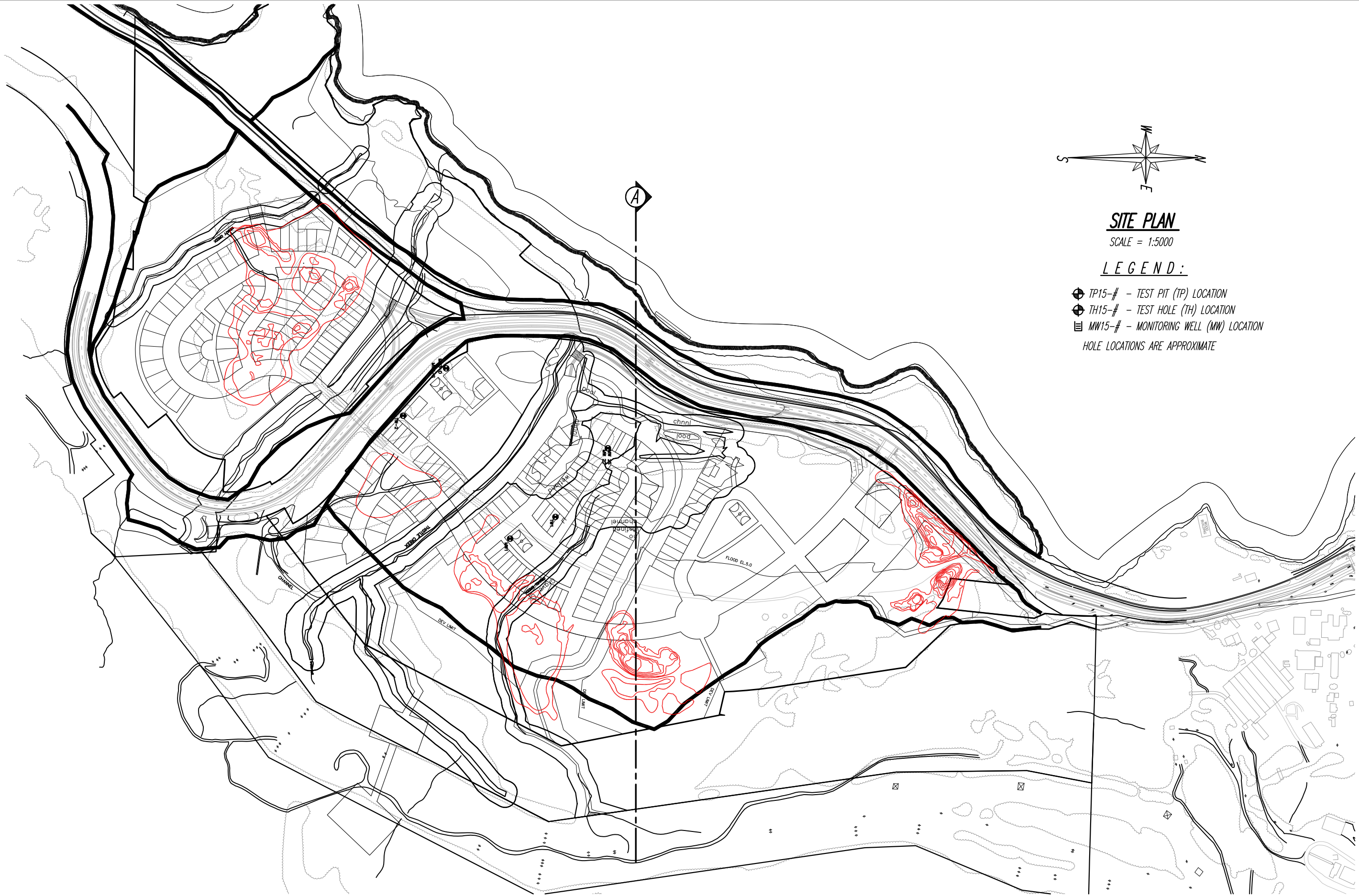
#215-1200 West 73rd Ave.
Vancouver, B.C. V6P 6G5
P 604.439.0922
F 604.439.9189

DATE: APRIL 18, 2016
DRAWN BY: M.P. APPROVED BY: S.M.F. REVIEWED BY: L.V.
SCALE: AS SHOWN

BRITANNIA BEACH SOUTH DEVELOPMENT
BRITANNIA BEACH, SQUAMISH-LILLOOET DISTRICT
SITE PLAN - TEST HOLE LOCATIONS

FILE NO.: 13088
DWG. NO.: 13088-1

REVISIONS:
A.
B.
C.



SITE PLAN
SCALE = 1:5000

LEGEND:

- ⊕ TP15-# - TEST PIT (TP) LOCATION
 - ⊕ TH15-# - TEST HOLE (TH) LOCATION
 - ≡ MW15-# - MONITORING WELL (MW) LOCATION
- HOLE LOCATIONS ARE APPROXIMATE



GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY

#215-1200 West 73rd Ave.
Vancouver, B.C. V6P 6G5
P 604.439.0922
F 604.439.9189

DATE:	APRIL 18, 2016		
DRAWN BY:	M.P.	APPROVED BY:	S.M.F.
SCALE:	AS SHOWN	REVIEWED BY:	L.V.

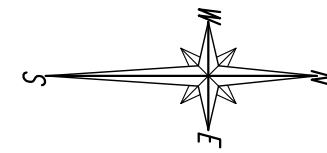
BRITANNIA BEACH SOUTH DEVELOPMENT
BRITANNIA BEACH, SQUAMISH-LILLOOET DISTRICT
SITE PLAN - SURFICIAL FILL MATERIAL

FILE NO.:	13088
DWG. NO.:	13088-3

REVISIONS:
A.
B.
C.

ORIGINAL PAPER SIZE 11"x17"

REFERENCE:



SITE PLAN

SCALE = 1:5000

LEGEND:

- ⊕ TP15-# - TEST PIT (TP) LOCATION
 - ⊕ TH15-# - TEST HOLE (TH) LOCATION
 - ▤ MW15-# - MONITORING WELL (MW) LOCATION
- HOLE LOCATIONS ARE APPROXIMATE

ORIGINAL PAPER SIZE 11"x17"

REFERENCE:



GEOPACIFIC
VANCOUVER EDMONTON CALGARY

#215-1200 West 73rd Ave.
Vancouver, B.C. V6P 6G5
P 604.439.0922
F 604.439.9189

DATE:	APRIL 18, 2016		
DRAWN BY:	M.P.	APPROVED BY:	S.M.F.
SCALE:	AS SHOWN	REVIEWED BY:	L.V.

BRITANNIA BEACH SOUTH DEVELOPMENT
BRITANNIA BEACH, SQUAMISH-LILLOOET DISTRICT
SITE PLAN - SUBGRADE FILL MATERIAL

FILE NO.:	13088
DWG. NO.:	13088-4

REVISIONS:
A.
B.
C.